2023 ANNUAL MONITORING REPORT
MUSCLOW-GREENVIEW WDS
ENVIRONMENTAL COMPLIANCE APPROVAL
NO. A362303

Prepared for:

The Corporation of the Municipality of Hastings Highlands
P.O. Box 130
33011 Highway No. 62
Maynooth, ON K0L 2S0

Prepared by:

BluMetric Environmental Inc.
4 Cataraqui Street
The Woolen Mill, The Tower
Kingston, ON K7K 1Z7

Project Number: 230225-07
25 March 2024

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(Provided on USB drive for Hard Copy)

1 Introduction

This report provides a summary and analysis of environmental monitoring activities at the Musclow-Greenview Waste Disposal Site (WDS), in Maynooth, Ontario. The WDS is herein referred to as the "Site".

BluMetric Environmental Inc. (BluMetric®) was retained by The Corporation of the Municipality of Hastings Highlands (MHHs or Municipality) to conduct the 2023 environmental monitoring and sampling program and prepare the 2023 Annual Monitoring Report. This report is prepared in accordance with Condition 6 of the Environmental Compliance approval (ECA) No. A362303 (amended April 27, 2018), a copy of which is included in **Appendix A (A-1).**

This report covers all work and activities carried out for the period from January 1 to December 31, 2023. The report includes details on both the environmental monitoring and sampling program as well as details relating to site operations, including the Waste Transfer (WT) areas at the Site.

The intent of this report is to be consistent with the general requirements of the Ontario Ministry of Environment, Conservation and Parks (MECP) document titled; Monitoring and Reporting for Waste Disposal Sites, Groundwater, and Surface Water: Technical Guidance Document (MOE, November 2010), referred to as the "WDS Technical Guidance". The Monitoring and Screening Checklist from the WDS Technical Guidance has been completed and is included as **Appendix B** of this report. The screening checklist was completed with the Operational Status set as "open" as the Site operated through 2023.

1.1 Location

The WDS is located on Part of Lot 11, Concession 11, at 3375 Musclow Greenview Road, Maynooth, Ontario in the Municipality of Hastings Highlands (Figure 01). The total area of the Site is 2.0 hectares (ha) with a 1.0 ha approved landfilling area. The Site layout is shown in Figure 02.

The Site is accessed via Musclow Greenview Road which is east of Highway 62. There are approximately 10 residences within 500 m of the Site. All are located topographically upgradient from the WDS.

1.2 Ownership and Key Personnel

The facility is operated by the MHHs, with the Municipal office located in Maynooth, Ontario. A copy of the land registry information showing the transfer of the land to the Township of Monteagle in 1980 is also provided in **Appendix A (A-2)**. The ownership of which was transferred to the MHHs under amalgamation procedures.

The facility's operational representative is responsible for all activities on-site. The Competent Environmental Practitioner (CEP) for both groundwater and surface water is Mark Somers, P.Eng., of BluMetric. Contact information is outlined in Table 1.

Table 1: Contact Information

	Name	Address	Phone Number	Email
Site Owner / Contact	The Corporation of the Municipality of Hastings Highlands CAO – David Stewart	P.O. Box 130 33011 Highway No. 62 Maynooth, ON K0L 2S0	(613) 338-2811 ext. 289	dstewart@ hastingshighlands.ca
CEP	Senior Engineer, BluMetric – Mark Somers, P.Eng.	1682 Woodward Drive, Ottawa, ON, K2C 3R8	(877) 487-8436 ext.446	msomers@blumetric.ca

1.3 Description and Development of the WDS

As mentioned, the Site has a total area of 2.0 ha with a 1.0 ha approved landfilling area. In addition to domestic wastes, the WDS also contains a scrap metal pile, a tire pile, a brush pile, a bulky waste pile, and electrical and electronic waste bin, and a recycling transfer station for handling aluminum, metal cans, plastic bottles, paper, cardboard, etc.

The initial development of the Site is unknown, and it is unlikely that studies were undertaken prior to the Site development. It is also unlikely that any engineering or cell planning was completed prior to the initial placement of waste. The original ECA is dated 1989, however anecdotally, it is believed that the first waste was placed around 1970.

1.4 Monitoring and Reporting Program Objectives and Requirements

The objectives of the monitoring and reporting program are to identify and mitigate impacts to the environment caused by the municipal solid WDS. The monitoring and reporting program has been developed with these objectives in mind. In addition, the monitoring and reporting programs are designed to adhere to the MECP's WDS-Technical Guidance (November 2010) document and the ECA for the Site. The amended ECA (April 2018) stipulates the requirements for surface water monitoring under Schedule B of the ECA. Historically, the Municipality has undertaken monitoring voluntarily because of the potential for site runoff to impact surface water (from 2006 onward). Shallow groundwater monitoring was initiated in the fall of 2016 with the installation of drive-point piezometers at the Site. The ECA now stipulates groundwater monitoring of the drive point piezometers in Schedule C of the ECA. Subsequent to the ECA Amendment, the MECP requested that additional site characterization be carried out and that a leachate and background well be installed at the Site. Three groundwater monitoring wells were installed at the Site in December 2018.

2 Physical Setting

2.1 Geology and Potential Receptors

2.1.1 Surficial Geology

The surficial geology underlying the Site is sand and gravel as determined from groundwater well information from the online Groundwater Information Network (GIN). Geological maps describe the surficial geology as glaciofluvial outwash deposits (MNDM, 2556). The immediate area of the Site is characterized by sand and gravel overburden

with a thickness ranging from 0 to 3 metres below ground surface (mbgs) overlying bedrock. Further site characterization work was carried out in December 2018 which encountered a range of overburden thickness from 8.5 mbgs to 14.5 mbgs along the north and west sides of the waste footprint. The monitoring well logs are provided in **Appendix C**.

2.1.2 Bedrock Geology

The Musclow-Greenview WDS is located within the Grenville geological province, on Precambrian metamorphic bedrock. The bedrock geology of the area is predominantly clastic metasedimentary rocks (for example conglomerate, wacke, quartz arenite, arkose, limestone) to mafic to ultramafic plutonic rocks such as diorite, gabbro, periodite, pyroxenite, anorthosite, derived metamorphic rocks (Map 2544, MNDM). The undifferentiated igneous and metamorphic rock is exposed at surface or covered by a discontinuous, thin layer of drift (Map 2556, MNDM).

2.2 MECP Well Records

A groundwater well information search in 2015 indicated that there are eight domestic wells within 0.5 km of the Site, and 25 domestic and two municipal wells within 1.5 km of the Site. Records show all wells are drilled into bedrock at depths of 30 mbgs or more. Only three of the wells appear to be topographically downgradient from the Site.

2.3 Surface Water Features

The Site is situated along the edge of a topographic high and is bordered by low-lying land to the north and west. The low-lying areas are connected to a wetland southwest of the WDS. These areas are designated as an Environmental Protection area. Based on the topography, the area to the north of the Site contains surface water that is primarily stagnant and if there is any flow, it flows east to west. The wetland area to the west of the Site drains south and west to an unnamed lake, however, a direct connection has not been observed during field investigations. Forested land makes up the majority of the remainder of the surroundings.

Potential groundwater and surface water receptors in the area surrounding the Site include:

- Unnamed Lake, 0.25 km southwest of the Site (Figure 01).
- Goodkey Creek, 0.6 km west of the Site (Figure 01), which flows north from the unnamed lake.

3 Description of Monitoring Program

3.1 Site Inspections and Operations Monitoring

Site visits to the Musclow-Greenview WDS were conducted on May 2, 2023, and October 18, 2023. The detailed site checklists are provided in **Appendix D (D-1)**. Generally, the Site was in good condition although the following concerns were noted:

- The bulky waste and scrap metal waste piles were noted to be large and spilling over the berms during the spring inspection. The scrap metal pile was recently removed from Site prior to the fall inspection.
- A large area of uncovered waste was noted during the fall inspection.
- The berms separating the segregated waste piles were noted to be insufficient.

The locations of groundwater and surface water monitoring locations are shown on Figure 02, Figure 03, and Figure 04. Select photographs taken during the site visits are provided at the end of the text following the tables and figures.

3.2 Monitoring Locations, Frequency, and Monitoring Parameters

3.2.1 Drive-Point Piezometer Monitoring

The Musclow-Greenview WDS has five drive-point piezometers which were installed to determine if impacted shallow groundwater from the Site is discharging to surface water. Four of the drive-point piezometers, MG-DP1 to MG-DP4, were installed by

BluMetric personnel on October 6, 2016, and were installed from 2.3 mbgs to 2.9 mbgs. More detailed installation data for MG-DP1 to MG-DP4 has been provided in the 2016 Annual Monitoring Report. The fifth drive-point piezometer (MG-DP5) was installed by BluMetric personnel on October 20, 2021, to a depth of 2.63 mbgs.

Drive-point piezometers are monitored on a semi-annual basis (spring and fall). **Table 2** summarizes the coordinates and monitoring location descriptions of the drive-point piezometers.

Table 2: Drive-Point Piezometer Sampling Locations

Sample Location	Northing	Easting	Description
MG-DP1	5,010,719	279,833	Adjacent to MG-SW1 approximately 75 m north of the waste mound.
MG-DP2	5,010,642	279,776	Adjacent to MG-SW2, approximately 45 m NW of the toe of the waste mound.
MG-DP3	5,010,568	279,750	Adjacent to MG-SW-3 approximately 55 m SW from the toe of the waste mound.
MG-DP4	5,010,676	279,838	Located approximately halfway between MG-SW-1 and the waste mound, approximately 35 m north of the waste mound.
MG-DP5	5,010,576	279,699	Located approximately 50 m west of MG-DP3 and 15 m northeast of MG-SW6, approximately 100 m west-southwest of the waste mound.

Note: An elevation survey was carried out on January 10, 2019, and provides the data in Table 5 for MG-DP1 to MG-DP4. An additional survey on October 20, 2021, provides the data for MG-DP5. Coordinates are in NAD 83 and Zone 18.

Groundwater samples were collected from the drive-point piezometers on May 2, 2023, and October 18, 2023. The laboratory reports and chain of custody records are included in **Appendix D (D-2)**. Table 4 lists the groundwater quality monitoring parameters. Field measurements of groundwater pH, temperature, and conductivity were collected at the time of sampling.

3.2.2 Groundwater Monitoring

The Musclow-Greenview WDS is monitored on a semi-annual basis (spring and fall). Three groundwater monitoring wells (MG-18-1, MG-18-2, and MG-18-3) were installed at the Site between December 18-20, 2018, and were surveyed on January 10, 2019. The groundwater sampling locations are illustrated on the Site Plan (Figure 02). These groundwater monitoring wells were installed as per the 2018 ECA amendment for the Site, which stipulated that further investigation into groundwater and surface water impacts be conducted within 12 months after issuance of the amendment. Bedrock drilling did not occur. Due to the background monitoring well MG-18-3 continuously being dry and being unable to collect a sample, a replacement well, MG-18-3R, was installed on September 18, 2023, to a depth of 16.2 mbgs. The boreholes were drilled to depths of 17.4 mbgs, 21.5 mbgs, and 16.2 mbgs (MG-18-1, MG-18-2, and MG-18-3R, respectively) and are completed in the overburden unit. **Table 3** summarizes the GPS coordinates and location description of the groundwater monitoring wells. Monitoring well logs are provided in **Appendix C**.

Table 3: Groundwater Monitoring Well Details

Sample Location	Northing (m)	Easting (m)	Description	Screened Interval (mbgs)
MG-18-1	5,010,620	279,830	Leachate characterization well (inside the approved footprint of the Site). North edge of the site.	14.33 to 17.38
MG-18-2	5,010,588	279,805	Leachate characterization well (inside the approved footprint of the Site). West side of the site.	18.28 to 21.30
MG-18-3	5,010,638	279,919	Installed to monitor background groundwater quality. East side of the site, depth was limited by boulders encountered during drilling. Monitoring well was decommissioned due to historical dry conditions.	4.72 to 6.25

Sample Location	Northing (m)	Easting (m)	Description	Screened Interval (mbgs)
MG-18-3R	5,010,639	279,918	Installed on September 18, 2023, to replace original background monitoring well, MG-18-3. East side of the site, directly adjacent to MG-18-3.	13.10 to 16.15

Note: Elevations and coordinates as per BluMetric surveys (January 2018, October 2021, and September 2023). NAD 83 and Zone 18.

Groundwater was sampled from the groundwater monitoring locations on May 2, 2023, and October 18, 2023. A groundwater sample was collected from MG-18-3 during the spring monitoring event, however, was subsequently decommissioned. A groundwater sample was collected from MG-18-3R during the fall monitoring event. The laboratory reports and chain of custody records are included in **Appendix D (D-2)**. **Table 4** lists the groundwater quality parameters which were analyzed in 2023.

Table 4: Groundwater Quality Monitoring Parameters

Category	Parameters
Organic Parameters	Biochemical Oxygen Demand (BOD_5), Dissolved Organic Carbon (DOC), Chemical Oxygen Demand (COD)
Inorganic Parameters	Nitrate, Ammonia, Chloride, Major Ions (Sodium, Calcium, Magnesium, Sulphate, Alkalinity)
Metals (dissolved)	Iron, Chromium, Lead, Cadmium, Boron, Barium, Aluminum, Cobalt, Manganese, Silver, Zinc
Volatile Organic Compounds*	Vinyl Chloride, Methylene Chloride, Benzene, Toluene, and 1,4-Dichlorobenzene
Other	Electrical Conductivity, pH (lab), Total Dissolved Solids (TDS), Total Suspended Solids (TSS)

Note: *MECP requested leachate wells be analyzed for VOCs in 2020. Since there were criteria exceedances, these wells were analyzed for VOCs again in 2022. VOC sampling was not conducted in 2023, however, the next VOC sampling event will occur in 2024.

