

**2020 ANNUAL GROUNDWATER MONITORING REPORT
MINDEMOYA WASTE DISPOSAL SITE
MINDEMOYA, ONTARIO**

Submitted to:

The Municipality of Central Manitoulin

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1.0 INTRODUCTION

Wood Environment & Infrastructure (Wood) was retained by The Municipality of Central Manitoulin (the Municipality) to prepare the 2020 annual groundwater monitoring report for the Mindemoya Waste Disposal Site (the Site). The following report provides a detailed evaluation and summary of the 2020 monitoring data and was completed to constitute the 2020 Annual Monitoring Report. This document also includes a review of the available groundwater flow and geochemical data, as well as an evaluation of the groundwater quality with respect to Ministry of the Environment, Conservation and Parks (MECP) Guideline B-7 (Guideline).

1.1 Site Location

The Site is located at 408 Elliot Road, northeast of Mindemoya, Ontario, east of the intersection of Hill Road and Elliot Road, as presented on Figure 1. The legal description of the Site is part Lot 27, Concession 2, Township of Carnarvon, Registered Plan No. 22, District of Manitoulin. The Universal Transverse Mercator (UTM) coordinates of the Site are 411220 Easting and 5067030 Northing, Zone 17, relative to the North American Datum (NAD) 83 (collected via handheld Global Positioning System (GPS), accuracy +/- 5 metres (m)). A Site plan including all monitoring locations, is presented on Figure 2.

1.2 Ownership and Key Personnel

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

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1.3 Description and Development of the Site

The Site was formerly operated under Provisional Certificate of Approval (C of A) No. A550701, issued 18 March 1980, recently replaced on 10 January 2019 with an amended Environmental Compliance Approval (ECA), provided in Appendix A. The Site is reported to have been in use prior to 1980 (Cambium Inc. (Cambium), 2013). Historically, the Site accepted domestic and commercial wastes, however during recent years waste consisted of only domestic waste originating from curbside pickup operations within the Municipality and was not open to the public (Cambium, 2013). The ECA indicates an approved waste disposal area of 0.81 hectares (ha), but it does not specify a total Site area or a maximum approved capacity. The Site stopped accepting waste in June 2016 and has been graded to the final waste contours, although no final cover has been applied.

1.3.1 Site Capacity

No topographical survey was undertaken in 2020, as no waste was deposited at the Site since the previous survey, completed 13 October 2017, and there was therefore no change to the volume of existing waste during the current monitoring year. A total volume of existing waste of approximately 37,720 cubic metres (m³) was measured during completion of 2017 survey, including both waste and interim cover material.

Although no maximum allowable capacity is stated in the Site's ECA, a theoretical maximum capacity of 36,050 m³ was previously calculated by Cambium, based on MECP approved design requirements. Based on this theoretical capacity, the Site is marginally over capacity, however if the slopes of the fill area can be graded appropriately (i.e., per MECP landfill standards) during capping, no removal of material is necessary. It is anticipated that the Site will be capped in 2021.

1.4 Monitoring and Reporting Program Objectives and Requirements

Historical Site investigations completed by others resulted in the instrumentation of the Site with four multi-level well nests, each comprised of a deep and shallow installation. Monitoring of these eight historical wells was initiated in 2014. Despite the previous installation of the monitoring well network, an annual sampling program was not historically undertaken at the Site.

Four additional well nests (nine wells in total) were installed at the Site during 2019 as part of separate study undertaken by Wood on behalf of the Municipality. The program for which the new wells were installed was intended to determine an appropriate contaminant attenuation zone (CAZ) for the Site and was submitted to the MECP by 31 March 2020, per a condition of the amended ECA. The new wells were incorporated into the annual monitoring program beginning in 2020 and will be sampled annually going forward. The locations of all groundwater monitoring wells are presented on Figure 2.

1.5 Assumptions and Limitations

Wood's limitation of liability and scope of work is as follows:

1. The work performed in this report was carried out in accordance with the Terms and Conditions made part of our contract. The conclusions presented herein are based solely upon the scope of services and time and budgetary limitations described in our contract.
2. The report has been prepared in accordance with generally accepted environmental study and/or engineering practices. No other warranties, either expressed or implied, are made as to the professional services provided under the terms of our contract and included in this report.
3. The services performed and outlined in this report were based, in part, upon a previously installed monitoring network, established by others and approved by the applicable regulatory agencies. Our opinion cannot be extended to portions of the Site which were unavailable for direct observations, reasonably beyond the control of Wood.
4. The objective of this report was to assess the water quality conditions at the Site, given the context of our contract, with respect to existing environmental regulations within the applicable jurisdiction.
5. The Site history interpreted herein relies on information supplied by others, such as local, provincial and federal agencies, as well as Site personnel. No attempt has been made to independently verify the accuracy of such information, unless specifically noted in our report.
6. Our interpretations relating to the landfill-derived leachate plume at the Site are described in this report. Where testing was performed, it was executed in accordance with our contract for these services. It should be noted that other compounds or materials not tested for may be present in the Site environment.
7. The conclusions of this report are based, in part, on the information provided by others. The possibility remains that unexpected environmental conditions may be encountered at the Site in locations not specifically investigated. Should such an event occur, Wood must be notified in order that we may determine if modifications to our conclusions are necessary.
8. The utilization of Wood's services during future monitoring at the Site will allow Wood to observe compliance with the conclusions and recommendations contained herein. It will also provide for changes as necessary to suit field conditions as they are encountered.
9. Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. Wood accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

2.0 PHYSICAL SETTING

2.1 Geology and Hydrogeology

The bedrock underlying the Site area is described as dolostone of the paleozoic age of the Lockport Formation (lateral equivalent to the top of the Amabel Formation); as illustrated on Manitoulin Island Geological Compilation Map 351A from the Ontario Geological Survey (OGS, 1937). Manitoulin Island is formed of glacially-abraded dolomite and limestone bedrock pavement, widely exposed across a significant portion of the island. Pavement is defined as “a roughly horizontal exposure of limestone (or dolostone) bedrock the surface of which is approximately parallel to its bedding and is divided into a geometrical pattern of blocks by the intersections of widened fissures” (Paterson and Chambers, 1982). Most soil deposits were stripped away during the Wisconsin period glaciation, resulting in minimal surficial deposits. Soils on the island are mainly of glacial origin and include lacustrine and outwash clays, silts, as well as sands, and occasionally underlain by glacial till (Hoffman, Wicklund, & Richards, December 1959).

Borehole logs detailing soil and groundwater conditions for the 2019 monitoring well installations are provided in Appendix B. It should be noted, however, that the percussion drilling did not allow for core samples to be recovered during the course of drilling, although surface deposits from coring did appear fairly uniform. Soils at the Site are thin, with exposed bedrock in some areas. No borehole logs for the historical monitoring well network are available. Water well records for locations within one kilometre (km) of the Site indicate that most wells are installed at depths of between 35 m and 45 m below ground surface and are installed in limestone bedrock. These well records also indicate that overburden consists of generally between one and six m of clay, loam, fine sand or stoney overburden (Cambium, 2013).

Static water levels were recorded by Wood in each of the wells during the November 2020 groundwater monitoring event. Appendix C presents the groundwater elevations measured during the 2020 groundwater monitoring event. Figures 3A and 3B present the inferred groundwater elevation contours and groundwater flow directions for the shallow and deep aquifers, respectively, for the 2020 monitoring event. Groundwater flow is inferred to be radial in the immediate vicinity of the landfill, with the overall primary groundwater flow path to the northwest, comprised of components of flow towards the north and west. Both the shallow and deep aquifers appear to be topographically controlled and follow a similar flow path. The radial flow is interpreted to be due to topographic influence of the landfill mound, which is above the surrounding grade, whereas the overall groundwater flow path is interpreted to be towards Mindemoya Lake, situated approximately 2.1 km downgradient of the Site.

3.0 DESCRIPTION OF MONITORING PROGRAM

3.1 Monitoring Locations

All groundwater monitoring locations are illustrated on Figure 2. Detailed locations are provided in Table 1. Monitoring well elevations for top of casing are provided in Appendix C.

Table 1: Monitoring Locations On-Site

Monitoring Location	Easting Zone 17 NAD 83	Northing Zone 17 NAD 83	Collection Method	Accuracy	Collection Personnel	Date Collected
Well Nest MW-E	412004	5067059	Handheld GPS	+/- 5 m	Trained Wood field crew	14 October 2014
Well Nest MW-N	411925	5067103				
Well Nest MW-S	411927	5067013				
Well Nest MW-W	411828	5067057				
Well Nest MW19-01	412038	5067008				13 August 2019
Well Nest MW19-02	411815	5067085				
Well Nest MW19-03	411814	5067111				
Well Nest MW19-04	411887	5067116				

Table 2 presents a summary of the installation depths and respective on-Site positions of the groundwater monitoring wells. Background groundwater quality at the Site was previously assessed by well nest MW-S, which was considered to be situated hydraulically upgradient (i.e., south) of the landfill; however, progressive filling at the Site resulted in leachate mounding over time and localized radial groundwater flow from the waste deposits. Increasing concentrations of landfill indicator parameters were subsequently observed in the MW-S well nest during recent years and it was determined that the MW-S well nest was no longer hydraulically upgradient of the fill area and not representative of background groundwater conditions. Well nest MW19-01 was installed as a replacement background well nest, at a proximity further from the fill area and upgradient (i.e., southeast) of any potential Site-derived impacts to groundwater quality, allowing a detailed evaluation of the Site to be undertaken with respect to MECP Guideline B-7.

Well nest MW-E is situated immediately east of the fill area and is considered a downgradient monitor, given its proximity to the waste deposits and the localized radial groundwater flow from the fill pile. All remaining monitoring well nests are situated at varying distances downgradient of the fill area to the north, west and northwest and are used to assess the performance of the natural attenuation process at the Site. Recently installed well nests MW19-02, MW19-03 and MW19-04 are located the furthest downgradient, at the proposed CAZ boundary limits, and have been considered compliance wells for the purpose of this report, pending approval of the proposed CAZ by the MECP.

Table 2: Groundwater Monitoring Well Construction Details

Well ID	Condition	Total Depth (mbtop) ¹	On-Site Position
MW-NS	Repairs required to risers and protective casing at ground surface	8.11	Downgradient shallow
MW-ND		11.75	Downgradient deep
MW-ES	Good	6.45	Downgradient shallow
MW-ED	Good	10.05	Downgradient deep
MW-SS	Good	7.42	Downgradient shallow
MW-SD	Good	11.75	Downgradient deep
MW-WS	Good	7.54	Downgradient shallow
MW-WD	Good	11.94	Downgradient deep
MW19-01S	Good	7.91	Upgradient shallow
MW19-01D	Good	13.17	Upgradient deep
MW19-02S	Good	7.91	Downgradient shallow
MW19-02D	Good	13.26	Downgradient deep
MW19-03A	Good	6.44	Downgradient shallow
MW19-03B	Good	7.43	Downgradient moderate
MW19-03D	Good	13.18	Downgradient deep
MW19-04S	Good	7.80	Downgradient deep
MW19-04D	Good	13.07	Downgradient shallow

Notes:

1) mbtop indicates m below top of pipe.

3.2 Monitoring Frequency

Groundwater was sampled by Wood once annually, during the fall. The annual monitoring event occurred on 2-3 November 2020.

3.3 Field and Laboratory Parameters and Analysis

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

3.4 Monitoring Procedures and Methods

Monitoring and sample collection followed typical industry standard practices. Each groundwater monitoring well was purged prior to sampling to ensure the sample was representative of the formation water. Dedicated well instrumentation (Waterra Tube and foot valve system) was used to obtain water samples from the groundwater monitoring wells, and samples were immediately transferred to laboratory-prepared sample vials and bottles. Samples identified for heavy metals analysis were field-filtered using a single use 0.45 µm filter unit, and the remaining samples were preserved following standard laboratory protocols as established in the MECP “*Guidance on Sampling for Use at Contaminated Sites in Ontario*” (revised December 1996).

Samples were submitted under chain of custody, in a temperature-controlled setting (i.e., in a cooler, on ice) to a Canadian Association for Laboratory Accreditation (CALA) accredited laboratory sub-contractor, AGAT Laboratories (AGAT), in Mississauga for analysis. The analytical results were subsequently forwarded to Wood. Laboratory analytical reports for 2020 are provided in Appendix D. The 2020 groundwater monitoring data were reviewed by comparison to the current MECP Ontario Drinking Water Standards (ODWS).

3.5 Quality Assurance for Sampling and Analysis

Wood uses recognized industry standards, including the Canadian Council of Ministers of the Environment (CCME) *Subsurface Assessment Handbook for Contaminated Sites* and MECP’s manual *Guidance on Sampling and Analytical Methods for Use at Contaminated Sites in Ontario* for conducting environmental assessments. For quality assurance, all work is supervised and internally reviewed by senior staff members.

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

As a minimum, for every ten groundwater samples collected, one field duplicate sample was collected and included in the laboratory submission for analysis. Two field duplicate samples were collected during the annual monitoring event. Samples were submitted to a CALA accredited laboratory that is MECP certified for the analysis of drinking water samples. Laboratory blanks and duplicates were used to ensure sample integrity. Relative Percent Differences (RPDs) were calculated and discussed where applicable. Samples were placed in

appropriate sample containers provided by the laboratory and preserved (as required based on type of analysis) until delivered (shipped by courier or hand delivered) to the laboratory for analysis. A chain of custody form accompanied samples at all points of handling.

4.0 MONITORING RESULTS

4.1 Historical Data

Historical (i.e., 2014 through 2019) data for groundwater are provided in Appendix E, along with the current data, presented on a well by well basis.

4.2 Data Quality Evaluation

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

Sample analysis dates provided on the laboratory analytical reports issued by AGAT indicate that all sample analyses were performed within the required sample/extract hold times, as indicated by the dates presented in columns for each sample parameter on the analytical report. The laboratory minimum detection limits were reported to be at or lower than the required MECP reporting detection limits for the parameters analyzed. A comparison of the internal laboratory duplicate samples indicates that all samples and their respective duplicates are within acceptable limits.

As a quality control measure, groundwater duplicate samples were collected during the annual sampling event. All duplicate data are provided in Appendix D and summarized in Appendix E. The groundwater duplicate samples were collected from MW19-04D and MW-ED and identified as MIND-DUP1 and MIND-DUP2, respectively. When compared to concentrations reported in the original samples, duplicate water quality data reported that all parameters were within an acceptable range with respect to relative percent difference (i.e., the industry standard of less than 50%), with the exceptions of barium, dissolved organic carbon (DOC), iron and manganese. Given that all but one of the exceeding relative percent difference values were quantified in the MW-ED duplicate sample, at which location concentrations are expected to be elevated and experience a greater range of fluctuation, there are not interpreted to be sampling or laboratory biases during 2020.

4.3 Groundwater Flow Monitoring

As discussed in Section 2.1, the recorded static groundwater levels indicate groundwater flow across the Site towards the northwest, with components of flow towards the north and west. Static groundwater levels are presented in Appendix C; inferred groundwater flow directions for the 2020 groundwater monitoring event are illustrated on Figures 3A and 3B.

In addition to the current groundwater elevation data, previous groundwater elevations were reviewed in order to identify trends or inconsistencies in the data. Overall, the approximate groundwater elevations reported during 2020 are consistent with those recorded during previous monitoring programs (Appendix C).

4.4 Groundwater Quality Monitoring

Samples were collected from all 17 groundwater monitoring wells during the fall 2020 monitoring event. Data summary tables are provided in Appendix E. A photographic inventory of the monitoring wells is provided in Appendix F. The condition of each monitoring well was assessed during the 2020 monitoring event, at which time it was noted that well nest MW-N requires repairs to the risers and the protective casing, which have been damaged at ground surface. Samples were obtained from both wells at the MW-N location during the 2020 sampling event and the risers were capped at ground surface as an interim measure. It is recommended that repairs be completed to this well nest during the spring of 2021 and that the remaining three historical well nests be assessed for stability at that time and repaired as necessary to prevent similar damage from occurring.

4.4.1 Background Water Quality

Background water quality in upgradient monitoring well nest MW19-01 is characterized by moderate concentrations of alkalinity and total dissolved solids (TDS), and low concentrations of chloride and metals parameters, when compared to the ODWS. While water quality is generally similar in the shallow and deep installations, concentrations of DOC and manganese are elevated in MW19-01S, in comparison to MW19-01D. One ODWS exceedance was quantified at the well nest during the 2020 monitoring event, a marginal exceedance of DOC in MW19-01S, as indicated by a bold entry in the associated data summary table provided in Appendix E. In accordance with Guideline B-7, these results are considered to be representative of Site-specific background water quality in the aquifers intersected by the well screens.

4.4.2 Nearfield Downgradient Water Quality

Nearfield groundwater quality is characterized by the historical monitoring well network and includes monitoring well nests MW-S, MW-E, MW-N and MW-W. Groundwater quality in MW-S is characterized by similar water quality in the shallow and deep installations and elevated concentrations of most parameters in comparison to background wells MW19-01S and MW19-01D. Groundwater quality in well nest MW-E is characterized by slightly higher concentrations of landfill indicator parameters in MW-ED than in MW-ES, with MW-ES exhibiting water quality very similar to background and MW-ED reporting slightly elevated concentrations of landfill indicator parameters as compared to background. A detectable concentration of toluene was quantified in MW-ED, at a level below the ODWS.

Well nests MW-N and MW-W are considered nearfield monitors but are situated further downgradient from the fill area than MW-S and MW-E and in the direction of overall groundwater flow. Groundwater quality in well nest MW-N is characterized by slightly elevated concentrations of landfill indicator parameters, as compared to background, with similar water

quality quantified in the shallow and deep installations. At well nest MW-W, an impact to water quality is apparent in both the shallow and deep wells, with higher concentrations of indicator parameters quantified in MW-WD, as compared to MW-WS.

Given the similarity of the water quality characteristics quantified in shallow and deep installations at well nests MW-S and MW-N, and the installation of the nested wells within the same borehole at each historical well nest, it is possible that the integrity of the hydraulic seals at these nested locations may be compromised. Groundwater may be infiltrating from the shallow aquifer to the screened layer in the deep well installation due to an inadequate annual well seal.

4.4.3 Farfield Downgradient Water Quality

Farfield groundwater quality is characterized by recently installed well nests MW19-02, MW19-03 and MW19-04, which are considered representative of the downgradient property boundaries for the purpose of this report. It is noted that all three well nests are downgradient of the current property boundary and are situated at the proposed CAZ, which is pending approval by the MECP.

Groundwater quality in well nest MW19-02, situated to the northwest of the fill area and east of the proposed CAZ, is characterized by concentrations of most leachate parameters at levels generally similar to background in both the shallow and deep monitoring wells. There is a slight variation in water quality between the shallow and deep aquifers at this well nest, but despite the minor differences in water quality characteristics, neither well is interpreted to indicate a measurable impact to water quality.

Well nest MW19-03, situated in the northwest corner of the proposed CAZ, comprises three wells, MW19-03A, MW19-03B and MW19-03D, which monitor groundwater at shallow, moderate depth and deep installation depths, respectively. Groundwater quality in MW19-03A and MW19-03B is almost identical, with concentrations of landfill indicator parameters only marginally elevated above background levels. A slightly different water quality is apparent in MW19-03D, as compared to the shallower installations at this location. Select parameters, including chloride, TDS, barium, boron and manganese, were quantified at elevated concentrations in MW19-03D, in comparison to background water quality, indicating a potential slight groundwater impact at this location and installation depth.

Water quality in well nest MW19-04, situated at the north boundary of the proposed CAZ, is characterized by concentrations of indicator parameters at levels similar to background in MW19-04S and slightly elevated concentrations of parameters including chloride and TDS in MW19-04D. These elevated parameter concentrations in MW19-04D are not interpreted to indicate a significant impact to groundwater quality.

4.4.4 Groundwater Field Parameter Measurements

Field parameters were measured at all monitoring wells at the time of sampling and are presented in Table 3.

Table 3: Fall 2020 Groundwater Field Parameter Measurements

Well ID	Temperature (°C)	pH	Conductivity (mS/cm)	Dissolved Solids (mg/L)
MW-SD	7.7	7.36	2190	1095
MW-SS	8.3	7.34	1833	917
MW-ES	6.1	7.32	460	230
MW-ED	8.9	7.16	687	344
MW-NS	8.4	7.86	552	276
MW-ND	8.2	7.82	614	307
MW-WS	7.0	7.63	793	397
MW-WD	7.6	7.56	946	473
MW19-01S	7.4	8.23	576	288
MW19-01D	7.1	8.16	535	268
MW19-02S	8.8	7.55	628	314
MW19-02D	6.3	7.96	617	309
MW19-03A	8.7	7.61	613	307
MW19-03B	7.1	7.83	626	313
MW19-03D	6.5	8.22	678	339
MW19-04S	7.0	8.10	589	295
MW19-04D	7.0	6.85	682	341

5.0 ASSESSMENT, INTERPRETATION AND DISCUSSION

5.1 Groundwater Chemistry Analysis

The groundwater major ion chemistry analyses for the 2020 monitoring event are presented in a Tri-Linear Piper Plot on Figure 4. A table depicting the calculations used to quantify the geochemical data is presented in Appendix G. The Piper diagram plots the major ions as percentages of milli-equivalents (meq) in two base triangles. The total cations and the total anions are set equal to 100% and the data points in the two triangles are projected onto an adjacent grid.

The positions of the 17 monitoring wells on the Piper Plot indicate generally similar water quality across the Site, with the exception of the MW-S well nest, which indicates an impact to water quality in both the shallow and deep installations, as displayed by a shift away from the interpreted background water quality on the Piper diagram. Remaining shallow monitoring wells illustrate an almost identical water quality, given their common placement on the diagram. Deep

well installations at the historical well nests are placed on the diagram in the same grouping as the shallow installations, which indicates further evidence that the hydraulic seals in the historical monitoring well network may have become compromised. Deep background well MW19-01D is on the periphery of the grouping, indicating a very slight variation in water quality at depth upgradient of the Site. Downgradient wells MW19-02D, MW19-03D and MW19-04D are placed slightly further outside of the grouping on the Piper diagram. Although this is indicative of a water quality differing from background, the difference in chemistry is potentially attributable to differences in bedrock composition at these depths and locations, rather than groundwater impacts, as these downgradient wells are not placed between the landfill-impacted MW-S monitoring wells and the deep background monitoring well, but rather are situated separately from both water types on the piper diagram. The three deep downgradient wells indicate the same water chemistry at the west, northwest and north boundaries of the proposed CAZ.

5.2 Groundwater Trend Analysis

The current and previous groundwater elevation and water quality data were reviewed with the objective of identifying apparent trends or inconsistencies in the monitoring record. With respect to the groundwater elevations, the available data indicate relatively stable elevations at the historical monitoring wells over time (Appendix H). Groundwater elevations recorded in recently installed monitoring wells during the September 2019 monitoring event appear to be the result of drilling effects and incomplete water level recovery following drilling and are not likely representative of actual groundwater elevations. All wells reported high groundwater elevations during the November 2019 monitoring event; these elevations are interpreted to be accurate and indicative of a high seasonal water table at the time of the event.

A series of time-concentration graphs were developed for several select typical groundwater landfill indicator parameters (including arsenic, barium, boron, chloride, DOC and TDS) for historical monitoring wells from 2014 to 2020. Recently installed monitoring wells have been included on the graphs, despite having only three data points compiled to date; trends cannot be discussed for these new monitoring locations until additional data have been compiled. It is noted, however, that the results for the recent installations, with the exception of MW19-01S, for the initial monitoring event in September 2019 appear to be unrepresentative of actual groundwater conditions in these wells, as most parameters are elevated in comparison to the concentrations quantified at these locations since the initial sampling event. As indicated above, this is likely the result of drilling effects, resolved following further well development. These time-concentration graphs are presented in Appendix H.

The available data generally indicate stable concentrations of landfill indicator parameters throughout the monitoring record at most of the groundwater monitoring locations (Appendix H). All monitoring locations show stable concentrations of arsenic over time, with the exception of MW-ED, where concentrations of arsenic are elevated in comparison to the remainder of the monitoring network but indicate a decreasing trend over time. A similar trend is apparent at MW-ED for barium. Concentrations of barium, boron, chloride, DOC and TDS are elevated in MW-SS and MW-SD as compared to the remaining historical monitoring wells. Increasing

trends are also noted at these wells for barium, DOC, TDS and, most notably, boron. Concentrations of all tested parameters at the MW-N and MW-W well nests are low and stable over time, with no trends apparent at these monitoring locations. Once the landfill is capped, the rate of leachate release from the waste pile should decrease; it is therefore expected that the concentrations of indicator parameters in downgradient wells will decrease over time.

5.3 Guideline B-7

In September 1986, a guideline was introduced by the MECP to assist in the evaluation of groundwater impacts, especially for the case of landfill and/or lagoon operations. The guideline was entitled “The Incorporation of the Reasonable Use Concept into MECP Groundwater Management Activities” and is referred to now as Guideline B-7. Simply stated, Guideline B-7 sets groundwater contaminant discharge criteria for landfills and/or lagoons that may impair local water quality; the criteria are based on maintaining the protection of groundwater resources on the adjacent lands or properties.

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

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

In order to establish the background geochemical profile (from well nest MW19-01), the geometric mean of the valid concentrations of each applicable ODWS parameter is calculated, and the resultant values are applied along with the ODWS, to complete a Guideline B-7 analysis for all of the on-Site groundwater monitoring wells for various landfill indicator parameters. Appendix I presents the Guideline B-7 calculations for the fall 2020 monitoring results that have been developed using valid background analytical data observed in MW19-01S and MW19-01D. As discussed above, the results of the initial sampling event conducted in September 2019 do not appear to be representative for MW19-01D. As these results are not considered

valid, that data set has not been included in the background geometric mean calculations for the deep aquifer.

It should be noted that these Guideline B-7 values are much lower (i.e., more stringent) than the ODWS, and a well-by-well comparison of the performance of each of the parameters at all of the downgradient property boundary groundwater monitoring wells is also presented in Appendix I for the 2020 monitoring events. Comparing concentrations observed in the groundwater monitoring wells during the 2020 sampling event to the maximum allowable concentration, two exceedances of DOC are noted in the shallow aquifer, in MW19-02S and MW19-03B, and two exceedances of TDS are noted in the deep aquifer, in MW19-03D and MW19-04D, indicated by bold and shaded entries in the table provided in Appendix I. It is noted that all four exceeding values are only marginally above the applicable maximum allowable concentration. Confirmation of these results through additional, regularly scheduled sampling in 2021 is recommended.

5.4 Adequacy of the Monitoring Program

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

6.0 CONCLUSIONS

Based on the results of the current (2020) monitoring program, the following conclusions have been made:

1. The Site is no longer receiving waste and is marginally over capacity based on the theoretical capacity calculated previously by Cambium. If the side and top slopes of the fill area can be graded according to MECP landfill standards prior to site closure, removal of material can be avoided.
2. Groundwater movement at the Site was determined by static groundwater level measurements recorded at each of the monitoring wells as being radial in the immediate vicinity of the landfill, with the overall primary groundwater flow path to the northwest, comprised of components of flow towards the north and west.
3. A measurable impact to groundwater quality is noted in nearfield downgradient well nest MW-S, which quantifies elevated concentrations of landfill indicator parameters such as alkalinity, DOC and TDS, in comparison to upgradient background monitoring well nest MW19-01. No significant impact to groundwater quality is inferred in farfield downgradient monitoring wells.
4. Three distinct water types are apparent at the Site, with most monitoring wells, including background wells, sharing a similar water chemistry. Well nest MW-S indicates an impacted water type, while deep downgradient boundary wells indicate a water type different from both background and impacted locations, possibly due to differences in bedrock composition at these depths and locations.

5. Increasing trends are apparent at the MW-S well nest for barium, DOC, TDS, and particularly boron, while decreasing trends for some parameters are noted at MW-ED. Concentrations are stable over time at remaining historical monitoring wells.
6. Two parameter exceedances of Guideline B-7 were quantified during the 2020 monitoring year, comprising DOC in the shallow aquifer and TDS in the deep aquifer, each exceeding at two locations. All four exceeding concentrations are noted as being only marginally above the Guideline B-7 maximum allowable concentration.
7. The Site is continuing to operate as designed, as a natural attenuation type facility, with results reported during 2020 consistent with those quantified during previous monitoring programs.

7.0 RECOMMENDATIONS

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

1. The Municipality should continue with the current frequency of groundwater monitoring, so that variations for certain parameters could be documented and understood.
2. Groundwater elevations at all existing monitoring wells should continue to be measured during the annual groundwater sampling round to further confirm groundwater flow directions.
3. The Site should be capped, as the addition of low permeability final cover material will significantly reduce infiltration and subsequently reduce leachate generation at the Site. A measureable improvement in groundwater quality in the immediate vicinity of the Site is expected following final capping.
4. Well nest MW-N requires repairs to the risers and the protective casing at ground surface. Repairs should be completed during the spring of 2021 and the remaining three historical well nests should be assessed for stability at that time and repaired as necessary to prevent similar damage from occurring.

