

**2022 Groundwater and Surface Water
Monitoring Report
Macdonald Meredith & Aberdeen Add'l Landfill
Site
Echo Bay, Ontario
District of Algoma**

prepared for

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1.0 Introduction

Tulloch Engineering Inc., in association with Sawicki Groundwater Engineering Inc., was retained by the Township of Macdonald Meredith and Aberdeen Additional to provide hydrogeological consulting services at the Township of Macdonald Meredith and Aberdeen Additional landfill site, near Echo Bay Ontario. **Figure 1** shows the site location. The completed work program was generally consistent with the monitoring program that previously satisfied the requirements of the Environmental Compliance Approval (ECA) issued for the site.

The Macdonald, Meredith and Aberdeen Additional landfill site operates under an Amended Environmental Compliance Approval No. A561302 dated October 14, 2021 (originally issued February 23, 2015, and previously amended November 22, 2017, and September 3, 2019) (**Appendix A**). The site is located in an upland area approximately 250 m west of Watson Road East, and is about 4.5 km southeast of Echo Bay (**Figure 1**).

Based on the municipality's desire to receive non-hazardous contaminated soil from outside the service area, an application for modifications to the ECA was submitted to the Ministry of Environment Conservation and Parks (MECP). The revised ECA was issued in October 2021. However, the field work for the 2021 monitoring program had largely been completed based on the ECA that was in force at the time. Thus, modifications to the monitoring program began in 2022.

The monitoring program for this landfill involves the collecting, analyzing and interpreting surface water and groundwater water data collected from established monitoring stations and existing groundwater monitoring wells. Both surface water and groundwater were sampled in the spring, summer, and fall of 2022. The various monitoring locations that are currently in use, and have been historically used in the past assessments, are shown on **Figure 2**. **Appendix B** presents the monitoring well logs and **Appendix C** provides the monitoring well construction details.

The Township of Macdonald Meredith and Aberdeen Additional landfill site has been the subject of previous studies by Waters Environmental Geosciences Ltd. and Tulloch Engineering Inc. A listing of the reports prepared regarding this landfill are presented in the References, at the end of this report.

This report presents the data collected, the results of the monitoring activity and an interpretation of the data collected during 2022.

2.0 Background and Monitoring system

2.1 Site Setting

The Site is located in an area where there are overburden filled depressions in the bedrock. The landfill is situated along the edge of a topographic depression that was at least partly filled with overburden material during the recession of the last glaciers. The overburden in the site vicinity is mapped as thin drift over Precambrian bedrock (OGS Google EARTH 2000).

The Precambrian bedrock that underlies the study area is the Cobalt Group (conglomerate, wacke, arkose, quartz arenite to argillite) of the Huronian Supergroup (OGS, 1991), which underlies much of the North Shore of Lake Huron.

The stratigraphy at the site is viewed along two stratigraphic cross sections based on the borehole data obtained during the previous well installation programs. **Figure 2** shows the site plan and cross section locations and **Figure 3** present the cross sections. Although the bedrock was not penetrated by the boreholes, refusal was encountered during the construction of MW-6, and numerous bedrock outcrops can be seen on the satellite imagery along the bedrock highland areas that flank the landfill. The sections highlight the thickness and dominance of the clay-rich overburden deposits at this landfill site. To demonstrate the position of the water table at the site, the groundwater elevations in the overburden (**Appendix D**) are presented on **Figure 4** (representing the conditions for early November 2022).

2.2 Groundwater Monitoring Wells

The initial drilling and well installation program was undertaken on July 25, 2013. At that time, monitoring wells were installed at 4 locations (MW-1, MW-2, MW-3 and MW-4) near the landfill site (**Figure 2**). MW-1 was assumed to be a background groundwater monitoring location, MW-2 and MW-3 are immediately downgradient of the waste deposits, while MW-4 is located on the edge of open pasture land that is topographically down-gradient from the landfill site.

In the summer of 2015, at the recommendation of the MECP, two additional groundwater monitoring wells were installed (MW-5 and MW-6, **Figure 2**). MW-5 was located in the assumed downgradient area of the site (i. e. downgradient of the fill area), in the identified Contaminant Attenuation Zone (CAZ), while MW-6 was situated near a local height of land, in an area assumed to be upgradient of the landfill (i.e., interpreted to be removed from potential impacts due to landfilling operations).

The well logs for the six monitoring wells are presented in **Appendix B**. Monitoring well construction details are presented in **Appendix C**, and the historical and current groundwater level monitoring results are presented in **Appendix D**.

2.3 Surface Water Sampling Stations

Figure 2 shows the historical and current surface water monitoring locations. In some of the previous site monitoring reports, although the surface water station locations may have been modified, the original station numbers were retained in the sampling sheets which could potentially lead to confusion in the long-term data interpretation. As a result, the 2015 monitoring report introduced a re-numbering of a few of the surface water station locations, and this convention has been continued in all subsequent monitoring reports.

Surface water station SW-1A (the original SW-1 location) is approximately 60 m downstream of the former leachate detention pond. This sampling location was used to collect surface water samples in June, 2010, October, 2012, and November, 2013. Following the installation of groundwater monitoring wells (in 2013), location SW-1A was abandoned and replaced with SW-1B located further downstream (adjacent to MW-4), approximately 150 m downstream of the former leachate detention pond. This sampling location has been used to collect surface water samples from November, 2014 to the present.

SW-2 is situated at the downstream end of a former man-made leachate detention pond (approximately 0.15 ha in size) located approximately 50 m west of the fill area. The leachate detention pond was reportedly constructed with an earth berm at the downstream end. The berm reportedly washed out several years ago and there is currently no surface water impoundment. Downstream flow at this location is in a northerly direction via the small un-named creek.

SW-3A, the former background station, is situated near the assumed headwater area of the small un-named creek that rises to the southwest of the landfill site. This surface water monitoring station has historically been interpreted as being representative of background surface water quality conditions at the landfill site. However, at times it has been difficult to collect a water sample because of low flow conditions (or non-existent flow). SW-3A was considered a suitable background location, being in a headwater area, because it represented upstream surface water quality in the un-named creek that flows past the toe of the fill area.

Starting in 2023, the “background” sampling station was located in another nearby stream. **Figure 2** shows the new monitoring location, labeled SW3b. The new background sampling station is located in a water course adjacent to Watson Road. The water course is on the east side of the bedrock ridge that is considered a local surface water divide. Therefore, the proposed location is not under the influence of surface runoff from the landfill.

SW-4A (the original SW-4 location) is situated on the un-named creek at the upstream side of a culvert crossing at Watson Road East (approximately 1 km north of the landfill site). This location was originally recommended to the Township by MECP staff and was described as being a “far-field” location for surface water impact assessment purposes. This sampling location was used to collect surface water samples once, in May, 2015.

Following discussions, and with the agreement of MECP staff, this location was abandoned in favour of a new surface water monitoring point at the current downstream property boundary (SW- 4B). The concern at the time was that any water quality impacts being observed at such a remote distance from the landfill could potentially be affected by other land use activities not specifically related to the landfill site operation.

Thus, the new SW-4, labeled SW-4B, is situated on the un-named creek at the northern property boundary, approximately 470 m north of the landfill site. This sampling location has been used to collect surface water samples from August, 2015 to the present.

2.4 2022 Monitoring Program

2.4.1 Groundwater Monitoring

Prior to collecting the groundwater samples in May, August and October/November, 2022, an initial static water level was measured in each monitoring well. The results are presented in **Appendix D** as both groundwater level hydrographs and in tabular form.

The monitoring wells were then purged of standing water and allowed to recover overnight prior to sampling. A total of 3 to 5 well volumes was removed from each well. In the case of a slowly-recovering well, the well was purged dry (water level lowered to no deeper than top of well screen).

Well purging and sampling was completed using single-use (disposable) bailers, and the groundwater samples were immediately transferred to the laboratory-prepared and provided sample containers, and preserved as required. In the case of the metals, the sample was field filtered using a 0.45 µm disposable filter prior to preservation with nitric acid. The groundwater samples were held in a temperature-controlled cooler, pending shipment to the analytical laboratory.

2.4.2 Surface Water Monitoring

Surface water samples were collected from the four surface water stations (SW-1B, SW-2, SW-3B and SW-4B) on the same day as the groundwater samples were collected. In accordance with MECP protocols, surface water samples for metals were not field filtered (resulting in the laboratory reporting total metals in their analyses).

The surface water samples were collected in laboratory-prepared and provided sample containers and preserved as required. The surface water samples were held in a temperature-controlled cooler, pending shipment to the analytical laboratory (Bureau Veritas Laboratories, Mississauga).

In accordance with the ECA, the water samples were submitted for analytical testing under Schedule 5 of the “Landfill Standards: A Guideline on the Regulatory and Approval Requirements for New or Expanding Landfill Sites” (revised, January 2012). The spring and summer sample sets were submitted for analysis of “Indicator” parameters, while the fall sample set was submitted for an enhanced version of the Indicator parameter list.

As well, field observations of the flow conditions, temperature and pH were taken at the various surface water sampling locations as part of the field program in 2022.

2.4.3 Quality Assurance and Quality Control Procedures

Consistent with previous monitoring at the site, the 2022 monitoring program followed several quality assurance / quality control procedures. The field protocols, primarily the sample collection, was done by experienced staff using industry-proven techniques. Sampling equipment was dedicated to each well location or was single-use, eliminating the potential for cross-contamination between sample points. Samples were held in temperature-controlled cooler chests, pending courier shipment to the laboratory, and sample holding times were within approved limits (typically next-day delivery to the laboratory following sampling).

Bureau Veritas Laboratories of Mississauga, Ontario, a CALA-certified laboratory (Canadian Association for Laboratory Accreditation) was retained to complete the laboratory testing of the surface water and groundwater samples. The laboratory standard operating practices imposed routine internal quality control procedures, such as sample spikes and matrix recovery analysis, as well as standard additions and internal calibration checks.

The third measure of quality assurance / quality control was the collection of “blind” field duplicate samples that were part of the submission to the laboratory. Blind duplicates were obtained from both groundwater and surface water monitoring locations during each sampling event, and were assigned a fictitious sample identification (MW-7 for groundwater and SW-5 for surface water). The duplicates

were taken randomly for each monitoring event and are included in the laboratory results reported in **Appendices E, F and G**.

To demonstrate the reliability of the QA/QC program, a plot of the concentrations reported for each sample versus the respective duplicate analysis for that sample was made for the groundwater and surface water samples. Only samples which produced results above the detection limits were plotted.

Figure 5 below (representing groundwater samples) shows the deviations from the theoretical straight line for the October/November 2022 duplicate data set. For these results, the relative percent difference (RPD) between each sample and its duplicate analysis ranged from a low value of 0 % (the duplicate was identical to the original sample result for several parameters) to a high value of 66 % (for the Copper duplicate). On average the RPD value was approximately 4.6 %, with an R^2 value of 1.0, which suggests excellent correlation. The spring and summer monitoring results have similarly good correlations.

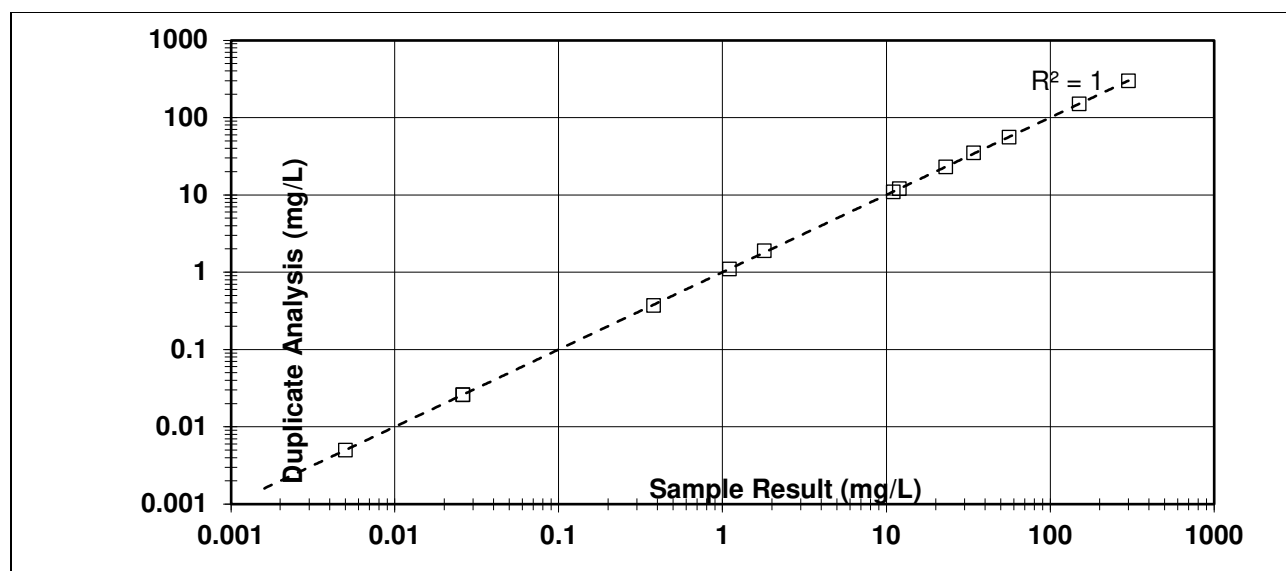


Figure 5 Groundwater Duplicate Analysis (Fall 2022 monitoring event)

3.0 Monitoring Results

3.1 Groundwater Flow System

Water levels in all monitoring wells were consistent and stable throughout the year, as shown on **Figure D-1, Appendix D**. No significant event or unusual seasonal fluctuations were observed as the timing of the monitoring events likely did not coincide with a major precipitation event. Consequently, the data collected in October/November 2022 was used to develop the groundwater flow map (**Figure 4**).

In comparison to the previous water level data, the water levels in 2022 were slightly lower during the spring and summer monitoring events but recovered in the autumn of 2022. Overall, the water levels were generally within the same range as previous years. The overall stability and consistency of the water levels is shown on the hydrographs (**Figure D-1**).

Based on the monitoring results, groundwater flow in the overburden is consistently northward with a small component of shallow groundwater contributing to flow in the small un-named creek that flows past the westerly edge of the landfill. The groundwater gradients between MW-3 or MW-5 and MW-4 (roughly along the groundwater flow path) were calculated to range from 0.31 to 0.40m/m and averages about 0.35 m/m, which is similar to past results.

In previous study reports, a localized groundwater mound was noted in the fill area. Although a localized mound is expected in the fill area, the data collected did not confirm the presence of the mound. The 2022 results show that there no notable changes to the overall local groundwater flow system; however, the groundwater mound previously depicted in earlier reports in the fill area is not shown for 2022.

The hydraulic conductivity of the overburden soils was determined (Waters' Report 213 - 265, dated April 26, 2014) to be 2.9×10^{-7} cm/sec, which is a reasonable value for unweathered lacustrine clays to glacial tills. Assuming a soil porosity of 0.4 (typical of clay-rich sediments), and using the average hydraulic conductivity value of 2.9×10^{-7} cm/sec, the average linear groundwater velocity (in the unweathered till) at the landfill is estimated at 2.9×10^{-7} cm/year (8 cm/yr.) which is similar to the average linear groundwater velocity interpreted in previous reports.

This average linear groundwater velocity is considered to be extremely slow, and indicates that the unweathered overburden groundwater flow system likely does not result in contaminants rapidly leaving the landfill site and moving to adjacent land parcels. When a water surplus develops and infiltration has been maximized on the landfill site, the excess water would likely move as overland flow to the adjacent surface water system. Thus, contaminant transport via the deeper overburden groundwater flow system is expected to be very low to insignificant.

A previous monitoring report (Waters Report No. 216 - 297, dated March 23, 2016) identified a bedrock-controlled groundwater divide at the southeastern portion of the study area. The groundwater divide appears as a bedrock ridge on cross-section B-B'. This divide (noted on **Figure 4**) essentially isolates the groundwater flow system southeast of the divide (e. g. near MW-6) from the flow system where the landfill is located. Thus, no southeastward contaminant movement is expected and none has been detected.

3.2 Surface Water Flow

In the autumn of 2022, surface water flow estimates were taken in the field. The results are summarized in **Appendix K**. The results show a slight increase in flow at SW-2 compared to SW-3. This could be a result of water storage in the wetland area upstream of SW-2 after a precipitation event and subsequent release of water which results in the apparent flow gain. It should be noted that it is within this reach of the stream that the landfill may be contributing a small amount of runoff and groundwater flow to that gain. Further downstream, at SW-1B, the estimated stream flow is lower, suggesting the stream is losing water either to infiltration to the groundwater system or to evapotranspiration.

3.3 Groundwater and Surface Water Chemistry

The laboratory water quality monitoring data for the spring, summer, and fall 2022 monitoring events are presented in **Appendices E, F, and G**, respectively. In addition, both the current (2022) and the historical (2010 – 2021) water quality monitoring data are presented as Geochemical Summary Sheets in **Appendix J**. The surface water data cover a 12-year period, while the groundwater data span the last 9 years.

Selected parameters are used to monitor the landfill performance (from an impact to natural resources perspective). These were reviewed and plotted as concentration versus time plots (specifically alkalinity, chloride, sulphate, boron, sodium, iron, manganese, zinc and dissolved organic carbon (DOC)) to examine long term trends in groundwater and surface water quality. These parameters are those identified in the Amended ECA (**Appendix A**).

3.3.1 Groundwater Trend Analyses

The concentration versus time trends for the groundwater samples are presented in **Figure 6** through **Figure 14**. Only laboratory results that were above the method detection limits (MDLs) were plotted on the charts (since the method detection limits can vary from analyses to analyses, and season to season).

For alkalinity (**Figure 6**), the spring 2022 levels were generally the same as or slightly lower than the autumn 2021 levels. The only exception was at MW-4 and MW-5 where the alkalinity appears to have risen since the previous monitoring. There appeared to be a slight increase in alkalinity after August 2022 in MW-2, MW-3 and MW-6 with the remaining locations remaining stable. Groundwater sampled from MW-4 had the highest alkalinity and had the largest variation in alkalinity over time.

Chloride (**Figure 7**) levels in all wells were stable with little fluctuation throughout 2022. The exception was at MW-3, where chloride levels are higher than at other locations, but still considered low. Chloride level remain low and within the typical range previously experienced at this monitoring location.

Sulphate concentration (**Figure 8**) in samples from all wells continued to trend lower. The only deviation to the trend was at MW-2, where sulphate levels had a small upward spike in concentration at the spring 2022 monitoring event. Sulphate levels remain low and within the typical ranges previously experienced at these monitoring locations.

Boron concentrations (**Figure 9**) for all locations, varied within their typical ranges in 2022. At MW-1, MW-2, MW-3, and MW-4 there was a drop in boron concentration in the spring, but the concentration trends were upward for the rest of the year. At MW-5 and MW-6, the concentration trend was flat. Overall, boron levels remain low and within the range typically seen at these locations.

Sodium trends (**Figure 10**) were also stable and within typical ranges at each monitoring location. At MW-2, MW-3, and MW-4 there were slight increases in sodium levels in October. However, the increases were small. The highest sodium concentrations were reported for MW-4, followed by MW-2, MW-3 and MW-1. The lowest sodium concentrations were reported for MW-5 and MW-6.

The data for dissolved iron at most locations was too sparse to establish any meaningful trends (**Figure 11**). Apart from an anomalous spike in iron concentrations noted for the summer 2019 sample set,

dissolved iron levels are low. In many cases the concentration of dissolved iron is below laboratory detection levels (MDLs), making trend plotting difficult. For the purpose of trend analysis, the data was plotted with lines joining the rather sparse data. The results confirm that there are no meaningful trends. These very low iron levels suggest a very limited potential for the migration of dissolved iron via the local groundwater flow system.

The long-term manganese concentration trends (**Figure 12**) are generally decreasing with time, but fluctuating within a consistent range. Continued decreasing trends in manganese can be seen MW-4 and MW-6 with small increases at MW-2 and MW-5. The highest manganese levels were reported for MW-5, followed by MW-2.

The data set for zinc was also too sparse to establish any meaningful trend at any of the monitoring wells (**Figure 13**). This was because many of the reported zinc concentrations were below the laboratory method detection limits (MDLs). For the purpose of trend analysis, the data was plotted with lines joining the data. The results confirm that there are no meaningful trends but that there is a suggestion that zinc concentrations are very low. These very low zinc levels suggest a very limited potential for the migration of dissolved zinc via the local groundwater flow system.

The long term dissolved organic carbon (DOC) levels (**Figure 14**) at all monitoring locations have been trending downward and stabilizing since 2013. In the spring of 2022, there was a spike in DOC levels MW-2 and MW-6. DOC in these wells return to their normal levels for the remainder of the year. DOC levels remained stable through 2022. The highest DOC levels were reported for MW-1 and the lowest levels were reported for MW-6.

3.3.2 Groundwater Compared to Ontario Drinking Water Standards

The analytical results received from the laboratory (**Appendices E, F, and G**) were compared to the applicable Ontario Drinking Water Standards (ODWS 2006). Of the suite of parameters analyzed, 27 are contained in the Ontario Drinking Water Standards, which are sub-divided into Table 2 - Chemical Standards (Health Related) and Table 4 - Chemical / Physical Objectives and Guidelines (Non-Health Related).

The Non-Health Related parameters (Table 4) are further sub-divided into Aesthetic Objectives (related to nuisance problems like staining of porcelain, etc.) and Operational Guidelines (which are set for the proper operation of municipal water distribution systems).

Appendix H present the result of the comparison of the monitoring result to the ODWS criteria and shows where the criteria are exceeded. A summary of the results for each sampling event are presented below.

May 2022 Sampling Event

Of the groundwater samples collected for the May, 2022 sampling event, none of the parameters tested exceeded either their respective criteria.

August 2022 Sampling Event

Of the groundwater samples collected for the August, 2022 sampling event, only iron exceeded the Table 4 (Not Health Related) criteria.

For the other indicator parameters used at the site, there were no other parameters that exceeded their respective ODWS during the August, 2022 sampling event.

October 2022 Sampling Event

Of the groundwater samples collected for the October 2022 sampling event, none of the parameters tested exceeded either their respective criteria.

3.2.3 Reasonable Use of Groundwater Evaluation

Background water quality, the criteria set out in the Ontario Drinking Water Standards (ODWS) for downgradient groundwater users, and the Provincial Water Quality Objectives (PWQO) for downgradient surface water users, were used to calculate the Guideline B-7 (Reasonable Use of Groundwater) contaminant discharge criteria (RUG) specific to the Township of Macdonald, Meredith & Aberdeen Additional landfill site. These calculations are presented in **Appendix I**.

The Guideline B-7 RUG values are the maximum concentrations allowable at the downgradient end of a contaminant attenuation zone (or point of discharge to a surface water body) and are critical parameters for evaluating the impacts of the landfill on both the natural environment and downgradient groundwater users. If a non-compliant groundwater monitoring location is situated at a critical boundary, then the results would suggest that the site is not functioning in accordance with the current groundwater management policies of the MECP and that remedial measures may be needed.

The usual course of action in such cases is to secure the use of additional buffer land beyond the existing property boundary as a contaminant attenuation zone (CAZ) so that additional natural attenuation of the contaminated groundwater can occur before the revised property boundary is reached by the subsurface flow. Alternatively, the landfill design and operations method could also be modified so as to reduce the landfill impacts on the downgradient water resources.

In the present analysis of the environmental impacts at this facility, the application of the RUG values (Appendix I) to the present monitoring data provides insight into the compliance of the landfill site with Guideline B-7 criteria at the monitoring locations within the designated attenuation (buffer) area of the site. The results of these comparisons are tabled below:

Groundwater Monitoring Location	Parameters Exceeding Guideline B-7 RUG Criteria (for downgradient groundwater users)	Parameters Exceeding Guideline B-7 RUG Criteria (for downgradient surface water users)
MW-1	none	none
MW-2	Alkalinity, TDS	DOC (In Aug only)

Groundwater Monitoring Location	Parameters Exceeding Guideline B-7 RUG Criteria (for downgradient groundwater users)	Parameters Exceeding Guideline B-7 RUG Criteria (for downgradient surface water users)
MW-3	none	none
MW-4	Alkalinity, TDS (May and October)	(Boron is just at RUG in August and October)
MW-5	None	None
MW-6	none	none

The monitoring locations showing contaminant concentrations at or above of the Guideline B-7 RUG values (in 2022) were MW-2 and MW-4. These monitoring locations are all within the designated CAZ for the landfill; therefore, they do not signal non-compliance of the landfill site under Guideline B-7.

3.2.4 Groundwater Monitoring Summary

Groundwater flow at the site is northward away from the fill area. This is consistent with previous years and no notable changes were detected.

During the field inspections (**Appendix K**), it was noted that MW-5 and MW-6 had loose protective casings. These should be repaired to prevent the infiltration of surface water into the wells. Also, well inspections and minor repairs should be completed at each monitoring event and the condition of each monitoring well documented (including photograph at least once per year).

The trends in groundwater quality are consistent with those observed in previous years. Many of the ODWS parameters that exceeded the standard are naturally elevated in Northern Ontario settings, and the results of **Appendix H** are not interpreted as indicating impacts from the landfill site.

The wells that are situated closest to the landfill site waste deposits have elevated concentrations or levels of parameters such as conductivity, alkalinity, TDS, chloride, sulphate and DOC when compared to the assumed background groundwater chemistry (MW-6). The present interpretation is that these wells are demonstrating varying degrees of landfill leachate impacts.

Overall, with the exception of the groundwater quality at MW-6, the data suggest that all of the monitoring well locations are showing varying impacts related to landfilling operations. For 2022, the wells that had parameters exceeding the calculated Guideline B-7 RUG levels are MW-2, and MW-4. The quality of groundwater as measured in the other wells suggests that flow in the local groundwater system will not result in unacceptable discharges at the site boundary.

In terms of groundwaters discharging to surface water bodies, groundwater quality at wells MW-2, and MW-4 also exceeds Guideline B-7 criteria for the indicator parameters tested. As indicated previously, the low hydraulic conductivity of the overburden and the slow groundwater migration rates calculated for the overburden flow system, indicates that the groundwater flow system is not considered a dominant pathway for the egress of contaminants at this landfill site.

3.3 Surface Water Chemistry

The results of the surface water sampling program were compiled (**Appendix E, F, and G**) and compared to the applicable Provincial Water Quality Objectives (PWQO, 2007) for the protection of surface water quality. The purpose for the comparison was determine whether there were potential surface water impacts resulting from the landfill. Of the suite of geochemical parameters analyzed in this sampling program, 14 are contained in the Provincial Water Quality Objectives.

The Provincial Water Quality Objectives are sub-divided into two categories, Provincial Water Quality Objectives (PWQO, for which scientific data support the standards) and Interim Provincial Water Quality Objectives (IPWQO, for which scientific support for the standard is pending). A summary of the comparison for each sampling event is presented in the sections which follow.

3.3.1 2022 Surface Water Sampling Events

Surface water samples were collected at three on site monitoring stations plus the new background station (SW-3B) in May, August and October/November 2022. For all of these sampling events, total phosphorous exceeded its PWQO criteria of 0.03 mg/l at all four monitoring stations. In addition, boron exceeded the PWQO at SW-1b, SW-2 and SW4b in August 2022. Also, zinc was detected above its criteria at SW-3B in May of 2022. None of the other leachate “indicator” parameters exceeded their respective PWQO criteria.

3.3.2 Surface Water Trend Analyses

The trend for selected indicator parameters versus time are presented in Figure 15 through 22. Only laboratory results that were above the method detection limits (MDLs) were plotted on the charts (since the method detection limits can vary from analyses to analyses, and season to season). Also, dates with no values were removed from the data for plotting purposes. Lines were used to connect the available data to provide a sense of the trends with time. Also, it should be noted that locations SW-1A and SW-4A are no longer being monitored, and have no recent data.

Data for SW3b was not included in the trend analysis as there is only one year of data to date. SW3b will be added to the trend analysis beginning in 2023.

The alkalinity trend with time (**Figure 15**) shows the rather large variation over short time periods, but there is a trend toward increased alkalinity with time since about 2020. The short-term fluctuations are interpreted to represent event-based changes. Over the long term, alkalinity appears to be slightly increasing at all stations. For 2022, alkalinity at the new background station, SW-3B, at this location, alkalinity appears to be higher than previously recorded at SW-3A, the old background station. During 2022, alkalinity was low in the spring and began rising in the summer. This suggest the alkalinity levels may be related to the availability of water (high in dry periods and lower during times when there is more water (dilution) in the system).

Chloride (**Figure 16**) levels at SW-3B was low, similar to previous results from SW-3A. At locations downstream of the landfill, there was more fluctuation in chloride and the levels were generally higher. This suggest that event and seasonal flows impact surface water quality in areas downstream from the

landfill. While the chloride at SW-1B, SW-2 and SW-4B fluctuated in 2022, there appears to be a trend toward rising chloride levels. Overall Chloride remained below the RUG level.

Sulphate levels (**Figure 17**) have fluctuated within a relatively narrow range over the last two years, but have been trending downward since 2018. At SW-3B, the initial sulphate level is low, consistent with previous results from SW3a.

Boron levels over time have been stable since 2010, except for a spike in 2015 and the summer of 2022 (**Figure 18**). Fluctuations in boron concentrations are low for all stations.

The trend sodium (**Figure 19**) concentrations suggest a historical variability with time. Given the change in the monitoring suite in 2016, (and the removal of sodium as a monitored parameter) there were no recent sodium data added to the dataset.

The iron concentration trend (**Figure 20**) shows that total iron was previously relatively stable and low at all monitoring stations. However, the spike in August 2021, and previously in 2016 and 2017, suggests that there can be significant variability in total iron with time. Again, this is interpreted to be precipitation event related.

Manganese data is somewhat sporadic making an assessment of trends with time inconclusive (**Figure 21**). Also, because of the change in the suite of analyses done for surface water beginning in 2016 (including the removal of manganese as a monitored parameter) there were no recent manganese data added to the dataset.

Since 2016, zinc levels have fluctuated over a relatively small range and have generally been less than 0.02 mg/l (**Figure 22**) all locations. At SW-3, the zinc concentration appears to have spiked in August 2022, but returned to within its normal range at the Autumn sampling.

When compared to the groundwater data set, the surface water results were considerably more variable from one sampling event to the next. The surface water monitoring stations are located on a small unnamed creek that rises as a spring in close to the landfill and all of the flow within the creek is generated essentially from infiltration across the small basin that is enclosed by the topographic bedrock rises on the east, south and west sides (**Figure 2**) or overland flow within that basin.

The landfill site occupies approximately 20% of the local catchment area (i. e. as far downstream as SW-1B) and the variability in the concentration of several leachate indicator parameters (in the surface water samples) is interpreted to be a result of rapid infiltration of precipitation through the waste and a relatively fast release of leachate from the fill area to the nearby surface water creek.

This type of “event driven” generation and release of leachate to the surface water system, where the amount of leachate released is in proportion to the recent history of rainfall event frequency, duration, and intensity creates a data set whereby trends with time become more difficult to analyze. Trend analyses is most useful when the best fit line for the data set is either stable or a gently sloping curve of concentration over time. The “event driven” data set is characteristically more random in nature, and follows no clear trend over time. It is recommended that the tables of Appendix K continue to be populated with new annual data (when available) so that any apparent trends can be tracked and monitored.

3.3.3 Surface Water Monitoring Summary

A summary of the field testing done at each surface water station for each monitoring event is presented in Appendix K. Flow measurements were obtained in the autumn of 2022. Monitoring flow at each monitoring event and inspecting each surface water station is again recommended for 2023. As the data set is developed, a more robust interpretation of the data can be done.

On reviewing the surface water quality data from all sampling events in 2022, all the surface water locations suggest impacts due to landfilling activities. SW-3B, the new background location, appears to have generally similar quality to the former background station, SW3a. Thus, the initial results suggest this will be a suitable background location out of the influence of the landfill. Going forward, SW3b will provide a representation of local background surface water quality.

Future field observations at SW-3B will confirm background conditions, which historically suggest low alkalinity, low conductivity and low pH. It is expected that the SW-3B chemistry profile will also show local surface water quality is affected by precipitation events. For 2022, the alkalinity at SW-3B was notably higher than historical results from SW3a, but the other indicators were similar to the historical results from SW3a. Future monitoring will assist in establishing surface water quality trends at SW3b.

The sample collected at SW-2, the discharge point from the leachate detention pond (**Figure 2**), had elevated concentrations of water quality indicator parameters that are often associated with landfill leachate impacts, including alkalinity, chloride, conductivity and total Dissolved Solids (TDS). The water quality at SW-2 (as measured in 2022), compared to the water quality at SW-3B, the background monitoring station, suggests that SW-2 is experiencing some water quality impacts from the landfill site.

As observed in the field, there is only seasonal and event-based flow in the surface water system at this site, particularly at SW-2. This is interpreted to be the cause of the historically-reported elevated surface water temperatures at this sampling location (when compared to the other surface water sampling locations).

Further downstream, at SW-1B, the water quality indicator parameters show some evidence of landfill leachate impacts, with marginal increases in alkalinity, chloride, conductivity and DOC levels compared to background. The concentrations were similar to those observed at SW-2, but higher than those seen at SW-3B in 2022.

The samples collected from SW-4B (located approximately 470 m north of the landfill site) in 2022 suggested the possibility of some leachate impact. Indicators like alkalinity, chloride, conductivity, pH and sulphate appear to be following a similar trend to other monitoring stations.

When comparing the surface water quality results to background, there is an indication that leachate is reaching the surface water system either via shallow groundwater flow from the landfill or overland from the fill area. The pathway by which these additional loadings are reaching the small creek is assumed to be in the very shallow overburden soils, which were not specifically instrumented by the monitoring wells installed in 2013 (i. e. the monitoring well screens are too deep and short to directly intercept the shallow weathered overburden).

For all three 2022 monitoring events, there was evidence of decreased contaminant loading to the small stream, likely a result of dilution and dispersion in the shallow groundwater system and dilution in surface water system within the watershed.

The results from the current monitoring program suggest that the deeper overburden is not a contaminant pathway from the landfill site, but that contaminant migration is occurring in the weathered zone of the very shallow soils (i. e. less than 1 m below grade) and above the saturated low hydraulic conductivity clay overburden. Flow in the shallow overburden is likely sporadic and induced by shallow runoff during precipitation events and snowmelt (in the spring). This shallow groundwater flow is interpreted to be toward the nearby un-named creek.

Surface water quality at the site is interpreted to be affected by water moving through the shallow groundwater flow regime and by overland flow that moves to the adjacent surface water stream. Both depend on the precipitation received over the study area in the days prior to the actual sampling.

4.0 Recommendations and Conclusions

Monitoring program for 2022 included inspection of the monitoring system plus the collection of both surface water and groundwater samples. The results were compiled and reviewed to assess the impact of the site on local groundwater and surface water resources.

Based on the borehole data previously collected and reported and the current and historical groundwater measurements, the saturated clay overburden groundwater flow system is not considered to be a dominant contaminant pathway at this site. The overburden soils have a very low hydraulic conductivity, and groundwater flow rates are interpreted to be extremely slow.

The uppermost metre of soil (which includes topsoil and a weathered zone within the clay overburden) is considered to be the main contaminant pathway at the landfill site. This is the zone where incident precipitation infiltrates and moves laterally toward the small un-named creek down gradient of the site to the north. This zone is extremely difficult to instrument with monitoring wells due to its shallow depth; however, based on the surface water monitoring results, it appears that landfill leachate may be moving laterally from the fill area to the creek. The impacts appear to be precipitation “event driven” and are most often detected shortly after a precipitation event when infiltrating water passes through the waste generating leachate.

Since all of the groundwater monitoring wells are located within the designated landfill attenuation zone, the water quality parameters identified as exceeding the of the groundwater Guideline B-7 criteria do not necessarily indicate an adverse groundwater quality impact is occurring beyond the property boundaries.

The monitoring data indicates shallow groundwater and any overland flow from the fill area that reaches the small creek located immediately downgradient of the landfill may be affecting the surface water quality in the creek. These effects and the degree of impact is a function of the frequency, duration and size of rainfall events in the watershed (and including the landfill area itself). Efforts to minimize rainwater infiltration into the landfill waste deposits should be encouraged. These efforts could include minimizing the size of the open working face at the site, the use of daily/weekly cover,

the application of a lower-permeability final cover to completed waste cell areas and the grading and contouring of the landfill to promote rainwater runoff from the covered portions of fill area.

The current groundwater and surface water monitoring program should be continued, implementing any changes identified in the amended ECA and the MacDonald Meredith Landfill Plan of Improvements. As stated in previous monitoring reports, a visual inspection of the entire length of the watercourse (i. e. within the site boundaries) is recommended, to confirm that the monitoring stations are representative of conditions prevalent in the un-named creek.

The new surface water station, SW3b, appears to provide a good representation of local background surface water quality. The parameter suite for this station and frequency of monitoring should be the same as previous monitoring events.

Continued well development, water level monitoring and groundwater sampling is recommended to monitor groundwater quality in the overburden. This recognizes the need to keep these wells active and yielding water, given the low permeability formations soils in which they are constructed.

Recommendations for specific improvements to the monitoring program include the following.

- All monitoring wells should be inspected and conditions documented (photo as needed) at each monitoring event. The inspections should be used to document the repairs needed, if any, to the monitoring wells.
- It is our understanding that MW-5 and MW-6 still have loose casings that have yet to be repaired. Repairs to wells must be done using a qualified well drilling contractor/technician, in accordance with Regulation 903. This will result in more reliable groundwater quality sampling from these wells.
- Quantitative flow data and field chemistry data (pH, conductivity, temperature and dissolved oxygen) should continue to be gathered for the surface water sampling locations at the time of surface water sampling.
- Field chemistry data (pH and conductivity) should be measured before and during groundwater purging to demonstrate the stability of groundwater quality before samples are collected.
- During sampling, a single, blind, field-split duplicate sample should continue to be taken randomly from both a groundwater and a surface water station (i.e., one additional sample from a selected surface water station, and one additional sample from a selected groundwater monitoring well). These duplicate samples are part of the quality assurance/ quality control measures for the monitoring program.
- A reconnaissance survey of the length of the watercourse within the site boundaries is recommended in order to confirm the flowing conditions of this stream during each sampling program. Field conductivity and pH measurements along the watercourse would assist in identifying possible locations of groundwater discharge areas into the surface water body.
- Using available meteorological data, the flow data collected from the un-named creek and an estimate of the catchment for the un-named stream, a water balance for the site could be developed.

This would enable some predictive contaminant loading calculations, estimate the contaminating life of the site, and better determine the impacts of the landfill on the creek.

Note that any recommendations above have been based on the information provided to Tulloch Engineering Inc., and subsequent data collected by our firm, in accordance with the work program agreed to by you. No warranties, representations or liabilities of whatsoever nature are extended to other parties who may receive copies of this report (or abstracted information from it).

Should supplemental information become available, concerning the groundwater conditions within the vicinity of the site, it is requested that Tulloch Engineering Inc. be contacted and allowed to review the information to determine if any modifications or changes to our recommendations are warranted.

In no event shall Tulloch Engineering Inc. have any legal duty or responsibility to any third party reviewing this report unless it has a formal contractual relationship with such a third party. Contractors or others who are considering undertaking work activities on this site should satisfy themselves of the site conditions reported herein before submitting quotations or work proposals for this site.

5.0 Closure

We thank you for the opportunity of working with the Township of Macdonald, Meredith and Aberdeen Additional on this project, and trust that this information is of assistance to you. If you have any questions about this report, or require any further details, please contact the undersigned directly.

Yours truly,

TULLOCH ENGINEERING INC.

SAWICKI GROUNDWATER ENGINEERING INC.



Marshall Thompson, P. Eng.
Project Manager

David Sawicki, P. Eng.
President

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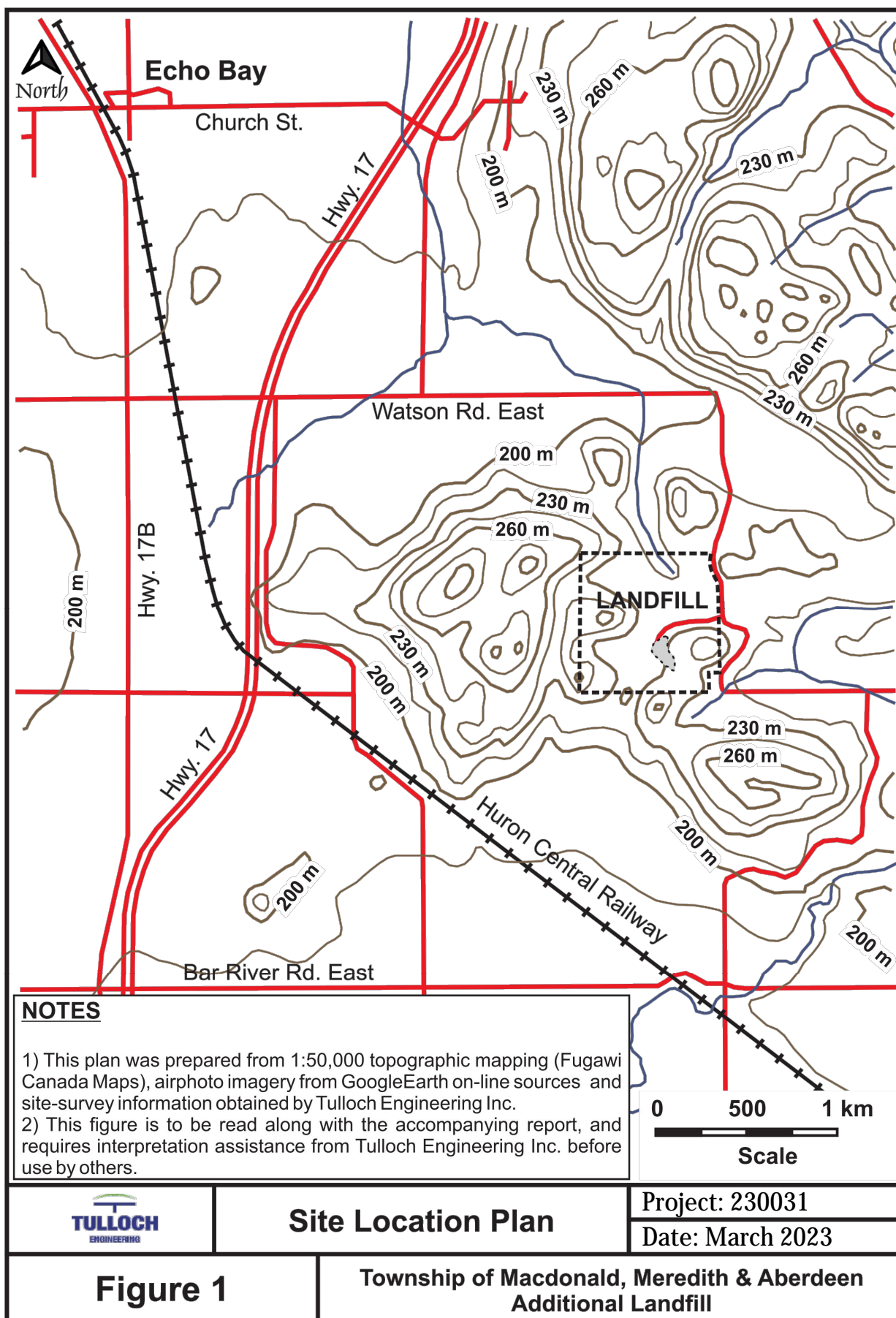
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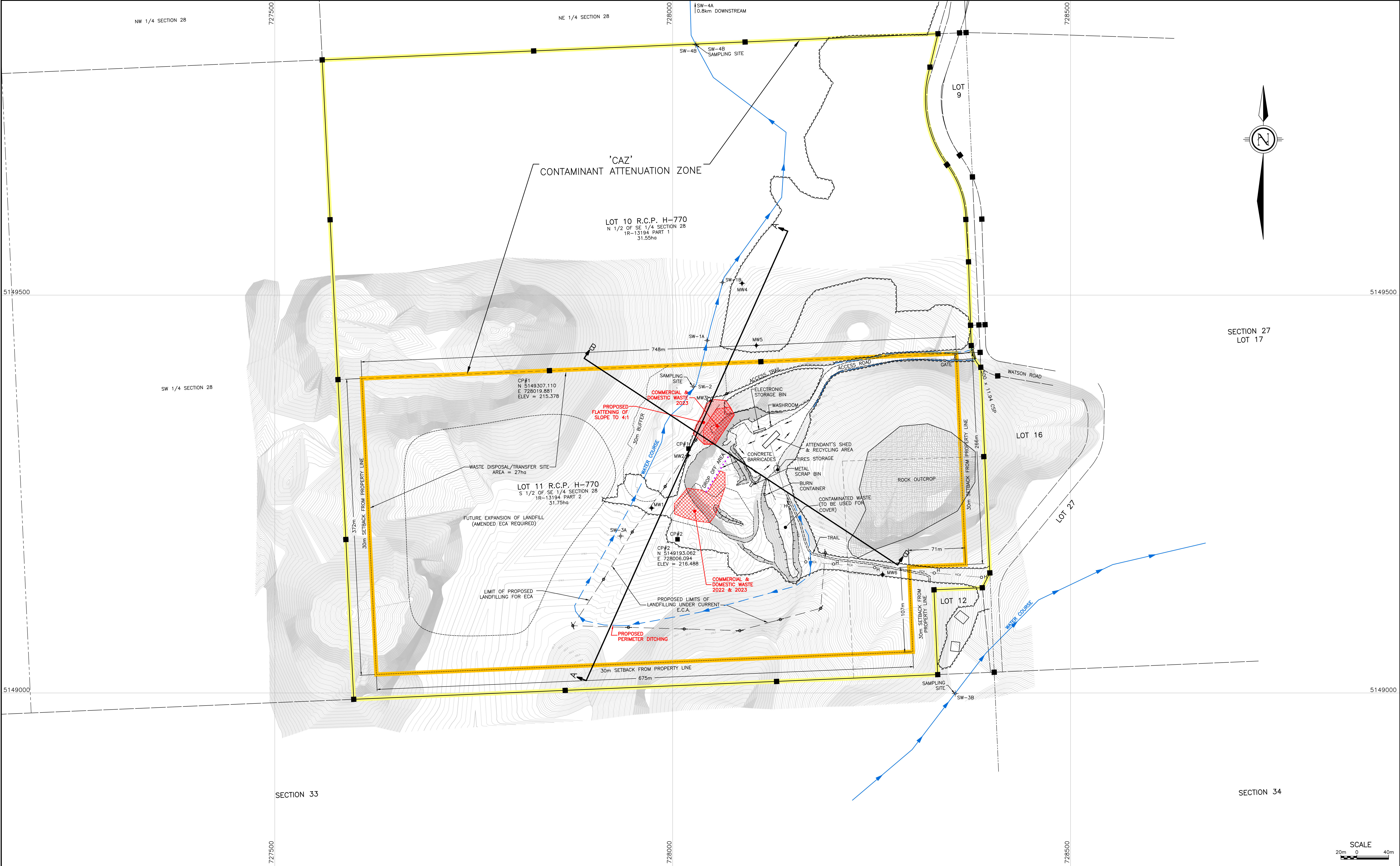
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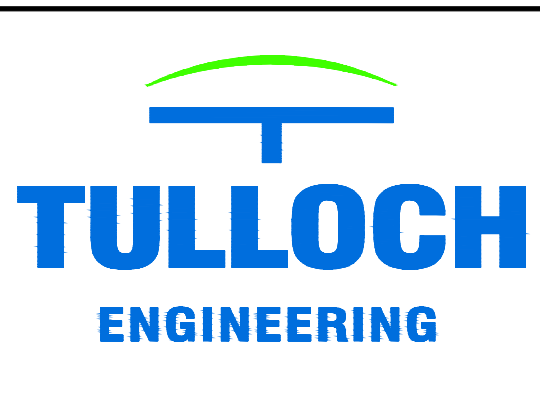
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INDEX CONTOUR (1.0m INTERVAL)	179.0
INTERMEDIATE CONTOUR (0.25m INTERVAL)	
PROPERTY LINE	
BUSH LINE	
EXISTING ROAD	
WATER COURSE	
TOP OF BANK	
BOTTOM OF BANK	
DITCH LINE	
UTILITY POLE	o B&H
ANCHOR	
CONTROL POINT	■ CP
SURVEY MONUMENT	■
MONITORING WELL	◆ MW1
SURFACE WATER SAMPLING SITE	⊕ SW-1
POSTED SIGN "LIMIT OF LANDFILL"	⊕
LANDFILL PROPERTY	
WASTE DISPOSAL AREA (27ha)	

NOTES:

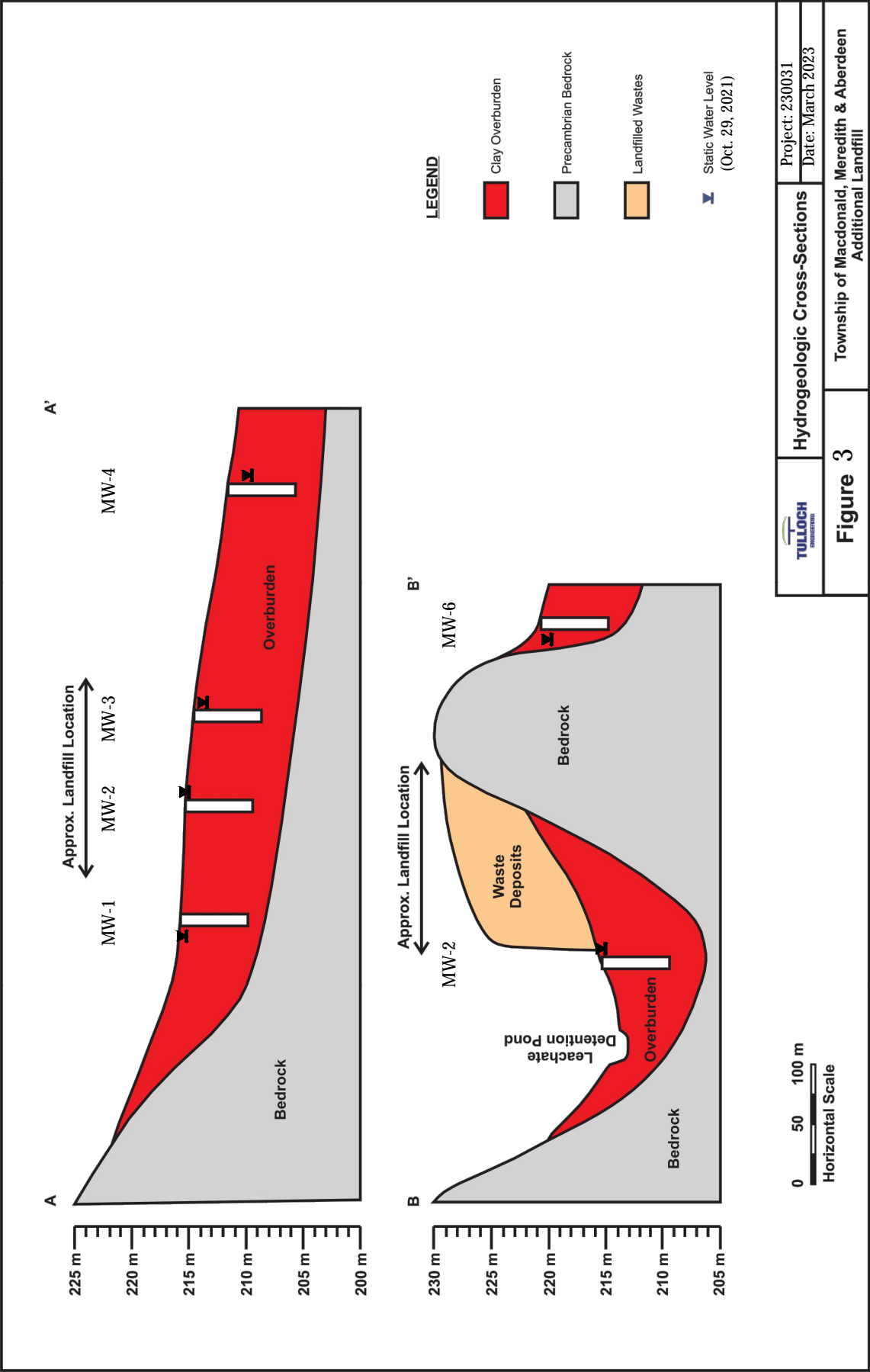
CONTOURS WITHIN THE LANDFILL AREA ARE BASED ON TOPOGRAPHICAL SURVEY COMPLETED BY TULLOCH ENGINEERING IN MAY 2008. CONTOURS BEYOND LANDFILL AREA ARE BASED ON TOPOGRAPHICAL MAP BY W.E. BOLAN, O.L.S. DATED DECEMBER 16, 1971.