Field measurements of groundwater pH, temperature, and conductivity were collected at the time of sampling. The field pH results for both sampling events in 2023 ranged from 6.12 to 7.28. Low pH values are typical in the region.

During the 2023 monitoring events, the conditions of groundwater monitoring wells were inspected. Any repairs, such as new locks, labels, or well caps, were made as necessary. It is recommended that protective casings be installed for MG-18-1 and MG-18-2. Protective casings with proper annular space seals remain in place to ensure that surface water or foreign materials cannot enter groundwater monitoring wells. Monitoring wells are fitted with a vermin proof cap to meet the requirements of Ontario Regulation 903 and are locked to provide protection against vandalism and are in line with industry best practices.

3.2.2.1 Groundwater Elevation and Flow Monitoring

During both monitoring events groundwater elevations were collected from each of the groundwater monitoring wells. Groundwater level measurements were collected using a Solinst electronic water level meter prior to the purging/sampling activity.

Groundwater elevations are typically not measured at drive-point locations because the water level tape cannot fit in the casing. Consequently the 2023 groundwater elevation data includes only one drive-point measurement (MG-DP5). Groundwater elevation data is summarized in **Table 5**.

Table 5: Groundwater Elevation Data

Groundwater Monitor	Elevation (TPVC)* (masl)	Water Level (m) 2-May-23	Groundwater Elevation (masl) 2-May-23	Water Level (m) 18-Oct-23	Groundwater Elevation (masl) 18-Oct-23
MG-DP1	377.55	NR	NR	NR	NR
MG-DP2	376.56	NR	NR	NR	NR
MG-DP3	376.63	NR	NR	NR	NR
MG-DP4	377.28	NR	NR	NR	NR
MG-DP5	376.80	0.94	375.86	1.23	375.57
MG-18-1	391.01	11.59	379.42	13.775	377.235
MG-18-2	391.39 (spring) 395.96 (fall)	12.49	378.90	19.065	376.895

Groundwater Monitor	Elevation (TPVC)* (masl)	Water Level (m) 2-May-23	Groundwater Elevation (masl) 2-May-23	Water Level (m) 18-Oct-23	Groundwater Elevation (masl) 18-Oct-23
MG-18-3	390.80	6.35	384.45	NA	NA
MG-18-3R	390.78	NA	NA	11.56	379.22

Notes: Elevations and coordinates as per BluMetric surveys (January 2018, October 2021, September 2023). NAD 83 and Zone 18.

*TPVC – Elevation (m) at top of PVC casing.

NR – No Reading

NA – Not applicable

3.2.2.2 Groundwater Gradients and Flow Direction

Groundwater elevations were not collected from the drive-point piezometers (except for MG-DP5). Therefore, groundwater flow gradients and direction could not be calculated. Historic data varies but generally, shallow groundwater is inferred to be mounding below the WDS and flowing radially away from the Site towards the west. A wetland is located approximately 140 m to the southwest of the final waste footprint. The wetland is adjacent to an unnamed lake which discharges to the north towards Goodkey Creek.

3.2.3 Surface Water Monitoring

Under the ECA, the current surface water monitoring program consists of four locations (historical locations MG-SW1, MG-SW2, MG-SW3, and a background location) which are monitored on a semi-annual frequency. The current background location is MG-SW4A. The sampling locations are identified on Figure 03. Location MG-SW1 is located north of the landfill. Location MG-SW2 is located near the north-northwest toe of the landfill and is intended to provide results reflective of potential runoff related impacts in this direction. Location MG-SW3 is located downstream of the landfill and is used to monitor potential surface water impacts from the landfill to the west and potentially to the lake southwest of the Site. Location MG-SW4A is an up-gradient background sample location collected from Goodkey Creek approximately 1 km north of the Site.

Previously, background surface water was sampled at location MG-SW4 and MG-SW5. These locations were found to be frequently dry and therefore were replaced by the current background location MG-SW4A. The former sample locations MG-SW4 and MG-SW5 are shown on Figure 03.

One-time, supplemental surface water samples (MG-SW6 and MG-SW7) were collected in the late summer and early fall of 2020 as requested by the MECP. Location MG-SW6 is located approximately 70 m west of MG-SW3 and MG-SW7 is located approximately 130 m southwest of MG-SW3. These two supplemental surface water sampling locations are illustrated on Figure 03. These locations were sampled to assist in determining the extent of potential downgradient WDS impacts on surface water. MG-SW6 should be sampled on a semi-annual frequency and MG-SW7 should be sampled every five years (e.g., 2025, 2030, etc.).

Surface water samples were collected from MG-SW1, MG-SW2, MG-SW3, MG-SW4A, and MG-SW6 on May 2, 2023, and from MG-SW4A on October 18, 2023. Samples could not be collected from MG-SW1, MG-SW2, MG-SW3, and MG-SW6 during the October sampling event due to dry conditions. Each sampling station was photographed, and physical conditions (velocity and watercourse dimensions) were documented. Table 6 details the GPS coordinates and general descriptions for the sample locations.

Table 6: Surface Water Sampling Locations

Sample Location	Northing	Easting	Location Description
ECA Sampling Locations			
MG-SW1	5,010,713	279,836	90 m north of the final waste footprint.
MG-SW2	5,010,640	279,775	45 m northwest of the toe of the final waste mound.
MG-SW3	5,010,566	279,754	55 m southwest from the toe of the final waste mound.
MG-SW4A (Background)	5,011,183	279,650	Goodkey Creek approximately 860 m northwest of the final waste footprint.
Supplemental Sampling Locations			
MG-SW6	5,010,569	279,685	70 m west of MG-SW3 and 120 m west of the final waste footprint, sampled semi-annually

Sample Location	Northing	Easting	Location Description
Supplemental Sampling Locations			
MG-SW7	5,010,539	279,636	130 m southwest of MG-SW3 and 180 m west of the final waste footprint, sampled every five years.
Former Background Locations			
MG-SW4	5,011,754	279,563	Goodkey Creek approximately 1 km north of the final waste footprint.
MG-SW5	5,011,732	279,580	Off of the access road to the municipal aggregate pit, 600 m to the north of the final waste footprint.

Note: NAD 83 datum, UTM Zone 18

Surface water temperature, pH, conductivity, and dissolved oxygen field measurements were recorded at the time of sampling. The field pH values ranged from 6.11 to 7.79 in 2023. Surface water samples were analyzed for the parameters listed in Schedule B of the ECA. Table 7 lists the surface water quality parameters which were analyzed in 2023.

Table 7: Surface Water Quality Parameters

Category	Parameters
Biological Parameters	BOD_5
Organic Parameters	COD, Phenols
Inorganic Parameters	Alkalinity, Chloride, Nitrite, Nitrate, Sulphate, Phosphorous (total), Total Kjeldahl Nitrogen (TKN), Ammonia (N) – Total, Calcium, Aluminum – Dissolved, Barium, Boron, Cadmium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Potassium, Sodium, Zinc
Physical/Chemical Parameters	pH, Conductivity, TDS, TSS, Total Hardness (as CaCO3)

Surface flow measurements were collected using a Global Flow Probe for open channel flow. The flow velocity in meters per second (m/s) was recorded along with the width and depth of flow. Table 8 summarizes the calculated flow measurements and water clarity observations for each location.

Table 8: **Surface Water Sampling Locations and Observations**

Date	Location	Field Observations
May 2, 2023	MG-SW1	Large, flooded area, no visible flow. The water was clear with some algae growth started. Sample collected.
	MG-SW2	Large swampy area, no visible flow. The water was clear with a yellow/brown tinge. Sample collected.
	MG-SW3	Swampy area with no direct flow path, minimal flow noted. The water was clear with a yellow/brown tinge. Sample collected and 2 pails for toxicity.
	MG-SW4A	Flow = 0.395 m^3/s. Area was flooded and above the normal creek bank. The water was clear with a light brown tinge. Sample collected.
	MG-SW6	Large, flooded area, minimal flow was observed. The water was clear with some algae growth started. Sample collected.
October 18, 2023	MG-SW1	Extremely shallow ponded area (<0.01 m). No sample collected.
	MG-SW2	Extremely shallow ponded area (<0.01 m). No sample collected.
	MG-SW3	Extremely shallow ponded area (<0.01 m). No sample collected.
October 18, 2023	MG-SW4A	No flow observed, water course was backed up and flooded, likely an obstruction downstream. The water was clear with a light brown tinge. Sample collected.
	MG-SW6	Extremely shallow ponded area (<0.01 m). No sample collected.

3.2.4 Landfill Gas Monitoring

The primary gas present at landfill sites is methane. Methane cannot cause an explosion unless it accumulates to a concentration above its lower explosive limit (LEL) in an enclosed area. The LEL for methane is 5% in air. Regulation 232/98 methane concentration limits are:

- Less than 2.5% methane gas (25,000 ppm, LEL=50%) in the subsurface at the property;
- Less than 1.0% methane gas (10,000 ppm, LEL-20%) in an on-site building, or its foundation; and,

- Less than 0.05 % methane gas (500 ppm, LEL=1%) in a building, or its foundation, which is located off-site.

Routine landfill gas monitoring within any buildings or structures is required at the Site.

3.3 Monitoring Procedures and Methods

3.3.1 Drive-Point Piezometer Monitoring

Drive-point piezometer purging and sampling was conducted using a peristaltic pump. Minimum purge and ultra-low flow rate techniques were used to purge and sample each drive-point. Each location was purged of the standing water in the sample tubing prior to filling sample bottles. In the case where a drive-point was purged dry, samples were collected after sufficient water had recovered. Field temperature, pH, and conductivity measurements were recorded at the time of sampling using a YSI multi-meter. The instrument was calibrated and/or checked for pH and conductivity. Samples were field filtered for DOC and metals analyses. Samples were collected in laboratory prepared and supplied bottles and submitted for analyses to AGAT Laboratories during the spring sampling event and to Bureau Veritas (BV) Laboratories during the fall sampling event. Laboratory reports and chain of custody forms are compiled in **Appendix D (D-2)**. AGAT and BV are accredited member of the Canadian Association of Laboratory Accreditation (CALA).

3.3.2 Groundwater Monitoring

Groundwater monitoring wells were purged a minimum of three borehole volumes or until the monitor purged dry. In the case where a monitor was purged dry, samples were collected after sufficient water had returned for sampling purposes. Field temperature, pH, and conductivity measurements were recorded at the time of sampling using a YSI multi-meter. The instrument was calibrated and/or checked for pH and conductivity. Samples were field filtered for DOC and metals analyses. Samples were collected in laboratory prepared and supplied bottles and submitted to AGAT Laboratories during the spring sampling event and to Bureau Veritas (BV) Laboratories

during the fall sampling event. Laboratory reports and chain of custody forms are compiled in **Appendix D (D-2)**.

3.3.3 Surface Water Monitoring

Surface water samples were collected using a peristaltic pump and new sample tubing. Field temperature, pH, conductivity, and dissolved oxygen measurements were recorded at the time of sampling. During both sampling events the field parameters were measured using a YSI multi-meter calibrated as per the manufacturer's instructions. Surface water samples were filtered by the laboratory for the dissolved aluminum and mercury sample analyses.

Surface water samples were collected in laboratory-prepared and supplied bottles and submitted to AGAT Laboratories during the spring sampling event and to Bureau Veritas (BV) Laboratories during the fall sampling event. Additional confirmatory phenols samples were submitted to BV and Caduceon Environmental Laboratory during the spring sampling event for each of the surface water sampling locations. Surface water samples were stored at approximately 4° Celsius during shipment to AGAT and BV Laboratories for chemical analyses. Holding times for samples conformed to CCME Standards where applicable (CCME, 1993). Chain of custody forms accompanied the samples from submittal to the laboratory until the chemical results were provided to BluMetric. Laboratory reports and chain of custody forms are compiled in **Appendix D (D-3)**.

3.3.4 Landfill Gas Monitoring

An RKI Eagle gas monitor with methane detection was used to monitor landfill gas at the Site during the semi-annual monitoring events.

There are no sampling valves, ports, or vapour monitors on-site. Gas monitoring was conducted for the site attendant's building and from the groundwater monitoring wells and drive-point piezometers during both the spring and fall 2023 sampling events. Gas monitoring measurements from the groundwater monitoring wells were collected

prior to collecting groundwater levels or samples. These measurements were completed by inserting the intake of the gas monitoring equipment under the cap of the monitoring well prior to removal of the cap and by keeping the best seal possible around the cap and gas equipment intake.

3.3.5 Quality Assurance/Quality Control Program

The Quality Assurance/Quality Control (QA/QC) program for the Site included the collection of field duplicate samples to demonstrate that field sampling techniques utilized by BluMetric personnel are capable of yielding reproducible results.
Field duplicates were collected concurrently with the original sample. One field duplicate per sample matrix was collected during each sampling event at the WDS.
Precision is a measure of the reproducibility of analytical results and can be expressed quantitatively by the relative percent difference (RPD) between the original sample(s) and their corresponding field blind duplicate sample(s). The RPD is defined by the following equation:

$$RPD = 2 \times \frac{|(S - D)|}{(S + D)} \times 100$$

Where S = concentration in the original sample
D = concentration in the duplicate

An RPD is calculated where the average of the measured parameter concentrations of the original (S) and duplicate (D) samples are greater than 5X the laboratory readable detection limits (RDL), which represents the RPD qualification criteria. A lower level of precision is expected where the above criteria are not met. A high level of reproducibility with respect to sample results collected at the Site is indicated by an RPD value below 10% for electrical conductivity, 20% for metals and inorganics, and 30% for BTEX and PHC. These criteria are used as a general guideline and correspond to those recommended within the O. Reg. 153/04 Analytical Protocol (MOE, 2011) and by the Ontario QA/QC Interpretation Guide – Environmental Services (Maxxam, 2015). An RPD

below the recommended criteria is considered acceptable, indicating that the sampling methodology can produce repeatable results.