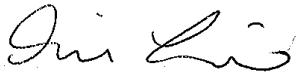
8.0 CLOSURE

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

Respectfully Submitted,

Wood Environment & Infrastructure Solutions
A Division of Wood Canada Limited

Prepared by:

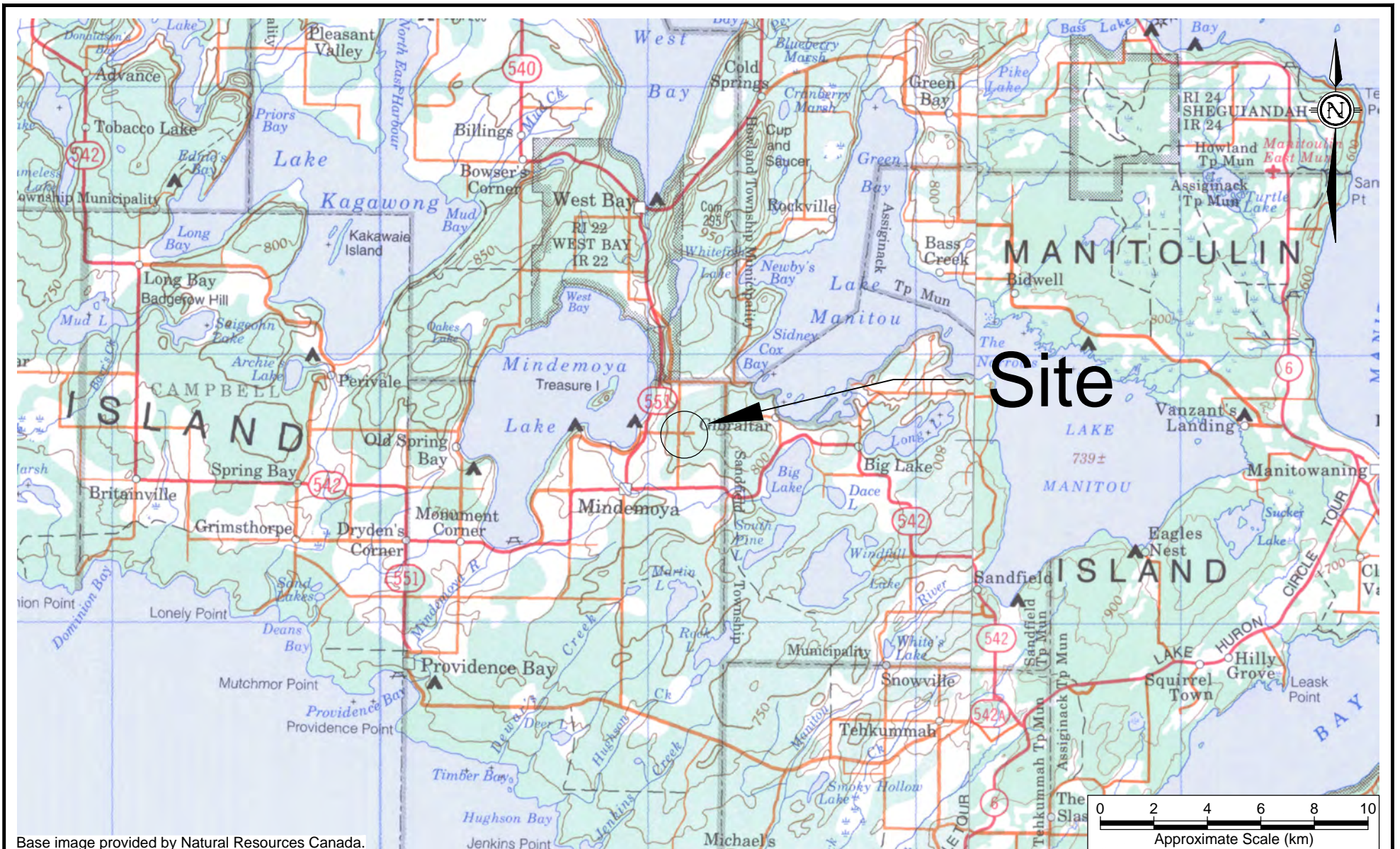


Emily Lemieux, B.Sc.
Environmental Scientist



Reviewed by:



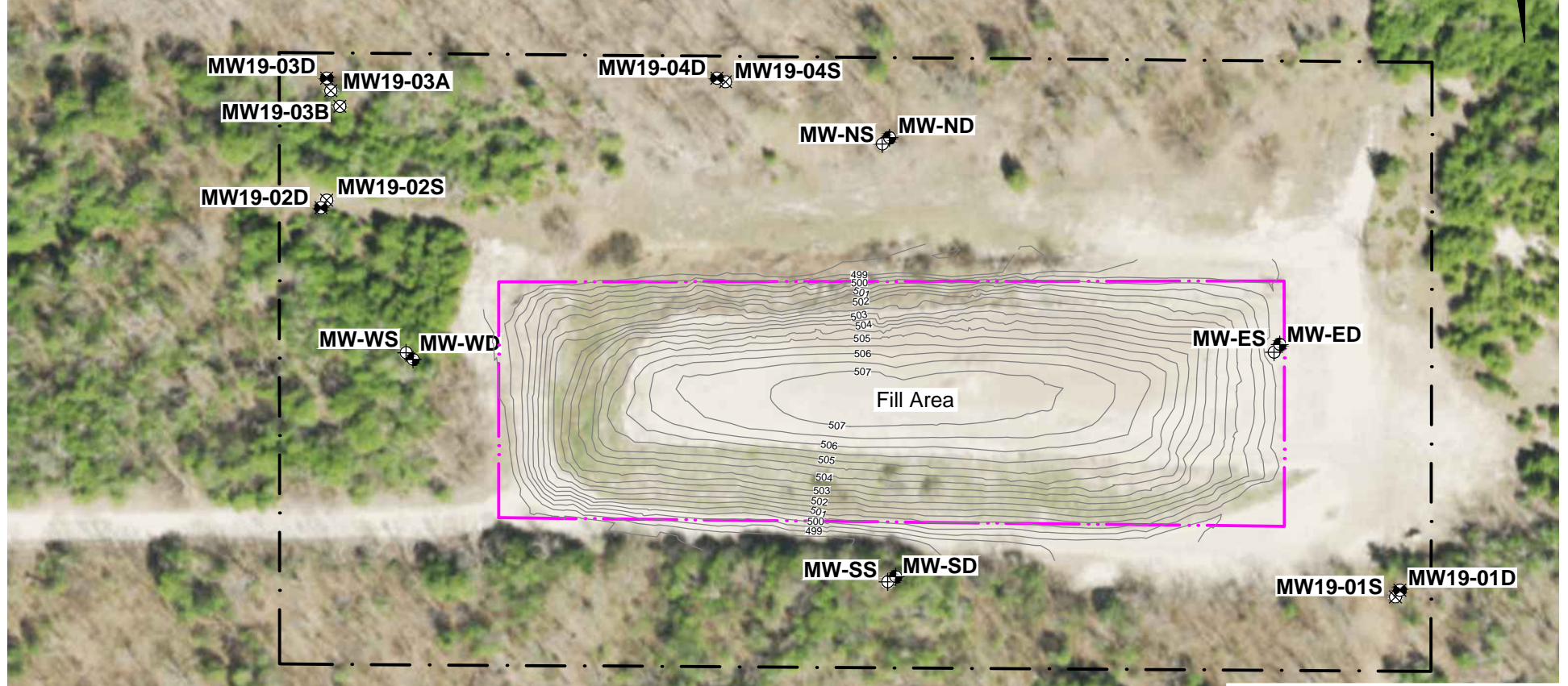
Brian Grant, P.Eng.
Senior Hydrogeologist





Base image provided by Natural Resources Canada.

	<p>The Municipality of Central Manitoulin</p>	DWN BY:	<p>PROJECT</p> <p>2020 Annual Groundwater Monitoring Report Mindemoya Waste Disposal Site</p>	REV. NO.:	1
		CHK'D BY:		DATE:	December 2020
<p>Wood Environment & Infrastructure Solutions</p> <p>131 Fielding Road Lively, Ontario P3Y 1L7 705-682-2632</p>		BRG	TITLE	PROJECT NO.:	TY1410143
		SCALE:	as shown	Site Location Map	FIGURE NO.:

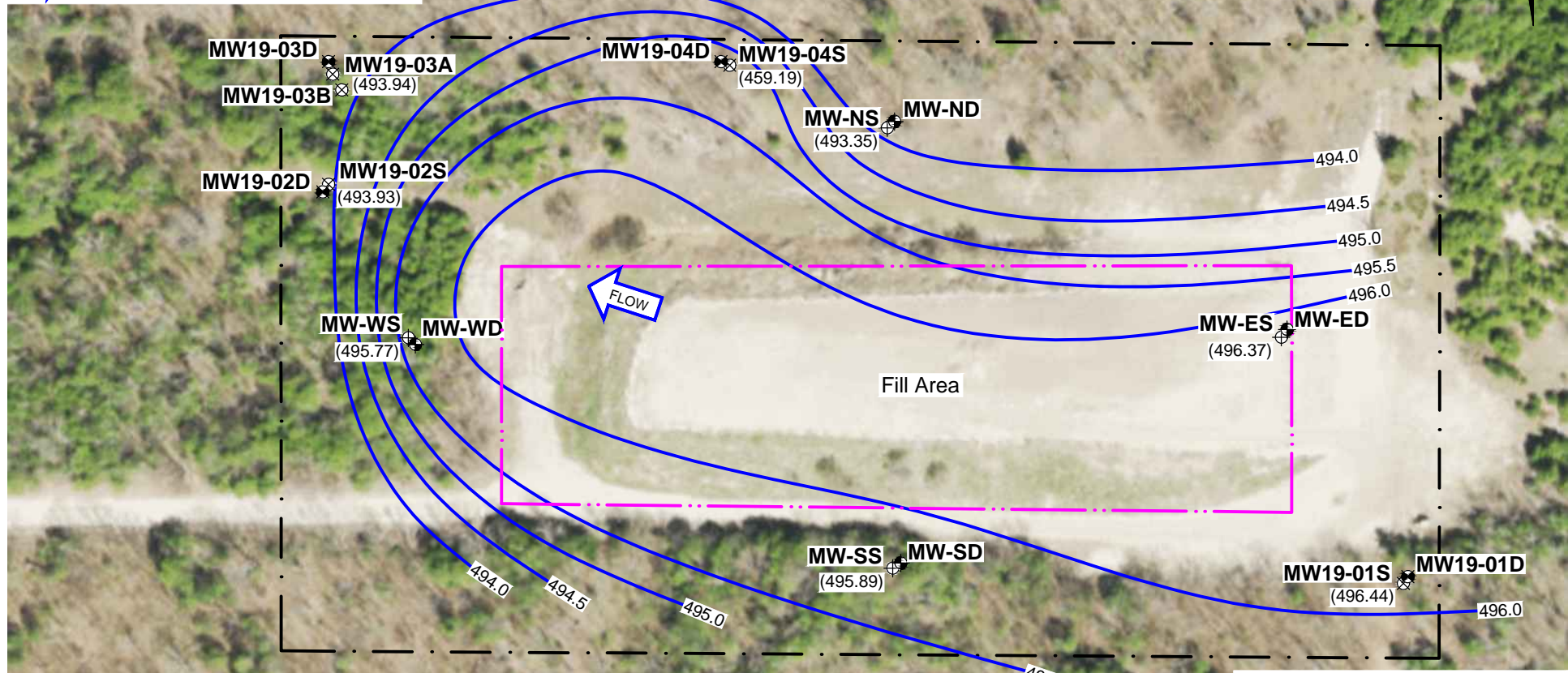
- Legend:**
- ⊕ Well Location (Historical) - Deep (D)
 - ⊕ Well Location (Historical) - Shallow (S)
 - ⊗ Well Location (August 2019) - Deep (D)
 - ⊗ Well Location (August 2019) - Shallow (S)
 - Property Boundary
 - - - Proposed Contaminant Attenuation Zone
 - 500— Surface Contours (masl)



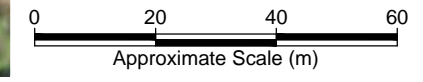
- Notes:**
1. Base image taken from the Ministry of Natural Resources and Forestry.
 2. Survey provided by Keatley Surveying Ltd. dated 2 October 2019.

	The Municipality of Central Manitoulin	DWN BY:	PROJECT 2020 Annual Groundwater Monitoring Report Mindemoya Waste Disposal Site	REV. NO.:	1
		CHK'D BY:		DATE:	December 2020
Wood Environment & Infrastructure Solutions 131 Fielding Road Lively, Ontario P3Y 1L7 705-682-2632		BRG	TITLE	PROJECT NO.:	TY1410143
		SCALE:	Site Plan	FIGURE NO.:	2
		as shown			

- Legend:**
- Well Location (Historical) - Deep (D)
 - Well Location (Historical) - Shallow (S)
 - Well Location (August 2019) - Deep (D)
 - Well Location (August 2019) - Shallow (S)
 - Property Boundary
 - Proposed Contaminant Attenuation Zone
 - Inferred Groundwater Contours (masl)
 - Inferred Groundwater Flow Direction

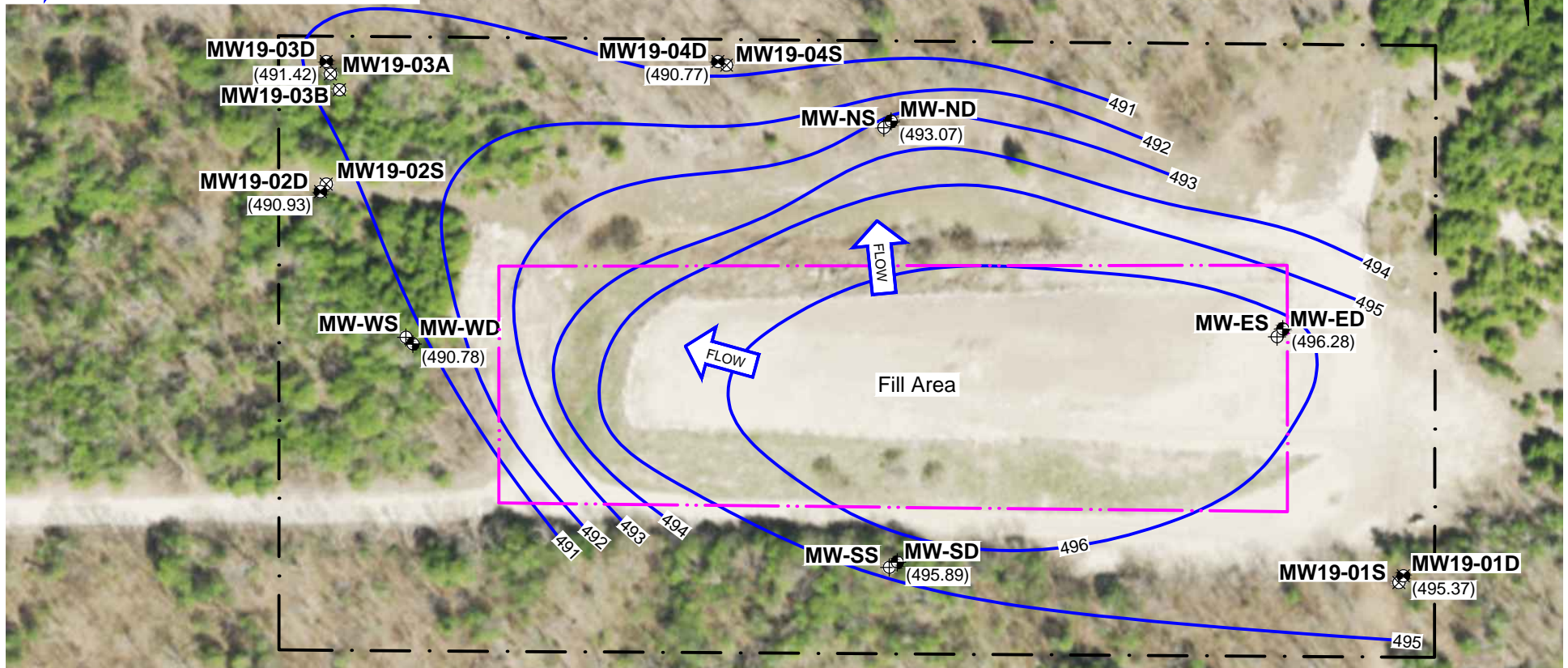


- Notes:**
1. Base image taken from the Ministry of Natural Resources and Forestry.
 2. Survey provided by Keatley Surveying Ltd. dated 2 October 2019.

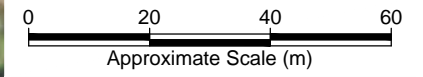


	<p>The Municipality of Central Manitoulin</p>	DWN BY:	<p>PROJECT</p> <p>2020 Annual Groundwater Monitoring Report Mindemoya Waste Disposal Site</p>	REV. NO.:	1
		CHK'D BY:		DATE:	December 2020
<p>Wood Environment & Infrastructure Solutions</p> <p>131 Fielding Road Lively, Ontario P3Y 1L7 705-682-2632</p>		BRG	TITLE:	PROJECT NO.:	TY1410143
		SCALE:	Inferred Shallow Groundwater Contours November 2020	FIGURE NO.:	3A
		as shown			

- Legend:**
- Well Location (Historical) - Deep (D)
 - Well Location (Historical) - Shallow (S)
 - Well Location (August 2019) - Deep (D)
 - Well Location (August 2019) - Shallow (S)
 - Property Boundary
 - Proposed Contaminant Attenuation Zone
 - Inferred Groundwater Contours (masl)
 - Inferred Groundwater Flow Direction



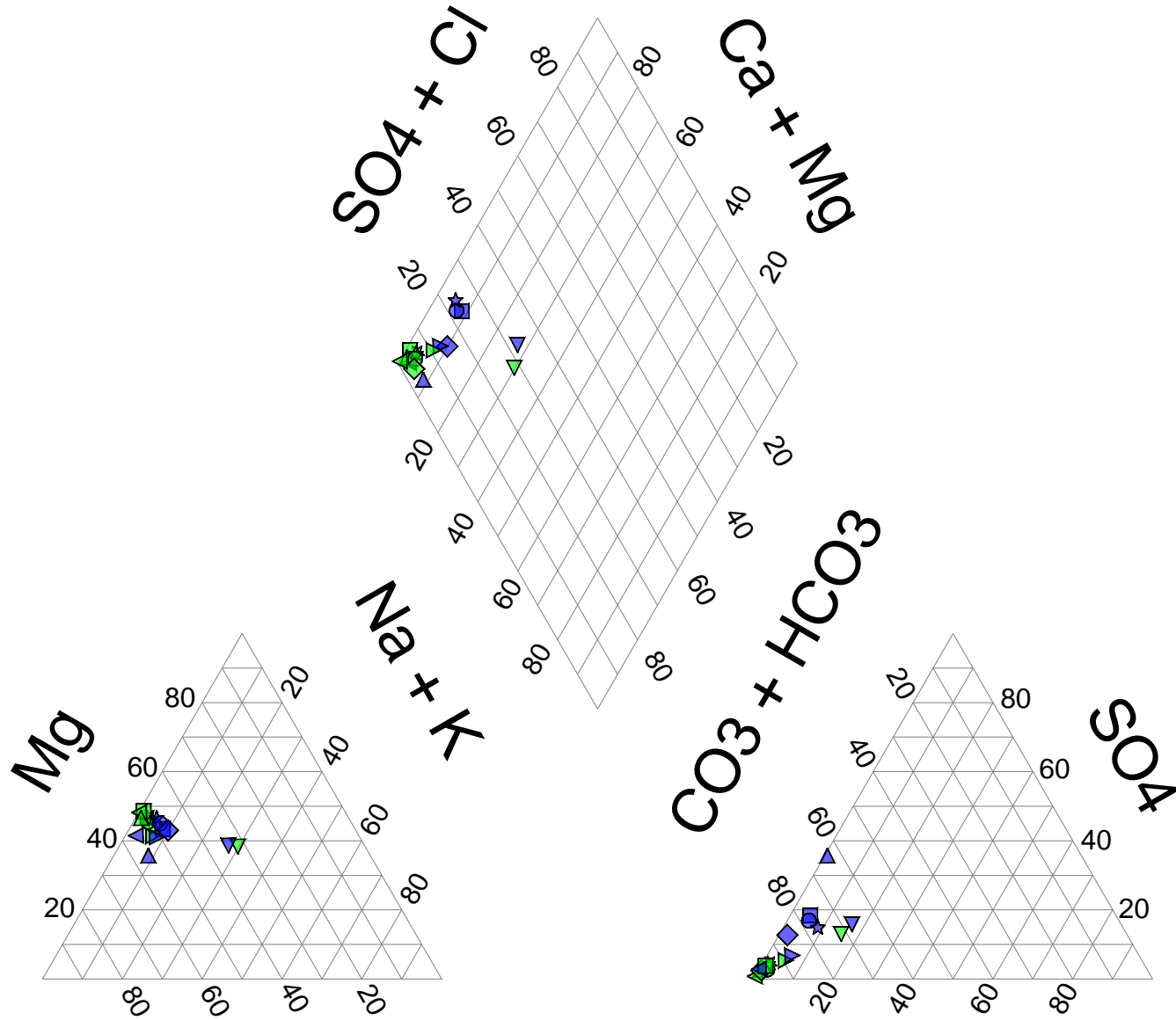
- Notes:**
1. Base image taken from the Ministry of Natural Resources and Forestry.
 2. Survey provided by Keatley Surveying Ltd. dated 2 October 2019.





	The Municipality of Central Manitoulin	DWN BY:	PROJECT 2020 Annual Groundwater Monitoring Report Mindemoya Waste Disposal Site	REV. NO.:	1
		CHK'D BY:		DATE:	December 2020
Wood Environment & Infrastructure Solutions 131 Fielding Road Lively, Ontario P3Y 1L7 705-682-2632		BRG	TITLE	PROJECT NO.:	TY1410143
		SCALE:	Inferred Deep Groundwater Contours November 2020	FIGURE NO.:	3B
		as shown			

Legend:

- ◆ MW19-01S
- MW19-02S
- ★ MW19-03A
- ☆ MW19-03B
- MW19-04S
- ▲ MW-ES
- ▼ MW-SS
- ▲ MW-NS
- ▲ MW-WS
- ◆ MW19-01D
- MW19-02D
- ★ MW19-03D
- MW19-04D
- ▲ MW-ED
- ▼ MW-SD
- ▲ MW-ND
- ▲ MW-WD



	The Municipality of Central Manitoulin	DWN BY:	PROJECT	REV. NO.:
		KKJ	2020 Annual Groundwater Monitoring Report Mindemoya Waste Disposal Site	1
Wood Environment & Infrastructure Solutions 131 Fielding Road Lively, Ontario P3Y 1L7 705-682-2632		CHK'D BY:	TITLE	DATE:
		BRG	Groundwater Tri-Linear Piper Plot November 2020	December 2020
		SCALE:	as shown	PROJECT NO.:
				FIGURE NO.:
				4

The Municipality of Central Manitoulin
2020 Annual Groundwater Monitoring Report
Mindemoya Waste Disposal Site
Mindemoya, Ontario
December 2020



APPENDIX A

ENVIRONMENTAL COMPLIANCE

APPROVAL

NO. A550701

AMENDMENT TO ENVIRONMENTAL COMPLIANCE APPROVAL

NUMBER A550701

Notice No. 1

Issue Date: January 10, 2019

The Corporation of the Municipality of Central Manitoulin
6020 Highway 542 PO Box 187, Mindemoya
Central Manitoulin, Ontario
P0P 1S0

Site Location: Mindemoya Landfill Site
Lot 27, Concession 2
Municipality of Central Manitoulin, District of Manitoulin

You are hereby notified that I have amended Approval No. A550701 issued on March 18, 1980 for a 0.81 hectare landfilling site , as follows:

I. The following conditions are hereby added:

2. The Site shall cease to receive the waste and be closed in accordance with Item 1-4 of Schedule "A".
3. By March 31, 2020, the Owner shall provide to the Ministry an action plan to acquire the required properties for the Contaminant Attenuation Zone (CAZ) or if necessary to develop an alternative leachate control system.
4. By March 31, 2021, the Owner shall obtain lands necessary to provide a Contaminant Attenuation Zone (CAZ) for the Site and shall register these lands on title.

II. The following items are hereby added to Schedule "A":

1. Application and supporting documentation for a Waste Disposal Site (Landfill) from Municipality of Central Manitoulin, dated February 2, 2017.
2. Report dated January 30, 2017 and revised on November 12, 2018, Closure Plan Mindemoya Waste Disposal Site, prepared for the Corporation of the Municipality of Central Manitoulin.
3. Memorandum dated October 14, 2016, from Luciana Rodrigues, Regional Hydrogeologist, Technical Support, Northern Region, MECP, to Steven Moggy, Senior Environmental Officer, Sudbury District Office, MECP.
4. Memorandum dated October 12, 2018, from Archana Uprety, Hydrogeologist,

Technical Support, Northern Region, MECP, to Steven Moggy, Senior Environmental Officer, Sudbury District Office, MECP.

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

1. The reason of Condition 2 is to approve the closure plan submitted by the proponent.
2. The reasons of Condition 3 and 4 are to ensure the site is in compliance with the Ministry Reasonable Use Concept.

This Notice shall constitute part of the approval issued under Approval No. A550701 dated March 18, 1980.

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.

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

This Notice must be served upon:

The Secretary*
Environmental Review Tribunal
655 Bay Street, Suite 1500

AND

The Director appointed for the purposes of Part II.1
of the Environmental Protection Act
Ministry of the Environment, Conservation and

Toronto, Ontario
M5G 1E5

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 10th day of January,
2019

Mohsen Keyvani, P.Eng.
Director
appointed for the purposes of Part
II.1 of the *Environmental
Protection Act*

AT/
c: District Manager, MECP Sudbury
David Bucholtz, Cambium Inc.



Ministry
of the
Environment

Provisional Certificate No. A 550701

**PROVISIONAL CERTIFICATE OF APPROVAL
WASTE DISPOSAL SITE**

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

Township of Carnarvon
Box 119
Mindemoya, Ontario
POP 1S0

RECEIVED

APR 1 1980

MUNICIPAL & PRIVATE
APPROVALS SECTION

for the use and operation of a 0.81 hectare landfilling site

all in accordance with the following plans and specifications:

Located: Lot 27, Concession 2
Township of Carnarvon
District of Manitoulin

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

and subject to the following conditions:

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

Dated this 18th day of March, 19 80.

Director, Section 39,
The Environmental Protection Act, 1971

The Municipality of Central Manitoulin
2020 Annual Groundwater Monitoring Report
Mindemoya Waste Disposal Site
Mindemoya, Ontario
December 2020



APPENDIX B
BOREHOLE LOGS

RECORD OF BOREHOLE No. **MW19-01D** Co-Ord. **412030E 5067010N**



Project Number: **TY1410144** Drilling Location: **Southeast of fill area** Logged by: **GLW**
 Project Client: **Municipality of Central Manitoulin** Drilling Method: **150 mm Hollow Stem Augers** Compiled by: **CKC**
 Project Name: **mindemoya CAZ Determination Program** Drilling Machine: **Track Mounted Drill** Reviewed by: **BRG**
 Project Location: **mindemoya, Ontario** Date Started: **12 Aug 2019** Date Completed: **12 Aug 2019** Revision No.: **0, 5/2/20**

Lithology Profile	SOIL SAMPLING				FIELD TESTING		LAB TESTING		INSTRUMENTATION INSTALLATION	COMMENTS
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	Atterberg Limits		
Lithology Plot	* Pocket Penetrometer (kg/cm ²) 1 2 3 4 Penetration Testing ○ SPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 15 30 45 60									
	Atterberg Limits W _p W W _L Plastic Liquid * Passing 75 µm (%) ○ Moisture Content (%)									
Local Ground Surface Elevation: 0.03 m organics over Dolostone (Amatel Formation)										
0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5										
Fracture										

1 riser pipe in bentonite
 1 riser pipe in sand
 1 slotted pipe in sand

Wood Environment & Infrastructure Solutions
 131 Fielding Road
 Lively, Ontario
 Canada P3Y 1L7
 Tel +1(705) 682-2632
 Fax +1(705) 682-2260

Groundwater depth on completion of drilling: **11.51 m.**
 Groundwater depth recorded on **8/12/2019 5:30:00 PM** at a depth of **11.62 m.**

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

RECORD OF BOREHOLE No. **MW19-01D** Co-Ord. **412030E 5067010N**



Project Number: **TY1410144**

Drilling Location: **Southeast of fill area**

Logged by: **GLW**

Lithology Plot	LITHOLOGY PROFILE	SOIL SAMPLING				DEPTH (m)		ELEVATION (m)		FIELD TESTING				LAB TESTING				INSTRUMENTATION INSTALLATION	COMMENTS
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	Penetration Testing		Atterberg Limits		* Passing 75 um (%)		Moisture Content (%)					
										* Pocket Penetrometer (kg/cm ²) 1 2 3 4 ○ SPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa)	W _p W W _L Plastic Liquid								
	0.03 m organics over Dolostone (Amatel Formation)																	1 riser pipe in bentonite 1 riser pipe in sand 1 slotted pipe in sand	
						5.0													
						5.5													
						6.0													
						6.5													
						7.0													
						7.5													
						8.0													
						8.5													
						9.0													
						9.5													

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

Scale: 1 : 25

Page: 2 of 3

RECORD OF BOREHOLE No. MW19-01D Co-Ord. 412030E 5067010N



Project Number: TY1410144

Drilling Location: Southeast of fill area

Logged by: GLW

Lithology Plot	LITHOLOGY PROFILE	SOIL SAMPLING				DEPTH (m)		FIELD TESTING				LAB TESTING				INSTRUMENTATION INSTALLATION	COMMENTS
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	Penetration Testing				Atterberg Limits					
								1	2	3	4	W _p	W	W _L	Plastic		
	0.03 m organics over Dolostone (Amatel Formation)							* Pocket Penetrometer (kg/cm ²) ○ SPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa)	* Passing 75 um (%) ○ Moisture Content (%)								
	Fracture					10.0											
						10.5											
						11.0											
						11.5											
						12.0											
	END OF BOREHOLE	12.2															

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

Scale: 1 : 25

Page: 3 of 3

RECORD OF BOREHOLE No. **MW19-01S** Co-Ord. **412030E 5067010N**



Project Number: **TY1410144** Drilling Location: **Southeast of fill area** Logged by: **GLW**
 Project Client: **Municipality of Central Manitoulin** Drilling Method: **150 mm Hollow Stem Augers** Compiled by: **CKC**
 Project Name: **mindemoya CAZ Determination Program** Drilling Machine: **Track Mounted Drill** Reviewed by: **BRG**
 Project Location: **mindemoya, Ontario** Date Started: **12 Aug 2019** Date Completed: **12 Aug 2019** Revision No.: **0, 5/2/20**

Lithology Profile	SOIL SAMPLING				FIELD TESTING		LAB TESTING		INSTRUMENTATION INSTALLATION	COMMENTS
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	Atterberg Limits W _p W L _p W _u Plastic Liquid		
Lithology Plot	* Pocket Penetrometer (kg/cm ²) 1 2 3 4 Penetration Testing ○ SPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 15 30 45 60 * Passing 75 um (%) ○ Moisture Content (%)									
	Local Ground Surface Elevation: 0.03 m organics over Dolostone (Amatel Formation)									
					0.5					
					1.0					
					1.5					
					2.0					
					2.5					
					3.0					
					3.5					
					4.0					
					4.5					
	Fracture									

Wood Environment & Infrastructure Solutions
 131 Fielding Road
 Lively, Ontario
 Canada P3Y 1L7
 Tel +1(705) 682-2632
 Fax +1(705) 682-2260

Groundwater depth on completion of drilling: **4.02 m**.
 Groundwater depth recorded on **8/12/2019 5:30:00 PM** at a depth of **5.21 m**.