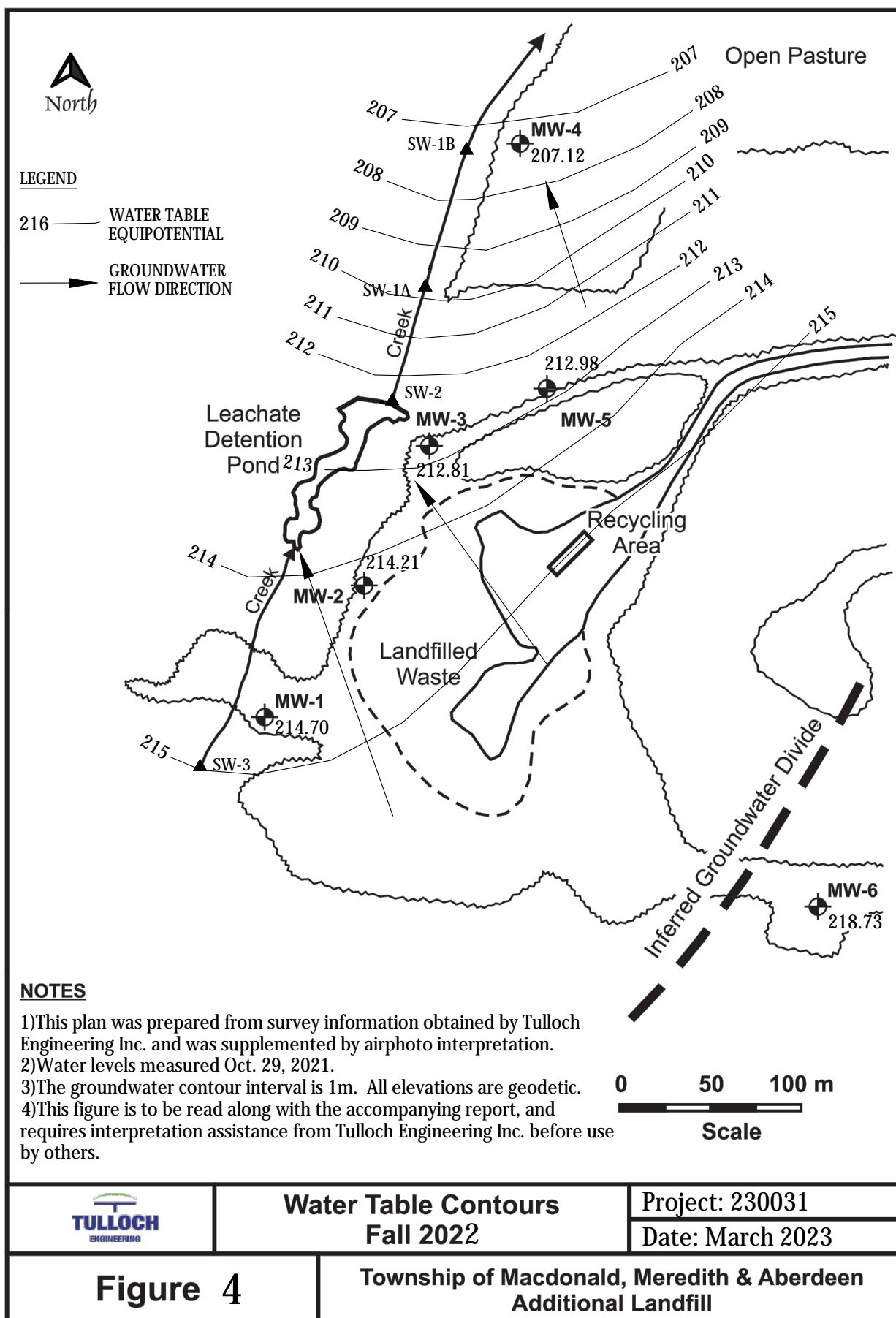
GRID LINES AT 500m BASED ON NAD 83 COORDINATES

Revision:	No.	Date	By



TOWNSHIP OF MacDONALD, MEREDITH & ABERDEEN ADD'L		Scale 1:2000	
MUNICIPAL LANDFILL SITE SITE PLAN AND MONITORING LOCATIONS		Dr. JS	Ch. MDT
		Date	APRIL 2023
		Dwg. No.	REV.
		FIGURE 2	0





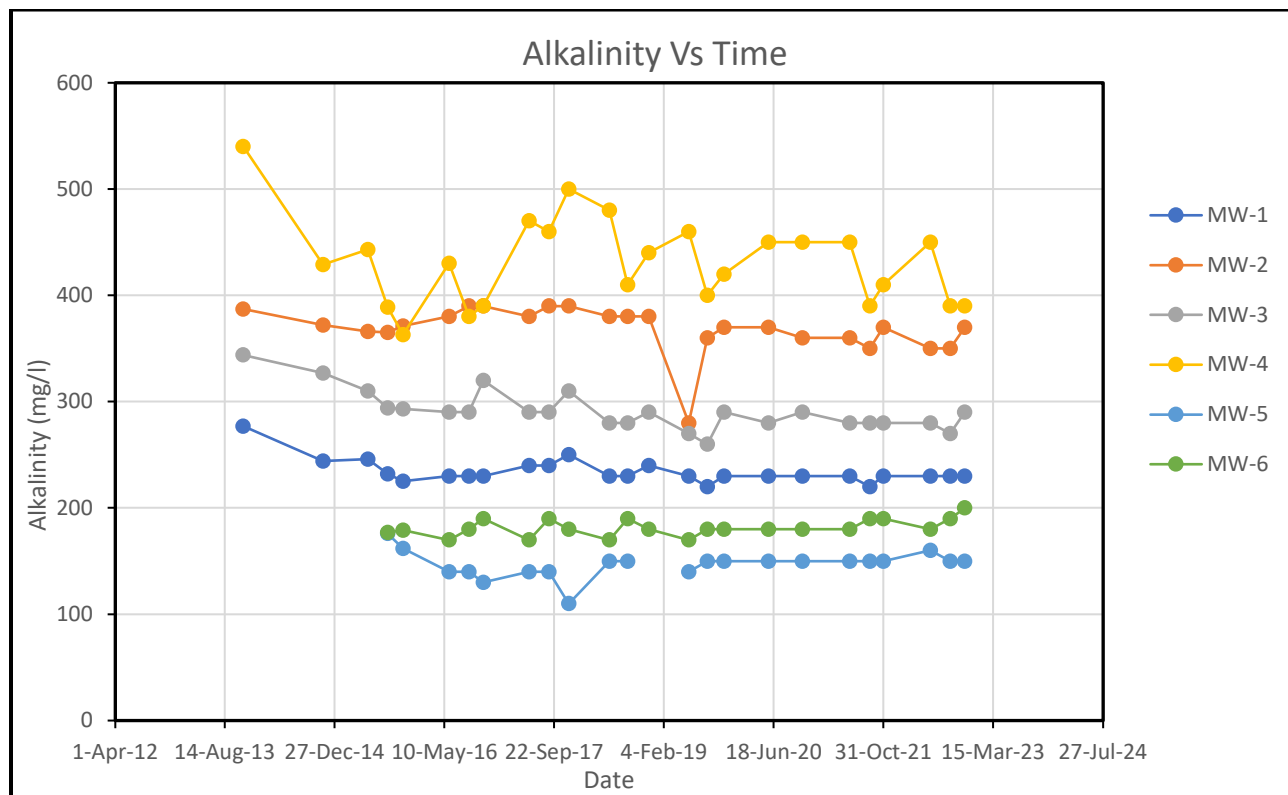


Figure 6 Alkalinity Vs Time Trend

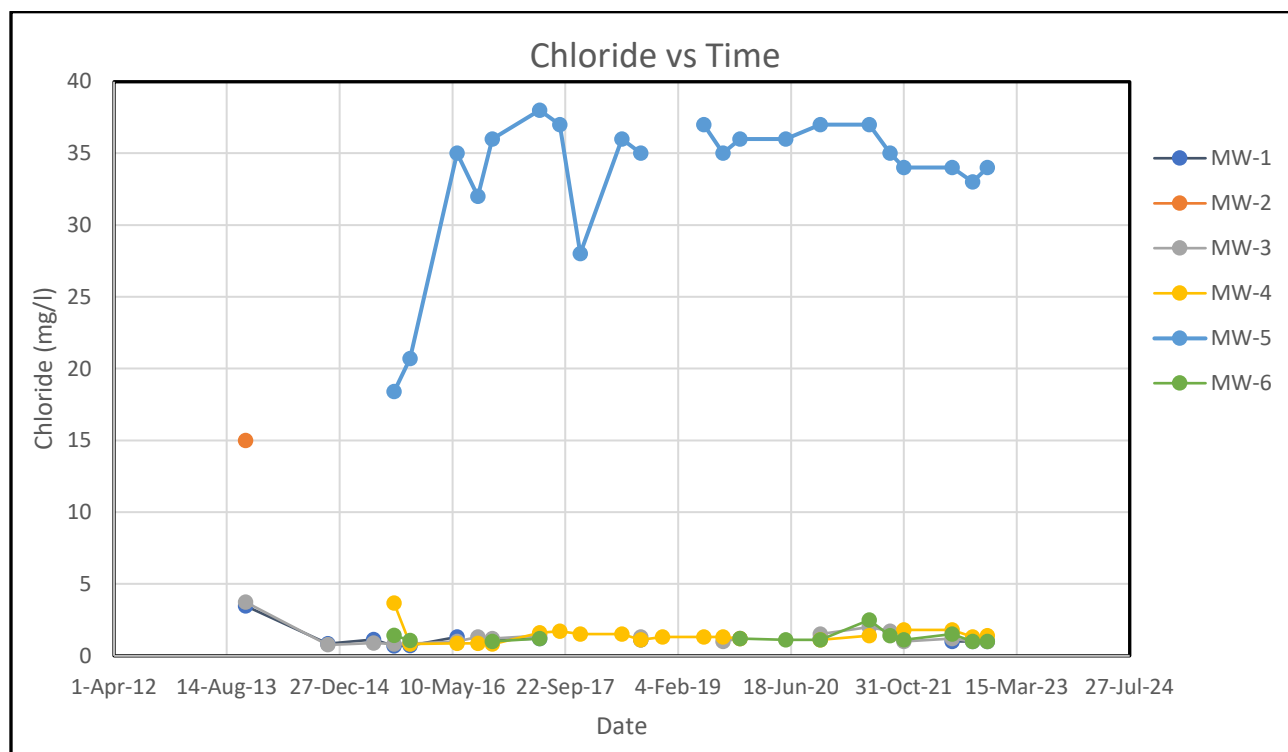


Figure 7 Chloride Vs Time Trend

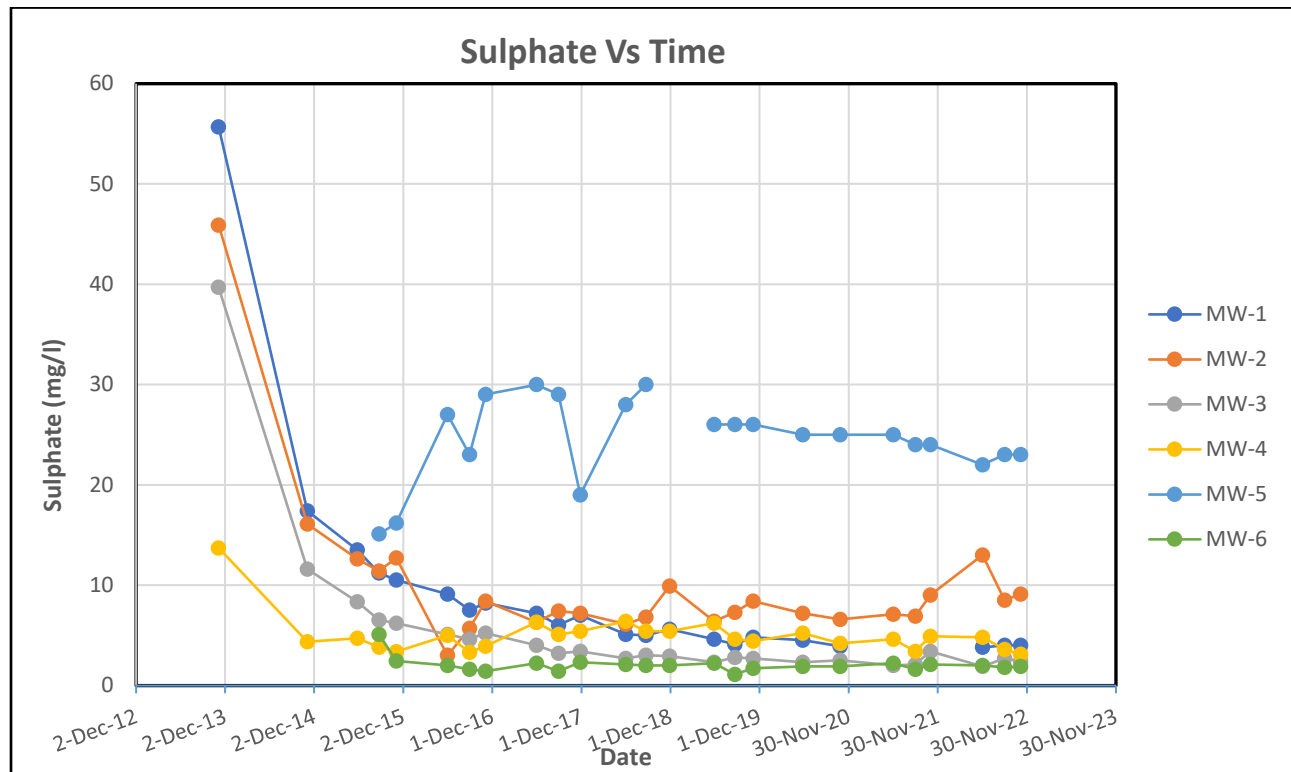


Figure 8 Sulphate Vs Time Trend

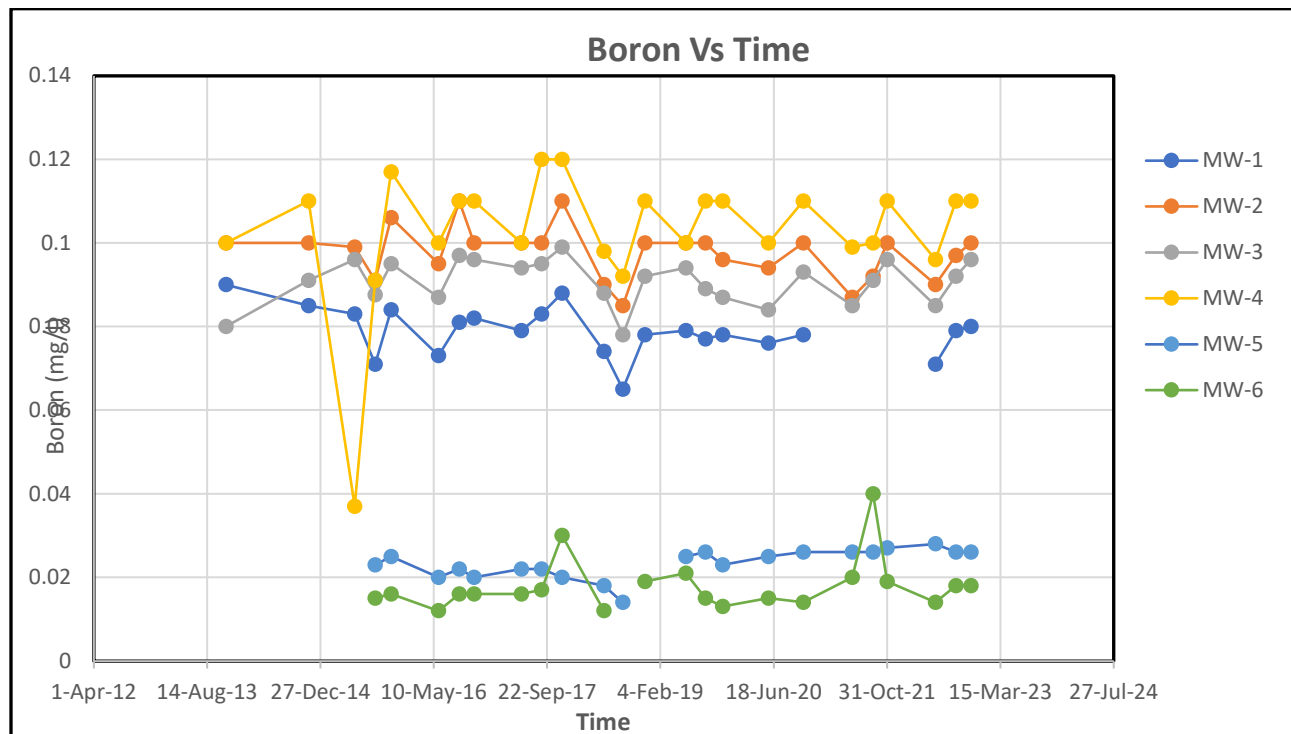


Figure 9 Boron Vs Time Trend

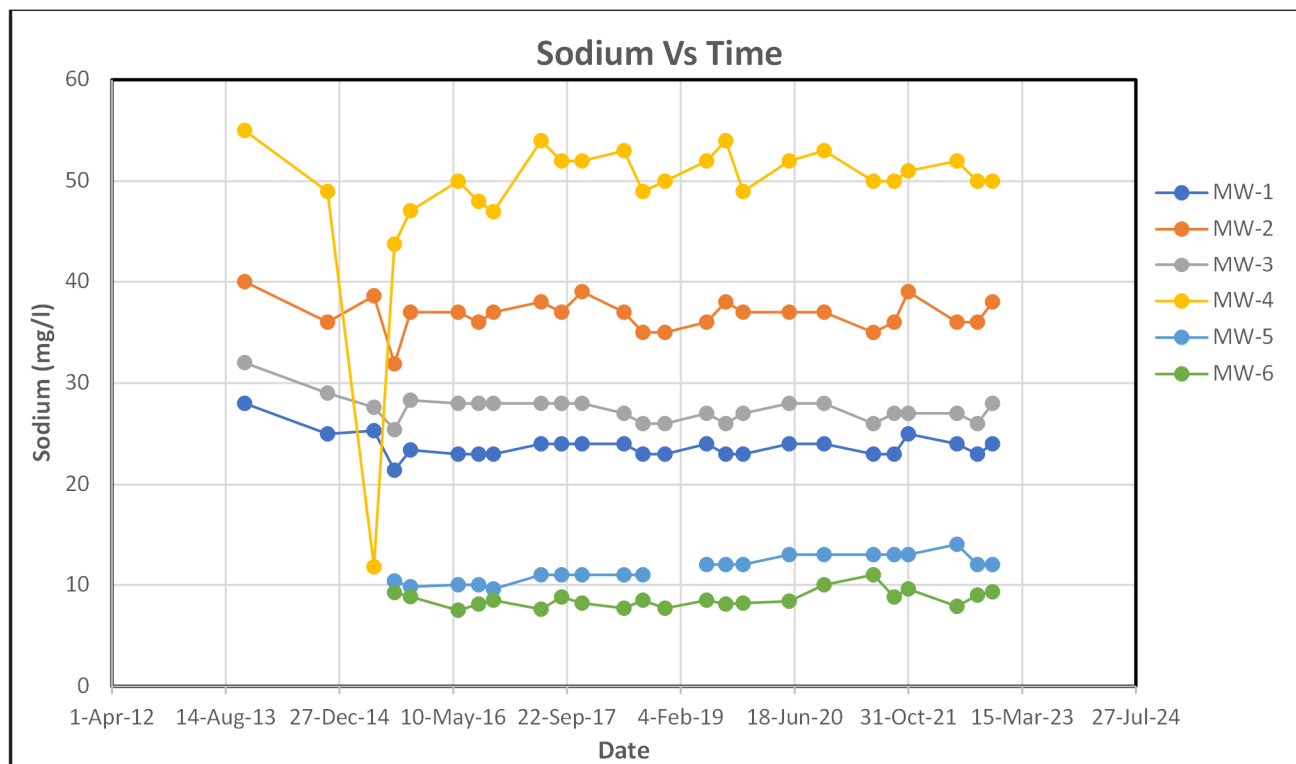


Figure 10 Sodium Vs Time Trend

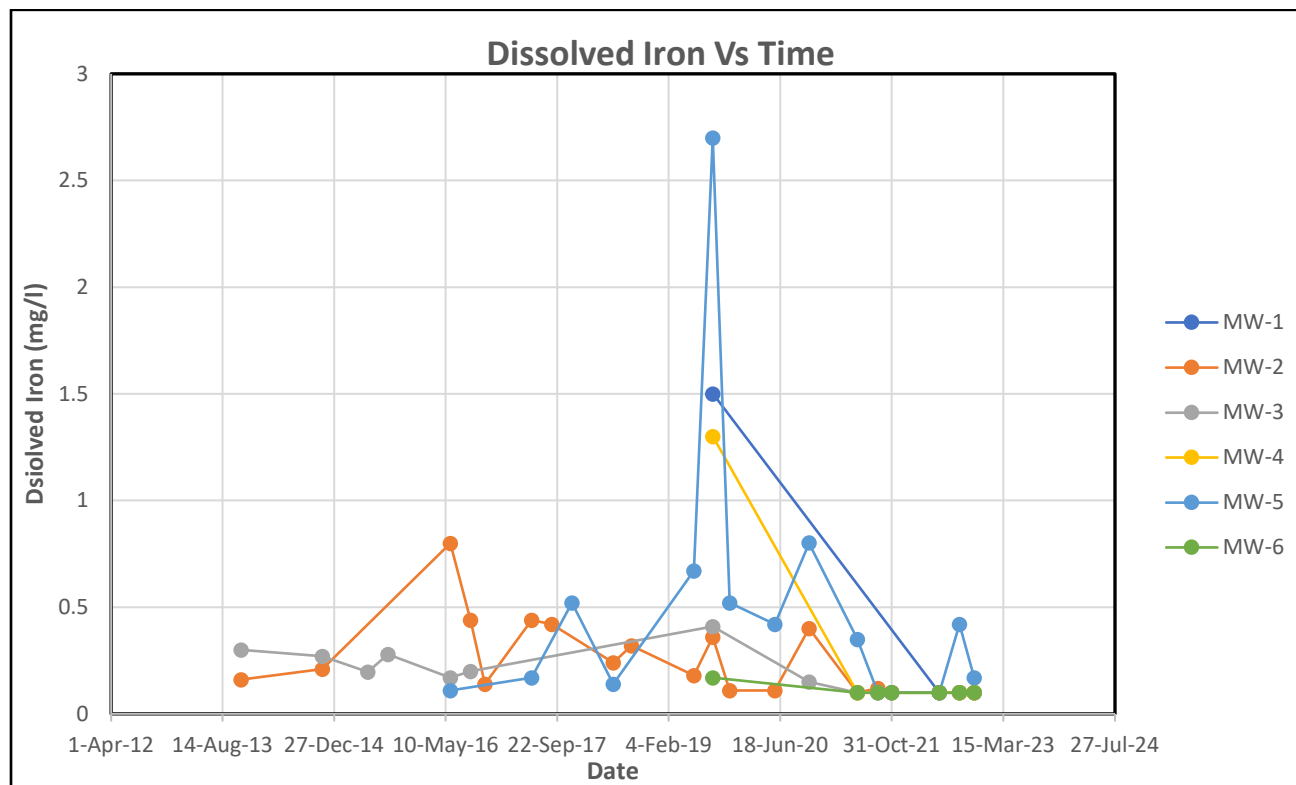


Figure 11 Dissolved Iron Vs Time Trend

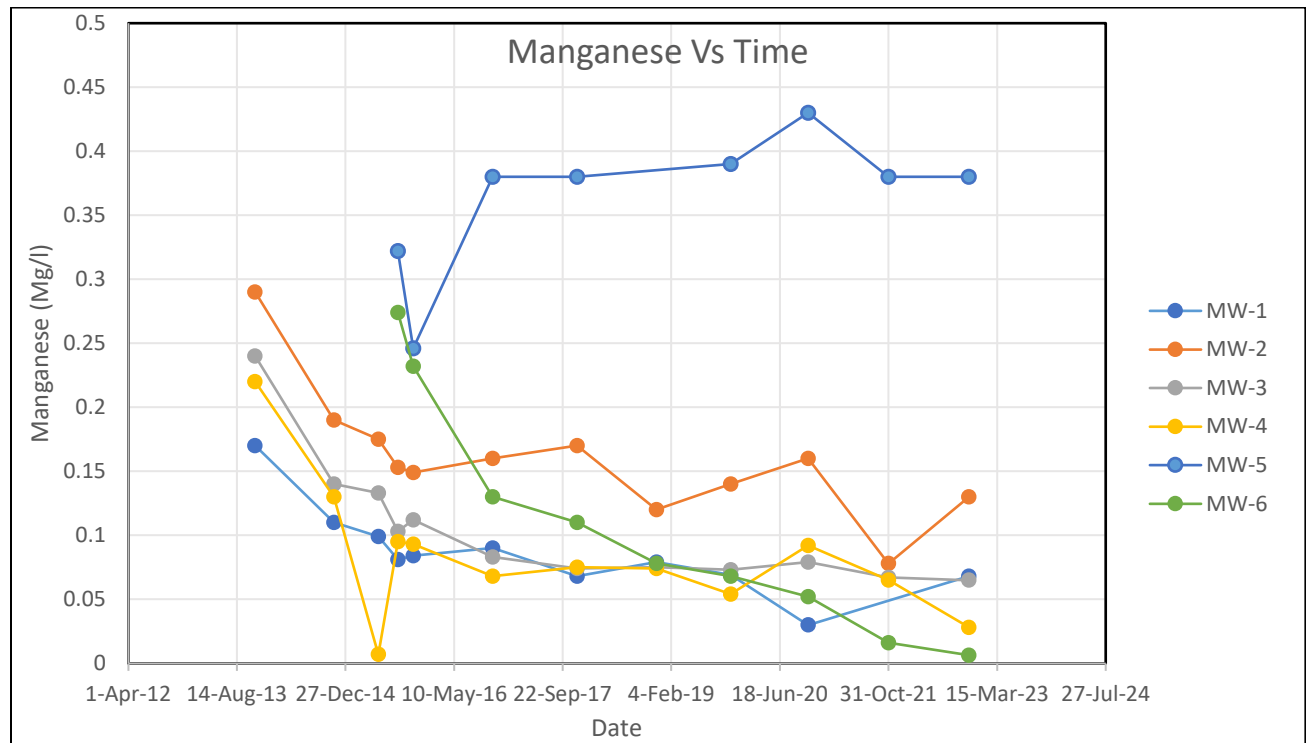


Figure 12 Manganese Vs Time Trend

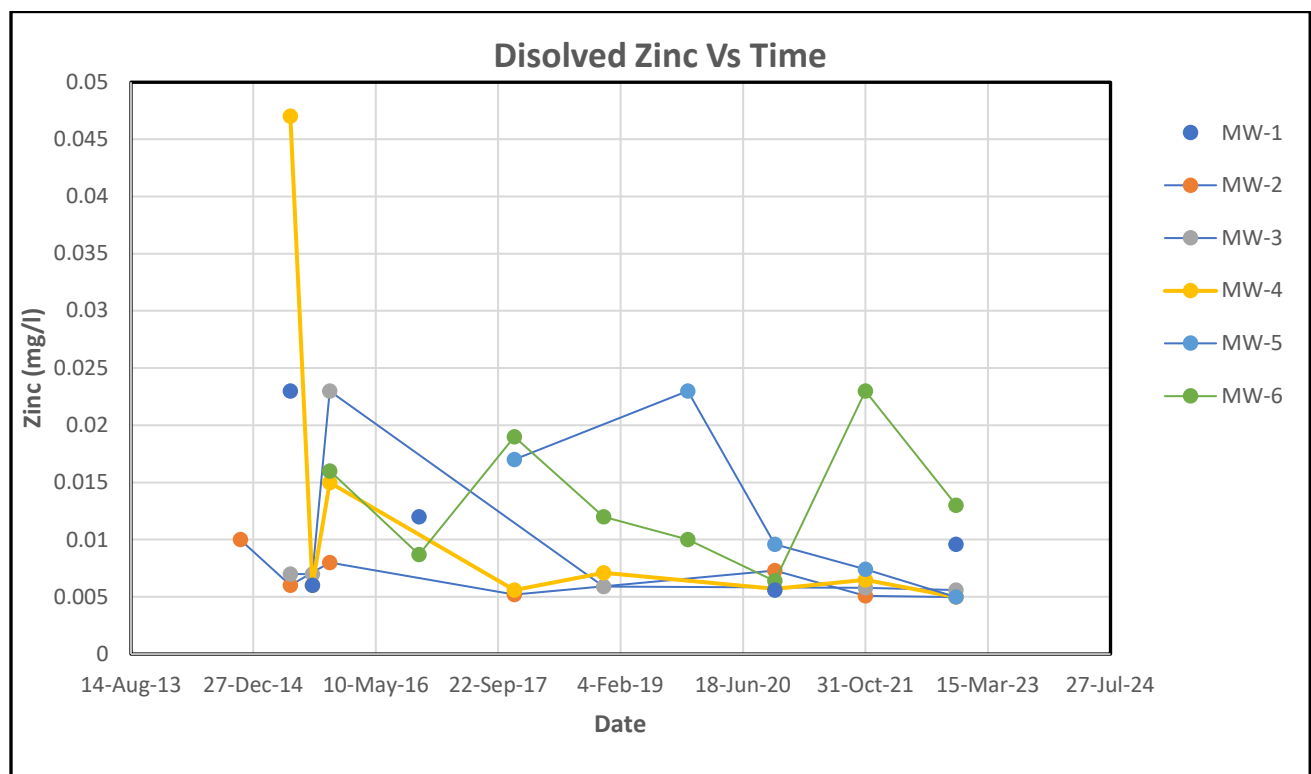


Figure 13 Zinc Vs Time Trend

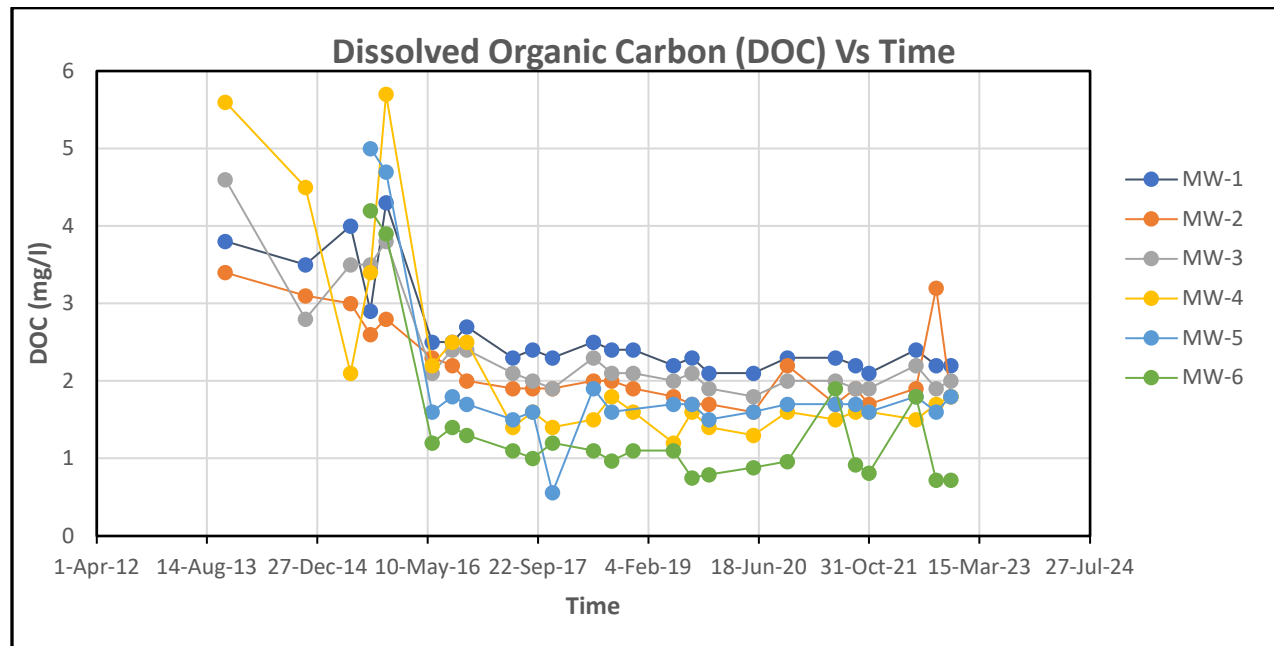


Figure 14 Dissolved Organic Carbon Vs Time Trend

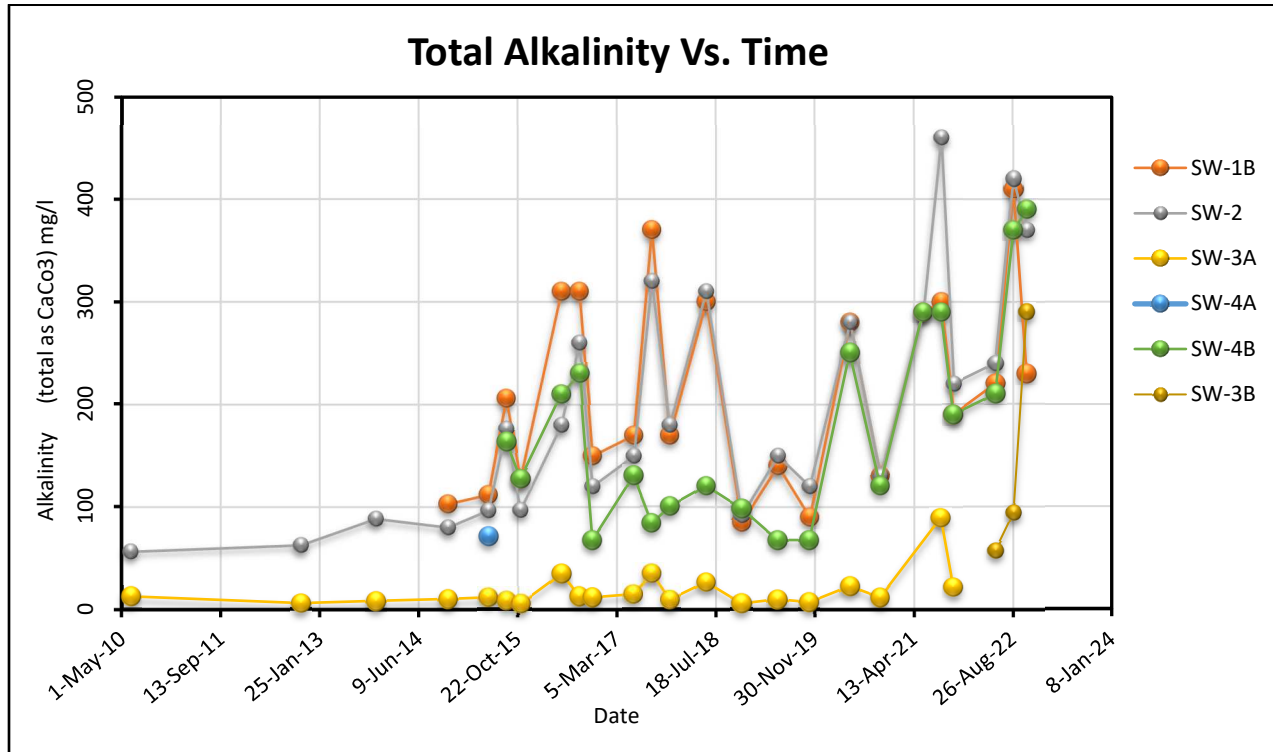


Figure 15 Alkalinity Vs Time in Surface Water

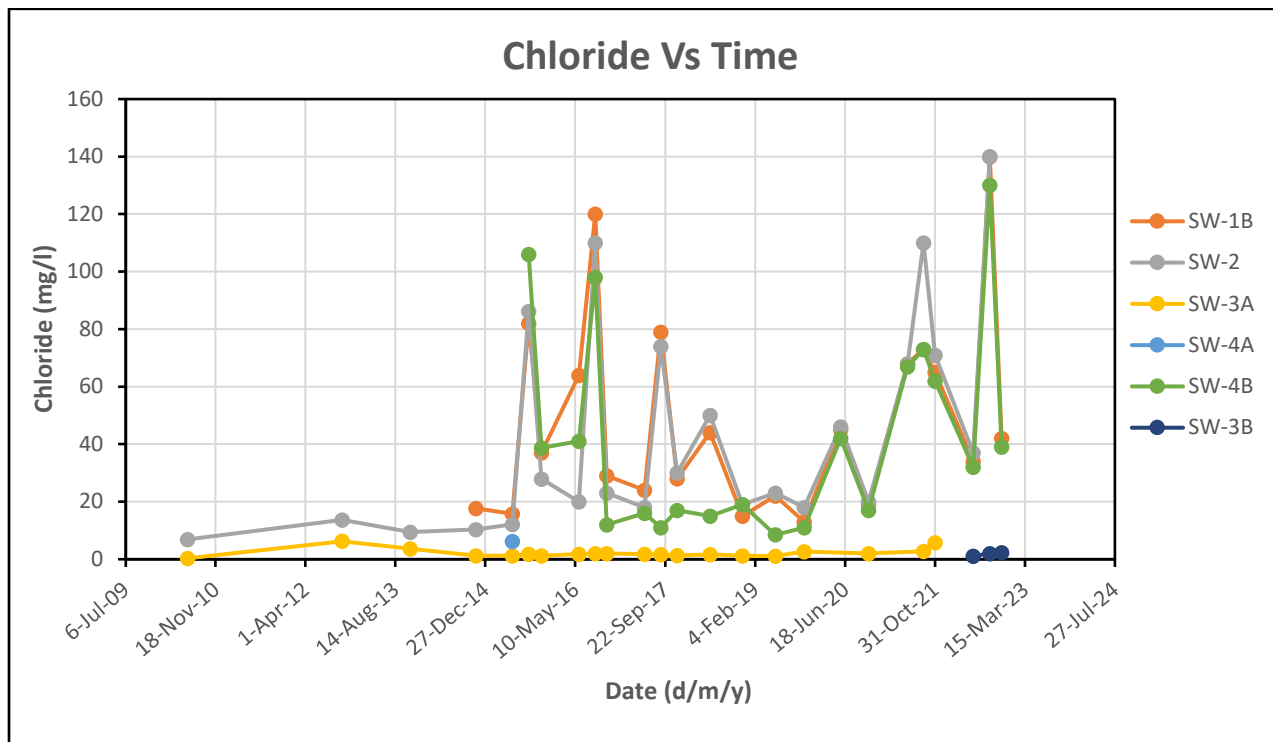


Figure 16 Chloride Vs Time in Surface Water

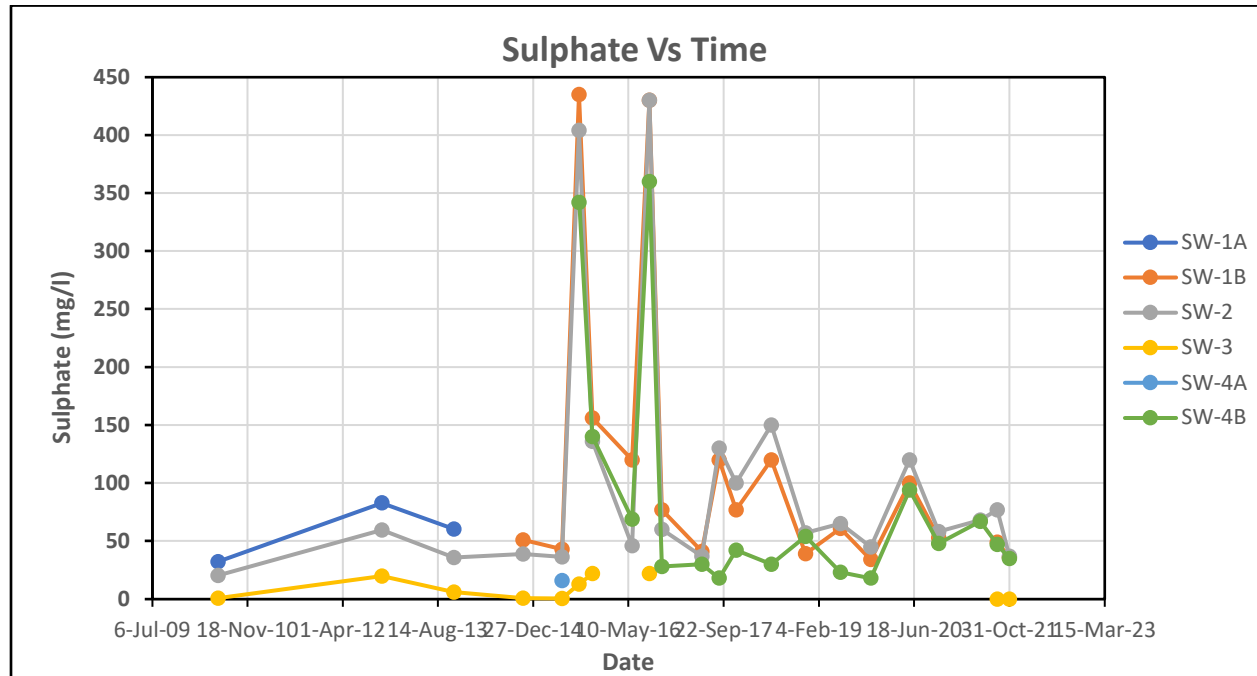


Figure 17 Sulphate Vs Time in Surface Water

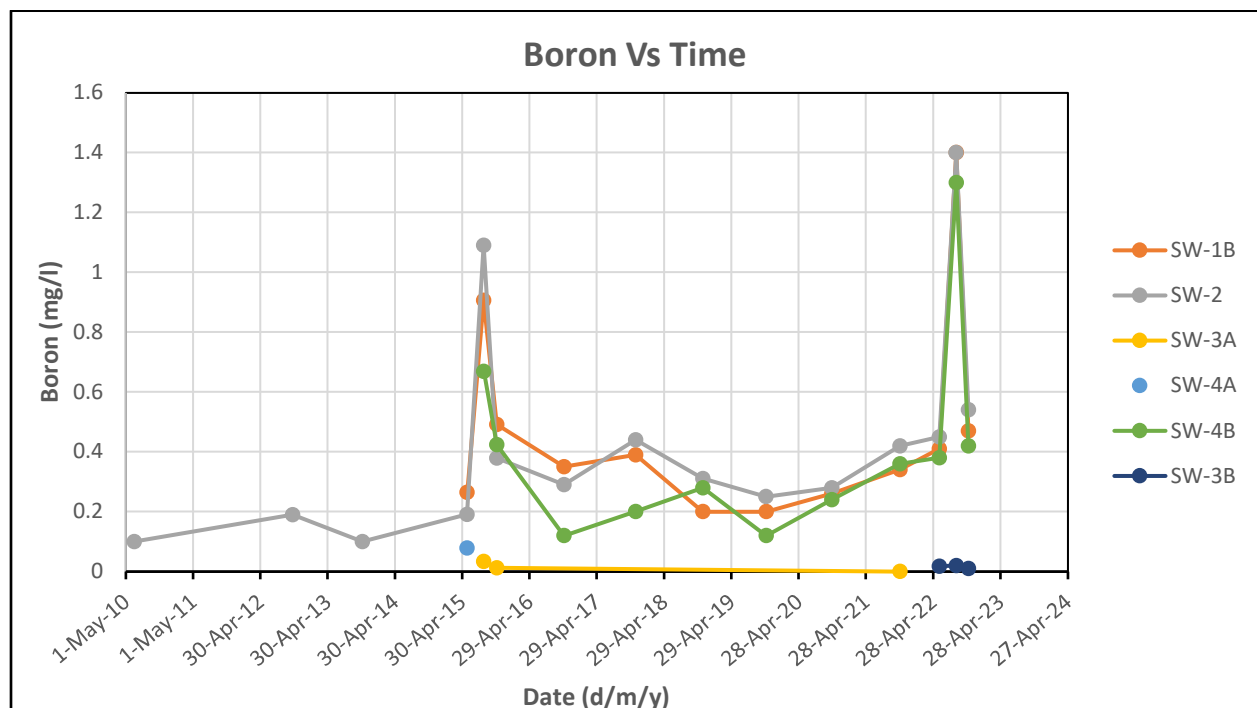


Figure 18 Boron Vs Time in Surface Water

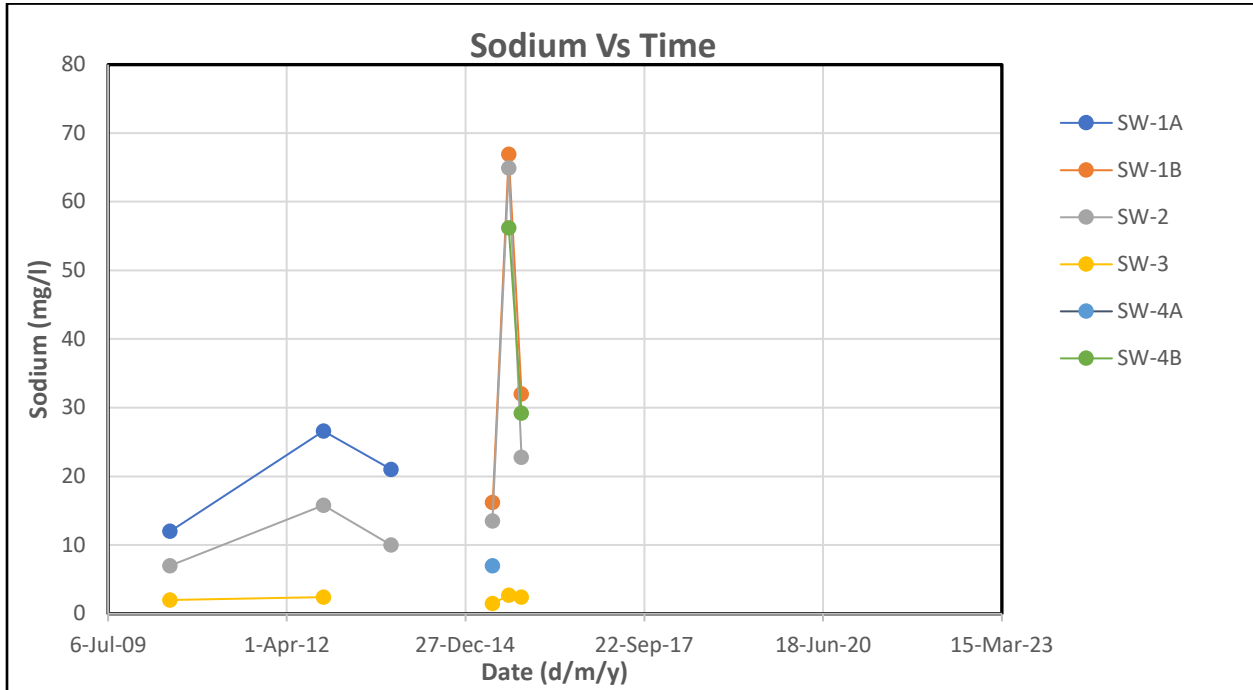


Figure 19 Sodium Vs Time in Surface Water

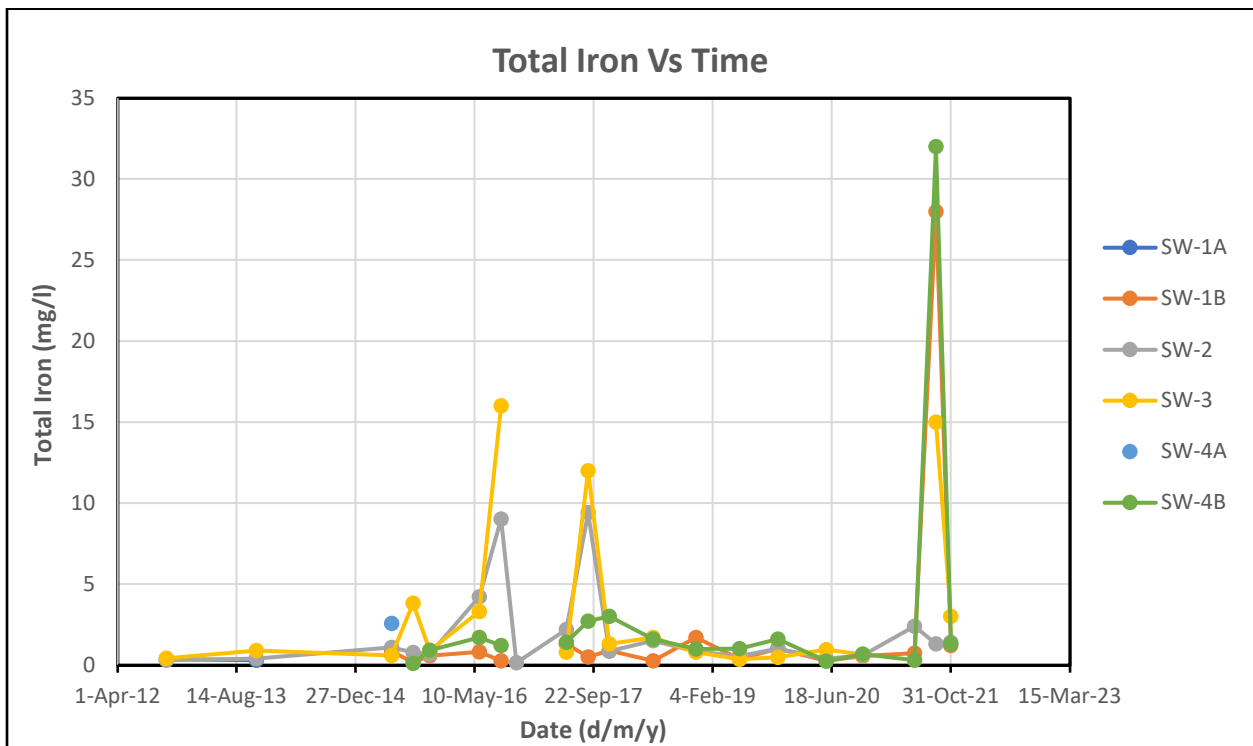


Figure 20 Total Iron Vs Time in Surface Water

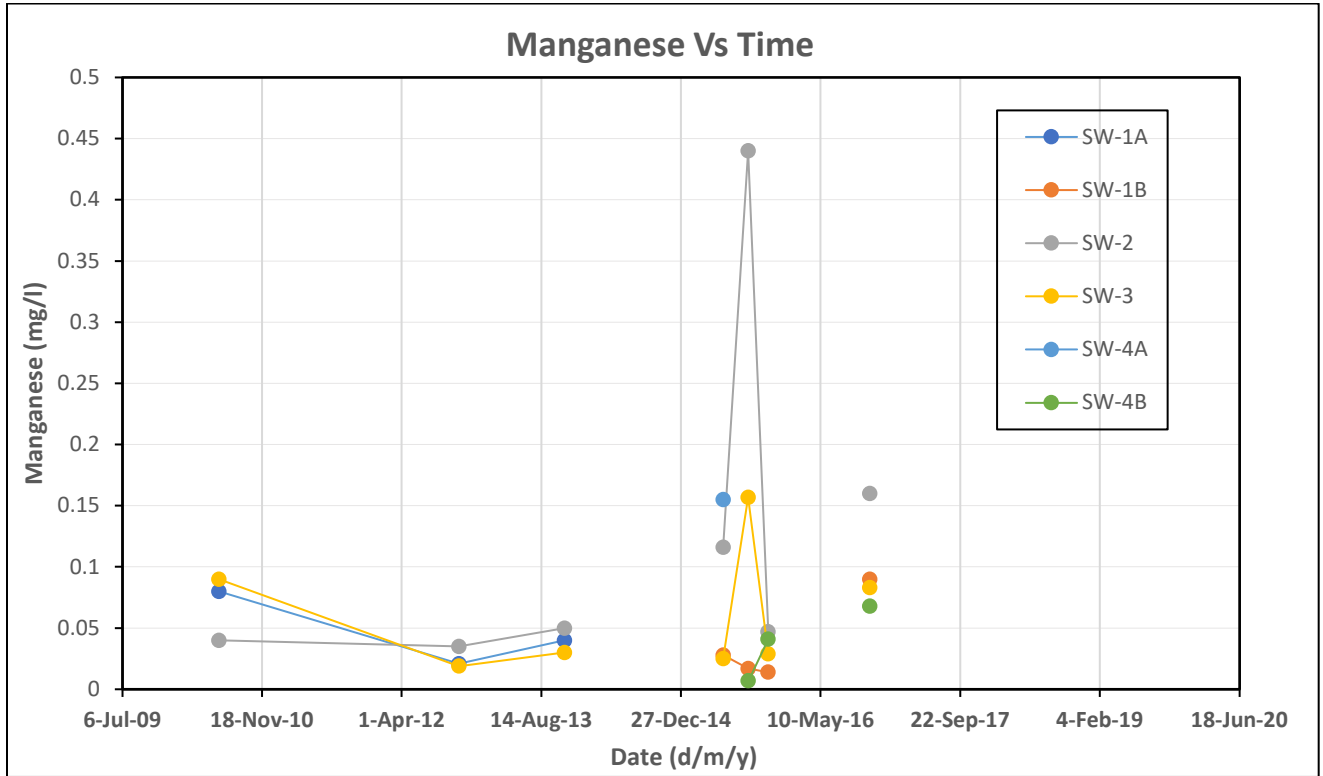


Figure 21 Manganese Vs Time in Surface Water

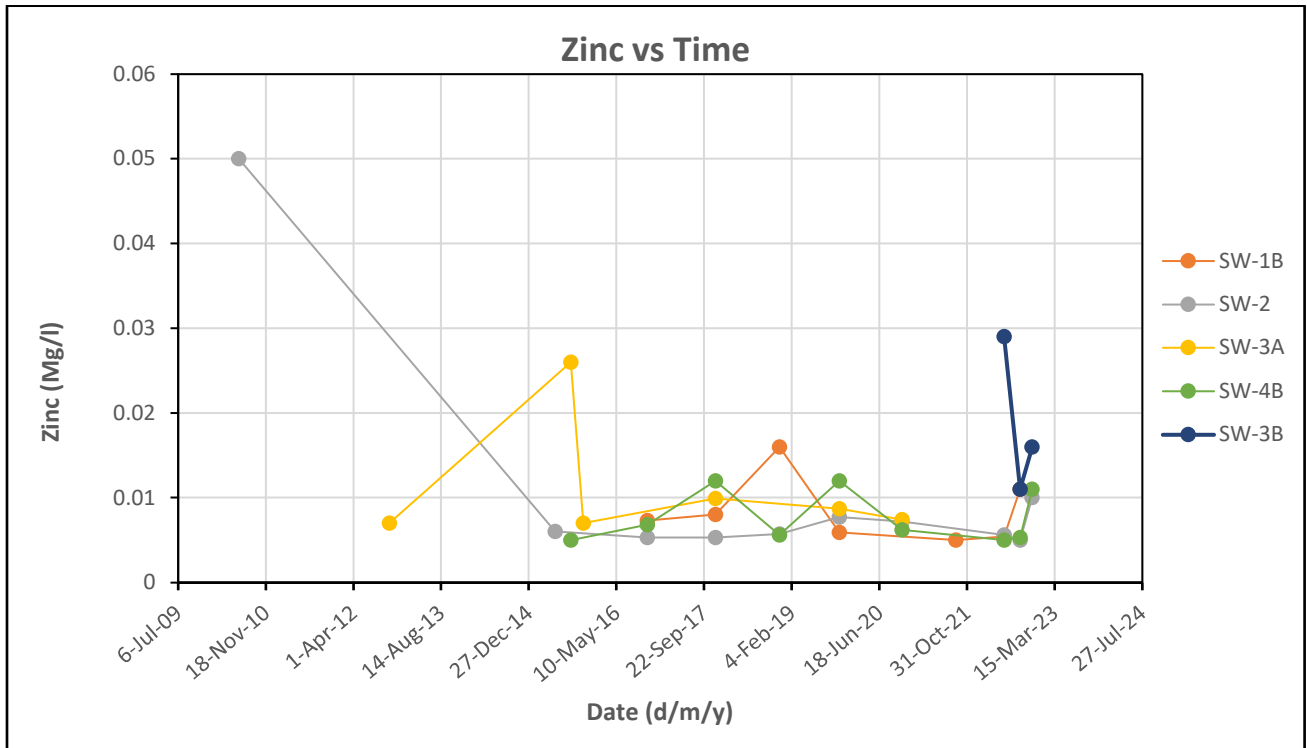


Figure 22 Zinc Vs Time in Surface Water

Appendix A

Environmental Compliance Approval

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The Macdonald, Meredith and Aberdeen Additional landfill currently operates under amended Environmental Compliance Approval (ECA) Number A561302 originally issued February 23, 2015. The ECA was most recently amended on October 14, 2021. A copy of the most recently amended ECA is attached.