All equipment for field parameter testing and gas monitoring are calibrated in the field during each sampling event, or by the supplier.

One blind field duplicate per media was sampled and submitted for analysis during each of the sampling events. The field duplicate bottles were filled simultaneously with the actual sample bottles at the sample location selected for duplication. The laboratory prepared bottles (identified and duplicate) for each group of chemical parameters (e.g., metals, nutrients, general chemistry etc.) were filled simultaneously to ensure identical water was collected into each container. This continued for each matching parameter group bottle until both sample bottle sets for that location were filled.

4 Monitoring Program Results

4.1 Groundwater Monitoring Results

Groundwater quality has been compared to the Ontario Drinking Water Standards and Operational Guidelines (ODWSOG), the calculated Reasonable Use Values (RUVs), and the Provincial Water Quality Objectives (PWQO).

Ontario Drinking Water Standards and Operational Guidelines (ODWSOG)

The 2023 drive-point and monitoring well groundwater chemistry results are shown in Table 16 (end of the text). The laboratory reports and chain of custody records are included in **Appendix D (D-3)**. The groundwater chemistry results were compared to the ODWSOG and parameters with results falling outside the criteria are summarized in Table 9 below.

Table 9: Groundwater Quality Parameters Below or Exceeding ODWSOG

Location	General Description	Parameter(s) Not Meeting ODWSOG
Drive-point Piezometer Data		
MG-DP1	Downgradient to the north of the WDS	DOC (fall only) TDS Manganese
MG-DP2	Downgradient to the northwest of the WDS	DOC Manganese
MG-DP3	Downgradient to the west of the WDS	Alkalinity DOC TDS Iron Manganese
MG-DP4	Downgradient to the north of the WDS	DOC (fall only)
MG-DP5	Downgradient to the west of the WDS	DOC TDS (fall only) Iron Manganese Zinc
Monitoring Well Data		
MG-18-1	Leachate well on the north side of the WDS	DOC (spring only) TDS Iron Manganese
MG-18-2	Leachate well on the west side of the WDS	Alkalinity DOC TDS Iron Manganese
MG-18-3	Background well on the east side of the WDS	None (only sampled in the spring)
MG-18-3R	Replacement background well on the east side of the WDS	Manganese (only sampled in the fall)

A limited group of VOCs were analyzed at MG-18-1 and MG-18-2 during the fall 2019, 2020, 2021 and spring 2022 sampling events with a full suite of VOCs sampled during the 2022 fall sampling event. Benzene and vinyl chloride exceeded ODWSOG guidelines during both sampling events at MG-18-2. Benzene and vinyl chloride concentrations have exceeded the ODWSOG guidelines at MG-18-2 during previous sampling events. The next VOC sampling event will occur in 2024.

Reasonable Use Values (RUVs)

The following calculations are based on the background groundwater (MG-18-3 and MG-18-3R) quality from the May 2019, May 2023, and October 2023 sampling events. It is important to note that the RUVs are based on only three data points (three sampling events) and as a result are not very reliable.

Cm = Cb + x(Cr-Cb); Where

Cm : maximum allowable concentration in groundwater beneath adjacent property (RUV)
Cb : median background concentration before any effects from human activity
Cr : maximum concentration that should be present based on use (ODWSOG)
x : constant that reduces the contamination to a level considered by the MECP to have only a negligible effect on the use of the water (0.25 for a health-related parameter and 0.5 for an aesthetic or physical parameter)

The following Table 10 summarizes the data used to calculate Cm values (RUVs).

Table 10: Reasonable Use Calculations

Parameter	Units	ODWSOG	Historical Median	x	RUV
		Cr	Cb		Cm
Alkalinity as CaCO3 (lower)	mg/L	30	64	0.5	47
Alkalinity as CaCO3 (upper)	mg/L	500	64	0.5	282
pH (lower)		6.5	7.42	0.5	6.96
pH (upper)		8.5	7.42	0.5	7.96
Aluminum	mg/L	0.1	0.00245	0.5	0.051225

Parameter	Units	ODWSOG	Historical Median	x	RUV
		Cr	Cb		Cm
Barium	mg/L	1.0	0.018	0.25	0.2635
Boron	mg/L	5.0	0.011	0.25	1.25825
Cadmium	mg/L	0.005	0.00005	0.25	0.0012875
Chromium	mg/L	0.05	0.0015	0.25	0.013625
Chloride	mg/L	250	1.36	0.5	125.68
DOC	mg/L	5.0	2.4	0.5	3.7
Iron	mg/L	0.30	0.005	0.5	0.1525
Lead	mg/L	0.01	0.00025	0.25	0.0026875
Manganese	mg/L	0.05	0.13	0.5	0.09
Nitrate	mg/L	10	0.05	0.25	2.5375
Sodium	mg/L	200	12.5	0.5	106.25
Sulphate	mg/L	500	19.6	0.5	259.8
TDS	mg/L	500	178	0.5	339
Zinc	mg/L	5.0	0.0025	0.50	2.50125

Parameters from the 2023 Musclow-Greenview WDS monitoring program that exceeded the RUVs are shown in the following Table 11.

Table 11: Groundwater Quality Parameters Below or Exceeding RUV Criteria

Location	Parameter(s) Below or Exceeding RUV Criteria
Drive-Point Data	
MG-DP1	DOC TDS pH (upper limit in fall) Manganese
MG-DP2	DOC
MG-DP3	Alkalinity (upper limit) DOC TDS Iron Manganese
MG-DP4	DOC (fall only)

Location	Parameter(s) Below or Exceeding RUV Criteria
Drive-Point Data	
MG-DP5	Alkalinity (upper limit in spring) DOC TDS pH (lower limit in spring) Iron Manganese Zinc
Monitoring Well Data	
MG-18-1	Alkalinity (upper limit in spring) Chloride (spring only) DOC TDS pH (lower limit in spring) Iron Manganese
MG-18-2	Alkalinity (upper limit) DOC TDS Barium (fall only) Iron Manganese
MG-18-3 (spring only)	Alkalinity (lower limit) Nitrate
MG-18-3R (fall only)	TDS Manganese

Provincial Water Quality Objectives (PWQO)

Since groundwater has the potential to discharge to surface water at the Musclow-Greenview WDS, groundwater has also been compared to the surface water criteria and the results are presented in Table 16 at the end of the text. The parameters not meeting PWQO criteria are summarized below in Table 12.

Table 12: Groundwater Quality Parameters Below or Exceeding PWQO Criteria

Location	General Description	Parameter(s) Not Meeting PWQO
Drive-Point Data		
MG-DP1	Downgradient to the north of the WDS	None
MG-DP2	Downgradient to the northwest of the WDS	None
MG-DP3	Downgradient to the west of the WDS	Iron Boron Cobalt
MG-DP4	Downgradient to the north of the WDS	None
MG-DP5	Downgradient to the west of the WDS	Iron Cobalt Zinc
Monitoring Well Data		
MG-18-1	Leachate well on the west side of the WDS	Iron Cobalt Zinc (fall only)
MG-18-2	Background well on the east side of the WDS	Iron Boron Cobalt
MG-18-3	Replacement background well on the east side of the WDS	None (only sampled in the spring)
MG-18-3R	Leachate well on the west side of the WDS	Cobalt (only sampled in the fall)

Historic groundwater data up to and including 2023 is provided in **Appendix E (E-1)**.

4.2 Surface Water Monitoring Locations Observations

Based on site observations, it appears that surface water does not have a direct flow path away from the mound and is relatively stagnant in the northwest and north portions of the Site, particularly at MG-SW1. This is especially true in the drier summer months and when water levels in the wetland are low. The wetland area surrounding the northwest and west sides of the WDS ultimately drains toward MG-SW3 and MG-SW6 which act as the downgradient sampling locations. These historic observations were confirmed during the spring sampling event with no flow observed at MG-SW1 and MG-SW2, and minimal flow observed at MG-SW3. The water at the background location (MG-SW4A) was observed to be flooded with water levels above the normal creek

banks. Sample location MG-SW6 was noted to be in a large, flooded area with minimal flow.

During the fall sampling event, no flow was observed at MG-SW1, MG-SW2, MG-SW3, and MG-SW6, with insufficient water to collect a representative sample. Background location MG-SW4A was noted to be backed up and flooded due to a presumed obstruction downstream.

4.3 Surface Water Quality Results

Surface water quality results were compared to PWQO, Table A, and Table B criteria of the WDS Technical Guidance document (MOE, 2010).

Table 13 summarizes the parameters that exceeded the criteria. The 2023 surface water results are summarized in Table 17 at the end of the text.

Table 13: Surface Water Quality Parameter Exceedances

Location	Exceeded PWQO	Exceeded Table A	Exceeded Table B
MG-SW1	Aluminum	None	None
MG-SW2	None	None	None
MG-SW3	Boron	None	None
MG-SW4A	Aluminum (spring only)	None	None
MG-SW6	Total phosphorus	None	None

The laboratory detection limit (LDL) for cadmium exceeded the Table B guidelines for all surface water samples submitted in 2023. This has routinely occurred since surface water monitoring began in 2006 at all locations, including the background sample locations. The Table B cadmium criteria is an interim guideline and well below the PWQO criteria (0.0001 mg/L or 0.0005 mg/L, hardness dependent). As a result, the cadmium LDL exceeding the Table B guideline is not considered to be a concern.

The average 2023 alkalinity concentration for MG-SW4A (background in the creek) was 29.5 mg/L. Alkalinity is typically low in the region. PWQO criteria states that alkalinity cannot be decreased by more than 25%, which in this case would be 22.1 mg/L.

Alkalinity concentrations in all other monitoring locations above 22.1 mg/L for each sampling event in 2023.

Historic surface water data up to and including 2022 is provided in **Appendix E (E-2)**.

4.4 Landfill Gas Monitoring

Landfill gas readings collected during the 2023 spring and fall sampling events are presented in Table 14 below.

Table 14: 2023 Landfill Gas Field Data

Building	Description of Reading Location	Reading (ppm)
May 2, 2023, Sampling Event		
Attendant's Building	RKI probe inserted through main door	0
DP1	Well head	5
DP2	Well head	0
DP3	Well head	0
DP4	Well head	0
DP5	Well head	0
MG-18-1	Well head	5
MG-18-2	Well head	15
MG-18-3	Well head	0
October 18, 2023, Sampling Event		
Attendant's Building	RKI probe inserted through main door	0
DP1	Well head	0
DP2	Well head	20
DP3	Well head	0
DP4	Well head	0
DP5	Well head	30
MG-18-1	Well head	5
MG-18-2	Well head	5
MG-18-3R	Well head	5

4.5 QA/QC Results

One groundwater and one surface water duplicate sample were collected during each of the spring and fall sampling events in 2023. The consistency of the results was evaluated based on the relative percentage difference (RPD) of each duplicate pair. The only groundwater duplicate sampling parameter that exceeded the QAQC criteria was sulphate with a RPD of 97% during the fall sampling event. The only surface water duplicate sampling parameter that exceeded the QAQC criteria was dissolved aluminum with a RPD of 92% during the spring sampling event. The QA/QC results are provided in **Appendix D (D-4).**

4.6 Trigger Mechanisms and Contingency Plan

In August 2019, BluMetric in consultation with the MECP developed revised Trigger Mechanisms and Contingency Plans for the Musclow-Greenview WDS. This document is provided in **Appendix F**. The document is to be further revised based on future monitoring results and discussions between BluMetric and the MECP. As part of this document, MG-SW1 and MG-SW3 are considered the surface water trigger points for the north and west property boundaries, respectively.

MG-SW1 (north property boundary) is sampled semi-annually with assessment criteria of iron, boron, lead, aluminum, unionized ammonia, and zinc. The contingency plan is activated if two or more of the assessment criteria exceeds PWQO. The MG-SW1 chemical results in 2023 did not trigger the Tier 1 Contingency Plan response for surface water.

MG-SW3 (west property boundary) is sampled semi-annually in the spring and fall for toxicity results. A toxicity sample was collected from MG-SW3 during the spring sampling event in 2023 for single-concentration acute lethality testing of Daphnia magna (48 hour) and rainbow trout (96 hour). No samples were collected from MG-SW3 during the fall sampling event due to insufficient water resulting in an unrepresentative sample. The single concentration test is typically reported as a “pass” or “fail” test, with 50% mortality being the passing limit. The results from the toxicity testing at MG-SW3

for the spring sampling event indicated that the percent mortality for Daphnia magna and Rainbow Trout were 0%. The MG-SW3 toxicity results in 2023 did not trigger the Tier 1 Contingency Plan response for surface water. The toxicity laboratory results are presented in **Appendix D (D-3).**

In addition to the surface water trigger mechanisms, a groundwater trigger mechanism and contingency plan is provided. A future assessment point will be determined if deemed necessary in consultation with the MECP. The assessment point will be sampled semi-annually with assessment criteria of alkalinity, aluminum, boron, DOC, iron, lead, manganese, TDS, and zinc. The Contingency Plan will be activated if three of more of the assessment criteria exceeds the specified criteria (PWQO or RUV).

5 Assessment, Interpretation, and Discussion

5.1 Groundwater Assessment

The groundwater chemistry results for the five drive-point piezometers and the on-site monitoring wells sampled during the two monitoring events in 2023 are summarized in Table 16 (end of text). Parameters that were outside the RUVs, ODWSOG, and/or PWQO criteria are flagged. **Appendix E-1** presents the historical groundwater quality results from the Musclow-Greenview WDS. Chemistry trend graphs for select parameters are provided following the tables, figures, and photographs at the end of this report.