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

Scale: 1 : 25
 Page: 1 of 2

RECORD OF BOREHOLE No. **MW19-01S** Co-Ord. **412030E 5067010N**



Project Number: **TY1410144**

Drilling Location: **Southeast of fill area**

Logged by: **GLW**

LITHOLOGY PROFILE	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)			SPT 'N' Value	* Pocket Penetrometer (kg/cm ²) 1 2 3 4 Penetration Testing ○ SPT ● DCPT △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa)		
Lithology Plot 0.03 m organics over Dolostone (Amatel Formation)					5.0 5.5 6.0 6.5 7.0	15 30 45 60			1 riser pipe in bentonite 1 riser pipe in sand 1 slotted pipe in sand	
END OF BOREHOLE	7.1									

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

RECORD OF BOREHOLE No. **MW19-02D** Co-Ord. **411890E 5067090N**



Project Number: **TY1410144** Drilling Location: **Northwest of fill area** Logged by: **GLW**
 Project Client: **Municipality of Central Manitoulin** Drilling Method: **150 mm Hollow Stem Augers** Compiled by: **CKC**
 Project Name: **mindemoya CAZ Determination Program** Drilling Machine: **Track Mounted Drill** Reviewed by: **BRG**
 Project Location: **mindemoya, Ontario** Date Started: **12 Aug 2019** Date Completed: **12 Aug 2019** Revision No.: **0, 5/2/20**

Lithology Profile	SOIL SAMPLING				FIELD TESTING		LAB TESTING		INSTRUMENTATION INSTALLATION	COMMENTS	
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	Atterberg Limits W _p W L _p W _u Plastic Liquid			
Lithology Plot Local Ground Surface Elevation: 0.03 m organics over fractured bedrock Dolostone (Amatel Formation) 0.9 Fracture										* Pocket Penetrometer (kg/cm ²) 1 2 3 4 Penetration Testing ○ SPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 15 30 45 60 * Passing 75 µm (%) ○ Moisture Content (%)	1 riser pipe in bentonite 1 riser pipe in sand 1 slotted pipe in sand
					0.5						
					1.0						
					1.5						
					2.0						
					2.5						
					3.0						
					3.5						
					4.0						
					4.5						

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Groundwater depth on completion of drilling: **12.61 m.**
 Groundwater depth recorded on **8/12/2019 5:30:00 PM** at a depth of **13.20 m.**

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

RECORD OF BOREHOLE No. MW19-02D Co-Ord. 411890E 5067090N



Project Number: TY1410144

Drilling Location: Northwest of fill area

Logged by: GLW

LITHOLOGY PROFILE	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)			SPT 'N' Value	* Pocket Penetrometer (kg/cm ²) 1 2 3 4 Penetration Testing ○ SPT ● DCPT △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa)		
Lithology Plot Dolostone (Amatel Formation)					5.0				1 riser pipe in bentonite 1 riser pipe in sand 1 slotted pipe in sand	
					5.5					
					6.0					
					6.5					
					7.0					
					7.5					
					8.0					
					8.5					
					9.0					
					9.5					

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

Scale: 1 : 25

Page: 2 of 3

RECORD OF BOREHOLE No. **MW19-02D** Co-Ord. **411890E 5067090N**



Project Number: **TY1410144**

Drilling Location: **Northwest of fill area**

Logged by: **GLW**

Lithology Plot	LITHOLOGY PROFILE	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING				LAB TESTING				INSTRUMENTATION INSTALLATION	COMMENTS
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value			Penetration Testing		Atterberg Limits		* Passing 75 um (%)		Moisture Content (%)			
								* Pocket Penetrometer (kg/cm ²) 1 2 3 4 ○ SPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa)	W _p W W _L Plastic Liquid	* Passing 75 um (%) ○ Moisture Content (%)					1 riser pipe in bentonite 1 riser pipe in sand 1 slotted pipe in sand		
	Dolostone (Amatel Formation)					10.0											
	Fracture					10.5											
						11.0											
						11.5											
						12.0											
	END OF BOREHOLE	12.1															

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

Scale: 1 : 25

Page: 3 of 3

RECORD OF BOREHOLE No. **MW19-02S** Co-Ord. **411810E 5067090N**



Project Number: **TY1410144** Drilling Location: **Northwest of fill area** Logged by: **GLW**
 Project Client: **Municipality of Central Manitoulin** Drilling Method: **150 mm Hollow Stem Augers** Compiled by: **CKC**
 Project Name: **mindemoya CAZ Determination Program** Drilling Machine: **Track Mounted Drill** Reviewed by: **BRG**
 Project Location: **mindemoya, Ontario** Date Started: **12 Aug 2019** Date Completed: **12 Aug 2019** Revision No.: **0, 5/2/20**

LITHOLOGY PROFILE		SOIL SAMPLING				FIELD TESTING		LAB TESTING				INSTRUMENTATION INSTALLATION	COMMENTS
Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	Atterberg Limits					
								W _p	W	W _L			
* Pocket Penetrometer (kg/cm ²) 1 2 3 4 Penetration Testing ○ SPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 15 30 45 60													
Atterberg Limits W _p W W _L Plastic Liquid * Passing 75 um (%) ○ Moisture Content (%)													
Local Ground Surface Elevation: 0.03 m organics over fractured bedrock													
Dolostone (Amatel Formation) 0.9													
Fracture													

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

Scale: 1 : 25
 Page: 1 of 2

RECORD OF BOREHOLE No. **MW19-02S** Co-Ord. **411810E 5067090N**



Project Number: **TY1410144**

Drilling Location: **Northwest of fill area**

Logged by: **GLW**

LITHOLOGY PROFILE	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)			SPT 'N' Value	* Pocket Penetrometer (kg/cm ²) 1 2 3 4 Penetration Testing ○ SPT ● DCPT △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa)		
Lithology Plot Dolostone (Amatel Formation)					5.0				1 riser pipe in bentonite 1 riser pipe in sand 1 slotted pipe in sand	
END OF BOREHOLE					7.0					

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

RECORD OF BOREHOLE No. MW19-03A Co-Ord. 411810E 5067115N



Project Number: TY1410144 Drilling Location: Northwest of fill area; north of MW1902 nest Logged by: GLW
 Project Client: Municipality of Central Manitoulin Drilling Method: 150 mm Hollow Stem Augers Compiled by: CKC
 Project Name: mindemoya CAZ Determination Program Drilling Machine: Track Mounted Drill Reviewed by: BRG
 Project Location: mindemoya, Ontario Date Started: 13 Aug 2019 Date Completed: 13 Aug 2019 Revision No.: 0, 5/2/20

LITHOLOGY PROFILE		SOIL SAMPLING				FIELD TESTING		LAB TESTING				INSTRUMENTATION INSTALLATION	COMMENTS
Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	Atterberg Limits					
								W _p	W	W _L			
* Pocket Penetrometer (kg/cm ²) 1 2 3 4 Penetration Testing ○ SPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 15 30 45 60 Atterberg Limits W _p W W _L Plastic Liquid * Passing 75 um (%) ○ Moisture Content (%)													
Local Ground Surface Elevation: 0.03 m organics over SAND AND GRAVEL fractured bedrock 0.6 Dolostone (Amatel Formation) 1.2 Fracture 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5													

1 riser pipe in bentonite
 1 riser pipe in sand
 1 slotted pipe in sand

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Groundwater depth on completion of drilling: 6.36 m.
 Groundwater depth recorded on 8/13/2019 5:30:00 PM at a depth of 6.54 m.

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

Scale: 1 : 25
 Page: 1 of 2

RECORD OF BOREHOLE No. MW19-03A Co-Ord. 411810E 5067115N



Project Number: **TY1410144**

Drilling Location: **Northwest of fill area; north of MW1902 nest**

Logged by: **GLW**

LITHOLOGY PROFILE	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)			SPT 'N' Value	* Pocket Penetrometer (kg/cm ²) 1 2 3 4 Penetration Testing ○ SPT ● DCPT △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa)		
Lithology Plot Dolostone (Amatel Formation)					5.0				1 riser pipe in bentonite 1 riser pipe in sand 1 slotted pipe in sand	
END OF BOREHOLE	5.8				5.5					

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

RECORD OF BOREHOLE No. **MW19-03B** Co-Ord. 411810E 5067115N



Project Number: TY1410144	Drilling Location: Northwest of fill area; north of MW1902 nest	Logged by: GLW
Project Client: Municipality of Central Manitoulin	Drilling Method: 150 mm Hollow Stem Augers	Compiled by: CKC
Project Name: mindemoya CAZ Determination Program	Drilling Machine: Track Mounted Drill	Reviewed by: BRG
Project Location: mindemoya, Ontario	Date Started: 12 Aug 2019 Date Completed: 12 Aug 2019	Revision No.: 0, 5/2/20

Lithology Plot	LITHOLOGY PROFILE		SOIL SAMPLING				FIELD TESTING		LAB TESTING				INSTRUMENTATION INSTALLATION	COMMENTS	
	DESCRIPTION		Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	Atterberg Limits	Penetration Testing					
	Local Ground Surface Elevation: 0.03 m organics over SAND AND GRAVEL fractured bedrock 0.6 Dolostone (Amatel Formation) 1.2 Fracture							* Pocket Penetrometer (kg/cm²) 1 2 3 4 Penetration Testing O SPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 15 30 45 60	Atterberg Limits W _p W W _L Plastic Liquid * Passing 75 µm (%) O Moisture Content (%)					1 riser pipe in bentonite 1 riser pipe in sand 1 slotted pipe in sand	
						0.5									
						1.0									
						1.5									
						2.0									
						2.5									
						3.0									
						3.5									
						4.0									
						4.5									

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Groundwater depth on completion of drilling: **6.36 m.**
 Groundwater depth recorded on **8/13/2019 5:30:00 PM** at a depth of **7.34 m.**

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

Scale: 1 : 25
 Page: 1 of 2

RECORD OF BOREHOLE No. **MW19-03B** Co-Ord. **411810E 5067115N**



Project Number: **TY1410144**

Drilling Location: **Northwest of fill area; north of MW1902 nest**

Logged by: **GLW**

LITHOLOGY PROFILE	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)			SPT 'N' Value	* Pocket Penetrometer (kg/cm ²) 1 2 3 4 Penetration Testing ○ SPT ● DCPT △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa)		
Lithology Plot Dolostone (Amatel Formation)					5.0 5.5 6.0 6.5	15 30 45 60	20 40 60 80	1 riser pipe in bentonite 1 riser pipe in sand 1 slotted pipe in sand		
END OF BOREHOLE	6.6				6.5					

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

RECORD OF BOREHOLE No. **MW19-03D** Co-Ord. **411810E 5067115N**



Project Number: **TY1410144** Drilling Location: **Northwest of fill area; north of MW1902 nest** Logged by: **GLW**
 Project Client: **Municipality of Central Manitoulin** Drilling Method: **150 mm Hollow Stem Augers** Compiled by: **CKC**
 Project Name: **mindemoya CAZ Determination Program** Drilling Machine: **Track Mounted Drill** Reviewed by: **BRG**
 Project Location: **mindemoya, Ontario** Date Started: **12 Aug 2019** Date Completed: **12 Aug 2019** Revision No.: **0, 5/2/20**

Lithology Profile	SOIL SAMPLING				FIELD TESTING		LAB TESTING		INSTRUMENTATION INSTALLATION	COMMENTS
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	Atterberg Limits		
Lithology Plot Local Ground Surface Elevation: 0.03 m organics over SAND AND GRAVEL 0.6 fractured bedrock 1.2 Dolostone (Amatel Formation)								Atterberg Limits W _p W W _L Plastic Liquid * Passing 75 um (%) o Moisture Content (%)	1 riser pipe in bentonite 1 riser pipe in sand 1 slotted pipe in sand	
					0.5					
					1.0					
					1.5					
					2.0					
					2.5					
					3.0					
					3.5					
					4.0					
					4.5					

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Groundwater depth on completion of drilling: **12.9 m.**
 Groundwater depth recorded on **8/12/2019 5:30:00 PM** at a depth of **13.09 m.**

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

Scale: 1 : 25
 Page: 1 of 3

RECORD OF BOREHOLE No. **MW19-03D** Co-Ord. **411810E 5067115N**



Project Number: **TY1410144**

Drilling Location: **Northwest of fill area; north of MW1902 nest**

Logged by: **GLW**

Lithology Plot	LITHOLOGY PROFILE	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING				LAB TESTING				INSTRUMENTATION INSTALLATION	COMMENTS
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value			Penetration Testing		Atterberg Limits		* Passing 75 um (%)		Moisture Content (%)			
								* Pocket Penetrometer (kg/cm ²) 1 2 3 4 ○ SPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa)	W _p W W _L Plastic Liquid	* Passing 75 um (%) ○ Moisture Content (%)							
	Dolostone (Amatel Formation)					5.0											
						5.5											
						6.0											
						6.5											
						7.0											
						7.5											
						8.0											
						8.5											
						9.0											
						9.5											

- 1 riser pipe in bentonite
- 1 riser pipe in sand
- 1 slotted pipe in sand

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

RECORD OF BOREHOLE No. **MW19-03D** Co-Ord. **411810E 5067115N**



Project Number: **TY1410144**

Drilling Location: **Northwest of fill area; north of MW1902 nest**

Logged by: **GLW**

LITHOLOGY PROFILE	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)			SPT 'N' Value	* Pocket Penetrometer (kg/cm ²) 1 2 3 4 Penetration Testing ○ SPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa)		
Lithology Plot Dolostone (Amatel Formation)					10.0					1 riser pipe in bentonite 1 riser pipe in sand 1 slotted pipe in sand
					10.5					
					11.0					
					11.5					
					12.0					
END OF BOREHOLE	12.1									

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

RECORD OF BOREHOLE No. **MW19-04D** Co-Ord. **411890E 5067115N**



Project Number: **TY1410144** Drilling Location: **Northwest of fill area; north of MW1902 nest** Logged by: **GLW**
 Project Client: **Municipality of Central Manitoulin** Drilling Method: **200 mm Hollow Stem Augers** Compiled by: **CKC**
 Project Name: **mindemoya CAZ Determination Program** Drilling Machine: **Track Mounted Drill** Reviewed by: **BRG**
 Project Location: **mindemoya, Ontario** Date Started: **13 Aug 2019** Date Completed: **13 Aug 2019** Revision No.: **0, 5/2/20**

LITHOLOGY PROFILE		SOIL SAMPLING				FIELD TESTING		LAB TESTING				INSTRUMENTATION INSTALLATION	COMMENTS
Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	Atterberg Limits					
								W _p	W	W _L			
* Pocket Penetrometer (kg/cm ²) 1 2 3 4 Penetration Testing ○ SPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 15 30 45 60 Atterberg Limits W _p W W _L Plastic Liquid * Passing 75 µm (%) ○ Moisture Content (%)													
Local Ground Surface Elevation: ORGANICS AND GRAVEL Fractured bedrock 0.2 Dolostone (Amatel Formation) 0.6 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5													

1 riser pipe in bentonite
 1 riser pipe in sand
 1 slotted pipe in sand

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Groundwater depth on completion of drilling: **12.68 m.**
 Groundwater depth recorded on **8/13/2019 5:30:00 PM** at a depth of **12.71 m.**

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

Scale: 1 : 25

RECORD OF BOREHOLE No. **MW19-04D** Co-Ord. **411890E 5067115N**



Project Number: **TY1410144**

Drilling Location: **Northwest of fill area; north of MW1902 nest**

Logged by: **GLW**

LITHOLOGY PROFILE	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)			SPT 'N' Value	* Pocket Penetrometer (kg/cm ²) 1 2 3 4 Penetration Testing ○ SPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa)		
Lithology Plot Dolostone (Amatel Formation)					5.0				1 riser pipe in bentonite 1 riser pipe in sand 1 slotted pipe in sand	
					5.5					
					6.0					
					6.5					
					7.0					
					7.5					
					8.0					
					8.5					
					9.0					
					9.5					

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

Scale: 1 : 25

Page: 2 of 3

RECORD OF BOREHOLE No. **MW19-04D** Co-Ord. **411890E 5067115N**



Project Number: **TY1410144**

Drilling Location: **Northwest of fill area; north of MW1902 nest**

Logged by: **GLW**

LITHOLOGY PROFILE	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)			SPT 'N' Value	* Pocket Penetrometer (kg/cm ²) 1 2 3 4 Penetration Testing ○ SPT ● DCPT △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa)		
Lithology Plot Dolostone (Amatel Formation)					10.0					
					10.5					
					11.0					
					11.5					
					12.0					
END OF BOREHOLE										
						11K 11L				

- 1 riser pipe in bentonite
- 1 riser pipe in sand
- 1 slotted pipe in sand

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

RECORD OF BOREHOLE No. **MW19-04S** Co-Ord. **411890E 5067115N**



Project Number: **TY1410144** Drilling Location: **Northwest of fill area; north of MW1902 nest** Logged by: **GLW**
 Project Client: **Municipality of Central Manitoulin** Drilling Method: **200 mm Hollow Stem Augers** Compiled by: **CKC**
 Project Name: **mindemoya CAZ Determination Program** Drilling Machine: **Track Mounted Drill** Reviewed by: **BRG**
 Project Location: **mindemoya, Ontario** Date Started: **13 Aug 2019** Date Completed: **13 Aug 2019** Revision No.: **0, 5/2/20**

LITHOLOGY PROFILE		SOIL SAMPLING				FIELD TESTING		LAB TESTING				INSTRUMENTATION INSTALLATION	COMMENTS
Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	Atterberg Limits					
								W _p	W	W _L			
* Pocket Penetrometer (kg/cm ²) 1 2 3 4 Penetration Testing ○ SPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 15 30 45 60													
Atterberg Limits W _p — W — W _L Plastic — Liquid * Passing 75 µm (%) ○ Moisture Content (%)													
LOCAL GROUND SURFACE ELEVATION: ORGANICS AND GRAVEL Fractured bedrock 0.2 Dolostone (Amatel Formation) 0.6 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5													

1 riser pipe in bentonite
 1 riser pipe in sand
 1 slotted pipe in sand

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Groundwater depth on completion of drilling: **7.4 m.**
 Groundwater depth recorded on **8/13/2019 5:30:00 PM** at a depth of **7.45 m.**

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

RECORD OF BOREHOLE No. **MW19-04S** Co-Ord. **411890E 5067115N**



Project Number: **TY1410144**

Drilling Location: **Northwest of fill area; north of MW1902 nest**

Logged by: **GLW**

LITHOLOGY PROFILE	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)			SPT 'N' Value	* Pocket Penetrometer (kg/cm ²) 1 2 3 4 Penetration Testing ○ SPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa)		
Lithology Plot Dolostone (Amatel Formation)					5.0 5.5 6.0 6.5				1 riser pipe in bentonite 1 riser pipe in sand 1 slotted pipe in sand	
END OF BOREHOLE	6.8									

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

The Municipality of Central Manitoulin
2020 Annual Groundwater Monitoring Report
Mindemoya Waste Disposal Site
Mindemoya, Ontario
December 2020



APPENDIX C
GROUNDWATER ELEVATIONS

Summary of Groundwater Elevations

Monitor No.	Measuring Point Elevation (masl) ¹	Elevation of Water (masl)							
		Oct-14	Sep-15	Sep-16	Oct-17	Sep-18	Sep-19	Nov-19	Nov-20
MW-WS	499.26	495.19	494.48	493.83	495.73	495.36	494.41	496.27	495.77
MW-WD	499.26	490.37	488.45	488.26	488.63	488.26	488.55	492.62	490.78
MW-SS	499.84	495.67	495.29	495.37	495.85	495.96	495.70	496.56	495.89
MW-SD	499.85	495.64	495.19	495.22	495.78	495.91	495.69	496.10	495.89
MW-ES	501.28	496.44	495.87	495.56	496.37	496.36	496.14	497.83	496.37
MW-ED	501.28	ND	495.18	494.88	496.04	495.81	495.85	498.05	496.28
MW-NS	499.93	493.19	493.00	493.11	493.14	493.20	493.09	497.29	493.35
MW-ND	499.92	493.22	493.05	493.14	493.19	493.20	493.08	497.31	493.07
MW19-01S	500.61						495.03	497.79	496.44
MW19-01D	500.83						488.85	495.63	495.37
MW19-02S	498.89						492.95	496.36	493.93
MW19-02D	498.86						485.94	491.11	490.93
MW19-03A	499.28						493.00	496.72	493.94
MW19-03B	499.18						493.00	496.73	493.94
MW19-03D	499.33						486.43	488.87	491.42
MW19-04S	499.48						493.39	497.24	495.19
MW19-04D	499.45						486.56	489.72	490.77

Notes:

(1) masl - metres above sea level.

(2) ND - no data available.

The Municipality of Central Manitoulin
2020 Annual Groundwater Monitoring Report
Mindemoya Waste Disposal Site
Mindemoya, Ontario
December 2020



APPENDIX D
2020 LABORATORY ANALYTICAL
REPORTS

**CLIENT NAME: WOOD CANADA LTD.
131 FIELDING ROAD
LIVELY, ON P3Y1L7
(705) 682-2632**

**ATTENTION TO: Emily Lemieux
PROJECT: Mindemoya GW**

AGAT WORK ORDER: 20T673714

TRACE ORGANICS REVIEWED BY: Oksana Gushyla, Trace Organics Lab Supervisor

WATER ANALYSIS REVIEWED BY: Yris Verastegui, Report Reviewer

DATE REPORTED: Nov 18, 2020

PAGES (INCLUDING COVER): 20

VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (905) 712-5100

***Notes**

Empty box for notes.

Disclaimer:

- All work conducted herein has been done using accepted standard protocols, and generally accepted practices and methods. AGAT test methods may incorporate modifications from the specified reference methods to improve performance.
- All samples will be disposed of within 30 days following analysis, unless expressly agreed otherwise in writing. Please contact your Client Project Manager if you require additional sample storage time.
- AGAT's liability in connection with any delay, performance or non-performance of these services is only to the Client and does not extend to any other third party. Unless expressly agreed otherwise in writing, AGAT's liability is limited to the actual cost of the specific analysis or analyses included in the services.
- This Certificate shall not be reproduced except in full, without the written approval of the laboratory.
- The test results reported herewith relate only to the samples as received by the laboratory.
- Application of guidelines is provided "as is" without warranty of any kind, either expressed or implied, including, but not limited to, warranties of merchantability, fitness for a particular purpose, or non-infringement. AGAT assumes no responsibility for any errors or omissions in the guidelines contained in this document.
- All reportable information as specified by ISO/IEC 17025:2017 is available from AGAT Laboratories upon request.

Certificate of Analysis

AGAT WORK ORDER: 20T673714

PROJECT: Mindemoya GW

CLIENT NAME: WOOD CANADA LTD.

ATTENTION TO: Emily Lemieux

SAMPLING SITE:

SAMPLED BY:

Volatile Organic Compounds in Water (ug/L)

DATE RECEIVED: 2020-11-05

DATE REPORTED: 2020-11-18

		SAMPLE DESCRIPTION:		MW-WS	MW-WD			MW-SS	MW-SD			MW-ES	MW-ED
		SAMPLE TYPE:		Water	Water			Water	Water			Water	Water
		DATE SAMPLED:		2020-11-02	2020-11-02			2020-11-03	2020-11-03			2020-11-03	2020-11-03
				10:00	10:00			10:00	10:00			10:00	10:00
Parameter	Unit	G / S	RDL	1652436	1652464	RDL	1652465	1652466	RDL	1652467	1652468		
Vinyl Chloride	µg/L		0.17	<0.17	<0.17	0.34	<0.34	<0.34	0.17	<0.17	<0.17		
Methylene Chloride	µg/L		0.30	<0.30	<0.30	0.60	<0.60	<0.60	0.30	<0.30	<0.30		
Benzene	µg/L		0.20	<0.20	<0.20	0.40	<0.40	<0.40	0.20	<0.20	<0.20		
Toluene	µg/L	24	0.20	<0.20	<0.20	0.40	<0.40	<0.40	0.20	<0.20	0.72		
1,4-Dichlorobenzene	µg/L	1	0.10	<0.10	<0.10	0.20	<0.20	<0.20	0.10	<0.10	<0.10		
Surrogate	Unit	Acceptable Limits											
Toluene-d8	% Recovery		50-140	120	114	2	111	120	1	110	123		
4-Bromofluorobenzene	% Recovery		50-140	89	90	2	86	82	1	83	81		
		SAMPLE DESCRIPTION:		MW-NS	MW-ND	MW19-01S	MW19-01D	MW19-02S	MW19-02D	MW19-03A	MW19-03B		
		SAMPLE TYPE:		Water	Water	Water	Water	Water	Water	Water	Water		
		DATE SAMPLED:		2020-11-03	2020-11-03	2020-11-03	2020-11-03	2020-11-02	2020-11-02	2020-11-02	2020-11-02		
				10:00	10:00	10:00	10:00	10:00	10:00	10:00	10:00		
Parameter	Unit	G / S	RDL	1652469	1652470	1652471	1652472	1652473	1652474	1652475	1652476		
Vinyl Chloride	µg/L		0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17		
Methylene Chloride	µg/L		0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30		
Benzene	µg/L		0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20		
Toluene	µg/L	24	0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20		
1,4-Dichlorobenzene	µg/L	1	0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10		
Surrogate	Unit	Acceptable Limits											
Toluene-d8	% Recovery		50-140	107	107	105	103	109	117	96	108		
4-Bromofluorobenzene	% Recovery		50-140	80	81	104	107	105	103	104	102		

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Certificate of Analysis

AGAT WORK ORDER: 20T673714

PROJECT: Mindemoya GW

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<http://www.agatlabs.com>

CLIENT NAME: WOOD CANADA LTD.

ATTENTION TO: Emily Lemieux

SAMPLING SITE:

SAMPLED BY:

Volatile Organic Compounds in Water (ug/L)

DATE RECEIVED: 2020-11-05

DATE REPORTED: 2020-11-18

Parameter	Unit	G / S	RDL	SAMPLE DESCRIPTION:	MW19-03D	MW19-04S	MW19-04D	MIND-DUP1	MIND-DUP2
				SAMPLE TYPE:	Water	Water	Water	Water	Water
				DATE SAMPLED:	2020-11-02	2020-11-02	2020-11-02	2020-11-02	2020-11-02
					10:00	10:00	10:00	10:00	10:00
					1652477	1652478	1652479	1652480	1652486
Vinyl Chloride	µg/L		0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17
Methylene Chloride	µg/L		0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
Benzene	µg/L		0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Toluene	µg/L	24	0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.77
1,4-Dichlorobenzene	µg/L	1	0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Surrogate	Unit	Acceptable Limits							
Toluene-d8	% Recovery	50-140		105	106	110	104	104	
4-Bromofluorobenzene	% Recovery	50-140		105	105	102	80	79	

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to O. Reg 169/03 - Ontario Drinking Water Quality Standards - Aesthetic Objectives and Operational Guidelines
 Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

1652436-1652464 Xylenes total is a calculated parameter. The calculated value is the sum of m&p-Xylene + o-Xylene.
 1,3-Dichloropropene total is a calculated parameter. The calculated value is the sum of Cis-1,3-Dichloropropene and Trans-1,3-Dichloropropene. The calculated parameter is non-accredited. The parameters that are components of the calculation are accredited.

1652465-1652466 Dilution factor=2
 The sample was diluted because it was foamy. The reporting detection limit has been corrected for the dilution factor used.
 Xylenes total is a calculated parameter. The calculated value is the sum of m&p-Xylene + o-Xylene.
 1,3-Dichloropropene total is a calculated parameter. The calculated value is the sum of Cis-1,3-Dichloropropene and Trans-1,3-Dichloropropene. The calculated parameter is non-accredited. The parameters that are components of the calculation are accredited.

1652467-1652486 Xylenes total is a calculated parameter. The calculated value is the sum of m&p-Xylene + o-Xylene.
 1,3-Dichloropropene total is a calculated parameter. The calculated value is the sum of Cis-1,3-Dichloropropene and Trans-1,3-Dichloropropene. The calculated parameter is non-accredited. The parameters that are components of the calculation are accredited.

Analysis performed at AGAT Toronto (unless marked by *)

Certified By:



Certificate of Analysis

AGAT WORK ORDER: 20T673714

PROJECT: Mindemoya GW

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<http://www.agatlabs.com>

CLIENT NAME: WOOD CANADA LTD.