Ministry of the Environment, Conservation and Parks
Ministère de l'Environnement, de la Protection de la nature et des Parcs

AMENDED ENVIRONMENTAL COMPLIANCE APPROVAL

NUMBER A561302

Issue Date: October 14, 2021

The Corporation of the Township of Macdonald, Meredith and Aberdeen Additional 208 Church St
Echo Bay, Ontario
POS 1C0

Site Location: 503 Watson Road East
Lot 10, 11, Concession 28
Macdonald, Meredith and Aberdeen Additional Township, District of Algoma POS 1C0

You have applied under section 20.2 of Part II.1 of the Environmental Protection Act, R.S.O. 1990, c. E. 19 (Environmental Protection Act) for approval of:

the use and operation of 27 hectare waste disposal/transfer site within a total site area of 63.3 hectares.

For the purpose of this environmental compliance approval, the following definitions apply:

“Approval” means this Environmental Compliance Approval and any Schedules attached to it;

“Contaminating Life Span” means contaminating life span as defined in Ontario Regulation 232/98;

“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 II.1 of the EPA;

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

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

"Ministry" means the ministry of the government of Ontario responsible for the EPA and OWRA and includes all officials, employees or other persons acting on its behalf;

“NMA” means the Nutrient Management Act, 2002, S.O. 2002, c. 4, as amended;

“O. Reg. 101/94” means Ontario Regulation 101: (Recycling and Composting of Municipal Waste), made under the EPA, as amended;

“O. Reg. 232/98” means Ontario Regulation 232/98: (Landfilling Sites), made under the EPA, as amended;

"O. Reg. 463/10" means Ontario Regulation 463/10 (Ozone Depleting Substances and Other Halocarbons), made under the EPA, as amended;

“Ontario Drinking Water Quality Standards” means Ontario Regulation 169/03 (Ontario Drinking Water Quality Standards), made under the SDWA, as amended;

“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 Approval, and includes the Corporation of the Township of Macdonald, Meredith and Aberdeen Additional and 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;

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

“Regional Director” means the Regional Director of the local Regional Office of the Ministry in which the Site is located;

“Reg. 347” means R.R.O. 1990, Reg. 347: (General - Waste Management), made under the EPA, as amended;

“Reg. 903” means R.R.O. 1990, Reg. 903: (Wells), made under the OWRA, as amended;

“SDWA” means the Safe Drinking Water Act, 2002, S.O. 2002, c. 32, as amended;

-

"Schedules" means the following schedules attached to this Approval and forming part of this Approval namely:

- o Schedule 1 - Supporting Documentation; o Schedule 2 - Surface Water Monitoring Program; and o Schedule 3 - Groundwater Monitoring Program;

"Site" means the entire waste disposal site, including the buffer lands, and contaminant attenuation zone at 503 Watson Road East, Lot 10, 11, Concession 28, Macdonald, Meredith and Aberdeen Additional Township, District of Algoma; and

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

- o relevant waste management legislation, regulations and guidelines; o major environmental concerns pertaining to the waste to be handled;
- o occupational health and safety concerns pertaining to the processes and wastes to be handled; o management procedures including the use and operation of equipment for the processes and wastes to be handled;
- o emergency response procedures;
- o specific written procedures for the control of nuisance conditions; o specific written procedures for refusal of unacceptable waste loads; and o the requirements of this Approval.

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

TERMS AND CONDITIONS

GENERAL

Compliance

1. The Owner and Operator shall ensure compliance with all the conditions of this Approval and shall ensure that any person authorized to carry out work on or operate any aspect of the Site is notified of this Approval 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 Approval.

In Accordance

3. Except as otherwise provided by this Approval, the Site shall be designed, developed, built, operated and maintained in accordance with the documentation listed in the attached Schedule

-

Interpretation

4. Where there is a conflict between a provision of any document listed in Schedule 1 in this Approval, and the conditions of this Approval, the conditions in this Approval shall take precedence.
5. Where there is a conflict between the application and a provision in any document listed in Schedule 1, 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 1, the document bearing the most recent date shall take precedence.
7. The conditions of this Approval are severable. If any condition of this Approval, or the application of any condition of this Approval to any circumstance, is held invalid or unenforceable, the application of such condition to other circumstances and the remainder of this Approval shall not be affected thereby.

Other Legal Obligations

8. The issuance of, and compliance with, this Approval 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 Approval.

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 Approval the person remains responsible for any contravention of any other condition of this Approval 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 Site, other than change to a successor municipality, the Owner shall notify the successor of and provide the successor with a copy of this Approval, and the Owner shall provide a copy of the notification to the District Manager and the Director.

Registration on Title Requirement

14. Prior to dealing with the property in any way, the Owner shall provide a copy of this Approval and any amendments, to any person who will acquire an interest in the property as a result of the dealing.
15.
 - a. Within thirty (30) calendar days from the date of issuance of this Approval, the Owner shall submit to the Director a completed Certificate of Requirement which shall include:
 - i. a plan of survey prepared, signed and sealed by an Ontario Land Surveyor, which shows the area of the Site where waste has been or is to be deposited at the Site;
 - ii. proof of ownership of the Site;
 - iii. a letter signed by a member of the Law Society of Upper Canada or other qualified legal practitioner acceptable to the Director, verifying the legal description provided in the Certificate of Requirement;
 - iv. the legal abstract of the property; and
 - v. any supporting documents including a registerable description of the Site.
 - b. Within fifteen (15) calendar days of receiving a Certificate of Requirement authorized by the Director, the Owner shall:
 - i. register the Certificate of Requirement in the appropriate Land Registry

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Office on the title to the property; and ii. submit to the Director and the District Manager, written verification that the Certificate of Requirement has been registered on title.

Inspections by the Ministry

16. 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 Approval 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 Approval are kept;
 - b. to have access to, inspect, and copy any records required to be kept by the conditions of this Approval;
 - c. to inspect the Site, related equipment and appurtenances;
 - d. to inspect the practices, procedures, or operations required by the conditions of this Approval; and
 - e. to sample and monitor for the purposes of assessing compliance with the terms and conditions of this Approval or the EPA, the OWRA, the PA, the SDWA or the NMA.

Information and Record Retention

17. a. Except as authorized in writing by the Director, all records required by this Approval shall be retained at the Site for a minimum of two (2) years from their date of creation.
- b. The Owner shall retain all documentation listed in Schedule 1 for as long as this Approval is valid.
- c. All monthly summary reports of waste records collected are to be kept at the Site until they are included in the Annual Report.
- d. The Owner shall retain employee training records as long as the employee is working at the Site.
- e. The Owner shall make all of the above documents available for inspection upon request of Ministry staff.
18. 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 Approval 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 Approval or any statute, regulation or other legal requirement; or
 - b. acceptance by the Ministry of the information's completeness or accuracy.

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19. The Owner shall ensure that a copy of this Approval, in its entirety and including all its Notices of Amendment, and documentation listed in Schedule 1, are retained at the Site at all times.
20. Any information related to this Approval and contained in Ministry files may be made available to the public in accordance with the provisions of the Freedom of Information and Protection of Privacy Act, RSO 1990, CF-31.
2. SITE OPERATION

Operation

1. The Site shall be operated and maintained at all times including management and disposal of all waste, in accordance with the EPA, Reg. 347, and the conditions of this Approval. At no time shall the discharge of a contaminant that causes or is likely to cause an adverse effect be permitted.

Signs

2. The Owner shall install and maintain a sign at the entrance to the Site. The sign shall be visible and readable from the main road leading to the Site. The following information shall be included on the sign:
 - a. the name of the Site and Owner;
 - b. the number of the Approval;
 - 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 recycling areas.
4. The Owner shall provide signs at recycling depot informing users what materials are acceptable and directing users to appropriate storage areas.

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.

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- b. Notwithstanding condition 2.6.a above, burning of segregated, clean wood and brush at the landfill may be carried out in strict compliance with the Ministry of the Environment Document titled "Guideline C-7, Burning at Landfill Sites" dated April 1994.

Site Access

7. Waste shall only be accepted during the following time periods:

Summer (April 1 - September 30) Tuesday:

12 noon - 8 p.m. Thursday: 12 noon - 5 p.m. Saturday: 8 am - 5 p.m.

Winter(October 1 - March 31) Tuesday: 12

noon - 5 p.m. Thursday: 12 noon - 5 p.m.

Saturday: 9 am - 5 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 Approval.
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 an 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 Owner or the Operator. Only Trained Personnel shall operate any aspect of the Site or carry out any activity required under this Approval.

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:

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- 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 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. All Spills as defined in the EPA shall be immediately reported to the Ministry's Spills Action Centre at 1-800-268-6060 and shall be recorded in the log book as to the nature of the emergency situation, and the action taken for clean-up, correction and prevention of future occurrences.
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 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. INSPECTIONS, RECORD KEEPING AND REPORTING

Daily Log Book

1. A daily log shall be maintained in written or electronic format and shall include the following information:
 - a. the type, date and time of arrival, hauler, and quantity (tonnes) of all 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 Approval, including but not limited to any records required to be kept by this Approval 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 Approval. 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.

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Annual Report

6. A written report on the development, operation and monitoring of the Site, shall be completed annually (Annual Report). The Annual Report shall be submitted to the District Manager, by March 31st of the year following the period being reported upon.
7. The Annual Report shall include but not be limited to the following information:
 - Operations:
 - a. 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;
 - b. site plans showing the existing contours of the Site; areas of landfilling operation during the reporting period; location of stockpile of non-hazardous contaminated soil; 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; facilities existing, added or removed during the reporting period; and site preparations and facilities planned for installation during the next reporting period;
 - c. calculations of the volume of waste, daily and intermediate cover, volume of non-hazardous contaminated soil used as daily and intermediate 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;
 - d. summary of the volume of non-hazardous contaminated soil received from the municipal boundary of the township of Macdonald, Meredith and Aberdeen Additional and the unincorporated Township of Kehoe (service area in condition 7.5);
 - e. summary of the volume of non-hazardous contaminated soil received from the district of Algoma (outside the service area in condition 7.5);
 - f. a calculation of the remaining capacity of the Site and an estimate of the remaining Site life;
 - g. a summary of the weekly, maximum daily and total annual quantity (tonnes) of waste received at the Site;
 - h. a summary of any complaints received and the responses made;
 - i. a discussion of any operational problems encountered at the Site and corrective action taken;
 - j. any changes to the Design and Operations Report and the Closure Plan that have been approved by the Director since the last Annual Report;
 - Monitoring:
 - k. an accurately scaled site plan illustrating the location of all buried wastes, the site boundaries, monitoring well locations, surface water sampling locations, and the location of the contaminant attenuation zone;

- l. an accurately scaled location map illustrating topography and the site relative to nearby potentially sensitive groundwater/surface water features (i.e., lakes, streams, wells);
- m. universal transverse mercator (UTM) coordinates for all sampling locations, North American Datum (1983);
- n. a water table contour map based on current data;
- o. stratigraphic cross-sections which clearly illustrate the subsurface distribution of geological materials;
- p. borehole logs for all monitoring wells;
- q. tables illustrating historical water chemistry and water level data;
- r. graphs illustrating historical water quality trends with time for key leachate indicator parameters (as a minimum these should include alkalinity, chloride, sulphate, boron, sodium, iron, manganese, zinc and DOC);
- s. an assessment of monitoring data to evaluate compliance with the requirements of Ministry's Guideline B-7;
- t. description and evaluation of any and all aquatic environmental effects associated with the site
- u. tabulation and interpretation of current and historical surface water monitoring data (including electronic file of historical and current data in EXCEL format), examination of spatial and temporal trends, and a comparison to Ontario
Provincial Water Quality Objectives, Canadian Water Quality Guidelines, Federal Environmental Quality Guidelines, and for sulphate the British Columbia Water Quality Guideline;
- v. graphs illustrating current and historical trends with time of key water quality parameters;
- w. recommendations for future monitoring and/or remedial actions;
- x. a section detailing the field sampling protocols and QA/QC measures.

7. LANDFILL DESIGN AND DEVELOPMENT

Approved Waste Types

1. Only municipal waste as defined under Reg. 347 being solid non-hazardous 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 Approval.
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

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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. Maximum volumetric capacity approved for the Site, consisting of the waste, daily cover and intermediate cover, but excluding the final cover based on the supporting documentation is 264,000 cubic metres.

Service Area

5. Only waste that is generated within the boundaries of the Township of Macdonald, Meredith and Aberdeen Additional and the unincorporated Township of Kehoe may be accepted at the Site.
6. Notwithstanding condition 7.5 the Owner may accept non-hazardous contaminated soil from District of Algoma, to use as daily and intermediate cover. Non-hazardous contaminated soil shall not be used as final cover.

Cover

7. 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 Approval. 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.
8. Cover material shall be applied as follows:
 - a. Bi-weekly Cover - Weather permitting, deposited waste shall be covered bi-weekly 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. Non-hazardous contaminated soil shall not be used in the final cover.

Geosynthetic Final Cover

9. If the Owner proposes Geosynthetic Clay Liner (GCL) for the final cover, the following are the minimum requirements for the Geosynthetic Clay final cover for the Site:
 - a. three hundred (300) millimeter subgrade soil compacted to 85% Standard Proctor Density;
 - b. three hundred (300) millimeter drainage layer protecting the GCL; and
 - c. one hundred and fifty (150) millimeter top soil.
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 to prevent methane concentration reaching the levels within its explosive range. 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

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 Groundwater

3. The Owner shall monitor surface water and groundwater in accordance with the monitoring programs in Schedules 2 and 3.
4. Within six (6) months of issuance of this approval, the Owner shall propose reference water sampling station(s) in nearby stream(s) with similar characteristics to the Unnamed Stream, at

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location(s) not exposed to contaminated seepage or runoff. The reference sampling location(s) shall be included in the water sampling program upon written approval by District Manager.

5. The temperature and pH of water shall be determined in the field at the time of sampling for Total Ammonia Nitrogen. The concentration of un-ionized ammonia shall be calculated using the total ammonia concentration, pH and temperature using the methodology stipulated in "Ontario's Provincial Water Quality Objectives" dated July 1994, as amended, for ammonia (un-ionized).
6. 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

7. The Owner shall ensure that all groundwater monitoring wells which form part of the monitoring program are properly capped, locked and protected from damage.
8. Where landfilling is to proceed around monitoring wells, suitable extensions shall be added to the wells and the wells shall be properly re-secured.
9. Any groundwater monitoring well included in the on-going monitoring program that is 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 Director for abandonment, shall be decommissioned by the Owner, as required, in accordance with Reg. 903, to 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

10.
 - a. Within one (1) year from the date of this Approval, 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.
 - b. Within one (1) year from the date of this Approval, the Owner shall submit to the Director for approval, and copies to the District Manager, details of a contingency

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plan to be implemented in the event that the surface water or groundwater quality exceeds any trigger mechanism.

11. In the event of a confirmed exceedance 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.
12. 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 exceedances;
 - 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 Director for approval; and
 - c. The contingency measures shall be implemented by the Owner upon approval by the Director.
13. 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 Approval.

Changes to the Monitoring Programs, Trigger Mechanisms and Contingency Plans

14. The Owner may request to make changes to the monitoring program(s), trigger mechanisms and/or contingency plan to the District Manager in accordance with the recommendations of the annual report. The Owner shall make clear reference to the proposed changes in a separate letter that shall accompany the annual report.
15. 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, trigger mechanisms and/or contingency plans, 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 Director requesting the Approval be amended to approve the proposed changes to the environmental monitoring plan prior to implementation.

9. CLOSURE PLAN

1. At least two (2) years prior to closure, 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

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landfilling operations at this Site, post-closure inspection, maintenance and monitoring, and end use. The plan shall include the following as a minimum but not limited to:

- a. a plan showing Site appearance after closure;
- b. a description of the proposed end use of the Site, that shall include a discussion on the Environmental Assessment commitments (if applicable) to dedicate portion of the lands within the Site that are not required for site post-closure operations and monitoring, to be used for community recreational purpose;
- c. a description of how pollinator friendly plants were considered in the final vegetative cover for the landfill and/or in the landscaping within the Site;
- d. a description of the procedures for closure of the Site:
 - i. advance notification of the public of the landfill closure;
 - ii. posting 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; and
 - vi. final construction of any control, treatment, disposal and monitoring facilities for leachate, groundwater, surface water and landfill gas;
- e. a schedule indicating the time-period for implementing sub-conditions (i) to (vi) above.
- f. 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;
- g. an assessment of the adequacy of and need to implement the contingency plans for leachate and methane gas; and
- h. 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 high wind events; and
 - c. if necessary to prevent litter, waste storage areas shall be covered during high winds events.

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2. The Owner/Operator shall remove the refrigerant as defined in O. Reg. 463/10 in accordance with the following:
 - a. all White Goods containing refrigerants which have not been tagged by a licensed technician to verify that the equipment no longer contains refrigerants, shall be stored in a separate area in an upright position; and
 - b. White Goods containing refrigerants received at the Site shall be shipped off-Site in order to have the refrigerants removed by a licensed technician in accordance with O. Reg. 463/10; or
 - c. the refrigerant shall be removed at the Site by a licensed technician, in accordance with O. Reg. 463/10, prior to shipping White Goods off-Site; and
 - d. a detailed log of all White Goods containing refrigerants received shall be maintained. The log shall include the following:
 - i. date of the record;
 - ii. types, quantities and source of White Goods containing refrigerants received;
 - iii. details on removal of refrigerants as required by O. Reg. 463/10; and
 - iv. the quantities and destination of the White Goods and/or refrigerants transferred from the Site.
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.
6. Collection, storage and transfer of Waste Electrical and Electronic Equipment shall be in accordance with the documents in the Schedule 1. If there is any discrepancy between the guideline titled "Collection Site Organizing & Operating Waste Electrical and Electronic Equipment (WEEE) Guidebook" dated November 2012 as amended prepared by Ontario Electronic Stewardship and the documents in Schedule 1, the guideline shall take precedence.

Schedule 1

Supporting Documentation

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1. Application for a Certificate of Approval dated November 2, 1970 and signed by Mrs. Robbins, including the attached supporting documentation.
2. Environmental Compliance Approval Application dated January 3, 2013 and signed by Lynne Duguay, Clerk Administrator, the Corporation of the Township of Macdonald, Meredith and Aberdeen Additional, including the attached supporting documentation.
3. Report titled "Design and Operations Plan, Macdonald Meredith & Aberdeen Add'l Landfill Site" dated February 2016 prepared by Tulloch Engineering Inc.
4. Environmental Compliance Approval Application dated June 22, 2020 and signed by Lynne Duguay, Clerk Administrator, The Corporation of the Township of Macdonald, Meredith and Aberdeen Additional, including the attached supporting documentation.

Schedule 2

Surface Water Monitoring Program Table 1.

Surface Water Sampling Locations

Sampling Location	Description	Frequency
SW3	Unnamed Stream Background	3 times per year (spring, summer, fall) **
SW2	Leachate Pond	
SW1B	Unnamed Stream 150 m downstream of Leachate Pond	
SW4B	Unnamed Stream at Property Boundary	
	Reference Stream (one or more to be proposed)	

**at least 60 days apart.

Table 2. Surface Water Monitoring Parameters*

Laboratory		Field
Alkalinity	Aluminum	Temperature pH
Ammonia	Arsenic	Conductivity
Barium	Boron	Dissolved Oxygen
Cadmium	Chloride	Flow**
Chromium	Conductivity	
Copper	Iron	
Lead	Mercury	
Nitrate	Nitrite	
Total Kjeldahl Nitrogen (TKN)	pH	
Total Phosphorus	Suspended Solids	
Total Dissolved Solids	Sulphate	
Zinc	Biochemical Oxygen Demand	
Chemical Oxygen Demand	(BOD)	
Hardness	5	
	Phenol	
	Dissolved Organic Carbon	

* For any parameter listed in Table 2 which has a Provincial Water Quality Objective (PWQO) or Canadian Water Quality Guideline (CWQG) or Federal Environmental Quality Guideline (FEQG) the detection limit for analyses shall be below the PWQO and Interim PWQO and CWQG and FEQG for each such parameter.

** If flow is not measurable, record observation and take photograph.

Schedule 3
Groundwater Monitoring Program
Table 3. Groundwater Sampling and Monitoring
Groundwater Wells: MW-1, MW-2, MW-3, MW-4, MW-6 and MW-7

Laboratory – Spring & Summer Sampling	Laboratory – Fall Sampling	Field – All Seasons
Alkalinity Ammonia Barium Boron Calcium Chloride Conductivity Iron Magnesium Nitrate pH Sodium Total Dissolved Solids Sulphate Chemical Oxygen Demand Dissolved Organic Carbon	Alkalinity, Ammonia Arsenic, Barium Boron, Cadmium Calcium, Chloride Chromium, Conductivity Copper, Iron, Lead Magnesium, Manganese Mercury, Nitrate Nitrite Total Kjeldahl Nitrogen pH, Total Phosphorus Potassium, Sodium Total Dissolved Solids Sulphate, Zinc Benzene 1,4 Dichlorobenzene Dichloromethane Toluene Vinyl Chloride Chemical Oxygen Demand Dissolved Organic Carbon Phenol	pH Conductivity

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

GENERAL

- The reason for conditions 1.1, 1.2, 1.4, 1.5, 1.6, 1.7, 1.8, 1.9, 1.10, 1.17, 1.18 and 1.19 is to clarify the legal rights and responsibilities of the Owner and Operator under this Approval.
- The reasons for condition 1.3 are 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.
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- 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.
- 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 Approval.
- The reason for condition 1.13 is to ensure that the successor is aware of its legal responsibilities.
- The reasons for conditions 1.14 and 1.15 are that the Part II.1 Director is an individual with authority pursuant to Section 197 of the Environmental Protection Act to require registration on title and provide any person with an interest in property before dealing with the property in any way to give a copy of the Approval to any person who will acquire an interest in the property as a result of the dealing.
- The reason for condition 1.16 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 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.
- Condition 1.20 has been included in order to clarify what information may be subject to the Freedom of Information Act.

SITE OPERATION

- 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.

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 Approval. - The reasons for condition 2.6.a and 2.6.b are open burning of municipal waste is unacceptable because of concerns with air emissions, smoke and other nuisance effects, and the potential fire hazard and to make sure burning of brush and wood are carried out in accordance with Ministry guidelines.
- 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.
- 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.
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EMPLOYEE TRAINING

- 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

- 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

- 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.
- 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.

INSPECTIONS, RECORD KEEPING AND REPORTING

- 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 Approval (such as fill rate, site capacity, record keeping, annual reporting, and financial assurance requirements), the EPA and its regulations.
- 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.

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

- The reason for conditions 7.1 to 7.6 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.
- Condition 7.7 is to provide the Owner the process for getting the approval for alternative daily and intermediate cover material.

-

- The reasons for condition 7.8 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.
- Condition 7.9 is included to provide minimum requirements for the geosynthetic clay final cover if the Owner proposes to use geosynthetic clay for the final cover.

LANDFILL MONITORING

- Reasons for condition 8.1 are to ensure that 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.
- Condition 8.2 is included to provide the groundwater and surface water limits to prevent water pollution at the Site.
- Conditions 8.3, 8.4, 8.5 and 8.6 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.
- Conditions 8.7, 8.8 and 8.9 are included to ensure the integrity of the groundwater monitoring network so that accurate monitoring results are achieved, and the natural environment is protected.
- Conditions 8.10 to 8.13 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.

Conditions 8.14 and 8.15 are included to streamline the approval of the changes to the monitoring plans and trigger mechanisms and contingency plans.

-

CLOSURE PLAN

- 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

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

Upon issuance of the environmental compliance approval, I hereby revoke Approval No(s). A561302 issued on February 23, 2015

In accordance with Section 139 of the Environmental Protection Act, 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:

- a. The portions of the environmental compliance approval or each term or condition in the environmental compliance approval in respect of which the hearing is required, and;
- b. The grounds on which you intend to rely at the hearing in relation to each portion appealed.

Pursuant to subsection 139(3) of the Environmental Protection Act, a hearing may not be required with respect to any terms and conditions in this environmental compliance approval, if the terms and conditions are substantially the same as those contained in an approval that is amended or revoked by this environmental compliance approval.

The Notice should also include:

- 1. The name of the appellant;
- 2. The address of the appellant;
- 3. The environmental compliance approval number;
- 4. The date of the environmental compliance approval;
- 5. The name of the Director, and;
- 6. The municipality or municipalities within which the project is to be engaged in.

-

Appendix A AMENDED ENVIRONMENTAL COMPLIANCE CERTIFICATE Project 22-0031

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

This Notice must be served upon:

The Secretary* the Environmental Protection Act
Environmental Review Tribunal

655 Bay Street, Suite 1500

Toronto, Ontario

M5G 1E5

AND

The Director appointed for the purposes of Part
II.1 of

Ministry of the Environment, Conservation and
Parks

135 St. Clair Avenue West, 1st Floor

Toronto, Ontario

M4V 1P5

* Further information on the Environmental Review Tribunal's requirements for an appeal can be obtained directly from the Tribunal at: Tel: (416) 212-6349, Fax: (416) 326-5370 or www.ert.gov.on.ca

The above noted activity is approved under s.20.3 of Part II.1 of the Environmental Protection Act. DATED AT
TORONTO this 14th day of October, 2021



Mohsen Keyvani, P.Eng.
Director

appointed for the purposes of Part II.1 of the
Environmental Protection Act

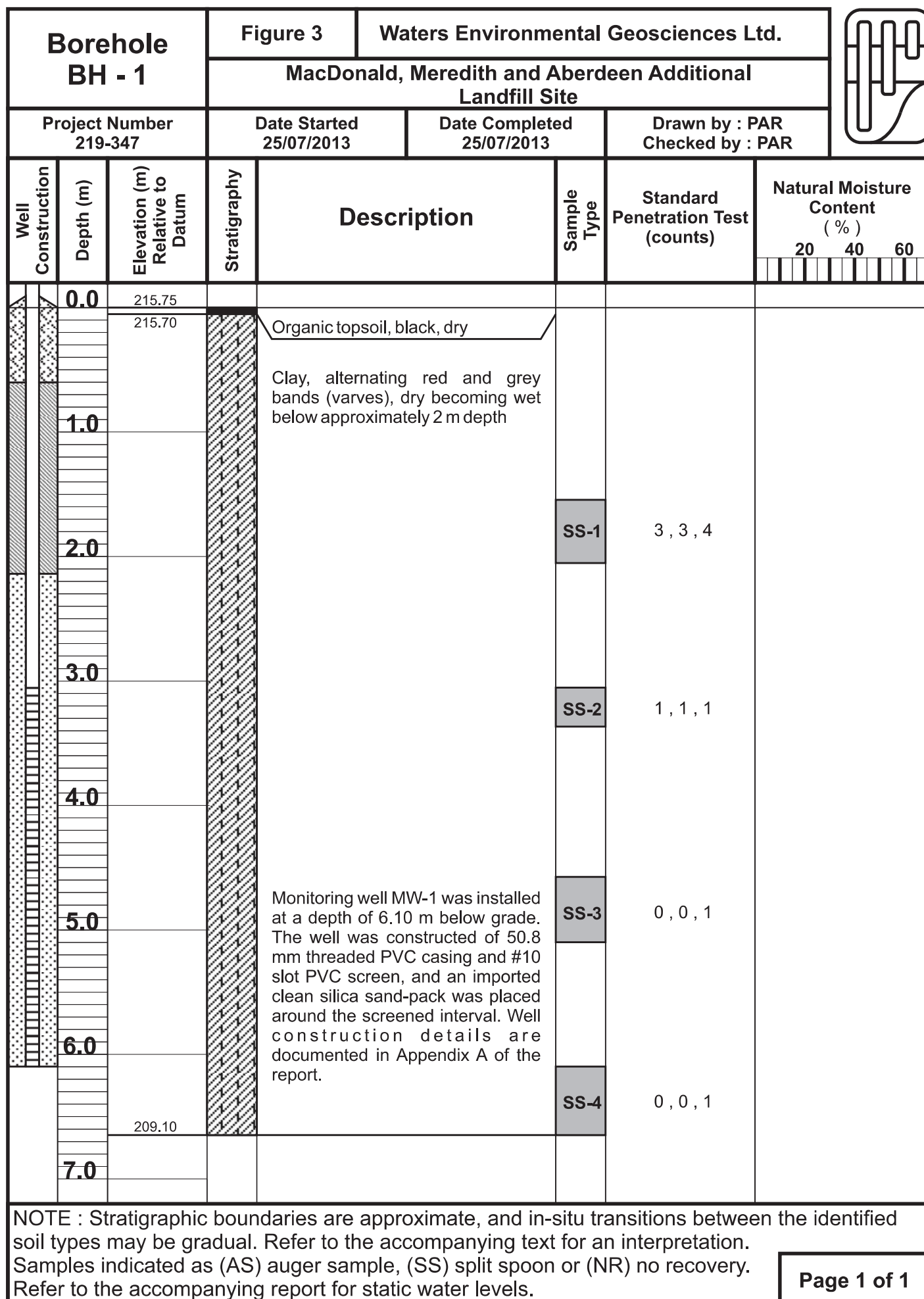
RM/

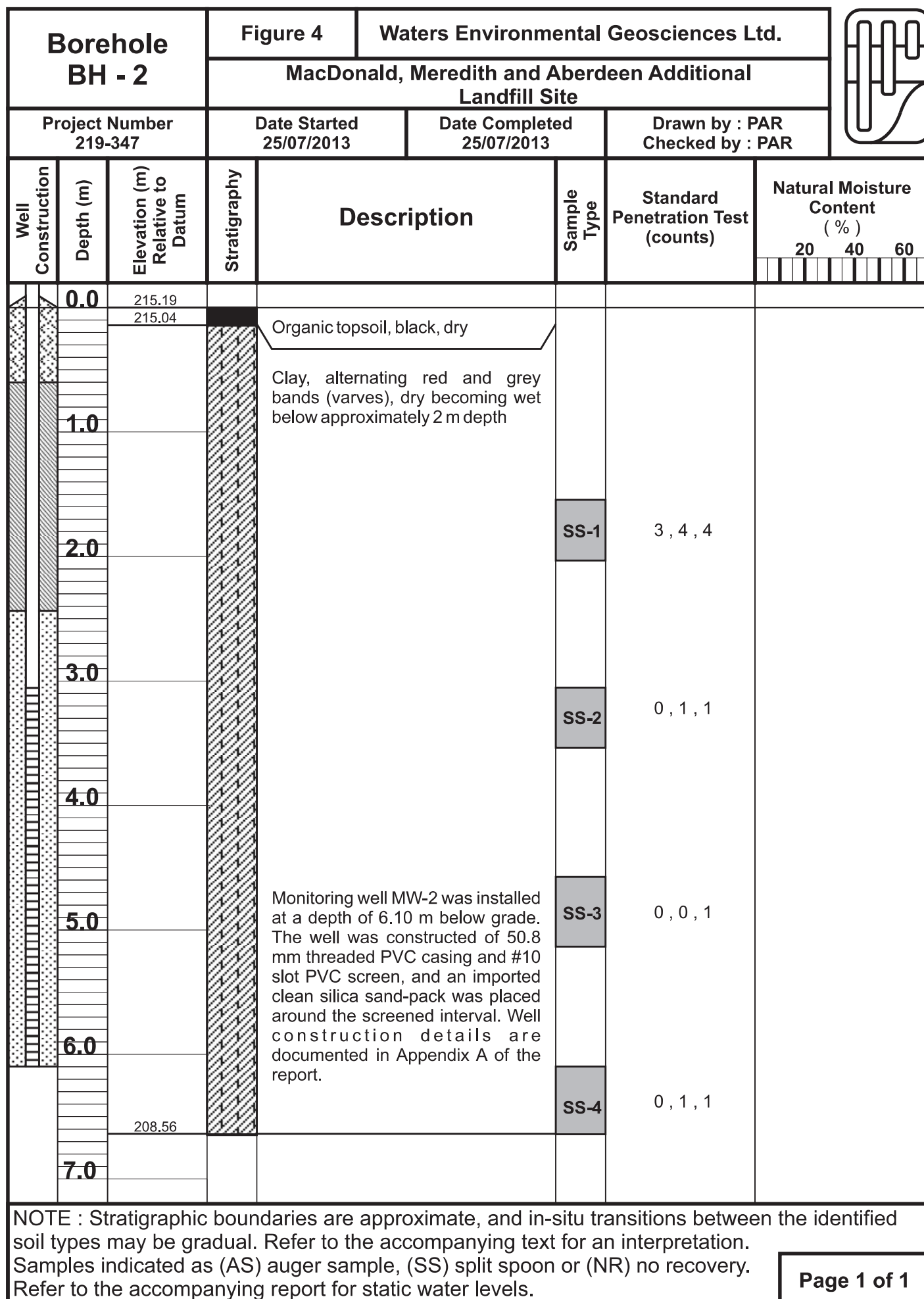
c: Area Manager, MECP Sault Ste. Marie c:
District Manager, MECP Sudbury

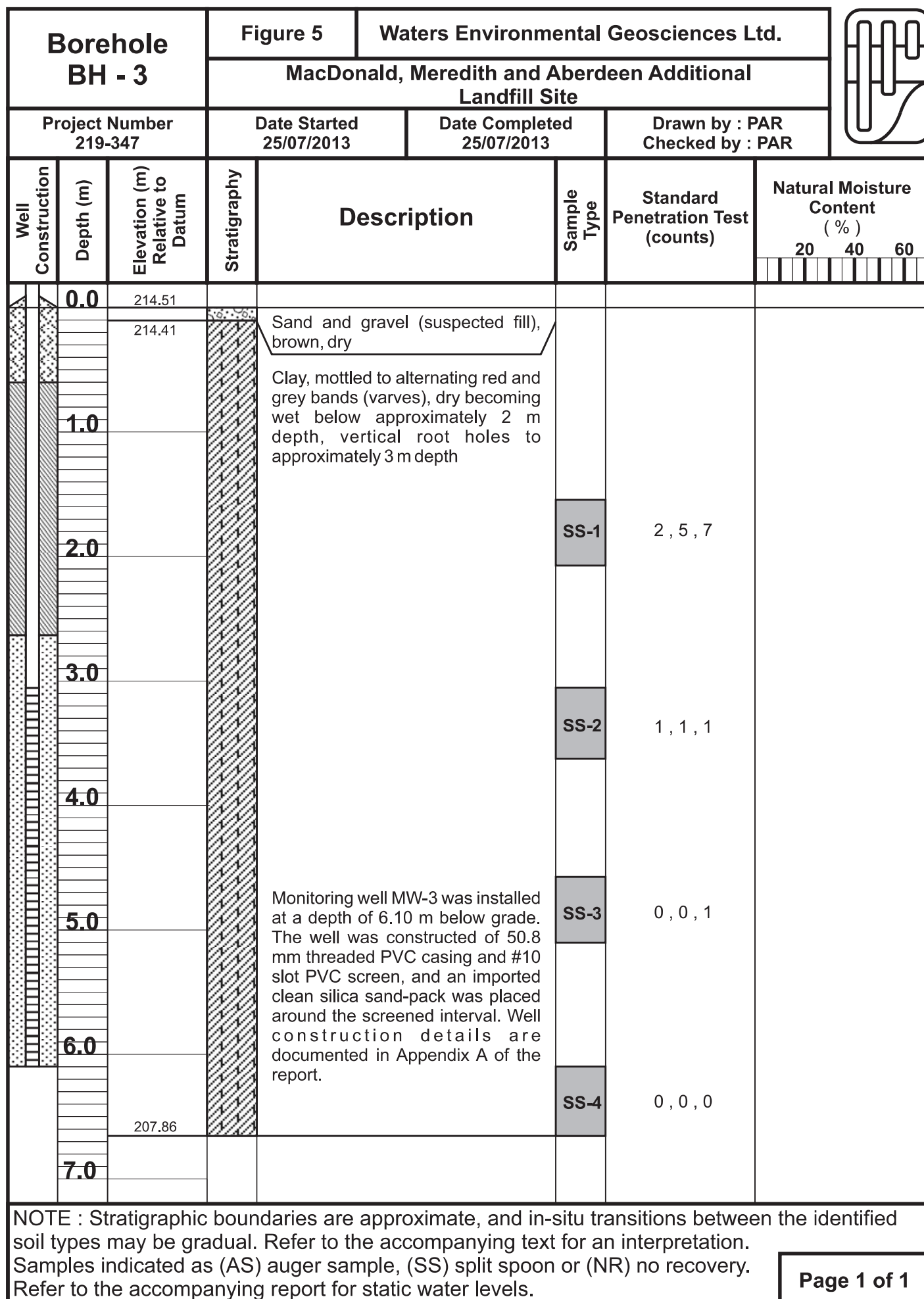
Marshall

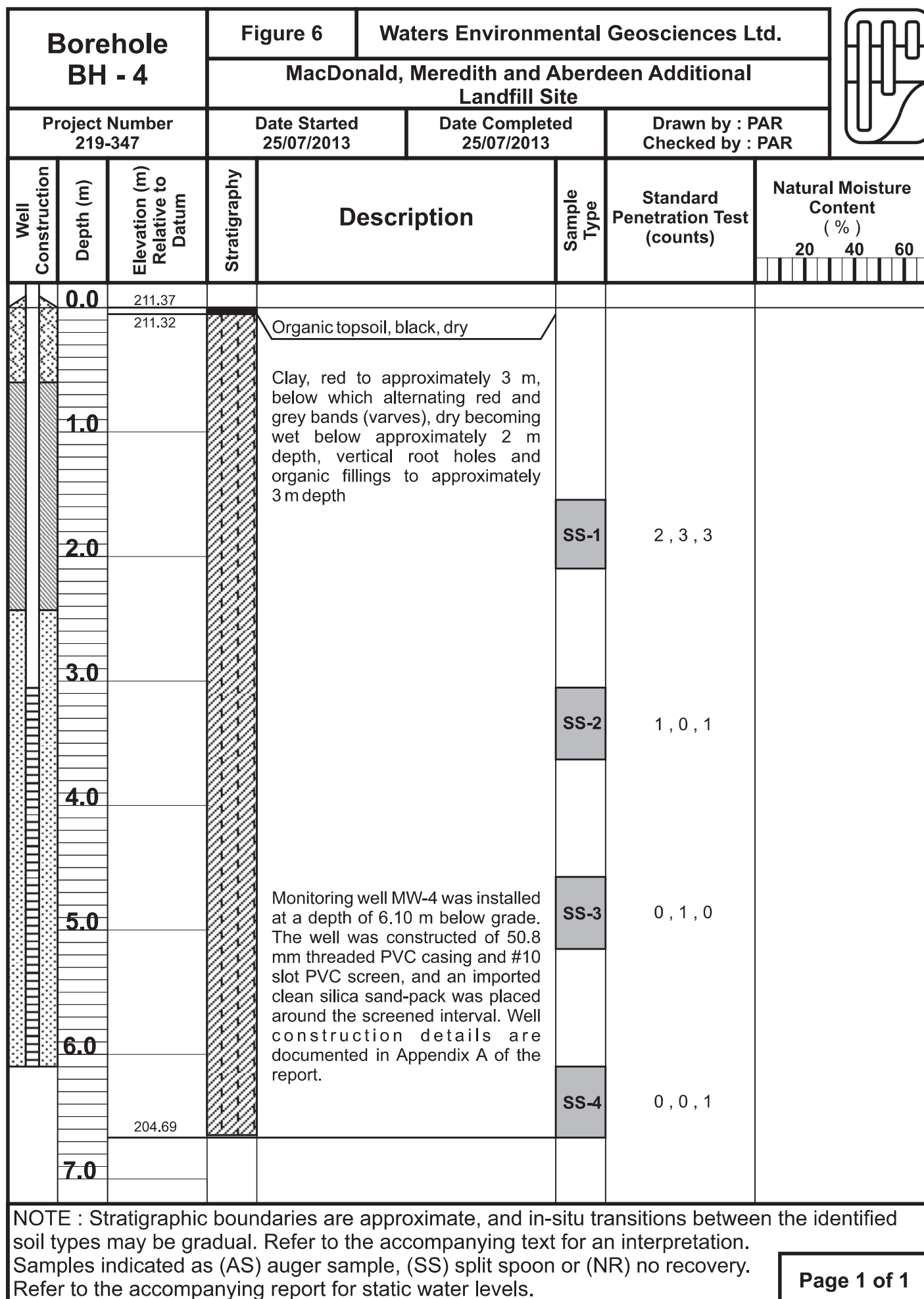
Appendix B

Monitoring Well Logs



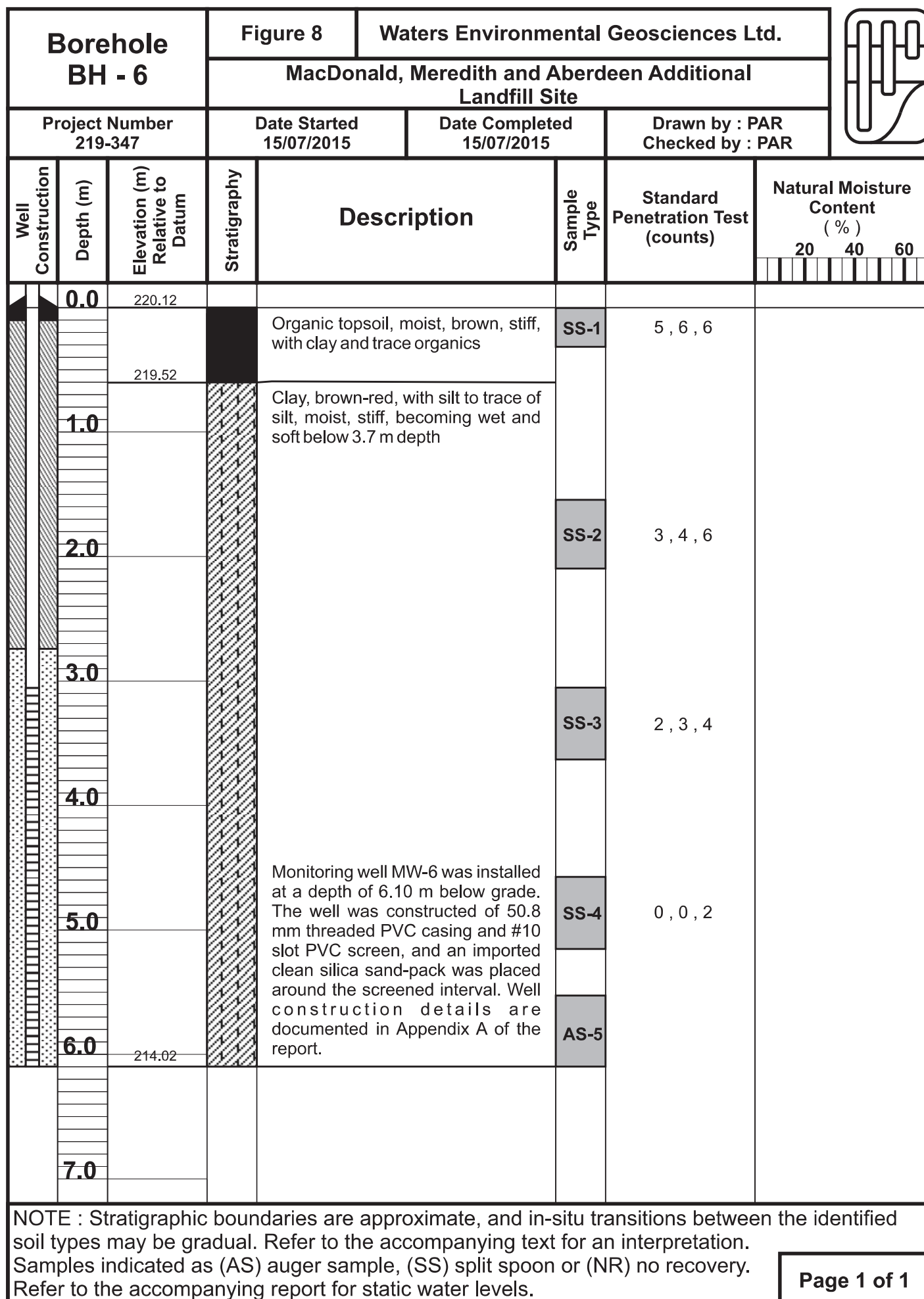






NOTE : Stratigraphic boundaries are approximate, and in-situ transitions between the identified soil types may be gradual. Refer to the accompanying text for an interpretation. Samples indicated as (AS) auger sample, (SS) split spoon or (NR) no recovery. Refer to the accompanying report for static water levels.

Page 1 of 1



Appendix C

Monitoring Well Construction Details

Monitoring Well Location	Description	Elevation (rel. to datum), in m
MW-1 Zone 16 0727972mE 5149231mN	Top of 50.8 mm PVC casing	216.52 m
	Ground surface elevation	215.75 m
	Cuttings and bentonite	215.14 m to 215.75 m
	Bentonite	213.62 m to 215.14 m
	Imported sand pack	209.65 m to 213.62 m
	Screen Interval (#10 slot PVC)	209.65 m to 212.69 m
MW-2 Zone 16 0728016mE 5149299mN	Top of 50.8 mm PVC casing	216.10 m
	Ground surface elevation	215.19 m
	Cuttings and bentonite	214.58 m to 215.19 m
	Bentonite	212.76 m to 214.58 m
	Imported sand pack	209.09 m to 212.76 m
	Screen Interval (#10 slot PVC)	209.09 m to 212.14 m
MW-3 Zone 16 0728042mE 5149368mN	Top of 50.8 mm PVC casing	215.35 m
	Ground surface elevation	214.51 m
	Cuttings and bentonite	213.90 m to 214.51 m
	Bentonite	211.89 m to 213.90 m
	Imported sand pack	208.41 m to 211.89 m
	Screen Interval (#10 slot PVC)	208.41 m to 211.46 m
MW-4 Zone 16 0728075mE 5149517mN	Top of 50.8 mm PVC casing	212.15 m
	Ground surface elevation	211.37 m
	Cuttings and bentonite	210.76 m to 211.37 m
	Bentonite	208.93 m to 210.76 m
	Imported sand pack	205.27 m to 208.93 m
	Screen Interval (#10 slot PVC)	205.27 m to 208.32 m

Monitoring Well Location	Description	Elevation (rel. to datum), in m
MW-5 Zone 16 0728106mE 5149440mN	Top of 50.8 mm PVC casing	216.41 m
	Ground surface elevation	215.56 m
	Bentonite	212.97 m to 215.56 m
	Imported sand pack	209.62 m to 212.97 m
	Screen Interval (#10 slot PVC)	209.62 m to 212.66 m
MW-6 Zone 16 0728264mE 5149150mN	Top of 50.8 mm PVC casing	220.97 m
	Ground surface elevation	220.12 m
	Bentonite	217.37 m to 220.12 m
	Imported sand pack	214.02 m to 217.37 m
	Screen Interval (#10 slot PVC)	214.02 m to 217.07 m

NOTES:

- 1) All elevations are reported as metres (geodetic), and were surveyed by Tulloch Engineering Inc.
- 2) This table is to be read with the accompanying report. Interpretation assistance is required by Tulloch Engineering Inc. before use by others.

APPENDIX D

GROUNDWATER LEVELS

Date	Well Number					
	MW-1	MW-2	MW-3	MW-4	MW-5	MW-6
11/5/2013	215.66	215.30	214.77	210.84		
3/11/2014	215.59	215.27	214.66	210.60		
5/26/2015	215.49	215.31	214.74	210.83		
8/25/2015	214.57	214.99	213.74	209.31	213.08	218.77
11/3/2015	214.78	215.09	213.26	209.14	213.35	219.53
5/30/2016	215.27	215.34	214.72	210.43	215.27	219.47
8/29/2016	214.30	214.96	213.35	208.82	213.15	218.89
11/2/2016	215.38	215.18	214.11	209.38	214.95	219.87
5/30/2017	215.62	215.40	214.69	210.67	215.82	219.92
8/29/2017	215.46	215.31	214.37	209.92	215.60	219.71
11/27/2017	215.62	215.31	214.57	210.57	214.90	220.08
5/30/2018	215.55	215.31	214.65	210.67	215.61	219.79
8/21/2018	214.41	214.86	213.28	208.87	212.75	218.45
11/26/2018	215.54	215.26	214.37	210.36	214.90	220.13
5/27/2019	215.63	215.32	214.75	210.91	216.37	220.11
8/20/2019	214.39	214.97	213.55	208.72	213.03	218.50
11/4/2019	215.48	215.24	214.35	210.12	216.38	220.09
5/25/2020	215.67	215.35	214.76	210.58	215.78	219.79
10/26/2020	215.72	215.39	214.63	210.41	216.41	220.17
5/30/2021	215.48	215.26	214.58	210.34	215.17	219.42
8/29/2021	215.55	215.19	214.02	210.14	214.74	219.90
10/29/2021	215.68	215.21	214.29	210.12	215.28	219.90
5/31/2022	214.67	214.46	213.63	209.86	214.96	218.38
8/30/2022	214.47	214.27	212.59	206.98	213.39	218.14
11/7/2022	214.7	214.21	212.81	207.12	212.98	218.73

- Sawicki Groundwater Engineering Inc.**

APPENDIX E
Spring 2022 Surface Water and Groundwater Quality
Laboratory Test Results



Your C.O.C. #: 877779-02-01, 877779-01-01

Attention: Marshall Thompson

Tulloch Engineering
200 Main Street
PO Box 579
Thessalon, ON
Canada P0R 1L0

Report Date: 2022/06/10

Report #: R7162174

Version: 1 - Final

CERTIFICATE OF ANALYSIS

BUREAU VERITAS JOB #: C2F0119

Received: 2022/06/02, 09:03

Sample Matrix: Water
Samples Received: 12

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Alkalinity	7	N/A	2022/06/03	CAM SOP-00448	SM 23 2320 B m
Alkalinity	2	N/A	2022/06/06	CAM SOP-00448	SM 23 2320 B m
Alkalinity	3	N/A	2022/06/07	CAM SOP-00448	SM 23 2320 B m
Biochemical Oxygen Demand (BOD)	5	2022/06/03	2022/06/08	CAM SOP-00427	SM 23 5210B m
Chloride by Automated Colourimetry	12	N/A	2022/06/03	CAM SOP-00463	SM 23 4500-Cl E m
Chemical Oxygen Demand	12	N/A	2022/06/07	CAM SOP-00416	SM 23 5220 D m
Conductivity	7	N/A	2022/06/03	CAM SOP-00414	SM 23 2510 m
Conductivity	2	N/A	2022/06/06	CAM SOP-00414	SM 23 2510 m
Conductivity	3	N/A	2022/06/07	CAM SOP-00414	SM 23 2510 m
Dissolved Organic Carbon (DOC) (1)	11	N/A	2022/06/06	CAM SOP-00446	SM 23 5310 B m
Dissolved Organic Carbon (DOC) (1)	1	N/A	2022/06/07	CAM SOP-00446	SM 23 5310 B m
Hardness (calculated as CaCO ₃)	5	N/A	2022/06/07	CAM SOP 00102/00408/00447	SM 2340 B
Mercury	5	2022/06/03	2022/06/03	CAM SOP-00453	EPA 7470A m
Lab Filtered Metals by ICPMS	7	2022/06/03	2022/06/06	CAM SOP-00447	EPA 6020B m
Total Metals Analysis by ICPMS	5	N/A	2022/06/07	CAM SOP-00447	EPA 6020B m
Total Ammonia-N	12	N/A	2022/06/08	CAM SOP-00441	USGS I-2522-90 m
Nitrate & Nitrite as Nitrogen in Water (2)	7	N/A	2022/06/03	CAM SOP-00440	SM 23 4500-NO3I/NO2B
Nitrate & Nitrite as Nitrogen in Water (2)	5	N/A	2022/06/06	CAM SOP-00440	SM 23 4500-NO3I/NO2B
pH	7	2022/06/02	2022/06/03	CAM SOP-00413	SM 4500H+ B m
pH	2	2022/06/03	2022/06/06	CAM SOP-00413	SM 4500H+ B m
pH	3	2022/06/03	2022/06/07	CAM SOP-00413	SM 4500H+ B m
Phenols (4AAP)	1	N/A	2022/06/03	CAM SOP-00444	OMOE E3179 m
Phenols (4AAP)	4	N/A	2022/06/06	CAM SOP-00444	OMOE E3179 m
Sulphate by Automated Colourimetry	12	N/A	2022/06/03	CAM SOP-00464	EPA 375.4 m
Total Dissolved Solids	12	2022/06/06	2022/06/07	CAM SOP-00428	SM 23 2540C m
Total Kjeldahl Nitrogen in Water	5	2022/06/06	2022/06/07	CAM SOP-00938	OMOE E3516 m
Total Phosphorus (Colourimetric)	4	2022/06/07	2022/06/07	CAM SOP-00407	SM 23 4500 P B H m
Total Phosphorus (Colourimetric)	1	2022/06/07	2022/06/09	CAM SOP-00407	SM 23 4500 P B H m
Low Level Total Suspended Solids	5	2022/06/06	2022/06/07	CAM SOP-00428	SM 23 2540D m



Your C.O.C. #: 877779-02-01, 877779-01-01

Attention: Marshall Thompson

Tulloch Engineering
200 Main Street
PO Box 579
Thessalon, ON
Canada P0R 1L0

Report Date: 2022/06/10

Report #: R7162174

Version: 1 - Final

CERTIFICATE OF ANALYSIS

BUREAU VERITAS JOB #: C2F0119

Received: 2022/06/02, 09:03

Remarks:

Bureau Veritas is accredited to ISO/IEC 17025 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Bureau Veritas are based upon recognized Provincial, Federal or US method compendia such as CCME, MELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Bureau Veritas' profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Bureau Veritas in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

Bureau Veritas liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Bureau Veritas has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Bureau Veritas, unless otherwise agreed in writing. Bureau Veritas is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.