5.1.1 Drive-Point Water Quality Assessment

Drive-point MG-DP1 is located to the north of the WDS and is considered to be a downgradient monitoring location due to the radial flow away from the WDS. Concentrations at MG-DP1 have generally remained consistent since monitoring began in 2016, with the exception of barium, chloride, sodium, manganese, and TDS which have shown a slight increasing trend. In addition, sulphate remains at the highest concentrations among all drive-point monitoring locations, however, remains well below ODWSOG and RUV limits. Exceedances of ODWSOG and RUV criteria at MG-DP1

include DOC, TDS, pH (above RUV criteria), and manganese. No PWQO exceedances were recorded at this monitoring location.

Drive-point MG-DP2 is located northwest of the toe of the waste mound and is a downgradient monitoring location. Concentrations for all monitored parameters have generally remained consistent at this location since monitoring began in 2016. Exceedances of ODWSOG and RUV criteria at MG-DP2 are limited to DOC and manganese. No PWQO exceedances were recorded at this monitoring location. No apparent trend in groundwater quality is apparent at MG-DP2.

Impacts related to the WDS are present at MG-DP3, located west of the WDS, with consistent ODWSOG, RUV, and PWQO exceedances of several parameters including alkalinity, DOC, TDS, boron, cobalt, iron, and manganese. Increasing concentrations of boron, cobalt, iron, alkalinity, barium, sodium, and TDS have been observed since monitoring began in 2016. PWQO exceedances at MG-DP3 were recorded for boron, cobalt, and iron. Boron at MG-DP3 remains well below the ODWSOG criteria but has consistently exceeded the interim PWQO criteria since 2017. Based on the 2023 sampling events, it appears that shallow groundwater in the vicinity of MG-DP3 has the potential to impact MG-SW3.

Drive-point MG-DP4 is located north of the WDS, between MG-DP1 and the WDS. Concentrations at MG-DP4 have generally remained consistent since monitoring began in 2016 with the exception of aluminum which had a significant spike in fall 2022 sampling event exceeding the RUV and PWQO. The concentration for aluminum was below the laboratory detection limit for both sampling events in 2023. An increasing trend in chloride concentrations is also apparent since 2019. The fall DOC result was above the RUV and ODWSOG. No other exceedances were recorded in 2023. Based on aluminum results for both sampling events in 2023, the spike observed in the fall 2022 sampling event does not indicate an emerging trend. Concentrations for many of the monitored parameters are greater at MG-DP1.

Impacts related to the WDS may be present at MG-DP5, however, it is difficult to draw conclusions based on the limited data set (five sampling events). Increasing concentrations of cobalt, iron, and manganese are observed since monitoring began in fall 2021. Exceedances of ODWSOG, RUV, and PWQO include DOC, pH (below RUV), TDS, cobalt, iron, manganese, and zinc. Continued monitoring is required to assess potential downgradient WDS impacts.

Some of the elevated DOC concentrations may be attributed to naturally occurring conditions associated with the wetland. Marshes and peatland have recorded ranges of DOC from 19 to 38 mg/L (Moore, 2003), and the 2023 data fell within or below this range at each location. The historical results for DOC at the Site that range from 59.9 to 185 mg/L could be attributed to WDS impacts.

To address potential impacts at MG-DP3 and MG-DP5, it is recommended that the Municipality plan for an assessment of the development of the Site based on this new data. Based on the results at MG-DP5, it is suggested that MG-SW6 continue to be sampled on a semi-annual basis.

Groundwater is expected to discharge to surface at or before the property line and therefore it is expected that groundwater downgradient from the WDS property boundary is not being impacted by leachate and is compliant with Guideline B-7.

5.1.2 Monitoring Well Water Quality Assessment

Groundwater quality on site is monitored by the three on-site monitoring wells, MG-18-1, MG-18-2, and MG-18-3/MG-18-3R. MG-18-3R was installed directly adjacent to the original background monitoring well MG-18-3, in response to the MECP indicating that if MG-18-3 continued to be dry that an alternate background monitoring well may be required (MECP, July 2019). Background monitoring well MG-18-3 had previously only been sampled once (2019) due to insufficient water, however, was sampled during the 2023 spring sampling event. Exceedances at MG-18-3 were limited to nitrate (RUV) and exceedances at MG-18-3R were limited to manganese (RUV and ODWSOG).

MG-18-1 is a leachate characterization well located on the north edge of the approved footprint. Groundwater quality at MG-18-1 has been relatively consistent since monitoring began in 2019. A minor increasing trend for chloride, sodium, boron, cobalt, and manganese is apparent at this location, with consistent RUV and ODWSOG exceedances of manganese and consistent PWQO exceedances for cobalt since monitoring began in 2019. In addition to the above noted exceedances, consistent RUV exceedances of iron (since October 2021), TDS, and DOC have been observed since monitoring began.

MG-18-2 is also a leachate characterization well, located on the west edge of the approved footprint. Several increasing trends are apparent at this location since monitoring began in 2019, including boron, cobalt, manganese, and sodium, as shown by the attached trend graphs at the end of the text. Remaining measured parameters have generally remained consistent and within the historical range of results. Maximum concentrations were recorded at this location during the fall 2022 sampling event for several parameters including boron, cobalt, manganese, sodium, and sulphate, however, have decreased for all of the mentioned parameters except for sulphate which marginally exceeded the fall 2022 result during the spring 2023 sampling event. Consistent criteria exceedances have been reported at this location since monitoring began for several parameters including alkalinity, TDS, DOC, iron, and manganese for RUV and ODWSOG. In addition, concentrations of boron, cobalt, and iron have consistently exceeded the PWQO. Concentrations at MG-18-2 tend to be the highest on site.

VOC monitoring was conducted at MG-18-1 and MG-18-2 during both sampling events in 2022. Concentration of benzene and vinyl chloride at MG-18-2 exceeded the ODWSOG during both sampling events, however, remained well below PWQO. Benzene exceedances were also reported at this location during the fall 2019 and fall 2021 sampling events. No VOC exceedances have been reported at MG-18-1 since monitoring began in 2019. The MECP review comments received in July 2019 indicate that comprehensive VOC sampling shall be conducted at only MG-18-1 and MG-18-2 on a biannual frequency. The next VOC sampling event will occur in 2024.

It is not currently expected that the bedrock groundwater aquifer is impacted by leachate, or out of compliance with RUVs and Guideline B-7. Due to the wetland surrounding the Site, groundwater is expected to discharge to surface at or before the property line prior to reaching any potential groundwater receptors. Based on this, a bedrock monitoring well is not deemed necessary. In addition, the WDS is considered to be compliant with Guideline B-7.

5.2 Surface Water Assessment

The surface water chemistry results from the two monitoring events in 2023 are summarized in Table 17 (end of text). Parameters that were outside the PWQO, MECP Table A and/or MECP Table B criteria are flagged. **Appendix E (E-2)** presents the historical surface water quality results from the Musclow-Greenview WDS. Chemistry trend graphs for select parameters are provided following the tables, figures, and photographs at the end of this report.

Surface water monitoring location MG-SW4A represents background surface water conditions for the Musclow-Greenview WDS. It is located on Goodkey Creek, approximately 860 m northwest of the final waste footprint. The only criteria exceedance observed at MG-SW4A was for the PWQO for dissolved aluminum during the spring sampling event. The PWQO for iron has been routinely exceeded during the fall sampling events along with sporadic exceedances of phenols and aluminum. The former background location MG-SW4 also had sporadic exceedances of phenols, total phosphorus, cadmium, iron, and zinc. No apparent trend in water quality is apparent at MG-SW4A, however, data is limited to due to the location only being established in spring 2020.

An increasing trend in boron concentrations has been apparent at MG-SW3 since the spring 2019 sampling event, however, a notable drop in concentration was observed during the spring 2023 sampling event. Boron routinely exceeds the PWQO at MG-SW3. The location was unable to be sampled during the fall sampling event due to dry conditions. Boron was also slightly elevated at MG-SW2 and MG-SW3 during the spring

2022 sampling event, however, had a notable drop during the spring 2023 sampling event.

There are no other apparent trends in water quality at any of the monitored locations. Several parameters have had sporadic exceedances throughout the years of monitoring. Examples include cobalt which has sporadically been detected above PWQO at MG-SW1, MG-SW2, and MG-SW3 with the highest concentrations observed at MG-SW2 and MG-SW3. No cobalt PWQO exceedances have been recorded since 2018 at any of the monitored locations. Zinc concentrations have also been sporadically detected above the PWQO between 2006 and 2017 at MG-SW1, MG-SW2, and MG-SW3, with no exceedances since 2018 with the exception of an exceedance at former background location MG-SW4 during the fall 2020 sampling event. Other parameters which have had sporadic exceedances throughout the years of monitoring at MG-SW1, MG-SW2, and/or MG-SW3 include cadmium, copper, lead, silver, thallium, and vanadium with the highest concentrations generally observed at MG-SW2 and MG-SW3.

Dissolved aluminum exceeded PWQO at MG-SW1 and MG-SW4A during the spring 2023 sampling event. These represent the first dissolved aluminum exceedances since monitoring began in 2006. Continued monitoring is recommended to determine whether these exceedances represent an emerging trend in water quality.

Total phosphorus concentrations have routinely been detected above PWQO criteria at all sampling locations except for the background sampling locations (MG-SW4A and previously MG-SW4). The highest concentrations of total phosphorus have generally been observed at MG-SW2 and MG-SW3. Wetland complexes can have naturally elevated concentrations of total phosphorus with respect to the PWQO. The only PWQO exceedance for total phosphorus in 2023 was recorded at MG-SW6.

Iron concentrations have also been routinely detected above the PWQO at MG-SW1, MG-SW2, MG-SW3, and MG-SW4A (and previously MG-SW4) with large fluctuations in concentrations for MG-SW1, MG-SW2, and MG-SW3. Typically, concentrations are higher during the fall sampling events when locations tend to have less water. There were no exceedances of iron during the 2023 sampling period.

Phenols concentrations have been detected above the PWQO during sampling events at all sampling locations, including the newly added MG-SW4A. Of these exceedances, the concentrations tend to be the highest at MG-SW3. The fall 2021 phenols concentration at MG-SW3 represents the maximum recorded concentration. Wetland complexes can have naturally elevated concentrations of phenols. All phenols concentrations in 2023 were below the laboratory detection limit, including the confirmatory samples submitted to BV and Caduceon Laboratories during the spring sampling event. Analytical data for MG-SW6 is limited to five sampling events with the first sampling event occurring in spring 2020. Concentrations of total phosphorus, cadmium, and iron have previously exceeded PWQO in 2020 and 2022, with the only exceedance during the 2023 sampling period being for total phosphorus during the spring event. Continued monitoring is required to assess whether there are any emerging trends at MG-SW6.

Historically, concentrations of parameters above PWQO are generally higher for surface water sampling locations MG-SW2 and MG-SW3 when compared to MG-SW1, and MG-SW4/MG-SW4A. The concentrations of multiple parameters above the PWQO at all locations indicate there are impacts from site operations to the surface water in the immediate vicinity of the WDS.

5.3 Landfill Gas Assessment

The RKI Eagle gas monitoring results for 2023 (0 to 30 ppm) indicated methane gas concentrations are well below the concentration of concern, 25,000 ppm, for the subsurface. Gas monitoring must be conducted at all groundwater monitoring wells and onsite structures (site attendant's building).

6 Site Observations

6.1 Annual Waste Summary

Although access to the Site is controlled via a locked security steel gate, some residents deposit garbage at the disposal site outside of the landfill's normal operating hours.

This contribution is collected by site personnel, recorded, and included in the total waste volumes identified for the Site.

Estimated volumes for the Site are provided below in Table 15 and are based on Contractors' tonnages and estimations based on the number of bags deposited at the Site. The tonnages below include recyclables and waste from primarily residential sources in the municipality.

The waste report for 2023 indicates that approximately 27.5 tonnes of recyclables (R) and 179 tonnes of waste (W) were deposited in the Musclow-Greenview WDS. The quarterly breakdown is shown below in Table 15. Based on the estimated numbers, a total of 13.3% of residential waste was recycled in 2023. Waste deposited at the Site increased in 2023 by 11.6%. The 2023 numbers also indicate an approximate 10.8% decrease in the recycling of mixed fibres and commingled containers at the Musclow-Greenview WDS from 2022 tonnages.

It should be noted that 2023 and 2022 waste numbers are based on estimates. The 2023 and 2022 waste calculations are based on bag counts at the waste sites. There were 11,954 bags deposited at the Musclow-Greenview WDS in 2023 and an assumed 15 kg/bag (MHH's) was used in the tonnage calculations.

Table 15: Annual Recycling and Waste Tonnages

Q1		**Q2**		**Q3**		**Q4**		**Year End**	
(R)	**(W)**	**(R)**	**(W)**	**(R)**	**(W)**	**(R)**	**(W)**	**(R)**	**(W)**
2023									
6.7	36.1	6.5	44.0	8.1	54.4	6.2	44.8	27.5	179.3
2022									
7.2	27.7	7.5	42.1	10.5	52.6	5.6	38.3	30.8	160.7

In addition, segregated materials were collected at the nine waste disposal/transfer sites in the MHHs. The breakdown of theses wastes in 2023 at the Musclow-Greenview site was:

- Scrap metal – 20.18 tonnes;

- Bulky wastes – 0 tonnes;
- Leaf and yard waste – 183 truck/trailer loads;
- Electrical and Electronic Equipment – 1.82 tonnes;
- Household batteries – 0 tonnes; and
- 0 tires.

There were no documented complaints for rejected waste at the Musclow-Greenview WDS and there were no emergency situations in 2023.