ATTENTION TO: Emily Lemieux

SAMPLING SITE:

SAMPLED BY:

Mindemoya Groundwater Parameters

DATE RECEIVED: 2020-11-05

DATE REPORTED: 2020-11-18

Parameter	Unit	SAMPLE DESCRIPTION:		MW-WS		MW-WD		MW-SS		MW-SD	
		G / S	RDL	Water	1652436	Water	1652464	Water	1652465	Water	1652466
				2020-11-02		2020-11-02		2020-11-03		2020-11-03	
				10:00		10:00		10:00		10:00	
Electrical Conductivity	µS/cm		2	874	2	1010	2	2040	2	2370	
pH	pH Units	6.5-8.5	NA	7.90	NA	7.85	NA	7.88	NA	7.84	
Total Dissolved Solids	mg/L	500	20	506	20	594	20	1250	20	1390	
Alkalinity (as CaCO3)	mg/L	30-500	5	446	5	509	5	826	5	923	
Chloride	mg/L	250	0.50	17.0	0.50	23.6	1.0	124	2.0	160	
Nitrate as N	mg/L		0.25	1.04	0.25	1.56	0.5	<0.5	1.0	<1.0	
Nitrite as N	mg/L		0.25	<0.25	0.25	<0.25	0.5	<0.5	1.0	<1.0	
Sulphate	mg/L	500	0.50	25.7	0.50	37.7	1.0	153	2.0	217	
Ammonia as N	mg/L		0.02	<0.02	0.02	<0.02	0.2	34.0	0.2	24.1	
Total Phosphorus	mg/L		0.02	0.79	0.02	0.14	0.02	0.32	0.02	0.05	
Chemical Oxygen Demand	mg/L		5	23	5	16	5	52	5	49	
Dissolved Organic Carbon	mg/L	5	0.5	3.4	0.5	4.2	0.5	20.2	0.5	18.4	
Phenols	mg/L		0.001	<0.001	0.001	<0.001	0.001	0.004	0.001	0.008	
Dissolved Calcium	mg/L		0.05	95.9	0.25	113	0.25	143	0.25	163	
Dissolved Magnesium	mg/L		0.05	46.1	0.25	54.8	0.25	107	0.25	115	
Dissolved Potassium	mg/L		0.05	4.74	0.25	5.87	0.25	64.3	0.25	58.2	
Dissolved Sodium	mg/L		0.05	10.6	0.25	15.6	0.25	115	0.25	115	
Dissolved Arsenic	mg/L		0.001	<0.001	0.001	0.001	0.001	0.002	0.001	0.001	
Dissolved Barium	mg/L		0.002	0.047	0.002	0.091	0.002	0.114	0.002	0.165	
Dissolved Boron	mg/L		0.010	0.073	0.010	0.099	0.010	0.837	0.010	0.801	
Dissolved Cadmium	mg/L		0.0001	<0.0001	0.0001	<0.0001	0.0001	0.0002	0.0001	0.0003	
Dissolved Chromium	mg/L		0.002	<0.002	0.002	<0.002	0.002	0.005	0.002	0.005	
Dissolved Copper	mg/L		0.001	0.005	0.001	0.005	0.001	0.007	0.001	0.011	
Dissolved Iron	mg/L		0.010	<0.010	0.010	<0.010	0.010	3.26	0.010	<0.010	
Dissolved Lead	mg/L		0.0005	<0.0005	0.0005	<0.0005	0.0005	0.0011	0.0005	0.0006	
Dissolved Manganese	mg/L		0.002	<0.002	0.002	<0.002	0.002	1.24	0.002	2.24	
Dissolved Mercury	mg/L		0.0001	<0.0001	0.0001	<0.0001	0.0001	<0.0001	0.0001	<0.0001	
Dissolved Zinc	mg/L		0.005	<0.005	0.005	<0.005	0.005	0.008	0.005	<0.005	
Lab Filtration Performed			Y		Y		Y		Y		Y

Certified By:

Jris Veraestegui



AGAT Laboratories

Certificate of Analysis

AGAT WORK ORDER: 20T673714

PROJECT: Mindemoya GW

5835 COOPERS AVENUE
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FAX (905)712-5122
<http://www.agatlabs.com>

CLIENT NAME: WOOD CANADA LTD.

ATTENTION TO: Emily Lemieux

SAMPLING SITE:

SAMPLED BY:

Mindemoya Groundwater Parameters

DATE RECEIVED: 2020-11-05

DATE REPORTED: 2020-11-18

Certified By:

Iris Vera'stegui

Certificate of Analysis

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Mindemoya Groundwater Parameters

DATE RECEIVED: 2020-11-05

DATE REPORTED: 2020-11-18

Parameter	Unit	SAMPLE DESCRIPTION:		MW-ES		MW-ED		MW-NS		MW-ND
		G / S	RDL	Water		Water		Water		Water
				2020-11-03		2020-11-03		2020-11-03		2020-11-03
				10:00		10:00		10:00		10:00
				1652467	RDL	1652468	RDL	1652469	RDL	1652470
Electrical Conductivity	µS/cm		2	480	2	660	2	579	2	678
pH	pH Units	6.5-8.5	NA	7.65	NA	7.83	NA	7.88	NA	7.93
Total Dissolved Solids	mg/L	500	20	264	20	368	20	306	20	340
Alkalinity (as CaCO ₃)	mg/L	30-500	5	262	5	362	5	326	5	376
Chloride	mg/L	250	0.10	1.41	0.20	2.54	0.10	1.26	0.20	1.38
Nitrate as N	mg/L		0.05	0.08	0.10	0.16	0.05	0.05	0.10	0.24
Nitrite as N	mg/L		0.05	<0.05	0.10	<0.10	0.05	<0.05	0.10	<0.10
Sulphate	mg/L	500	0.10	5.19	0.20	9.58	0.10	2.42	0.20	10.8
Ammonia as N	mg/L		0.02	<0.02	0.02	0.13	0.02	<0.02	0.02	0.08
Total Phosphorus	mg/L		0.02	0.24	0.02	0.80	0.02	0.23	0.02	0.33
Chemical Oxygen Demand	mg/L		5	17	5	25	5	16	5	17
Dissolved Organic Carbon	mg/L	5	0.5	5.2	0.5	10.3	0.5	6.6	0.5	5.0
Phenols	mg/L		0.001	<0.001	0.001	0.001	0.001	<0.001	0.001	<0.001
Dissolved Calcium	mg/L		0.05	55.9	0.05	80.7	0.05	65.9	0.05	81.6
Dissolved Magnesium	mg/L		0.05	29.7	0.05	30.6	0.05	37.7	0.05	37.1
Dissolved Potassium	mg/L		0.05	0.77	0.05	0.96	0.05	0.46	0.05	1.06
Dissolved Sodium	mg/L		0.05	1.67	0.05	14.4	0.05	0.70	0.05	4.81
Dissolved Arsenic	mg/L		0.001	<0.001	0.001	0.003	0.001	0.001	0.001	0.002
Dissolved Barium	mg/L		0.002	0.015	0.002	0.073	0.002	0.027	0.002	0.034
Dissolved Boron	mg/L		0.010	0.047	0.010	0.033	0.010	0.027	0.010	0.023
Dissolved Cadmium	mg/L		0.0001	<0.0001	0.0001	<0.0001	0.0001	<0.0001	0.0001	<0.0001
Dissolved Chromium	mg/L		0.002	<0.002	0.002	<0.002	0.002	<0.002	0.002	<0.002
Dissolved Copper	mg/L		0.001	0.004	0.001	<0.001	0.001	0.004	0.001	0.002
Dissolved Iron	mg/L		0.010	<0.010	0.010	1.13	0.010	<0.010	0.010	0.026
Dissolved Lead	mg/L		0.0005	<0.0005	0.0005	<0.0005	0.0005	<0.0005	0.0005	<0.0005
Dissolved Manganese	mg/L		0.002	0.029	0.002	1.06	0.002	0.002	0.002	0.213
Dissolved Mercury	mg/L		0.0001	<0.0001	0.0001	<0.0001	0.0001	<0.0001	0.0001	<0.0001
Dissolved Zinc	mg/L		0.005	<0.005	0.005	<0.005	0.005	<0.005	0.005	<0.005
Lab Filtration Performed				Y		Y		Y		Y

Certified By:

Jris Veraestegui



AGAT Laboratories

Certificate of Analysis

AGAT WORK ORDER: 20T673714

PROJECT: Mindemoya GW

5835 COOPERS AVENUE
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CLIENT NAME: WOOD CANADA LTD.

ATTENTION TO: Emily Lemieux

SAMPLING SITE:

SAMPLED BY:

Mindemoya Groundwater Parameters

DATE RECEIVED: 2020-11-05

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SAMPLING SITE:

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Mindemoya Groundwater Parameters

DATE RECEIVED: 2020-11-05

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Parameter	Unit	SAMPLE DESCRIPTION:		MW19-01S	MW19-01D	MW19-02S	MW19-02D	MW19-03A	MW19-03B	MW19-03D	
		G / S	RDL	Water	Water	Water	Water	Water	Water	Water	
				DATE SAMPLED:	DATE SAMPLED:	DATE SAMPLED:	DATE SAMPLED:	DATE SAMPLED:	DATE SAMPLED:	DATE SAMPLED:	
				2020-11-03	2020-11-03	2020-11-02	2020-11-02	2020-11-02	2020-11-02	2020-11-02	
				10:00	10:00	10:00	10:00	10:00	10:00	10:00	
				1652471	1652472	RDL	1652473	1652474	1652475	1652476	1652477
Electrical Conductivity	µS/cm		2	560	535	2	669	647	654	662	700
pH	pH Units	6.5-8.5	NA	7.85	7.96	NA	7.92	8.03	7.97	7.92	7.99
Total Dissolved Solids	mg/L	500	20	298	294	20	380	368	348	330	420
Alkalinity (as CaCO3)	mg/L	30-500	5	308	251	5	361	279	349	353	295
Chloride	mg/L	250	0.10	1.56	4.37	0.20	5.52	13.8	3.96	4.91	23.8
Nitrate as N	mg/L		0.05	0.06	0.11	0.10	0.94	0.28	0.52	0.46	<0.10
Nitrite as N	mg/L		0.05	<0.05	<0.05	0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Sulphate	mg/L	500	0.10	7.63	36.0	0.20	10.2	58.2	15.1	16.1	54.8
Ammonia as N	mg/L		0.02	0.05	<0.02	0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Total Phosphorus	mg/L		0.02	0.37	0.08	0.02	0.20	0.23	0.38	0.57	0.06
Chemical Oxygen Demand	mg/L		5	18	7	5	12	7	11	12	12
Dissolved Organic Carbon	mg/L	5	0.5	5.1	1.3	0.5	4.2	2.2	4.1	4.8	1.8
Phenols	mg/L		0.001	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Dissolved Calcium	mg/L		0.05	61.8	47.1	0.05	73.8	67.5	73.7	72.5	70.5
Dissolved Magnesium	mg/L		0.05	33.6	26.0	0.05	40.0	38.4	41.0	41.3	41.2
Dissolved Potassium	mg/L		0.05	0.77	3.77	0.05	2.41	3.10	1.60	1.68	4.67
Dissolved Sodium	mg/L		0.05	6.27	9.16	0.05	4.56	9.48	4.27	4.33	6.11
Dissolved Arsenic	mg/L		0.001	<0.001	0.001	0.001	<0.001	0.001	<0.001	0.002	0.001
Dissolved Barium	mg/L		0.002	0.016	0.022	0.002	0.016	0.023	0.014	0.018	0.050
Dissolved Boron	mg/L		0.010	0.019	0.063	0.010	0.050	0.034	0.025	0.036	0.086
Dissolved Cadmium	mg/L		0.0001	<0.0001	<0.0001	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Dissolved Chromium	mg/L		0.002	<0.002	<0.002	0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Dissolved Copper	mg/L		0.001	0.003	<0.001	0.001	0.003	<0.001	0.002	0.002	<0.001
Dissolved Iron	mg/L		0.010	<0.010	<0.010	0.010	<0.010	<0.010	<0.010	<0.010	0.020
Dissolved Lead	mg/L		0.0005	<0.0005	<0.0005	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Dissolved Manganese	mg/L		0.002	0.042	0.002	0.002	0.013	0.058	0.004	0.013	0.249
Dissolved Mercury	mg/L		0.0001	<0.0001	<0.0001	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Dissolved Zinc	mg/L		0.005	<0.005	<0.005	0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Lab Filtration Performed				Y	Y		Y	Y	Y	Y	Y

Certified By:

José Verástegui



AGAT Laboratories

Certificate of Analysis

AGAT WORK ORDER: 20T673714

PROJECT: Mindemoya GW

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
<http://www.agatlabs.com>

CLIENT NAME: WOOD CANADA LTD.

ATTENTION TO: Emily Lemieux

SAMPLING SITE:

SAMPLED BY:

Mindemoya Groundwater Parameters

DATE RECEIVED: 2020-11-05

DATE REPORTED: 2020-11-18

Certified By:

Iris Veraístequi

Certificate of Analysis

AGAT WORK ORDER: 20T673714

PROJECT: Mindemoya GW

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CLIENT NAME: WOOD CANADA LTD.

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SAMPLING SITE:

SAMPLED BY:

Mindemoya Groundwater Parameters

DATE RECEIVED: 2020-11-05

DATE REPORTED: 2020-11-18

Parameter	Unit	SAMPLE DESCRIPTION:		MW19-04S		MW19-04D		MIND-DUP1		MIND-DUP2	
		G / S	RDL	Water	1652478	Water	1652479	Water	1652480	Water	1652486
Electrical Conductivity	µS/cm		2	611	2	712	2	714	665		
pH	pH Units	6.5-8.5	NA	8.05	NA	8.01	NA	8.01	7.87		
Total Dissolved Solids	mg/L	500	20	320	20	414	20	398	350		
Alkalinity (as CaCO3)	mg/L	30-500	5	333	5	305	5	305	368		
Chloride	mg/L	250	0.20	2.70	0.20	14.2	0.20	14.4	2.23		
Nitrate as N	mg/L		0.10	<0.10	0.10	0.25	0.10	0.23	0.15		
Nitrite as N	mg/L		0.10	<0.10	0.10	<0.10	0.10	<0.10	<0.10		
Sulphate	mg/L	500	0.20	12.8	0.20	70.5	0.20	70.8	8.92		
Ammonia as N	mg/L		0.02	<0.02	0.02	<0.02	0.02	<0.02	0.16		
Total Phosphorus	mg/L		0.02	0.06	0.02	0.04	0.02	0.04	0.98		
Chemical Oxygen Demand	mg/L		5	8	5	<5	5	6	24		
Dissolved Organic Carbon	mg/L	5	0.5	2.6	1.0	2.0	0.5	1.9	3.5		
Phenols	mg/L		0.001	<0.001	0.001	<0.001	0.001	<0.001	0.001		
Dissolved Calcium	mg/L		0.05	68.4	0.05	74.9	0.05	75.1	78.7		
Dissolved Magnesium	mg/L		0.05	40.0	0.05	40.9	0.05	41.2	30.1		
Dissolved Potassium	mg/L		0.05	0.95	0.05	3.51	0.05	3.50	0.95		
Dissolved Sodium	mg/L		0.05	0.96	0.05	12.9	0.05	12.9	14.5		
Dissolved Arsenic	mg/L		0.001	<0.001	0.001	<0.001	0.001	<0.001	<0.001		
Dissolved Barium	mg/L		0.002	0.020	0.002	0.030	0.002	0.004	0.007		
Dissolved Boron	mg/L		0.010	0.015	0.010	0.065	0.010	<0.010	<0.010		
Dissolved Cadmium	mg/L		0.0001	<0.0001	0.0001	<0.0001	0.0001	<0.0001	<0.0001		
Dissolved Chromium	mg/L		0.002	<0.002	0.002	<0.002	0.002	<0.002	<0.002		
Dissolved Copper	mg/L		0.001	<0.001	0.001	0.003	0.001	<0.001	<0.001		
Dissolved Iron	mg/L		0.010	<0.010	0.010	<0.010	0.010	<0.010	0.111		
Dissolved Lead	mg/L		0.0005	<0.0005	0.0005	<0.0005	0.0005	<0.0005	<0.0005		
Dissolved Manganese	mg/L		0.002	0.021	0.002	0.007	0.002	<0.002	0.091		
Dissolved Mercury	mg/L		0.0001	<0.0001	0.0001	<0.0001	0.0001	<0.0001	<0.0001		
Dissolved Zinc	mg/L		0.005	<0.005	0.005	<0.005	0.005	<0.005	<0.005		
Lab Filtration Performed			Y		Y		Y		Y		Y

Certified By:

Jris Veraestegui



AGAT Laboratories

Certificate of Analysis

AGAT WORK ORDER: 20T673714

PROJECT: Mindemoya GW

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
<http://www.agatlabs.com>

CLIENT NAME: WOOD CANADA LTD.

ATTENTION TO: Emily Lemieux

SAMPLING SITE:

SAMPLED BY:

Mindemoya Groundwater Parameters

DATE RECEIVED: 2020-11-05

DATE REPORTED: 2020-11-18

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to O. Reg 169/03 - Ontario Drinking Water Quality Standards - Aesthetic Objectives and Operational Guidelines
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

1652436-1652486 DOC analysis completed on a lab filtered sample.
Dilution required, RDL has been increased accordingly.

Analysis performed at AGAT Toronto (unless marked by *)

Certified By:

Certificate of Analysis

AGAT WORK ORDER: 20T673714

PROJECT: Mindemoya GW

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CLIENT NAME: WOOD CANADA LTD.

SAMPLING SITE:

ATTENTION TO: Emily Lemieux

SAMPLED BY:

Water Analysis - TKN

DATE RECEIVED: 2020-11-05

DATE REPORTED: 2020-11-18

Parameter	Unit	SAMPLE DESCRIPTION:		MW-WS	MW-WD		MW-SS	MW-SD		MW-ES	MW-ED	
		SAMPLE TYPE:		Water	Water		Water	Water		Water	Water	
		DATE SAMPLED:		2020-11-02 10:00	2020-11-02 10:00		2020-11-03 10:00	2020-11-03 10:00		2020-11-03 10:00	2020-11-03 10:00	
		G / S	RDL		RDL		RDL		RDL			
Total Kjeldahl Nitrogen	mg/L		0.1	0.5	1.0	0.5	36.5	25.4	0.1	0.5	1.1	
Parameter	Unit	SAMPLE DESCRIPTION:		MW-NS	MW-ND	MW19-01S	MW19-01D	MW19-02S	MW19-02D	MW19-03A	MW19-03B	
		SAMPLE TYPE:		Water	Water	Water	Water	Water	Water	Water	Water	Water
		DATE SAMPLED:		2020-11-03 10:00	2020-11-03 10:00	2020-11-03 10:00	2020-11-03 10:00	2020-11-02 10:00	2020-11-02 10:00	2020-11-02 10:00	2020-11-02 10:00	2020-11-02 10:00
		G / S	RDL		RDL		RDL		RDL		RDL	
Total Kjeldahl Nitrogen	mg/L		0.1	0.6	0.9	0.5	0.4	0.6	0.5	0.6	0.8	
Parameter	Unit	SAMPLE DESCRIPTION:		MW19-03D	MW19-04S	MW19-04D	MIND-DUP1	MIND-DUP2				
		SAMPLE TYPE:		Water	Water	Water	Water	Water				
		DATE SAMPLED:		2020-11-02 10:00	2020-11-02 10:00	2020-11-02 10:00	2020-11-02 10:00	2020-11-02 10:00				
		G / S	RDL		RDL		RDL		RDL			
Total Kjeldahl Nitrogen	mg/L		0.1	0.4	0.4	0.4	0.4	1.1				

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

1652465-1652466 Note: Results(TKN) were verified by repeat analysis
Dilution required, RDL has been increased accordingly.

Certified By:

José Verástegui



Exceedance Summary

AGAT WORK ORDER: 20T673714

PROJECT: Mindemoya GW

5835 COOPERS AVENUE
 MISSISSAUGA, ONTARIO
 CANADA L4Z 1Y2
 TEL (905)712-5100
 FAX (905)712-5122
<http://www.agatlabs.com>

CLIENT NAME: WOOD CANADA LTD.

ATTENTION TO: Emily Lemieux

SAMPLEID	SAMPLE TITLE	GUIDELINE	ANALYSIS PACKAGE	PARAMETER	UNIT	GUIDEVALUE	RESULT
1652436	MW-WS	ON 169/03 AO&OG	Mindemoya Groundwater Parameters	Total Dissolved Solids	mg/L	500	506
1652464	MW-WD	ON 169/03 AO&OG	Mindemoya Groundwater Parameters	Alkalinity (as CaCO3)	mg/L	30-500	509
1652464	MW-WD	ON 169/03 AO&OG	Mindemoya Groundwater Parameters	Total Dissolved Solids	mg/L	500	594
1652465	MW-SS	ON 169/03 AO&OG	Mindemoya Groundwater Parameters	Alkalinity (as CaCO3)	mg/L	30-500	826
1652465	MW-SS	ON 169/03 AO&OG	Mindemoya Groundwater Parameters	Dissolved Organic Carbon	mg/L	5	20.2
1652465	MW-SS	ON 169/03 AO&OG	Mindemoya Groundwater Parameters	Total Dissolved Solids	mg/L	500	1250
1652466	MW-SD	ON 169/03 AO&OG	Mindemoya Groundwater Parameters	Alkalinity (as CaCO3)	mg/L	30-500	923
1652466	MW-SD	ON 169/03 AO&OG	Mindemoya Groundwater Parameters	Dissolved Organic Carbon	mg/L	5	18.4
1652466	MW-SD	ON 169/03 AO&OG	Mindemoya Groundwater Parameters	Total Dissolved Solids	mg/L	500	1390
1652467	MW-ES	ON 169/03 AO&OG	Mindemoya Groundwater Parameters	Dissolved Organic Carbon	mg/L	5	5.2
1652468	MW-ED	ON 169/03 AO&OG	Mindemoya Groundwater Parameters	Dissolved Organic Carbon	mg/L	5	10.3
1652469	MW-NS	ON 169/03 AO&OG	Mindemoya Groundwater Parameters	Dissolved Organic Carbon	mg/L	5	6.6
1652471	MW19-01S	ON 169/03 AO&OG	Mindemoya Groundwater Parameters	Dissolved Organic Carbon	mg/L	5	5.1

Quality Assurance

CLIENT NAME: WOOD CANADA LTD.
 PROJECT: Mindemoya GW
 SAMPLING SITE:

AGAT WORK ORDER: 20T673714
 ATTENTION TO: Emily Lemieux
 SAMPLED BY:

Trace Organics Analysis


RPT Date: Nov 18, 2020			DUPLICATE				Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Measured Value		Acceptable Limits			Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper	Lower		Upper	Lower		Upper	

Volatile Organic Compounds in Water (ug/L)

Vinyl Chloride	1652480	1652480	<0.17	<0.17	NA	< 0.17	103%	50%	140%	87%	50%	140%	76%	50%	140%
Methylene Chloride	1652480	1652480	<0.30	<0.30	NA	< 0.30	83%	50%	140%	92%	60%	130%	72%	50%	140%
Benzene	1652480	1652480	<0.20	<0.20	NA	< 0.20	81%	50%	140%	79%	60%	130%	82%	50%	140%
Toluene	1652480	1652480	<0.20	<0.20	NA	< 0.20	104%	50%	140%	104%	60%	130%	99%	50%	140%
1,4-Dichlorobenzene	1652480	1652480	<0.10	<0.10	NA	< 0.10	106%	50%	140%	104%	60%	130%	102%	50%	140%

Comments: When the average of the sample and duplicate results is less than 5x the RDL, the Relative Percent Difference (RPD) will be indicated as Not Applicable (NA).

Certified By: _____



Quality Assurance

CLIENT NAME: WOOD CANADA LTD.
PROJECT: Mindemoya GW
SAMPLING SITE:

AGAT WORK ORDER: 20T673714
ATTENTION TO: Emily Lemieux
SAMPLED BY:

Water Analysis																
RPT Date: Nov 18, 2020			DUPLICATE				Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Measured Value		Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits		
								Lower	Upper		Lower	Upper		Lower	Upper	

Mindemoya Groundwater Parameters

Electrical Conductivity	1652293		659	661	0.3%	< 2	98%	90%	110%						
pH	1652293		8.07	8.01	0.7%	NA	100%	90%	110%						
Total Dissolved Solids	1652436	1652436	506	518	2.3%	< 20	102%	80%	120%						
Alkalinity (as CaCO3)	1652293		206	208	1.0%	< 5	98%	80%	120%						
Chloride	1652436	1652436	17.0	17.1	0.6%	< 0.10	95%	70%	130%	103%	80%	120%	104%	70%	130%
Nitrate as N	1652436	1652436	1.04	1.08	3.8%	< 0.05	101%	70%	130%	107%	80%	120%	108%	70%	130%
Nitrite as N	1652436	1652436	<0.25	<0.25	NA	< 0.05	95%	70%	130%	101%	80%	120%	94%	70%	130%
Sulphate	1652436	1652436	25.7	26.5	3.1%	< 0.10	101%	70%	130%	105%	80%	120%	107%	70%	130%
Ammonia as N	1652307		0.03	0.04	NA	< 0.02	110%	70%	130%	105%	80%	120%	94%	70%	130%
Total Phosphorus	1624139		0.08	0.08	NA	< 0.02	101%	70%	130%	97%	80%	120%	99%	70%	130%
Chemical Oxygen Demand	1652297		8	10	NA	< 5	103%	80%	120%	100%	90%	110%	112%	70%	130%
Dissolved Organic Carbon	1655221		3.1	3.1	0.0%	< 0.5	100%	90%	110%	94%	90%	110%	95%	80%	120%
Phenols	1675437		<0.001	<0.001	NA	< 0.001	96%	90%	110%	99%	90%	110%	95%	80%	120%
Dissolved Calcium	1653384		6.91	6.93	0.3%	< 0.05	97%	70%	130%	98%	80%	120%	98%	70%	130%
Dissolved Magnesium	1653384		2.27	2.29	0.9%	< 0.05	101%	70%	130%	103%	80%	120%	101%	70%	130%
Dissolved Potassium	1653384		0.83	0.82	1.2%	< 0.05	95%	70%	130%	97%	80%	120%	96%	70%	130%
Dissolved Sodium	1653384		18.6	18.6	0.0%	< 0.05	99%	70%	130%	101%	80%	120%	100%	70%	130%
Dissolved Arsenic	1652436	1652436	<0.001	<0.001	NA	< 0.001	103%	70%	130%	111%	80%	120%	123%	70%	130%
Dissolved Barium	1652436	1652436	0.047	0.047	0.0%	< 0.002	99%	70%	130%	100%	80%	120%	99%	70%	130%
Dissolved Boron	1652436	1652436	0.073	0.073	0.0%	< 0.010	104%	70%	130%	104%	80%	120%	110%	70%	130%
Dissolved Cadmium	1652436	1652436	<0.0001	<0.0001	NA	< 0.0001	100%	70%	130%	108%	80%	120%	113%	70%	130%
Dissolved Chromium	1652436	1652436	<0.002	<0.002	NA	< 0.002	99%	70%	130%	100%	80%	120%	109%	70%	130%
Dissolved Copper	1652436	1652436	0.005	0.005	0.0%	< 0.001	99%	70%	130%	104%	80%	120%	107%	70%	130%
Dissolved Iron	1652436	1652436	<0.010	<0.010	NA	< 0.010	96%	70%	130%	96%	80%	120%	105%	70%	130%
Dissolved Lead	1652436	1652436	<0.0005	<0.0005	NA	< 0.0005	99%	70%	130%	106%	80%	120%	105%	70%	130%
Dissolved Manganese	1652436	1652436	<0.002	<0.002	NA	< 0.002	92%	70%	130%	98%	80%	120%	105%	70%	130%
Dissolved Mercury	1652436	1652436	<0.0001	<0.0001	NA	< 0.0001	103%	70%	130%	98%	80%	120%	105%	70%	130%
Dissolved Zinc	1652436	1652436	<0.005	<0.005	NA	< 0.005	101%	70%	130%	106%	80%	120%	116%	70%	130%

Water Analysis - TKN

Total Kjeldahl Nitrogen	1661513	1661513	0.8	0.8	0.0%	< 0.1	83%	70%	130%	97%	80%	120%	87%	70%	130%
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Comments: NA signifies Not Applicable.
 If the RPD value is NA, the results of the duplicates are under 5X the RDL and will not be calculated.

Certified By:

Jris Verastegui

Method Summary

CLIENT NAME: WOOD CANADA LTD.

AGAT WORK ORDER: 20T673714

PROJECT: Mindemoya GW

ATTENTION TO: Emily Lemieux

SAMPLING SITE:

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Trace Organics Analysis			
Vinyl Chloride	VOL-91-5001	modified from EPA 5030B & EPA 8260D	(P&T)GC/MS
Methylene Chloride	VOL-91-5001	modified from EPA 5030B & EPA 8260D	(P&T)GC/MS
Benzene	VOL-91-5001	modified from EPA 5030B & EPA 8260D	(P&T)GC/MS
Toluene	VOL-91-5001	modified from EPA 5030B & EPA 8260D	(P&T)GC/MS
1,4-Dichlorobenzene	VOL-91-5001	modified from EPA 5030B & EPA 8260D	(P&T)GC/MS
Toluene-d8	VOL-91-5001	modified from EPA 5030B & EPA 8260D	(P&T)GC/MS
4-Bromofluorobenzene	VOL-91-5001	modified from EPA 5030B & EPA 8260D	(P&T)GC/MS

Method Summary

CLIENT NAME: WOOD CANADA LTD.