Results relate to samples tested. When sampling is not conducted by Bureau Veritas, results relate to the supplied samples tested.

This Certificate shall not be reproduced except in full, without the written approval of the laboratory.

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

(1) Dissolved Organic Carbon (DOC) present in the sample should be considered as non-purgeable DOC.

(2) Values for calculated parameters may not appear to add up due to rounding of raw data and significant figures.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.

Sara Singh, B.Sc, Senior Project Manager

Email: Sara.Singh@bureauveritas.com

Phone# (905)817-5827

=====

This report has been generated and distributed using a secure automated process.

Bureau Veritas has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Total Cover Pages : 2

Page 2 of 14

Bureau Veritas 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.bvlabs.com

Microbiology testing is conducted at 6660 Campobello Rd. Chemistry testing is conducted at 6740 Campobello Rd.

BUREAU
VERITAS

Bureau Veritas Job #: C2F0119

Report Date: 2022/06/10

Tulloch Engineering

Sampler Initials: JS

RESULTS OF ANALYSES OF WATER

Bureau Veritas ID		SUB067			SUB067			SUB068		
Sampling Date		2022/06/01 10:20			2022/06/01 10:20			2022/06/01 10:35		
COC Number		877779-02-01			877779-02-01			877779-02-01		
	UNITS	MW1	RDL	QC Batch	MW1 Lab-Dup	RDL	QC Batch	MW2	RDL	QC Batch

Inorganics

Total Ammonia-N	mg/L	0.065	0.050	8037453				0.11	0.050	8037453
Total Chemical Oxygen Demand (COD)	mg/L	8.1	4.0	8036026				6.7	4.0	8036026
Conductivity	umho/cm	430	1.0	8030842				690	1.0	8030842
Total Dissolved Solids	mg/L	235	10	8035459				365	10	8035459
Dissolved Organic Carbon	mg/L	2.4	0.40	8032690				1.9	0.40	8032692
pH	pH	8.02		8030846				7.94		8030846
Dissolved Sulphate (SO4)	mg/L	3.8	1.0	8030892				8.2	1.0	8030892
Alkalinity (Total as CaCO3)	mg/L	230	1.0	8030834				350	1.0	8030834
Dissolved Chloride (Cl-)	mg/L	ND	1.0	8030886				13	1.0	8030886
Nitrate (N)	mg/L	ND	0.10	8031071	ND	0.10	8031071	ND	0.10	8030926

RDL = Reportable Detection Limit

QC Batch = Quality Control Batch

Lab-Dup = Laboratory Initiated Duplicate

ND = Not Detected at a concentration equal or greater than the indicated Detection Limit.

Bureau Veritas ID		SUB068			SUB069		SUB070		
Sampling Date		2022/06/01 10:35			2022/06/01 11:00		2022/06/01 11:30		
COC Number		877779-02-01			877779-02-01		877779-02-01		
	UNITS	MW2 Lab-Dup	RDL	QC Batch	MW3	QC Batch	MW4	RDL	QC Batch

Inorganics

Total Ammonia-N	mg/L				0.076	8037453	ND	0.050	8037453
Total Chemical Oxygen Demand (COD)	mg/L	7.7	4.0	8036026	6.0	8036026	6.7	4.0	8036026
Conductivity	umho/cm				510	8030842	810	1.0	8030842
Total Dissolved Solids	mg/L	370	10	8035459	285	8035459	405	10	8035459
Dissolved Organic Carbon	mg/L	1.9	0.40	8032692	2.2	8032690	1.5	0.40	8032690
pH	pH				7.93	8030846	7.93		8030846
Dissolved Sulphate (SO4)	mg/L				1.9	8030892	4.8	1.0	8030892
Alkalinity (Total as CaCO3)	mg/L				280	8030834	450	1.0	8030834
Dissolved Chloride (Cl-)	mg/L				1.2	8030886	1.6	1.0	8030886
Nitrate (N)	mg/L				ND	8030926	ND	0.10	8030916

RDL = Reportable Detection Limit

QC Batch = Quality Control Batch

Lab-Dup = Laboratory Initiated Duplicate

ND = Not Detected at a concentration equal or greater than the indicated Detection Limit.



RESULTS OF ANALYSES OF WATER

Bureau Veritas ID		SUB071		SUB072			SUB072		
Sampling Date		2022/06/01 11:20		2022/06/01 10:00			2022/06/01 10:00		
COC Number		877779-02-01		877779-02-01			877779-02-01		
	UNITS	MW5	QC Batch	MW6	RDL	QC Batch	MW6 Lab-Dup	RDL	QC Batch
Inorganics									
Total Ammonia-N	mg/L	0.068	8037453	ND	0.050	8037453	ND	0.050	8037453
Total Chemical Oxygen Demand (COD)	mg/L	11	8036026	15	4.0	8036026			
Conductivity	umho/cm	450	8030842	340	1.0	8030842			
Total Dissolved Solids	mg/L	265	8035459	205	10	8035459			
Dissolved Organic Carbon	mg/L	1.8	8032690	1.8	0.40	8032690			
pH	pH	7.82	8030846	7.92		8030846			
Dissolved Sulphate (SO ₄)	mg/L	22	8030892	2.0	1.0	8030892			
Alkalinity (Total as CaCO ₃)	mg/L	160	8030834	180	1.0	8030834			
Dissolved Chloride (Cl ⁻)	mg/L	34	8030886	1.5	1.0	8030886			
Nitrate (N)	mg/L	ND	8030926	ND	0.10	8030916			
RDL = Reportable Detection Limit QC Batch = Quality Control Batch Lab-Dup = Laboratory Initiated Duplicate ND = Not Detected at a concentration equal or greater than the indicated Detection Limit.									



RESULTS OF ANALYSES OF WATER

Bureau Veritas ID		SUB073			SUB074		SUB075		
Sampling Date		2022/06/01 10:45			2022/05/31 11:45		2022/05/31 11:00		
COC Number		877779-02-01			877779-02-01		877779-02-01		
	UNITS	MW7	RDL	QC Batch	SW1	QC Batch	SW2	RDL	QC Batch

Calculated Parameters

Hardness (CaCO ₃)	mg/L				230	8029010	250	1.0	8029010
Inorganics									
Total Ammonia-N	mg/L	0.11	0.050	8037453	ND	8037453	ND	0.050	8037453
Total BOD	mg/L				ND	8031297	ND	2	8031297
Total Chemical Oxygen Demand (COD)	mg/L	12	4.0	8036026	55	8036026	44	4.0	8036026
Conductivity	umho/cm	690	1.0	8030842	590	8032752	660	1.0	8032110
Total Dissolved Solids	mg/L	360	10	8035459	350	8035459	325	10	8035459
Total Kjeldahl Nitrogen (TKN)	mg/L				0.87	8036075	0.89	0.10	8036075
Dissolved Organic Carbon	mg/L	2.0	0.40	8032690	20	8032690	22	0.40	8032690
pH	pH	7.93		8030846	8.00	8032772	7.94		8032111
Phenols-4AAP	mg/L				ND	8032195	ND	0.0010	8035426
Total Phosphorus	mg/L				0.048	8037061	0.057	0.004	8037061
Total Suspended Solids	mg/L				8	8032554	7	1	8032554
Dissolved Sulphate (SO ₄)	mg/L	8.0	1.0	8030892	38	8030892	43	1.0	8030892
Alkalinity (Total as CaCO ₃)	mg/L	350	1.0	8030834	220	8032769	240	1.0	8032104
Dissolved Chloride (Cl ⁻)	mg/L	13	1.0	8030886	34	8030886	37	1.0	8030886
Nitrite (N)	mg/L				ND	8030926	0.010	0.010	8030916
Nitrate (N)	mg/L	ND	0.10	8030916	ND	8030926	ND	0.10	8030916

RDL = Reportable Detection Limit

QC Batch = Quality Control Batch

ND = Not Detected at a concentration equal or greater than the indicated Detection Limit.



RESULTS OF ANALYSES OF WATER

Bureau Veritas ID		SUB075			SUB076		SUB077		
Sampling Date		2022/05/31 11:00			2022/05/31 12:40		2022/05/31 12:15		
COC Number		877779-02-01			877779-02-01		877779-01-01		
	UNITS	SW2 Lab-Dup	RDL	QC Batch	SW3	QC Batch	SW4	RDL	QC Batch

Calculated Parameters									
Hardness (CaCO ₃)	mg/L				52	8029010	220	1.0	8029010
Inorganics									
Total Ammonia-N	mg/L				ND	8037453	ND	0.050	8037453
Total BOD	mg/L				ND	8031297	ND	2	8031297
Total Chemical Oxygen Demand (COD)	mg/L				15	8036026	54	4.0	8036026
Conductivity	umho/cm				120	8032752	560	1.0	8032110
Total Dissolved Solids	mg/L				100	8035459	345	10	8035459
Total Kjeldahl Nitrogen (TKN)	mg/L				0.14	8036075	0.67	0.10	8036075
Dissolved Organic Carbon	mg/L				4.7	8032690	19	0.40	8032690
pH	pH				7.41	8032772	8.03		8032111
Phenols-4AAP	mg/L				ND	8035426	ND	0.0010	8035426
Total Phosphorus	mg/L				0.034	8037061	0.040	0.004	8037061
Total Suspended Solids	mg/L				9	8032554	5	1	8032554
Dissolved Sulphate (SO ₄)	mg/L	42	1.0	8030892	1.9	8030892	34	1.0	8030892
Alkalinity (Total as CaCO ₃)	mg/L				57	8032769	210	1.0	8032104
Dissolved Chloride (Cl ⁻)	mg/L	37	1.0	8030886	1.1	8030886	32	1.0	8030886
Nitrite (N)	mg/L				ND	8030926	0.011	0.010	8030916
Nitrate (N)	mg/L				ND	8030926	ND	0.10	8030916

RDL = Reportable Detection Limit

QC Batch = Quality Control Batch

Lab-Dup = Laboratory Initiated Duplicate

ND = Not Detected at a concentration equal or greater than the indicated Detection Limit.

**RESULTS OF ANALYSES OF WATER**

Bureau Veritas ID		SUB078			SUB078		
Sampling Date		2022/05/31 11:55			2022/05/31 11:55		
COC Number		877779-01-01			877779-01-01		
	UNITS	SW5	RDL	QC Batch	SW5 Lab-Dup	RDL	QC Batch

Calculated Parameters							
Hardness (CaCO ₃)	mg/L	230	1.0	8029010			
Inorganics							
Total Ammonia-N	mg/L	ND	0.050	8037453			
Total BOD	mg/L	ND	2	8031297			
Total Chemical Oxygen Demand (COD)	mg/L	56	4.0	8036026			
Conductivity	umho/cm	600	1.0	8032110			
Total Dissolved Solids	mg/L	350	10	8035459			
Total Kjeldahl Nitrogen (TKN)	mg/L	0.82	0.10	8036075			
Dissolved Organic Carbon	mg/L	20	0.40	8032690			
pH	pH	7.98		8032111			
Phenols-4AAP	mg/L	ND	0.0010	8035426			
Total Phosphorus	mg/L	0.052	0.004	8037079	0.054	0.004	8037079
Total Suspended Solids	mg/L	7	1	8032554			
Dissolved Sulphate (SO ₄)	mg/L	39	1.0	8030892			
Alkalinity (Total as CaCO ₃)	mg/L	220	1.0	8032104			
Dissolved Chloride (Cl ⁻)	mg/L	34	1.0	8030886			
Nitrite (N)	mg/L	ND	0.010	8030926	ND	0.010	8030926
Nitrate (N)	mg/L	ND	0.10	8030926	ND	0.10	8030926

RDL = Reportable Detection Limit

QC Batch = Quality Control Batch

Lab-Dup = Laboratory Initiated Duplicate

ND = Not Detected at a concentration equal or greater than the indicated Detection Limit.



ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Bureau Veritas ID		SUB067		SUB068		SUB069		SUB070		
Sampling Date		2022/06/01 10:20		2022/06/01 10:35		2022/06/01 11:00		2022/06/01 11:30		
COC Number		877779-02-01		877779-02-01		877779-02-01		877779-02-01		
	UNITS	MW1	QC Batch	MW2	QC Batch	MW3	QC Batch	MW4	RDL	QC Batch

Metals

Dissolved Barium (Ba)	ug/L	40	8033068	55	8033049	51	8033068	89	2.0	8033049
Dissolved Boron (B)	ug/L	71	8033068	90	8033049	85	8033068	96	10	8033049
Dissolved Calcium (Ca)	ug/L	49000	8033068	72000	8033049	54000	8033068	71000	200	8033049
Dissolved Iron (Fe)	ug/L	ND	8033068	ND	8033049	ND	8033068	ND	100	8033049
Dissolved Magnesium (Mg)	ug/L	16000	8033068	30000	8033049	21000	8033068	40000	50	8033049
Dissolved Sodium (Na)	ug/L	24000	8033068	36000	8033049	27000	8033068	52000	100	8033049

RDL = Reportable Detection Limit

QC Batch = Quality Control Batch

ND = Not Detected at a concentration equal or greater than the indicated Detection Limit.

Bureau Veritas ID		SUB071		SUB072	SUB072		SUB073		
Sampling Date		2022/06/01 11:20		2022/06/01 10:00	2022/06/01 10:00		2022/06/01 10:45		
COC Number		877779-02-01		877779-02-01	877779-02-01		877779-02-01		
	UNITS	MW5	QC Batch	MW6	MW6 Lab-Dup	QC Batch	MW7	RDL	QC Batch

Metals

Dissolved Barium (Ba)	ug/L	28	8033049	31	32	8033068	57	2.0	8033049
Dissolved Boron (B)	ug/L	28	8033049	14	14	8033068	93	10	8033049
Dissolved Calcium (Ca)	ug/L	57000	8033049	40000	41000	8033068	71000	200	8033049
Dissolved Iron (Fe)	ug/L	ND	8033049	ND	ND	8033068	ND	100	8033049
Dissolved Magnesium (Mg)	ug/L	12000	8033049	15000	15000	8033068	29000	50	8033049
Dissolved Sodium (Na)	ug/L	14000	8033049	7900	8000	8033068	36000	100	8033049

RDL = Reportable Detection Limit

QC Batch = Quality Control Batch

Lab-Dup = Laboratory Initiated Duplicate

ND = Not Detected at a concentration equal or greater than the indicated Detection Limit.



ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Bureau Veritas ID		SUB074	SUB075		SUB076		SUB077	SUB078		
Sampling Date		2022/05/31 11:45	2022/05/31 11:00		2022/05/31 12:40		2022/05/31 12:15	2022/05/31 11:55		
COC Number		877779-02-01	877779-02-01		877779-02-01		877779-01-01	877779-01-01		
	UNITS	SW1	SW2	QC Batch	SW3	QC Batch	SW4	SW5	RDL	QC Batch

Metals

Mercury (Hg)	ug/L	ND	ND	8031794	ND	8031462	ND	ND	0.10	8031794
Total Aluminum (Al)	ug/L	420	290	8035907	7600	8035907	440	690	4.9	8035907
Total Arsenic (As)	ug/L	ND	ND	8035907	1.4	8035907	ND	ND	1.0	8035907
Total Barium (Ba)	ug/L	43	41	8035907	150	8035907	43	44	2.0	8035907
Total Boron (B)	ug/L	410	450	8035907	17	8035907	380	410	10	8035907
Total Cadmium (Cd)	ug/L	ND	ND	8035907	0.12	8035907	ND	ND	0.090	8035907
Total Chromium (Cr)	ug/L	ND	ND	8035907	15	8035907	ND	ND	5.0	8035907
Total Copper (Cu)	ug/L	3.1	2.3	8035907	9.0	8035907	3.1	3.5	0.90	8035907
Total Lead (Pb)	ug/L	ND	ND	8035907	4.3	8035907	ND	ND	0.50	8035907
Total Zinc (Zn)	ug/L	ND	5.6	8035907	29	8035907	ND	5.5	5.0	8035907

RDL = Reportable Detection Limit

QC Batch = Quality Control Batch

ND = Not Detected at a concentration equal or greater than the indicated Detection Limit.



GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	5.7°C
Package 2	9.0°C

Results relate only to the items tested.

BUREAU
VERITAS

Bureau Veritas Job #: C2F0119

Report Date: 2022/06/10

QUALITY ASSURANCE REPORT

Tulloch Engineering

Sampler Initials: JS

QC Batch	Parameter	Date	Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
8030834	Alkalinity (Total as CaCO ₃)	2022/06/03			96	85 - 115	ND, RDL=1.0	mg/L	1.5	20		
8030842	Conductivity	2022/06/03			101	85 - 115	ND, RDL=1.0	umho/cm	0.97	25		
8030846	pH	2022/06/03			102	98 - 103			1.8	N/A		
8030886	Dissolved Chloride (Cl ⁻)	2022/06/03	NC	80 - 120	102	80 - 120	ND, RDL=1.0	mg/L	0.077	20		
8030892	Dissolved Sulphate (SO ₄)	2022/06/03	NC	75 - 125	106	80 - 120	ND, RDL=1.0	mg/L	1.6	20		
8030916	Nitrate (N)	2022/06/06	95	80 - 120	100	80 - 120	ND, RDL=0.10	mg/L	1.8	20		
8030916	Nitrite (N)	2022/06/06	105	80 - 120	106	80 - 120	ND, RDL=0.010	mg/L	NC	20		
8030926	Nitrate (N)	2022/06/03	98	80 - 120	102	80 - 120	ND, RDL=0.10	mg/L	NC	20		
8030926	Nitrite (N)	2022/06/03	102	80 - 120	102	80 - 120	ND, RDL=0.010	mg/L	NC	20		
8031071	Nitrate (N)	2022/06/03	97	80 - 120	100	80 - 120	ND, RDL=0.10	mg/L	NC	20		
8031297	Total BOD	2022/06/08					ND, RDL=2	mg/L	NC	30	90	80 - 120
8031462	Mercury (Hg)	2022/06/03	97	75 - 125	98	80 - 120	ND, RDL=0.10	ug/L	NC	20		
8031794	Mercury (Hg)	2022/06/03	97	75 - 125	100	80 - 120	ND, RDL=0.10	ug/L	NC	20		
8032104	Alkalinity (Total as CaCO ₃)	2022/06/06			101	85 - 115	ND, RDL=1.0	mg/L	0.25	20		
8032110	Conductivity	2022/06/06			103	85 - 115	ND, RDL=1.0	umho/cm	0.24	25		
8032111	pH	2022/06/06			101	98 - 103			0.40	N/A		
8032195	Phenols-4AAP	2022/06/06	104	80 - 120	104	80 - 120	ND, RDL=0.0010	mg/L	NC	20		
8032554	Total Suspended Solids	2022/06/07					ND, RDL=1	mg/L	NC	25	100	85 - 115
8032690	Dissolved Organic Carbon	2022/06/06	97	80 - 120	96	80 - 120	ND, RDL=0.40	mg/L	0.93	20		
8032692	Dissolved Organic Carbon	2022/06/07	99	80 - 120	95	80 - 120	ND, RDL=0.40	mg/L	1.0	20		
8032752	Conductivity	2022/06/07			101	85 - 115	ND, RDL=1.0	umho/cm	1.5	25		
8032769	Alkalinity (Total as CaCO ₃)	2022/06/07			99	85 - 115	ND, RDL=1.0	mg/L	2.8	20		
8032772	pH	2022/06/07			101	98 - 103			0.74	N/A		
8033049	Dissolved Barium (Ba)	2022/06/06	102	80 - 120	97	80 - 120	ND, RDL=2.0	ug/L	0.54	20		
8033049	Dissolved Boron (B)	2022/06/06	96	80 - 120	89	80 - 120	ND, RDL=10	ug/L	2.1	20		
8033049	Dissolved Calcium (Ca)	2022/06/06	NC	80 - 120	97	80 - 120	ND, RDL=200	ug/L	1.4	20		

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VERITAS

Bureau Veritas Job #: C2F0119

Report Date: 2022/06/10

QUALITY ASSURANCE REPORT(CONT'D)

Tulloch Engineering

Sampler Initials: JS

QC Batch	Parameter	Date	Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
8033049	Dissolved Iron (Fe)	2022/06/06	98	80 - 120	97	80 - 120	ND, RDL=100	ug/L	NC	20		
8033049	Dissolved Magnesium (Mg)	2022/06/06	99	80 - 120	99	80 - 120	ND, RDL=50	ug/L	0.11	20		
8033049	Dissolved Sodium (Na)	2022/06/06	NC	80 - 120	97	80 - 120	ND, RDL=100	ug/L	1.1	20		
8033068	Dissolved Barium (Ba)	2022/06/06	102	80 - 120	97	80 - 120	ND, RDL=2.0	ug/L	2.0	20		
8033068	Dissolved Boron (B)	2022/06/06	94	80 - 120	91	80 - 120	ND, RDL=10	ug/L	1.3	20		
8033068	Dissolved Calcium (Ca)	2022/06/06	NC	80 - 120	100	80 - 120	ND, RDL=200	ug/L	1.5	20		
8033068	Dissolved Iron (Fe)	2022/06/06	100	80 - 120	98	80 - 120	ND, RDL=100	ug/L	NC	20		
8033068	Dissolved Magnesium (Mg)	2022/06/06	104	80 - 120	102	80 - 120	ND, RDL=50	ug/L	2.9	20		
8033068	Dissolved Sodium (Na)	2022/06/06	100	80 - 120	98	80 - 120	ND, RDL=100	ug/L	1.5	20		
8035426	Phenols-4AAP	2022/06/06	102	80 - 120	103	80 - 120	ND, RDL=0.0010	mg/L	NC	20		
8035459	Total Dissolved Solids	2022/06/07					ND, RDL=10	mg/L	1.4	25	102	90 - 110
8035907	Total Aluminum (Al)	2022/06/07	110	80 - 120	98	80 - 120	ND, RDL=4.9	ug/L				
8035907	Total Arsenic (As)	2022/06/07	98	80 - 120	96	80 - 120	ND, RDL=1.0	ug/L				
8035907	Total Barium (Ba)	2022/06/07	99	80 - 120	98	80 - 120	ND, RDL=2.0	ug/L				
8035907	Total Boron (B)	2022/06/07	98	80 - 120	94	80 - 120	ND, RDL=10	ug/L				
8035907	Total Cadmium (Cd)	2022/06/07	98	80 - 120	96	80 - 120	ND, RDL=0.090	ug/L				
8035907	Total Chromium (Cr)	2022/06/07	93	80 - 120	90	80 - 120	ND, RDL=5.0	ug/L				
8035907	Total Copper (Cu)	2022/06/07	101	80 - 120	96	80 - 120	ND, RDL=0.90	ug/L				
8035907	Total Lead (Pb)	2022/06/07	94	80 - 120	95	80 - 120	ND, RDL=0.50	ug/L				
8035907	Total Zinc (Zn)	2022/06/07	96	80 - 120	96	80 - 120	ND, RDL=5.0	ug/L				
8036026	Total Chemical Oxygen Demand (COD)	2022/06/07	104	80 - 120	101	80 - 120	ND, RDL=4.0	mg/L	14	20		
8036075	Total Kjeldahl Nitrogen (TKN)	2022/06/07	96	80 - 120	97	80 - 120	ND, RDL=0.10	mg/L	6.6	20	96	80 - 120
8037061	Total Phosphorus	2022/06/07	98	80 - 120	100	80 - 120	ND, RDL=0.004	mg/L	8.8	20	95	80 - 120
8037079	Total Phosphorus	2022/06/09	NC	80 - 120	105	80 - 120	ND, RDL=0.004	mg/L	3.2	20	99	80 - 120

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VERITAS

Bureau Veritas Job #: C2F0119

Report Date: 2022/06/10

QUALITY ASSURANCE REPORT(CONT'D)

Tulloch Engineering

Sampler Initials: JS

QC Batch	Parameter	Date	Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
8037453	Total Ammonia-N	2022/06/08	96	75 - 125	97	80 - 120	ND, RDL=0.050	mg/L	NC	20		

N/A = Not Applicable

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

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

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference $\leq 2 \times \text{RDL}$).



BUREAU
VERITAS

Bureau Veritas Job #: C2F0119



Report Date: 2022/06/10

Tulloch Engineering

Sampler Initials: JS

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by:

Ewa Pranjic, M.Sc., C.Chem, Scientific Specialist

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APPENDIX F
Summer 2022 Surface Water and Groundwater Quality
Laboratory Test Results



Your Project #: Macdonald Meredith 2022
Your C.O.C. #: 890430-01-01, 890430-02-01

Attention: Marshall Thompson

Tulloch Engineering
200 Main Street
PO Box 579
Thessalon, ON
Canada P0R 1L0

Report Date: 2022/09/14
Report #: R7295440
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BUREAU VERITAS JOB #: C2P2588

Received: 2022/09/02, 09:12

Sample Matrix: Water
Samples Received: 12

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Alkalinity	12	N/A	2022/09/06	CAM SOP-00448	SM 23 2320 B m
Biochemical Oxygen Demand (BOD)	5	2022/09/03	2022/09/08	CAM SOP-00427	SM 23 5210B m
Chloride by Automated Colourimetry	12	N/A	2022/09/08	CAM SOP-00463	SM 23 4500-Cl E m
Chemical Oxygen Demand	11	N/A	2022/09/06	CAM SOP-00416	SM 23 5220 D m
Chemical Oxygen Demand	1	N/A	2022/09/08	CAM SOP-00416	SM 23 5220 D m
Conductivity	12	N/A	2022/09/06	CAM SOP-00414	SM 23 2510 m
Dissolved Organic Carbon (DOC) (1)	12	N/A	2022/09/06	CAM SOP-00446	SM 23 5310 B m
Hardness (calculated as CaCO ₃)	5	N/A	2022/09/08	CAM SOP 00102/00408/00447	SM 2340 B
Mercury	5	2022/09/06	2022/09/06	CAM SOP-00453	EPA 7470A m
Dissolved Metals by ICPMS	7	N/A	2022/09/09	CAM SOP-00447	EPA 6020B m
Total Metals Analysis by ICPMS	1	N/A	2022/09/07	CAM SOP-00447	EPA 6020B m
Total Metals Analysis by ICPMS	4	N/A	2022/09/08	CAM SOP-00447	EPA 6020B m
Total Ammonia-N	12	N/A	2022/09/08	CAM SOP-00441	USGS I-2522-90 m
Nitrate & Nitrite as Nitrogen in Water (2)	12	N/A	2022/09/13	CAM SOP-00440	SM 23 4500-NO3I/NO2B
pH	12	2022/09/06	2022/09/06	CAM SOP-00413	SM 4500H+ B m
Phenols (4AAP)	5	N/A	2022/09/07	CAM SOP-00444	OMOE E3179 m
Sulphate by Automated Colourimetry	12	N/A	2022/09/08	CAM SOP-00464	EPA 375.4 m
Total Dissolved Solids	5	2022/09/06	2022/09/07	CAM SOP-00428	SM 23 2540C m
Total Dissolved Solids	7	2022/09/07	2022/09/08	CAM SOP-00428	SM 23 2540C m
Total Kjeldahl Nitrogen in Water	5	2022/09/06	2022/09/08	CAM SOP-00938	OMOE E3516 m
Total Phosphorus (Colourimetric)	5	2022/09/07	2022/09/07	CAM SOP-00407	SM 23 4500-P I
Low Level Total Suspended Solids	5	2022/09/06	2022/09/08	CAM SOP-00428	SM 23 2540D m

Remarks:

Bureau Veritas is accredited to ISO/IEC 17025 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Bureau Veritas are based upon recognized Provincial, Federal or US method compendia such as CCME, MELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Bureau Veritas' profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Bureau Veritas in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are



Your Project #: Macdonald Meredith 2022
Your C.O.C. #: 890430-01-01, 890430-02-01

Attention: Marshall Thompson

Tulloch Engineering
200 Main Street
PO Box 579
Thessalon, ON
Canada P0R 1L0

Report Date: 2022/09/14
Report #: R7295440
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BUREAU VERITAS JOB #: C2P2588

Received: 2022/09/02, 09:12

reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

Bureau Veritas liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Bureau Veritas has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Bureau Veritas, unless otherwise agreed in writing. Bureau Veritas is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.

Results relate to samples tested. When sampling is not conducted by Bureau Veritas, results relate to the supplied samples tested.

This Certificate shall not be reproduced except in full, without the written approval of the laboratory.

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

(1) Dissolved Organic Carbon (DOC) present in the sample should be considered as non-purgeable DOC.

(2) Values for calculated parameters may not appear to add up due to rounding of raw data and significant figures.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.

Sara Singh, B.Sc, Senior Project Manager

Email: Sara.Singh@bureauveritas.com

Phone# (905)817-5827

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BUREAU
VERITAS

Bureau Veritas Job #: C2P2588

Report Date: 2022/09/14

Tulloch Engineering

Client Project #: Macdonald Meredith 2022

Sampler Initials: J.S

RESULTS OF ANALYSES OF WATER

Bureau Veritas ID		TQA099		TQA100		TQA101		
Sampling Date		2022/08/31 10:50		2022/08/31 11:05		2022/08/31 11:20		
COC Number		890430-01-01		890430-01-01		890430-01-01		
	UNITS	MW1	QC Batch	MW2	QC Batch	MW3	RDL	QC Batch
Inorganics								
Total Ammonia-N	mg/L	0.071	8208105	0.13	8208105	0.091	0.050	8208105
Total Chemical Oxygen Demand (COD)	mg/L	6.5	8207786	6.9	8207786	6.2	4.0	8207786
Conductivity	umho/cm	410	8208054	670	8208054	490	1.0	8208054
Total Dissolved Solids	mg/L	225	8210520	290	8210520	205	10	8210520
Dissolved Organic Carbon	mg/L	2.2	8207734	3.2	8207734	1.9	0.40	8207734
pH	pH	8.09	8208043	7.94	8208043	7.99		8208043
Dissolved Sulphate (SO ₄)	mg/L	4.0	8208018	8.5	8208018	2.7	1.0	8208018
Alkalinity (Total as CaCO ₃)	mg/L	230	8208056	350	8208056	270	1.0	8208056
Dissolved Chloride (Cl ⁻)	mg/L	ND	8208008	13	8208008	1.0	1.0	8208008
Nitrate (N)	mg/L	ND	8208270	ND	8208005	0.17	0.10	8208270
RDL = Reportable Detection Limit								
QC Batch = Quality Control Batch								
ND = Not Detected at a concentration equal or greater than the indicated Detection Limit.								

Bureau Veritas ID		TQA102	TQA103		TQA104		
Sampling Date		2022/08/31 12:00	2022/08/31 12:15		2022/08/31 10:15		
COC Number		890430-01-01	890430-01-01		890430-01-01		
	UNITS	MW4	MW5	QC Batch	MW6	RDL	QC Batch
Inorganics							
Total Ammonia-N	mg/L	ND	ND	8208105	ND	0.050	8208105
Total Chemical Oxygen Demand (COD)	mg/L	ND	ND	8207786	ND	4.0	8207786
Conductivity	umho/cm	690	430	8208054	350	1.0	8208054
Total Dissolved Solids	mg/L	320	145	8210520	175	10	8210520
Dissolved Organic Carbon	mg/L	1.7	1.6	8207734	0.72	0.40	8207734
pH	pH	7.95	7.96	8208043	8.09		8208043
Dissolved Sulphate (SO ₄)	mg/L	3.6	23	8208018	1.8	1.0	8208018
Alkalinity (Total as CaCO ₃)	mg/L	390	150	8208056	190	1.0	8208056
Dissolved Chloride (Cl ⁻)	mg/L	1.1	33	8208008	ND	1.0	8208008
Nitrate (N)	mg/L	ND	ND	8208005	ND	0.10	8208270
RDL = Reportable Detection Limit							
QC Batch = Quality Control Batch							
ND = Not Detected at a concentration equal or greater than the indicated Detection Limit.							



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Bureau Veritas Job #: C2P2588

Report Date: 2022/09/14

Tulloch Engineering

Client Project #: Macdonald Meredith 2022

Sampler Initials: J.S

RESULTS OF ANALYSES OF WATER

Bureau Veritas ID		TQA104			TQA105			TQA105		
Sampling Date		2022/08/31 10:15			2022/08/31 10:25			2022/08/31 10:25		
COC Number		890430-01-01			890430-01-01			890430-01-01		
	UNITS	MW6 Lab-Dup	RDL	QC Batch	MW7	RDL	QC Batch	MW7 Lab-Dup	RDL	QC Batch

Inorganics										
Total Ammonia-N	mg/L				ND	0.050	8208105			
Total Chemical Oxygen Demand (COD)	mg/L				ND	4.0	8208728	ND	4.0	8208728
Conductivity	umho/cm				350	1.0	8208054	350	1.0	8208054
Total Dissolved Solids	mg/L	175	10	8210520	165	10	8210520			
Dissolved Organic Carbon	mg/L				0.70	0.40	8207734	0.69	0.40	8207734
pH	pH				8.03		8208043	8.08		8208043
Dissolved Sulphate (SO ₄)	mg/L				2.0	1.0	8208018			
Alkalinity (Total as CaCO ₃)	mg/L				190	1.0	8208056	190	1.0	8208056
Dissolved Chloride (Cl ⁻)	mg/L				ND	1.0	8208008			
Nitrate (N)	mg/L				ND	0.10	8208005			

RDL = Reportable Detection Limit

QC Batch = Quality Control Batch

Lab-Dup = Laboratory Initiated Duplicate

ND = Not Detected at a concentration equal or greater than the indicated Detection Limit.



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Bureau Veritas Job #: C2P2588

Report Date: 2022/09/14

Tulloch Engineering

Client Project #: Macdonald Meredith 2022

Sampler Initials: J.S

RESULTS OF ANALYSES OF WATER

Bureau Veritas ID		TQA106	TQA107			TQA108		
Sampling Date		2022/08/30 13:45	2022/08/30 12:20			2022/08/30 14:30		
COC Number		890430-01-01	890430-01-01			890430-01-01		
	UNITS	SW1	SW2	RDL	QC Batch	SW3	RDL	QC Batch
Calculated Parameters								
Hardness (CaCO ₃)	mg/L	480	500	1.0	8206034	93	1.0	8206034
Inorganics								
Total Ammonia-N	mg/L	0.10	0.21	0.050	8208105	ND	0.050	8208105
Total BOD	mg/L	2	ND	2	8205870	ND	2	8205870
Total Chemical Oxygen Demand (COD)	mg/L	68	72	4.0	8207786	20	4.0	8207786
Conductivity	umho/cm	1400	1400	1.0	8208054	190	1.0	8208054
Total Dissolved Solids	mg/L	855	910	10	8207778	150	10	8207778
Total Kjeldahl Nitrogen (TKN)	mg/L	1.5	1.6	0.10	8207784	0.27	0.10	8208327
Dissolved Organic Carbon	mg/L	27	27	0.40	8207734	5.2	0.40	8207734
pH	pH	8.23	8.03		8208043	7.61		8208043
Phenols-4AAP	mg/L	0.0020	0.0018	0.0010	8209974	ND	0.0010	8209974
Total Phosphorus	mg/L	0.064	0.069	0.004	8209401	0.084	0.004	8209401
Total Suspended Solids	mg/L	18	10	1	8207352	97	1	8207352
Dissolved Sulphate (SO ₄)	mg/L	130	140	1.0	8208018	4.6	1.0	8208018
Alkalinity (Total as CaCO ₃)	mg/L	410	420	1.0	8208056	94	1.0	8208056
Dissolved Chloride (Cl ⁻)	mg/L	140	140	2.0	8208008	2.0	1.0	8208008
Nitrite (N)	mg/L	0.016	0.078	0.010	8208270	ND	0.010	8208005
Nitrate (N)	mg/L	0.51	0.43	0.10	8208270	ND	0.10	8208005
RDL = Reportable Detection Limit								
QC Batch = Quality Control Batch								
ND = Not Detected at a concentration equal or greater than the indicated Detection Limit.								

**RESULTS OF ANALYSES OF WATER**

Bureau Veritas ID		TQA111		TQA115		
Sampling Date		2022/08/30 14:10		2022/08/30 14:40		
COC Number		890430-02-01		890430-02-01		
	UNITS	SW4	RDL	SW5	RDL	QC Batch
Calculated Parameters						
Hardness (CaCO ₃)	mg/L	460	1.0	100	1.0	8206034
Inorganics						
Total Ammonia-N	mg/L	0.097	0.050	ND	0.050	8208315
Total BOD	mg/L	ND	2	2	2	8205870
Total Chemical Oxygen Demand (COD)	mg/L	64	4.0	20	4.0	8207786
Conductivity	umho/cm	1300	1.0	210	1.0	8208054
Total Dissolved Solids	mg/L	825	10	185	10	8207778
Total Kjeldahl Nitrogen (TKN)	mg/L	1.3	0.10	0.28	0.10	8208327
Dissolved Organic Carbon	mg/L	26	0.40	5.1	0.40	8207734
pH	pH	8.23		7.61		8208043
Phenols-4AAP	mg/L	0.0022	0.0010	0.0023	0.0010	8209974
Total Phosphorus	mg/L	0.063	0.004	0.099	0.004	8209401
Total Suspended Solids	mg/L	14	1	92	2	8207352
Dissolved Sulphate (SO ₄)	mg/L	130	1.0	4.9	1.0	8208018
Alkalinity (Total as CaCO ₃)	mg/L	370	1.0	100	1.0	8208056
Dissolved Chloride (Cl ⁻)	mg/L	130	1.0	2.6	1.0	8208008
Nitrite (N)	mg/L	0.034	0.010	0.033	0.010	8208270
Nitrate (N)	mg/L	0.49	0.10	0.27	0.10	8208270
RDL = Reportable Detection Limit						
QC Batch = Quality Control Batch						
ND = Not Detected at a concentration equal or greater than the indicated Detection Limit.						



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Bureau Veritas Job #: C2P2588
Report Date: 2022/09/14

Tulloch Engineering
Client Project #: Macdonald Meredith 2022
Sampler Initials: J.S

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Bureau Veritas ID		TQA099	TQA100	TQA101	TQA102	TQA103	TQA104		
Sampling Date		2022/08/31 10:50	2022/08/31 11:05	2022/08/31 11:20	2022/08/31 12:00	2022/08/31 12:15	2022/08/31 10:15		
COC Number		890430-01-01	890430-01-01	890430-01-01	890430-01-01	890430-01-01	890430-01-01		
	UNITS	MW1	MW2	MW3	MW4	MW5	MW6	RDL	QC Batch

Metals

Dissolved Barium (Ba)	ug/L	37	57	52	80	28	35	2.0	8206352
Dissolved Boron (B)	ug/L	79	97	92	110	26	18	10	8206352
Dissolved Calcium (Ca)	ug/L	45000	70000	51000	61000	55000	41000	200	8206352
Dissolved Iron (Fe)	ug/L	ND	ND	ND	ND	420	ND	100	8206352
Dissolved Magnesium (Mg)	ug/L	15000	29000	20000	33000	12000	16000	50	8206352
Dissolved Sodium (Na)	ug/L	23000	36000	26000	50000	12000	9000	100	8206352

RDL = Reportable Detection Limit

QC Batch = Quality Control Batch

ND = Not Detected at a concentration equal or greater than the indicated Detection Limit.

Bureau Veritas ID		TQA105			TQA106	TQA107		TQA108		
Sampling Date		2022/08/31 10:25			2022/08/30 13:45	2022/08/30 12:20		2022/08/30 14:30		
COC Number		890430-01-01			890430-01-01	890430-01-01		890430-01-01		
	UNITS	MW7	RDL	QC Batch	SW1	SW2	QC Batch	SW3	RDL	QC Batch

Metals

Mercury (Hg)	ug/L				ND	ND	8207630	ND	0.10	8207630
Total Aluminum (Al)	ug/L				880	310	8212135	2900	4.9	8209357
Total Arsenic (As)	ug/L				1.1	1.0	8212135	1.7	1.0	8209357
Dissolved Barium (Ba)	ug/L	35	2.0	8206352						
Total Barium (Ba)	ug/L				83	77	8212135	130	2.0	8209357
Dissolved Boron (B)	ug/L	18	10	8206352						
Total Boron (B)	ug/L				1400	1400	8212135	20	10	8209357
Total Cadmium (Cd)	ug/L				ND	ND	8212135	ND	0.090	8209357
Dissolved Calcium (Ca)	ug/L	41000	200	8206352						
Total Chromium (Cr)	ug/L				ND	6.1	8212135	6.6	5.0	8209357
Total Copper (Cu)	ug/L				4.2	3.0	8212135	4.1	0.90	8209357
Dissolved Iron (Fe)	ug/L	ND	100	8206352						
Total Lead (Pb)	ug/L				ND	ND	8212135	1.8	0.50	8209357
Dissolved Magnesium (Mg)	ug/L	16000	50	8206352						
Dissolved Sodium (Na)	ug/L	8800	100	8206352						
Total Zinc (Zn)	ug/L				5.4	ND	8212135	11	5.0	8209357

RDL = Reportable Detection Limit

QC Batch = Quality Control Batch

ND = Not Detected at a concentration equal or greater than the indicated Detection Limit.



ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Bureau Veritas ID		TQA111	TQA115		
Sampling Date		2022/08/30 14:10	2022/08/30 14:40		
COC Number		890430-02-01	890430-02-01		
	UNITS	SW4	SW5	RDL	QC Batch
Metals					
Mercury (Hg)	ug/L	ND	ND	0.10	8207630
Total Aluminum (Al)	ug/L	580	1700	4.9	8212135
Total Arsenic (As)	ug/L	1.2	1.4	1.0	8212135
Total Barium (Ba)	ug/L	87	110	2.0	8212135
Total Boron (B)	ug/L	1300	30	10	8212135
Total Cadmium (Cd)	ug/L	ND	ND	0.090	8212135
Total Chromium (Cr)	ug/L	ND	ND	5.0	8212135
Total Copper (Cu)	ug/L	4.0	2.9	0.90	8212135
Total Lead (Pb)	ug/L	ND	0.98	0.50	8212135
Total Zinc (Zn)	ug/L	5.3	8.7	5.0	8212135
RDL = Reportable Detection Limit					
QC Batch = Quality Control Batch					
ND = Not Detected at a concentration equal or greater than the indicated Detection Limit.					



GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	14.7°C
Package 2	15.0°C
Package 3	17.3°C

Results relate only to the items tested.

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Bureau Veritas Job #: C2P2588

Report Date: 2022/09/14

QUALITY ASSURANCE REPORT

Tulloch Engineering

Client Project #: Macdonald Meredith 2022

Sampler Initials: J.S

QC Batch	Parameter	Date	Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
8205870	Total BOD	2022/09/08					ND,RDL=2	mg/L	NC	30	91	80 - 120
8206352	Dissolved Barium (Ba)	2022/09/09	101	80 - 120	104	80 - 120	ND, RDL=2.0	ug/L	2.8	20		
8206352	Dissolved Boron (B)	2022/09/09	102	80 - 120	101	80 - 120	ND, RDL=10	ug/L	2.8	20		
8206352	Dissolved Calcium (Ca)	2022/09/09	95	80 - 120	97	80 - 120	ND, RDL=200	ug/L	0.65	20		
8206352	Dissolved Iron (Fe)	2022/09/09	97	80 - 120	99	80 - 120	ND, RDL=100	ug/L	1.2	20		
8206352	Dissolved Magnesium (Mg)	2022/09/09	92	80 - 120	99	80 - 120	ND, RDL=50	ug/L	3.8	20		
8206352	Dissolved Sodium (Na)	2022/09/09	NC	80 - 120	97	80 - 120	ND, RDL=100	ug/L	2.2	20		
8207352	Total Suspended Solids	2022/09/08					ND,RDL=1	mg/L	NC	25	98	85 - 115
8207630	Mercury (Hg)	2022/09/06	96	75 - 125	99	80 - 120	ND, RDL=0.10	ug/L	NC	20		
8207734	Dissolved Organic Carbon	2022/09/06	94	80 - 120	97	80 - 120	ND, RDL=0.40	mg/L	2.4	20		
8207778	Total Dissolved Solids	2022/09/07					ND, RDL=10	mg/L	6.2	25	98	90 - 110
8207784	Total Kjeldahl Nitrogen (TKN)	2022/09/08	96	80 - 120	98	80 - 120	ND, RDL=0.10	mg/L	NC (1)	20	94	80 - 120
8207786	Total Chemical Oxygen Demand (COD)	2022/09/08	86	80 - 120	99	80 - 120	ND, RDL=4.0	mg/L	8.6	20		
8208005	Nitrate (N)	2022/09/13	97	80 - 120	97	80 - 120	ND, RDL=0.10	mg/L	NC	20		
8208005	Nitrite (N)	2022/09/13	107	80 - 120	106	80 - 120	ND, RDL=0.010	mg/L	NC	20		
8208008	Dissolved Chloride (Cl-)	2022/09/08	NC	80 - 120	104	80 - 120	ND, RDL=1.0	mg/L	0.028	20		
8208018	Dissolved Sulphate (SO4)	2022/09/08	NC	75 - 125	107	80 - 120	ND, RDL=1.0	mg/L	0.71	20		
8208043	pH	2022/09/06			102	98 - 103			0.59	N/A		
8208054	Conductivity	2022/09/06			100	85 - 115	ND, RDL=1.0	umho/cm	0.28	25		
8208056	Alkalinity (Total as CaCO3)	2022/09/06			95	85 - 115	ND, RDL=1.0	mg/L	0.25	20		
8208105	Total Ammonia-N	2022/09/08	96	75 - 125	98	80 - 120	ND, RDL=0.050	mg/L	7.0	20		
8208270	Nitrate (N)	2022/09/13	NC	80 - 120	93	80 - 120	ND, RDL=0.10	mg/L	NC	20		
8208270	Nitrite (N)	2022/09/13	NC	80 - 120	106	80 - 120	ND, RDL=0.010	mg/L	3.8	20		
8208315	Total Ammonia-N	2022/09/08	93	75 - 125	96	80 - 120	ND, RDL=0.050	mg/L	NC	20		
8208327	Total Kjeldahl Nitrogen (TKN)	2022/09/08	102	80 - 120	95	80 - 120	ND, RDL=0.10	mg/L	NC	20	97	80 - 120
8208728	Total Chemical Oxygen Demand (COD)	2022/09/08	108	80 - 120	105	80 - 120	ND, RDL=4.0	mg/L	NC	20		

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Bureau Veritas Job #: C2P2588

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QUALITY ASSURANCE REPORT(CONT'D)

Tulloch Engineering

Client Project #: Macdonald Meredith 2022

Sampler Initials: J.S

QC Batch	Parameter	Date	Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
8209357	Total Aluminum (Al)	2022/09/07	132 (2)	80 - 120	106	80 - 120	ND, RDL=4.9	ug/L	2.8	20		
8209357	Total Arsenic (As)	2022/09/07	103	80 - 120	103	80 - 120	ND, RDL=1.0	ug/L	NC	20		
8209357	Total Barium (Ba)	2022/09/07	100	80 - 120	101	80 - 120	ND, RDL=2.0	ug/L	3.2	20		
8209357	Total Boron (B)	2022/09/07	107	80 - 120	108	80 - 120	ND, RDL=10	ug/L	2.8	20		
8209357	Total Cadmium (Cd)	2022/09/07	103	80 - 120	102	80 - 120	ND, RDL=0.090	ug/L	NC	20		
8209357	Total Chromium (Cr)	2022/09/07	101	80 - 120	100	80 - 120	ND, RDL=5.0	ug/L	NC	20		
8209357	Total Copper (Cu)	2022/09/07	98	80 - 120	99	80 - 120	ND, RDL=0.90	ug/L	NC	20		
8209357	Total Lead (Pb)	2022/09/07	95	80 - 120	97	80 - 120	ND, RDL=0.50	ug/L	1.2	20		
8209357	Total Zinc (Zn)	2022/09/07	102	80 - 120	103	80 - 120	ND, RDL=5.0	ug/L	NC	20		
8209401	Total Phosphorus	2022/09/07	100	80 - 120	97	80 - 120	ND, RDL=0.004	mg/L	5.9	20	115	80 - 120
8209974	Phenols-4AAP	2022/09/07	NC	80 - 120	103	80 - 120	ND, RDL=0.0010	mg/L	2.3	20		
8210520	Total Dissolved Solids	2022/09/08					ND, RDL=10	mg/L	0	25	102	90 - 110
8212135	Total Aluminum (Al)	2022/09/08	104	80 - 120	103	80 - 120	ND, RDL=4.9	ug/L				
8212135	Total Arsenic (As)	2022/09/08	104	80 - 120	103	80 - 120	ND, RDL=1.0	ug/L				
8212135	Total Barium (Ba)	2022/09/08	100	80 - 120	98	80 - 120	ND, RDL=2.0	ug/L				
8212135	Total Boron (B)	2022/09/08	100	80 - 120	100	80 - 120	ND, RDL=10	ug/L				
8212135	Total Cadmium (Cd)	2022/09/08	103	80 - 120	104	80 - 120	ND, RDL=0.090	ug/L	NC	20		
8212135	Total Chromium (Cr)	2022/09/08	100	80 - 120	100	80 - 120	ND, RDL=5.0	ug/L	NC	20		
8212135	Total Copper (Cu)	2022/09/08	102	80 - 120	101	80 - 120	ND, RDL=0.90	ug/L	19	20		
8212135	Total Lead (Pb)	2022/09/08	98	80 - 120	97	80 - 120	ND, RDL=0.50	ug/L	NC	20		

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Bureau Veritas Job #: C2P2588

Report Date: 2022/09/14

QUALITY ASSURANCE REPORT(CONT'D)

Tulloch Engineering

Client Project #: Macdonald Meredith 2022

Sampler Initials: J.S

QC Batch	Parameter	Date	Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
8212135	Total Zinc (Zn)	2022/09/08	104	80 - 120	105	80 - 120	ND, RDL=5.0	ug/L	NC	20		

N/A = Not Applicable

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

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

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference $\leq 2 \times$ RDL).(1) Due to a high concentration of NO_x, the sample required dilution. The detection limit was adjusted accordingly.

(2) Matrix Spike exceeds acceptance limits, probable matrix interference.