6.2 Capacity and Remaining Site Life

The approved capacity for the Musclow-Greenview WDS is 27,500 m^3. According to the most recent survey data (November 2022) and the updated 2017 D&O Plan, the current net volume remaining was calculated to be 18,103 m^3, including intermediate cover. The total volume of fill (intermediate cover) required to cover the waste site was calculated at 3,964 m^3. Thus, the volume remaining for waste and daily cover placement was estimated at 14,139 m^3. The remaining capacity of the WDS is illustrated on Figure 05.

The last five annual monitoring reports for the Site have recorded annual waste generation rates of 109.1 (2019), 112.7 (2020), 138.3 (2021), 160.7 (2022), and 179.3 (2023) tonnes, resulting in an average tonnage of 140.0 tonnes per year. The 140.0 tonnes are estimated to equate to 280.0 m^3 of compacted waste per year (no soil cover), assuming a compaction rate of 500 kg/m^3. Taking the requirement for clean fill to be applied as daily cover between waste layers, soil requirements are assumed to be 25% of the total waste volume. Therefore, the total annual fill rate is expected to be approximately 373 m^3 per year.

Based on the current available information and the average fill rate of 373 m^3 for the last five years, the life expectancy of the waste site is estimated to be 37 years from the November 2022 survey (i.e. 2059).

A number of factors (e.g., environmental capacity and changes to fill rates) can result in significant changes to the actual life of the Site. Due to the impacts to the wetland, a reduced capacity is likely.

7 Summary Statements, Conclusions, and Recommendations

The following summary statements, conclusions, and recommendations are based on the results of the 2023 monitoring program.

7.1 Groundwater

7.1.1 Drive-Point Piezometers

- It is recommended that the drive-point piezometers continue to be used as a measure of surface water quality not groundwater quality and therefore compared to the surface water criteria for compliance.
- An upwards trend in boron, cobalt, iron, alkalinity, barium, sodium, and TDS concentrations is observed at MG-DP3. Comparatively, a similar potential increasing trend in boron concentrations is also apparent at MG-SW3. Boron at MG-DP3 remains well below the ODWSOG criteria but exceeds the interim PWQO criteria. Based on the 2023 sampling events, it appears that shallow groundwater in the vicinity of MG-DP3 has the potential to impact surface water at MG-SW3.
- Impacts related to the WDS may be present at MG-DP5, however, it is difficult to draw conclusions based on the limited data set (five samples). Continued monitoring is required to assess potential downgradient WDS impacts.
- To address potential impacts at MG-DP3 and MG-DP5, it is recommended that the Municipality plan for an assessment of the development of the Site based on this new data. Based on the results at MG-DP5 it is suggested that MG-SW6 be formally added to the semi-annual surface water monitoring program.

7.1.2 Groundwater Monitoring Wells

- It is recommended that protective casings be installed for MG-18-1 and MG-18-2.
- Groundwater adjacent to the WDS continues to be impacted by the Site.
- In 2022, the leachate monitoring wells (MG-18-1 and MG-18-2) were sampled for VOCs with exceedances of ODWSOG guidelines for benzene and vinyl chloride during both sampling events at MG-18-2. Benzene concentrations have exceeded the ODWSOG guidelines at MG-18-2 previously during the fall 2019 and fall 2021 sampling events. In accordance with the MECP review comments received in July 2019, comprehensive VOC sampling shall be conducted at MG-18-1 and MG-18-2 on a biannual frequency. The next VOC sampling event will occur in 2024.
- A replacement background monitoring well, MG-18-3R was installed in September 2023, directly adjacent to the original background monitoring well MG-18-3, in response to the MECP indicating that if MG-18-3 continued to be dry that an alternate background monitoring well may be required (MECP, July 2019).
- Groundwater is expected to discharge to surface at or before the property line and therefore it is expected that groundwater downgradient from the WDS property boundary is not being impacted by leachate and is compliant with Guideline B-7.
- It is not currently expected that the bedrock groundwater aquifer is impacted by leachate based on the above interpretation. Based on this, a bedrock monitoring well is not deemed necessary.

7.2 Surface Water

- Surface water in the wetland adjacent to the WDS continues to be impacted by the Site.
- Historically, concentrations of parameters above PWQO are generally higher for surface water sampling locations MG-SW2 and MG-SW3 when compared to MG-SW1. The concentrations of multiple parameters above the PWQO at all

locations indicate there are impacts from site operations to the surface water in the immediate vicinity of the WDS.

- Recent results at MG-SW3 from 2018 to 2023 indicate a potential increasing trend in boron concentrations, however, concentrations remain within normal historic ranges except for the fall 2021 sample which represents a historical maximum concentration. Boron also had a notable spike in concentration during the spring 2022 sampling event at MG-SW1 (below PWQO), however, had a notable drop during the spring 2023 sampling event. Continued monitoring is required to assess the potential upwards trend at these monitoring locations. No other surface water locations exhibited any increasing trends.
- Surface water monitoring should continue at four locations on a semi-annual basis for the Musclow-Greenview site. It is recommended that MG-SW4A continue to be sampled as the background location, replacing prior background locations MG-SW4 and MG-SW5. It is recommended that site visits be made during the wet seasons in the spring and fall of 2024 to obtain the most representative samples.
- It is recommended that MG-SW6 continue to be sampled on a semi-annual basis and be formally added to the annual surface water monitoring program based on the results at MG-DP5.
- It is recommended that surface water location MG-SW7 be sampled every five years (e.g., 2025, 2030).
- Surface water samples should continue to be collected by peristaltic pump to avoid introducing organic matter into samples collected from shallow conditions.

7.3 Landfill Gas

- Landfill gas readings were collected from all monitowing wells and drive-point piezometers during both sampling events in 2023. All readings were at levels well below the applicable Regulation 232/98 limit of 25,000 ppm for methane in the subsurface with a peak concentration of 30 ppm.

- Landfill gas monitoring at all monitoring wells and the attendant's building should be continued during the 2024 semi-annual monitoring program.

7.4 Site Operations

- Site operations and the order and management of debris have greatly improved during recent years at the Musclow-Greenview WDS. The Municipality should continue these efforts.
- Construction of berms was initiated in 2016 to define locations for segregated materials. Materials should be removed at a frequency to maintain good segregation of metal, tires, and bulky items into the appropriately signed designated areas. The berms should also assist in reducing surface water contact with waste and the potential impacts site run-off may have on adjacent surface water bodies. The bulky waste pile was noted to be large and spilling over the berms during both site visits in 2023.
- Interim/daily cover should be applied on a regular basis to reduce the wind-blown litter around the site.
- It is recommended that waste transferred to the Site continue to be accounted for and documented by tracking the number of bags/vehicles deposited at the Site. Detailed descriptions and quantities of rejected waste should continue to be documented for the Musclow-Greenview WDS.
- Public education with respect to waste reduction and recycling should be an on-going effort by the Municipality, including reminders on the local collection points for household hazardous waste and electronic waste.

7.5 Landfill Capacity

- Based on the current available information and the average fill rate of 373 m^3 for the last five years, the life expectancy of the waste site is estimated to be 37 years from the November 2022 survey (i.e. 2059).
- A number of factors (e.g., environmental capacity and changes to fill rates) can result in significant changes to the actual life of the Site.

8 Limiting Conditions

The conclusions presented in this report represent our professional opinion and are based upon the work described in this report and any limiting conditions in the terms of reference, scope of work, or conditions noted herein.

The findings presented in this report are based on conditions observed at the specified dates and locations, the analysis of samples for the specified parameters, and information obtained for this project. Unless otherwise stated, the findings cannot be extended to previous or future site conditions, locations that were not investigated directly, or types of analysis not performed.

BluMetric Environmental Inc. makes no warranty as to the accuracy or completeness of the information provided by others, or of conclusions and recommendations predicated on the accuracy of that information.

This report has been prepared for The Corporation of the Municipality of Hastings Highlands. Any use a third party makes of this report, any reliance on the report, or decisions based upon the report, are the responsibility of those third parties unless authorization is received from BluMetric Environmental Inc. in writing.

BluMetric Environmental Inc. accepts no responsibility for any loss or damages suffered by any unauthorized third party as a result of decisions made or actions taken based on this report.

Respectfully submitted,
BluMetric Environmental Inc.

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Engineering Intern

Mark Somers, B.A.Sc., M.Eng., P.Eng.
Senior Environmental Engineer

9 References

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Tables

Table 16: 2023 Groundwater Chemistry Results						Location	MG-18-1	MG-18-1	MG-18-1	MG-18-2	MG-18-2	MG-18-3	MG-18-3R	MG-18-3R	MG-DP1	MG-DP1	MG-DP2	MG-DP2	MG-DP3	MG-DP3
Parameter	Units	RUV-MG	ODWQS-ALL-MERGED	PWQO-GENERAL	PWQO-INTERIM	Sample ID	MG-18-1	AQC-GW1 (MG-	MG-18-1	MG-18-2	MG-18-2	MG-18-3	MG-18-3R	AQC-GW1 (MG-	MG-DP1	MG-DP1	MG-DP2	MG-DP2	MG-DP3	MG-DP3
						Sample Date	2023-May-02	2023-May-02	2023-Oct-18	2023-May-02	2023-Oct-18	2023-May-02	2023-Oct-18	2023-Oct-18	2023-May-02	2023-Oct-18	2023-May-02	2023-Oct-18	2023-May-02	2023-Oct-18
Anions						Detection Limit														
Chloride	mg/L	125.68	250	-	-	0.1	145	134	87	117	97	1.36	<1	<1	52.2	44	1.04	<1	77.7	57
Nitrate as N	mg/L	2.5375	10	-	-	0.05	<0.05	<0.05	<0.1	<0.05	<0.1	3.18	<0.1	<0.1	<0.05	<0.1	<0.05	<0.1	<0.05	<0.1
Sulphate	mg/L	259.8	500	-	-	0.1	11.4	12.6	20	24.6	15	51.8	1.9	5.5	116	110	3.09	<1	37	24
Cations																				
Calcium (diss)	mg/L	-	-	-	-	0.05	116	121	92	297	330	22.2	22	21	140	150	47.4	47	250	260
Magnesium (diss)	mg/L	-	-	-	-	0.05	27.1	26	20	53	58	4.75	1.6	1.6	11.4	11	4.42	4	31.3	33
Sodium (diss)	mg/L	106.25	200	-	-	0.05	21.7	21.1	26	75.6	86	12.5	3	3.1	10	12	4.26	4.4	48.6	71
General Chemistry																				
Alkalinity (as CaCO3)	mg/L	47 - 282	30 - 500	See Factsheet	-	1	284	286	220	963	970	45	64	65	239	250	158	160	736	680
Ammonia as N	mg/L	-	-	-	-	0.02	<0.02	<0.02	0.073	0.08	0.46	<0.02	0.059	0.052	0.19	0.29	5.65	5.9	0.05	0.53
Biochemical Oxygen Demand	mg/L	-	-	-	-	2	<2	<2	2	<2	<2	<2	<2	<2	<2	<2	<2	5	<2	<2
Chemical Oxygen Demand	mg/L	-	-	-	-	4	11	23	16	42	52	<5	8.2	<4	<5	17	13	36	25	54
Dissolved Organic Carbon	mg/L	3.7	5	-	-	0.4	8.9	8.8	5	15.2	16	2.4	2	1.5	4.8	6.4	7.6	17	12.2	22
Electrical Conductivity	uS/cm	-	-	-	-	1	949	958	760	1950	2100	218	140	140	812	830	306	330	1480	1500
pH	pH units	6.96 - 7.96	6.5 - 8.5	6.5 - 8.5	-		6.93	6.99	7.55	7.03	7.47	7.42	7.59	7.66	7.65	8.02	7.25	7.71	6.99	7.59
Total Dissolved Solids	mg/L	339	500	-	-	10	558	656	590	1150	1250	108	340	340	540	610	184	190	882	910
Total Suspended Solids	mg/L	-	-	-	-	10	4940	5760	13000	1500	11000	10500	38000	50000	11	<10	<10	<10	<10	<10
Metals																				
Aluminum (diss)	mg/L	0.051225	0.1	-	Calculated	0.004	0.004	<0.004	<0.0049	0.007	<0.0049	<0.004	<0.0049	<0.0049	<0.004	<0.0049	0.006	<0.0049	<0.004	<0.0049
Barium (diss)	mg/L	0.2635	1	-	-	0.002	0.108	0.103	0.087	0.237	0.28	0.015	0.022	0.022	0.069	0.085	0.031	0.031	0.172	0.25
Boron (diss)	mg/L	1.25825	5	-	0.2	0.01	0.148	0.14	0.19	1.22	1.2	0.015	0.01	<0.01	0.061	0.072	0.038	0.045	0.52	0.81
Cadmium (diss)	mg/L	0.0012875	0.005	-	Calculated	0.00009	<0.0001	<0.0001	0.00011	<0.0001	0.00048	<0.0001	<0.00009	<0.00009	<0.0001	<0.00009	<0.0001	<0.00009	<0.0001	<0.00009
Chromium (diss)	mg/L	0.013625	0.05	-	-	0.002	<0.002	<0.002	<0.005	<0.002	<0.005	<0.002	<0.005	<0.005	<0.002	<0.005	<0.002	<0.005	<0.002	<0.005
Cobalt (diss)	mg/L	-	-	-	0.0009	0.0005	0.0354	0.0348	0.025	0.0449	0.049	<0.0005	0.0011	0.0011	<0.0005	<0.0005	<0.0005	<0.0005	0.0038	0.0034
Iron (diss)	mg/L	0.1525	0.3	0.3	-	0.01	**0.354**	**0.357**	**0.36**	**6.15**	**6**	<0.01	<0.1	<0.1	0.016	<0.1	0.018	<0.1	**0.796**	**0.57**
Lead (diss)	mg/L	0.0026875	0.01	-	Calculated	0.0005	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Manganese (diss)	mg/L	0.09	0.05	-	-	0.002	7.46	7.33	5.2	11.7	11	0.01	0.13	0.13	0.144	0.15	0.068	0.067	0.343	0.19
Silver (diss)	mg/L	-	-	0.0001	-	0.00009	<0.0001	<0.0001	<0.00009	<0.0001	<0.00009	<0.0001	<0.00009	<0.00009	<0.0001	<0.00009	<0.0001	<0.00009	<0.0001	<0.00009
Zinc (diss)	mg/L	2.50125	5	-	0.02	0.005	<0.005	<0.005	0.026	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.008	<0.005	<0.005	<0.005