AGAT WORK ORDER: 20T673714

PROJECT: Mindemoya GW

ATTENTION TO: Emily Lemieux

SAMPLING SITE:

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Water Analysis			
Electrical Conductivity	INOR-93-6000	modified from SM 2510 B	PC TITRATE
pH	INOR-93-6000	modified from SM 4500-H+ B	PC TITRATE
Total Dissolved Solids	INOR-93-6028	modified from EPA 1684,ON MOECC E3139,SM 2540C,D	BALANCE
Alkalinity (as CaCO ₃)	INOR-93-6000	SM 2320 B	PC TITRATE
Chloride	INOR-93-6004	modified from SM 4110 B	ION CHROMATOGRAPH
Nitrate as N	INOR-93-6004	modified from SM 4110 B	ION CHROMATOGRAPH
Nitrite as N	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH
Sulphate	INOR-93-6004	modified from SM 4110 B	ION CHROMATOGRAPH
Ammonia as N	INOR-93-6059	modified from SM 4500-NH ₃ H	LACHAT FIA
Total Phosphorus	INOR-93-6057	modified from LACHAT 10-115-01-3A	LACHAT FIA
Chemical Oxygen Demand	INOR-93-6042	SM 5220 D	SPECTROPHOTOMETER
Dissolved Organic Carbon	INOR-93-6049	modified from SM 5310 B	SHIMADZU CARBON ANALYZER
Phenols	INOR-93-6072	modified from SM 5530 D	LACHAT FIA
Dissolved Calcium	MET-93-6105	modified from EPA 6010D	ICP/OES
Dissolved Magnesium	MET-93-6105	modified from EPA 6010D	ICP/OES
Dissolved Potassium	MET-93-6105	modified from EPA 6010D	ICP/OES
Dissolved Sodium	MET-93-6105	modified from EPA 6010D	ICP/OES
Dissolved Arsenic	MET-93-6103	modified from EPA 200.8 and EPA 3005A	ICP-MS
Dissolved Barium	MET-93-6103	modified from EPA 200.8 and EPA 3005A	ICP-MS
Dissolved Boron	MET-93-6103	modified from EPA 200.8 and EPA 3005A	ICP-MS
Dissolved Cadmium	MET-93-6103	modified from EPA 200.8 and EPA 3005A	ICP-MS
Dissolved Chromium	MET-93-6103	modified from EPA 200.8 and EPA 3005A	ICP-MS
Dissolved Copper	MET-93-6103	modified from EPA 200.8 and EPA 3005A	ICP-MS
Dissolved Iron	MET-93-6103	modified from EPA 200.8 and EPA 3005A	ICP-MS
Dissolved Lead	MET-93-6103	modified from EPA 200.8 and EPA 3005A	ICP-MS
Dissolved Manganese	MET-93-6103	modified from EPA 200.8 and EPA 3005A	ICP-MS
Dissolved Mercury	MET-93-6100	modified from EPA 245.2 and SM 3112 B	CVAAS
Dissolved Zinc	MET-93-6103	modified from EPA 200.8 and EPA 3005A	ICP-MS
Lab Filtration Performed			FILTRATION
Total Kjeldahl Nitrogen	INST 0520	EPA 351.2	DISCRETE ANALYZER



AGAT Laboratories

8167 BIK

5835 Coopers Avenue
Mississauga, Ontario L4Z 1Y2
Ph: 905.712.5100 Fax: 905.712.5122
webearth.agatlabs.com

Laboratory Use Only
Work Order #: 20T673714
Cooler Quantity: _____
Arrival Temperatures: See attached
Custody Seal Intact: Yes No N/A
Notes: on ice

Chain of Custody Record

If this is a Drinking Water sample, please use Drinking Water Chain of Custody Form (potable water consumed by humans)

Report Information:
Company: Wood
Contact: Emily Lemieux
Address: 131 Fielding Road
Lively, ON P3Y 1L7
Phone: 705-602-2632 Fax: 705 682 2260
Reports to be sent to: emily.lemieux@woodplc.com
1. Email: _____
2. Email: _____

Regulatory Requirements: No Regulatory Requirement
(Please check all applicable boxes)

Regulation 153/04 Sewer Use Regulation 558
Table Indicate One Sanitary CCME
 Ind/Com Storm Prov. Water Quality Objectives (PWQO)
 Res/Park Storm Other
 Agriculture Storm Other
Soil Texture (Check One) Region _____
 Coarse Fine MISA Indicate One

Turnaround Time (TAT) Required:
Regular TAT 5 to 7 Business Days
Rush TAT (Rush Surcharges Apply)
 3 Business Days 2 Business Days Next Business Day
OR Date Required (Rush Surcharges May Apply): _____
*Please provide prior notification for rush TAT
TAT is exclusive of weekends and statutory holidays
For 'Same Day' analysis, please contact your AGAT CPM

Project Information:
Project: Mindemoya GW
Site Location: _____
Sampled By: _____
AGAT Quote #: 42882 PO: _____
Please note: If quotation number is not provided, client will be billed full price for analysis.

Is this submission for a Record of Site Condition?
 Yes No

Report Guideline on Certificate of Analysis
 Yes No

Invoice Information: Bill To Same: Yes No
Company: _____
Contact: _____
Address: _____
Email: _____

Sample Matrix Legend
B Biota
GW Ground Water
O Oil
P Paint
S Soil
SD Sediment
SW Surface Water

Y/N	O. Reg 153														Field Filtered - Metals, Hg, CrVI			
	Metals and Inorganics	All Metals	Hydride Metals	ORPs	Cr*	pH	Full Metals Scan	Regulation/Custom Metals	Nutrients	Volatiles	PHCs F1 - F4	ABNS	PAHs	PCBs		Organochlorine Pesticides	TCLP	Sewer Use
Y	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Y	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Y	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Y	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Y	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Y	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Y	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Y	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Y	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Y	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Samples Relinquished By (Print Name and Sign): <u>P. Courchesne</u>	Date: <u>09 Nov 20</u>	Time: <u>10:00</u>	Samples Received By (Print Name and Sign): <u>SIMRAN</u>	Date: <u>Nov 5/20</u>	Time: <u>10:00am</u>
Samples Relinquished By (Print Name and Sign):	Date:	Time:	Samples Received By (Print Name and Sign):	Date:	Time:
Samples Relinquished By (Print Name and Sign):	Date:	Time:	Samples Received By (Print Name and Sign):	Date:	Time:

Page 1 of 2



AGAT Laboratories

5835 Coopers Avenue
Mississauga, Ontario L4Z 1Y2
Ph: 905.712.5100 Fax: 905.712.5122
webearth.agatlabs.com

Laboratory Use Only

Work Order #: 20T673714

Cooler Quantity: _____

Arrival Temperatures: _____

Custody Seal Intact: Yes No N/A

Notes: _____

Chain of Custody Record

If this is a Drinking Water sample, please use Drinking Water Chain of Custody Form (potable water consumed by humans)

Report Information:

Company: Wood
Contact: Emily Lemieux
Address: 131 Fielding Road
Lively, ON P3Y 1L7
Phone: 705-682-2632 Fax: 705-682-2260
Reports to be sent to: emily.lemieux@woodplc.com
1. Email: _____
2. Email: _____

Regulatory Requirements: No Regulatory Requirement

(Please check all applicable boxes)

Regulation 153/04 Sewer Use Regulation 558

Table Indicate One

Ind/Com
 Res/Park
 Agriculture

Sanitary

Storm

CCME

Prov. Water Quality Objectives (PWQO)

Other

Soil Texture (Check One)

Coarse

Fine

Region Indicate One

MISA

ODWS
Indicate One

Is this submission for a Record of Site Condition?
 Yes No

Report Guideline on Certificate of Analysis
 Yes No

Project Information:

Project: Mindemoya GW
Site Location: _____
Sampled By: _____
AGAT Quote #: 42882 PO: _____
Please note: If quotation number is not provided, client will be billed full price for analysis.

Invoice Information:

Bill To Same: Yes No

Company: _____
Contact: _____
Address: _____
Email: _____

Sample Matrix Legend

B Biota
GW Ground Water
O Oil
P Paint
S Soil
SD Sediment
SW Surface Water

Field Filtered - Metals, Hg, CVI

O. Reg 153

Metals and Inorganics

All Metals 153 Metals (excl. Hydrides)

Hydride Metals 153 Metals (Incl. Hydrides)

ORPs: B+WS Cl CN

Cr⁶⁺ EC FOC Hg

pH SAR

Full Metals Scan

Regulation/Custom Metals

Nutrients: TP NH₃ TKN

NO₃ NO₂ NO_x+NO₂

Volatiles: VOC BTEX THM

PHCs F1 - F4

ABNS

PAHs

PCBs: Total Atoclor

Organochlorine Pesticides

TCLP: M&I VOCs ABNs B(a)P PCBs

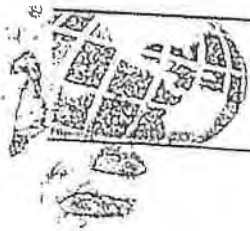
Sewer Use

Groundwater Column

Sample Identification	Date Sampled	Time Sampled	# of Containers	Sample Matrix	Comments/ Special Instructions	Y/N	Field Filtered - Metals, Hg, CVI	Metals and Inorganics	O. Reg 153	Regulation/Custom Metals	Nutrients: TP, NH ₃ , TKN, NO ₃ , NO ₂ , NO _x +NO ₂	Volatiles: VOC, BTEX, THM	PHCs F1 - F4	ABNS	PAHs	PCBs: Total, Atoclor	Organochlorine Pesticides	TCLP: M&I, VOCs, ABNs, B(a)P, PCBs	Sewer Use	Groundwater Column	
MW19-02D	02 Nov 20	10:00	10	Water		Y															<input checked="" type="checkbox"/>
MW19-03A	02		10	Water		Y															<input checked="" type="checkbox"/>
MW19-03B	02		10	Water		Y															<input checked="" type="checkbox"/>
MW19-03D	02		10	Water		Y															<input checked="" type="checkbox"/>
MW19-04S	02		10	Water		Y															<input checked="" type="checkbox"/>
MW19-04D	02		10	Water		Y															<input checked="" type="checkbox"/>
MIND-DUP1	-	-	10	Water		Y															<input checked="" type="checkbox"/>
MIND-DUP2	-	-	10	Water		Y															<input checked="" type="checkbox"/>

Samples Relinquished By (Print Name and Sign) <u>D. Goussard</u>	Date <u>02 Nov 20</u>	Time <u>1000</u>	Samples Received By (Print Name and Sign)	Date	Time
Samples Relinquished By (Print Name and Sign)	Date	Time	Samples Received By (Print Name and Sign)	Date	Time
Samples Relinquished By (Print Name and Sign)	Date	Time	Samples Received By (Print Name and Sign)	Date	Time

Page 2 of 2



AGAT

Laboratories

Sample Temperature Log

Client: WOOD

of Coolers: 8

COC# or Work Order #: _____

Arrival Temperatures - Branch/Driver

Cooler #1: 3.2 / 3.3 / 3.5

Cooler #2: 4.1 / 4.9 / 5.2

Cooler #3: 3.9 / 3.6 / 3.8

Cooler #4: 2.0 / 2.3 / 2.9

Cooler #5: 4.1 / 4.3 / 4.8

Cooler #6: 3.1 / 3.2 / 3.5

Cooler #7: 4.4 / 4.6 / 5.3

Cooler #8: 4.3 / 4.8 / 4.7

Cooler #9: _____ / _____ / _____

Cooler #10: _____ / _____ / _____

of Submissions: 2

Arrival Temperatures - Laboratory

Cooler #1: _____ / _____ / _____

Cooler #2: _____ / _____ / _____

Cooler #3: _____ / _____ / _____

Cooler #4: _____ / _____ / _____

Cooler #5: _____ / _____ / _____

Cooler #6: _____ / _____ / _____

Cooler #7: _____ / _____ / _____

Cooler #8: _____ / _____ / _____

Cooler #9: _____ / _____ / _____

Cooler #10: _____ / _____ / _____

IR Gun ID: _____

Taken By: SIMRAN 

IR Gun ID: _____

Taken By: _____

Date (yyyy/mm/dd): 2020/11/05

Time: 10:00 AM / PM

Date: _____

(yyyy/mm/dd): _____

Time: _____: _____ AM / PM

Instructions for use of this form: 1) complete all fields of info including total # of coolers and # of submissions rec'd, 2) photocopy and place in each submission prior to giving a WO#, 3) Proceed as normal, write the WO# and scan (please make sure to scan along with the COC)

The Municipality of Central Manitoulin
2020 Annual Groundwater Monitoring Report
Mindemoya Waste Disposal Site
Mindemoya, Ontario
December 2020



APPENDIX E

**SUMMARY OF GROUNDWATER
GEOCHEMICAL ANALYSES**

Groundwater Geochemical Results MW19-01D

Parameters	Units	ODWS ⁽¹⁾	Sep-19	Nov-19	Nov-20
General Chemistry					
Alkalinity (Total as CaCO ₃)	mg/L	30-500 OG ⁽²⁾	221	250	251
Ammonia	mg/L		0.1	0.03	<0.02
Chloride	mg/L	250 AO ⁽³⁾	288	88.9	4.37
COD	mg/L		7	<5	7
Conductivity	umho/cm		1420	813	535
Dissolved Organic Carbon (DOC)	mg/L	5 AO	2.6	2.0	1.3
Nitrate (N)	mg/L	10 MAC ⁽⁴⁾	<0.25	<0.25	0.11
Nitrite (N)	mg/L	1 MAC	<0.25	<0.25	<0.05
pH	pH	6.5-8.5	7.74	7.71	7.96
Phenols	mg/L			<0.001	<0.001
Total Phosphorus	mg/L		0.38	0.03	0.08
Sulphate	mg/L	500 AO	97.4	71.4	36.0
Total Dissolved Solids (TDS)	mg/L	500 AO	710	314	294
TKN	mg/L		0.5	0.19	0.4
Metals					
Arsenic	mg/L	0.01 MAC	0.006	<0.003	0.001
Barium	mg/L	1 MAC	0.096	0.056	0.022
Boron	mg/L	5 IMAC	0.181	0.112	0.063
Cadmium	mg/L	0.005 MAC	<0.002	<0.002	<0.0001
Calcium	mg/L		125	81.2	47.1
Chromium	mg/L	0.05 MAC	<0.003	<0.003	<0.002
Copper	mg/L	1 AO	0.004	0.004	<0.001
Iron	mg/L	0.3 AO	<0.010	0.036	<0.010
Lead	mg/L	0.01 MAC	<0.001	<0.001	<0.0005
Magnesium	mg/L		63.8	42.2	26.0
Manganese	mg/L	0.05 AO	0.133	0.093	0.002
Mercury	mg/L	0.001 MAC	<0.0001	<0.0001	<0.0001
Potassium	mg/L		10.9	6.5	3.8
Sodium	mg/L	200 AO	47.2	17.7	9.16
Zinc	mg/L	5 AO	0.008	<0.005	<0.005
Volatile Organic Compounds					
1,4-Dichlorobenzene	mg/L	0.005 MAC	<0.0001	<0.0001	<0.0001
Benzene	mg/L	0.001 MAC	<0.0002	<0.0002	<0.0002
Methylene Chloride(Dichloromethane)	mg/L	0.05 MAC	<0.0003	<0.0003	<0.0003
Toluene	mg/L	0.024 AO	0.00040	0.00033	<0.0002
Vinyl Chloride	mg/L	0.001 MAC	<0.00017	<0.00017	<0.00017

Notes:

- (1) MECP Ontario Drinking Water Standards.
- (2) Operational Guideline (OG) within ODWS.
- (3) Aesthetic Objective (AO) within ODWS.
- (4) Maximum Acceptable Concentration (MAC) within ODWS.
- (5) ODWS exceedances indicated by **bold** and shaded entries.

Groundwater Geochemical Results MW19-01S

Parameters	Units	ODWS ⁽¹⁾	Sep-19	Nov-19	Nov-20
General Chemistry					
Alkalinity (Total as CaCO3)	mg/L	30-500 OG ⁽²⁾	287	343	308
Ammonia	mg/L		0.2	0.2	0.1
Chloride	mg/L	250 AO ⁽³⁾	12.6	16.0	1.56
COD	mg/L		10	10	18
Conductivity	umho/cm		611	672	560
Dissolved Organic Carbon (DOC)	mg/L	5 AO	2.0	3.4	5.1
Nitrate (N)	mg/L	10 MAC ⁽⁴⁾	<0.10	1.26	0.06
Nitrite (N)	mg/L	1 MAC	<0.10	<0.10	<0.05
pH	pH	6.5-8.5	7.74	7.63	7.85
Phenols	mg/L			<0.001	<0.001
Total Phosphorus	mg/L		0.57	0.34	0.37
Sulphate	mg/L	500 AO	20.3	14.6	7.63
Total Dissolved Solids (TDS)	mg/L	500 AO	296	368	298
TKN	mg/L		0.56	0.75	0.5
Metals					
Arsenic	mg/L	0.01 MAC	<0.003	<0.003	<0.001
Barium	mg/L	1 MAC	0.031	0.018	0.016
Boron	mg/L	5 IMAC	0.026	0.048	0.019
Cadmium	mg/L	0.005 MAC	<0.002	<0.002	<0.0001
Calcium	mg/L		57.9	75.0	61.8
Chromium	mg/L	0.05 MAC	<0.003	<0.003	<0.002
Copper	mg/L	1 AO	<0.003	0.005	0.003
Iron	mg/L	0.3 AO	0.074	0.031	<0.010
Lead	mg/L	0.01 MAC	<0.001	<0.001	<0.0005
Magnesium	mg/L		29.7	40.0	33.6
Manganese	mg/L	0.05 AO	0.16	0.02	0.04
Mercury	mg/L	0.001 MAC	<0.0001	<0.0001	<0.0001
Potassium	mg/L		0.60	3.26	0.77
Sodium	mg/L	200 AO	27.2	8.14	6.27
Zinc	mg/L	5 AO	0.006	<0.005	<0.005
Volatile Organic Compounds					
1,4-Dichlorobenzene	mg/L	0.005 MAC	<0.0001	<0.0001	<0.0001
Benzene	mg/L	0.001 MAC	<0.0002	<0.0002	<0.0002
Methylene Chloride(Dichloromethane)	mg/L	0.05 MAC	<0.0003	<0.0003	<0.0003
Toluene	mg/L	0.024 AO	<0.0002	<0.0002	<0.0002
Vinyl Chloride	mg/L	0.001 MAC	<0.00017	<0.00017	<0.00017

Notes:

- (1) MECP Ontario Drinking Water Standards.
- (2) Operational Guideline (OG) within ODWS.
- (3) Aesthetic Objective (AO) within ODWS.
- (4) Maximum Acceptable Concentration (MAC) within ODWS.
- (5) ODWS exceedances indicated by **bold** and shaded entries.

Groundwater Geochemical Results MW19-02D

Parameters	Units	ODWS ⁽¹⁾	Sep-19	Nov-19	Nov-20
General Chemistry					
Alkalinity (Total as CaCO ₃)	mg/L	30-500 OG ⁽²⁾	212	256	279
Ammonia	mg/L		0.12	<0.02	<0.02
Chloride	mg/L	250 AO ⁽³⁾	320	80.5	13.8
COD	mg/L		28	11	7
Conductivity	umho/cm		1460	835	647
Dissolved Organic Carbon (DOC)	mg/L	5 AO		2.9	2.2
Nitrate (N)	mg/L	10 MAC ⁽⁴⁾	0.6	<0.25	0.28
Nitrite (N)	mg/L	1 MAC	<0.25	<0.25	<0.10
pH	pH	6.5-8.5	7.61	7.79	8.03
Phenols	mg/L			<0.001	<0.001
Total Phosphorus	mg/L		2.37	0.19	0.23
Sulphate	mg/L	500 AO	79.9	65.0	58.2
Total Dissolved Solids (TDS)	mg/L	500 AO	1080	372	368
TKN	mg/L		2.18	0.22	0.5
Metals					
Arsenic	mg/L	0.01 MAC	0.006	0.004	0.001
Barium	mg/L	1 MAC	0.07	0.053	0.023
Boron	mg/L	5 IMAC	0.195	0.106	0.034
Cadmium	mg/L	0.005 MAC	<0.002	<0.002	<0.0001
Calcium	mg/L		109	79.9	67.5
Chromium	mg/L	0.05 MAC	<0.003	<0.003	<0.002
Copper	mg/L	1 AO	0.017	0.005	<0.001
Iron	mg/L	0.3 AO	<0.010	<0.010	<0.010
Lead	mg/L	0.01 MAC	<0.001	<0.001	<0.0005
Magnesium	mg/L		57.1	42.3	38.4
Manganese	mg/L	0.05 AO	0.109	0.137	0.058
Mercury	mg/L	0.001 MAC	<0.0001	<0.0001	<0.0001
Potassium	mg/L		10.3	5.12	3.1
Sodium	mg/L	200 AO	69.5	16.8	9.48
Zinc	mg/L	5 AO	0.01	<0.005	<0.005
Volatile Organic Compounds					
1,4-Dichlorobenzene	mg/L	0.005 MAC		<0.0001	<0.0001
Benzene	mg/L	0.001 MAC		<0.0002	<0.0002
Methylene Chloride(Dichloromethane)	mg/L	0.05 MAC		<0.0003	<0.0003
Toluene	mg/L	0.024 AO		0.00065	<0.0002
Vinyl Chloride	mg/L	0.001 MAC		<0.00017	<0.00017

Notes:

- (1) MECP Ontario Drinking Water Standards.
- (2) Operational Guideline (OG) within ODWS.
- (3) Aesthetic Objective (AO) within ODWS.
- (4) Maximum Acceptable Concentration (MAC) within ODWS.
- (5) ODWS exceedances indicated by **bold** and shaded entries.

Groundwater Geochemical Results MW19-02S

Parameters	Units	ODWS ⁽¹⁾	Sep-19	Nov-19	Nov-20
General Chemistry					
Alkalinity (Total as CaCO ₃)	mg/L	30-500 OG ⁽²⁾	555	246	361
Ammonia	mg/L		7.22	0.17	<0.02
Chloride	mg/L	250 AO ⁽³⁾	53.3	3.56	5.52
COD	mg/L		16	33	12
Conductivity	umho/cm		1200	497	669
Dissolved Organic Carbon (DOC)	mg/L	5 AO	5.5	4.4	4.2
Nitrate (N)	mg/L	10 MAC ⁽⁴⁾	1.15	<0.05	0.94
Nitrite (N)	mg/L	1 MAC	<0.25	<0.05	<0.10
pH	pH	6.5-8.5	7.90	7.66	7.92
Phenols	mg/L			<0.001	<0.001
Total Phosphorus	mg/L		0.57	0.63	0.2
Sulphate	mg/L	500 AO	31.8	8.7	10.2
Total Dissolved Solids (TDS)	mg/L	500 AO	620	218	380
TKN	mg/L		7.87	0.37	0.6
Metals					
Arsenic	mg/L	0.01 MAC	<0.003	<0.003	<0.001
Barium	mg/L	1 MAC	0.066	0.019	0.016
Boron	mg/L	5 IMAC	0.228	0.014	0.050
Cadmium	mg/L	0.005 MAC	<0.002	<0.002	<0.0001
Calcium	mg/L		119	48.9	73.8
Chromium	mg/L	0.05 MAC	<0.003	<0.003	<0.002
Copper	mg/L	1 AO	0.008	0.005	0.003
Iron	mg/L	0.3 AO	<0.010	0.129	<0.010
Lead	mg/L	0.01 MAC	<0.001	<0.001	<0.0005
Magnesium	mg/L		61.2	25.0	40.0
Manganese	mg/L	0.05 AO	0.088	0.063	0.013
Mercury	mg/L	0.001 MAC	<0.0001	<0.0001	<0.0001
Potassium	mg/L		12.6	0.42	2.41
Sodium	mg/L	200 AO	33.3	11.4	4.6
Zinc	mg/L	5 AO	<0.005	<0.005	<0.005
Volatile Organic Compounds					
1,4-Dichlorobenzene	mg/L	0.005 MAC	<0.0001	<0.0001	<0.0001
Benzene	mg/L	0.001 MAC	<0.0002	<0.0002	<0.0002
Methylene Chloride(Dichloromethane)	mg/L	0.05 MAC	<0.0003	<0.0003	<0.0003
Toluene	mg/L	0.024 AO	<0.0002	<0.0002	<0.0002
Vinyl Chloride	mg/L	0.001 MAC	<0.00017	<0.00017	<0.00017

Notes:

- (1) MECP Ontario Drinking Water Standards.
- (2) Operational Guideline (OG) within ODWS.
- (3) Aesthetic Objective (AO) within ODWS.
- (4) Maximum Acceptable Concentration (MAC) within ODWS.
- (5) ODWS exceedances indicated by **bold** and shaded entries.

Groundwater Geochemical Results MW19-03A

Parameters	Units	ODWS ⁽¹⁾	Sep-19	Nov-19	Nov-20
General Chemistry					
Alkalinity (Total as CaCO ₃)	mg/L	30-500 OG ⁽²⁾	362	303	349
Ammonia	mg/L			0.03	<0.02
Chloride	mg/L	250 AO ⁽³⁾	272	18.2	4.0
COD	mg/L			6	11
Conductivity	umho/cm		1540	643	654
Dissolved Organic Carbon (DOC)	mg/L	5 AO		4.7	4.1
Nitrate (N)	mg/L	10 MAC ⁽⁴⁾	<0.25	0.44	0.52
Nitrite (N)	mg/L	1 MAC	<0.25	<0.10	<0.10
pH	pH	6.5-8.5	7.82	7.78	7.97
Phenols	mg/L			<0.001	<0.001
Total Phosphorus	mg/L			0.97	0.38
Sulphate	mg/L	500 AO	78.5	19.2	15.1
Total Dissolved Solids (TDS)	mg/L	500 AO	1080	320	348
TKN	mg/L			0.43	0.6
Metals					
Arsenic	mg/L	0.01 MAC	0.007	<0.003	<0.001
Barium	mg/L	1 MAC	0.110	0.025	0.014
Boron	mg/L	5 IMAC	0.208	0.032	0.025
Cadmium	mg/L	0.005 MAC	<0.002	<0.002	<0.0001
Calcium	mg/L		147	67.4	73.7
Chromium	mg/L	0.05 MAC	<0.003	<0.003	<0.002
Copper	mg/L	1 AO	0.003	0.005	0.002
Iron	mg/L	0.3 AO	<0.010	<0.010	<0.010
Lead	mg/L	0.01 MAC	<0.001	<0.001	<0.0005
Magnesium	mg/L		75.5	37.7	41.0
Manganese	mg/L	0.05 AO	0.354	0.030	0.004
Mercury	mg/L	0.001 MAC	<0.0001	<0.0001	<0.0001
Potassium	mg/L		21.2	2.52	1.6
Sodium	mg/L	200 AO	8.48	4.18	4.27
Zinc	mg/L	5 AO	0.014	<0.005	<0.005
Volatile Organic Compounds					
1,4-Dichlorobenzene	mg/L	0.005 MAC		<0.0001	<0.0001
Benzene	mg/L	0.001 MAC		<0.0002	<0.0002
Methylene Chloride(Dichloromethane)	mg/L	0.05 MAC		<0.0003	<0.0003
Toluene	mg/L	0.024 AO		<0.0002	<0.0002
Vinyl Chloride	mg/L	0.001 MAC		<0.00017	<0.00017

Notes:

- (1) MECP Ontario Drinking Water Standards.
- (2) Operational Guideline (OG) within ODWS.
- (3) Aesthetic Objective (AO) within ODWS.
- (4) Maximum Acceptable Concentration (MAC) within ODWS.
- (5) ODWS exceedances indicated by **bold** and shaded entries.

Groundwater Geochemical Results MW19-03B

Parameters	Units	ODWS ⁽¹⁾	Sep-19	Nov-19	Nov-20
General Chemistry					
Alkalinity (Total as CaCO ₃)	mg/L	30-500 OG ⁽²⁾	341	298	353
Ammonia	mg/L		0.04	<0.02	<0.02
Chloride	mg/L	250 AO ⁽³⁾	494	12.7	4.91
COD	mg/L		18	16	12
Conductivity	umho/cm			596	662
Dissolved Organic Carbon (DOC)	mg/L	5 AO	2.5	5.1	4.8
Nitrate (N)	mg/L	10 MAC ⁽⁴⁾	<0.5	0.45	0.46
Nitrite (N)	mg/L	1 MAC	<0.5	<0.05	<0.10
pH	pH	6.5-8.5	7.72	7.65	7.92
Phenols	mg/L			<0.001	<0.001
Total Phosphorus	mg/L		1.11	0.87	0.57
Sulphate	mg/L	500 AO	104	13.9	16.1
Total Dissolved Solids (TDS)	mg/L	500 AO	860	308	330
TKN	mg/L		0.55	0.29	0.8
Metals					
Arsenic	mg/L	0.01 MAC	0.006	<0.003	0.002
Barium	mg/L	1 MAC	0.123	0.028	0.018
Boron	mg/L	5 IMAC	0.203	0.037	0.036
Cadmium	mg/L	0.005 MAC	<0.002	<0.002	<0.0001
Calcium	mg/L		170	64.3	72.5
Chromium	mg/L	0.05 MAC	<0.003	<0.003	<0.002
Copper	mg/L	1 AO	0.005	0.003	0.002
Iron	mg/L	0.3 AO	<0.010	<0.010	<0.010
Lead	mg/L	0.01 MAC	<0.001	<0.001	<0.0005
Magnesium	mg/L		90.2	35.4	41.3
Manganese	mg/L	0.05 AO	0.352	0.031	0.013
Mercury	mg/L	0.001 MAC	<0.0001	<0.0001	<0.0001
Potassium	mg/L		10.7	2.19	1.68
Sodium	mg/L	200 AO	35.2	3.39	4.33
Zinc	mg/L	5 AO	0.008	<0.005	<0.005
Volatile Organic Compounds					
1,4-Dichlorobenzene	mg/L	0.005 MAC	<0.0001	<0.0001	<0.0001
Benzene	mg/L	0.001 MAC	<0.0002	<0.0002	<0.0002
Methylene Chloride(Dichloromethane)	mg/L	0.05 MAC	<0.0003	<0.0003	<0.0003
Toluene	mg/L	0.024 AO	0.00029	0.00210	<0.0002
Vinyl Chloride	mg/L	0.001 MAC	<0.00017	<0.00017	<0.00017

Notes:

- (1) MECP Ontario Drinking Water Standards.
- (2) Operational Guideline (OG) within ODWS.
- (3) Aesthetic Objective (AO) within ODWS.
- (4) Maximum Acceptable Concentration (MAC) within ODWS.
- (5) ODWS exceedances indicated by **bold** and shaded entries.