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Bureau Veritas Job #: C2P2588

Report Date: 2022/09/14

Tulloch Engineering

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VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by:

Anastassia Hamanov, Scientific Specialist

Cristina Carriere, Senior Scientific Specialist

Bureau Veritas has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

APPENDIX G
Autumn 2022 Surface Water and Groundwater Quality
Laboratory Test Results



Your C.O.C. #: 905034-01-01

Attention: Marshall Thompson

Tulloch Engineering
200 Main Street
PO Box 579
Thessalon, ON
Canada P0R 1L0

Report Date: 2023/04/10

Report #: R7581426

Version: 2 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

BUREAU VERITAS JOB #: C2X0341

Received: 2022/11/10, 09:36

Sample Matrix: Water
Samples Received: 12

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Alkalinity	7	N/A	2022/11/15	CAM SOP-00448	SM 23 2320 B m
Alkalinity	5	N/A	2022/11/16	CAM SOP-00448	SM 23 2320 B m
Biochemical Oxygen Demand (BOD)	5	2022/11/11	2022/11/16	CAM SOP-00427	SM 23 5210B m
Chloride by Automated Colourimetry	2	N/A	2022/11/15	CAM SOP-00463	SM 23 4500-Cl E m
Chloride by Automated Colourimetry	10	N/A	2022/11/16	CAM SOP-00463	SM 23 4500-Cl E m
Chemical Oxygen Demand	1	N/A	2022/11/16	CAM SOP-00416	SM 23 5220 D m
Chemical Oxygen Demand	11	N/A	2022/11/17	CAM SOP-00416	SM 23 5220 D m
Conductivity	7	N/A	2022/11/15	CAM SOP-00414	SM 23 2510 m
Conductivity	5	N/A	2022/11/16	CAM SOP-00414	SM 23 2510 m
Dissolved Organic Carbon (DOC) (1)	7	N/A	2022/11/11	CAM SOP-00446	SM 23 5310 B m
Dissolved Organic Carbon (DOC) (1)	5	N/A	2022/11/12	CAM SOP-00446	SM 23 5310 B m
Hardness (calculated as CaCO ₃)	5	N/A	2022/11/15	CAM SOP 00102/00408/00447	SM 2340 B
Mercury	5	2022/11/14	2022/11/14	CAM SOP-00453	EPA 7470A m
Dissolved Metals by ICPMS	4	N/A	2022/11/16	CAM SOP-00447	EPA 6020B m
Dissolved Metals by ICPMS	3	N/A	2022/11/17	CAM SOP-00447	EPA 6020B m
Total Metals Analysis by ICPMS	5	2022/11/14	2022/11/15	CAM SOP-00447	EPA 6020B m
Total Ammonia-N	12	N/A	2022/11/13	CAM SOP-00441	USGS I-2522-90 m
Nitrate & Nitrite as Nitrogen in Water (2)	5	N/A	2022/11/15	CAM SOP-00440	SM 23 4500-NO3I/NO2B
Nitrate & Nitrite as Nitrogen in Water (2)	7	N/A	2022/11/17	CAM SOP-00440	SM 23 4500-NO3I/NO2B
pH	2	2022/11/11	2022/11/15	CAM SOP-00413	SM 4500H+ B m
pH	5	2022/11/14	2022/11/15	CAM SOP-00413	SM 4500H+ B m
pH	5	2022/11/14	2022/11/16	CAM SOP-00413	SM 4500H+ B m
Phenols (4AAP)	5	N/A	2022/11/15	CAM SOP-00444	OMOE E3179 m
Sulphate by Automated Turbidimetry	2	N/A	2022/11/14	CAM SOP-00464	SM 23 4500-SO42- E m
Sulphate by Automated Turbidimetry	1	N/A	2022/11/17	CAM SOP-00464	EPA 375.4 m
Sulphate by Automated Turbidimetry	2	N/A	2022/11/17	CAM SOP-00464	SM 23 4500-SO42- E m
Sulphate by Automated Turbidimetry	7	N/A	2022/11/17	CAM SOP-00464	EPA 375.4 m
Total Dissolved Solids	12	2022/11/14	2022/11/15	CAM SOP-00428	SM 23 2540C m
Total Kjeldahl Nitrogen in Water	5	2022/11/14	2022/11/15	CAM SOP-00938	OMOE E3516 m



Your C.O.C. #: 905034-01-01

Attention: Marshall Thompson

Tulloch Engineering
200 Main Street
PO Box 579
Thessalon, ON
Canada P0R 1L0

Report Date: 2023/04/10

Report #: R7581426

Version: 2 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

BUREAU VERITAS JOB #: C2X0341

Received: 2022/11/10, 09:36

Sample Matrix: Water
Samples Received: 12

Analyses	Quantity	Date	Date	Laboratory Method	Analytical Method
		Extracted	Analyzed		
Total Phosphorus (Colourimetric)	5	2022/11/14	2022/11/15	CAM SOP-00407	SM 23 4500-P I
Low Level Total Suspended Solids	5	2022/11/14	2022/11/15	CAM SOP-00428	SM 23 2540D m

Remarks:

Bureau Veritas is accredited to ISO/IEC 17025 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Bureau Veritas are based upon recognized Provincial, Federal or US method compendia such as CCME, MELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Bureau Veritas' profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Bureau Veritas in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

Bureau Veritas liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Bureau Veritas has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Bureau Veritas, unless otherwise agreed in writing. Bureau Veritas is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.

Results relate to samples tested. When sampling is not conducted by Bureau Veritas, results relate to the supplied samples tested.

This Certificate shall not be reproduced except in full, without the written approval of the laboratory.

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

(1) Dissolved Organic Carbon (DOC) present in the sample should be considered as non-purgeable DOC.

(2) Values for calculated parameters may not appear to add up due to rounding of raw data and significant figures.



Your C.O.C. #: 905034-01-01

Attention: Marshall Thompson

Tulloch Engineering
200 Main Street
PO Box 579
Thessalon, ON
Canada P0R 1L0

Report Date: 2023/04/10

Report #: R7581426

Version: 2 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

BUREAU VERITAS JOB #: C2X0341

Received: 2022/11/10, 09:36

Encryption Key

Please direct all questions regarding this Certificate of Analysis to:

Sara Singh, B.Sc, Senior Project Manager

Email: Sara.Singh@bureauveritas.com

Phone# (905)817-5827

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Bureau Veritas has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation, please refer to the Validation Signatures page if included, otherwise available by request. For Department specific Analyst/Supervisor validation names, please refer to the Test Summary section if included, otherwise available by request. This report is authorized by Rodney Major, General Manager responsible for Ontario Environmental laboratory operations.

Total Cover Pages : 3

Page 3 of 16

Bureau Veritas 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.bvna.com

Microbiology testing is conducted at 6660 Campobello Rd. Chemistry testing is conducted at 6740 Campobello Rd.



RESULTS OF ANALYSES OF WATER

Bureau Veritas ID		UGP187		UGP188			UGP188		
Sampling Date		2022/11/05 10:50		2022/11/05 11:10			2022/11/05 11:10		
COC Number		905034-01-01		905034-01-01			905034-01-01		
	UNITS	MW1	QC Batch	MW2	RDL	QC Batch	MW2 Lab-Dup	RDL	QC Batch

Inorganics

Total Ammonia-N	mg/L	0.13	8342411	0.17	0.050	8342411			
Total Chemical Oxygen Demand (COD)	mg/L	4.1	8343863	8.9	4.0	8343924	8.2	4.0	8343924
Conductivity	umho/cm	430	8341731	700	1.0	8341731			
Total Dissolved Solids	mg/L	240	8342696	370	10	8342696			
Dissolved Organic Carbon	mg/L	2.2	8340696	1.8	0.40	8340696			
pH	pH	8.07	8341714	7.93		8341714			
Dissolved Sulphate (SO4)	mg/L	4.0	8341647	9.1	1.0	8341647			
Alkalinity (Total as CaCO3)	mg/L	230	8341730	370	1.0	8341730			
Dissolved Chloride (Cl-)	mg/L	ND	8341499	15	1.0	8341499			
Nitrate (N)	mg/L	ND	8342245	ND	0.10	8342245			

RDL = Reportable Detection Limit

QC Batch = Quality Control Batch

Lab-Dup = Laboratory Initiated Duplicate

ND = Not Detected at a concentration equal or greater than the indicated Detection Limit.

Bureau Veritas ID		UGP189			UGP189			UGP190		
Sampling Date		2022/11/05 11:30			2022/11/05 11:30			2022/11/05 12:40		
COC Number		905034-01-01			905034-01-01			905034-01-01		
	UNITS	MW3	RDL	QC Batch	MW3 Lab-Dup	RDL	QC Batch	MW4	RDL	QC Batch

Inorganics

Total Ammonia-N	mg/L	0.056	0.050	8342421	0.053	0.050	8342421	0.15	0.050	8342411
Total Chemical Oxygen Demand (COD)	mg/L	ND	4.0	8343863				ND	4.0	8343863
Conductivity	umho/cm	520	1.0	8345405				680	1.0	8345327
Total Dissolved Solids	mg/L	295	10	8342696				360	10	8342696
Dissolved Organic Carbon	mg/L	2.0	0.40	8340696				1.8	0.40	8340696
pH	pH	7.97		8345416				8.13		8345313
Dissolved Sulphate (SO4)	mg/L	2.4	1.0	8344464				3.1	1.0	8345355
Alkalinity (Total as CaCO3)	mg/L	290	1.0	8345404				390	1.0	8345326
Dissolved Chloride (Cl-)	mg/L	ND	1.0	8344456				ND	1.0	8345351
Nitrate (N)	mg/L	ND	0.10	8344637				0.10	0.10	8344637

RDL = Reportable Detection Limit

QC Batch = Quality Control Batch

Lab-Dup = Laboratory Initiated Duplicate

ND = Not Detected at a concentration equal or greater than the indicated Detection Limit.



RESULTS OF ANALYSES OF WATER

Bureau Veritas ID		UGP191		UGP192			UGP192		
Sampling Date		2022/11/05 12:10		2022/11/05 10:10			2022/11/05 10:10		
COC Number		905034-01-01		905034-01-01			905034-01-01		
	UNITS	MW5	QC Batch	MW6	RDL	QC Batch	MW6 Lab-Dup	RDL	QC Batch
Inorganics									
Total Ammonia-N	mg/L	0.10	8342411	ND	0.050	8342411			
Total Chemical Oxygen Demand (COD)	mg/L	6.2	8343863	8.2	4.0	8343857			
Conductivity	umho/cm	440	8345327	360	1.0	8345386	360	1.0	8345386
Total Dissolved Solids	mg/L	300	8342696	220	10	8342696			
Dissolved Organic Carbon	mg/L	1.8	8340696	0.72	0.40	8340696			
pH	pH	8.08	8345313	8.18		8345377	8.21		8345377
Dissolved Sulphate (SO ₄)	mg/L	23	8344464	1.9	1.0	8345355			
Alkalinity (Total as CaCO ₃)	mg/L	150	8345326	200	1.0	8345373	200	1.0	8345373
Dissolved Chloride (Cl ⁻)	mg/L	34	8344456	ND	1.0	8345351			
Nitrate (N)	mg/L	ND	8344637	ND	0.10	8344637			
RDL = Reportable Detection Limit QC Batch = Quality Control Batch Lab-Dup = Laboratory Initiated Duplicate ND = Not Detected at a concentration equal or greater than the indicated Detection Limit.									



BUREAU
VERITAS

Bureau Veritas Job #: C2X0341

Report Date: 2023/04/10

Tulloch Engineering

Sampler Initials: JS

RESULTS OF ANALYSES OF WATER

Bureau Veritas ID		UGP193			UGP194			UGP194		
Sampling Date		2022/11/05 12:20			2022/11/07 14:40			2022/11/07 14:40		
COC Number		905034-01-01			905034-01-01			905034-01-01		
	UNITS	MW7	RDL	QC Batch	SW1	RDL	QC Batch	SW1 Lab-Dup	RDL	QC Batch

Calculated Parameters

Hardness (CaCO ₃)	mg/L				210	1.0	8339687			
Inorganics										
Total Ammonia-N	mg/L	0.11	0.050	8342411	0.99	0.050	8342489			
Total BOD	mg/L				ND	2	8339981	ND	2	8339981
Total Chemical Oxygen Demand (COD)	mg/L	8.2	4.0	8343857	84	4.0	8343857			
Conductivity	umho/cm	440	1.0	8345405	570	1.0	8345450			
Total Dissolved Solids	mg/L	300	10	8342696	360	10	8342696			
Total Kjeldahl Nitrogen (TKN)	mg/L				2.0	0.10	8343847			
Dissolved Organic Carbon	mg/L	1.9	0.40	8340696	27	0.40	8340696			
pH	pH	7.98		8345416	7.94		8345453			
Phenols-4AAP	mg/L				ND	0.0010	8347504	ND	0.0010	8347504
Total Phosphorus	mg/L				0.091	0.004	8343900			
Total Suspended Solids	mg/L				18	1	8342191			
Dissolved Sulphate (SO ₄)	mg/L	23	1.0	8345355	59	1.0	8345355			
Alkalinity (Total as CaCO ₃)	mg/L	150	1.0	8345404	160	1.0	8345452			
Dissolved Chloride (Cl ⁻)	mg/L	35	1.0	8345351	42	1.0	8345351			
Nitrite (N)	mg/L				0.085	0.010	8345366			
Nitrate (N)	mg/L	ND	0.10	8344637	0.32	0.10	8345366			

RDL = Reportable Detection Limit

QC Batch = Quality Control Batch

Lab-Dup = Laboratory Initiated Duplicate

ND = Not Detected at a concentration equal or greater than the indicated Detection Limit.

BUREAU
VERITAS

Bureau Veritas Job #: C2X0341

Report Date: 2023/04/10

Tulloch Engineering

Sampler Initials: JS

RESULTS OF ANALYSES OF WATER

Bureau Veritas ID		UGP195	UGP196		UGP197		UGP198		
Sampling Date		2022/11/07 13:00	2022/11/07 16:20		2022/11/07 15:00		2022/11/07 15:10		
COC Number		905034-01-01	905034-01-01		905034-01-01		905034-01-01		
	UNITS	SW2	SW3B	QC Batch	SW4	QC Batch	SW5	RDL	QC Batch

Calculated Parameters

Hardness (CaCO ₃)	mg/L	220	25	8339687	190	8339687	190	1.0	8339687
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Inorganics

Total Ammonia-N	mg/L	1.2	0.11	8342489	0.76	8342489	0.77	0.050	8342489
Total BOD	mg/L	ND	ND	8339981	ND	8339981	ND	2	8339981
Total Chemical Oxygen Demand (COD)	mg/L	90	51	8343857	78	8343857	77	4.0	8343924
Conductivity	umho/cm	630	54	8345450	520	8345450	510	1.0	8345450
Total Dissolved Solids	mg/L	375	75	8342696	335	8342696	270	10	8342713
Total Kjeldahl Nitrogen (TKN)	mg/L	2.2	0.47	8343847	1.6	8343847	1.6	0.10	8343847
Dissolved Organic Carbon	mg/L	28	15	8340696	26	8340696	26	0.40	8340696
pH	pH	7.91	7.18	8345453	7.94	8345453	7.85		8345453
Phenols-4AAP	mg/L	ND	ND	8347504	ND	8347504	ND	0.0010	8347504
Total Phosphorus	mg/L	0.088	0.11	8343900	0.077	8343900	0.077	0.004	8343900
Total Suspended Solids	mg/L	16	18	8342692	14	8344921	15	1	8342692
Dissolved Sulphate (SO ₄)	mg/L	65	ND	8345355	52	8345355	54	1.0	8345355
Alkalinity (Total as CaCO ₃)	mg/L	180	24	8345452	150	8345452	140	1.0	8345452
Dissolved Chloride (Cl ⁻)	mg/L	45	2.3	8345351	39	8345351	39	1.0	8345351
Nitrite (N)	mg/L	0.095	ND	8345366	0.051	8345366	0.062	0.010	8345366
Nitrate (N)	mg/L	0.30	ND	8345366	0.27	8345366	0.25	0.10	8345366

RDL = Reportable Detection Limit

QC Batch = Quality Control Batch

ND = Not Detected at a concentration equal or greater than the indicated Detection Limit.

Bureau Veritas ID		UGP198		
Sampling Date		2022/11/07 15:10		
COC Number		905034-01-01		
	UNITS	SW5 Lab-Dup	RDL	QC Batch

Inorganics				
Conductivity	umho/cm	510	1.0	8345450
pH	pH	7.87		8345453
Alkalinity (Total as CaCO ₃)	mg/L	150	1.0	8345452

RDL = Reportable Detection Limit

QC Batch = Quality Control Batch

Lab-Dup = Laboratory Initiated Duplicate

**ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)**

Bureau Veritas ID		UGP187		UGP188	UGP189	UGP189	UGP190		
Sampling Date		2022/11/05 10:50		2022/11/05 11:10	2022/11/05 11:30	2022/11/05 11:30	2022/11/05 12:40		
COC Number		905034-01-01		905034-01-01	905034-01-01	905034-01-01	905034-01-01		
	UNITS	MW1	QC Batch	MW2	MW3	MW3 Lab-Dup	MW4	RDL	QC Batch
Metals									
Dissolved Arsenic (As)	ug/L	2.6	8341079	2.4	1.7	1.7	1.4	1.0	8342158
Dissolved Barium (Ba)	ug/L	38	8341079	61	53	53	77	2.0	8342158
Dissolved Boron (B)	ug/L	80	8341079	100	96	93	110	10	8342158
Dissolved Cadmium (Cd)	ug/L	ND	8341079	ND	ND	ND	ND	0.090	8342158
Dissolved Calcium (Ca)	ug/L	48000	8341079	76000	55000	55000	61000	200	8342158
Dissolved Chromium (Cr)	ug/L	ND	8341079	ND	ND	ND	ND	5.0	8342158
Dissolved Copper (Cu)	ug/L	2.5	8341079	ND	1.4	1.4	1.8	0.90	8342158
Dissolved Iron (Fe)	ug/L	ND	8341079	ND	ND	ND	ND	100	8342158
Dissolved Lead (Pb)	ug/L	ND	8341079	ND	ND	ND	ND	0.50	8342158
Dissolved Magnesium (Mg)	ug/L	16000	8341079	30000	21000	21000	31000	50	8342158
Dissolved Manganese (Mn)	ug/L	68	8341079	130	65	64	28	2.0	8342158
Dissolved Potassium (K)	ug/L	1800	8341079	2400	2400	2400	2800	200	8342158
Dissolved Sodium (Na)	ug/L	24000	8341079	38000	28000	28000	50000	100	8342158
Dissolved Zinc (Zn)	ug/L	9.6	8341079	ND	5.6	5.4	ND	5.0	8342158
RDL = Reportable Detection Limit									
QC Batch = Quality Control Batch									
Lab-Dup = Laboratory Initiated Duplicate									
ND = Not Detected at a concentration equal or greater than the indicated Detection Limit.									

**ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)**

Bureau Veritas ID		UGP191	UGP192	UGP193			UGP194		
Sampling Date		2022/11/05 12:10	2022/11/05 10:10	2022/11/05 12:20			2022/11/07 14:40		
COC Number		905034-01-01	905034-01-01	905034-01-01			905034-01-01		
	UNITS	MW5	MW6	MW7	RDL	QC Batch	SW1	RDL	QC Batch
Metals									
Mercury (Hg)	ug/L						ND	0.10	8343465
Total Aluminum (Al)	ug/L						1700	4.9	8343389
Dissolved Arsenic (As)	ug/L	3.8	ND	3.6	1.0	8341079			
Total Arsenic (As)	ug/L						ND	1.0	8343389
Dissolved Barium (Ba)	ug/L	26	33	25	2.0	8341079			
Total Barium (Ba)	ug/L						46	2.0	8343389
Dissolved Boron (B)	ug/L	26	18	26	10	8341079			
Total Boron (B)	ug/L						470	10	8343389
Dissolved Cadmium (Cd)	ug/L	ND	ND	ND	0.090	8341079			
Total Cadmium (Cd)	ug/L						ND	0.090	8343389
Dissolved Calcium (Ca)	ug/L	56000	43000	56000	200	8341079			
Dissolved Chromium (Cr)	ug/L	ND	ND	ND	5.0	8341079			
Total Chromium (Cr)	ug/L						ND	5.0	8343389
Dissolved Copper (Cu)	ug/L	1.6	1.7	ND	0.90	8341079			
Total Copper (Cu)	ug/L						5.8	0.90	8343389
Dissolved Iron (Fe)	ug/L	170	ND	170	100	8341079			
Dissolved Lead (Pb)	ug/L	ND	ND	ND	0.50	8341079			
Total Lead (Pb)	ug/L						1.5	0.50	8343389
Dissolved Magnesium (Mg)	ug/L	11000	16000	11000	50	8341079			
Dissolved Manganese (Mn)	ug/L	380	6.3	370	2.0	8341079			
Dissolved Potassium (K)	ug/L	1100	2000	1100	200	8341079			
Dissolved Sodium (Na)	ug/L	12000	9300	12000	100	8341079			
Dissolved Zinc (Zn)	ug/L	ND	13	ND	5.0	8341079			
Total Zinc (Zn)	ug/L						11	5.0	8343389
RDL = Reportable Detection Limit									
QC Batch = Quality Control Batch									
ND = Not Detected at a concentration equal or greater than the indicated Detection Limit.									



ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Bureau Veritas ID		UGP195		UGP196	UGP197	UGP198		
Sampling Date		2022/11/07 13:00		2022/11/07 16:20	2022/11/07 15:00	2022/11/07 15:10		
COC Number		905034-01-01		905034-01-01	905034-01-01	905034-01-01		
	UNITS	SW2	QC Batch	SW3B	SW4	SW5	RDL	QC Batch

Metals								
Mercury (Hg)	ug/L	ND	8343465	ND	ND	ND	0.10	8343465
Total Aluminum (Al)	ug/L	1700	8343294	4700	1800	1800	4.9	8343389
Total Arsenic (As)	ug/L	ND	8343294	ND	ND	ND	1.0	8343389
Total Barium (Ba)	ug/L	52	8343294	73	47	46	2.0	8343389
Total Boron (B)	ug/L	540	8343294	10	420	410	10	8343389
Total Cadmium (Cd)	ug/L	0.091	8343294	ND	ND	ND	0.090	8343389
Total Chromium (Cr)	ug/L	ND	8343294	8.6	ND	ND	5.0	8343389
Total Copper (Cu)	ug/L	5.5	8343294	5.7	5.8	6.1	0.90	8343389
Total Lead (Pb)	ug/L	1.4	8343294	2.3	1.6	1.6	0.50	8343389
Total Zinc (Zn)	ug/L	10	8343294	16	11	13	5.0	8343389

RDL = Reportable Detection Limit

QC Batch = Quality Control Batch

ND = Not Detected at a concentration equal or greater than the indicated Detection Limit.



GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	5.7°C
Package 2	10.0°C
Package 3	9.3°C

Revised Report [2023/04/10]: Additional parameters toggled under ICPMSD-W as per client request.

Results relate only to the items tested.

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Bureau Veritas Job #: C2X0341

Report Date: 2023/04/10

QUALITY ASSURANCE REPORT

Tulloch Engineering

Sampler Initials: JS

QC Batch	Parameter	Date	Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
8339981	Total BOD	2022/11/16					ND,RDL=2	mg/L	NC	30	99	80 - 120
8340696	Dissolved Organic Carbon	2022/11/11	97	80 - 120	98	80 - 120	ND, RDL=0.40	mg/L	3.9	20		
8341079	Dissolved Arsenic (As)	2022/11/16	101	80 - 120	98	80 - 120	ND, RDL=1.0	ug/L	0.19	20		
8341079	Dissolved Barium (Ba)	2022/11/16	99	80 - 120	96	80 - 120	ND, RDL=2.0	ug/L	0.44	20		
8341079	Dissolved Boron (B)	2022/11/16	98	80 - 120	94	80 - 120	ND, RDL=10	ug/L	2.1	20		
8341079	Dissolved Cadmium (Cd)	2022/11/16	102	80 - 120	98	80 - 120	ND, RDL=0.090	ug/L	NC	20		
8341079	Dissolved Calcium (Ca)	2022/11/16	NC	80 - 120	98	80 - 120	ND, RDL=200	ug/L				
8341079	Dissolved Chromium (Cr)	2022/11/16	101	80 - 120	96	80 - 120	ND, RDL=5.0	ug/L	NC	20		
8341079	Dissolved Copper (Cu)	2022/11/16	100	80 - 120	94	80 - 120	ND, RDL=0.90	ug/L	0.57	20		
8341079	Dissolved Iron (Fe)	2022/11/16	100	80 - 120	97	80 - 120	ND, RDL=100	ug/L				
8341079	Dissolved Lead (Pb)	2022/11/16	101	80 - 120	99	80 - 120	ND, RDL=0.50	ug/L	NC	20		
8341079	Dissolved Magnesium (Mg)	2022/11/16	NC	80 - 120	97	80 - 120	ND, RDL=50	ug/L				
8341079	Dissolved Manganese (Mn)	2022/11/16	NC	80 - 120	95	80 - 120	ND, RDL=2.0	ug/L				
8341079	Dissolved Potassium (K)	2022/11/16	101	80 - 120	96	80 - 120	ND, RDL=200	ug/L				
8341079	Dissolved Sodium (Na)	2022/11/16	NC	80 - 120	96	80 - 120	ND, RDL=100	ug/L	0.51	20		
8341079	Dissolved Zinc (Zn)	2022/11/16	101	80 - 120	98	80 - 120	ND, RDL=5.0	ug/L	NC	20		
8341499	Dissolved Chloride (Cl-)	2022/11/16	120	80 - 120	102	80 - 120	ND, RDL=1.0	mg/L	2.1	20		
8341647	Dissolved Sulphate (SO4)	2022/11/14	123	75 - 125	104	80 - 120	ND, RDL=1.0	mg/L	0.55	20		
8341714	pH	2022/11/15			102	98 - 103			0.26	N/A		
8341730	Alkalinity (Total as CaCO3)	2022/11/15			96	85 - 115	ND, RDL=1.0	mg/L	1.1	20		
8341731	Conductivity	2022/11/15			101	85 - 115	ND, RDL=1.0	umho/cm	0	25		
8342158	Dissolved Arsenic (As)	2022/11/17	100	80 - 120	98	80 - 120	ND, RDL=1.0	ug/L	2.8	20		
8342158	Dissolved Barium (Ba)	2022/11/17	100	80 - 120	99	80 - 120	ND, RDL=2.0	ug/L	1.4	20		
8342158	Dissolved Boron (B)	2022/11/17	100	80 - 120	100	80 - 120	ND, RDL=10	ug/L	2.9	20		
8342158	Dissolved Cadmium (Cd)	2022/11/17	99	80 - 120	97	80 - 120	ND, RDL=0.090	ug/L	NC	20		
8342158	Dissolved Calcium (Ca)	2022/11/17	NC	80 - 120	100	80 - 120	ND, RDL=200	ug/L	0.28	20		
8342158	Dissolved Chromium (Cr)	2022/11/17	97	80 - 120	97	80 - 120	ND, RDL=5.0	ug/L	NC	20		
8342158	Dissolved Copper (Cu)	2022/11/17	99	80 - 120	99	80 - 120	ND, RDL=0.90	ug/L	1.3	20		
8342158	Dissolved Iron (Fe)	2022/11/17	100	80 - 120	100	80 - 120	ND, RDL=100	ug/L	NC	20		

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QC Batch	Parameter	Date	Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
8342158	Dissolved Lead (Pb)	2022/11/17	93	80 - 120	94	80 - 120	ND, RDL=0.50	ug/L	NC	20		
8342158	Dissolved Magnesium (Mg)	2022/11/17	97	80 - 120	99	80 - 120	ND, RDL=50	ug/L	0.15	20		
8342158	Dissolved Manganese (Mn)	2022/11/17	98	80 - 120	98	80 - 120	ND, RDL=2.0	ug/L	2.5	20		
8342158	Dissolved Potassium (K)	2022/11/17	101	80 - 120	103	80 - 120	ND, RDL=200	ug/L	0.066	20		
8342158	Dissolved Sodium (Na)	2022/11/17	NC	80 - 120	99	80 - 120	ND, RDL=100	ug/L	0.19	20		
8342158	Dissolved Zinc (Zn)	2022/11/17	97	80 - 120	98	80 - 120	ND, RDL=5.0	ug/L	4.2	20		
8342191	Total Suspended Solids	2022/11/15					ND,RDL=1	mg/L	0	20	101	85 - 115
8342245	Nitrate (N)	2022/11/17	86	80 - 120	91	80 - 120	ND, RDL=0.10	mg/L	0.72	20		
8342411	Total Ammonia-N	2022/11/13	100	75 - 125	101	80 - 120	ND, RDL=0.050	mg/L	17	20		
8342421	Total Ammonia-N	2022/11/13	99	75 - 125	101	80 - 120	ND, RDL=0.050	mg/L	6.3	20		
8342489	Total Ammonia-N	2022/11/13	102	75 - 125	102	80 - 120	ND, RDL=0.050	mg/L	13	20		
8342692	Total Suspended Solids	2022/11/15					ND,RDL=1	mg/L	8.7	20	97	85 - 115
8342696	Total Dissolved Solids	2022/11/15					ND, RDL=10	mg/L	9.5	20	98	90 - 110
8342713	Total Dissolved Solids	2022/11/15					ND, RDL=10	mg/L	2.4	20	95	90 - 110
8343294	Total Aluminum (Al)	2022/11/15	NC	80 - 120	102	80 - 120	ND, RDL=4.9	ug/L	4.1	20		
8343294	Total Arsenic (As)	2022/11/15	103	80 - 120	101	80 - 120	ND, RDL=1.0	ug/L	1.7	20		
8343294	Total Barium (Ba)	2022/11/15	108	80 - 120	100	80 - 120	ND, RDL=2.0	ug/L	0.34	20		
8343294	Total Boron (B)	2022/11/15	NC	80 - 120	99	80 - 120	ND, RDL=10	ug/L	1.0	20		
8343294	Total Cadmium (Cd)	2022/11/15	102	80 - 120	100	80 - 120	ND, RDL=0.090	ug/L	10	20		
8343294	Total Chromium (Cr)	2022/11/15	102	80 - 120	100	80 - 120	ND, RDL=5.0	ug/L	2.3	20		
8343294	Total Copper (Cu)	2022/11/15	101	80 - 120	100	80 - 120	ND, RDL=0.90	ug/L	1.3	20		
8343294	Total Lead (Pb)	2022/11/15	96	80 - 120	96	80 - 120	ND, RDL=0.50	ug/L	0.22	20		
8343294	Total Zinc (Zn)	2022/11/15	103	80 - 120	102	80 - 120	ND, RDL=5.0	ug/L	4.4	20		
8343389	Total Aluminum (Al)	2022/11/15	93	80 - 120	92	80 - 120	ND, RDL=4.9	ug/L	NC	20		
8343389	Total Arsenic (As)	2022/11/15	NC	80 - 120	99	80 - 120	ND, RDL=1.0	ug/L	1.6	20		
8343389	Total Barium (Ba)	2022/11/15	96	80 - 120	95	80 - 120	ND, RDL=2.0	ug/L	4.0	20		
8343389	Total Boron (B)	2022/11/15	97	80 - 120	94	80 - 120	ND, RDL=10	ug/L	0.57	20		

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QC Batch	Parameter	Date	Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
8343389	Total Cadmium (Cd)	2022/11/15	101	80 - 120	99	80 - 120	ND, RDL=0.090	ug/L	NC	20		
8343389	Total Chromium (Cr)	2022/11/15	97	80 - 120	96	80 - 120	ND, RDL=5.0	ug/L	NC	20		
8343389	Total Copper (Cu)	2022/11/15	99	80 - 120	95	80 - 120	ND, RDL=0.90	ug/L	2.6	20		
8343389	Total Lead (Pb)	2022/11/15	101	80 - 120	99	80 - 120	ND, RDL=0.50	ug/L	NC	20		
8343389	Total Zinc (Zn)	2022/11/15	101	80 - 120	102	80 - 120	ND, RDL=5.0	ug/L	NC	20		
8343465	Mercury (Hg)	2022/11/14	96	75 - 125	100	80 - 120	ND, RDL=0.10	ug/L	NC	20		
8343847	Total Kjeldahl Nitrogen (TKN)	2022/11/15	98	80 - 120	100	80 - 120	ND, RDL=0.10	mg/L	0	20	103	80 - 120
8343857	Total Chemical Oxygen Demand (COD)	2022/11/16	89	80 - 120	99	80 - 120	ND, RDL=4.0	mg/L	0	20		
8343863	Total Chemical Oxygen Demand (COD)	2022/11/17	109	80 - 120	102	80 - 120	4.5, RDL=4.0	mg/L	2.7	20		
8343900	Total Phosphorus	2022/11/15	101	80 - 120	97	80 - 120	ND, RDL=0.004	mg/L	2.7	20	114	80 - 120
8343924	Total Chemical Oxygen Demand (COD)	2022/11/16	101	80 - 120	100	80 - 120	ND, RDL=4.0	mg/L	8.3	20		
8344456	Dissolved Chloride (Cl-)	2022/11/15	NC	80 - 120	103	80 - 120	ND, RDL=1.0	mg/L	4.4	20		
8344464	Dissolved Sulphate (SO4)	2022/11/17	NC	75 - 125	97	80 - 120	ND, RDL=1.0	mg/L	6.0	20		
8344637	Nitrate (N)	2022/11/15	104	80 - 120	104	80 - 120	ND, RDL=0.10	mg/L	0.21	20		
8344921	Total Suspended Solids	2022/11/15					ND, RDL=1	mg/L	NC	20	95	85 - 115
8345313	pH	2022/11/16			101	98 - 103			0.069	N/A		
8345326	Alkalinity (Total as CaCO3)	2022/11/16			96	85 - 115	ND, RDL=1.0	mg/L	0.73	20		
8345327	Conductivity	2022/11/16			99	85 - 115	ND, RDL=1.0	umho/cm	0	25		
8345351	Dissolved Chloride (Cl-)	2022/11/16	120	80 - 120	102	80 - 120	ND, RDL=1.0	mg/L	NC	20		
8345355	Dissolved Sulphate (SO4)	2022/11/17	NC	75 - 125	104	80 - 120	ND, RDL=1.0	mg/L	0.51	20		
8345366	Nitrate (N)	2022/11/17	80	80 - 120	86	80 - 120	ND, RDL=0.10	mg/L	NC	20		
8345366	Nitrite (N)	2022/11/17	102	80 - 120	108	80 - 120	ND, RDL=0.010	mg/L	NC	20		
8345373	Alkalinity (Total as CaCO3)	2022/11/17			97	85 - 115	ND, RDL=1.0	mg/L	0.30	20		
8345377	pH	2022/11/17			102	98 - 103			0.35	N/A		
8345386	Conductivity	2022/11/17			100	85 - 115	ND, RDL=1.0	umho/cm	0.55	25		
8345404	Alkalinity (Total as CaCO3)	2022/11/16			97	85 - 115	ND, RDL=1.0	mg/L	1.1	20		



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QC Batch	Parameter	Date	Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
8345405	Conductivity	2022/11/16			98	85 - 115	ND, RDL=1.0	umho/cm	0.49	25		
8345416	pH	2022/11/16			102	98 - 103			0.21	N/A		
8345450	Conductivity	2022/11/15			99	85 - 115	ND, RDL=1.0	umho/cm	0.38	25		
8345452	Alkalinity (Total as CaCO ₃)	2022/11/15			96	85 - 115	ND, RDL=1.0	mg/L	1.3	20		
8345453	pH	2022/11/15			102	98 - 103			0.26	N/A		
8347504	Phenols-4AAP	2022/11/15	103	80 - 120	102	80 - 120	ND, RDL=0.0010	mg/L	NC	20		

N/A = Not Applicable

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

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

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).



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VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by:

Anastassia Hamanov, Scientific Specialist

Cristina Carriere, Senior Scientific Specialist

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APPENDIX H

**Parameters Exceeding ODWS and PWQO
Standards**

The groundwater parameters with reported concentrations exceeding the Ontario Drinking Water Standards, as reported by the laboratory for the 2022 sampling events, are presented in the tables below. The parameter concentrations exceeding the ODWS criteria are in red and shaded.

Table H-1 Spring 2022

Parameter	May 2022						
	ODWS (mg/L)	MW-1	MW-2	MW-3	MW-4	MW-5	MW-6
Alkalinity (as CaCO ₃)	30 - 500	230	350	280	450	160	180
Iron	0.3	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Boron	1.0	0.071	0.09	0.085	0.096	0.028	0.014
Nitrate (as N)	10	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0

Table H-2 Summer 2022

Parameter	August 2022						
	ODWS (mg/L)	MW-1	MW-2	MW-3	MW-4	MW-5	MW-6
Alkalinity (as CaCO ₃)	30 - 500	230	350	270	390	150	190
Iron	0.3	<0.1	<0.1	<0.1	<0.1	0.42	<0.1
Boron	1.0	0.079	0.097	0.092	0.11	0.026	0.018
Nitrate (as N)	10	<0.1	<0.1	0.17	<0.1	<0.1	<0.1

Table H-3 Autumn 2022

Parameter	October 2022						
	ODWS (mg/L)	MW-1	MW-2	MW-3	MW-4	MW-5	MW-6
Alkalinity (as CaCO ₃)	30 - 500	230	370	290	390	150	200
Iron	0.3	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Boron	1.0	0.08	0.1	.096	0.11	0.26	0.18
Nitrate (as N)	10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1

NOTES:

1. All concentrations are reported in units of mg/L. "NSS" indicates no sample submitted for the given analysis. Duplicate samples are indicated by brackets.

2. “ODWS” refers to the 2006 Ontario Drinking Water Standards (Ministry of the Environment). All of the indicated exceedances were for the Table 4 Non-Health Related Parameters (Objectives and Guidelines). Iron, manganese and total dissolved solids have Aesthetic Objectives while hardness has an Operational Guideline value.
3. Hardness was determined by calculation, following the method outlined in “Standard Methods for the Examination of Water and Wastewater, 17th Edition (1989).
4. This table is to be read with the accompanying report. Interpretation assistance is required by Tulloch Engineering Inc. use by others.

The 2022 surface water quality results for the monitoring stations at the landfill are compared to Provincial Waters Quality Objectives in the following tables. Those parameters exceeding the PWQO are shaded and in red.

Table H-4 Spring 2022

Parameter	May 2022				
	PWQO (mg/L)	SW-1B	SW-2	SW-3	SW-4B
pH	6.5 – 8.5	8.0	7.94	7.41	8.03
Total Phosphorus	0.03	0.048	0.057	0.034	0.040
Boron	0.2	0.41	0.45	0.17	0.38
Zinc	0.02	<0.005	0.0056	0.029	<0.005

Table H-5 Summer 2022

Parameter	August 2022				
	PWQO (mg/L)	SW-1B	SW-2	SW-3	SW-4B
pH	6.5 – 8.5	8.23	8.03	7.61	8.23
Total Phosphorus	0.03	0.064	0.069	0.084	0.063
Boron	0.2	1.4	1.4	0.02	1.3
Zinc	0.02	0.0054	<0.005	0.011	0.0053

Table H-6 Autumn 2022

Parameter	October 2021				
	PWQO (mg/L)	SW-1B	SW-2	SW-3	SW-4B
pH	6.5 – 8.5	7.94	7.91	7.18	7.94
Total Phosphorus	0.03	0.091	0.088	0.11	0.077
Boron	0.2	0.47	0.54	0.01	0.42
Zinc	0.02	NSS	NSS	NSS	NSS

NOTES:

1. All concentrations are reported in units of mg/L. “NSS” indicates no sample submitted for the given analysis.
2. All metals are reported as total (unfiltered) metals.
3. “PWQO” refers to the 2007 Provincial Water Quality Objectives (Ministry of the Environment). Iron has a Provincial Water Quality Objective while total phosphorus and boron have Interim Provincial Water Quality Objectives.
4. This table is to be read with the accompanying report. Interpretation assistance is required by Tulloch Engineering Inc. before use by others.

APPENDIX I

MECP GUIDELINE B-7 ANALYSIS

Ministry of the Environment, Conservation and Parks Guideline B-7 (The reasonable Use of Groundwater Guideline) states that groundwater quality downgradient of a landfill can only have a negligible impact on the adjacent groundwater resources. Under the Guideline, the impacts are considered negligible if the groundwater quality falls within established contaminant discharge criteria, which can be set for representative leachate indicator parameters.

For the parameter list covered by the monitoring data for this facility (and following the methodology included in the publication “Landfill Standards: A Guideline on the Regulatory and Approval Requirements for New or Expanding Landfill Sites, Ministry of the Environment, May, 1998), many of the parameters have an applicable Ontario Drinking Water Standard (Ministry of the Environment, 2006) or a Provincial Water Quality Objective (2007), while several others included in the suite of analysis are of a more general use in water quality assessment on the vicinity of a landfill.

In July, 2015, MW-6 was installed at a location that is interpreted to be hydraulically isolated from any landfill discharge waters. This monitoring well produces water that is considered representative of background groundwater quality for the purpose of the Guideline B-7 assessment.

In accordance with the MECP Reasonable Use Concept, the maximum allowable concentrations at the site boundary for selected leachate indicator parameters (parameters requested by the MECP) have been calculated. Using the 2020 water quality data for the north, east and west boundary wells, wells with parameter concentrations at or above the Reasonable Use maximum acceptable concentrations (MAC) from one or more of the 2020 sampling events were identified, as summarized in the following table. When there is a downgradient surface water body into which groundwater discharges (i.e. the downgradient water user), a similar calculation can be applied. In this situation the factor used in calculating the RUG is 0.50, and CPWQO is the respective concentration listed in the Provincial Water Quality Objectives.

As per guidance received from the Ministry of the Environment, Conservation and Parks (Agyemang to Mitchell, dated February 14, 2019), and recognizing that the site groundwaters immediately downgradient of the waste deposits ultimately discharge towards an un-named creek that flows past the landfill area, the Guideline B-7 analysis was revised (from previous assessments) to include an additional Reasonable Use calculation based on the Provincial Water Quality Objectives (which apply to surface water quality management).

From a Guideline B-7 (or “Reasonable Use”) analysis perspective, only those geochemical parameters being analyzed that have Ontario Drinking Water Standards and Provincial Water Quality Objectives were used in the assessment which follows.

Note that parameters with concentrations that were below the laboratory method detection limits were assigned concentrations equal to the method detection limits for the calculation of the maximum allowable concentration. Note that the maximum Reasonable Use Guideline concentration (RUG) is the maximum concentration allowable at the site/attenuation zone boundary.

1.0 Ontario Drinking Water Standards RUG Values

Parameter	Objective Type	Concentration (mg/L)		
		Background	ODWS	RUG Value
Table 2 - Health Related Parameters				
arsenic	IMAC	0.001	0.025	0.007
barium	MAC	0.031	1.0	0.27
benzene	MAC	0.0001	0.005	0.0013
boron	IMAC	0.016	5	1.26
cadmium	MAC	0.00017	0.005	0.0014
chromium	MAC	0.0043	0.05	0.016
lead	MAC	0.00039	0.01	0.0028
mercury	MAC	0.0001	0.001	0.00033
methylene chloride	MAC	0.0005	0.05	0.013
nitrite (as N)	MAC	0.01	1	0.26
nitrate (as N)	MAC	0.083	10	2.56
vinyl chloride	MAC	0.0002	0.002	0.00065
1,4 dichlorobenzene	MAC	0.0002	0.005	0.0014

Parameter	Objective Type	Concentration (mg/L)		
		Background	ODWS	RUG Value
Table 4 - Not Health Related Parameters				
alkalinity (as CaCO ₃)	OG	179	30 to 500	340
chloride	AO	1.07	250	126
copper	AO	0.00247	1.0	0.50
DOC	AO	1.43	5.0	3.2
hardness (as CaCO ₃)	OG	158.0	80 to 100	NA
iron	AO	0.104	0.30	0.20
manganese	AO	0.135	0.05	NA
organic nitrogen	OG	0.239	0.15	NA
phenols	AO	0.0011	0.03	0.016
sodium	AO	8.37	200	104
sulphate	AO	2.08	500	251
TDS	AO	193	500	347
toluene	AO	0.0002	0.024	0.012
zinc	AO	0.0112	5.0	2.5

2.0 Provincial Water Quality Objectives RUG Values

Parameter	Objective Type	Concentration (mg/L)		
		Background	PWQO/IPWQO	RUG Value
unionized ammonia	PWQO	0.00085	0.020	0.01
phenols	PWQO	0.0011	0.001	N
total phosphorus	IPWQO	0.043	0.030	N
mercury	PWQO	0.0001	0.0002	0.00015
arsenic	PWQO	0.001	0.100	0.051
boron	IPWQO	0.016	0.200	0.11
cadmium	PWQO	0.00017	0.0002	0.00019
chromium	PWQO	0.0043	0.001	N
copper	PWQO	0.00247	0.005	0.0037

Parameter	Objective Type	Concentration (mg/L)		
		Background	PWQO/IPWQO	RUG Value
iron	PWQO	0.104	0.300	0.20
lead	PWQO	0.00039	0.025	0.013
zinc	PWQO	0.0112	0.030	0.021
benzene	IPWQO	0.0001	0.100	0.05
1,4 dichlorobenzene	PWQO	0.0002	0.004	0.0021
methylene chloride	IPWQO	0.0005	0.100	0.05
toluene	IPWQO	0.0002	0.0008	0.0005
vinyl chloride	IPWQO	0.0002	0.600	0.30

3.0 Interpretation

The RUG values calculated above can be used to assess the Guideline B-7 compliance of a groundwater monitoring well location. If the concentration of a particular parameter exceeds the calculated RUG value, then the monitoring location does not comply with the groundwater protection objectives of Guideline B-7. For monitoring wells situated adjacent to groundwater users, the Section 1.0 RUG values apply. For monitoring wells situated adjacent to surface water bodies, the Section 2.0 RUG values apply.

NOTES:

1. Concentration units are in mg/L. DOC refers to dissolved organic carbon, TDS refers to total dissolved solids. NA indicates that a RUG value for that parameter is "Not Applicable", because the background concentration is above the Ontario Drinking Water Standards (2006) or the Provincial Water Quality Objectives (2007) value.
2. pH does not appear in the above table. The pH range of potable water should not exceed the range of 6.5 to 8.5 pH units.
3. ODWS refers to the Ontario Drinking Water Standards (2006). MAC refers to the Maximum Acceptable Concentration, and IMAC refers to the Interim Maximum Acceptable Concentration. AO refers to Aesthetic Objectives, and OG refers to Operational Guidelines.
4. PWQO refers to the Provincial Water Quality Objective, while IPWQO refers to the Interim Provincial Water Quality Objective.
5. For Table 1 ODWS RUG Values, total phenols have been assumed to be equal to the pentachlorophenol form (worst case), for which an aesthetic objective is quoted in the ODWS.
6. For Table 2 PWQO RUG values, the average ammonia concentration was converted to an un-ionized concentration using the conversion table presented in the PWQO.
7. This table is to be read with the accompanying report. Interpretation assistance is required by Tulloch Engineering Inc. before use by others.