-LEGEND-

Detection Limit	DL: May vary between sample locations and events
DL exceeds criteria	
Concentration exceeds RUV-MG	Reasonable Use Values Musclow Greenview
Concentration exceeds ODWQS-ALL-MERGED	Ontario Drinking Water Quality Standards All Types Merged
Concentration exceeds PWQO-GENERAL	Provincial Water Quality Objectives General
Concentration exceeds PWQO-INTERIM	Provincial Water Quality Objectives Interim

Table 16: 2023 Groundwater Chemistry Results						Location	MG-DP4	MG-DP4	MG-DP5	MG-DP5
Parameter	Units	RUV-MG	ODWQS-ALL-MERGED	PWQO-GENERAL	PWQO-INTERIM	Sample ID	MG-DP4	MG-DP4	MG-DP5	MG-DP5
						Sample Date	2023-May-02	2023-Oct-18	2023-May-02	2023-Oct-18
Anions						Detection Limit				
Chloride	mg/L	125.68	250	-	-	0.1	4.94	2.8	66	63
Nitrate as N	mg/L	2.5375	10	-	-	0.05	0.12	0.13	<0.05	<0.1
Sulphate	mg/L	259.8	500	-	-	0.1	13.2	11	52.3	53
Cations										
Calcium (diss)	mg/L	-	-	-	-	0.05	33.3	31	113	120
Magnesium (diss)	mg/L	-	-	-	-	0.05	4.79	4.6	11.3	9.8
Sodium (diss)	mg/L	106.25	200	-	-	0.05	4.52	4.8	8.12	7.9
General Chemistry										
Alkalinity (as CaCO3)	mg/L	47 - 282	30 - 500	See Factsheet	-	1	103	96	305	230
Ammonia as N	mg/L	-	-	-	-	0.02	<0.02	<0.05	0.06	0.078
Biochemical Oxygen Demand	mg/L	-	-	-	-	2	<2	12	<6	7
Chemical Oxygen Demand	mg/L	-	-	-	-	4	18	29	25	42
Dissolved Organic Carbon	mg/L	3.7	5	-	-	0.4	1.7	11	7.1	9.7
Electrical Conductivity	uS/cm	-	-	-	-	1	229	230	791	750
pH	pH units	6.96 - 7.96	6.5 - 8.5	6.5 - 8.5	-		7.85	7.96	6.87	7.06
Total Dissolved Solids	mg/L	339	500	-	-	10	102	155	490	625
Total Suspended Solids	mg/L	-	-	-	-	10	14	82	73	340
Metals										
Aluminum (diss)	mg/L	0.051225	0.1	-	Calculated	0.004	<0.004	<0.0049	<0.004	<0.0049
Barium (diss)	mg/L	0.2635	1	-	-	0.002	0.012	0.011	0.041	0.046
Boron (diss)	mg/L	1.25825	5	-	0.2	0.01	0.015	0.014	0.031	0.038
Cadmium (diss)	mg/L	0.0012875	0.005	-	Calculated	0.00009	<0.0001	<0.00009	<0.0001	<0.00009
Chromium (diss)	mg/L	0.013625	0.05	-	-	0.002	<0.002	<0.005	<0.002	<0.005
Cobalt (diss)	mg/L	-	-	-	0.0009	0.0005	<0.0005	<0.0005	0.068	0.1
Iron (diss)	mg/L	0.1525	0.3	0.3	-	0.01	<0.01	<0.1	**27.3**	**120**
Lead (diss)	mg/L	0.0026875	0.01	-	Calculated	0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Manganese (diss)	mg/L	0.09	0.05	-	-	0.002	<0.002	<0.002	2.79	3.9
Silver (diss)	mg/L	-	-	0.0001	-	0.00009	<0.0001	<0.00009	<0.0001	<0.00009
Zinc (diss)	mg/L	2.50125	5	-	0.02	0.005	<0.005	<0.005	48.7	43

-LEGEND-

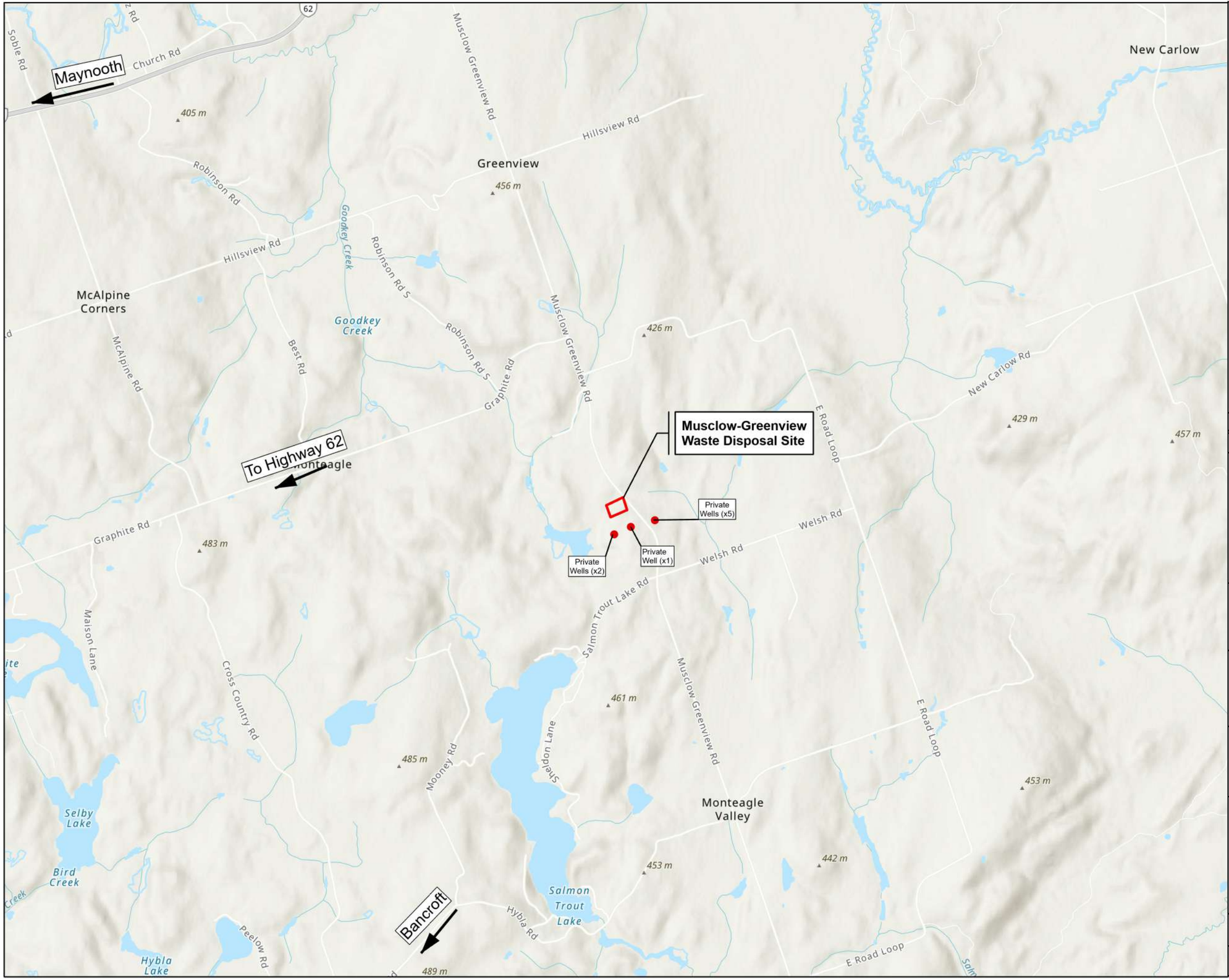
Detection Limit	DL: May vary between sample locations and events
DL exceeds criteria	
Concentration exceeds RUV-MG	Reasonable Use Values Musclow Greenview
Concentration exceeds ODWQS-ALL-MERGED	Ontario Drinking Water Quality Standards All Types Merged
Concentration exceeds PWQO-GENERAL	Provincial Water Quality Objectives General
Concentration exceeds PWQO-INTERIM	Provincial Water Quality Objectives Interim

Table 17: 2023 Surface Water Chemistry Results						Location	MG-SW1	MG-SW2	MG-SW3	MG-SW4A	MG-SW4A	MG-SW4A	MG-SW4A	MG-SW6
Parameter	Units	PWQO-GENERAL	PWQO-INTERIM	MECP-GD-TA	MECP-GD-TB	Sample ID	MG-SW1	MG-SW2	MG-SW3	MG-SW4A	AQC-SW1 (MG-S	MG-SW4A	AQC-SW1 (MG-S	MG-SW6
						Sample Date	2023-May-02	2023-May-02	2023-May-02	2023-May-02	2023-May-02	2023-Oct-18	2023-Oct-18	2023-May-02
Anions						Detection Limit								
Chloride	mg/L	-	-	180	128	0.1	21	5.4	18	3.42	3.37	5.7	5.6	8.96
Nitrate + Nitrite	mg/L	-	-	-	-	0.1	-	-	-	-	-	<0.1	<0.1	-
Nitrate as N	mg/L	-	-	-	-	0.05	<0.05	<0.05	0.72	<0.05	<0.05	<0.1	<0.1	<0.05
Nitrite as N	mg/L	-	-	-	-	0.01	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	<0.01	<0.05
Sulphate	mg/L	-	-	100	-	0.1	30.5	4.49	33.1	4.96	4.94	12	12	11
Cations														
Calcium (tot)	mg/L	-	-	-	-	0.2	31.8	6.5	43.2	5.03	6.51	18	18	18.8
Magnesium (tot)	mg/L	-	-	-	-	0.05	1.51	1.11	6.16	1.15	0.97	2.6	2.6	1.61
Potassium (tot)	mg/L	-	-	-	-	0.2	0.94	<0.5	4.79	0.73	0.74	1.4	1.4	0.95
Sodium (tot)	mg/L	-	-	-	-	0.1	12	6.15	12	2.51	2.01	4.1	4.2	5.83
General Chemistry														
Alkalinity (as CaCO3)	mg/L	See Factsheet	-	-	-	1	82	34	182	16	16	42	44	54
Ammonia as N	mg/L	-	-	-	-	0.02	<0.02	<0.02	0.15	<0.02	<0.02	<0.05	<0.05	<0.02
Biochemical Oxygen Demand	mg/L	-	-	-	-	2	<2	<2	<2	<2	<2	<2	<2	<2
Chemical Oxygen Demand	mg/L	-	-	-	-	4	26	19	27	31	28	15	12	28
Colour	TCU	-	-	-	-	2.5	-	-	-	-	-	-	-	-
Electrical Conductivity	uS/cm	-	-	-	-	1	281	94	468	63	63	140	140	159
pH	pH units	6.5 - 8.5	-	6 - 9	-		7.42	7.16	7.8	7.01	6.91	7.74	7.71	7.44
Phenols-4AAP	mg/L	-	-	-	-	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Total Dissolved Solids	mg/L	-	-	-	-	10	180	74	256	64	56	95	105	98
Total Kjeldahl Nitrogen	mg/L	-	-	-	-	0.1	0.4	0.23	0.47	0.29	0.28	0.2	0.21	0.32
Total Phosphorus	mg/L	0.03	-	-	-	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.05
Total Suspended Solids	mg/L	-	-	-	-	10	<10	<10	<10	<10	<10	<10	<10	<10
Turbidity	NTU	-	-	-	-	0.5	-	-	-	-	-	-	-	-
Unionized Ammonia (Calc)	mg/L	-	-	-	-	0.000002	<0.000002	<0.000002	0.192	<0.000002	<0.000002	<0.00052	<0.00052	<0.000002
Metals														
Aluminum (diss, PWQO)	mg/L	-	Calculated	-	-	0.004	0.088	0.057	0.062	0.034	0.092	0.01	0.009	0.046
Arsenic (tot)	mg/L	-	0.005	-	-	0.003	-	-	-	-	-	-	-	-
Barium (tot)	mg/L	-	-	2.3	-	0.002	0.031	0.01	0.041	0.011	0.012	0.016	0.016	0.015
Boron (tot)	mg/L	-	0.2	3.55	1.5	0.01	0.015	0.018	0.268	0.023	0.022	<0.01	<0.01	0.027
Cadmium (tot)	mg/L	-	Calculated	0.00021	0.000017	0.00009	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.00009	<0.00009	<0.0001
Chromium (tot)	mg/L	-	-	0.064	-	0.003	-	-	-	-	-	-	-	-
Cobalt (tot)	mg/L	-	0.0009	-	-	0.0005	<0.0005	<0.0005	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Copper (tot)	mg/L	-	Calculated	0.0069	-	0.0009	0.002	<0.001	<0.001	<0.001	0.004	<0.0009	<0.0009	<0.001
Iron (tot)	mg/L	0.3	-	1	-	0.01	0.156	0.091	0.094	0.195	0.208	0.23	0.23	0.077
Lead (tot)	mg/L	-	Calculated	0.002	-	0.0005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0005	<0.0005	<0.001
Manganese (tot)	mg/L	-	-	-	-	0.002	0.009	0.006	0.019	0.005	0.007	0.005	0.0052	0.03
Mercury (diss)	mg/L	0.0002	-	-	-	0.0001	-	-	-	-	-	-	-	-
Nickel (tot)	mg/L	0.025	-	-	-	0.003	-	-	-	-	-	-	-	-
Selenium (tot)	mg/L	0.1	-	-	-	0.002	-	-	-	-	-	-	-	-
Silver (tot)	mg/L	0.0001	-	-	-	0.0001	-	-	-	-	-	-	-	-
Zinc (tot)	mg/L	-	0.02	0.089	0.03	0.005	<0.02	<0.02	<0.02	<0.02	<0.02	<0.005	<0.005	<0.02

-LEGEND-

Detection Limit	DL: May vary between sample locations and events
DL exceeds criteria	
Concentration exceeds PWQO-GENERAL	Provincial Water Quality Objectives General
Concentration exceeds PWQO-INTERIM	Provincial Water Quality Objectives Interim
Concentration exceeds MECP-GD-TA	MECP Guidance Document Table A
Concentration exceeds MECP-GD-TB	MECP Guidance Document Table B

Figures



LEGEND

Waste Disposal Site

Private Wells Within 500m of the Site

REV.	DESCRIPTION	YY/MM/DD	BY	CHK
1				

REFERENCES

DO NOT SCALE DRAWING.
THIS DRAWING MAY HAVE BEEN REDUCED. ALL SCALE NOTATIONS INDICATED ARE BASED ON 11"x17" FORMAT DRAWINGS.