Groundwater Geochemical Results MW19-03D

Parameters	Units	ODWS ⁽¹⁾	Sep-19	Nov-19	Nov-20
General Chemistry					
Alkalinity (Total as CaCO ₃)	mg/L	30-500 OG ⁽²⁾	245	298	295
Ammonia	mg/L		0.11	0.02	<0.02
Chloride	mg/L	250 AO ⁽³⁾	241	114	24
COD	mg/L		15	<5	12
Conductivity	umho/cm			968	700
Dissolved Organic Carbon (DOC)	mg/L	5 AO	3	2.5	1.8
Nitrate (N)	mg/L	10 MAC ⁽⁴⁾	<0.25	<0.25	<0.10
Nitrite (N)	mg/L	1 MAC	<0.25	<0.25	<0.10
pH	pH	6.5-8.5	7.76	7.69	7.99
Phenols	mg/L			<0.001	<0.001
Total Phosphorus	mg/L		0.14	0.05	0.06
Sulphate	mg/L	500 AO	41.4	77.4	54.8
Total Dissolved Solids (TDS)	mg/L	500 AO	966	490	420
TKN	mg/L		0.8	0.59	0.4
Metals					
Arsenic	mg/L	0.01 MAC	0.004	0.004	0.001
Barium	mg/L	1 MAC	0.101	0.094	0.050
Boron	mg/L	5 IMAC	0.146	0.145	0.086
Cadmium	mg/L	0.005 MAC	<0.002	<0.002	<0.0001
Calcium	mg/L		101	105	70.5
Chromium	mg/L	0.05 MAC	<0.003	<0.003	<0.002
Copper	mg/L	1 AO	0.004	<0.003	<0.001
Iron	mg/L	0.3 AO	<0.010	<0.010	0.02
Lead	mg/L	0.01 MAC	<0.001	<0.001	<0.0005
Magnesium	mg/L		51.8	53.2	41.2
Manganese	mg/L	0.05 AO	0.273	0.404	0.249
Mercury	mg/L	0.001 MAC	<0.0001	<0.0001	<0.0001
Potassium	mg/L		7.07	6.47	4.67
Sodium	mg/L	200 AO	29.8	13.2	6.11
Zinc	mg/L	5 AO	0.012	<0.005	<0.005
Volatile Organic Compounds					
1,4-Dichlorobenzene	mg/L	0.005 MAC	<0.0001	<0.0001	<0.0001
Benzene	mg/L	0.001 MAC	<0.0002	<0.0002	<0.0002
Methylene Chloride(Dichloromethane)	mg/L	0.05 MAC	<0.0003	<0.0003	<0.0003
Toluene	mg/L	0.024 AO	0.00031	0.00047	<0.0002
Vinyl Chloride	mg/L	0.001 MAC	<0.00017	<0.00017	<0.00017

Notes:

- (1) MECP Ontario Drinking Water Standards.
- (2) Operational Guideline (OG) within ODWS.
- (3) Aesthetic Objective (AO) within ODWS.
- (4) Maximum Acceptable Concentration (MAC) within ODWS.
- (5) ODWS exceedances indicated by **bold** and shaded entries.

Groundwater Geochemical Results MW19-04D

Parameters	Units	ODWS ⁽¹⁾	Sep-19	Nov-19	Nov-20
General Chemistry					
Alkalinity (Total as CaCO ₃)	mg/L	30-500 OG ⁽²⁾		294	305
Ammonia	mg/L			0.02	<0.02
Chloride	mg/L	250 AO ⁽³⁾		59	14.2
COD	mg/L			7	<5
Conductivity	umho/cm			794	712
Dissolved Organic Carbon (DOC)	mg/L	5 AO		2.2	2.0
Nitrate (N)	mg/L	10 MAC ⁽⁴⁾		<0.25	0.25
Nitrite (N)	mg/L	1 MAC		<0.25	<0.10
pH	pH	6.5-8.5		7.77	8.01
Phenols	mg/L			<0.001	<0.001
Total Phosphorus	mg/L			0.02	0.04
Sulphate	mg/L	500 AO		51.8	70.5
Total Dissolved Solids (TDS)	mg/L	500 AO		454	414
TKN	mg/L			0.29	0.4
Metals					
Arsenic	mg/L	0.01 MAC	0.006	<0.003	<0.001
Barium	mg/L	1 MAC	0.075	0.062	0.030
Boron	mg/L	5 IMAC	0.181	0.092	0.065
Cadmium	mg/L	0.005 MAC	<0.002	<0.002	<0.0001
Calcium	mg/L			81.9	74.9
Chromium	mg/L	0.05 MAC	<0.003	<0.003	<0.002
Copper	mg/L	1 AO	0.005	0.004	0.003
Iron	mg/L	0.3 AO	<0.010	0.064	<0.010
Lead	mg/L	0.01 MAC	<0.001	<0.001	<0.0005
Magnesium	mg/L			42.9	40.9
Manganese	mg/L	0.05 AO	0.134	0.173	0.007
Mercury	mg/L	0.001 MAC		<0.0001	<0.0001
Potassium	mg/L			4.3	3.51
Sodium	mg/L	200 AO		11.8	12.9
Zinc	mg/L	5 AO	0.006	<0.005	<0.005
Volatile Organic Compounds					
1,4-Dichlorobenzene	mg/L	0.005 MAC		<0.0001	<0.0001
Benzene	mg/L	0.001 MAC		<0.0002	<0.0002
Methylene Chloride(Dichloromethane)	mg/L	0.05 MAC		<0.0003	<0.0003
Toluene	mg/L	0.024 AO		<0.0002	<0.0002
Vinyl Chloride	mg/L	0.001 MAC		<0.00017	<0.00017

Notes:

- (1) MECP Ontario Drinking Water Standards.
- (2) Operational Guideline (OG) within ODWS.
- (3) Aesthetic Objective (AO) within ODWS.
- (4) Maximum Acceptable Concentration (MAC) within ODWS.
- (5) ODWS exceedances indicated by **bold** and shaded entries.

Groundwater Geochemical Results MW19-04S

Parameters	Units	ODWS ⁽¹⁾	Sep-19	Nov-19	Nov-20
General Chemistry					
Alkalinity (Total as CaCO ₃)	mg/L	30-500 OG ⁽²⁾	285	336	333
Ammonia	mg/L		0.15	<0.02	<0.02
Chloride	mg/L	250 AO ⁽³⁾	699	18.8	2.7
COD	mg/L		7	<5	8
Conductivity	umho/cm			698	611
Dissolved Organic Carbon (DOC)	mg/L	5 AO	2.9	3.0	2.6
Nitrate (N)	mg/L	10 MAC ⁽⁴⁾	<0.5	<0.10	<0.10
Nitrite (N)	mg/L	1 MAC	<0.5	<0.10	<0.10
pH	pH	6.5-8.5	7.72	7.75	8.05
Phenols	mg/L			<0.001	<0.001
Total Phosphorus	mg/L		0.04	0.02	0.06
Sulphate	mg/L	500 AO	116	20.3	12.8
Total Dissolved Solids (TDS)	mg/L	500 AO	1260	332	320
TKN	mg/L		0.56	0.35	0.4
Metals					
Arsenic	mg/L	0.01 MAC	0.010	<0.003	<0.001
Barium	mg/L	1 MAC	0.164	0.028	0.020
Boron	mg/L	5 IMAC	0.274	0.017	0.015
Cadmium	mg/L	0.005 MAC	<0.002	<0.002	<0.0001
Calcium	mg/L		215	73.6	68.4
Chromium	mg/L	0.05 MAC	<0.003	<0.003	<0.002
Copper	mg/L	1 AO	<0.003	0.004	<0.001
Iron	mg/L	0.3 AO	<0.010	<0.010	<0.010
Lead	mg/L	0.01 MAC	<0.001	<0.001	<0.0005
Magnesium	mg/L		114	40.9	40
Manganese	mg/L	0.05 AO	0.599	0.053	0.021
Mercury	mg/L	0.001 MAC	<0.0001	<0.0001	<0.0001
Potassium	mg/L		16.5	1.96	0.95
Sodium	mg/L	200 AO	40.2	4.71	0.96
Zinc	mg/L	5 AO	0.007	<0.005	<0.005
Volatile Organic Compounds					
1,4-Dichlorobenzene	mg/L	0.005 MAC	<0.0001	<0.0001	<0.0001
Benzene	mg/L	0.001 MAC	<0.0002	<0.0002	<0.0002
Methylene Chloride(Dichloromethane)	mg/L	0.05 MAC	<0.0003	<0.0003	<0.0003
Toluene	mg/L	0.024 AO	<0.0002	<0.0002	<0.0002
Vinyl Chloride	mg/L	0.001 MAC	<0.00017	<0.00017	<0.00017

Notes:

- (1) MECP Ontario Drinking Water Standards.
- (2) Operational Guideline (OG) within ODWS.
- (3) Aesthetic Objective (AO) within ODWS.
- (4) Maximum Acceptable Concentration (MAC) within ODWS.
- (5) ODWS exceedances indicated by **bold** and shaded entries.

Groundwater Geochemical Results MW-ES

Parameters	Units	ODWS ⁽¹⁾	Oct-14	Sep-15	Sep-16	Oct-17	Sep-18	Sep-19	Nov-20
General Chemistry									
Alkalinity (Total as CaCO ₃)	mg/L	30-500 OG ⁽²⁾	294	450	638	384	399	428	262
Ammonia	mg/L		0.52	1.15	3.08	0.37	0.24	0.42	<0.02
Chloride	mg/L	250 AO ⁽³⁾	6.81	69.8	119	7.85	4.88	15.3	1.41
COD	mg/L		16	59	60	25	18	10	17
Conductivity	umho/cm		567	1160	1500	694	727	847	480
Dissolved Organic Carbon (DOC)	mg/L	5 AO	8.5	4.5	9.1	10.3	4.1	3.5	5.2
Nitrate (N)	mg/L	10 MAC ⁽⁴⁾	<0.10	<0.05	<0.25	<0.10	<0.05	<0.25	0.08
Nitrite (N)	mg/L	1 MAC	<0.10	<0.05	<0.25	<0.10	<0.05	<0.25	<0.05
pH	pH	6.5-8.5	6.98	7.56	7.78	7.90	7.08	7.48	7.65
Phenols	mg/L		<0.001	0.005	0.039	0.002	0.002	<0.001	<0.001
Total Phosphorus	mg/L		0.70	2.71	2.4	1.44	1.36	0.69	0.24
Sulphate	mg/L	500 AO	9.14	46.1	22.2	25.2	10.3	13.0	5.2
Total Dissolved Solids (TDS)	mg/L	500 AO	298	634	800	382	396	426	264
TKN	mg/L		1.09	5.65	5.05	1.14	1.66	1.08	0.5
Metals									
Arsenic	mg/L	0.01 MAC	0.006	0.008	0.005	0.003	0.004	<0.003	<0.001
Barium	mg/L	1 MAC	0.024	0.061	0.071	0.031	0.045	0.036	0.015
Boron	mg/L	5 IMAC	0.016	0.032	0.045	0.026	0.035	0.068	0.047
Cadmium	mg/L	0.005 MAC	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.0001
Calcium	mg/L		69.7	116	143	88.4	88.7	102	55.9
Chromium	mg/L	0.05 MAC	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.002
Copper	mg/L	1 AO	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	0.004
Iron	mg/L	0.3 AO	11.3	8.73	14.7	4.74	3.58	<0.010	<0.010
Lead	mg/L	0.01 MAC	<0.002	<0.002	<0.002	<0.002	<0.001	<0.001	<0.0005
Magnesium	mg/L		31.6	46.9	52.0	37.7	39.2	39.7	29.7
Manganese	mg/L	0.05 AO	1.65	2.13	2.05	0.887	1.17	0.439	0.029
Mercury	mg/L	0.001 MAC	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Potassium	mg/L		2.17	4.77	8.96	2.29	2.83	3.66	0.77
Sodium	mg/L	200 AO	4.24	31.5	89.0	11.9	6.74	14.0	1.7
Zinc	mg/L	5 AO	<0.005	<0.005	0.008	<0.005	<0.005	0.006	<0.005
Volatile Organic Compounds									
1,4-Dichlorobenzene	mg/L	0.005 MAC	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Benzene	mg/L	0.001 MAC	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Methylene Chloride(Dichloromethane)	mg/L	0.05 MAC	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003
Toluene	mg/L	0.024 AO	0.00097	0.0058	0.0150	0.00024	0.00056	0.00064	<0.0002
Vinyl Chloride	mg/L	0.001 MAC	<0.00017	<0.00018	<0.00017	<0.00017	<0.00017	<0.00017	<0.00017

Notes:

- (1) MECP Ontario Drinking Water Standards.
- (2) Operational Guideline (OG) within ODWS.
- (3) Aesthetic Objective (AO) within ODWS.
- (4) Maximum Acceptable Concentration (MAC) within ODWS.
- (5) ODWS exceedances indicated by **bold** and shaded entries.

Groundwater Geochemical Results MW-ED

Parameters	Units	ODWS ⁽¹⁾	Oct-14	Sep-15	Sep-16	Oct-17	Sep-18	Sep-19	Nov-20
General Chemistry									
Alkalinity (Total as CaCO ₃)	mg/L	30-500 OG ⁽²⁾	No sample	517	706	496	521	484	362
Ammonia	mg/L		obtained	5.6	6.74	1.68	0.73	0.41	0.13
Chloride	mg/L	250 AO ⁽³⁾		59.6	141	13.4	27.8	31.2	2.54
COD	mg/L			52	51	47	29	24	25
Conductivity	umho/cm			1240	1630	873	1040	986	660
Dissolved Organic Carbon (DOC)	mg/L	5 AO		6.9	9.6	19.2	4.1	4.5	10.3
Nitrate (N)	mg/L	10 MAC ⁽⁴⁾		<0.05	<0.25	<0.25	<0.25	<0.25	0.16
Nitrite (N)	mg/L	1 MAC		<0.05	<0.25	<0.25	<0.25	<0.25	<0.10
pH	pH	6.5-8.5		7.59	7.84	8.13	7.32	7.56	7.83
Phenols	mg/L			0.009	<0.001	<0.001	0.001	<0.001	0.001
Total Phosphorus	mg/L			0.78	<0.05	2.31	1.21	0.77	0.8
Sulphate	mg/L	500 AO		29.0	25.1	23.7	25.7	15.0	9.6
Total Dissolved Solids (TDS)	mg/L	500 AO		662	884	500	540	514	368
TKN	mg/L			8.6	9.38	4.7	1.82	1.45	1.1
Metals									
Arsenic	mg/L	0.01 MAC		0.018	0.024	0.009	0.011	0.006	0.003
Barium	mg/L	1 MAC		0.256	0.212	0.118	0.152	0.12	0.073
Boron	mg/L	5 IMAC		<0.010	0.011	<0.010	0.025	0.032	0.033
Cadmium	mg/L	0.005 MAC		<0.002	<0.002	<0.002	<0.002	<0.002	<0.0001
Calcium	mg/L			134	166	114	121	125	80.7
Chromium	mg/L	0.05 MAC		<0.003	<0.003	<0.003	<0.003	<0.003	<0.002
Copper	mg/L	1 AO		<0.003	<0.003	<0.003	<0.003	<0.003	<0.001
Iron	mg/L	0.3 AO		2.29	22.2	10.0	11.6	5.2	1.1
Lead	mg/L	0.01 MAC		<0.002	<0.002	<0.002	<0.001	<0.001	<0.0005
Magnesium	mg/L			46.2	53	36	41.9	44.3	30.6
Manganese	mg/L	0.05 AO		1.31	2.21	1.64	1.71	1.8	1.06
Mercury	mg/L	0.001 MAC		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Potassium	mg/L			8.71	6.79	3.68	4.88	3.33	0.96
Sodium	mg/L	200 AO		34.3	101	34.9	32.2	20.3	14.4
Zinc	mg/L	5 AO		0.005	0.013	0.007	<0.005	<0.005	<0.005
Volatile Organic Compounds									
1,4-Dichlorobenzene	mg/L	0.005 MAC		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Benzene	mg/L	0.001 MAC		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Methylene Chloride(Dichloromethane)	mg/L	0.05 MAC		<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003
Toluene	mg/L	0.024 AO		0.310	0.290	0.031	0.00050	0.00038	0.00072
Vinyl Chloride	mg/L	0.001 MAC		<0.00017	<0.00017	<0.00017	<0.00017	<0.00017	<0.00017

Notes:

- (1) MECP Ontario Drinking Water Standards.
- (2) Operational Guideline (OG) within ODWS.
- (3) Aesthetic Objective (AO) within ODWS.
- (4) Maximum Acceptable Concentration (MAC) within ODWS.
- (5) ODWS exceedances indicated by **bold** and shaded entries.

Groundwater Geochemical Results MW-ND

Parameters	Units	ODWS ⁽¹⁾	Oct-14	Sep-15	Sep-16	Oct-17	Sep-18	Sep-19	Nov-20
General Chemistry									
Alkalinity (Total as CaCO ₃)	mg/L	30-500 OG ⁽²⁾	480	275	312	376	402	357	376
Ammonia	mg/L		38.6	1.5	0.85	0.4	0.28	0.32	0.08
Chloride	mg/L	250 AO ⁽³⁾	6.74	2.43	3.25	0.92	1.67	2.06	1.38
COD	mg/L		482	30	37	18	19	6	17
Conductivity	umho/cm		1030	588	699	622	733	674	678
Dissolved Organic Carbon (DOC)	mg/L	5 AO	40.1	3.0	2.9	9.6	3.1	3.0	5.0
Nitrate (N)	mg/L	10 MAC ⁽⁴⁾	<0.25	0.23	0.9	<0.10	<0.25	<0.10	0.24
Nitrite (N)	mg/L	1 MAC	<0.25	<0.05	0.10	<0.10	<0.25	<0.10	<0.10
pH	pH	6.5-8.5	7.36	7.63	7.97	8.20	7.71	7.64	7.93
Phenols	mg/L		0.364	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Total Phosphorus	mg/L		5.83	0.96	2.34	0.8	2.58	0.29	0.33
Sulphate	mg/L	500 AO	3.16	14.8	8.05	11.3	14.3	12.9	10.8
Total Dissolved Solids (TDS)	mg/L	500 AO	430	344	380	326	402	318	340
TKN	mg/L		38.6	8.54	2.2	0.86	1.01	0.82	0.9
Metals									
Arsenic	mg/L	0.01 MAC	<0.003	0.006	<0.003	<0.003	<0.003	<0.003	0.002
Barium	mg/L	1 MAC	0.035	0.024	0.028	0.030	0.034	0.030	0.034
Boron	mg/L	5 IMAC	<0.010	<0.010	<0.010	<0.010	<0.010	0.015	0.023
Cadmium	mg/L	0.005 MAC	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.0001
Calcium	mg/L		77.6	70.9	72.5	83.9	92.7	84.3	81.6
Chromium	mg/L	0.05 MAC	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.002
Copper	mg/L	1 AO	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	0.002
Iron	mg/L	0.3 AO	1.13	4.79	1.66	0.941	1.14	0.35	0.026
Lead	mg/L	0.01 MAC	<0.002	<0.002	<0.002	<0.002	<0.001	<0.001	<0.0005
Magnesium	mg/L		36.0	29.7	30.1	37.4	42.5	35.4	37.1
Manganese	mg/L	0.05 AO	0.269	0.622	0.678	0.263	0.19	0.358	0.213
Mercury	mg/L	0.001 MAC	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Potassium	mg/L		11.1	1.47	1.27	1.2	1.27	1.16	1.06
Sodium	mg/L	200 AO	6.58	4.06	5.15	4.99	3.91	4.99	4.81
Zinc	mg/L	5 AO	<0.005	<0.005	0.014	<0.005	<0.005	<0.005	<0.005
Volatile Organic Compounds									
1,4-Dichlorobenzene	mg/L	0.005 MAC	<0.0001	<0.0001	<0.0001	<0.0001		<0.0001	<0.0001
Benzene	mg/L	0.001 MAC	<0.0002	<0.0002	<0.0002	<0.0002		<0.0002	<0.0002
Methylene Chloride(Dichloromethane)	mg/L	0.05 MAC	<0.0003	<0.0003	<0.0003	<0.0003		<0.0003	<0.0003
Toluene	mg/L	0.024 AO	0.0052	0.00084	0.00068	<0.0002		<0.0002	<0.0002
Vinyl Chloride	mg/L	0.001 MAC	<0.00017	<0.00018	<0.00017	<0.00017		<0.00017	<0.00017

Notes:

- (1) MECP Ontario Drinking Water Standards.
- (2) Operational Guideline (OG) within ODWS.
- (3) Aesthetic Objective (AO) within ODWS.
- (4) Maximum Acceptable Concentration (MAC) within ODWS.
- (5) ODWS exceedances indicated by **bold** and shaded entries.

Groundwater Geochemical Results MW-NS

Parameters	Units	ODWS ⁽¹⁾	Oct-14	Sep-15	Sep-16	Oct-17	Sep-18	Sep-19	Nov-20
General Chemistry									
Alkalinity (Total as CaCO ₃)	mg/L	30-500 OG ⁽²⁾	397	549	431	375		No sample obtained	326
Ammonia	mg/L		0.11	0.05	0.06	0.02			<0.02
Chloride	mg/L	250 AO ⁽³⁾	2.18	2.68	2.01	1.0			1.3
COD	mg/L		20	32	13	35			16
Conductivity	umho/cm		722	1080	780	625			579
Dissolved Organic Carbon (DOC)	mg/L	5 AO	13.4	3.3	3.1	12.5			6.6
Nitrate (N)	mg/L	10 MAC ⁽⁴⁾	<0.10	<0.05	0.44	0.20			0.05
Nitrite (N)	mg/L	1 MAC	<0.10	<0.05	0.08	<0.10			<0.05
pH	pH	6.5-8.5	7.62	7.57	8.04	8.08			7.88
Phenols	mg/L		<0.001	<0.001	<0.001	<0.001			<0.001
Total Phosphorus	mg/L		1.59	1.84	<0.05	1.85			0.23
Sulphate	mg/L	500 AO	11.5	12.3	15.2	12.9			2.42
Total Dissolved Solids (TDS)	mg/L	500 AO	418	538		342			306
TKN	mg/L		1.2	4.09	0.33	0.69			0.6
Metals									
Arsenic	mg/L	0.01 MAC	<0.003	<0.003	<0.003	<0.003	<0.003		0.001
Barium	mg/L	1 MAC	0.04	0.048	0.041	0.028	0.037		0.027
Boron	mg/L	5 IMAC	<0.010	0.011	<0.010	<0.010	0.013		0.027
Cadmium	mg/L	0.005 MAC	<0.002	<0.002	<0.002	<0.002	<0.002		<0.0001
Calcium	mg/L		93.7	131	102	87.2			65.9
Chromium	mg/L	0.05 MAC	<0.003	<0.003	<0.003	<0.003	<0.003		<0.002
Copper	mg/L	1 AO	<0.003	<0.003	<0.003	<0.003	<0.003		0.004
Iron	mg/L	0.3 AO	1.23	0.561	0.241	0.048	<0.010		<0.010
Lead	mg/L	0.01 MAC	<0.002	<0.002	<0.002	<0.002	<0.001		<0.0005
Magnesium	mg/L		43.3	57.1	45.3	38.1			37.7
Manganese	mg/L	0.05 AO	0.155	0.452	0.140	0.072	0.022		0.002
Mercury	mg/L	0.001 MAC	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001		<0.0001
Potassium	mg/L		0.96	0.99	1.12	0.64			0.46
Sodium	mg/L	200 AO	1.96	1.49	3.35	1.48			0.7
Zinc	mg/L	5 AO	<0.005	<0.005	0.010	0.005	<0.005		<0.005
Volatile Organic Compounds									
1,4-Dichlorobenzene	mg/L	0.005 MAC	<0.0001	<0.0001	<0.0001	<0.0001			<0.0001
Benzene	mg/L	0.001 MAC	<0.0002	<0.0002	<0.0002	<0.0002			<0.0002
Methylene Chloride(Dichloromethane)	mg/L	0.05 MAC	<0.0003	<0.0003	<0.0003	<0.0003			<0.0003
Toluene	mg/L	0.024 AO	0.00048	0.0003	<0.0002	<0.0002			<0.0002
Vinyl Chloride	mg/L	0.001 MAC	<0.00017	<0.00018	<0.00017	<0.00017			<0.00017

Notes:

- (1) MECP Ontario Drinking Water Standards.
- (2) Operational Guideline (OG) within ODWS.
- (3) Aesthetic Objective (AO) within ODWS.
- (4) Maximum Acceptable Concentration (MAC) within ODWS.
- (5) ODWS exceedances indicated by **bold** and shaded entries.

Groundwater Geochemical Results MW-SD

Parameters	Units	ODWS ⁽¹⁾	Oct-14	Sep-15	Sep-16	Oct-17	Sep-18	Sep-19	Nov-20
General Chemistry									
Alkalinity (Total as CaCO3)	mg/L	30-500 OG ⁽²⁾	539	543	522	729	850	767	923
Ammonia	mg/L		0.03	0.10	0.55	<0.02	13.1	13.1	24.1
Chloride	mg/L	250 AO ⁽³⁾	117	133	178	140	106	125	160
COD	mg/L		7	15	16	45	27	29	49
Conductivity	umho/cm		1530	1840	1990	1870	2070	2010	2370
Dissolved Organic Carbon (DOC)	mg/L	5 AO	4.9	6.2	5.8	13.4	12.2	10.0	18.4
Nitrate (N)	mg/L	10 MAC ⁽⁴⁾	<0.25	<0.25	<0.5	<0.5	<0.25	<0.5	<1.0
Nitrite (N)	mg/L	1 MAC	<0.25	<0.25	<0.5	<0.5	<0.25	<0.5	<1.0
pH	pH	6.5-8.5	7.58	7.68	7.98	8.15	7.47	7.64	7.84
Phenols	mg/L		<0.001	<0.001	<0.001	<0.001	0.001	0.002	0.008
Total Phosphorus	mg/L		0.07	0.15	0.09	0.12	0.04	0.04	0.05
Sulphate	mg/L	500 AO	199	249	357	266	223	215	217
Total Dissolved Solids (TDS)	mg/L	500 AO	1000	1110	1180	1210	1200	1170	1390
TKN	mg/L		0.35	0.78	0.97	6.06	15.7	13.9	25.4
Metals									
Arsenic	mg/L	0.01 MAC	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	0.001
Barium	mg/L	1 MAC	0.071	0.090	0.100	0.143	0.145	0.157	0.165
Boron	mg/L	5 IMAC	0.115	0.182	0.203	0.546	0.526	0.606	0.801
Cadmium	mg/L	0.005 MAC	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.0003
Calcium	mg/L		168	168	188	178	176	167	163
Chromium	mg/L	0.05 MAC	<0.003	0.003	<0.003	<0.003	0.004	<0.003	0.005
Copper	mg/L	1 AO	<0.003	0.004	0.004	0.012	0.007	0.005	0.011
Iron	mg/L	0.3 AO	0.188	<0.010	0.103	<0.010	<0.010	<0.010	<0.010
Lead	mg/L	0.01 MAC	<0.002	<0.002	<0.002	<0.002	<0.001	<0.001	0.0006
Magnesium	mg/L		78.6	84.4	100	107	108	102	115
Manganese	mg/L	0.05 AO	1.19	1.0	1.1	1.3	1.2	1.1	2.2
Mercury	mg/L	0.001 MAC	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Potassium	mg/L		14.1	21.4	27.1	52.2	54.7	51	58.2
Sodium	mg/L	200 AO	46.3	80.2	103	99.3	87.1	85.7	115
Zinc	mg/L	5 AO	0.01	0.006	0.006	<0.005	<0.005	<0.005	<0.005
Volatile Organic Compounds									
1,4-Dichlorobenzene	mg/L	0.005 MAC	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0002
Benzene	mg/L	0.001 MAC	<0.0002	<0.0002	<0.0002	<0.0002	0.00041	<0.0002	<0.0004
Methylene Chloride(Dichloromethane)	mg/L	0.05 MAC	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0006
Toluene	mg/L	0.024 AO	<0.0002	0.0003	<0.0002	<0.0002	<0.0002	<0.0002	<0.0004
Vinyl Chloride	mg/L	0.001 MAC	<0.00017	<0.00017	<0.00017	<0.00017	<0.00017	<0.00017	<0.00034

Notes:

- (1) MECP Ontario Drinking Water Standards.
- (2) Operational Guideline (OG) within ODWS.
- (3) Aesthetic Objective (AO) within ODWS.
- (4) Maximum Acceptable Concentration (MAC) within ODWS.
- (5) ODWS exceedances indicated by **bold** and shaded entries.