APPENDIX J
Surface Water and Groundwater
Water Quality Data Summary Sheets

**Macdonald, Meredith and Aberdeen Additional Township
2020 Annual Monitoring Report**

MW-1
Project No. 230202

Parameters	Date Sampled									
	06/11/2013		04/11/2014		5/27/2015		8/25/2015		11/4/2015	
Alkalinity, as CaCO ₃		277		244		246		232		225
Ammonia, as N		0.33		0.23		0.17		0.15		0.05
Chloride		3.48		0.846		1.13		0.693		0.707
COD	<	5		7.4		46	<	10		15
Conductivity		584		471		463		435		426
DOC		3.8		3.5		4		2.9		4.3
Fluoride		0.162		0.163		0.201		0.168		0.165
Hardness, as CaCO ₃		236		200		185		145		184
Nitrate, as N	<	0.025		0.22		0.194	<	0.02		0.238
Nitrite, as N										
pH		7.76		7.95		7.91		8.13		8.13
Total P, as P		0.43		0.14		0.06		0.04		0.04
Sulphate		55.7		17.4		13.5		11.2		10.5
TKN, as N		0.54		1.45		1.47		0.44		0.61
TDS				276		280		248		252
Aluminum (dissolved)		0.01		0.0084		0.005				0.002
Aluminum (total)										
Antimony (dissolved)	<	0.0005	<	0.0005	<	0.0005	<	0.0005	<	0.0005
Antimony (total)										
Arsenic (dissolved)	<	0.01		0.003		0.004		0.003		0.003
Arsenic (total)										
Barium (dissolved)		0.06		0.055		0.047		0.042		0.045
Barium (total)										
Beryllium (dissolved)	<	0.0005	<	0.0005	<	0.0005	<	0.0005	<	0.0005
Beryllium (total)										
Boron (dissolved)		0.09		0.085		0.083		0.071		0.084
Boron (total)										
Cadmium (dissolved)		0.0002		0.00019		0.0029		0.0007	<	0.0001
Cadmium (total)										
Calcium (dissolved)		60		52		45.2		35.3		48.5
Calcium (total)										
Chromium (dissolved)	<	0.001	<	0.005		0.003	<	0.001	<	0.001
Chromium (total)										
Cobalt (dissolved)		0.0007	<	0.0005	<	0.0005	<	0.0005	<	0.0005
Cobalt (total)										
Copper (dissolved)	<	0.001	<	0.001		0.0054	<	0.0005	<	0.0005
Copper (total)										
Iron (dissolved)	<	0.03	<	0.1	<	0.1	<	0.1	<	0.1
Iron (total)										

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MW-1

Project No. 230202

Parameters	Date Sampled									
	06/11/2013		04/11/2014		5/27/2015		8/25/2015		11/4/2015	
Lead (dissolved)	<	0.001	<	0.0005		0.0001	<	0.0001	<	0.0001
Lead (total)										
Magnesium (dissolved)		21		17		17.5		13.7		15.3
Magnesium (total)										
Manganese (dissolved)		0.17		0.11		0.099		0.081		0.084
Manganese (total)										
Molybdenum (dissolved)	<	0.005		0.0023		0.0015		0.0016		0.0019
Molybdenum (total)										
Nickel (dissolved)	<	0.005	<	0.001		0.002	<	0.001	<	0.001
Nickel (total)										
Potassium (dissolved)		2		1.7		1.73		1.48		1.65
Potassium (total)										
Selenium (dissolved)	<	0.001	<	0.002	<	0.001	<	0.001	<	0.001
Selenium (total)										
Silicon (dissolved)		6.4		6.4		2.58		5.96		6.96
Silicon (total)										
Silver (dissolved)	<	0.0001	<	0.0001	<	0.0001	<	0.0001	<	0.0001
Silver (total)										
Sodium (dissolved)		28		25		25.3		21.4		23.4
Sodium (total)										
Strontium (dissolved)		0.569		0.47		0.434		0.386		0.403
Strontium (total)										
Thallium (dissolved)	<	0.0001	<	0.00005	<	0.0001	<	0.0001	<	0.0001
Thallium (total)										
Titanium (dissolved)	<	0.01	<	0.005	<	0.005	<	0.005	<	0.005
Titanium (total)										
Vanadium (dissolved)	<	0.001		0.00054		0.0044	<	0.0005		0.0006
Vanadium (total)										
Zinc (dissolved)	<	0.01	<	0.005		0.023		0.006	<	0.005
Zinc (total)										
Phenols										
Mercury										
Benzene										
1,4 Dichlorobenzene										
Methylene Chloride										
Toluene										
Vinyl Chloride										

**Macdonald, Meredith and Aberdeen Additional Township
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MW-1

Project No. 230202

Parameters	Date Sampled									
	31/05/2016		30/08/2016		03/11/2016		31/05/2017		30/08/2017	
Alkalinity, as CaCO ₃		230		230		230		240		240
Ammonia, as N		0.14		0.083		0.087		0.13		0.11
Chloride		1.3	<	1		1.1		1.2	<	1
COD		25		15		11		6.7		5.1
Conductivity		430		420		440		450		440
DOC		2.5		2.5		2.7		2.3		2.4
Fluoride										
Hardness, as CaCO ₃		188		173		179		190		187
Nitrate, as N	<	0.1	<	0.1	<	0.1	<	0.1	<	0.1
Nitrite, as N						0.047				
pH		8.06		8		8.11		8.16		8.2
Total P, as P						0.068				
Sulphate		9.1		7.5		8.2		7.2		6
TKN, as N						0.33				
TDS		262		250		274		256		266
Aluminum (dissolved)										
Aluminum (total)										
Antimony (dissolved)										
Antimony (total)										
Arsenic (dissolved)						0.0032				
Arsenic (total)										
Barium (dissolved)		0.043		0.036		0.044		0.041		0.039
Barium (total)										
Beryllium (dissolved)										
Beryllium (total)										
Boron (dissolved)		0.073		0.081		0.082		0.079		0.083
Boron (total)										
Cadmium (dissolved)						0.00059				
Cadmium (total)										
Calcium (dissolved)		49		46		47		48		47
Calcium (total)										
Chromium (dissolved)					<	0.005				
Chromium (total)										
Cobalt (dissolved)										
Cobalt (total)										
Copper (dissolved)						0.0011				
Copper (total)										
Iron (dissolved)	<	0.1	<	0.1	<	0.1	<	0.1	<	0.1
Iron (total)										

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MW-1

Project No. 230202

Parameters	Date Sampled									
	31/05/2016		30/08/2016		03/11/2016		31/05/2017		30/08/2017	
Lead (dissolved)					<	0.0005				
Lead (total)										
Magnesium (dissolved)		16		14		15		17		17
Magnesium (total)										
Manganese (dissolved)						0.09				
Manganese (total)										
Molybdenum (dissolved)										
Molybdenum (total)										
Nickel (dissolved)										
Nickel (total)										
Potassium (dissolved)						1.9				
Potassium (total)										
Selenium (dissolved)										
Selenium (total)										
Silicon (dissolved)										
Silicon (total)										
Silver (dissolved)										
Silver (total)										
Sodium (dissolved)		23		23		23		24		24
Sodium (total)										
Strontium (dissolved)										
Strontium (total)										
Thallium (dissolved)										
Thallium (total)										
Titanium (dissolved)										
Titanium (total)										
Vanadium (dissolved)										
Vanadium (total)										
Zinc (dissolved)						0.012				
Zinc (total)										
Phenols					<	0.001				
Mercury					<	0.0001				
Benzene					<	0.0001				
1,4 Dichlorobenzene					<	0.0002				
Methylene Chloride					<	0.0005				
Toluene					<	0.0002				
Vinyl Chloride					<	0.0002				

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Project No. 230202

Parameters	Date Sampled									
	27/11/2017		04/12/2017		31/05/2018		22/08/2018		27/11/2018	
Alkalinity, as CaCO ₃		250				230		230		240
Ammonia, as N	<	0.05				0.15		0.14		0.11
Chloride	<	1			<	1		1.1	<	1
COD		8.1				8.1		6.9	<	4
Conductivity		450				440		420		450
DOC		2.3				2.5		2.4		2.4
Fluoride										
Hardness, as CaCO ₃		183				181		168		195
Nitrate, as N		0.11			<	0.1		0.16	<	0.1
Nitrite, as N									<	0.01
pH		8.18				8.2		8.09		8.19
Total P, as P		0.11								0.42
Sulphate		7				5.1		5		5.6
TKN, as N		0.17								0.12
TDS		270				195		280		215
Aluminum (dissolved)										
Aluminum (total)										
Antimony (dissolved)										
Antimony (total)										
Arsenic (dissolved)		0.0024								0.0021
Arsenic (total)										
Barium (dissolved)		0.041				0.039		0.034		0.049
Barium (total)										
Beryllium (dissolved)										
Beryllium (total)										
Boron (dissolved)		0.088				0.074		0.065		0.078
Boron (total)										
Cadmium (dissolved)	<	0.0001							<	0.0001
Cadmium (total)										
Calcium (dissolved)		47				46		44		50
Calcium (total)										
Chromium (dissolved)	<	0.005							<	0.005
Chromium (total)										
Cobalt (dissolved)										
Cobalt (total)										
Copper (dissolved)	<	0.001								0.0013
Copper (total)										
Iron (dissolved)	<	0.1			<	0.1	<	0.1	<	0.1
Iron (total)										

**Macdonald, Meredith and Aberdeen Additional Township
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MW-1

Project No. 230202

Parameters	Date Sampled									
	27/11/2017		04/12/2017		31/05/2018		22/08/2018		27/11/2018	
Lead (dissolved)	<	0.0005							<	0.0005
Lead (total)										
Magnesium (dissolved)		16				16		14		17
Magnesium (total)										
Manganese (dissolved)		0.068								0.079
Manganese (total)										
Molybdenum (dissolved)										
Molybdenum (total)										
Nickel (dissolved)										
Nickel (total)										
Potassium (dissolved)		1.6								1.7
Potassium (total)										
Selenium (dissolved)										
Selenium (total)										
Silicon (dissolved)										
Silicon (total)										
Silver (dissolved)										
Silver (total)										
Sodium (dissolved)		24				24		23		23
Sodium (total)										
Strontium (dissolved)										
Strontium (total)										
Thallium (dissolved)										
Thallium (total)										
Titanium (dissolved)										
Titanium (total)										
Vanadium (dissolved)										
Vanadium (total)										
Zinc (dissolved)	<	0.005							<	0.005
Zinc (total)										
Phenols			<	0.001					<	0.001
Mercury			<	0.0001					<	0.0001
Benzene			<	0.00025					<	0.0001
1,4 Dichlorobenzene			<	0.0005					<	0.0002
Methylene Chloride			<	0.0013					<	0.0005
Toluene			<	0.0005					<	0.0002
Vinyl Chloride			<	0.0005					<	0.0002

**Macdonald, Meredith and Aberdeen Additional Township
2022 Annual Monitoring Report**

MW-1

Project No. 230202

Parameters	Date Sampled																					
	28/05/2019		21/08/2019		05/11/2019		25/05/2020		26/10/2020		31/05/2021		30/08/2021		31/10/2021		1/6/2022		31/08/2022		5/11/2022	
Alkalinity, as CaCO3		230		220		230		230		230		220		230		230		230		230		230
Ammonia, as N		0.12		0.17		0.1		0.052		0.052		0.065		0.13		0.062		0.065		0.071		0.13
Chloride	<	1	<	1	<	1	<	1		1.2		2.2		1.3	<	1	<	1.0	<	1.0	<	1.0
COD	<	4		6.8		5.8		7		6.7		7.9	<	4		10		8.1		6.5		4.1
Conductivity		440		410		430		430		420		430		400		430		430		410		430
DOC		2.2		2.3		2.1		2.1		2.3		2.3		2.2		2.1		2.4		2.2		2.2
Fluoride																						
Hardness, as CaCO3		188		187		177		186		174		179		177		183						
Nitrate, as N	<	0.1	<	0.1	<	0.1	<	0.1	<	0.1	<	0.1	<	0.1	<	0.1	<	0.1	<	0.1	<	0.1
Nitrite, as N					<	0.01			<	0.01	<	0.01			<	0.01						
pH		8.16		8.21		8.24		7.88		7.97		8.14		8.08		8.12		8.02		8.09		8.07
Total P, as P						0.053				0.051						0.061						
Sulphate		4.6		4.1		4.8		4.5		3.9		4.1		3.7		4.3		3.8		4.0		4
TKN, as N						0.21				0.23						0.35						
TDS		230		270		270		265		340		225		195		245		235		225		240
Aluminum (dissolved)																						
Aluminum (total)																						
Antimony (dissolved)																						
Antimony (total)																						
Arsenic (dissolved)						0.0025				0.003						0.0029					0.0026	
Arsenic (total)																						
Barium (dissolved)		0.04		0.057		0.038		0.039		0.036		0.037		0.036		0.036		0.04		0.037		0.038
Barium (total)																						
Beryllium (dissolved)																						
Beryllium (total)																						
Boron (dissolved)		0.079		0.077		0.078		0.076		0.078		0.073		0.078		0.083		0.071		0.079		0.08
Boron (total)																						
Cadmium (dissolved)					<	0.0001			<	0.00009					<	0.00009					<	0.00009
Cadmium (total)																						
Calcium (dissolved)		49		50		46		48		45		47		46		47		49		45		48
Calcium (total)																						
Chromium (dissolved)					<	0.005			<	0.005					<	0.005					<	0.005
Chromium (total)																						
Cobalt (dissolved)																						
Cobalt (total)																						
Copper (dissolved)					<	0.001				0.0022						0.0011					0.0025	
Copper (total)																						
Iron (dissolved)	<	0.1		1.5	<	0.1	<	0.1	<	0.1	<	0.01	<	0.01	<	0.01	<	0.1	<	0.1		0.1
Iron (total)																						

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2022 Annual Monitoring Report**

MW-1
Project No. 230202

Parameters	Date Sampled																							
	28/05/2019		21/08/2019		05/11/2019		25/05/2020		26/10/2020		31/05/2021		30/08/2021		31/10/2021		1/6/2022		31/08/2022		5/11/2022			
Lead (dissolved)					<	0.0005			<	0.0005					<	0.0005					<	0.0005		
Lead (total)																								
Magnesium (dissolved)		16		15		15			16		15			15		16		16		15		16		
Magnesium (total)																								
Manganese (dissolved)						0.069				0.03						0.08						0.068		
Manganese (total)																								
Molybdenum (dissolved)																								
Molybdenum (total)																								
Nickel (dissolved)																								
Nickel (total)																								
Potassium (dissolved)						1.5				1.7						1.6						1.8		
Potassium (total)																								
Selenium (dissolved)																								
Selenium (total)																								
Silicon (dissolved)																								
Silicon (total)																								
Silver (dissolved)																								
Silver (total)																								
Sodium (dissolved)		24		23		23			24		24			23		23		25		24		23		24
Sodium (total)																								
Strontium (dissolved)																								
Strontium (total)																								
Thallium (dissolved)																								
Thallium (total)																								
Titanium (dissolved)																								
Titanium (total)																								
Vanadium (dissolved)																								
Vanadium (total)																								
Zinc (dissolved)					<	0.005				0.0056					<	0.005							0.0096	
Zinc (total)																								
Phenols					<	0.001				<	0.001				<	0.001								
Mercury					<	0.0001				<	0.0001				<	0.0001								
Benzene					<	0.0001				<	0.0001				<	0.0001								
1,4 Dichlorobenzene					<	0.0002				<	0.0002				<	0.0002								
Methylene Chloride					<	0.0005				<	0.0005				<	0.0005								
Toluene					<	0.0002				<	0.0002				<	0.0002								
Vinyl Chloride					<	0.0002				<	0.0002				<	0.0002								

**Macdonald, Meredith and Aberdeen Additional Township
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MW-2

Project No. 21-0031

Parameters	Date Sampled									
	06/11/2013		04/11/2014		5/27/2015		8/25/2015		11/4/2015	
Alkalinity, as CaCO ₃		387		372		366		365		371
Ammonia, as N		0.48		0.23		0.16		0.14		0.07
Chloride		15.1		9.42		8.7		7.9		11
COD	<	5	<	4		25		11		16
Conductivity		801		695		673		677		703
DOC		3.4		3.1		3		2.6		2.8
Fluoride		0.132		0.133		0.168		0.152		0.156
Hardness, as CaCO ₃		321		295		305		239		311
Nitrate, as N		0.168		0.204		0.144		0.237		0.173
Nitrite, as N										
pH		7.54		7.84		7.87		8.04		8.05
Total P, as P		0.11		0.13		0.04		0.03		0.02
Sulphate		45.9		16.1		12.6		11.4		12.7
TKN, as N		0.72		1.22		0.68		0.55		
TDS				404		400		384		416
Aluminum (dissolved)	<	0.01	<	0.005		0.002			<	0.001
Aluminum (total)										
Antimony (dissolved)	<	0.0005	<	0.0005	<	0.0005	<	0.0005	<	0.0005
Antimony (total)										
Arsenic (dissolved)	<	0.01		0.0044		0.005		0.004		0.003
Arsenic (total)										
Barium (dissolved)		0.07		0.072		0.06		0.058		0.07
Barium (total)										
Beryllium (dissolved)	<	0.0005		0.0005	<	0.0005	<	0.0005	<	0.0005
Beryllium (total)										
Boron (dissolved)		0.1		0.1		0.099		0.091		0.106
Boron (total)										
Cadmium (dissolved)		0.0005		0.00024		0.0006		0.0002		0.0006
Cadmium (total)										
Calcium (dissolved)		79		72		68.8		53.7		74.4
Calcium (total)										
Chromium (dissolved)		0.002	<	0.005		0.004	<	0.001	<	0.001
Chromium (total)										
Cobalt (dissolved)		0.0009	<	0.0005	<	0.0005	<	0.0005	<	0.0005
Cobalt (total)										
Copper (dissolved)	<	0.001	<	0.001		0.0009	<	0.0005	<	0.0005
Copper (total)										
Iron (dissolved)		0.16		0.21	<	0.1	<	0.1	<	0.1
Iron (total)										

**Macdonald, Meredith and Aberdeen Additional Township
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MW-2

Project No. 21-0031

Parameters	Date Sampled									
	06/11/2013		04/11/2014		5/27/2015		8/25/2015		11/4/2015	
Lead (dissolved)	<	0.001	<	0.0005	<	0.0001	<	0.0001	<	0.0001
Lead (total)										
Magnesium (dissolved)		30		28		32.4		25.4		30.4
Magnesium (total)										
Manganese (dissolved)		0.29		0.19		0.175		0.153		0.149
Manganese (total)										
Molybdenum (dissolved)	<	0.005		0.0026		0.0015		0.0015		0.0019
Molybdenum (total)										
Nickel (dissolved)	<	0.005	<	0.001		0.002	<	0.001	<	0.001
Nickel (total)										
Potassium (dissolved)		2		2.2		1.82		1.98		2.45
Potassium (total)										
Selenium (dissolved)	<	0.001	<	0.002	<	0.001	<	0.001	<	0.001
Selenium (total)										
Silicon (dissolved)		7		7		2.9		6.59		7.43
Silicon (total)										
Silver (dissolved)	<	0.0001	<	0.0001	<	0.0001	<	0.0001	<	0.0001
Silver (total)										
Sodium (dissolved)		40		36		38.6		31.9		37
Sodium (total)										
Strontium (dissolved)		0.694		0.59		0.554		0.515		0.553
Strontium (total)										
Thallium (dissolved)	<	0.0001	<	0.00005	<	0.0001	<	0.0001	<	0.0001
Thallium (total)										
Titanium (dissolved)	<	0.01	<	0.005	<	0.005	<	0.005	<	0.005
Titanium (total)										
Vanadium (dissolved)	<	0.001	<	0.0005		0.0053	<	0.0005		0.0007
Vanadium (total)										
Zinc (dissolved)	<	0.01		0.01		0.006	<	0.005		0.008
Zinc (total)										
Phenols										
Mercury										
Benzene										
1,4 Dichlorobenzene										
Methylene Chloride										
Toluene										
Vinyl Chloride										

**Macdonald, Meredith and Aberdeen Additional Township
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MW-2

Project No. 21-0031

Parameters	Date Sampled									
	31/05/2016		30/08/2016		03/11/2016		31/05/2017		30/08/2017	
Alkalinity, as CaCO ₃		380		390		390		380		390
Ammonia, as N		0.17		0.12		0.14		0.14		0.16
Chloride		10		14		14		12		13
COD		6.6		5.6		5.8	<	4		8.2
Conductivity		680		740		730		720		720
DOC		2.3		2.2		2		1.9		1.9
Fluoride										
Hardness, as CaCO ₃		308		306		312		322		307
Nitrate, as N	<	0.1	<	0.1	<	0.1	<	0.1	<	0.1
Nitrite, as N						0.021				
pH		8.01		7.85		8.03		8.12		8.09
Total P, as P						0.036				
Sulphate		3		5.7		8.4		6.3		7.4
TKN, as N						0.33				
TDS		406		430		426		382		406
Aluminum (dissolved)										
Aluminum (total)										
Antimony (dissolved)										
Antimony (total)										
Arsenic (dissolved)						0.0042				
Arsenic (total)										
Barium (dissolved)		0.065		0.073		0.076		0.07		0.064
Barium (total)										
Beryllium (dissolved)										
Beryllium (total)										
Boron (dissolved)		0.095		0.11		0.1		0.1		0.1
Boron (total)										
Cadmium (dissolved)						0.0007				
Cadmium (total)										
Calcium (dissolved)		74		73		74		76		72
Calcium (total)										
Chromium (dissolved)					<	0.005				
Chromium (total)										
Cobalt (dissolved)										
Cobalt (total)										
Copper (dissolved)					<	0.001				
Copper (total)										
Iron (dissolved)		0.8		0.44		0.14		0.44		0.42
Iron (total)										

**Macdonald, Meredith and Aberdeen Additional Township
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Project No. 21-0031

Parameters	Date Sampled									
	31/05/2016		30/08/2016		03/11/2016		31/05/2017		30/08/2017	
Lead (dissolved)					<	0.0005				
Lead (total)										
Magnesium (dissolved)		30		30		31		32		31
Magnesium (total)										
Manganese (dissolved)						0.16				
Manganese (total)										
Molybdenum (dissolved)										
Molybdenum (total)										
Nickel (dissolved)										
Nickel (total)										
Potassium (dissolved)						2.9				
Potassium (total)										
Selenium (dissolved)										
Selenium (total)										
Silicon (dissolved)										
Silicon (total)										
Silver (dissolved)										
Silver (total)										
Sodium (dissolved)		37		36		37		38		37
Sodium (total)										
Strontium (dissolved)										
Strontium (total)										
Thallium (dissolved)										
Thallium (total)										
Titanium (dissolved)										
Titanium (total)										
Vanadium (dissolved)										
Vanadium (total)										
Zinc (dissolved)					<	0.005				
Zinc (total)										
Phenols					<	0.001				
Mercury					<	0.0001				
Benzene					<	0.0001				
1,4 Dichlorobenzene					<	0.0002				
Methylene Chloride					<	0.0005				
Toluene					<	0.0002				
Vinyl Chloride					<	0.0002				

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MW-2

Project No. 21-0031

Parameters	Date Sampled									
	28/11/2017		04/12/2017		31/05/2018		22/08/2018		27/11/2018	
Alkalinity, as CaCO ₃		390				380		380		380
Ammonia, as N		0.14				0.16		0.19		0.2
Chloride		12				12		11		16
COD		4.5				4.2		9.9	<	4
Conductivity		710				700		690		740
DOC		1.9				2		2		1.9
Fluoride										
Hardness, as CaCO ₃		310				298		294		315
Nitrate, as N	<	0.1			<	0.1	<	0.1	<	0.1
Nitrite, as N									<	0.01
pH		8.09				8.05		8.01		8.09
Total P, as P		0.043								0.031
Sulphate		7.2				6.1		6.8		9.9
TKN, as N		0.42								0.23
TDS		390				340		355		365
Aluminum (dissolved)										
Aluminum (total)										
Antimony (dissolved)										
Antimony (total)										
Arsenic (dissolved)		0.0038								0.0029
Arsenic (total)										
Barium (dissolved)		0.066				0.064		0.059		0.071
Barium (total)										
Beryllium (dissolved)										
Beryllium (total)										
Boron (dissolved)		0.11				0.09		0.085		0.1
Boron (total)										
Cadmium (dissolved)	<	0.0001							<	0.0001
Cadmium (total)										
Calcium (dissolved)		73				70		70		75
Calcium (total)										
Chromium (dissolved)	<	0.005							<	0.005
Chromium (total)										
Cobalt (dissolved)										
Cobalt (total)										
Copper (dissolved)	<	0.001							<	0.001
Copper (total)										
Iron (dissolved)	<	0.1				0.24		0.32	<	0.1
Iron (total)										

**Macdonald, Meredith and Aberdeen Additional Township
2020 Annual Monitoring Report**

MW-2

Project No. 21-0031

Parameters	Date Sampled									
	28/11/2017		04/12/2017		31/05/2018		22/08/2018		27/11/2018	
Lead (dissolved)	<	0.0005							<	0.0005
Lead (total)										
Magnesium (dissolved)		31				30		29		31
Magnesium (total)										
Manganese (dissolved)		0.17								0.12
Manganese (total)										
Molybdenum (dissolved)										
Molybdenum (total)										
Nickel (dissolved)										
Nickel (total)										
Potassium (dissolved)		2.4								2.4
Potassium (total)										
Selenium (dissolved)										
Selenium (total)										
Silicon (dissolved)										
Silicon (total)										
Silver (dissolved)										
Silver (total)										
Sodium (dissolved)		39				37		35		35
Sodium (total)										
Strontium (dissolved)										
Strontium (total)										
Thallium (dissolved)										
Thallium (total)										
Titanium (dissolved)										
Titanium (total)										
Vanadium (dissolved)										
Vanadium (total)										
Zinc (dissolved)		0.0052							<	0.005
Zinc (total)										
Phenols				0.0011					<	0.001
Mercury			<	0.0001					<	0.0001
Benzene			<	0.0001					<	0.0001
1,4 Dichlorobenzene			<	0.0002					<	0.0002
Methylene Chloride			<	0.0005					<	0.0005
Toluene			<	0.0002					<	0.0002
Vinyl Chloride			<	0.0002					<	0.0002

Macdonald, Meredith and Aberdeen Additional Township
2022 Annual Monitoring Report

MW-2
Project No. 230202

Parameters	Date Sampled																					
	28/05/2019		21/08/2019		11/2019		25/05/2020		26/10/2020		31/05/2021		30/08/2021		31/10/2021		1/6/2022		31/08/2022		5/11/2022	
Alkalinity, as CaCO3		280		360		370		370		360		360		350		370		350		350		370
Ammonia, as N		0.18		0.26		0.18		0.13		0.19		0.13		0.18		0.062		0.11		0.13		0.17
Chloride		13		12		13		12		12		12		12		15		13		13		15
COD	<	4		5.4		4.4		4.9		34		6.8		5.1		9.2		6.7		6.9		8.9
Conductivity		690		700		720		690		690		700		650		710		690		670		700
DOC		1.8		1.7		1.7		1.6		2.2		1.7		1.9		1.7		1.9		3.2		1.8
Fluoride																						
Hardness, as CaCO3		308		320		307		307		299		295		290		319						
Nitrate, as N	<	0.1	<	0.1	<	0.1	<	0.1	<	0.1			<	0.1	<	0.1	<	0.1	<	0.1	<	0.1
Nitrite, as N					<	0.01			<	0.01	<	0.01				0.017						
pH		8.3		7.95		7.98		7.69		8.13		8.07		7.96		8		7.94		7.94		7.93
Total P, as P										0.1						0.033						
Sulphate		6.4		7.3		8.4		7.2		6.6		7.1		6.9		9		8.2		8.5		9.1
TKN, as N																0.47						
TDS		350		425		410		375		395		370		335		410		365		290		370
Aluminum (dissolved)																						
Aluminum (total)																						
Antimony (dissolved)																						
Antimony (total)																						
Arsenic (dissolved)					0.0028					0.0043						2					0.0024	
Arsenic (total)																						
Barium (dissolved)		0.062		0.062		0.059		0.062		0.054		0.058		0.051		0.075		0.055		0.057		0.061
Barium (total)																						
Beryllium (dissolved)																						
Beryllium (total)																						
Boron (dissolved)		0.1		0.1		0.096		0.094		0.1		0.087		0.092		0.1		0.09		0.097		0.1
Boron (total)																						
Cadmium (dissolved)				<	0.0001			<	0.00009						<	0.0001					<	0.00009
Cadmium (total)																						
Calcium (dissolved)		74		77		72		72		72				70		75		72		70		76
Calcium (total)																						
Chromium (dissolved)					<	0.005			<	0.005					<	0.005					<	0.005
Chromium (total)																						
Cobalt (dissolved)																						
Cobalt (total)																						
Copper (dissolved)					<	0.001				0.0012						0.0016					<	0.0009
Copper (total)																						
Iron (dissolved)		0.18		0.36		0.11		0.11		0.4	<	0.01		0.12	<	0.01	<	0.1	<	0.1	<	0.1
Iron (total)																						

Parameters	Date Sampled											
	28/05/2019	21/08/2019	11/2019	25/05/2020	26/10/2020	31/05/2021	30/08/2021	31/10/2021	1/6/2022	31/08/2022	5/11/2022	
Lead (dissolved)			< 0.0005		< 0.0005			< 0.0005			< 0.0005	
Lead (total)												
Magnesium (dissolved)	30	31	31	31	29	28	28	32	30	29	30	
Magnesium (total)												
Manganese (dissolved)			0.14		0.16			0.078			0.013	
Manganese (total)												
Molybdenum (dissolved)												
Molybdenum (total)												
Nickel (dissolved)												
Nickel (total)												
Potassium (dissolved)			2.1		2.3			2.4			2.4	
Potassium (total)												
Selenium (dissolved)												
Selenium (total)												
Silicon (dissolved)												
Silicon (total)												
Silver (dissolved)												
Silver (total)												
Sodium (dissolved)	36	38	37	37	37	35	36	39	36	36	38	
Sodium (total)												
Strontium (dissolved)												
Strontium (total)												
Thallium (dissolved)												
Thallium (total)												
Titanium (dissolved)												
Titanium (total)												
Vanadium (dissolved)												
Vanadium (total)												
Zinc (dissolved)			< 0.005		0.0073			0.0051			< 0.005	
Zinc (total)												
Phenols			< 0.001		< 0.001			< 0.001				
Mercury			< 0.0001		< 0.0001			< 0.0001				
Benzene			< 0.0001		< 0.0001			< 0.0001				
1,4 Dichlorobenzene			< 0.0002		< 0.0002			< 0.0002				
Methylene Chloride			< 0.0005		< 0.0005			< 0.0005				
Toluene			< 0.0002		< 0.0002			< 0.0002				
Vinyl Chloride			< 0.0002		< 0.0002			< 0.0002				

Macdonald, Meredith and Aberdeen Additional Township**2022 Annual Monitoring Report**

Project No. 230202

MW-3B

Parameters	Date Sampled					
	1/6/2022		31/08/2022		5/11/2022	
Lead (dissolved)					<	0.0005
Lead (total)						
Magnesium (dissolved)		21		20		21
Magnesium (total)						
Manganese (dissolved)						0.065
Manganese (total)						
Molybdenum (dissolved)						
Molybdenum (total)						
Nickel (dissolved)						
Nickel (total)						
Potassium (dissolved)						2.4
Potassium (total)						
Selenium (dissolved)						
Selenium (total)						
Silicon (dissolved)						
Silicon (total)						
Silver (dissolved)						
Silver (total)						
Sodium (dissolved)		27		26		28
Sodium (total)						
Strontium (dissolved)						
Strontium (total)						
Thallium (dissolved)						
Thallium (total)						
Titanium (dissolved)						
Titanium (total)						
Vanadium (dissolved)						
Vanadium (total)						
Zinc (dissolved)						0.0056
Zinc (total)						
Phenols						
Mercury						
Benzene						
1,4 Dichlorobenzene						
Methylene Chloride						
Toluene						
Vinyl Chloride						

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MW-4

Project No. 21-0031

Parameters	Date Sampled									
	06/11/2013		04/11/2014		5/27/2015		8/25/2015		11/4/2015	
Alkalinity, as CaCO ₃		540		429		443		389		363
Ammonia, as N		0.73		0.57		0.13		0.2		0.22
Chloride		3.68		0.82		0.865		0.855		0.809
COD		22		12		12		32	<	10
Conductivity		773		747		766		668		639
DOC		5.6		4.5		2.1		3.4		5.7
Fluoride		0.159		0.139		0.188		0.158		0.158
Hardness, as CaCO ₃		269		306		211		238		256
Nitrate, as N		0.168		0.374		0.164		0.331		0.247
Nitrite, as N										
pH		7.62		7.77		8		8.09		7.98
Total P, as P		0.7		0.28		0.03		0.19		0.9
Sulphate		13.7		4.36		4.7		3.81		3.37
TKN, as N		0.67		1.46		0.7		0.61		1.11
TDS						436		384		372
Aluminum (dissolved)		0.02		0.012		0.002				0.014
Aluminum (total)										
Antimony (dissolved)	<	0.0005	<	0.0005	<	0.0005	<	0.0005	<	0.0005
Antimony (total)										
Arsenic (dissolved)	<	0.01		0.0016	<	0.001		0.001		0.002
Arsenic (total)										
Barium (dissolved)		0.11		0.1		0.119		0.085		0.091
Barium (total)										
Beryllium (dissolved)	<	0.0005	<	0.0005	<	0.0005	<	0.0005	<	0.0005
Beryllium (total)										
Boron (dissolved)		0.1		0.11		0.037		0.091		0.117
Boron (total)										
Cadmium (dissolved)		0.0002		0.00011	<	0.0001		0.0004		0.0083
Cadmium (total)										
Calcium (dissolved)		60		65		50.8		44.5		56.4
Calcium (total)										
Chromium (dissolved)		0.002	<	0.005		0.004	<	0.001	<	0.001
Chromium (total)										
Cobalt (dissolved)		0.0004	<	0.0005	<	0.0005	<	0.0005	<	0.0005
Cobalt (total)										
Copper (dissolved)	<	0.001	<	0.001		0.0158	<	0.0005	<	0.0005
Copper (total)										
Iron (dissolved)	<	0.03	<	0.1	<	0.1	<	0.1	<	0.1
Iron (total)										

**Macdonald, Meredith and Aberdeen Additional Township
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MW-4

Project No. 21-0031

Parameters	Date Sampled									
	06/11/2013		04/11/2014		5/27/2015		8/25/2015		11/4/2015	
Lead (dissolved)	<	0.001	<	0.0005		0.0002	<	0.0001	<	0.0001
Lead (total)										
Magnesium (dissolved)		29		35		20.5		28.5		27.9
Magnesium (total)										
Manganese (dissolved)		0.22		0.13		0.007		0.095		0.093
Manganese (total)										
Molybdenum (dissolved)		0.012		0.0077		0.0008		0.0057		0.0068
Molybdenum (total)										
Nickel (dissolved)	<	0.005	<	0.001		0.002	<	0.001		0.001
Nickel (total)										
Potassium (dissolved)		2		2.8		2.37		2.45		2.78
Potassium (total)										
Selenium (dissolved)	<	0.001	<	0.002	<	0.001	<	0.001	<	0.001
Selenium (total)										
Silicon (dissolved)		6.8		7.1		2.69		6.19		7.3
Silicon (total)										
Silver (dissolved)	<	0.0001	<	0.0001	<	0.0001	<	0.0001	<	0.0001
Silver (total)										
Sodium (dissolved)		55		49		11.8		43.8		47.1
Sodium (total)										
Strontium (dissolved)		0.518		0.54		0.337		0.427		0.424
Strontium (total)										
Thallium (dissolved)	<	0.0001	<	0.00005	<	0.0001	<	0.0001	<	0.0001
Thallium (total)										
Titanium (dissolved)	<	0.01	<	0.005	<	0.005	<	0.005	<	0.005
Titanium (total)										
Vanadium (dissolved)		0.003		0.002		0.0058		0.0009		0.0006
Vanadium (total)										
Zinc (dissolved)	<	0.01	<	0.005		0.047		0.006		0.015
Zinc (total)										
Phenols										
Mercury										
Benzene										
1,4 Dichlorobenzene										
Methylene Chloride										
Toluene										
Vinyl Chloride										

**Macdonald, Meredith and Aberdeen Additional Township
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MW-4

Project No. 21-0031

Parameters	Date Sampled									
	31/05/2016		30/08/2016		03/11/2016		31/05/2017		30/08/2017	
Alkalinity, as CaCO ₃		430		380		390		470		460
Ammonia, as N		0.14		0.14		0.083	<	0.05		0.08
Chloride		1.6		1.7		1.5		1.5		1.1
COD		4.7		14		4.7	<	4		5.1
Conductivity		750		670		690		820		780
DOC		2.2		2.5		2.5		1.4		1.6
Fluoride										
Hardness, as CaCO ₃		331		268		275		368		317
Nitrate, as N	<	0.1	<	0.1	<	0.1	<	0.1	<	0.1
Nitrite, as N					<	0.01				
pH		8.01		7.95		8.08		8.06		8.12
Total P, as P						0.18				
Sulphate		5		3.3		3.9		6.3		5.1
TKN, as N						0.26				
TDS		466		410		408		456		464
Aluminum (dissolved)										
Aluminum (total)										
Antimony (dissolved)										
Antimony (total)										
Arsenic (dissolved)						0.0013				
Arsenic (total)										
Barium (dissolved)		0.092		0.079		0.084		0.099		0.088
Barium (total)										
Beryllium (dissolved)										
Beryllium (total)										
Boron (dissolved)		0.1		0.11		0.11		0.1		0.12
Boron (total)										
Cadmium (dissolved)						0.00052				
Cadmium (total)										
Calcium (dissolved)		70		58		59		75		66
Calcium (total)										
Chromium (dissolved)					<	0.005				
Chromium (total)										
Cobalt (dissolved)										
Cobalt (total)										
Copper (dissolved)					<	0.001				
Copper (total)										
Iron (dissolved)	<	0.1	<	0.1	<	0.1	<	0.1	<	0.1
Iron (total)										

**Macdonald, Meredith and Aberdeen Additional Township
2020 Annual Monitoring Report**

MW-4

Project No. 21-0031

Parameters	Date Sampled									
	31/05/2016		30/08/2016		03/11/2016		31/05/2017		30/08/2017	
Lead (dissolved)					<	0.0005				
Lead (total)										
Magnesium (dissolved)		38		30		31		44		37
Magnesium (total)										
Manganese (dissolved)						0.068				
Manganese (total)										
Molybdenum (dissolved)										
Molybdenum (total)										
Nickel (dissolved)										
Nickel (total)										
Potassium (dissolved)						3.3				
Potassium (total)										
Selenium (dissolved)										
Selenium (total)										
Silicon (dissolved)										
Silicon (total)										
Silver (dissolved)										
Silver (total)										
Sodium (dissolved)		50		48		47		54		52
Sodium (total)										
Strontium (dissolved)										
Strontium (total)										
Thallium (dissolved)										
Thallium (total)										
Titanium (dissolved)										
Titanium (total)										
Vanadium (dissolved)										
Vanadium (total)										
Zinc (dissolved)					<	0.005				
Zinc (total)										
Phenols					<	0.001				
Mercury					<	0.0001				
Benzene					<	0.0001				
1,4 Dichlorobenzene					<	0.0002				
Methylene Chloride					<	0.0005				
Toluene					<	0.0002				
Vinyl Chloride					<	0.0002				

**Macdonald, Meredith and Aberdeen Additional Township
2020 Annual Monitoring Report**

MW-4

Project No. 21-0031

Parameters	Date Sampled									
	28/11/2017		04/12/2017		31/05/2018		22/08/2018		27/11/2018	
Alkalinity, as CaCO ₃		500				480		410		440
Ammonia, as N		0.065				0.056		0.11		0.15
Chloride		1.3				1.3		1.3		1.2
COD	<	4			<	4	<	4		4.8
Conductivity		870				850		710		780
DOC		1.4				1.5		1.8		1.6
Fluoride										
Hardness, as CaCO ₃		358				370		279		325
Nitrate, as N	<	0.1			<	0.1	<	0.1	<	0.1
Nitrite, as N										0.014
pH		8.07				8.05		8.05		8.09
Total P, as P		0.052								0.023
Sulphate		5.4				6.4		5.4		5.4
TKN, as N		0.29								0.16
TDS		470				405		350		415
Aluminum (dissolved)										
Aluminum (total)										
Antimony (dissolved)										
Antimony (total)										
Arsenic (dissolved)	<	0.001							<	0.001
Arsenic (total)										
Barium (dissolved)		0.1				0.099		0.08		0.1
Barium (total)										
Beryllium (dissolved)										
Beryllium (total)										
Boron (dissolved)		0.12				0.098		0.092		0.11
Boron (total)										
Cadmium (dissolved)	<	0.0001							<	0.0001
Cadmium (total)										
Calcium (dissolved)		74				74		59		69
Calcium (total)										
Chromium (dissolved)	<	0.005							<	0.005
Chromium (total)										
Cobalt (dissolved)										
Cobalt (total)										
Copper (dissolved)		0.0016								0.0014
Copper (total)										
Iron (dissolved)	<	0.1			<	0.1	<	0.1	<	0.1
Iron (total)										

**Macdonald, Meredith and Aberdeen Additional Township
2020 Annual Monitoring Report**

MW-4

Project No. 21-0031

Parameters	Date Sampled									
	28/11/2017		04/12/2017		31/05/2018		22/08/2018		27/11/2018	
Lead (dissolved)	<	0.0005							<	0.0005
Lead (total)										
Magnesium (dissolved)		42				45		32		37
Magnesium (total)										
Manganese (dissolved)		0.075								0.074
Manganese (total)										
Molybdenum (dissolved)										
Molybdenum (total)										
Nickel (dissolved)										
Nickel (total)										
Potassium (dissolved)		3.1								3
Potassium (total)										
Selenium (dissolved)										
Selenium (total)										
Silicon (dissolved)										
Silicon (total)										
Silver (dissolved)										
Silver (total)										
Sodium (dissolved)		52				53		49		50
Sodium (total)										
Strontium (dissolved)										
Strontium (total)										
Thallium (dissolved)										
Thallium (total)										
Titanium (dissolved)										
Titanium (total)										
Vanadium (dissolved)										
Vanadium (total)										
Zinc (dissolved)		0.0056								0.0071
Zinc (total)										
Phenols				0.001					<	0.001
Mercury			<	0.0001					<	0.0001
Benzene			<	0.0001					<	0.0001
1,4 Dichlorobenzene			<	0.0002					<	0.0002
Methylene Chloride			<	0.0005					<	0.0005
Toluene			<	0.0002					<	0.0002
Vinyl Chloride			<	0.0002					<	0.0002

**Macdonald, Meredith and Aberdeen Additional Township
2022 Annual Monitoring Report**

MW-4
Project No. 230202

Parameters	Date Sampled															
	28/05/2019	21/08/2019	05/11/2019	25/05/2020	26/10/2020	31/05/2021	30/08/2021	31/10/2021	1/6/2022	31/08/2022	5/11/2022					
Alkalinity, as CaCO3	460	400	420	450	450	450	390	410	450	390	390					
Ammonia, as N	< 0.05	0.19	0.06	< 0.05	0.12	< 0.05	< 0.05	0.054	< 0.05	< 0.05	0.15					
Chloride	< 1	1.1	1.4	< 1	1.8	1.8	1.3	1.4	1.6	1.1	< 1					
COD	< 4	9.9	< 4	< 4	< 4	13	< 4	7.4	6.7	< 4	< 4					
Conductivity	820	710	760	800	780	800	700	740	810	690	680					
DOC	1.2	1.6	1.4	1.3	1.6	1.5	1.6	1.6	1.5	1.7	1.8					
Fluoride																
Hardness, as CaCO3	378	342	306	355	335	342	292	319								
Nitrate, as N	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	0.1					
Nitrite, as N			0.028		< 0.01			0.02								
pH	8.02	8.06	8.02	7.56	8	7.95	7.94	8.03	7.93	7.95	8.13					
Total P, as P			< 0.02		0.08			0.039								
Sulphate	6.2	4.6	4.4	5.2	4.2	4.6	3.4	4.9	4.38	3.6	3.1					
TKN, as N			0.21		0.21			0.45								
TDS	465	435	455	440	435	440	325	445	405	320	360					
Aluminum (dissolved)																
Aluminum (total)																
Antimony (dissolved)																
Antimony (total)																
Arsenic (dissolved)			< 0.001		< 0.001			0.0011			0.0014					
Arsenic (total)																
Barium (dissolved)	0.1	0.13	0.086	0.097	0.094	0.09	0.079	0.086	0.089	0.08	0.077					
Barium (total)																
Beryllium (dissolved)																
Beryllium (total)																
Boron (dissolved)	0.1	0.11	0.11	0.1	0.11	0.099	0.1	0.11	0.096	0.11	0.11					
Boron (total)																
Cadmium (dissolved)			< 0.0001		< 0.00009			< 0.00009			< 0.00009					
Cadmium (total)																
Calcium (dissolved)	77	76	65	73	70	73	61	67	71	61	61					
Calcium (total)																
Chromium (dissolved)			< 0.005		< 0.005			< 0.0005			< 0.005					
Chromium (total)																
Cobalt (dissolved)																
Cobalt (total)																
Copper (dissolved)			0.0017		0.003			0.0031			0.0018					
Copper (total)																
Iron (dissolved)	< 0.1	1.3	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1					
Iron (total)																

**Macdonald, Meredith and Aberdeen Additional Township
2022 Annual Monitoring Report**

MW-4
Project No. 230202

Parameters	Date Sampled											
	28/05/2019	21/08/2019	05/11/2019	25/05/2020	26/10/2020	31/05/2021	30/08/2021	31/10/2021	1/6/2022	31/08/2022	5/11/2022	
Lead (dissolved)			< 0.0005		< 0.0005			< 0.0005			< 5E-04	
Lead (total)												
Magnesium (dissolved)	45	37	35	42	39	39	34	37	40	33	31	
Magnesium (total)												
Manganese (dissolved)			0.054		0.092			0.065			0.028	
Manganese (total)												
Molybdenum (dissolved)												
Molybdenum (total)												
Nickel (dissolved)												
Nickel (total)												
Potassium (dissolved)			2.6		3.1			2.8			2.8	
Potassium (total)												
Selenium (dissolved)												
Selenium (total)												
Silicon (dissolved)												
Silicon (total)												
Silver (dissolved)												
Silver (total)												
Sodium (dissolved)	52	54	49	52	53	50	50	51	52	50	50	
Sodium (total)												
Strontium (dissolved)												
Strontium (total)												
Thallium (dissolved)												
Thallium (total)												
Titanium (dissolved)												
Titanium (total)												
Vanadium (dissolved)												
Vanadium (total)												
Zinc (dissolved)			< 0.005		0.0057			0.0065			< 0.005	
Zinc (total)												
Phenols			< 0.001		< 0.001			< 0.001				
Mercury			< 0.0001		< 0.0001			< 0.0001				
Benzene			< 0.0001		< 0.0001			< 0.0001				
1,4 Dichlorobenzene			< 0.0002		< 0.0002			< 0.0002				
Methylene Chloride			< 0.0005		< 0.0005			< 0.0005				
Toluene			< 0.0002		< 0.0002			< 0.0002				
Vinyl Chloride			< 0.0002		< 0.0002			< 0.0002				

**Macdonald, Meredith and Aberdeen Additional Township
2020 Annual Monitoring Report**

MW-5
Project No. 21-0031

Parameters	Date Sampled									
	8/25/2015		11/4/2015		31/05/2016		30/08/2016		03/11/2016	
Alkalinity, as CaCO ₃		176		162		140		140		130
Ammonia, as N		0.06		0.04		0.11		0.08		0.086
Chloride		18.4		20.7		35		32		36
COD		28		28		12		12		7.4
Conductivity		410		400		430		430		430
DOC		5		4.7		1.6		1.8		1.7
Fluoride		0.088		0.078						
Hardness, as CaCO ₃		150		184		183		183		183
Nitrate, as N	<	0.02	<	0.02	<	0.1	<	0.1	<	0.1
Nitrite, as N										0.012
pH		7.94		8.02		8.02		7.95		8.01
Total P, as P		0.06		1.03						0.04
Sulphate		15.1		16.2		27		23		29
TKN, as N		0.39		0.61						0.15
TDS		236		244		308		260		296
Aluminum (dissolved)				0.003						
Aluminum (total)										
Antimony (dissolved)	<	0.0005	<	0.0005						
Antimony (total)										
Arsenic (dissolved)		0.001		0.003						0.0049
Arsenic (total)										
Barium (dissolved)		0.05		0.036		0.027		0.025		0.026
Barium (total)										
Beryllium (dissolved)	<	0.0005	<	0.0005						
Beryllium (total)										
Boron (dissolved)		0.023		0.025		0.02		0.022		0.02
Boron (total)										
Cadmium (dissolved)		0.0004		0.0008						0.00013
Cadmium (total)										
Calcium (dissolved)		39.7		53.3		55		55		55
Calcium (total)										
Chromium (dissolved)	<	0.001	<	0.001					<	0.005
Chromium (total)										
Cobalt (dissolved)		0.002		0.001						
Cobalt (total)										
Copper (dissolved)	<	0.0005	<	0.0005					<	0.001
Copper (total)										
Iron (dissolved)	<	0.1	<	0.1		0.11	<	0.1	<	0.1
Iron (total)										

**Macdonald, Meredith and Aberdeen Additional Township
2020 Annual Monitoring Report**

MW-5
Project No. 21-0031

Parameters	Date Sampled									
	8/25/2015		11/4/2015		31/05/2016		30/08/2016		03/11/2016	
Lead (dissolved)	<	0.0001	<	0.0001					<	0.0005
Lead (total)										
Magnesium (dissolved)		12.4		12.3		11		11		11
Magnesium (total)										
Manganese (dissolved)		0.322		0.246						0.38
Manganese (total)										
Molybdenum (dissolved)		0.002		0.0014						
Molybdenum (total)										
Nickel (dissolved)		0.001	<	0.001						
Nickel (total)										
Potassium (dissolved)		1.61		1.45						1.3
Potassium (total)										
Selenium (dissolved)	<	0.001	<	0.001						
Selenium (total)										
Silicon (dissolved)		6.16		8.63						
Silicon (total)										
Silver (dissolved)	<	0.0001	<	0.0001						
Silver (total)										
Sodium (dissolved)		10.4		9.82		10		10		9.6
Sodium (total)										
Strontium (dissolved)		0.226		0.207						
Strontium (total)										
Thallium (dissolved)	<	0.0001	<	0.0001						
Thallium (total)										
Titanium (dissolved)	<	0.005	<	0.005						
Titanium (total)										
Vanadium (dissolved)	<	0.0005	<	0.0005						
Vanadium (total)										
Zinc (dissolved)	<	0.005	<	0.005					<	0.005
Zinc (total)										
Phenols									<	0.001
Mercury									<	0.0001
Benzene									<	0.0001
1,4 Dichlorobenzene									<	0.0002
Methylene Chloride									<	0.0005
Toluene									<	0.0002
Vinyl Chloride									<	0.0002

**Macdonald, Meredith and Aberdeen Additional Township
2020 Annual Monitoring Report**

MW-5
Project No. 21-0031

Parameters	Date Sampled									
	31/05/2017		30/08/2017		04/12/2017		31/05/2018		22/08/2018	
Alkalinity, as CaCO ₃		140		140		110		150		150
Ammonia, as N		0.087		0.085		0.059		0.075		0.068
Chloride		38		37		28		36		35
COD	<	4		6.1		5.9		4	<	4
Conductivity		460		450		350		460		450
DOC		1.5		1.6		0.56		1.9		1.6
Fluoride										
Hardness, as CaCO ₃		201		201		201		194		189
Nitrate, as N	<	0.1	<	0.1	<	0.1	<	0.1		0.11
Nitrite, as N					<	0.01				
pH		8.01		8.02		8.07		8.05		7.95
Total P, as P						0.085				
Sulphate		30		29		19		28		30
TKN, as N						0.22				
TDS		252		276		210		235		280
Aluminum (dissolved)										
Aluminum (total)										
Antimony (dissolved)										
Antimony (total)										
Arsenic (dissolved)						0.0064				
Arsenic (total)										
Barium (dissolved)		0.025		0.025		0.025		0.026		0.028
Barium (total)										
Beryllium (dissolved)										
Beryllium (total)										
Boron (dissolved)		0.022		0.022		0.02		0.018		0.014
Boron (total)										
Cadmium (dissolved)						0.00013				
Cadmium (total)										
Calcium (dissolved)		59		59		58		58		56
Calcium (total)										
Chromium (dissolved)					<	0.005				
Chromium (total)										
Cobalt (dissolved)										
Cobalt (total)										
Copper (dissolved)						0.0015				
Copper (total)										
Iron (dissolved)		0.17	<	0.1		0.52		0.14	<	0.1
Iron (total)										

Macdonald, Meredith and Aberdeen Additional Township
2020 Annual Monitoring Report

MW-5
 Project No. 21-0031

Parameters	Date Sampled									
	31/05/2017		30/08/2017		04/12/2017		31/05/2018		22/08/2018	
Lead (dissolved)					<	0.0005				
Lead (total)										
Magnesium (dissolved)		13		13		12		12		12
Magnesium (total)										
Manganese (dissolved)						0.38				
Manganese (total)										
Molybdenum (dissolved)										
Molybdenum (total)										
Nickel (dissolved)										
Nickel (total)										
Potassium (dissolved)						1.2				
Potassium (total)										
Selenium (dissolved)										
Selenium (total)										
Silicon (dissolved)										
Silicon (total)										
Silver (dissolved)										
Silver (total)										
Sodium (dissolved)		11		11		11		11		11
Sodium (total)										
Strontium (dissolved)										
Strontium (total)										
Thallium (dissolved)										
Thallium (total)										
Titanium (dissolved)										
Titanium (total)										
Vanadium (dissolved)										
Vanadium (total)										
Zinc (dissolved)						0.017				
Zinc (total)										
Phenols						0.002				
Mercury					<	0.0001				
Benzene					<	0.0001				
1,4 Dichlorobenzene					<	0.0002				
Methylene Chloride					<	0.0005				
Toluene					<	0.0002				
Vinyl Chloride					<	0.0002				

**Macdonald, Meredith and Aberdeen Additional Township
2020 Annual Monitoring Report**

MW-5

Project No. 21-0031

Parameters	Date Sampled							
	27/11/2018		28/05/2019		21/08/2019		05/11/2019	
Alkalinity, as CaCO ₃				140		150		150
Ammonia, as N				0.15		0.15		0.096
Chloride				37		35		36
COD			<	4	<	4	<	4
Conductivity				460		450		460
DOC				1.7		1.7		1.5
Fluoride								
Hardness, as CaCO ₃				199		222		197
Nitrate, as N			<	0.1	<	0.1	<	0.1
Nitrite, as N							<	0.01
pH				8.15		8.08		8.05
Total P, as P								0.045
Sulphate				26		26		26
TKN, as N								0.26
TDS				280		340		310
Aluminum (dissolved)								
Aluminum (total)								
Antimony (dissolved)								
Antimony (total)								
Arsenic (dissolved)								0.0047
Arsenic (total)								
Barium (dissolved)				0.027		0.053		0.025
Barium (total)								
Beryllium (dissolved)								
Beryllium (total)								
Boron (dissolved)				0.025		0.026		0.023
Boron (total)								
Cadmium (dissolved)								0.00015
Cadmium (total)								
Calcium (dissolved)				60		66		59
Calcium (total)								
Chromium (dissolved)							<	0.005
Chromium (total)								
Cobalt (dissolved)								
Cobalt (total)								
Copper (dissolved)							<	0.1
Copper (total)								
Iron (dissolved)				0.67		2.7		0.52
Iron (total)								

**Macdonald, Meredith and Aberdeen Additional Township
2020 Annual Monitoring Report**

MW-5

Project No. 21-0031

Parameters	Date Sampled							
	27/11/2018		28/05/2019		21/08/2019		05/11/2019	
Lead (dissolved)							<	0.0005
Lead (total)								
Magnesium (dissolved)				12		14		12
Magnesium (total)								
Manganese (dissolved)								0.39
Manganese (total)								
Molybdenum (dissolved)								
Molybdenum (total)								
Nickel (dissolved)								
Nickel (total)								
Potassium (dissolved)								1.1
Potassium (total)								
Selenium (dissolved)								
Selenium (total)								
Silicon (dissolved)								
Silicon (total)								
Silver (dissolved)								
Silver (total)								
Sodium (dissolved)				12		12		12
Sodium (total)								
Strontium (dissolved)								
Strontium (total)								
Thallium (dissolved)								
Thallium (total)								
Titanium (dissolved)								
Titanium (total)								
Vanadium (dissolved)								
Vanadium (total)								
Zinc (dissolved)								0.0023
Zinc (total)								
Phenols							<	0.001
Mercury							<	0.0001
Benzene							<	0.0001
1,4 Dichlorobenzene							<	0.0002
Methylene Chloride							<	0.0005
Toluene							<	0.0002
Vinyl Chloride							<	0.0002

Macdonald, Meredith and Aberdeen Additional Township
2022 Annual Monitoring Report

MW-5

Project No. 230202

Parameters	Date Sampled									
	25/05/2020	26/10/2020	31/05/2021	30/08/2021	31/10/2021	1/6/2022	31/08/2022	5/11/2022		
Alkalinity, as CaCO ₃		150	149	150	150	150	160	150	150	
Ammonia, as N	< 0.05	0.1	0.052	< 0.05	0.08	0.068	< 0.05	0.1		
Chloride	36	37	37	35	34	34	33	34		
COD	5.2	< 4	5.7	< 4	10	11	< 4	6.2		
Conductivity	460	460	460	440	450	450	430	440		
DOC	1.6	1.7	1.7	1.7	1.6	1.8	1.6	1.8		
Fluoride										
Hardness, as CaCO ₃	206	199	199	197	188					
Nitrate, as N	< 0.1	< 0.1		< 0.1	< 0.1	< 0.1	< 0.1	< 0.1		
Nitrite, as N		< 0.01	< 0.01		< 0.01					
pH	7.66	7.81	8.01	7.99	7.98	7.82	7.96	8.08		
Total P, as P		0.06			< 0.02					
Sulphate	25	25	25	24	24	22	23	23		
TKN, as N		0.17			0.51					
TDS	300	280	275	210	280	265	145	300		
Aluminum (dissolved)										
Aluminum (total)										
Antimony (dissolved)										
Antimony (total)										
Arsenic (dissolved)		0.0058			0.003			0.0038		
Arsenic (total)										
Barium (dissolved)	0.028	0.028	0.029	0.028	0.026	0.028	0.028	0.026		
Barium (total)										
Beryllium (dissolved)										
Beryllium (total)										
Boron (dissolved)	0.025	0.026	0.026	0.026	0.027	0.028	0.026	0.026		
Boron (total)										
Cadmium (dissolved)		< 0.00009			< 0.00009			< 0.00009		
Cadmium (total)										
Calcium (dissolved)	61	60	60	59	57	57	55	56		
Calcium (total)										
Chromium (dissolved)		< 0.005			< 0.005			< 0.005		
Chromium (total)										
Cobalt (dissolved)										
Cobalt (total)										
Copper (dissolved)		0.0012			0.0019			0.0016		
Copper (total)										
Iron (dissolved)	0.42	0.8	0.35	< 0.1	< 0.1	< 0.1	0.42	0.17		
Iron (total)										