N W E S

0 500 1,000 Meters

CLIENT

Municipality of Hastings Highlands

PROJECT

Musclow-Greenview Waste Disposal Site

TITLE

Site Location Map

BluMetric Environmental

The Tower - The Woolen Mill,
4 Cataraqui St.,
Kingston, Ontario K7K 1Z7
TEL: (613) 531-2725
FAX: (613) 531-1852
Email: info@blumetric.ca
Web: http://www.blumetric.ca

PROJECT #	DATE
230225-7	February 21, 2024

DRAWN	CHECKED	FIG NO.	REV
ZS	TH	01	0

LEGEND

- Approximate Property Outline (2 ha)
- Site Features
- Final Footprint Design (0.87 ha)
- Abandoned Monitoring Well
- Groundwater Monitoring Location
- Benchmark
- Surface Water Sampling Locations
- Supplemental Surface Water Sampling Locations
- Historical Surface Water Sampling Locations

NOTES:
Imagery taken on November 9th 2022

REV.	DESCRIPTION	YY/MM/DD	BY	CHK
1				

REFERENCES

DO NOT SCALE DRAWING.
THIS DRAWING MAY HAVE BEEN REDUCED. ALL SCALE NOTATIONS INDICATED ARE BASED ON 11"x17" FORMAT DRAWINGS.

N W E S

0 25 50 Meters

1:1,000

CLIENT

Municipality of Hastings Highlands

PROJECT

Musclow-Greenview Waste Disposal Site

TITLE

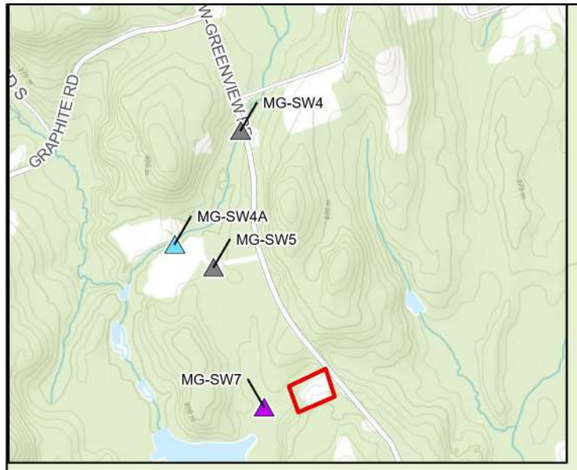
Site Plan

BluMetric Environmental

The Tower - The Woolen Mill,
4 Cataraqui St.,
Kingston, Ontario K7K 1Z7
TEL: (613) 531-2725
FAX: (613) 531-1852
Email: info@blumetric.ca
Web: http://www.blumetric.ca

PROJECT #	DATE
230225-7	February 21, 2024

DRAWN	CHECKED	FIG NO.	REV
ZS	TH	02	0



LEGEND

- Approximate Property Outline (2 ha)
- Site Features
- Final Footprint Design (0.87 ha)
- Treeline
- Groundwater Monitoring Locations
- Historical Surface Water Sampling Locations;
- Supplemental Surface Water Sampling Locations
- Surface Water Sampling Locations
- Inferred Direction of Groundwater Flow
- 375.67 Groundwater Elevation Spring, 2023

REV.	DESCRIPTION	YY/MM/DD	BY	CHK
1				

REFERENCES

0 25 50 Meters

1:1,000

CLIENT

Municipality of Hastings Highlands

PROJECT

Musclow-Greenview Waste Disposal Site

TITLE

Groundwater Elevations - Spring 2023

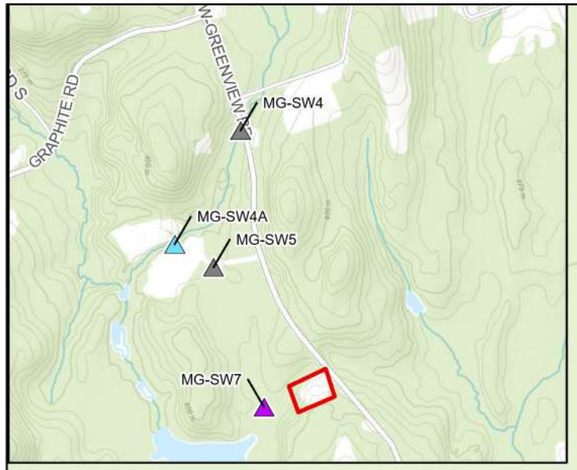
BluMetric Environmental

The Tower - The Woolen Mill,
4 Cataraqui St.,
Kingston, Ontario K7K 1Z7
TEL: (613) 531-2725
FAX: (613) 531-1852
Email: info@blumetric.ca
Web: http://www.blumetric.ca

PROJECT #	DATE
230225-7	February 21, 2024

DRAWN	CHECKED	FIG NO.	REV
ZS	TH	03	0

C:\SP\BluMetric Environmental\Geomatics - GIS (1)\GIS_PROJECTS\PROJECTS\MHH\Projects\230225 - MHHs - 2023 AMR WDS-WSTs - Maynooth,ON\07-Musclow-Greenview\APRX\2024-02-21\230225-07-Musclow.aprx



MG-SW1
MG-DP1
MG-DP4
MG-DP2
MG-SW2
Bulky Waste
Metals
Tires
Brush and Leaf
MG-18-1
377.235
MG 18-3R
379.22
MG-18-3
Property Boundary (2 ha)
Attendant's Building
Recycling Bins
Electrical and Electronic Equipment
Final Footprint Design (0.65 ha)
MG-18-2
376.895
MG-DP5
MG-SW6
MG-SW3
MG-DP3
MG-SW7
DRAINAGE SWALE ALONG SOUTH SIDE OF FINAL DESIGN FOOTPRINT
MUSCLOW-GREENVIEW RD

LEGEND

- Approximate Property Outline (2 ha)
- Site Features
- Final Footprint Design (0.87 ha)
- Treeline
- Groundwater Monitoring Locations
- Abandoned Monitoring Well
- Historical Surface Water Sampling Locations;
- Supplemental Surface Water Sampling Locations
- Surface Water Sampling Locations
- 375.67 Groundwater Elevation Fall, 2023
- Inferred Direction of Groundwater Flow

REV.	DESCRIPTION	YY/MM/DD	BY	CHK
1				

REFERENCES

0 25 50 Meters

1:1,000

CLIENT

Municipality of Hastings Highlands

PROJECT

Musclow-Greenview Waste Disposal Site

TITLE

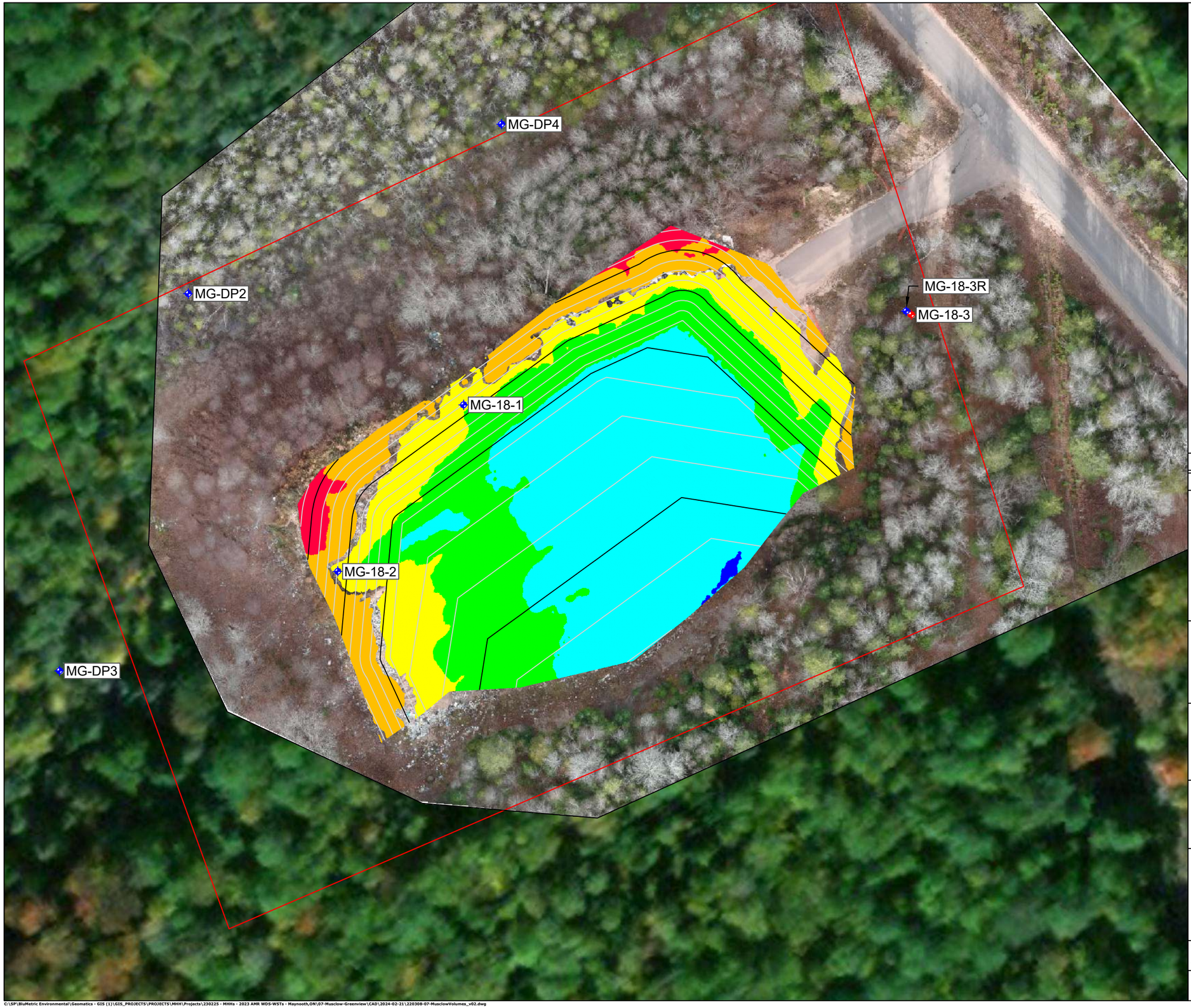
Groundwater Elevations - Fall 2023

The Tower - The Woolen Mill,
4 Cataraqui St.,
Kingston, Ontario K7K 1Z7
TEL: (613) 531-2725
FAX: (613) 531-1852
Email: info@blumetric.ca
Web: http://www.blumetric.ca

PROJECT #	DATE
230225-7	February 21, 2024

DRAWN	CHECKED	FIG NO.	REV
ZS	TH	04	0

C:\SP\BluMetric Environmental\Geomatics - GIS (1)\GIS_PROJECTS\PROJECTS\MHH\Projects\230225 - MHHs - 2023 AMR WDS-WSTs - Maynooth,ON\07-Musclow-Greenview\APRX\2024-02-21\230225-07-Musclow.aprx



LEGEND

- Monitoring Well Location
- Abandoned Monitoring Well Location
- Approximate Property Outline (2 ha)
- Final Elevation Contour (0.5 m)
- Final Elevation Contour (2.0 m)

Volume to Remove (Cut): 1,047 m³
Volume to be Added (Fill): 19,151 m³
Volume of Intermediate Cover: 3,964 m³
Net Volume to be Added (Netfill): 18,103 m³

Elevations Table				
Number	Minimum Elevation	Maximum Elevation	Volume	Color
1	−3.75	−2.00	73	
2	−2.00	−0.30	700	
3	0.30	2.00	8226	
4	2.00	4.00	7028	
5	4.00	6.00	2264	
6	6.00	6.40	2	

REV.	DESCRIPTION	YY/MM/DD	BY	CHK
1				

REFERENCES

0 15 30 Metres
1:750

N W E S

CLIENT

Municipality of Hastings Highlands

PROJECT

Musclow-Grenview Waste Disposal Site

TITLE

Remaining Fill Capacity as of November 09, 2022

BluMetric™ Environmental
1682 Woodward Drive
Ottawa, Ontario, K2C 3R8
TEL: (613) 839-3053
FAX: (613) 839-5376
Email: info@blumetric.ca
Web: http://www.blumetric.ca