Groundwater Geochemical Results MW-SS

Parameters	Units	ODWS ⁽¹⁾	Oct-14	Sep-15	Sep-16	Oct-17	Sep-18	Sep-19	Nov-20
General Chemistry									
Alkalinity (Total as CaCO ₃)	mg/L	30-500 OG ⁽²⁾	519	505	463	870	920	902	826
Ammonia	mg/L		0.06	1.26	1.02	16.8	17.0	4.72	34
Chloride	mg/L	250 AO ⁽³⁾	158	109	110	181	131	179	124
COD	mg/L		21	23	30	60	42	66	52
Conductivity	umho/cm		1720	1640	1520	2240	2290	2390	2040
Dissolved Organic Carbon (DOC)	mg/L	5 AO	12.2	5.7	4.5	17.5	16.4	15.0	20.2
Nitrate (N)	mg/L	10 MAC ⁽⁴⁾	<0.25	0.56	0.63	<0.5	<0.5	<1.0	<0.5
Nitrite (N)	mg/L	1 MAC	<0.25	<0.25	<0.25	<0.5	<0.5	<1.0	<0.5
pH	pH	6.5-8.5	7.21	7.73	7.89	8.19	7.40	7.69	7.88
Phenols	mg/L		<0.001	<0.001	0.001	<0.001	0.001	0.001	0.004
Total Phosphorus	mg/L		0.86	0.79	0.83	0.94	0.84	1.0	0.3
Sulphate	mg/L	500 AO	246	206	232	326	296	241	153
Total Dissolved Solids (TDS)	mg/L	500 AO	1190	898	934	1440	1420	1330	1250
TKN	mg/L		0.63	3.58	2.96	18.3	22.5	24.9	36.5
Metals									
Arsenic	mg/L	0.01 MAC	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	0.002
Barium	mg/L	1 MAC	0.077	0.095	0.093	0.136	0.105	0.125	0.114
Boron	mg/L	5 IMAC	0.134	0.165	0.181	0.683	0.631	0.694	0.837
Cadmium	mg/L	0.005 MAC	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.0002
Calcium	mg/L		167	149	149	194	194	186	143
Chromium	mg/L	0.05 MAC	<0.003	<0.003	<0.003	<0.003	0.004	0.004	0.005
Copper	mg/L	1 AO	0.004	<0.003	0.003	0.010	<0.003	0.004	0.007
Iron	mg/L	0.3 AO	0.023	<0.010	0.059	0.042	4.13	1.45	3.26
Lead	mg/L	0.01 MAC	<0.002	<0.002	<0.002	<0.002	<0.001	<0.001	0.0011
Magnesium	mg/L		83.2	78.3	78.9	130	132	127	107
Manganese	mg/L	0.05 AO	0.769	1.24	1.05	1.41	1.63	1.56	1.24
Mercury	mg/L	0.001 MAC	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Potassium	mg/L		17.0	22.3	21.0	63.4	59.5	57.1	64.3
Sodium	mg/L	200 AO	69.3	56.2	53.2	118	98.8	115	115
Zinc	mg/L	5 AO	<0.005	0.007	0.006	<0.005	0.007	<0.005	0.008
Volatile Organic Compounds									
1,4-Dichlorobenzene	mg/L	0.005 MAC	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0002
Benzene	mg/L	0.001 MAC	<0.0002	<0.0002	<0.0002	0.00029	0.00036	<0.0002	<0.0004
Methylene Chloride(Dichloromethane)	mg/L	0.05 MAC	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0006
Toluene	mg/L	0.024 AO	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.00033	<0.0004
Vinyl Chloride	mg/L	0.001 MAC	<0.00017	<0.00017	<0.00017	<0.00017	<0.00017	<0.00017	<0.00034

Notes:

- (1) MECP Ontario Drinking Water Standards.
- (2) Operational Guideline (OG) within ODWS.
- (3) Aesthetic Objective (AO) within ODWS.
- (4) Maximum Acceptable Concentration (MAC) within ODWS.
- (5) ODWS exceedances indicated by **bold** and shaded entries.

Groundwater Geochemical Results MW-WD

Parameters	Units	ODWS ⁽¹⁾	Oct-14	Sep-15	Sep-16	Oct-17	Sep-18	Sep-19	Nov-20
General Chemistry									
Alkalinity (Total as CaCO ₃)	mg/L	30-500 OG ⁽²⁾	467	448		514		456	509
Ammonia	mg/L		<0.02	1.32	0.07	<0.02			<0.02
Chloride	mg/L	250 AO ⁽³⁾	18.7	36.3		25.5		35.2	23.6
COD	mg/L		18	64	24	19			16
Conductivity	umho/cm		914	1050		943		1000	1010
Dissolved Organic Carbon (DOC)	mg/L	5 AO	14.4	6.5	4.7	6.8			4.2
Nitrate (N)	mg/L	10 MAC ⁽⁴⁾	<0.25	0.29		0.5		0.9	1.56
Nitrite (N)	mg/L	1 MAC	<0.25	<0.25		<0.25		<0.25	<0.25
pH	pH	6.5-8.5	7.50	7.72		8.19		7.66	7.85
Phenols	mg/L		<0.001	0.031		<0.001		<0.001	<0.001
Total Phosphorus	mg/L		1.1	1.39	<0.05	0.34			0.14
Sulphate	mg/L	500 AO	25.5	36.8		39.5		49.4	37.7
Total Dissolved Solids (TDS)	mg/L	500 AO	528	518		554		528	594
TKN	mg/L		0.47	5.5	1.37	0.3			1.0
Metals									
Arsenic	mg/L	0.01 MAC	<0.003	0.003	<0.003	<0.003	<0.003	<0.003	0.001
Barium	mg/L	1 MAC	0.074	0.068	0.075	0.083	0.077	0.086	0.091
Boron	mg/L	5 IMAC	0.052	0.054	0.041	0.084	0.064	0.085	0.099
Cadmium	mg/L	0.005 MAC	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.0001
Calcium	mg/L		113	110		119		116	113
Chromium	mg/L	0.05 MAC	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.002
Copper	mg/L	1 AO	<0.003	<0.003	<0.003	0.006	0.012	0.012	0.005
Iron	mg/L	0.3 AO	<0.010	0.252	<0.010	<0.010	<0.010	<0.010	<0.010
Lead	mg/L	0.01 MAC	<0.002	<0.002	<0.002	<0.002	0.002	<0.001	<0.0005
Magnesium	mg/L		53.8	50.7		57.1		53.2	54.8
Manganese	mg/L	0.05 AO	<0.002	0.314	0.005	0.003	0.004	0.003	<0.002
Mercury	mg/L	0.001 MAC	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Potassium	mg/L		4.75	4.77		5.74		5.67	5.87
Sodium	mg/L	200 AO	9.93	13.8		15.6		15.4	15.6
Zinc	mg/L	5 AO	<0.005	<0.005	0.013	0.006	0.027	0.019	<0.005
Volatile Organic Compounds									
1,4-Dichlorobenzene	mg/L	0.005 MAC	<0.0001	<0.0001	<0.0001	<0.0001			<0.0001
Benzene	mg/L	0.001 MAC	<0.0002	<0.0002	<0.0002	<0.0002			<0.0002
Methylene Chloride(Dichloromethane)	mg/L	0.05 MAC	<0.0003	<0.0003	<0.0003	<0.0003			<0.0003
Toluene	mg/L	0.024 AO	<0.0002	0.0079	<0.0002	<0.0002			<0.0002
Vinyl Chloride	mg/L	0.001 MAC	<0.00017	<0.00018	<0.00017	<0.00017			<0.00017

Notes:

- (1) MECP Ontario Drinking Water Standards.
- (2) Operational Guideline (OG) within ODWS.
- (3) Aesthetic Objective (AO) within ODWS.
- (4) Maximum Acceptable Concentration (MAC) within ODWS.
- (5) ODWS exceedances indicated by **bold** and shaded entries.

Groundwater Geochemical Results MW-WS

Parameters	Units	ODWS ⁽¹⁾	Oct-14	Sep-15	Sep-16	Oct-17	Sep-18	Sep-19	Nov-20
General Chemistry									
Alkalinity (Total as CaCO ₃)	mg/L	30-500 OG ⁽²⁾	353	494	512	510	539	518	446
Ammonia	mg/L		0.03	2.37	0.12	0.11	<0.02	0.14	<0.02
Chloride	mg/L	250 AO ⁽³⁾	10.3	46.0	39.0	24.2	33.8	44.2	17.0
COD	mg/L		33	51	18	19	18	24	23
Conductivity	umho/cm		689	1150	1080	938	1050	1120	874
Dissolved Organic Carbon (DOC)	mg/L	5 AO	14.4	10.7	3.5	7.2	4.2	3.4	3.4
Nitrate (N)	mg/L	10 MAC ⁽⁴⁾	0.49	0.26	0.45	0.8	1.21	0.35	1.04
Nitrite (N)	mg/L	1 MAC	<0.10	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25
pH	pH	6.5-8.5	7.36	7.74	8.03	8.27	7.41	7.57	7.90
Phenols	mg/L		<0.001	0.015	<0.001	<0.001	<0.001	<0.001	<0.001
Total Phosphorus	mg/L		1.98	2.1	0.79	0.48	1.34	1.11	0.79
Sulphate	mg/L	500 AO	16.0	31.7	43.8	36.8	46.3	57.8	25.7
Total Dissolved Solids (TDS)	mg/L	500 AO	398	616	598	526	632	584	506
TKN	mg/L		0.79	14.5	0.74	0.41	0.76	1.08	0.5
Metals									
Arsenic	mg/L	0.01 MAC	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.001
Barium	mg/L	1 MAC	0.051	0.083	0.064	0.073	0.065	0.072	0.047
Boron	mg/L	5 IMAC	0.047	0.093	0.071	0.106	0.095	0.126	0.073
Cadmium	mg/L	0.005 MAC	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.0001
Calcium	mg/L		88.4	123	127	119	131	130	95.9
Chromium	mg/L	0.05 MAC	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.002
Copper	mg/L	1 AO	<0.003	<0.003	<0.003	<0.003	<0.003	0.003	0.005
Iron	mg/L	0.3 AO	0.19	0.535	0.099	0.127	<0.010	<0.010	<0.010
Lead	mg/L	0.01 MAC	<0.002	<0.002	<0.002	<0.002	<0.001	<0.001	<0.0005
Magnesium	mg/L		41.9	53.8	59.8	56.5	61.9	60.3	46.1
Manganese	mg/L	0.05 AO	0.050	0.441	0.086	0.163	0.021	0.266	<0.002
Mercury	mg/L	0.001 MAC	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Potassium	mg/L		3.58	8.56	6.89	7.02	7.82	6.94	4.74
Sodium	mg/L	200 AO	5.43	18.9	18.5	15.6	19.5	20.4	10.6
Zinc	mg/L	5 AO	<0.005	0.007	0.012	<0.005	<0.005	0.014	<0.005
Volatile Organic Compounds									
1,4-Dichlorobenzene	mg/L	0.005 MAC	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Benzene	mg/L	0.001 MAC	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Methylene Chloride(Dichloromethane)	mg/L	0.05 MAC	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003
Toluene	mg/L	0.024 AO	<0.0002	0.0180	<0.0002	<0.0002	0.00059	<0.0002	<0.0002
Vinyl Chloride	mg/L	0.001 MAC	<0.00017	<0.00018	<0.00017	<0.00017	<0.00017	<0.00017	<0.00017

Notes:

- (1) MECP Ontario Drinking Water Standards.
- (2) Operational Guideline (OG) within ODWS.
- (3) Aesthetic Objective (AO) within ODWS.
- (4) Maximum Acceptable Concentration (MAC) within ODWS.
- (5) ODWS exceedances indicated by **bold** and shaded entries.

2020 Groundwater Duplicate Data

Parameters	Units	Nov-20					
		MW19-04D	MIND-DUP1	Relative Percent Difference (%)	MW-ED	MIND-DUP2	Relative Percent Difference (%)
General Chemistry							
Alkalinity (Total as CaCO3)	mg/L	305	305	0.000	362	368	(1.644)
Ammonia	mg/L	<0.02	<0.02	NC	0.1	0.2	(20.690)
Chloride	mg/L	14.2	14.4	(1.399)	2.5	2.2	12.998
COD	mg/L	<5	6	NC	25	24	4.082
Conductivity	umho/cm	712	714	(0.281)	660	665	(0.755)
Dissolved Organic Carbon (DOC)	mg/L	2.0	1.9	5.128	10.3	3.5	98.551
Nitrate (N)	mg/L	0.25	0.23	8.333	0.16	0.15	6.452
Nitrite (N)	mg/L	<0.10	<0.10	NC	<0.10	<0.10	NC
pH	pH	8.01	8.01	0.000	7.83	7.87	(0.510)
Phenols	mg/L	<0.001	<0.001	NC	0.001	0.001	0.000
Total Phosphorus	mg/L	0.04	0.04	0.000	0.80	0.98	(20.225)
Sulphate	mg/L	70.5	70.8	(0.425)	9.6	8.9	7.135
Total Dissolved Solids (TDS)	mg/L	414	398	3.941	368	350	5.014
TKN	mg/L	0.4	0.4	0.000	1.1	1.1	0.000
Metals							
Arsenic	mg/L	<0.001	<0.001	NC	0.003	<0.001	NC
Barium	mg/L	0.030	0.004	152.941	0.073	0.007	165.000
Boron	mg/L	0.065	<0.010	NC	0.033	<0.010	NC
Cadmium	mg/L	<0.0001	<0.0001	NC	<0.0001	<0.0001	NC
Calcium	mg/L	74.9	75.1	(0.267)	80.7	78.7	2.509
Chromium	mg/L	<0.002	<0.002	NC	<0.002	<0.002	NC
Copper	mg/L	0.003	<0.001	NC	<0.001	<0.001	NC
Iron	mg/L	<0.010	<0.010	NC	1.13	0.11	164.222
Lead	mg/L	<0.0005	<0.0005	NC	<0.0005	<0.0005	NC
Magnesium	mg/L	40.9	41.2	(0.731)	30.6	30.1	1.647
Manganese	mg/L	0.007	<0.002	NC	1.06	0.09	168.375
Mercury	mg/L	<0.0001	<0.0001	NC	<0.0001	<0.0001	NC
Potassium	mg/L	3.5	3.5	0.285	1.0	0.95	1.047
Sodium	mg/L	12.9	12.9	0.000	14.4	14.5	(0.692)
Zinc	mg/L	<0.005	<0.005	NC	<0.005	<0.005	NC
Volatile Organic Compounds							
1,4-Dichlorobenzene	mg/L	<0.0001	<0.0001	NC	<0.0001	<0.0001	NC
Benzene	mg/L	<0.0002	<0.0002	NC	<0.0002	<0.0002	NC
Methylene Chloride(Dichloromethane)	mg/L	<0.0003	<0.0003	NC	<0.0003	<0.0003	NC
Toluene	mg/L	<0.0002	<0.0002	NC	0.00072	0.00077	(6.711)
Vinyl Chloride	mg/L	<0.00017	<0.00017	NC	<0.00017	<0.00017	NC

Notes:

(1) NC - not calculable as one or both concentrations are below the laboratory method detection limit.

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APPENDIX F

**PHOTOGRAPHIC INVENTORY OF
GROUNDWATER MONITORING
LOCATIONS**



**MW-E
Well Nest
2019**



**MW-E
Well Nest
2019**



**MW-S
Well Nest
2019**



**MW-S
Well Nest
2019**



**MW-W
Well Nest
2019**



**MW-W
Well Nest
2019**



**MW-N
Well Nest
2019**



**MW-N
Well Nest
2019**



MW19-01S
2019



MW19-01D
2019



MW19-01
Well Nest
2019



MW19-02S
2019



MW19-02D
2019



MW19-02
Well Nest
2019



MW19-03A
2019



MW19-03B
2019



MW19-03D
2019



MW19-03
Well Nest
2019



MW19-04S
2019



MW19-04D
2019



**MW19-04
Well Nest
2019**

APPENDIX G

**GROUNDWATER IONIC BALANCE AND
PIPER PLOT DATA TABLE**

Groundwater Ionic Balance and Piper Plot Data - November 2020

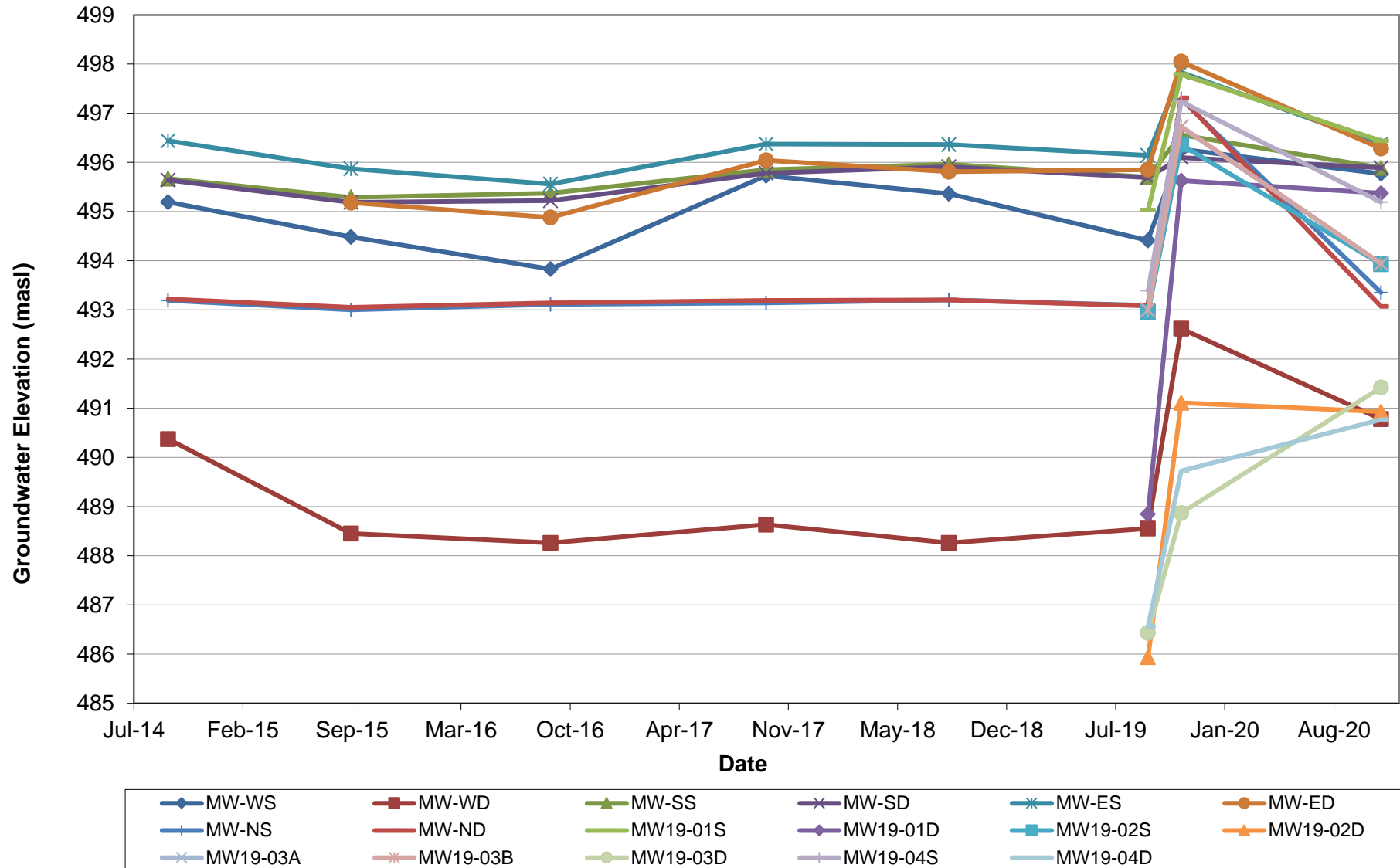
Raw Data (mg/L)	MW-ES	MW-ED	MW-SS	MW-SD	MW-NS	MW-ND	MW-WS	MW-WD	MW19-01S	MW19-01D	MW19-02S	MW19-02D	MW19-03A	MW19-03B	MW19-03D	MW19-04S	MW19-04D
Ca	55.9	80.7	143	163	65.9	81.6	95.9	113	61.8	47.1	73.8	67.5	73.7	72.5	70.5	68.4	74.9
Mg	29.7	30.6	107	115	37.7	37.1	46.1	54.8	33.6	26.0	40.0	38.4	41.0	41.3	41.2	40.0	40.9
Na	1.67	14.4	115	115	0.70	4.81	10.6	15.6	6.27	9.16	4.56	9.48	4.27	4.33	6.11	0.96	12.9
K	0.77	0.96	64.3	58.2	0.46	1.06	4.74	5.87	0.77	3.77	2.41	3.10	1.60	1.68	4.67	0.95	3.51
Cl	1.41	2.54	124	160	1.26	1.38	17.0	23.6	1.56	4.37	5.52	13.8	3.96	4.91	23.8	2.70	14.2
SO4	5.19	9.58	153	217	2.42	10.8	25.7	37.7	7.63	36.0	10.2	58.2	15.1	16.1	54.8	12.8	70.5
ALK	262	362	826	923	326	376	446	509	308	251	361	279	349	353	295	333	305
pH	7.65	7.83	7.88	7.84	7.88	7.93	7.90	7.85	7.85	7.96	7.92	8.03	7.97	7.92	7.99	8.05	8.01
Ion Balance Data and Piper Plot (%)																	
Cations:	5.33	7.20	22.59	24.09	6.43	7.36	9.16	10.98	6.14	4.98	7.23	7.02	7.28	7.25	7.29	6.77	7.75
Anions:	5.38	7.50	23.19	27.47	6.60	7.78	9.93	11.62	6.36	5.89	7.58	7.18	7.40	7.53	7.71	7.00	7.96
CBE (%):	-0.53	-2.10	-1.31	-6.57	-1.28	-2.74	-4.01	-2.85	-1.73	-8.30	-2.34	-1.09	-0.82	-1.89	-2.75	-1.63	-1.32
Mg:	45.9	35.0	39.0	39.3	48.2	41.5	41.4	41.1	45.0	42.9	45.5	45.0	46.4	46.9	46.5	48.6	43.4
Ca:	52.4	56.0	31.6	33.8	51.1	55.3	52.2	51.4	50.2	47.1	50.9	48.0	50.5	49.9	48.2	50.4	48.2
Na+K:	1.7	9.0	29.4	26.9	0.7	3.2	6.4	7.5	4.8	9.9	3.6	7.0	3.1	3.2	5.3	1.0	8.4
Cl:	0.7	1.0	15.1	16.4	0.5	0.5	4.8	5.7	0.7	2.1	2.1	5.4	1.5	1.8	8.7	1.1	5.0
SO4:	2.0	2.7	13.7	16.4	0.8	2.9	5.4	6.8	2.5	12.7	2.8	16.9	4.2	4.5	14.8	3.8	18.4
HCO3+CO3:	97.3	96.4	71.2	67.1	98.7	96.6	89.8	87.5	96.8	85.2	95.1	77.7	94.2	93.7	76.5	95.1	76.5

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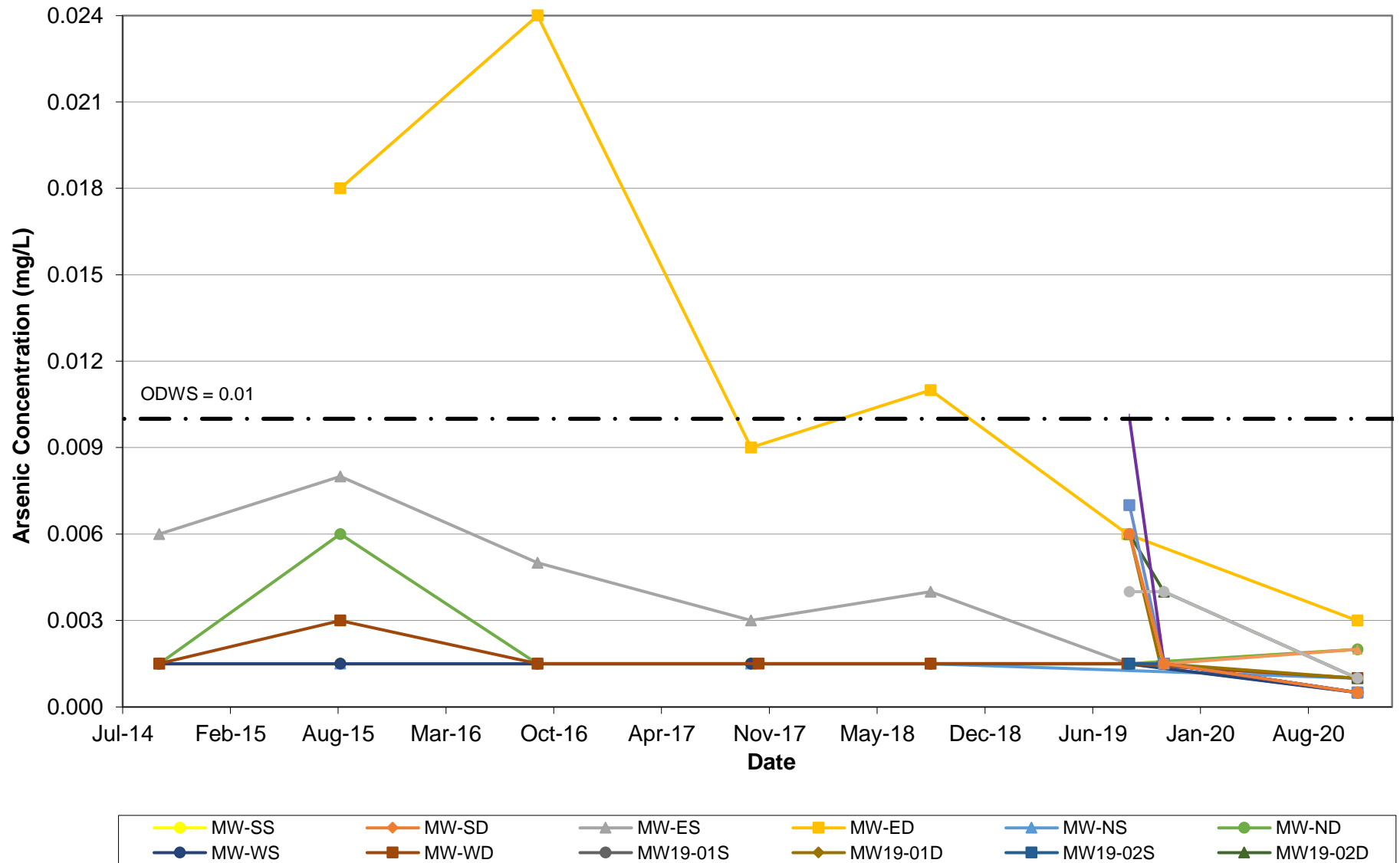