Macdonald, Meredith and Aberdeen Additional Towns MW-5
2022 Annual Monitoring Report Project No. 230202

Parameters	Sampling Date									
	25/05/2020	26/10/2020	31/05/2021	30/08/2021	31/10/2021	1/6/2022	31/08/2022	5/11/2022		
Lead (dissolved)		< 0.0005			< 0.0005			< 0.0005		
Lead (total)										
Magnesium (dissolved)	13	12	12	12	11	12	12	11		
Magnesium (total)										
Manganese (dissolved)		0.43			0.38			0.38		
Manganese (total)										
Molybdenum (dissolved)										
Molybdenum (total)										
Nickel (dissolved)										
Nickel (total)										
Potassium (dissolved)		1.3			1.2			1.1		
Potassium (total)										
Selenium (dissolved)										
Selenium (total)										
Silicon (dissolved)										
Silicon (total)										
Silver (dissolved)										
Silver (total)										
Sodium (dissolved)	13	13	13	13	13	14	12	12		
Sodium (total)										
Strontium (dissolved)										
Strontium (total)										
Thallium (dissolved)										
Thallium (total)										
Titanium (dissolved)										
Titanium (total)										
Vanadium (dissolved)										
Vanadium (total)										
Zinc (dissolved)		0.0096			0.0074			< 0.005		
Zinc (total)										
Phenols		< 0.001			< 0.001					
Mercury		< 0.0001			< 0.0001					
Benzene		< 0.0001			< 0.0001					
1,4 Dichlorobenzene		< 0.0002			< 0.0002					
Methylene Chloride		< 0.0005			< 0.0005					
Toluene		< 0.0002			< 0.0002					
Vinyl Chloride		< 0.0002			< 0.0002					

**Macdonald, Meredith and Aberdeen Additional Township
2020 Annual Monitoring Report**

MW-6
Project No. 21-0031

Parameters	Date Sampled									
	25/08/2015		04/11/2015		31/05/2016		30/08/2016		03/11/2016	
Alkalinity, as CaCO ₃		177		179		170		180		190
Ammonia, as N	<	0.015		0.03		0.051	<	0.05	<	0.05
Chloride		1.41		1.07	<	1	<	1		1
COD		30		19		5	<	4	<	4
Conductivity		333		335		320		340		330
DOC		4.2		3.9		1.2		1.4		1.3
Fluoride		0.105		0.108						
Hardness, as CaCO ₃		127		159		153		162		164
Nitrate, as N		0.247	<	0.02	<	0.1	<	0.1	<	0.1
Nitrite, as N									<	0.01
pH		8.05		8.02		8.05		8.06		8.13
Total P, as P	<	0.013		0.15					<	0.02
Sulphate		5.08		2.43		2		1.6		1.4
TKN, as N		0.18		0.53						0.28
TDS		184		192		194		192		200
Aluminum (dissolved)				0.007						
Aluminum (total)										
Antimony (dissolved)	<	0.0005	<	0.0005						
Antimony (total)										
Arsenic (dissolved)	<	0.001	<	0.001					<	0.001
Arsenic (total)										
Barium (dissolved)		0.039		0.038		0.03		0.028		0.03
Barium (total)										
Beryllium (dissolved)	<	0.0005	<	0.0005						
Beryllium (total)										
Boron (dissolved)		0.015		0.016		0.012		0.016		0.016
Boron (total)										
Cadmium (dissolved)	<	0.0001		0.0002					<	0.0001
Cadmium (total)										
Calcium (dissolved)		29.4		39.6		38		40		41
Calcium (total)										
Chromium (dissolved)	<	0.001	<	0.001					<	0.005
Chromium (total)										
Cobalt (dissolved)		0.0019		0.0011						
Cobalt (total)										
Copper (dissolved)	<	0.0005		0.0046						0.0013
Copper (total)										
Iron (dissolved)	<	0.1	<	0.1	<	0.1		< 0.1	<	0.1
Iron (total)										

**Macdonald, Meredith and Aberdeen Additional Township
2020 Annual Monitoring Report**

MW-6
Project No. 21-0031

Parameters	Date Sampled									
	25/08/2015		04/11/2015		31/05/2016		30/08/2016		03/11/2016	
Lead (dissolved)	<	0.0001	<	0.0001					<	0.0005
Lead (total)										
Magnesium (dissolved)		13.1		14.6		14		15		15
Magnesium (total)										
Manganese (dissolved)		0.274		0.232						0.13
Manganese (total)										
Molybdenum (dissolved)		0.0019		0.0017						
Molybdenum (total)										
Nickel (dissolved)		0.001		0.002						
Nickel (total)										
Potassium (dissolved)		1.73		2.09						1.7
Potassium (total)										
Selenium (dissolved)	<	0.001	<	0.001						
Selenium (total)										
Silicon (dissolved)		7.26		7.62						
Silicon (total)										
Silver (dissolved)	<	0.0001	<	0.0001						
Silver (total)										
Sodium (dissolved)		9.24		8.85		7.5		8.1		8.5
Sodium (total)										
Strontium (dissolved)		0.154		0.138						
Strontium (total)										
Thallium (dissolved)	<	0.0001	<	0.0001						
Thallium (total)										
Titanium (dissolved)	<	0.005	<	0.005						
Titanium (total)										
Vanadium (dissolved)	<	0.0008		0.0008						
Vanadium (total)										
Zinc (dissolved)	<	0.006		0.016						0.0087
Zinc (total)										
Phenols									<	0.001
Mercury									<	0.0001
Benzene									<	0.0001
1,4 Dichlorobenzene									<	0.0002
Methylene Chloride									<	0.0005
Toluene									<	0.0002
Vinyl Chloride									<	0.0002

Macdonald, Meredith and Aberdeen Additional Township
2020 Annual Monitoring Report

MW-6
 Project No. 21-0031

Parameters	Date Sampled									
	31/05/2017		30/08/2017		28/11/2017		04/12/2017		31/05/2018	
Alkalinity, as CaCO ₃		170		190		180				170
Ammonia, as N	<	0.05	<	0.05	<	0.05			<	0.05
Chloride		1.2	<	1	<	1			<	1
COD	<	4	<	4		6.7			<	4
Conductivity		320		320		320				330
DOC		1.1		1		1.2				1.1
Fluoride										
Hardness, as CaCO ₃		159		166		155				162
Nitrate, as N	<	0.1	<	0.1	<	0.1			<	0.1
Nitrite, as N										
pH		8.11		8.17		8.15				8.17
Total P, as P						0.03				
Sulphate		2.2		1.4		2.3				2.1
TKN, as N						0.28				
TDS		188		210		205				145
Aluminum (dissolved)										
Aluminum (total)										
Antimony (dissolved)										
Antimony (total)										
Arsenic (dissolved)					<	0.001				
Arsenic (total)										
Barium (dissolved)		0.027		0.028		0.029				0.03
Barium (total)										
Beryllium (dissolved)										
Beryllium (total)										
Boron (dissolved)		0.016		0.017		0.03				0.012
Boron (total)										
Cadmium (dissolved)						0.00014				
Cadmium (total)										
Calcium (dissolved)		39		40		39				40
Calcium (total)										
Chromium (dissolved)					<	0.005				
Chromium (total)										
Cobalt (dissolved)										
Cobalt (total)										
Copper (dissolved)						0.0041				
Copper (total)										
Iron (dissolved)	<	0.1	<	0.1	<	0.1			<	0.1
Iron (total)										

**Macdonald, Meredith and Aberdeen Additional Township
2020 Annual Monitoring Report**

MW-6
Project No. 21-0031

Parameters	Date Sampled									
	31/05/2017		30/08/2017		28/11/2017		04/12/2017		31/05/2018	
Lead (dissolved)					<	0.0005				
Lead (total)										
Magnesium (dissolved)		15		16		14				15
Magnesium (total)										
Manganese (dissolved)						0.11				
Manganese (total)										
Molybdenum (dissolved)										
Molybdenum (total)										
Nickel (dissolved)										
Nickel (total)										
Potassium (dissolved)						1.8				
Potassium (total)										
Selenium (dissolved)										
Selenium (total)										
Silicon (dissolved)										
Silicon (total)										
Silver (dissolved)										
Silver (total)										
Sodium (dissolved)		7.6		8.8		8.2				7.7
Sodium (total)										
Strontium (dissolved)										
Strontium (total)										
Thallium (dissolved)										
Thallium (total)										
Titanium (dissolved)										
Titanium (total)										
Vanadium (dissolved)										
Vanadium (total)										
Zinc (dissolved)						0.019				
Zinc (total)										
Phenols								0.0016		
Mercury							<	0.0001		
Benzene							<	0.0001		
1,4 Dichlorobenzene							<	0.0002		
Methylene Chloride							<	0.0005		
Toluene							<	0.0002		
Vinyl Chloride							<	0.0002		

**Macdonald, Meredith and Aberdeen Additional Township
2020 Annual Monitoring Report**

MW-6
Project No. 21-0031

Parameters	Date Sampled									
	22/08/2018		27/11/2018		28/05/2019		21/08/2019		05/11/2019	
Alkalinity, as CaCO ₃		190		180		170		180		180
Ammonia, as N	<	0.05	<	0.05	<	0.05		0.11	<	0.05
Chloride	<	1	<	1	<	1	<	1		1.2
COD		6.2		5.1	<	4		5.4	<	4
Conductivity		340		340		310		340		330
DOC		0.97		1.1		1.1		0.75		0.79
Fluoride										
Hardness, as CaCO ₃		162		155		152		167		155
Nitrate, as N	<	0.1	<	0.1	<	0.1	<	0.1	<	0.1
Nitrite, as N			<	0.01					<	0.01
pH		8.07		8.16		8.18		8.18		8.17
Total P, as P				0.022					<	0.02
Sulphate		2		2		2.2		1.1		1.7
TKN, as N				0.18						0.17
TDS		165		160		200		210		230
Aluminum (dissolved)										
Aluminum (total)										
Antimony (dissolved)										
Antimony (total)										
Arsenic (dissolved)			<	0.001					<	0.001
Arsenic (total)										
Barium (dissolved)		0.032		0.032		0.031		0.035		0.03
Barium (total)										
Beryllium (dissolved)										
Beryllium (total)										
Boron (dissolved)	<	0.01		0.019		0.021		0.015		0.013
Boron (total)										
Cadmium (dissolved)				0.00011						0.00044
Cadmium (total)										
Calcium (dissolved)		40		39		38		42		39
Calcium (total)										
Chromium (dissolved)			<	0.005					<	0.005
Chromium (total)										
Cobalt (dissolved)										
Cobalt (total)										
Copper (dissolved)				0.0032						0.0022
Copper (total)										
Iron (dissolved)	<	0.1	<	0.1	<	0.1		0.17	<	0.1
Iron (total)										

**Macdonald, Meredith and Aberdeen Additional Township
2020 Annual Monitoring Report**

MW-6
Project No. 21-0031

Parameters	Date Sampled									
	22/08/2018		27/11/2018		28/05/2019		21/08/2019		05/11/2019	
Lead (dissolved)			<	0.0005					<	0.0005
Lead (total)										
Magnesium (dissolved)		15		14		14		15		14
Magnesium (total)										
Manganese (dissolved)				0.078						0.068
Manganese (total)										
Molybdenum (dissolved)										
Molybdenum (total)										
Nickel (dissolved)										
Nickel (total)										
Potassium (dissolved)				2						1.6
Potassium (total)										
Selenium (dissolved)										
Selenium (total)										
Silicon (dissolved)										
Silicon (total)										
Silver (dissolved)										
Silver (total)										
Sodium (dissolved)		8.5		7.7		8.5		8.1		8.2
Sodium (total)										
Strontium (dissolved)										
Strontium (total)										
Thallium (dissolved)										
Thallium (total)										
Titanium (dissolved)										
Titanium (total)										
Vanadium (dissolved)										
Vanadium (total)										
Zinc (dissolved)				0.012						0.01
Zinc (total)										
Phenols			<	0.001					<	0.001
Mercury			<	0.0001					<	0.0001
Benzene			<	0.0001					<	0.0001
1,4 Dichlorobenzene			<	0.0002					<	0.0002
Methylene Chloride			<	0.0005					<	0.0005
Toluene			<	0.0002					<	0.0002
Vinyl Chloride			<	0.0002					<	0.0002

Macdonald, Meredith and Aberdeen Additional Township
2022 Annual Monitoring Report

MW-6
Project No. 230202

Parameters	Date Sampled											
	25/05/2020		26/10/2020		31/05/2021		30/08/2021		31/10/2021		1/6/2022	
Alkalinity, as CaCO ₃		180		180		180		190		190		200
Ammonia, as N	<	0.05	<	0.05	<	0.05	<	0.05	<	0.05	<	0.05
Chloride		1.1		1.1		2.5		1.4		1.1		1
COD		6.5		5		14	<	4	<	4		8.2
Conductivity		320		340		340		350		350		360
DOC		0.88		0.96		1.9		0.92		0.81		0.72
Fluoride												
Hardness, as CaCO ₃		162		161		164		164		175		
Nitrate, as N	<	0.1	<	0.1	<	0.1	<	0.1	<	0.1	<	0.1
Nitrite, as N			<	0.01					<	0.01		
pH		7.83		8.03		8.11		8.05		8.11		8.18
Total P, as P				0.043					<	0.02		
Sulphate		1.9		1.9		2.2		1.6		2.1		1.9
TKN, as N				0.35						0.2		
TDS		180		235		195		140		215		220
Aluminum (dissolved)												
Aluminum (total)												
Antimony (dissolved)												
Antimony (total)												
Arsenic (dissolved)			<	0.001					<	0.001		<
Arsenic (total)												
Barium (dissolved)		0.031		0.032		0.032		0.033		0.034		0.033
Barium (total)												
Beryllium (dissolved)												
Beryllium (total)												
Boron (dissolved)		0.015		0.014		0.020		0.040		0.019		0.018
Boron (total)												
Cadmium (dissolved)			<	0.00009					<	0.00009		<
Cadmium (total)												
Calcium (dissolved)		40		40		41		41		42		43
Calcium (total)												
Chromium (dissolved)			<	0.005					<	0.005		<
Chromium (total)												
Cobalt (dissolved)												
Cobalt (total)												
Copper (dissolved)				0.0014						0.0043		0.0017
Copper (total)												
Iron (dissolved)	<	0.1	<	0.1	<	0.1	<	0.1	<	0.1	<	0.1
Iron (total)												

**Macdonald, Meredith and Aberdeen Additional Township
2022 Annual Monitoring Report**

MW-6
Project No. 230202

Parameters	Date Sampled									
	25/05/2020	26/10/2020	31/05/2021	30/08/2021	31/10/2021	1/6/2022	31/08/2022	5/11/2022		
Lead (dissolved)		< 0.0005			< 0.0005			< 0.0005		
Lead (total)										
Magnesium (dissolved)	15	15	15	15	17	15	16	16		
Magnesium (total)										
Manganese (dissolved)		0.052			0.016			0.0063		
Manganese (total)										
Molybdenum (dissolved)										
Molybdenum (total)										
Nickel (dissolved)										
Nickel (total)										
Potassium (dissolved)		1.8			2			2		
Potassium (total)										
Selenium (dissolved)										
Selenium (total)										
Silicon (dissolved)										
Silicon (total)										
Silver (dissolved)										
Silver (total)										
Sodium (dissolved)	8.4	10	11	8.8	9.6	8	9	9.3		
Sodium (total)										
Strontium (dissolved)										
Strontium (total)										
Thallium (dissolved)										
Thallium (total)										
Titanium (dissolved)										
Titanium (total)										
Vanadium (dissolved)										
Vanadium (total)										
Zinc (dissolved)		0.0064			0.023			0.013		
Zinc (total)										
Phenols		< 0.001			< 0.001					
Mercury		< 0.0001			< 0.0001					
Benzene		< 0.0001			< 0.0001					
1,4 Dichlorobenzene		< 0.0002			< 0.0002					
Methylene Chloride		< 0.0005			< 0.0005					
Toluene		< 0.0002			< 0.0002					
Vinyl Chloride		< 0.0002			< 0.0002					

SW-1A

Macdonald, Meredith and Aberdeen Additional Township 2021 Annual Monitoring Report

Project No. 22-0031

Parameters	Date Sampled					
	16/06/2010		23/10/2012		05/11/2013	
Alkalinity, as CaCO ₃		65.4		89.4		135
Ammonia, as N	<	0.024	<	0.024		0.16
BOD						
Chloride		10.6		22.2		20
COD		65		47		36
Conductivity		224		431		450
DOC		27.3		16.6		14.6
Fluoride	<	0.004		0.075		0.069
Hardness, as CaCO ₃		85		168		156
Mercury						
Nitrate, as N		0.384		0.191		0.299
Nitrite, as N						
pH		7.71		7.73		7.81
Total P, as P		0.312		0.0675		0.0232
Sulphate		32.3		82.9		60.3
TKN, as N		2.1		0.75		0.85
TDS		240		316		324
TSS						
Aluminum (dissolved)		0.6		0.174		0.2
Aluminum (total)		4.4		0.3		0.6
Antimony (dissolved)		0.0002	<	0.001	<	0.0005
Antimony (total)	<	0.01	<	0.001	<	0.01
Arsenic (dissolved)	<	0.001	<	0.001	<	0.001
Arsenic (total)	<	0.05	<	0.001	<	0.02
Barium (dissolved)		0.02		0.03		0.03
Barium (total)		0.06		0.03		0.03
Beryllium (dissolved)	<	0.001	<	0.001	<	0.0005
Beryllium (total)	<	0.01	<	0.001	<	0.01
Boron (dissolved)		0.14		0.32		0.26
Boron (total)		0.2		0.29		0.2
Cadmium (dissolved)	<	0.0001	<	0.0001	<	0.0001
Cadmium (total)	<	0.01	<	0.0001	<	0.008
Calcium (dissolved)		21		41.3		41
Calcium (total)		21		43.2		41
Chromium (dissolved)		0.002		0.004	<	0.001
Chromium (total)	<	0.05		0.003	<	0.05
Cobalt (dissolved)		0.0004	<	0.0005		0.0003
Cobalt (total)	<	0.01	<	0.0005	<	0.01

**Macdonald, Meredith and Aberdeen Additional Township
2021 Annual Monitoring Report**

SW-1A

Project No. 22-0031

Parameters	Date Sampled					
	16/06/2010		23/10/2012		05/11/2013	
Copper (dissolved)		0.005		0.003		0.002
Copper (total)	<	0.01		0.004	<	0.01
Iron (dissolved)		0.42		0.19		0.28
Iron (total)		3.2		0.37		0.3
Lead (dissolved)	<	0.001	<	0.001	<	0.001
Lead (total)	<	0.01	<	0.001	<	0.01
Magnesium (dissolved)		8		14		13
Magnesium (total)		8		14.7		13
Manganese (dissolved)		0.03		0.019		0.04
Manganese (total)		0.08		0.021		0.04
Molybdenum (dissolved)	<	0.005	<	0.002	<	0.005
Molybdenum (total)	<	0.01	<	0.002	<	0.01
Nickel (dissolved)	<	0.005		0.002	<	0.005
Nickel (total)	<	0.01		0.002	<	0.01
Potassium (dissolved)		3		6.71		6
Potassium (total)		4		7.08		6
Selenium (dissolved)	<	0.001	<	0.004	<	0.001
Selenium (total)	<	0.05	<	0.004	<	0.02
Silicon (dissolved)		3.8		5.39		5
Silicon (total)		7		4.9		5
Silver (dissolved)	<	0.0001	<	0.001	<	0.0001
Silver (total)	<	0.01	<	0.001	<	0.01
Sodium (dissolved)		13		25.7		20
Sodium (total)		12		26.6		21
Strontium (dissolved)		0.093		0.147		0.182
Strontium (total)		0.11		0.133		0.17
Thallium (dissolved)	<	0.0001	<	0.0003	<	0.0001
Thallium (total)	<	0.01	<	0.0003	<	0.01
Titanium (dissolved)		0.02		0.01	<	0.01
Titanium (total)	<	0.1		0.009	<	0.1
Vanadium (dissolved)		0.002	<	0.002		0.001
Vanadium (total)	<	0.05		0.002	<	0.05
Zinc (dissolved)	<	0.01	<	0.005	<	0.01
Zinc (total)		0.05		0.007	<	0.04
Phenols						

**Macdonald, Meredith and Aberdeen Additional Township
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SW-1B
Project No. 21-0031

Parameters	Date Sampled									
	04/11/2014		5/27/2015		8/25/2015		11/4/2015		30/05/2016	
Alkalinity, as CaCO ₃		103		112		206		127		310
Ammonia, as N		0.02		0.03		0.02		0.04		0.076
BOD									<	2
Chloride		17.7		15.8		82		37		64
COD		40		68		51		55		58
Conductivity		379		353		1290		635		960
DOC		15		12.6		16.3		11		
Fluoride		0.059		0.105		0.099		0.075		
Hardness, as CaCO ₃		153		122		442		237		
Mercury										
Nitrate, as N		0.232	<	0.02		0.27		0.305	<	0.1
Nitrite, as N										
pH		7.82		7.88		7.97		8.05		8.2
Total P, as P		0.03		0.044		0.0315		0.028		0.063
Sulphate		51		42.8		435		156		120
TKN, as N		1.12		1.66		1.15		0.73		0.75
TDS		256		276		924		428		674
TSS										12
Aluminum (dissolved)		0.19								
Aluminum (total)				1.08		0.22		0.671		
Antimony (dissolved)	<	0.0005								
Antimony (total)			<	0.0005	<	0.0005	<	0.0005		
Arsenic (dissolved)	<	0.001								
Arsenic (total)			<	0.001	<	0.001	<	0.001		
Barium (dissolved)		0.029								
Barium (total)				0.035		0.122		0.051		
Beryllium (dissolved)	<	0.0005								
Beryllium (total)			<	0.0005	<	0.0005	<	0.0005		
Boron (dissolved)		0.2								
Boron (total)				0.264		0.906		0.491		
Cadmium (dissolved)		0.00017								
Cadmium (total)			<	0.0001	<	0.0001	<	0.0001		
Calcium (dissolved)		36								
Calcium (total)				30.7		107		59.3		
Chromium (dissolved)	<	0.005								
Chromium (total)				0.002	<	0.001		0.001		
Cobalt (dissolved)	<	0.0005								
Cobalt (total)				0.0006	<	0.0005	<	0.0005		

**Macdonald, Meredith and Aberdeen Additional Township
2020 Annual Monitoring Report**

SW-1B
Project No. 21-0031

Parameters	Date Sampled									
	04/11/2014		5/27/2015		8/25/2015		11/4/2015		30/05/2016	
Copper (dissolved)		0.0016								
Copper (total)				0.0016	<	0.0005		0.0042		
Iron (dissolved)		0.69								
Iron (total)				0.847		0.176		0.582		0.82
Lead (dissolved)	<	0.0005								
Lead (total)				0.0006	<	0.0001		0.0004		
Magnesium (dissolved)		12								
Magnesium (total)				11.1		42.5		21.7		
Manganese (dissolved)		0.024								
Manganese (total)				0.028		0.017		0.014		
Molybdenum (dissolved)	<	0.0005								
Molybdenum (total)			<	0.0005	<	0.0005	<	0.0005		
Nickel (dissolved)		0.0017								
Nickel (total)				0.003		0.004		0.003		
Potassium (dissolved)		5.1								
Potassium (total)				4.11		15.4		8.95		
Selenium (dissolved)	<	0.002								
Selenium (total)			<	0.001	<	0.001	<	0.001		
Silicon (dissolved)		4.6								
Silicon (total)				5.15		4.63		6.28		
Silver (dissolved)	<	0.0001								
Silver (total)			<	0.0001	<	0.0001	<	0.0001		
Sodium (dissolved)		18								
Sodium (total)				16.2		66.9		32		
Strontium (dissolved)		0.15								
Strontium (total)				0.122		0.524		0.243		
Thallium (dissolved)	<	0.00005								
Thallium (total)			<	0.0001	<	0.0001	<	0.0001		
Titanium (dissolved)	<	0.005								
Titanium (total)				0.03		0.008		0.025		
Vanadium (dissolved)		0.00059								
Vanadium (total)				0.0026		0.0014		0.0016		
Zinc (dissolved)		0.032								
Zinc (total)			<	0.005	<	0.005	<	0.005		
Phenols									<	0.001

**Macdonald, Meredith and Aberdeen Additional Township
2020 Annual Monitoring Report**

SW-1B
Project No. 21-0031

Parameters	Date Sampled									
	29/08/2016		02/11/2016		30/05/2017		29/08/2017		27/11/2017	
Alkalinity, as CaCO ₃		310		150		170		370		170
Ammonia, as N	<	0.05	<	0.05	<	0.05	<	0.05		0.088
BOD	<	2	<	2		2	<	2	<	2
Chloride		120		29		24		79		28
COD		77		53		51		57		39
Conductivity		1700		540		480		1100		580
DOC										
Fluoride										
Hardness, as CaCO ₃										
Mercury			<	0.0001						
Nitrate, as N	<	0.1	<	0.1	<	0.1		0.11		0.41
Nitrite, as N				0.014	<	0.01	<	0.01	<	0.01
pH		8		8.02		7.98		8.29		8.11
Total P, as P	<	0.04		0.04		0.05		0.05		0.038
Sulphate		430		77		41		120		77
TKN, as N		1.1		0.67		0.96		1		0.65
TDS		1320		362		312		692		360
TSS		3		23		22		9		16
Aluminum (dissolved)										
Aluminum (total)										
Antimony (dissolved)										
Antimony (total)										
Arsenic (dissolved)										
Arsenic (total)			<	0.001					<	0.001
Barium (dissolved)										
Barium (total)				0.044						0.041
Beryllium (dissolved)										
Beryllium (total)										
Boron (dissolved)										
Boron (total)				0.35						0.39
Cadmium (dissolved)										
Cadmium (total)			<	0.0001					<	0.0001
Calcium (dissolved)										
Calcium (total)										
Chromium (dissolved)										
Chromium (total)			<	0.005					<	0.005
Cobalt (dissolved)										
Cobalt (total)										

**Macdonald, Meredith and Aberdeen Additional Township
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SW-1B
Project No. 21-0031

Parameters	Date Sampled									
	29/08/2016		02/11/2016		30/05/2017		29/08/2017		27/11/2017	
Copper (dissolved)										
Copper (total)				0.0033						0.0025
Iron (dissolved)										
Iron (total)		0.26		1.2		1.3		0.5		0.89
Lead (dissolved)										
Lead (total)				0.00057						0.0007
Magnesium (dissolved)										
Magnesium (total)										
Manganese (dissolved)										
Manganese (total)										
Molybdenum (dissolved)										
Molybdenum (total)										
Nickel (dissolved)										
Nickel (total)										
Potassium (dissolved)										
Potassium (total)										
Selenium (dissolved)										
Selenium (total)										
Silicon (dissolved)										
Silicon (total)										
Silver (dissolved)										
Silver (total)										
Sodium (dissolved)										
Sodium (total)										
Strontium (dissolved)										
Strontium (total)										
Thallium (dissolved)										
Thallium (total)										
Titanium (dissolved)										
Titanium (total)										
Vanadium (dissolved)										
Vanadium (total)										
Zinc (dissolved)										
Zinc (total)			<	0.005						0.0073
Phenols	<	0.001	<	0.001		0.0021		0.0064	<	0.001

Macdonald, Meredith and Aberdeen Additional Township
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SW-1B
 Project No. 21-0031

Parameters	Date Sampled									
	04/12/2017		30/05/2018		21/08/2018		26/11/2018		28/05/2019	
Alkalinity, as CaCO ₃				300				85		140
Ammonia, as N			<	0.05				0.13	<	0.05
BOD							<	2	<	2
Chloride				44				15		22
COD				55				32		32
Conductivity				920				300		460
DOC										
Fluoride										
Hardness, as CaCO ₃										
Mercury	<	0.0001					<	0.0001		
Nitrate, as N			<	0.1				0.2	<	0.1
Nitrite, as N			<	0.01			<	0.01	<	0.01
pH				8.16				7.85		8.12
Total P, as P				0.046				0.059		0.004
Sulphate				120				39		61
TKN, as N				0.8				0.41		0.46
TDS				520				205		290
TSS				6				20		5
Aluminum (dissolved)										
Aluminum (total)										
Antimony (dissolved)										
Antimony (total)										
Arsenic (dissolved)										
Arsenic (total)							<	0.001		
Barium (dissolved)										
Barium (total)								0.035		
Beryllium (dissolved)										
Beryllium (total)										
Boron (dissolved)										
Boron (total)								0.2		
Cadmium (dissolved)										
Cadmium (total)							<	0.0001		
Calcium (dissolved)										
Calcium (total)										
Chromium (dissolved)										
Chromium (total)							<	0.005		
Cobalt (dissolved)										
Cobalt (total)										

**Macdonald, Meredith and Aberdeen Additional Township
2020 Annual Monitoring Report**

SW-1B
Project No. 21-0031

Parameters	Date Sampled									
	04/12/2017		30/05/2018		21/08/2018		26/11/2018		28/05/2019	
Copper (dissolved)										
Copper (total)							0.0047			
Iron (dissolved)										
Iron (total)				0.25			1.7		0.37	
Lead (dissolved)										
Lead (total)							0.0012			
Magnesium (dissolved)										
Magnesium (total)										
Manganese (dissolved)										
Manganese (total)										
Molybdenum (dissolved)										
Molybdenum (total)										
Nickel (dissolved)										
Nickel (total)										
Potassium (dissolved)										
Potassium (total)										
Selenium (dissolved)										
Selenium (total)										
Silicon (dissolved)										
Silicon (total)										
Silver (dissolved)										
Silver (total)										
Sodium (dissolved)										
Sodium (total)										
Strontium (dissolved)										
Strontium (total)										
Thallium (dissolved)										
Thallium (total)										
Titanium (dissolved)										
Titanium (total)										
Vanadium (dissolved)										
Vanadium (total)										
Zinc (dissolved)										
Zinc (total)							0.008			
Phenols			<	0.001			<	0.001	<	0.001

Macdonald, Meredith and Aberdeen Additional Township
2022 Annual Monitoring Report

SW-1B
Project No. 230202

Parameters	Date Sampled																			
	21/08/2019		04/11/2019		25/05/2020		26/10/2020		31/05/2021		29/08/2021		31/10/2021		31/05/2022		30/08/2022		5/11/2022	
Alkalinity, as CaCO3				90		280		130		290		300		190		220		410		160
Ammonia, as N			<	0.05	<	0.05		0.12	<	0.024		0.12	<	0.024	<	0.05		0.1		0.99
BOD			<	2	<	2	<	2	<	2		8		2	<	2		2	<	2
Chloride				13		45		19		45		73		65		34		140		42
COD				34		38		37		41		54		68		55		68		84
Conductivity				290		850		420		810		830		610		590		1400		570
DOC																20		27		27
Fluoride																				
Hardness, as CaCO3																230		480		210
Mercury			<	0.0001			<	0.0001					<	0.0001	<	0.1	<	0.0001	<	0.0001
Nitrate, as N			<	0.1		0.1		0.25		0.2	<	0.1		0.18	<	0.1		0.51		0.32
Nitrite, as N				0.012	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01		0.016		0.085
pH				7.87		8.01		7.89		8.15		8.11		7.98		8		8.23		7.94
Total P, as P				0.037		0.035		0.026		0.036		0.7		0.097		0.048		0.064		0.091
Sulphate				34		100		53		68		49		36		38		130		59
TKN, as N				0.52		0.93		0.57		0.69		1.1		0.81		0.87		1.5		2
TDS				195		505		355		460		450		390		350		855		360
TSS				10		6		6		15		710		62		8		18		18
Aluminum (dissolved)																				
Aluminum (total)																0.42		0.88		1.7
Antimony (dissolved)																				
Antimony (total)																				
Arsenic (dissolved)																				
Arsenic (total)			<	0.001			<	0.001					<	1	<	0.001		0.0011	<	1
Barium (dissolved)														0.033						
Barium (total)				0.029				0.027								0.043		0.083		0.046
Beryllium (dissolved)																				
Beryllium (total)																				
Boron (dissolved)																				
Boron (total)				0.2				0.26						0.34		0.41		1.4		0.47
Cadmium (dissolved)																				
Cadmium (total)			<	0.0001			<	0.00009					<	0.09	<	0.0009	<	0.00009	<	0.00009
Calcium (dissolved)																				
Calcium (total)																				
Chromium (dissolved)																				
Chromium (total)			<	0.005			<	0.005					<	5	<	0.005	<	0.005	<	0.005
Cobalt (dissolved)																				
Cobalt (total)																				

Macdonald, Meredith and Aberdeen Additional Township
2022 Annual Monitoring Report

SW-1B
Project No. 230202

Parameters	Date Sampled										
	21/08/2019	04/11/2019	25/05/2020	26/10/2020	31/05/2021	29/08/2021	31/10/2021	31/05/2022	30/08/2022	5/11/2022	
Copper (dissolved)											
Copper (total)		0.031		0.021			0.031	0.0031	0.0042	0.0058	
Iron (dissolved)											
Iron (total)		1	0.26	0.56	0.73	28	1.2				
Lead (dissolved)											
Lead (total)		0.00073		< 0.0005			0.00075	< 0.0005	< 0.0005	0.0015	
Magnesium (dissolved)											
Magnesium (total)											
Manganese (dissolved)											
Manganese (total)											
Molybdenum (dissolved)											
Molybdenum (total)											
Nickel (dissolved)											
Nickel (total)											
Potassium (dissolved)											
Potassium (total)											
Selenium (dissolved)											
Selenium (total)											
Silicon (dissolved)											
Silicon (total)											
Silver (dissolved)											
Silver (total)											
Sodium (dissolved)											
Sodium (total)											
Strontium (dissolved)											
Strontium (total)											
Thallium (dissolved)											
Thallium (total)											
Titanium (dissolved)											
Titanium (total)											
Vanadium (dissolved)											
Vanadium (total)											
Zinc (dissolved)											
Zinc (total)		0.016		0.0059			0.0061	< 0.005		0.011	
Phenols	<	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.002	< 0.001	

**Macdonald, Meredith and Aberdeen Additional Township
2020 Annual Monitoring Report**

SW-2
Project No. 21-0031

Parameters	Date Sampled									
	16/06/2010		23/10/2012		05/11/2013		04/11/2014		5/27/2015	
Alkalinity, as CaCO ₃		56.5		62.9		88.5		80.1		96.7
Ammonia, as N	<	0.024	<	0.024		0.24		0.02		0.05
BOD										
Chloride		6.88		13.7		9.39		10.3		12.1
COD		70		48		33		38		82
Conductivity		194		316		273		290		305
DOC		28.3		17.4		14.7		15		15.2
Fluoride		0.052		0.046		0.066		0.058		0.1
Hardness, as CaCO ₃		62		123		104		111		105
Mercury										
Nitrate, as N		0.278	<	0.025	<	0.025		0.204	<	0.02
Nitrite, as N										
pH		7.56		7.42		7.56		7.5		7.67
Total P, as P		0.201		0.0731		0.0279		0.03		0.053
Sulphate		20.4		59.4		35.7		38.7		36.4
TKN, as N		2.31		0.65		0.64		1.15		1.32
TDS		212		236		220		212		240
TSS										
Aluminum (dissolved)		0.84		0.188		0.4		0.2		
Aluminum (total)		2.8		0.243		0.7				1
Antimony (dissolved)		0.0002	<	0.001	<	0.01	<	0.0005		
Antimony (total)	<	0.01	<	0.001	<	0.01			<	0.0005
Arsenic (dissolved)	<	0.001		0.001	<	0.02	<	0.001		
Arsenic (total)	<	0.05	<	0.001	<	0.02			<	0.001
Barium (dissolved)		0.02		0.027		0.02		0.023		
Barium (total)		0.04		0.027		0.02				0.034
Beryllium (dissolved)	<	0.001	<	0.001	<	0.01	<	0.0005		
Beryllium (total)	<	0.01	<	0.001	<	0.01			<	0.0005
Boron (dissolved)		0.13		0.21		0.1		0.011		
Boron (total)		0.1		0.19		0.1				0.191
Cadmium (dissolved)	<	0.0001	<	0.0001	<	0.008	<	0.0001		
Cadmium (total)	<	0.01	<	0.0001	<	0.008				0.0004
Calcium (dissolved)		21		33		27		38		
Calcium (total)		15		31		27				25.2
Chromium (dissolved)		0.003		0.003	<	0.05	<	0.005		
Chromium (total)	<	0.05		0.002	<	0.05				0.002
Cobalt (dissolved)		0.0004	<	0.0005	<	0.01	<	0.0005		
Cobalt (total)	<	0.01	<	0.0005	<	0.01				0.0007

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SW-2
Project No. 21-0031

Parameters	Date Sampled									
	16/06/2010		23/10/2012		05/11/2013		04/11/2014		5/27/2015	
Copper (dissolved)		0.005		0.003	<	0.01		0.0017		
Copper (total)	<	0.01		0.003	<	0.01				0.0018
Iron (dissolved)		0.56		0.17		0.1		0.74		
Iron (total)		1.7		0.29		0.4				1.08
Lead (dissolved)	<	0.001	<	0.001	<	0.01	<	0.0005		
Lead (total)	<	0.01	<	0.001	<	0.01				0.0008
Magnesium (dissolved)		7		11.7		9		12		
Magnesium (total)		6		11		9				10.3
Manganese (dissolved)		0.02		0.043		0.04		0.046		
Manganese (total)		0.04		0.035		0.05				0.116
Molybdenum (dissolved)	<	0.005	<	0.002	<	0.01	<	0.0005		
Molybdenum (total)	<	0.01	<	0.002	<	0.01			<	0.0005
Nickel (dissolved)	<	0.005		0.002	<	0.01		0.0019		
Nickel (total)	<	0.01		0.002	<	0.01				0.003
Potassium (dissolved)		3		4.27		3		5		
Potassium (total)		2		3.73		3				3.68
Selenium (dissolved)	<	0.001	<	0.004	<	0.02	<	0.002		
Selenium (total)	<	0.05	<	0.004	<	0.02			<	0.001
Silicon (dissolved)		4.3		4.95		4.7		5.1		
Silicon (total)		6		4.88		4.6				4.7
Silver (dissolved)	<	0.0001	<	0.0001	<	0.01	<	0.0001		
Silver (total)	<	0.01	<	0.0001	<	0.01			<	0.0001
Sodium (dissolved)		12		17.8		11		17		
Sodium (total)		7		15.8		10				13.5
Strontium (dissolved)		0.083		0.117		0.1		0.13		
Strontium (total)		0.07		0.1		0.11				0.11
Thallium (dissolved)	<	0.0001	<	0.0003	<	0.01	<	0.00005		
Thallium (total)	<	0.01	<	0.0003	<	0.01			<	0.0001
Titanium (dissolved)		0.03		0.008	<	0.1		0.0051		
Titanium (total)	<	0.1		0.007	<	0.1				0.038
Vanadium (dissolved)		0.002		0.005	<	0.05		0.0007		
Vanadium (total)	<	0.05	<	0.002	<	0.05				0.003
Zinc (dissolved)	<	0.01		0.006	<	0.04		0.008		
Zinc (total)		0.06	<	0.005	<	0.04				0.006
Phenols										

**Macdonald, Meredith and Aberdeen Additional Township
2020 Annual Monitoring Report**

SW-2
Project No. 21-0031

Parameters	Date Sampled									
	8/25/2015		11/4/2015		30/05/2016		29/08/2016		02/11/2016	
Alkalinity, as CaCO ₃		176		97		180		260		120
Ammonia, as N		0.03		0.08		0.086		0.064	<	0.05
BOD						2		5	<	2
Chloride		86.2		27.9		20		110		23
COD		66		61		46		94		82
Conductivity		1310		517		470		1600		420
DOC		16		4.5						
Fluoride		0.086		0.057						
Hardness, as CaCO ₃		452		202						
Mercury									<	0.0001
Nitrate, as N	<	0.02		0.464	<	0.1	<	0.1	<	0.1
Nitrite, as N									<	0.01
pH		7.89		7.95		8.85		8.03		7.81
Total P, as P		0.0827		0.0369		0.28		0.29		0.08
Sulphate		404		136		46		430		60
TKN, as N		1.3		1.34		0.71		1.2		0.76
TDS		936		364		382		1270		298
TSS						210		450		62
Aluminum (dissolved)										
Aluminum (total)		0.413		0.671						
Antimony (dissolved)										
Antimony (total)	<	0.0005	<	0.0005						
Arsenic (dissolved)										
Arsenic (total)	<	0.001	<	0.001					<	0.001
Barium (dissolved)										
Barium (total)		0.109		0.041						0.035
Beryllium (dissolved)										
Beryllium (total)	<	0.0005	<	0.0005						
Boron (dissolved)										
Boron (total)		1.09		0.379						0.29
Cadmium (dissolved)										
Cadmium (total)	<	0.0001	<	0.0001						0.00082
Calcium (dissolved)										
Calcium (total)		109		52.7						
Chromium (dissolved)										
Chromium (total)		0.001		0.002					<	0.005
Cobalt (dissolved)										
Cobalt (total)		0.0009	<	0.0005						

**Macdonald, Meredith and Aberdeen Additional Township
2020 Annual Monitoring Report**

SW-2
Project No. 21-0031

Parameters	Date Sampled									
	8/25/2015		11/4/2015		30/05/2016		29/08/2016		02/11/2016	
Copper (dissolved)										
Copper (total)	<	0.0005		0.0013						0.0031
Iron (dissolved)										
Iron (total)		0.771		0.672		4.2		9		1.1
Lead (dissolved)										
Lead (total)	<	0.0001		0.0004						0.00058
Magnesium (dissolved)										
Magnesium (total)		43.7		17.1						
Manganese (dissolved)										
Manganese (total)		0.44		0.047						
Molybdenum (dissolved)										
Molybdenum (total)	<	0.0005	<	0.0005						
Nickel (dissolved)										
Nickel (total)		0.005		0.002						
Potassium (dissolved)										
Potassium (total)		11.9		6.02						
Selenium (dissolved)										
Selenium (total)	<	0.001	<	0.001						
Silicon (dissolved)										
Silicon (total)		4.76		6.02						
Silver (dissolved)										
Silver (total)	<	0.0001	<	0.0001						
Sodium (dissolved)										
Sodium (total)		64.9		22.8						
Strontium (dissolved)										
Strontium (total)		0.527		0.196						
Thallium (dissolved)										
Thallium (total)	<	0.0001	<	0.0001						
Titanium (dissolved)										
Titanium (total)		0.02		0.024						
Vanadium (dissolved)										
Vanadium (total)		0.0016		0.0015						
Zinc (dissolved)										
Zinc (total)	<	0.005	<	0.005						0.0053
Phenols					<	0.001	<	0.001	<	0.001

**Macdonald, Meredith and Aberdeen Additional Township
2020 Annual Monitoring Report**

SW-2
Project No. 21-0031

Parameters	Date Sampled									
	30/05/2017		29/08/2017		27/11/2017		04/12/2017		30/05/2018	
Alkalinity, as CaCO ₃		150		320		180				310
Ammonia, as N		0.054		0.058		0.11				0.063
BOD	<	2	<	2	<	2			<	2
Chloride		18		74		30				50
COD		49		68		42				60
Conductivity		400		1000		610				1000
DOC										
Fluoride										
Hardness, as CaCO ₃										
Mercury							<	0.0001		
Nitrate, as N	<	0.1	<	0.1		0.41			<	0.1
Nitrite, as N	<	0.01	<	0.01		0.011			<	0.01
pH		7.89		8.14		8.06				8.19
Total P, as P		0.08		0.11		0.037				0.05
Sulphate		37		130		100				150
TKN, as N		1		1		0.54				0.87
TDS		286		562		390				595
TSS		49		190		7				18
Aluminum (dissolved)										
Aluminum (total)										
Antimony (dissolved)										
Antimony (total)										
Arsenic (dissolved)										
Arsenic (total)					<	0.001				
Barium (dissolved)										
Barium (total)						0.039				
Beryllium (dissolved)										
Beryllium (total)										
Boron (dissolved)										
Boron (total)						0.44				
Cadmium (dissolved)										
Cadmium (total)					<	0.0001				
Calcium (dissolved)										
Calcium (total)										
Chromium (dissolved)										
Chromium (total)					<	0.005				
Cobalt (dissolved)										
Cobalt (total)										

**Macdonald, Meredith and Aberdeen Additional Township
2020 Annual Monitoring Report**

SW-2
Project No. 21-0031

Parameters	Date Sampled									
	30/05/2017		29/08/2017		27/11/2017		04/12/2017		30/05/2018	
Copper (dissolved)										
Copper (total)						0.0023				
Iron (dissolved)										
Iron (total)		2.2		9.4		0.85				1.5
Lead (dissolved)										
Lead (total)						0.00065				
Magnesium (dissolved)										
Magnesium (total)										
Manganese (dissolved)										
Manganese (total)										
Molybdenum (dissolved)										
Molybdenum (total)										
Nickel (dissolved)										
Nickel (total)										
Potassium (dissolved)										
Potassium (total)										
Selenium (dissolved)										
Selenium (total)										
Silicon (dissolved)										
Silicon (total)										
Silver (dissolved)										
Silver (total)										
Sodium (dissolved)										
Sodium (total)										
Strontium (dissolved)										
Strontium (total)										
Thallium (dissolved)										
Thallium (total)										
Titanium (dissolved)										
Titanium (total)										
Vanadium (dissolved)										
Vanadium (total)										
Zinc (dissolved)										
Zinc (total)						0.0053				
Phenols		0.0032		0.008	<	0.001			<	0.001

**Macdonald, Meredith and Aberdeen Additional Township
2021 Annual Monitoring Report**

SW-2
Project No. 21-0031

Parameters	Date Sampled									
	21/08/2018		26/11/2018		28/05/2019		21/08/2019		04/11/2019	
Alkalinity, as CaCO ₃				92		150				120
Ammonia, as N				0.15	<	0.05				0.064
BOD			<	2	<	2			<	2
Chloride				19		23				18
COD				29		33				37
Conductivity				360		490				370
DOC										
Fluoride										
Hardness, as CaCO ₃										
Mercury			<	0.0001					<	0.0001
Nitrate, as N				0.24	<	0.1				0.14
Nitrite, as N				0.012	<	0.01				0.01
pH				7.89		8.07				7.98
Total P, as P				0.028		0.004				0.042
Sulphate				57		65				45
TKN, as N				0.54		0.48				9,53
TDS				225		285				290
TSS				6		17				9
Aluminum (dissolved)										
Aluminum (total)										
Antimony (dissolved)										
Antimony (total)										
Arsenic (dissolved)										
Arsenic (total)			<	0.001					<	0.001
Barium (dissolved)										
Barium (total)				0.028						0.032
Beryllium (dissolved)										
Beryllium (total)										
Boron (dissolved)										
Boron (total)				0.31						0.25
Cadmium (dissolved)										
Cadmium (total)			<	0.0001					<	0.0001
Calcium (dissolved)										
Calcium (total)										
Chromium (dissolved)										
Chromium (total)			<	0.005					<	0.005
Cobalt (dissolved)										
Cobalt (total)										

**Macdonald, Meredith and Aberdeen Additional Township
2020 Annual Monitoring Report**

SW-2
Project No. 21-0031

Parameters	Date Sampled									
	21/08/2018		26/11/2018		28/05/2019		21/08/2019		04/11/2019	
Copper (dissolved)										
Copper (total)				0.0035						0.0033
Iron (dissolved)										
Iron (total)				0.84		0.56				1
Lead (dissolved)										
Lead (total)				0.00066						0.0007
Magnesium (dissolved)										
Magnesium (total)										
Manganese (dissolved)										
Manganese (total)										
Molybdenum (dissolved)										
Molybdenum (total)										
Nickel (dissolved)										
Nickel (total)										
Potassium (dissolved)										
Potassium (total)										
Selenium (dissolved)										
Selenium (total)										
Silicon (dissolved)										
Silicon (total)										
Silver (dissolved)										
Silver (total)										
Sodium (dissolved)										
Sodium (total)										
Strontium (dissolved)										
Strontium (total)										
Thallium (dissolved)										
Thallium (total)										
Titanium (dissolved)										
Titanium (total)										
Vanadium (dissolved)										
Vanadium (total)										
Zinc (dissolved)										
Zinc (total)				0.0057						0.0077
Phenols			<	0.001	<	0.001			<	0.001

**Macdonald, Meredith and Aberdeen Additional Township
2022 Annual Monitoring Report**

SW-2
Project No. 230202

Parameters	Date Sampled															
	25/05/2020		26/10/2020		30/05/2021		29/08/2021		31/10/2021		31/05/2022		31/08/2022		1/11/2022	
Alkalinity, as CaCO3		280		130		290		460		220		240		420		180
Ammonia, as N	<	0.05		0.12		0.12	<	0.05	<	0.05	<	0.05		0.21		1.2
BOD	<	2	<	2		3		3		3	<	2	<	2	<	2
Chloride		46		20		45		110		71		37		140		45
COD		42		46		45		66		72		44		72		90
Conductivity		880		450		810		1300		640		660		1400		630
DOC												22		27		28
Fluoride																
Hardness, as CaCO3												250		500		220
Mercury			<	0.0001					<	0.0001	<	0.0001	<	0.0001	<	0.0001
Nitrate, as N		0.29		0.25	<	0.1	<	0.1		0.24	<	0.1		0.43		0.3
Nitrite, as N		0.01		0.013		0.016	<	0.01	<	0.01		0.01		0.078		0.095
pH		7.9		7.87		8.06		8.07		7.9		7.94		8.03		7.91
Total P, as P		0.04		0.03		0.11		0.067		0.079		0.057		0.069		0.088
Sulphate		120		58		68		77		37		43		140		65
TKN, as N		1		0.6		0.79		1.4		0.8		0.89		1.6		2.2
TDS		595		310		435		675		430		325		910		375
TSS		4		6		46		21		11		7		10		16
Aluminum (dissolved)																
Aluminum (total)												290		0.31		1.7
Antimony (dissolved)																
Antimony (total)																
Arsenic (dissolved)																
Arsenic (total)			<	0.001					<	0.001	<	0.001		0.001	<	0.001
Barium (dissolved)																
Barium (total)				0.029						0.004		0.041		0.077		0.052
Beryllium (dissolved)																
Beryllium (total)																
Boron (dissolved)																
Boron (total)				0.28						0.42		0.45		1.4		0.54
Cadmium (dissolved)																
Cadmium (total)			<	0.00009					<	0.00009	<	0.00009	<	0.00009		0.000091
Calcium (dissolved)																
Calcium (total)																
Chromium (dissolved)																
Chromium (total)			<	0.005					<	0.005	<	0.005		0.0061	<	0.005
Cobalt (dissolved)																
Cobalt (total)																

**Macdonald, Meredith and Aberdeen Additional Township
2022 Annual Monitoring Report**

SW-2

Project No. 230202

2022 Annual Monitoring Report																	Project No. 200402																
Parameters	Date Sampled																																
	25/05/2020		26/10/2020		30/05/2021		29/08/2021		31/10/2021		31/05/2022		31/08/2022		1/11/2022																		
Copper (dissolved)																																	
Copper (total)				0.0022						0.0031		0.0023		0.003		0.0055																	
Iron (dissolved)																																	
Iron (total)		0.4		0.59		2.4		1.3		1.4																							
Lead (dissolved)																																	
Lead (total)			<	0.0005						0.00081	<	0.0005	<	0.0005		0.0014																	
Magnesium (dissolved)																																	
Magnesium (total)																																	
Manganese (dissolved)																																	
Manganese (total)																																	
Molybdenum (dissolved)																																	
Molybdenum (total)																																	
Nickel (dissolved)																																	
Nickel (total)																																	
Potassium (dissolved)																																	
Potassium (total)																																	
Selenium (dissolved)																																	
Selenium (total)																																	
Silicon (dissolved)																																	
Silicon (total)																																	
Silver (dissolved)																																	
Silver (total)																																	
Sodium (dissolved)																																	
Sodium (total)																																	
Strontium (dissolved)																																	
Strontium (total)																																	
Thallium (dissolved)																																	
Thallium (total)																																	
Titanium (dissolved)																																	
Titanium (total)																																	
Vanadium (dissolved)																																	
Vanadium (total)																																	
Zinc (dissolved)																																	
Zinc (total)				0.0072						0.007		0.0056	<	0.005		0.01																	
Phenols	<	0.001	<	0.001	<	0.001	<	0.001	<	0.001	<	0.001		0.0018	<	0.001																	

**Macdonald, Meredith and Aberdeen Additional Township
2020 Annual Monitoring Report**

SW-3
Project No. 21-0031

Parameters	Date Sampled									
	22/06/2010		23/10/2012		05/11/2013		04/11/2014		5/27/2015	
Alkalinity, as CaCO ₃		11.8		5.41		7.62		9.28		11.1
Ammonia, as N	<	0.024	<	0.024		0.21		0.04		0.02
BOD										
Chloride		0.348		6.28		3.63		1.25		1.19
COD		110		82		33		96		87
Conductivity		36.6		62.4		33.7		35.4		35
DOC		30.7		28.9		30.8		33		18
Fluoride		0.047		0.018		0.049		0.047		0.069
Hardness, as CaCO ₃		23		28.6		18		18		16
Mercury										
Nitrate, as N	<	0.025		0.212		0.168	<	0.018	<	0.02
Nitrite, as N										
pH		6.43		5.86		6.2		6.21		6.57
Total P, as P		0.0865		0.0618		0.0299		0.05		0.05
Sulphate		0.656		19.8		5.92		0.797		0.435
TKN, as N		2.2		0.91		0.87		1.74		1.4
TDS		112		16		124		96		84
TSS										
Aluminum (dissolved)		1.09		0.562		0.8		0.64		
Aluminum (total)		2.4		0.581		1.5				0.67
Antimony (dissolved)		0.0001	<	0.001	<	0.01	<	0.0001		
Antimony (total)	<	0.01	<	0.001	<	0.01			<	0.0005
Arsenic (dissolved)	<	0.001	<	0.001	<	0.02	<	0.001		
Arsenic (total)	<	0.05	<	0.001	<	0.02			<	0.001
Barium (dissolved)		0.01		0.011	<	0.01		0.0076		
Barium (total)		0.02		0.012		0.01				0.01
Beryllium (dissolved)	<	0.001	<	0.001	<	0.01	<	0.0005		
Beryllium (total)	<	0.01	<	0.001	<	0.01			<	0.0005
Boron (dissolved)		0.01	<	0.01	<	0.1		0.011		
Boron (total)	<	0.1	<	0.01	<	0.1			<	0.01
Cadmium (dissolved)	<	0.0001	<	0.0001	<	0.008		0.00011		
Cadmium (total)	<	0.01	<	0.0001	<	0.008			<	0.0001
Calcium (dissolved)		5		5.99		4		3.8		
Calcium (total)		6		6.27		4				3.87
Chromium (dissolved)		0.003		0.002	<	0.05	<	0.005		
Chromium (total)	<	0.05		0.002	<	0.05				0.001
Cobalt (dissolved)		0.0012	<	0.0005	<	0.01	<	0.0005		
Cobalt (total)	<	0.01	<	0.0005	<	0.01			<	0.0005

**Macdonald, Meredith and Aberdeen Additional Township
2020 Annual Monitoring Report**

SW-3
Project No. 21-0031

Parameters	Date Sampled									
	22/06/2010		23/10/2012		05/11/2013		04/11/2014		5/27/2015	
Copper (dissolved)		0.004		0.004	<	0.01		0.0021		
Copper (total)	<	0.01		0.004	<	0.01				0.0017
Iron (dissolved)		0.74		0.38		0.6		0.61		
Iron (total)		1.3		0.42		0.9				0.592
Lead (dissolved)		0.001	<	0.001	<	0.01		0.0006		
Lead (total)	<	0.01	<	0.001	<	0.01			<	0.0009
Magnesium (dissolved)		2		2.97		2		2		
Magnesium (total)		2		3.16		2				1.59
Manganese (dissolved)		0.08		0.018		0.03		0.019		
Manganese (total)		0.09		0.019		0.03				0.025
Molybdenum (dissolved)	<	0.005	<	0.002	<	0.01	<	0.0005		
Molybdenum (total)	<	0.01	<	0.002	<	0.01			<	0.0005
Nickel (dissolved)	<	0.005		0.002	<	0.01		0.0021		
Nickel (total)	<	0.01		0.002	<	0.01				0.002
Potassium (dissolved)	<	1		0.54	<	1		0.52		
Potassium (total)	<	1		0.52	<	1				0.235
Selenium (dissolved)		0.002	<	0.004	<	0.02	<	0.002		
Selenium (total)	<	0.05	<	0.004	<	0.02			<	0.001
Silicon (dissolved)		5.2		6.01		5		4.7		
Silicon (total)		4		5.6		5.1				3.02
Silver (dissolved)	<	0.0001	<	0.0001	<	0.01	<	0.0001		
Silver (total)	<	0.01	<	0.0001	<	0.01			<	0.0001
Sodium (dissolved)	<	2		2.37	<	2		1.4		
Sodium (total)		2		2.41	<	2				1.49
Strontium (dissolved)		0.023		0.028	<	0.05		0.02		
Strontium (total)	<	0.05		0.027	<	0.05				0.019
Thallium (dissolved)	<	0.0001	<	0.0003	<	0.01	<	0.00005		
Thallium (total)	<	0.01	<	0.0003	<	0.01			<	0.0001
Titanium (dissolved)		0.02		0.009	<	0.1		0.0082		
Titanium (total)	<	0.1		0.007	<	0.1				0.016
Vanadium (dissolved)		0.003		0.002	<	0.05		0.0011		
Vanadium (total)	<	0.05		0.002	<	0.05				0.0015
Zinc (dissolved)	<	0.01		0.008	<	0.04		0.011		
Zinc (total)	<	0.05		0.007	<	0.04			<	0.005
Phenols										

**Macdonald, Meredith and Aberdeen Additional Township
2020 Annual Monitoring Report**

SW-3
Project No. 21-0031

Parameters	Date Sampled									
	8/25/2015		11/4/2015		30/05/2016		29/08/2016		02/11/2016	
Alkalinity, as CaCO ₃		7.86		4.86		34		12		11
Ammonia, as N		0.04		0.04		0.14	<	0.05	<	0.05
BOD					<	2		18	<	2
Chloride		1.71		1.18		1.8		2		2
COD		109		57		94		190		86
Conductivity		62.5		85.2		70		86		38
DOC		18.9		12.5						
Fluoride		0.053		0.037						
Hardness, as CaCO ₃		27		34						
Mercury									<	0.0001
Nitrate, as N		0.298		1.39	<	0.1		1.04	<	0.1
Nitrite, as N									<	0.01
pH		6.56		6.52		6.97		6.68		6.52
Total P, as P		0.231		0.0436		0.25		0.96		0.03
Sulphate		13		21.9	<	1		22	<	1
TKN, as N		2.46		1.24		0.95		0.93		0.8
TDS		148		104		220		152		126
TSS						130		380		8
Aluminum (dissolved)										
Aluminum (total)		6.34		1.07						
Antimony (dissolved)										
Antimony (total)	<	0.0005	<	0.0005						
Arsenic (dissolved)										
Arsenic (total)	<	0.001	<	0.001					<	0.001
Barium (dissolved)										
Barium (total)		0.062		0.021						0.01
Beryllium (dissolved)										
Beryllium (total)	<	0.0005	<	0.0005						
Boron (dissolved)										
Boron (total)		0.034		0.012					<	0.01
Cadmium (dissolved)										
Cadmium (total)		0.0002		0.0004					<	0.0001
Calcium (dissolved)										
Calcium (total)		4.79		7.63						
Chromium (dissolved)										
Chromium (total)		0.01		0.002					<	0.005
Cobalt (dissolved)										
Cobalt (total)		0.0022		0.0006						

**Macdonald, Meredith and Aberdeen Additional Township
2020 Annual Monitoring Report**

SW-3
Project No. 21-0031

Parameters	Date Sampled									
	8/25/2015		11/4/2015		30/05/2016		29/08/2016		02/11/2016	
Copper (dissolved)										
Copper (total)		0.0037		0.0016						0.0037
Iron (dissolved)										
Iron (total)		3.82		0.881		3.3		16		0.66
Lead (dissolved)										
Lead (total)		0.0036		0.0011						0.00082
Magnesium (dissolved)										
Magnesium (total)		3.72		3.54						
Manganese (dissolved)										
Manganese (total)		0.157		0.029						
Molybdenum (dissolved)										
Molybdenum (total)	<	0.0005	<	0.0005						
Nickel (dissolved)										
Nickel (total)		0.005		0.002						
Potassium (dissolved)										
Potassium (total)		2.57		1.09						
Selenium (dissolved)										
Selenium (total)	<	0.001	<	0.001						
Silicon (dissolved)										
Silicon (total)		10.1		6.25						
Silver (dissolved)										
Silver (total)	<	0.0001	<	0.0001						
Sodium (dissolved)										
Sodium (total)		2.68		2.4						
Strontium (dissolved)										
Strontium (total)		0.039		0.038						
Thallium (dissolved)										
Thallium (total)	<	0.0001	<	0.0001						
Titanium (dissolved)										
Titanium (total)		0.135		0.03						
Vanadium (dissolved)										
Vanadium (total)		0.008		0.0022						
Zinc (dissolved)										
Zinc (total)		0.026		0.007					<	0.005
Phenols					<	0.001	<	0.001	<	0.001

**Macdonald, Meredith and Aberdeen Additional Township
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SW-3
Project No. 21-0031

Parameters	Date Sampled									
	30/05/2017		29/08/2017		27/11/2017		04/12/2017		30/05/2018	
Alkalinity, as CaCO ₃		14		34		8.8				26
Ammonia, as N		0.057		0.17	<	0.05				0.075
BOD	<	2	<	2	<	2			<	2
Chloride		1.8		1.6		1.3				1.6
COD		75		110		44				78
Conductivity		39		71		31				57
DOC										
Fluoride										
Hardness, as CaCO ₃										
Mercury							<	0.0001		
Nitrate, as N	<	0.1	<	0.5		0.15			<	0.5
Nitrite, as N	<	0.01	<	0.05	<	0.01			<	0.05
pH		6.76		7.07		6.68				6.96
Total P, as P		0.08		0.25		0.046				0.2
Sulphate	<	1	<	1	<	1			<	1
TKN, as N		1.1		1.5		0.35				0.95
TDS		98		140		85				65
TSS		11		64		4				320
Aluminum (dissolved)										
Aluminum (total)										
Antimony (dissolved)										
Antimony (total)										
Arsenic (dissolved)										
Arsenic (total)					<	0.001				
Barium (dissolved)										
Barium (total)						0.017				
Beryllium (dissolved)										
Beryllium (total)										
Boron (dissolved)										
Boron (total)					<	0.01				
Cadmium (dissolved)										
Cadmium (total)					<	0.0001				
Calcium (dissolved)										
Calcium (total)										
Chromium (dissolved)										
Chromium (total)					<	0.005				
Cobalt (dissolved)										
Cobalt (total)										

**Macdonald, Meredith and Aberdeen Additional Township
2020 Annual Monitoring Report**

SW-3
Project No. 21-0031

Parameters	Date Sampled									
	30/05/2017		29/08/2017		27/11/2017		04/12/2017		30/05/2018	
Copper (dissolved)										
Copper (total)						0.0033				
Iron (dissolved)										
Iron (total)		0.79		12		1.3				1.7
Lead (dissolved)										
Lead (total)						0.0015				
Magnesium (dissolved)										
Magnesium (total)										
Manganese (dissolved)										
Manganese (total)										
Molybdenum (dissolved)										
Molybdenum (total)										
Nickel (dissolved)										
Nickel (total)										
Potassium (dissolved)										
Potassium (total)										
Selenium (dissolved)										
Selenium (total)										
Silicon (dissolved)										
Silicon (total)										
Silver (dissolved)										
Silver (total)										
Sodium (dissolved)										
Sodium (total)										
Strontium (dissolved)										
Strontium (total)										
Thallium (dissolved)										
Thallium (total)										
Titanium (dissolved)										
Titanium (total)										
Vanadium (dissolved)										
Vanadium (total)										
Zinc (dissolved)										
Zinc (total)						0.0099				
Phenols		0.0031		0.01	<	0.001			<	0.001

**Macdonald, Meredith and Aberdeen Additional Township
2020 Annual Monitoring Report**

SW-3
Project No. 21-0031

Parameters	Date Sampled									
	21/08/2018		26/11/2018		28/05/2019		21/08/2019		04/11/2019	
Alkalinity, as CaCO ₃				5		9.1				6.3
Ammonia, as N				0.072	<	0.05				0.31
BOD			<	2	<	2			<	2
Chloride				1.2		1.1				2.6
COD				35		41				41
Conductivity				27		26				30
DOC										
Fluoride										
Hardness, as CaCO ₃										
Mercury			<	0.0001					<	0.0001
Nitrate, as N			<	0.1	<	0.1			<	0.1
Nitrite, as N			<	0.01	<	0.01			<	0.01
pH				6.54		6.76				6.56
Total P, as P				0.03		0.033				0.043
Sulphate			<	1	<	1			<	1
TKN, as N				0.3		0.52				0.49
TDS				70		45				75
TSS				2	<	1				2
Aluminum (dissolved)										
Aluminum (total)										
Antimony (dissolved)										
Antimony (total)										
Arsenic (dissolved)										
Arsenic (total)			<	0.001					<	0.001
Barium (dissolved)										
Barium (total)				0.011						0.0087
Beryllium (dissolved)										
Beryllium (total)										
Boron (dissolved)										
Boron (total)			<	0.01					<	0.01
Cadmium (dissolved)										
Cadmium (total)			<	0.0001					<	0.0001
Calcium (dissolved)										
Calcium (total)										
Chromium (dissolved)										
Chromium (total)			<	0.005					<	0.005
Cobalt (dissolved)										
Cobalt (total)										

**Macdonald, Meredith and Aberdeen Additional Township
2020 Annual Monitoring Report**

SW-3
Project No. 21-0031

Parameters	Date Sampled									
	21/08/2018		26/11/2018		28/05/2019		21/08/2019		04/11/2019	
Copper (dissolved)										
Copper (total)				0.0024						0.0031
Iron (dissolved)										
Iron (total)				0.79		0.36				0.47
Lead (dissolved)										
Lead (total)				0.00068						0.0006
Magnesium (dissolved)										
Magnesium (total)										
Manganese (dissolved)										
Manganese (total)										
Molybdenum (dissolved)										
Molybdenum (total)										
Nickel (dissolved)										
Nickel (total)										
Potassium (dissolved)										
Potassium (total)										
Selenium (dissolved)										
Selenium (total)										
Silicon (dissolved)										
Silicon (total)										
Silver (dissolved)										
Silver (total)										
Sodium (dissolved)										
Sodium (total)										
Strontium (dissolved)										
Strontium (total)										
Thallium (dissolved)										
Thallium (total)										
Titanium (dissolved)										
Titanium (total)										
Vanadium (dissolved)										
Vanadium (total)										
Zinc (dissolved)										
Zinc (total)			<	0.005						0.00087
Phenols			<	0.001	<	0.001			<	0.001

SW-3A

2022 Annual Monitoring Report

Project No. 230202

Parameters	Date Sampled									
	25/05/2020		26/10/2020		30/05/2021		29/08/2021		31/10/2021	
Alkalinity, as CaCO3		22		11				89		21
Ammonia, as N	<	0.05	<	0.05				1.8		0.21
BOD	<	2	<	2				7		2
Chloride	<	1		2				2.8		5.8
COD		56		46				160		120
Conductivity		45		34				190		51
DOC										
Fluoride										
Hardness, as CaCO3										
Mercury			<	0.0001						
Nitrate, as N	<	0.1	<	0.1			<	0.1	<	0.1
Nitrite, as N	<	0.01	<	0.01			<	0.01		0.016
pH		6.36		6.7				7.11		6.63
Total P, as P		0.081		0.029				0.7		0.22
Sulphate	<	1	<	1			<	1	<	1
TKN, as N		0.78		0.41				3.5		1.2
TDS		80		95				130		175
TSS		35		3				210		20
Aluminum (dissolved)										
Aluminum (total)										
Antimony (dissolved)										
Antimony (total)										
Arsenic (dissolved)										
Arsenic (total)			<	0.001					<	0.001
Barium (dissolved)										
Barium (total)				0.01						0.027
Beryllium (dissolved)										
Beryllium (total)										
Boron (dissolved)										
Boron (total)			<	0.01					<	0.01
Cadmium (dissolved)										
Cadmium (total)			<	0.00009						0.00021
Calcium (dissolved)										
Calcium (total)										
Chromium (dissolved)										
Chromium (total)			<	0.005						0.0057
Cobalt (dissolved)										
Cobalt (total)										

2022 Annual Monitoring Report

Parameters	Date Sampled				
	25/05/2020	26/10/2020	30/05/2021	29/08/2021	31/10/2021
Copper (dissolved)					
Copper (total)		0.0024			0.0063
Iron (dissolved)					
Iron (total)	0.95	0.66		15	3
Lead (dissolved)					
Lead (total)		0.00064			0.0031
Magnesium (dissolved)					
Magnesium (total)					
Manganese (dissolved)					
Manganese (total)					
Molybdenum (dissolved)					
Molybdenum (total)					
Nickel (dissolved)					
Nickel (total)					
Potassium (dissolved)					
Potassium (total)					
Selenium (dissolved)					
Selenium (total)					
Silicon (dissolved)					
Silicon (total)					
Silver (dissolved)					
Silver (total)					
Sodium (dissolved)					
Sodium (total)					
Strontium (dissolved)					
Strontium (total)					
Thallium (dissolved)					
Thallium (total)					
Titanium (dissolved)					
Titanium (total)					
Vanadium (dissolved)					
Vanadium (total)					
Zinc (dissolved)					
Zinc (total)		0.0074			0.013
Phenols	< 0.001	< 0.001		0.0016	0.001

Macdonald, Meredith and Aberdeen Additional Township
2022 Annual Monitoring Report

SW-3B

Project No. 230202

Parameters	Date Sampled							
	31/05/2022		30/08/2022		7/11/2022			
Alkalinity, as CaCO ₃		57		94		24		
Ammonia, as N	<	0.05	<	0.05		0.11		
BOD	<	2	<	2	<	2		
Chloride		1.1		2		2.3		
COD		15		20		51		
Conductivity		120		190		54		
DOC		4.7		5.2		15		
Fluoride								
Hardness, as CaCO ₃		52		93		25		
Mercury	<	0.0001	<	0.0001	<	0.0001		
Nitrate, as N	<	0.1	<	0.1	<	0.0001		
Nitrite, as N	<	0.01	<	0.01	<	0.1		
pH		7.41		7.61		7.18		
Total P, as P		0.034		0.084		0.11		
Sulphate		1.9		4.6	<	1		
TKN, as N		0.14		0.27		0.47		
TDS		100		150		75		
TSS		9		97		18		
Aluminum (dissolved)								
Aluminum (total)		7.6		2.9		4.7		
Antimony (dissolved)								
Antimony (total)								
Arsenic (dissolved)								
Arsenic (total)		0.0014		0.0017	<	0.001		
Barium (dissolved)								
Barium (total)		0.15		0.13		0.073		
Beryllium (dissolved)								
Beryllium (total)								
Boron (dissolved)								
Boron (total)		0.017		0.02		0.01		
Cadmium (dissolved)								
Cadmium (total)	<	0.00009	<	0.00009	<	0.00009		
Calcium (dissolved)								
Calcium (total)								
Chromium (dissolved)								
Chromium (total)		0.015		0.0066		0.0086		
Cobalt (dissolved)								
Cobalt (total)								

Macdonald, Meredith and Aberdeen Additional Township
2022 Annual Monitoring Report

SW-3B
 Project No. 230202

Parameters	Date Sampled							
	31/05/2022		30/08/2022		7/11/2022			
Copper (dissolved)								
Copper (total)		0.009		0.0041		0.0057		
Iron (dissolved)								
Iron (total)								
Lead (dissolved)								
Lead (total)		0.0043		0.0018		0.0023		
Magnesium (dissolved)								
Magnesium (total)								
Manganese (dissolved)								
Manganese (total)								
Molybdenum (dissolved)								
Molybdenum (total)								
Nickel (dissolved)								
Nickel (total)								
Potassium (dissolved)								
Potassium (total)								
Selenium (dissolved)								
Selenium (total)								
Silicon (dissolved)								
Silicon (total)								
Silver (dissolved)								
Silver (total)								
Sodium (dissolved)								
Sodium (total)								
Strontium (dissolved)								
Strontium (total)								
Thallium (dissolved)								
Thallium (total)								
Titanium (dissolved)								
Titanium (total)								
Vanadium (dissolved)								
Vanadium (total)								
Zinc (dissolved)								
Zinc (total)		0.029		0.011		0.016		
Phenols	<	0.001	<	0.001	<	0.001		

**Macdonald, Meredith and Aberdeen Additional Township
2022 Annual Monitoring Report**

SW-4A
Project No. 230202

Parameters	Date Sampled									
	5/27/2015									
Alkalinity, as CaCO ₃		70.7								
Ammonia, as N		0.04								
BOD										
Chloride		6.18								
COD		57								
Conductivity		193								
DOC		9.8								
Fluoride		0.091								
Hardness, as CaCO ₃		72								
Mercury										
Nitrate, as N	<	0.02								
Nitrite, as N										
pH		7.85								
Total P, as P		0.098								
Sulphate		15.9								
TKN, as N		1.5								
TDS		188								
TSS										
Aluminum (dissolved)										
Aluminum (total)		0.267								
Antimony (dissolved)										
Antimony (total)	<	0.0005								
Arsenic (dissolved)										
Arsenic (total)	<	0.001								
Barium (dissolved)										
Barium (total)		0.043								
Beryllium (dissolved)										
Beryllium (total)	<	0.0005								
Boron (dissolved)										
Boron (total)		0.078								
Cadmium (dissolved)										
Cadmium (total)	<	0.0001								
Calcium (dissolved)										
Calcium (total)		17.6								
Chromium (dissolved)										
Chromium (total)		0.006								
Cobalt (dissolved)										
Cobalt (total)		0.0012								

**Macdonald, Meredith and Aberdeen Additional Township
2022 Annual Monitoring Report**

SW-4A
Project No. 230202

Parameters	Date Sampled									
	5/27/2015									
Copper (dissolved)										
Copper (total)		0.0035								
Iron (dissolved)										
Iron (total)		2.57								
Lead (dissolved)										
Lead (total)		0.0012								
Magnesium (dissolved)										
Magnesium (total)		6.78								
Manganese (dissolved)										
Manganese (total)		0.155								
Molybdenum (dissolved)										
Molybdenum (total)	<	0.0005								
Nickel (dissolved)										
Nickel (total)		0.004								
Potassium (dissolved)										
Potassium (total)		2.57								
Selenium (dissolved)										
Selenium (total)	<	0.001								
Silicon (dissolved)										
Silicon (total)		7.2								
Silver (dissolved)										
Silver (total)	<	0.0001								
Sodium (dissolved)										
Sodium (total)		6.96								
Strontium (dissolved)										
Strontium (total)		0.076								
Thallium (dissolved)										
Thallium (total)	<	0.0001								
Titanium (dissolved)										
Titanium (total)		0.083								
Vanadium (dissolved)										
Vanadium (total)		0.0049								
Zinc (dissolved)										
Zinc (total)		0.007								
Phenols										

Macdonald, Meredith and Aberdeen Additional Township
2020 Annual Monitoring Report

SW-4B
 Project No. 21-0031

Parameters	Date Sampled									
	8/25/2015		11/4/2015		30/05/2016		29/08/2016		02/11/2016	
Alkalinity, as CaCO ₃		163		127		210		230		67
Ammonia, as N	<	0.015		0.03		0.066		0.058	<	0.05
BOD					<	2	<	2	<	2
Chloride		106		38.7		41		98		12
COD		49		53		32		54		26
Conductivity		1140		612		670		1400		220
DOC		16.3		10.1						
Fluoride		0.082		0.085						
Hardness, as CaCO ₃		372		230						
Mercury									<	0.0001
Nitrate, as N		0.246		0.172	<	0.1	<	0.1	<	0.1
Nitrite, as N									<	0.01
pH		7.95		7.97		7.97		7.99		7.68
Total P, as P		0.0325		0.0318		0.05		0.04		0.06
Sulphate		342		140		69		360		28
TKN, as N		1.11		0.93		0.42		0.9		0.31
TDS		792		400		464		982		208
TSS						25		6		35
Aluminum (dissolved)										
Aluminum (total)		0.165		0.804						
Antimony (dissolved)										
Antimony (total)	<	0.0005	<	0.0005						
Arsenic (dissolved)										
Arsenic (total)	<	0.001	<	0.001					<	0.001
Barium (dissolved)										
Barium (total)		0.113		0.061						0.047
Beryllium (dissolved)										
Beryllium (total)	<	0.0005	<	0.0005						
Boron (dissolved)										
Boron (total)		0.669		0.424						0.12
Cadmium (dissolved)										
Cadmium (total)	<	0.0001	<	0.0001					<	0.0001
Calcium (dissolved)										
Calcium (total)		90.6		59.7						
Chromium (dissolved)										
Chromium (total)	<	0.001		0.002					<	0.005
Cobalt (dissolved)										
Cobalt (total)	<	0.0005		0.0005						

**Macdonald, Meredith and Aberdeen Additional Township
2020 Annual Monitoring Report**

SW-4B
Project No. 21-0031

Parameters	Date Sampled									
	8/25/2015		11/4/2015		30/05/2016		29/08/2016		02/11/2016	
Copper (dissolved)										
Copper (total)	<	0.0005		0.0013						0.0041
Iron (dissolved)										
Iron (total)		0.102		0.918		1.7		1.2		2.2
Lead (dissolved)										
Lead (total)	<	0.0001		0.0004						0.0009
Magnesium (dissolved)										
Magnesium (total)		35.5		19.7						
Manganese (dissolved)										
Manganese (total)		0.007		0.041						
Molybdenum (dissolved)										
Molybdenum (total)	<	0.0005	<	0.0005						
Nickel (dissolved)										
Nickel (total)		0.004		0.003						
Potassium (dissolved)										
Potassium (total)		12.4		8.02						
Selenium (dissolved)										
Selenium (total)	<	0.001	<	0.001						
Silicon (dissolved)										
Silicon (total)		4.18		6.32						
Silver (dissolved)										
Silver (total)	<	0.0001	<	0.0001						
Sodium (dissolved)										
Sodium (total)		56.2		29.2						
Strontium (dissolved)										
Strontium (total)		0.433		0.228						
Thallium (dissolved)										
Thallium (total)		0.0001	<	0.0001						
Titanium (dissolved)										
Titanium (total)		0.007		0.028						
Vanadium (dissolved)										
Vanadium (total)		0.0013		0.0015						
Zinc (dissolved)										
Zinc (total)		0.005	<	0.005						0.0068
Phenols					<	0.001	<	0.001		0.0035

**Macdonald, Meredith and Aberdeen Additional Township
2020 Annual Monitoring Report**

SW-4B
Project No. 21-0031

Parameters	Date Sampled									
	30/05/2017		29/08/2017		27/11/2017		04/12/2017		30/05/2018	
Alkalinity, as CaCO ₃		130		84		100				120
Ammonia, as N	<	0.05	<	0.05		0.05			<	0.05
BOD	<	2	<	2	<	2			<	2
Chloride		16		11		17				15
COD		39		39		40				35
Conductivity		340		220		340				330
DOC										
Fluoride										
Hardness, as CaCO ₃										
Mercury							<	0.0001		
Nitrate, as N	<	0.1	<	0.1		0.22			<	0.1
Nitrite, as N	<	0.01	<	0.01	<	0.01			<	0.01
pH		7.77		7.7		7.85				7.75
Total P, as P		0.07		0.12		0.076				0.06
Sulphate		30		18		42				30
TKN, as N		0.71		0.41		0.43				0.51
TDS		220		184		235				185
TSS		19		37		30				20
Aluminum (dissolved)										
Aluminum (total)										
Antimony (dissolved)										
Antimony (total)										
Arsenic (dissolved)										
Arsenic (total)						0.0011				
Barium (dissolved)										
Barium (total)						0.048				
Beryllium (dissolved)										
Beryllium (total)										
Boron (dissolved)										
Boron (total)						0.2				
Cadmium (dissolved)										
Cadmium (total)					<	0.0001				
Calcium (dissolved)										
Calcium (total)										
Chromium (dissolved)										
Chromium (total)						0.0053				
Cobalt (dissolved)										
Cobalt (total)										

**Macdonald, Meredith and Aberdeen Additional Township
2020 Annual Monitoring Report**

SW-4B
Project No. 21-0031

Parameters	Date Sampled									
	30/05/2017		29/08/2017		27/11/2017		04/12/2017		30/05/2018	
Copper (dissolved)										
Copper (total)						0.0048				
Iron (dissolved)										
Iron (total)		1.4		2.7		3				1.6
Lead (dissolved)										
Lead (total)						0.0016				
Magnesium (dissolved)										
Magnesium (total)										
Manganese (dissolved)										
Manganese (total)										
Molybdenum (dissolved)										
Molybdenum (total)										
Nickel (dissolved)										
Nickel (total)										
Potassium (dissolved)										
Potassium (total)										
Selenium (dissolved)										
Selenium (total)										
Silicon (dissolved)										
Silicon (total)										
Silver (dissolved)										
Silver (total)										
Sodium (dissolved)										
Sodium (total)										
Strontium (dissolved)										
Strontium (total)										
Thallium (dissolved)										
Thallium (total)										
Titanium (dissolved)										
Titanium (total)										
Vanadium (dissolved)										
Vanadium (total)										
Zinc (dissolved)										
Zinc (total)						0.012				
Phenols		0.0038		0.0067		0.0029			<	0.001

**Macdonald, Meredith and Aberdeen Additional Township
2020 Annual Monitoring Report**

SW-4B
Project No. 21-0031

Parameters	Date Sampled									
	21/08/2018		26/11/2018		28/05/2019		21/08/2019		04/11/2019	
Alkalinity, as CaCO ₃				98		67				67
Ammonia, as N				0.11	<	0.05			<	0.05
BOD			<	2	<	2			<	2
Chloride				19		8.5				11
COD				31		17				31
Conductivity				370		210				210
DOC										
Fluoride										
Hardness, as CaCO ₃										
Mercury			<	0.0001					<	0.0001
Nitrate, as N				0.028	<	0.1			<	0.1
Nitrite, as N				0.011	<	0.01				0.015
pH				7.89		7.7				7.77
Total P, as P				0.033		0.061				0.053
Sulphate				54		23				18
TKN, as N				0.5		0.32				0.46
TDS				230		115				165
TSS				8		7				14
Aluminum (dissolved)										
Aluminum (total)										
Antimony (dissolved)										
Antimony (total)										
Arsenic (dissolved)										
Arsenic (total)			<	0.001					<	0.001
Barium (dissolved)										
Barium (total)				0.027						0.033
Beryllium (dissolved)										
Beryllium (total)										
Boron (dissolved)										
Boron (total)				0.28						0.12
Cadmium (dissolved)										
Cadmium (total)			<	0.0001					<	0.0001
Calcium (dissolved)										
Calcium (total)										
Chromium (dissolved)										
Chromium (total)			<	0.005					<	0.005
Cobalt (dissolved)										
Cobalt (total)										

**Macdonald, Meredith and Aberdeen Additional Township
2020 Annual Monitoring Report**

SW-4B
Project No. 21-0031

Parameters	Date Sampled									
	21/08/2018		26/11/2018		28/05/2019		21/08/2019		04/11/2019	
Copper (dissolved)										
Copper (total)				0.0031						0.0036
Iron (dissolved)										
Iron (total)				0.98		1				1.6
Lead (dissolved)										
Lead (total)				0.00077						1
Magnesium (dissolved)										
Magnesium (total)										
Manganese (dissolved)										
Manganese (total)										
Molybdenum (dissolved)										
Molybdenum (total)										
Nickel (dissolved)										
Nickel (total)										
Potassium (dissolved)										
Potassium (total)										
Selenium (dissolved)										
Selenium (total)										
Silicon (dissolved)										
Silicon (total)										
Silver (dissolved)										
Silver (total)										
Sodium (dissolved)										
Sodium (total)										
Strontium (dissolved)										
Strontium (total)										
Thallium (dissolved)										
Thallium (total)										
Titanium (dissolved)										
Titanium (total)										
Vanadium (dissolved)										
Vanadium (total)										
Zinc (dissolved)										
Zinc (total)				0.0056						0.012
Phenols			<	0.001		0.0012			<	0.001

**Macdonald, Meredith and Aberdeen Additional Township
2022 Annual Monitoring Report**

SW-4B

Project No. 230202

Parameters	Date Sampled															
	25/05/2020		26/10/2020		30/05/2021		29/08/2021		30/10/2021		1/6/2022		30/08/2022		7/11/2022	
Alkalinity, as CaCO3		250		120		280		280		190		210		370		150
Ammonia, as N	<	0.05		0.071	<	0.05		0.12	<	0.05	<	0.05		0.097		0.76
BOD	<	2	<	2	<	2		11	<	2	<	2	<	2	<	2
Chloride		42		17		45		73		62		32		130		39
COD		38		39		43		57		73		54		64		78
Conductivity		780		390		800		810		590		560		1300		520
DOC										0.86		0.19		26		26
Fluoride																
Hardness, as CaCO3												220		460		190
Mercury			<	0.0001							<	0.0001	<	0.0001	<	..0001
Nitrate, as N	<	0.1		0.22	<	0.1	<	0.1		0.14	<	0.1		0.49		0.27
Nitrite, as N	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01		0.011		0.034		0.051
pH		7.77		7.9		8.1		8.11		8.03		8.03		8.23		7.94
Total P, as P		0.031		0.028		0.033		0.8				0.04		0.063		0.077
Sulphate		94		48		67		47		35		34		130		52
TKN, as N		0.8		0.54		0.62		1		0.86		0.67		1.3		1.6
TDS		490		330		450		445		390		345		825		335
TSS		5		6		5		960		36		5		14		14
Aluminum (dissolved)																
Aluminum (total)												7.6		0.58		1.8
Antimony (dissolved)																
Antimony (total)																
Arsenic (dissolved)																
Arsenic (total)			<	0.001					<	0.001		0.0014		0.0012	<	0.001
Barium (dissolved)																
Barium (total)				0.026						0.037		0.15		0.087		0.047
Beryllium (dissolved)																
Beryllium (total)																
Boron (dissolved)																
Boron (total)				0.24						0.36		0.017		1.3		0.42
Cadmium (dissolved)																
Cadmium (total)			<	0.0009					<	0.0009		0.00012	<	0.00009	<	0.00009
Calcium (dissolved)																
Calcium (total)																
Chromium (dissolved)																
Chromium (total)			<	0.005					<	0.005		0.015	<	0.005	<	0.005
Cobalt (dissolved)																
Cobalt (total)																

**Macdonald, Meredith and Aberdeen Additional Township
2022 Annual Monitoring Report**

SW-4B

Project No. 230202

Parameters	Date Sampled													
	25/05/2020	26/10/2020	30/05/2021	29/08/2021	30/10/2021	1/6/2022	30/08/2022	7/11/2022						
Copper (dissolved)														
Copper (total)			0.0027			0.0036	0.009	0.004	0.0058					
Iron (dissolved)														
Iron (total)		0.24	0.68	0.29	32	1.3								
Lead (dissolved)														
Lead (total)		<	0.0005			0.0009	0.0043	<	0.0005	0.0016				
Magnesium (dissolved)														
Magnesium (total)														
Manganese (dissolved)														
Manganese (total)														
Molybdenum (dissolved)														
Molybdenum (total)														
Nickel (dissolved)														
Nickel (total)														
Potassium (dissolved)														
Potassium (total)														
Selenium (dissolved)														
Selenium (total)														
Silicon (dissolved)														
Silicon (total)														
Silver (dissolved)														
Silver (total)														
Sodium (dissolved)														
Sodium (total)														
Strontium (dissolved)														
Strontium (total)														
Thallium (dissolved)														
Thallium (total)														
Titanium (dissolved)														
Titanium (total)														
Vanadium (dissolved)														
Vanadium (total)														
Zinc (dissolved)														
Zinc (total)			0.0062			0.0097	0.029	0.0053	0.011					
Phenols	<	0.001	<	0.001	<	0.001	0.0032	<	0.001	0.0022	<	0.001		

APPENDIX K
Field Monitoring Data Summary

Appendix K FIELD MONITORING SUMMARY**Project 230202**

During the sampling activities, surface water field chemistry data were collected by Tulloch Engineering Inc. staff, as well as general observations of the flow conditions at the surface water stations.

The data are summarized in as follows:

May 2022	SW-1	SW-2	SW-3B	SW-4	SW-5
Water Temp (°C)	15.8	16.6	16.6	16.1	15.8
pH	7.8	7.5	7.4	7.8	7.8
Conductivity (µS/cm)	984	1072	540	470	984
Flow	Not measured	Not measured	Not measured	Not measured	Not measured

August 2022	SW-1	SW-2	SW-3B	SW-4	SW-5
Water Temp (°C)	17.4	17.6	15.9	17.7	15.9
pH	8.0	7.6	7.4	8.0	7.4
Conductivity (µS/cm)	261	1400	297	254	297
Flow	Not measured	Not measured	Not measured	Not measured	Not measured

November 2022	SW-1	SW-2	SW-3B	SW-4	SW-5
Water Temp (°C)	17.4	17.6	15.9	17.7	15.9
pH	8.0	7.6	7.4	8.0	7.4
Conductivity (µS/cm)	1140	1150	1122	1142	1142
Dissolved O ₂ (mg/l)	13.8	13.5	13.5	6.2	6.2
Flow (m ³ /sec)	0.021	0.060	.040	0.003	0.003

NOTES:

1. Duplicate readings taken and labelled as SW5
2. These tables are to be read with the accompanying report, and require interpretation assistance from Tulloch Engineering Inc. before use by others.

APPENDIX K
Field Monitoring Data Summary

Appendix K FIELD MONITORING SUMMARY**Project 230202**

During the sampling activities, surface water field chemistry data were collected by Tulloch Engineering Inc. staff, as well as general observations of the flow conditions at the surface water stations.

The data are summarized in as follows:

May 2022	SW-1	SW-2	SW-3B	SW-4	SW-5
Water Temp (°C)	15.8	16.6	16.6	16.1	15.8
pH	7.8	7.5	7.4	7.8	7.8
Conductivity (µS/cm)	984	1072	540	470	984
Flow	Not measured	Not measured	Not measured	Not measured	Not measured

August 2022	SW-1	SW-2	SW-3B	SW-4	SW-5
Water Temp (°C)	17.4	17.6	15.9	17.7	15.9
pH	8.0	7.6	7.4	8.0	7.4
Conductivity (µS/cm)	261	1400	297	254	297
Flow	Not measured	Not measured	Not measured	Not measured	Not measured

November 2022	SW-1	SW-2	SW-3B	SW-4	SW-5
Water Temp (°C)	17.4	17.6	15.9	17.7	15.9
pH	8.0	7.6	7.4	8.0	7.4
Conductivity (µS/cm)	1140	1150	1122	1142	1142
Dissolved O ₂ (mg/l)	13.8	13.5	13.5	6.2	6.2
Flow (m ³ /sec)	0.021	0.060	.040	0.003	0.003

NOTES:

1. Duplicate readings taken and labelled as SW5
2. These tables are to be read with the accompanying report, and require interpretation assistance from Tulloch Engineering Inc. before use by others.

LANDFILL MONITORING SAMPLING FORM - May 2022
TOWNSHIPS OF MACDONALD MEREDITH AND ABERDEEN ADDITIONAL

Well Development

Date: May 31 /2022

Temp.: 27°C

Weather: Partly Cloudy

M.W. #	Well Depth (m)	Well Ø (m)	Static Depth (m)	Water Depth (m)	Water Volume (L)
1	6.91	0.052	0.810	6.10	13.0
2	6.90	0.052	0.804	6.09	12.9
3	6.85	0.052	0.954	5.90	12.5
4	6.66	0.052	0.478	6.18	13.1
5	6.95	0.052	0.204	6.75	14.3
6	6.78	0.052	1.037	5.74	12.2

M.W. #	Static		Completion of Initial Purge		
	Time	Depth (m)	Volume (L)	Time	Depth (m)
1	10:12 AM	0.810	13.0	10:16 AM	4.379
2	10:36 AM	0.804	12.9	10:42 AM	4.321
3	11:06 AM	0.954	12.5	11:11 AM	4.320
4	12:05 PM	0.478	13.1	12:10 PM	4.515
5	11:40 AM	0.204	14.3	11:45 AM	4.501
6	9:35 AM	1.037	12.2	9:41 AM	4.595

M.W. #	Well Recovery					
	Time	Depth (m)	Time	Depth (m)	Time	Depth (m)
1	10:18 AM	4.356	10:20 AM	4.345	10:22 AM	4.342
	10:24 AM	4.340	10:26 AM	4.337		
2	10:44 AM	4.311	10:46 AM	4.301	10:48 AM	4.292
	10:50 AM	4.284	10:52 AM	4.276		
3	11:13 AM	4.320	11:15 AM	4.314	11:17 AM	4.307
	11:19 AM	4.301	11:21 AM	4.295		
4	12:12 PM	4.501	12:14 PM	4.491	12:16 PM	4.489
	12:18 PM	4.479	12:20 PM	4.475		
5	11:47 AM	3.920	11:49 AM	3.670	11:51 AM	3.371
	11:53 AM	3.125	11:55 AM	2.876		
6	9:43 AM	4.430	9:45 AM	4.316	9:47 AM	4.220
	9:49 AM	4.128	9:51 AM	4.019		

* MW 1, 2, 3, 4, 5 & 6 Purged a Total of 1x's their Volume on Day 1 (May 31, 2022)

Notes:

- MW1 - Good Condition
- MW2 - Fair Condition
- MW3 - Good Condition
- MW4 - Good Condition
- MW5 - Fair Condition - Well can be rocked back and forth due to heaved concrete base
- MW6 - Fair Condition - Well can be rocked back and forth due to heaved concrete base

LANDFILL MONITORING SAMPLING FORM - May 2022
TOWNSHIPS OF MACDONALD MEREDITH AND ABERDEEN ADDITIONAL

Sampling

Date: May 31 /2022 **Temp.:** 27°C **Weather:** Partly Cloudy

S.W. #	Sample Date	Sample Time	# of Bottles	Water Depth (m)	Water Temperature	pH	Conductivity $\mu\text{S/cm}$	UTM Coordinates
1	May 31 /2022	11:45 AM	9	0.15	15.8	7.8	984	0728048; 5149514
2	May 31 /2022	11:00 AM	9	0.10	16.6	7.5	1072	0728014; 5149392
3B	May 31 /2022	12:40 PM	9	0.10	16.6	7.4	540	0728392; 5149040
4	May 31 /2022	12:15 PM	9	0.30	16.1	7.8	470	0728034; 5149805
5	May 31 /2022	11:55 AM	9	0.15	15.8	7.8	984	0728048; 5149514

- Notes:**
1. Surface water samples were not field filtered
 2. Duplicate sample taken at SW1, Labelled as SW5

Date & Time Sent: June 2, 2022, 1 pm, on Purolator from Thessalon

Samples Taken By: Josh Smith

Sampling

Date: June 1/2022 **Temp.:** 17°C **Weather:** Cloudy

M.W. #	Sample Date	Sample Time	# of Bottles
1	June 1/2022	10:20 AM	6
2	June 1/2022	10:35 AM	6
3	June 1/2022	11:00 AM	6
4	June 1/2022	11:30 AM	6
5	June 1/2022	11:20 AM	6
6	June 1/2022	10:00 AM	6
7	June 1/2022	10:45 AM	6

- Filtration**
- MW 1 - No discolouration with no particulates, required 1 filter
 - MW 2 - Light brown precipitate with no particulates, required 1 filter
 - MW 3 - No discolouration with no particulates, required 1 filter
 - MW 4 - No discolouration with some particulates, required 1 filter
 - MW 2 - No discolouration with no particulates, required 1 filter
 - MW 6 - No discolouration with no particulates, required 1 filter
 - MW 7 - Light brown precipitate with no particulates, required 1 filter

- Notes:**
1. Dissolved Metals samples were field filtered.
 2. Duplicate sample taken at MW2, Labelled as MW7

Date & Time Sent: June 2, 2022, 1 pm, on Purolator from Thessalon

Samples Taken By: Josh Smith

LANDFILL MONITORING SAMPLING FORM - AUGUST 2022
TOWNSHIPS OF MACDONALD MEREDITH AND ABERDEEN ADDITIONAL

Well Development

Date: August 30 /2022

Temp.: 20°C

Weather: Cloudy/Rain

M.W. #	Well Depth (m)	Well Ø (m)	Static Depth (m)	Water Depth (m)	Water Volume (L)
1	6.91	0.052	1.082	5.83	12.4
2	6.91	0.052	0.920	5.99	12.7
3	6.81	0.052	1.430	5.38	11.4
4	6.66	0.052	3.156	3.50	7.4
5	6.95	0.052	1.356	5.60	11.9
6	6.81	0.052	1.761	5.05	10.7

M.W. #	Static		Completion of Initial Purge		
	Time	Depth (m)	Volume (L)	Time	Depth (m)
1	11:17 AM	1.082	12.4	11:24 AM	4.736
2	11:39 AM	0.920	12.7	11:43 AM	4.372
3	12:01 PM	1.430	11.4	12:06 PM	4.660
4	1:25 PM	3.156	7.4	1:28 PM	4.569
5	1:02 PM	1.356	11.9	1:06 PM	4.678
6	10:28 AM	1.761	10.7	10:33 AM	4.585

M.W. #	Well Recovery					
	Time	Depth (m)	Time	Depth (m)	Time	Depth (m)
1	11:26 AM	4.704	11:28 AM	4.693	11:30 AM	4.687
	11:32 AM	4.681	11:34 AM	4.676		
2	11:45 AM	4.341	11:47 AM	4.320	11:49 AM	4.313
	11:51 AM	4.308	11:53 AM	4.302		
3	12:08 PM	4.630	12:10 PM	4.621	12:12 PM	4.610
	12:14 PM	4.610	12:16 PM	4.606		
4	1:30 PM	4.543	1:32 PM	4.538	1:34 PM	4.533
	1:36 PM	4.529	1:38 PM	4.525		
5	1:08 PM	4.565	1:10 PM	4.443	1:12 PM	4.330
	1:14 PM	4.211	1:16 PM	4.132		
6	10:35 AM	4.452	10:37 AM	4.361	10:39 AM	4.275
	10:41 AM	4.193	10:43 AM	4.112		

* MW 1, 2, 3, 4, 5 & 6 Purged a Total of 1x's their Volume on Day 1 (August 30, 2022)

Notes: MW1 - Fair Condition - Lock was difficult to open.
MW2 - Good Condition
MW3 - Fair Condition - Lock was difficult to open.
MW4 - Good Condition
MW5 - Fair Condition - Well can be rocked back and forth due to heaved concrete base
MW6 - Fair Condition - Well can be rocked back and forth due to heaved concrete base

LANDFILL MONITORING SAMPLING FORM - AUGUST 2022
TOWNSHIPS OF MACDONALD MEREDITH AND ABERDEEN ADDITIONAL

Sampling

Date: August 30 /2022 **Temp.:** 20°C **Weather:** Cloudy/Rain

S.W. #	Sample Date	Sample Time	# of Bottles	Water Depth (m)	Water Temperature	pH	Conductivity $\mu\text{S/cm}$	UTM Coordinates
1	August 30 /2022	1:45 PM	9	0.10	17.4	8.0	261	0728048; 5149514
2	August 30 /2022	12:20 PM	9	0.03	17.6	7.6	1400	0728014; 5149392
3B	August 30 /2022	2:30 PM	9	0.10	15.9	7.4	297	0728392; 5149040
4	August 30 /2022	2:10 PM	9	0.18	17.7	8.0	254	0728034; 5149805
5	August 30 /2022	2:40 PM	9	0.10	15.9	7.4	297	0728392; 5149040

- Notes:**
1. Surface water samples were not field filtered
 2. Duplicate sample taken at SW3, Labelled as SW5

Date & Time Sent: September 1, 2022, 1 pm, on Purolator from Thessalon

Samples Taken By: Josh Smith

Sampling

Date: August 31 /2022 **Temp.:** 19°C **Weather:** Clear

M.W. #	Sample Date	Sample Time	# of Bottles
1	August 31/2022	10:50 AM	6
2	August 31/2022	11:05 AM	6
3	August 31/2022	11:20 AM	6
4	August 31/2022	12:00 PM	6
5	August 31/2022	12:15 PM	6
6	August 31/2022	10:15 AM	6
7	August 31/2022	10:25 AM	6

- Filtration**
- MW 1 - No discolouration with no particulates, required 1 filter
 - MW 2 - Light brown precipitate with no particulates, required 1 filter
 - MW 3 - No discolouration with no particulates, required 1 filter
 - MW 4 - No discolouration with some particulates, required 1 filter
 - MW 2 - No discolouration with no particulates, required 1 filter
 - MW 6 - No discolouration with no particulates, required 1 filter
 - MW 7 - No discolouration with no particulates, required 1 filter

- Notes:**
1. Dissolved Metals samples were field filtered.
 2. Duplicate sample taken at MW6, Labelled as MW7

Date & Time Sent: September 1, 2022, 1 pm, on Purolator from Thessalon

Samples Taken By: Josh Smith

LANDFILL MONITORING SAMPLING FORM - November 2022
TOWNSHIPS OF MACDONALD MEREDITH AND ABERDEEN ADDITIONAL

Well Development

Date: November 7 /2022 Temp.: 9°C Weather: Partly Cloudy

M.W. #	Well Depth (m)	Well Ø (m)	Static Depth (m)	Water Depth (m)	Water Volume (L)
1	6.99	0.052	0.980	6.01	12.8
2	6.92	0.052	0.998	5.92	12.6
3	6.81	0.052	1.481	5.33	11.3
4	6.66	0.052	3.002	3.66	7.8
5	6.92	0.052	2.305	4.62	9.8
6	6.78	0.052	1.171	5.61	11.9

M.W. #	Static		Completion of Initial Purge		
	Time	Depth (m)	Volume (L)	Time	Depth (m)
1	11:12 AM	0.980	12.8	11:18 AM	4.409
2	11:42 AM	0.998	12.6	11:47 AM	4.522
3	12:07 PM	1.481	11.3	12:11 PM	4.768
4	1:50 PM	3.002	7.8	1:55 PM	4.862
5	1:15 PM	2.305	9.8	1:22 PM	4.751
6	10:15 AM	1.171	11.9	10:20 AM	4.735

M.W. #	Well Recovery					
	Time	Depth (m)	Time	Depth (m)	Time	Depth (m)
1	11:20 AM	4.385	11:22 AM	4.377	11:24 AM	4.372
	11:26 AM	4.368	11:28 AM	4.364		
2	11:49 AM	4.498	11:51 AM	4.485	11:53 AM	4.478
	11:55 AM	4.473	11:57 AM	4.468		
3	12:13 PM	4.752	12:15 PM	4.742	12:17 PM	4.736
	12:19 PM	4.731	12:21 PM	4.728		
4	1:57 PM	4.843	1:59 PM	4.830	2:01 PM	4.821
	2:03 PM	4.813	2:05 PM	4.804		
5	1:24 PM	4.660	1:26 PM	4.587	1:28 PM	4.503
	1:30 PM	4.437	1:32 PM	4.392		
6	10:22 AM	4.543	10:24 AM	4.421	10:26 AM	4.318
	10:28 AM	4.225	10:30 AM	4.126		

* MW 1, 2, 3, 4, 5 & 6 Purged a Total of 1x's their Volume on Day 1 (November 7, 2022)

Notes: MW1 - Good Condition
MW2 - Fair Condition
MW3 - Good Condition
MW4 - Good Condition
MW5 - Fair Condition - Well can be rocked back and forth due to heaved concrete base
MW6 - Fair Condition - Well can be rocked back and forth due to heaved concrete base



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LANDFILL MONITORING SAMPLING FORM - November 2022
TOWNSHIPS OF MACDONALD MEREDITH AND ABERDEEN ADDITIONAL

Sampling

Date: November 7 /2022 Temp.: 9°C Weather: Partly Cloudy

S.W. #	Sample Date	Sample Time	# of Bottles	Water Depth (m)	Water Temperature	pH	Conductivity (µS/cm)	Dissolved Oxygen (mg/L)	Flow (m ³ /s)	UTM Coordinates
1	November 7 /2022	1:45 PM	6	0.10	17.4	8.0	1140	13.8	0.021	0728048; 5149514
2	November 7 /2022	12:20 PM	6	0.03	17.6	7.6	1150	13.5	0.060	0728014; 5149392
3	November 7 /2022	2:30 PM	6	0.10	15.9	7.4	1122	13.5	0.040	0728392; 5149040
4	November 7 /2022	2:10 PM	6	0.18	17.7	8.0	1142	6.2	0.003	0728034; 5149805
5	November 7 /2022	2:40 PM	6	0.10	15.9	7.4	1142	6.2	0.003	0728401; 5149029

- Notes:
1. Surface water samples were not field filtered
 2. Duplicate sample taken at SW4, Labelled as SW5

Date & Time Sent: November 9, 2022, 1 pm, on Purolator from Thessalon

Samples Taken By: Josh Smith

Sampling

Date: November 8 /2022 Temp.: 5°C Weather: Partly Cloudy

M.W. #	Sample Date	Sample Time	# of Bottles	Conductivity (µS/cm)
1	November 8 /2022	10:50 AM	6	1086
2	November 8 /2022	11:10 AM	6	1054
3	November 8 /2022	11:30 AM	6	1038
4	November 8 /2022	12:40 PM	6	1102
5	November 8 /2022	12:10 PM	6	1103
6	November 8 /2022	10:10 AM	6	1193
7	November 8 /2022	12:40 PM	6	1103

- Filtration
- MW 1 - No discolouration with no particulates, required 1 filter
MW 2 - Light brown precipitate with no particulates, required 1 filter
MW 3 - No discolouration with no particulates, required 1 filter
MW 4 - No discolouration with some particulates, required 1 filter
MW 5 - No discolouration with no particulates, required 1 filter
MW 6 - No discolouration with no particulates, required 1 filter
MW 7 - No discolouration with no particulates, required 1 filter

- Notes:
1. Dissolved Metals samples were field filtered.
 2. Duplicate sample taken at MW5, Labelled as MW7

Date & Time Sent: November 9, 2022, 1 pm, on Purolator from Thessalon

Samples Taken By: Josh Smith