APPENDIX H
TREND ANALYSIS

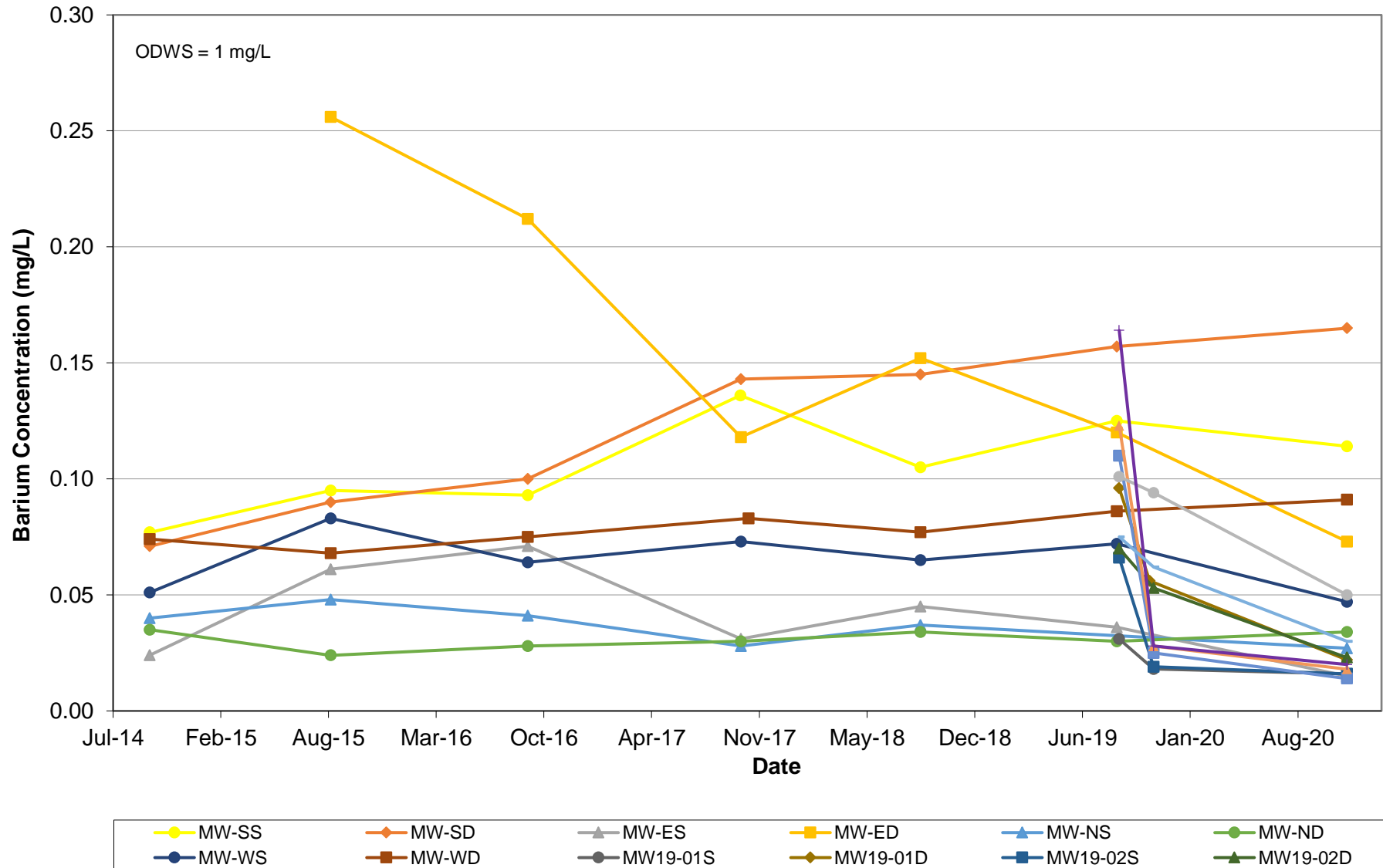
Groundwater Elevation Trend Analysis



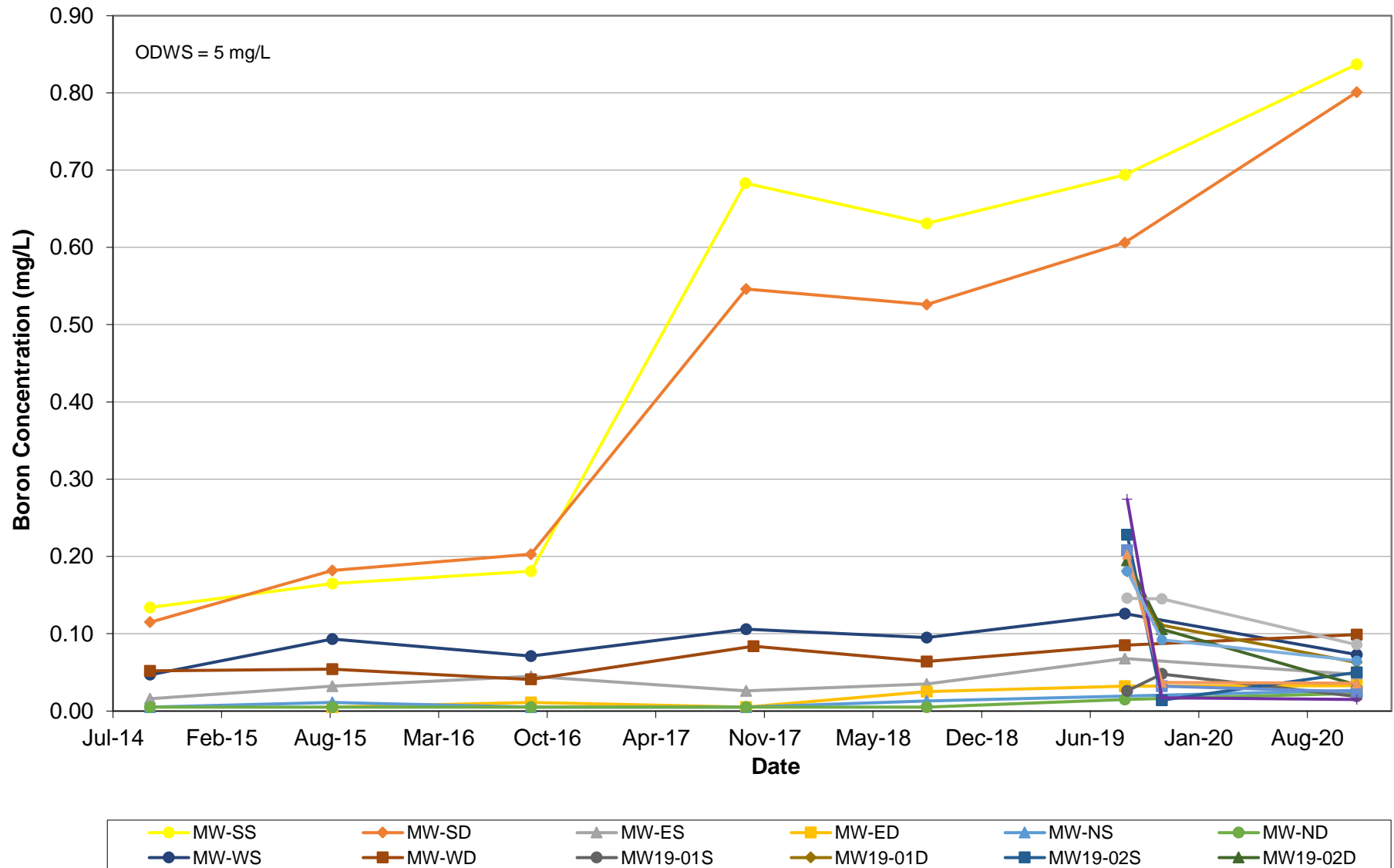
Arsenic Trend Analysis - Groundwater



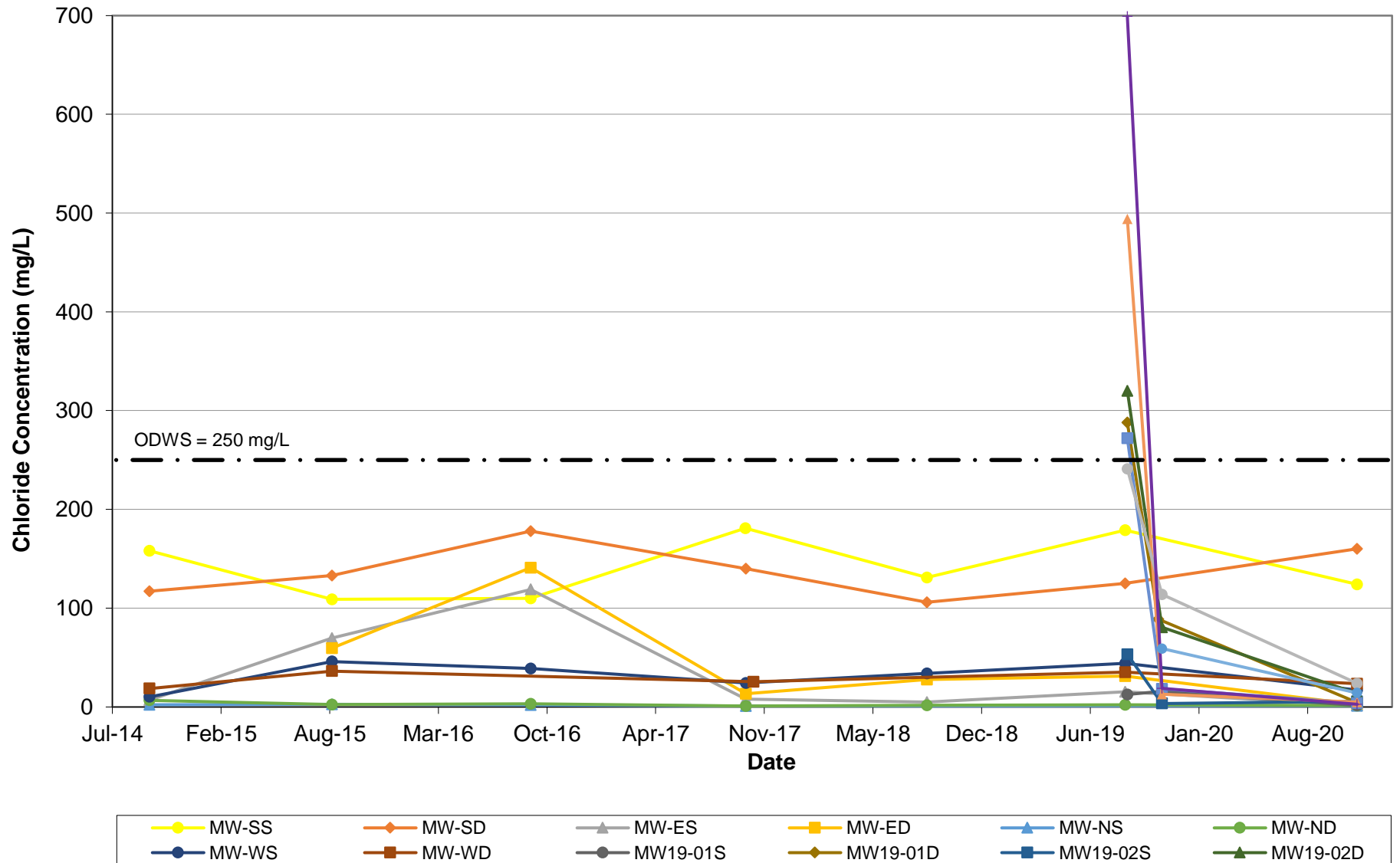
Barium Trend Analysis - Groundwater



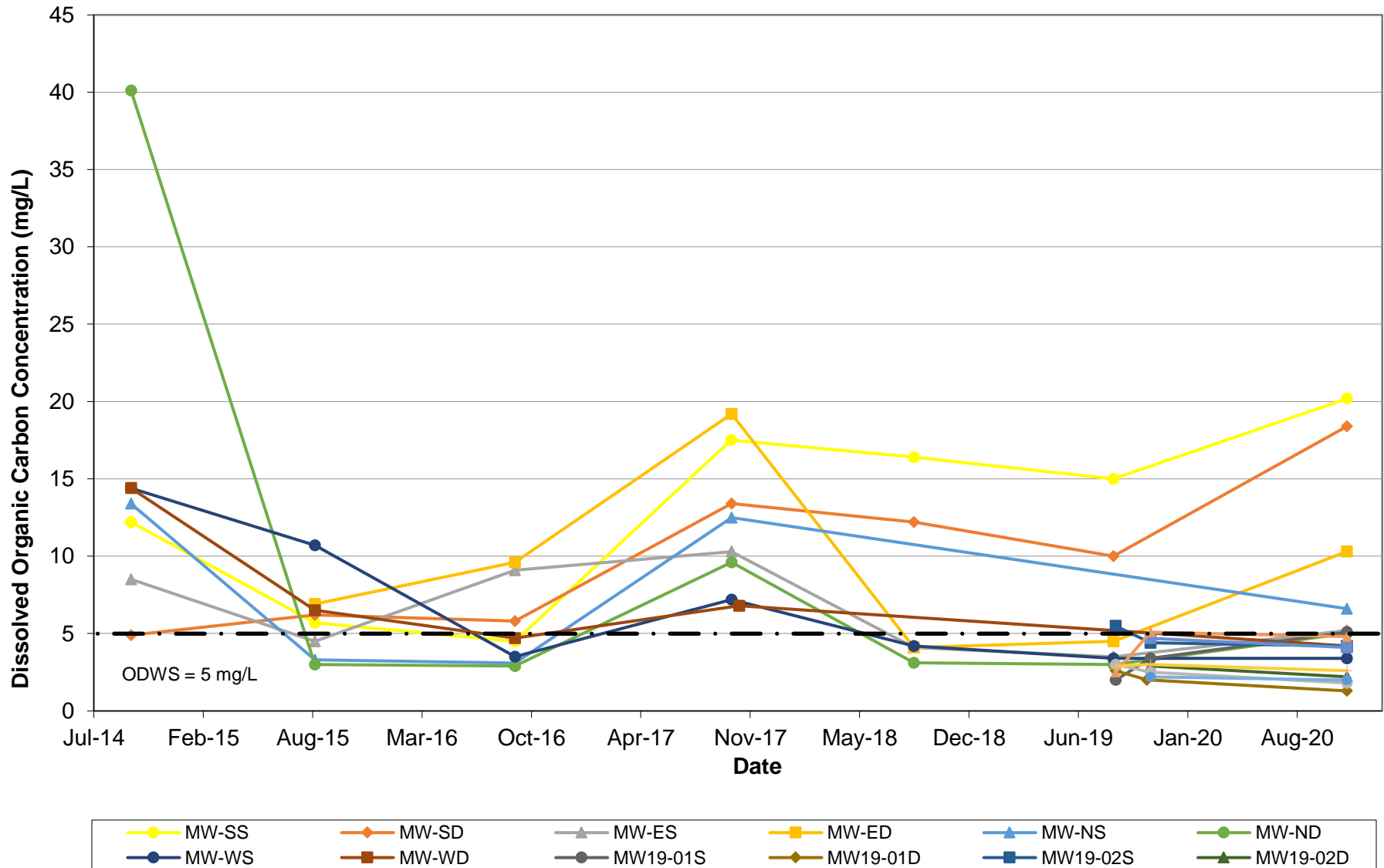
Boron Trend Analysis - Groundwater



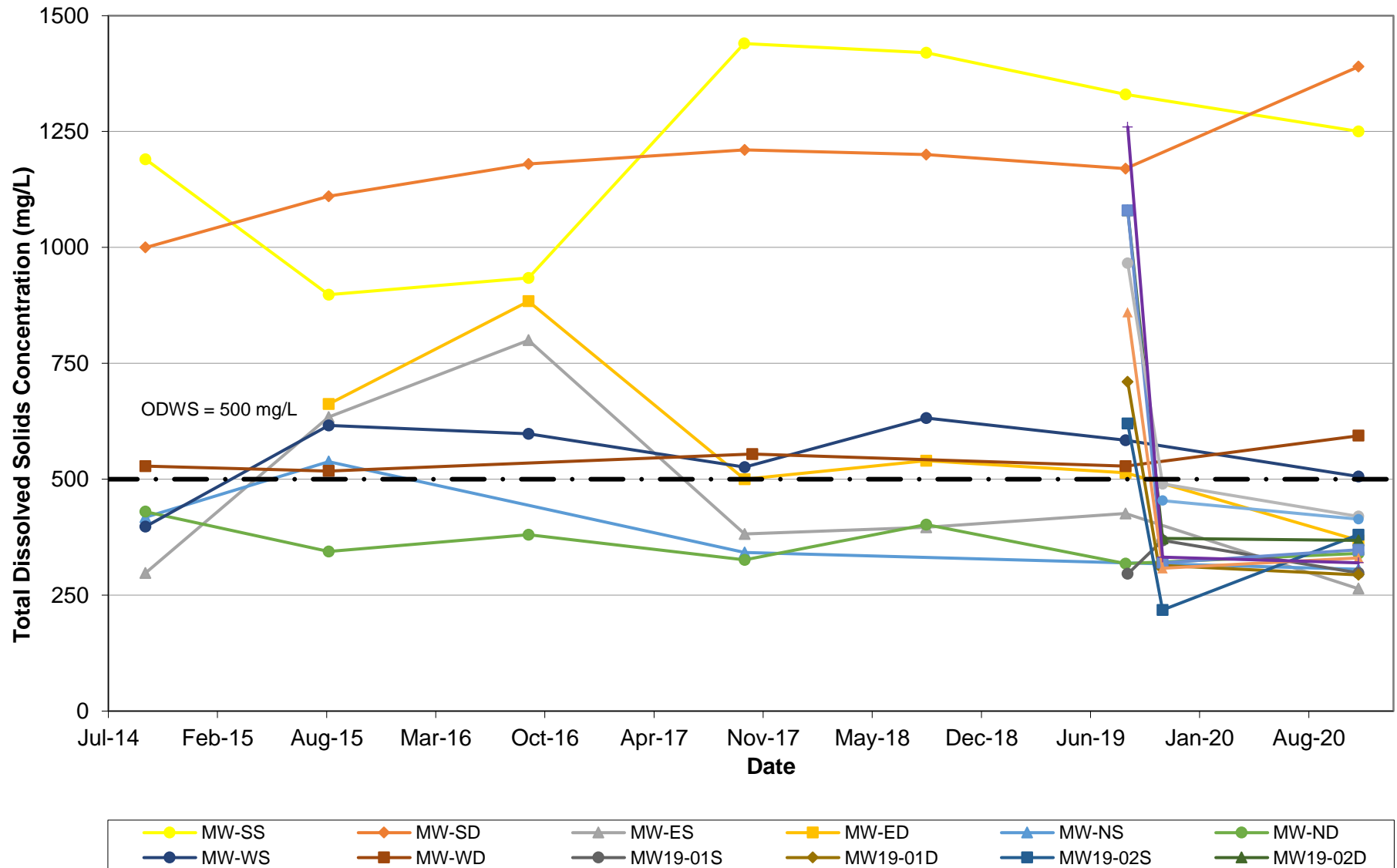
Chloride Trend Analysis - Groundwater



Dissolved Organic Carbon Trend Analysis - Groundwater



Total Dissolved Solids Trend Analysis - Groundwater



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APPENDIX I
GUIDELINE B-7 CALCULATIONS

**Guideline B-7
 November 2020 Monitoring Event - Shallow Aquifer**

Guideline B-7 Calculation				Downgradient Property Boundary Well Concentrations			
Parameter	ODWS ⁽³⁾ C _r (mg/L)	Background Concentration C _b ⁽¹⁾ (mg/L)	Maximum Concentration C _m =C _b +x(C _r -C _b) (mg/L)	MW19-02S (mg/L)	MW19-03A (mg/L)	MW19-03B (mg/L)	MW19-04S (mg/L)
Health Related			x=0.25 ⁽²⁾				
Arsenic	0.01	0.001	0.003	<0.001	<0.001	0.002	<0.001
Barium	1	0.021	0.266	0.016	0.014	0.018	0.020
Boron	5	0.029	1.27	0.050	0.025	0.036	0.015
Cadmium	0.005	0.0004	0.002	<0.0001	<0.0001	<0.0001	<0.0001
Chromium	0.05	0.001	0.013	<0.002	<0.002	<0.002	<0.002
Lead	0.01	0.0004	0.003	<0.0005	<0.0005	<0.0005	<0.0005
Nitrate-N	10	0.16	2.62	0.94	0.52	0.46	<0.10
Nitrite-N	1	0.04	0.28	<0.10	<0.10	<0.10	<0.10
Non-Health Related			x=0.50 ⁽²⁾				
Chloride	250	6.8	128	5.5	4.0	4.9	2.7
Copper	1	0.003	0.50	0.003	0.002	0.002	<0.001
DOC	5	3.3	4.1	4.2	4.1	4.8	2.6
pH	6.5-8.5	7.74	6.5-8.5	7.92	7.97	7.92	8.05
Sodium	200	11.2	106	4.56	4.27	4.33	0.96
Sulphate	500	13.1	257	10.2	15.1	16.1	12.8
TDS	500	319	409	380	348	330	320
Toluene	0.024	0.0001	0.012	<0.0002	<0.0002	<0.0002	<0.0002
Zinc	5	0.003	2.50	<0.005	<0.005	<0.005	<0.005

Notes:

- (1) Average of valid sampling rounds at MW19-01S.
- (2) Defined according to Guideline B-7 (MECP, 1994).
- (3) ODWS - Ontario Drinking Water Standards (MECP, 2001).
- (4) **BOLD** and shaded indicates an exceedance of the Maximum Concentration.

**Guideline B-7
 November 2020 Monitoring Event - Deep Aquifer**

Guideline B-7 Calculation				Downgradient Property Boundary Well Concentrations		
Parameter	ODWS ⁽³⁾ C _r (mg/L)	Background Concentration C _b ⁽¹⁾ (mg/L)	Maximum Concentration C _m =C _b +x(C _r -C _b) (mg/L)	MW19-02D (mg/L)	MW19-03D (mg/L)	MW19-04D (mg/L)
Health Related			x=0.25 ⁽²⁾			
Arsenic	0.01	0.001	0.003	0.001	0.001	<0.001
Barium	1	0.035	0.276	0.023	0.050	0.030
Boron	5	0.084	1.31	0.034	0.086	0.065
Cadmium	0.005	0.0002	0.001	<0.0001	<0.0001	<0.0001
Chromium	0.05	0.001	0.013	<0.002	<0.002	<0.002
Lead	0.01	0.0004	0.003	<0.0005	<0.0005	<0.0005
Nitrate-N	10	0.12	2.59	0.28	<0.10	0.25
Nitrite-N	1	0.06	0.29	<0.10	<0.10	<0.10
Non-Health Related			x=0.50 ⁽²⁾			
Chloride	250	19.7	135	13.8	23.8	14.2
Copper	1	0.001	0.50	<0.001	<0.001	0.003
DOC	5	1.6	3.3	2.2	1.8	2.0
pH	6.5-8.5	7.83	6.5-8.5	8.03	7.99	8.01
Sodium	200	12.7	106	9.5	6.1	12.9
Sulphate	500	50.7	275	58.2	54.8	70.5
TDS	500	304	402	368	420	414
Toluene	0.024	0.0002	0.012	<0.0002	<0.0002	<0.0002
Zinc	5	0.003	2.50	<0.005	<0.005	<0.005

Notes:

- (1) Average of valid sampling rounds at MW19-01D.
- (2) Defined according to Guideline B-7 (MECP, 1994).
- (3) ODWS - Ontario Drinking Water Standards (MECP, 2001).
- (4) **BOLD** and shaded indicates an exceedance of the Maximum Concentration.

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APPENDIX J

**MONITORING AND SCREENING
CHECKLIST**

Appendix D-Monitoring and Screening Checklist

General Information and Instructions

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

Instructions: A complete checklist consists of:

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

Definition of Groundwater CEP:

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

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

Definition of Surface water CEP:

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

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

Monitoring Report and Site Information

Monitoring Report and Site Information	
Waste Disposal Site Name	Mindemoya Waste Disposal Site
Location (e.g. street address, lot, concession)	408 Elliot Road, Lot 27, Concession 2, Township of Canarvon, Registered Plan No. 22, District of Manitoulin
GPS Location (taken within the property boundary at front gate/ front entry)	411220 Easting and 5067030 Northing, Zone 17
Municipality	Central Manitoulin
Client and/or Site Owner	The Municipality of Central Manitoulin
Monitoring Period (Year)	2020
This Monitoring Report is being submitted under the following:	
Certificate of Approval No.:	A550701
Director's Order No.:	
Provincial Officer's Order No.:	
Other:	

Report Submission Frequency	<input checked="" type="radio"/> Annual <input type="radio"/> Other	Specify (Type Here):
The site is:	<input type="radio"/> Active <input type="radio"/> Inactive <input checked="" type="radio"/> Closed	
If closed, specify C of A, control or authorizing document closure date:		
Has the nature of the operations at the site changed during this monitoring period?	<input type="radio"/> Yes <input checked="" type="radio"/> No	
If yes, provide details:		
Have any measurements been taken since the last reporting period that indicate landfill gas volumes have exceeded the MOE limits for subsurface or adjacent buildings? (i. e. exceeded the LEL for methane)	<input type="radio"/> Yes <input checked="" type="radio"/> No	

Groundwater WDS Verification:

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

Sampling and Monitoring Program Status:

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

Groundwater Sampling Location	Description/Explanation for change (change in name or location, additions, deletions)	Date
Type Here	Type Here	Select Date
Type Here	Type Here	Select Date
Type Here	Type Here	Select Date

3) a) Some or all groundwater, leachate and WDS gas sampling and monitoring requirements have been established or defined outside of a ministry C of A, authorizing, or control document.	<input type="radio"/> Yes <input checked="" type="radio"/> No <input type="radio"/> Not Applicable	
b) If yes, the sampling and monitoring identified under 3(a) for the monitoring period being reported on was successfully completed in accordance with established protocols, frequencies, locations, and parameters developed as per the Technical Guidance Document:	<input type="radio"/> Yes <input type="radio"/> No <input checked="" type="radio"/> Not Applicable	If no, list exceptions below or attach additional information.
Groundwater Sampling Location	Description/Explanation for change (change in name or location, additions, deletions)	Date
Type Here	Type Here	Select Date
Type Here	Type Here	Select Date
Type Here	Type Here	Select Date
Type Here	Type Here	Select Date
4) All field work for groundwater investigations was done in accordance with standard operating procedures as established/outlined per the Technical Guidance Document (including internal/external QA/QC requirements) (Note: A SOP can be from a published source, developed internally by the site owner's consultant, or adopted by the consultant from another organization):	<input checked="" type="radio"/> Yes <input type="radio"/> No	If no, specify (Type Here):

Sampling and Monitoring Program Results/WDS Conditions and Assessment:

<p>5) The site has an adequate buffer, Contaminant Attenuation Zone (CAZ) and/or contingency plan in place. Design and operational measures, including the size and configuration of any CAZ, are adequate to prevent potential human health impacts and impairment of the environment.</p>	<p><input type="radio"/> Yes <input checked="" type="radio"/> No</p>	<p>Approval of the proposed CAZ by the MECP is pending.</p>	
<p>6) The site meets compliance and assessment criteria.</p>	<p><input type="radio"/> Yes <input checked="" type="radio"/> No</p>	<p>Exceedances of Guideline B-7 were quantified for DOC in the shallow aquifer and for TDS in the deep aquifer at downgradient boundary wells.</p>	
<p>7) The site continues to perform as anticipated. There have been no unusual trends/ changes in measured leachate and groundwater levels or concentrations.</p>	<p><input checked="" type="radio"/> Yes <input type="radio"/> No</p>		
<p>1) Is one or more of the following risk reduction practices in place at the site:</p> <p>(a) There is minimal reliance on natural attenuation of leachate due to the presence of an effective waste liner and active leachate collection/treatment; or</p> <p>(b) There is a predictive monitoring program in-place (modeled indicator concentrations projected over time for key locations); or</p> <p>(c) The site meets the following two conditions (typically achieved after 15 years or longer of site operation):</p> <p><i>i.</i> The site has developed stable leachate mound(s) and stable leachate plume geometry/concentrations; and</p> <p><i>ii.</i> Seasonal and annual water levels and water quality fluctuations are well understood.</p>	<p><input checked="" type="radio"/> Yes <input type="radio"/> No</p>	<p>Note which practice(s):</p>	<p><input type="checkbox"/> (a) <input type="checkbox"/> (b) <input checked="" type="checkbox"/> (c)</p>
<p>9) Have trigger values for contingency plans or site remedial actions been exceeded (where they exist):</p>	<p><input type="radio"/> Yes <input type="radio"/> No <input checked="" type="radio"/> Not Applicable</p>	<p>If yes, list value(s) that are/have been exceeded and follow-up action taken (Type Here):</p>	

Groundwater CEP Declaration:

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

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

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

Recommendations:

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

No changes to the monitoring program are recommended



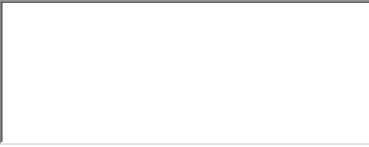
The following change(s) to the monitoring program is/are recommended:

Repairs to well nest MW-N should be completed in the spring of 2021.

No Changes to site design and operation are recommended

The following change(s) to the site design and operation is/are recommended:

The Site should be capped, as the addition of low permeability final cover material is anticipated to reduce infiltration and subsequently reduce leachate generation at the Site. A measureable improvement in groundwater quality in the immediate vicinity of the Site is expected following final capping.

Name:	Brian Grant		
Seal:	Add Image		
Signature:		Date:	7-Dec-2020
CEP Contact Information:	Brian Grant, P.Eng.		
Company:	Wood Environment & Infrastructure Solutions		
Address:	131 Fielding Road, Lively, Ontario, P3Y 1L7		
Telephone No.:	705-682-2632 x 235	Fax No. :	705-682-2260
E-mail Address:	brian.grant@woodplc.com		
Co-signers for additional expertise provided:			
Signature:		Date:	Select Date
Signature:		Date:	Select Date

Surface Water WDS Verification:

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

Name (s)	NONE
Distance(s)	N/A

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

Sampling and Monitoring Program Status:

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

Surface Water Sampling Location	Description/Explanation for change (change in name or location, additions, deletions)	Date
Type Here	Type Here	Select Date
Type Here	Type Here	Select Date
Type Here	Type Here	Select Date
Type Here	Type Here	Select Date

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

Sampling and Monitoring Program Results/WDS Conditions and Assessment:

5) The receiving water body meets surface water-related compliance criteria and assessment criteria: i.e., there are no exceedances of criteria, based on MOE legislation, regulations, Water Management Policies, Guidelines and Provincial Water Quality Objectives and other assessment criteria (e.g., CWQGs, APVs), as noted in Table A or Table B in the Technical Guidance Document (Section 4.6):

- Yes
 No

If no, list parameters that exceed criteria outlined above and the amount/percentage of the exceedance as per the table below or provide details in an attachment:

Parameter	Compliance or Assessment Criteria or Background	Amount by which Compliance or Assessment Criteria or Background Exceeded
e.g. Nickel	e.g. C of A limit, PWQO, background	e.g. X% above PWQO
		Not applicable
Type Here	Type Here	Type Here
Type Here	Type Here	Type Here

6) In my opinion, any exceedances listed in Question 5 are the result of non-WDS related influences (such as background, road salting, sampling site conditions)?

- Yes
 No

Not applicable

<p>7) All monitoring program surface water parameter concentrations fall within a stable or decreasing trend. The site is not characterized by historical ranges of concentrations above assessment and compliance criteria.</p>	<p><input checked="" type="radio"/> Yes</p> <p><input type="radio"/> No</p>	<p>N/A</p>
<p>8) For the monitoring program parameters, does the water quality in the groundwater zones adjacent to surface water receivers exceed assessment or compliance criteria (e.g., PWQOs, CWQGs, or toxicity values for aquatic biota (APVs)):</p>	<p><input type="radio"/> Yes</p> <p><input type="radio"/> No</p> <p><input type="radio"/> Not Known</p> <p><input checked="" type="radio"/> Not Applicable</p>	<p>If yes, provide details and whether remedial measures are necessary (Type Here)</p>
<p>9) Have trigger values for contingency plans or site remedial actions been exceeded (where they exist):</p>	<p><input type="radio"/> Yes</p> <p><input type="radio"/> No</p> <p><input checked="" type="radio"/> Not Applicable</p>	<p>If yes, list value(s) that are/have been exceeded and follow-up action taken (Type Here)</p>

Surface Water CEP Declaration:

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

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

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

Recommendations:

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

<p><input checked="" type="radio"/> No Changes to the monitoring program are recommended</p> <p><input type="radio"/> The following change(s) to the monitoring program is/are recommended:</p>	<p>Type Here</p>
<p><input checked="" type="radio"/> No changes to the site design and operation are recommended</p> <p><input type="radio"/> The following change(s) to the site design and operation is/are recommended:</p>	<p>Type Here</p>

CEP Signature	Brian Grant Digitally signed by Brian Grant Date: 2020.12.07 13:13:39 -05'00'	
Relevant Discipline	Hydrogeologist	
Date:	7-Dec-2020	
CEP Contact Information:	Brian Grant	
Company:	Wood Environment & Infrastructure Solutions	
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Save As		Print Form