PROJECT #	DATE
230225-07	February 21, 2024

DRAWN	CHECKED	DWG NO.	REV
GM	CM	05	0

C:\SP\BluMetric Environmental\Geomatics - GIS (1)\GIS_PROJECTS\PROJECTS\MHH\Projects\230225 - MHHs - 2023 AMR WDS-WSTs - Maynooth,ON\07-Musclow-Greenview\CAD\2024-02-21\220308-07-MusclowVolumes_v02.dwg

Site Photographs

Photo 1: Front entrance with signage – May 2, 2023

Photo 2: Attendant's building and recycling depot – May 2, 2023

Photo 3: Site view facing southwest – May 2, 2023

Photo 4: Cover material being added to active landfilling area – May 2, 2023

Photo 5: Segregated metals – May 2, 2023

Photo 6: Segregated tires – May 2, 2023

Photo 7: Bulk waste area – May 2, 2023

Photo 8: Brush and yard waste – May 2, 2023

Photo 9: MG-SW1 monitoring location – May 2, 2023

Photo 10: MG-SW2 monitoring location – May 2, 2023

Photo 12: MG-SW4A monitoring location – May 2, 2023

Photo 11: MG-SW6 monitoring location – May 2, 2023

Photo 13: Active waste area – October 18, 2023

Photo 14: Site view facing southwest – October 18, 2023

Photo 15: Recycling depot – October 18, 2023

Photo 16: Brush and yard waste – October 18, 2023

Photo 17: Segregated metals –
October 18, 2023

Photo 18: Segregated tires –
October 18, 2023

Photo 19: Bulk waste area –
October 18, 2023

Photo 20: MG-SW1 monitoring location –
October 18, 2023

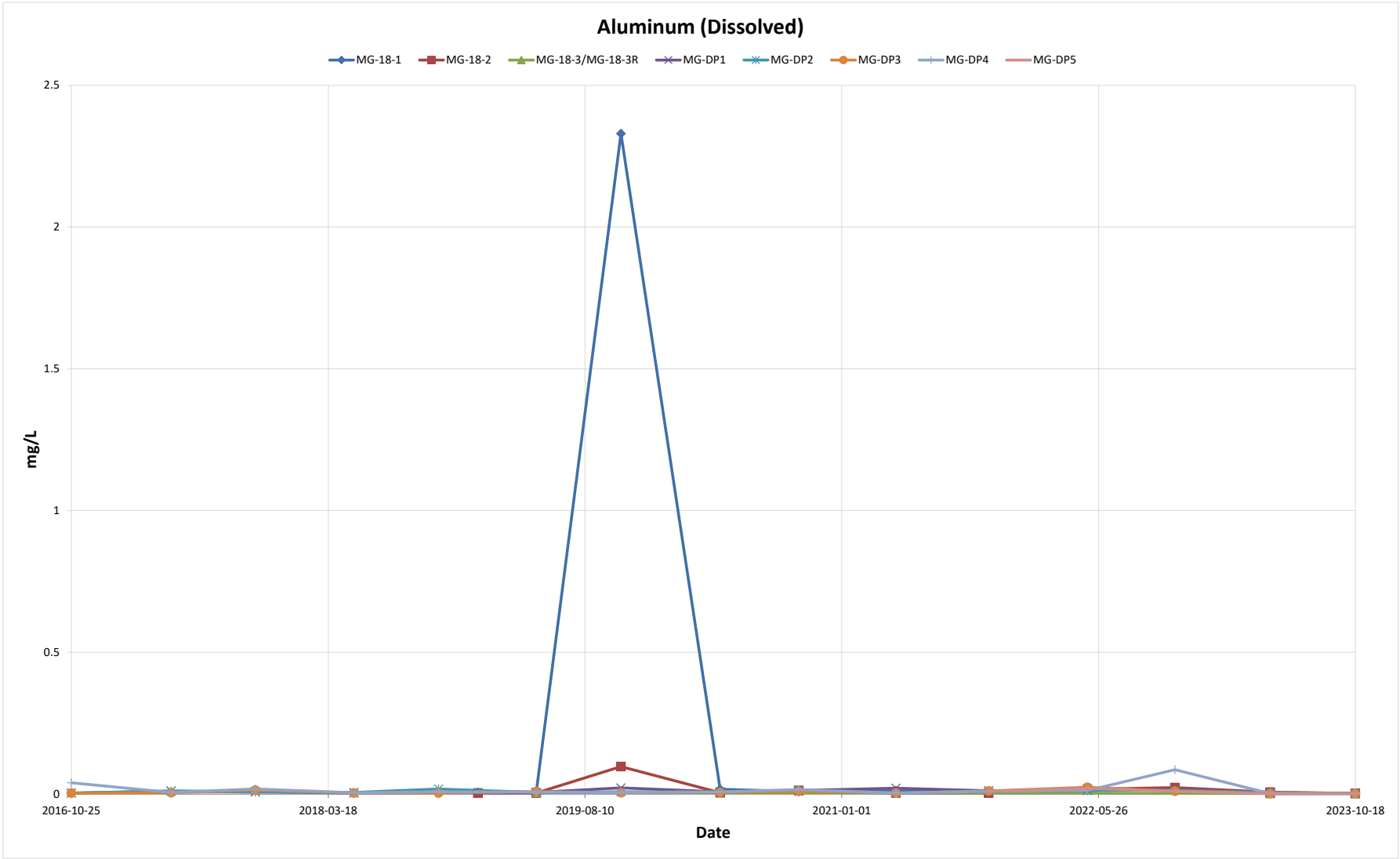
Photo 21: MG-SW2 monitoring location – October 18, 2023

Photo 22: MG-SW3 monitoring location – October 18, 2023

Photo 19: MG-SW4A monitoring location – October 18, 2023

Photo 20: MG-SW6 monitoring location – October 18, 2023

Chemistry Trend Graphs

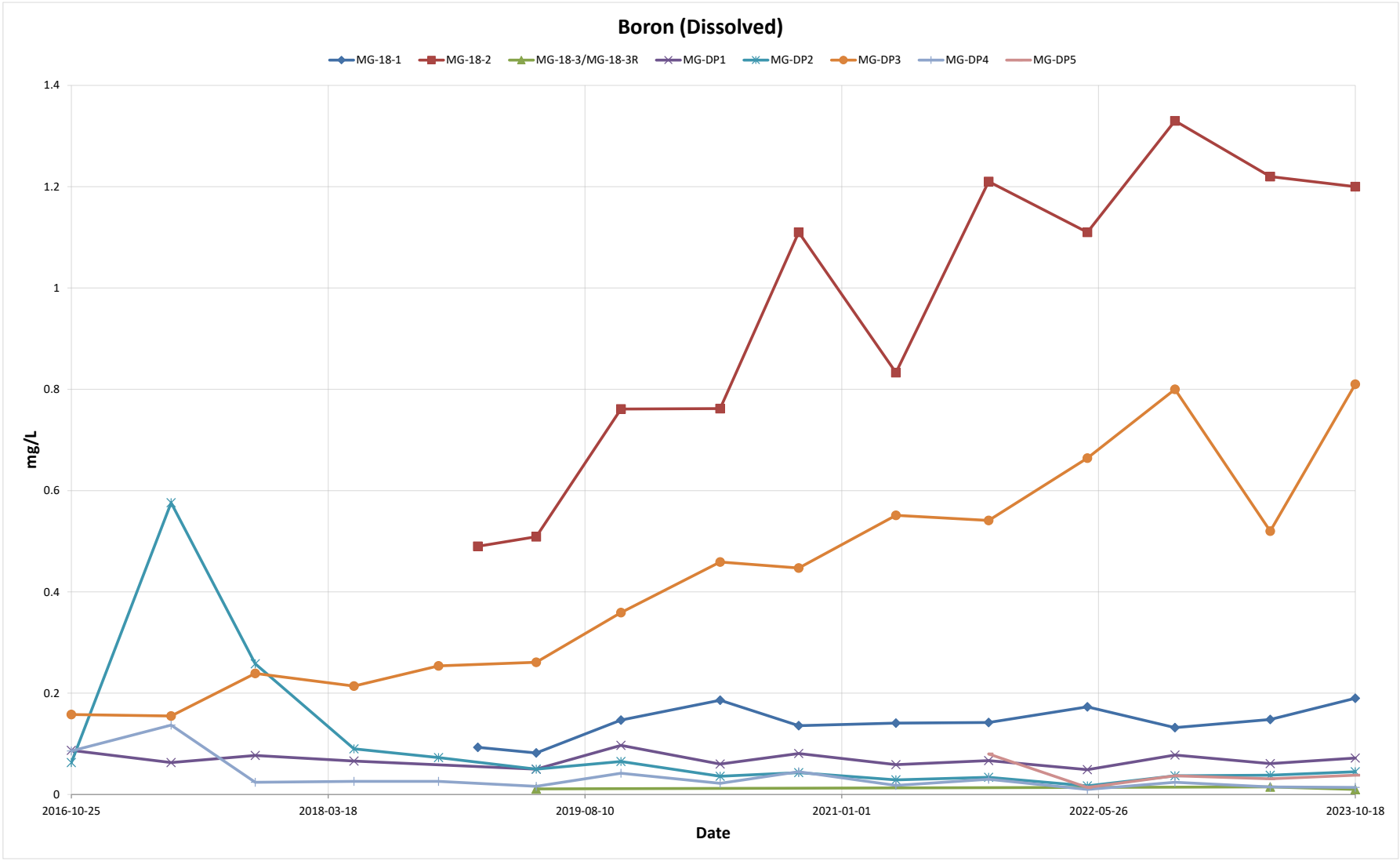


Musclow-Greenview WDS
Municipality of Hasting's Highlands

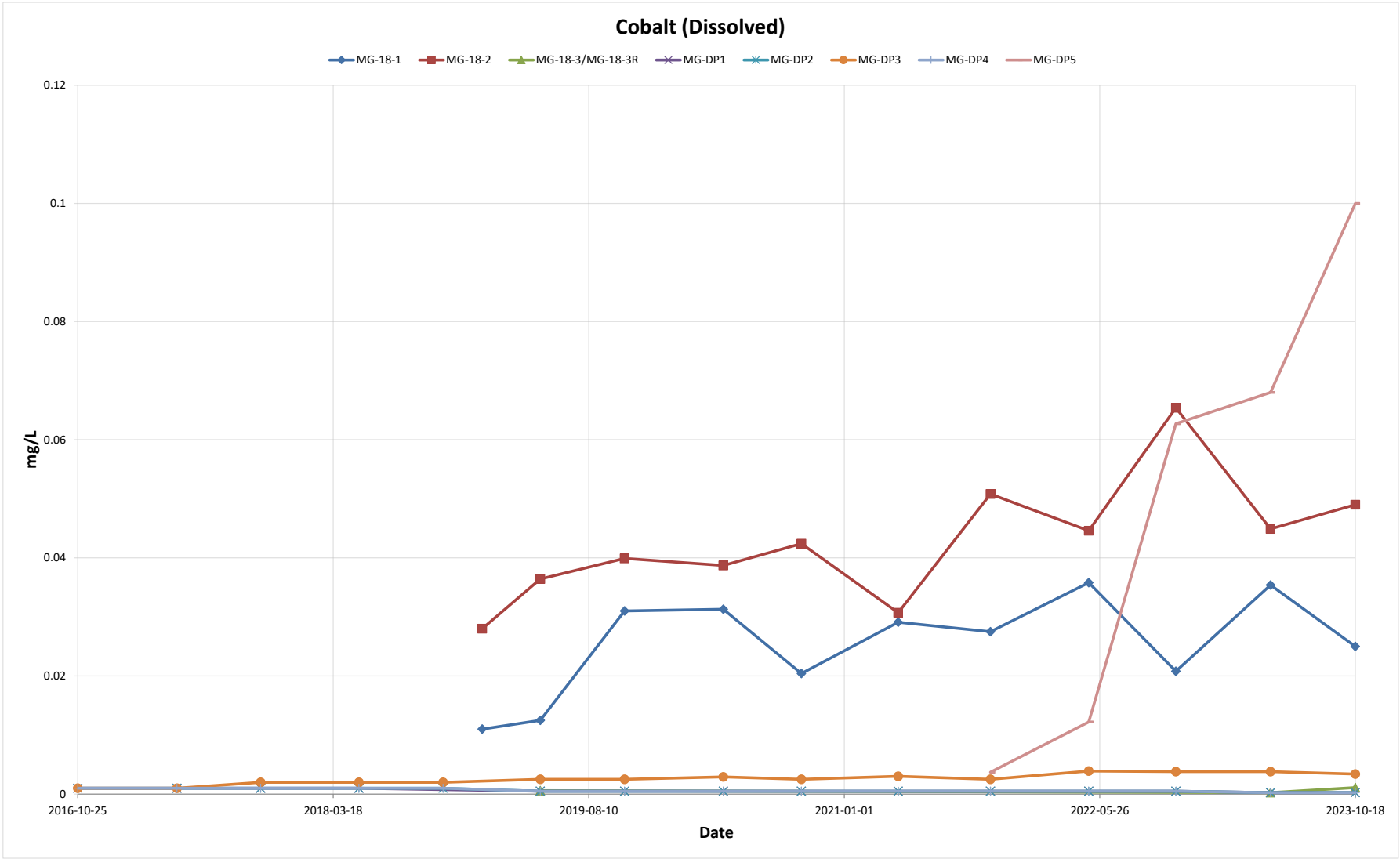
BluMetric Proj No: **230225**
Date: **March 18, 2024**

Graph 1
Dissolved Aluminum in Groundwater

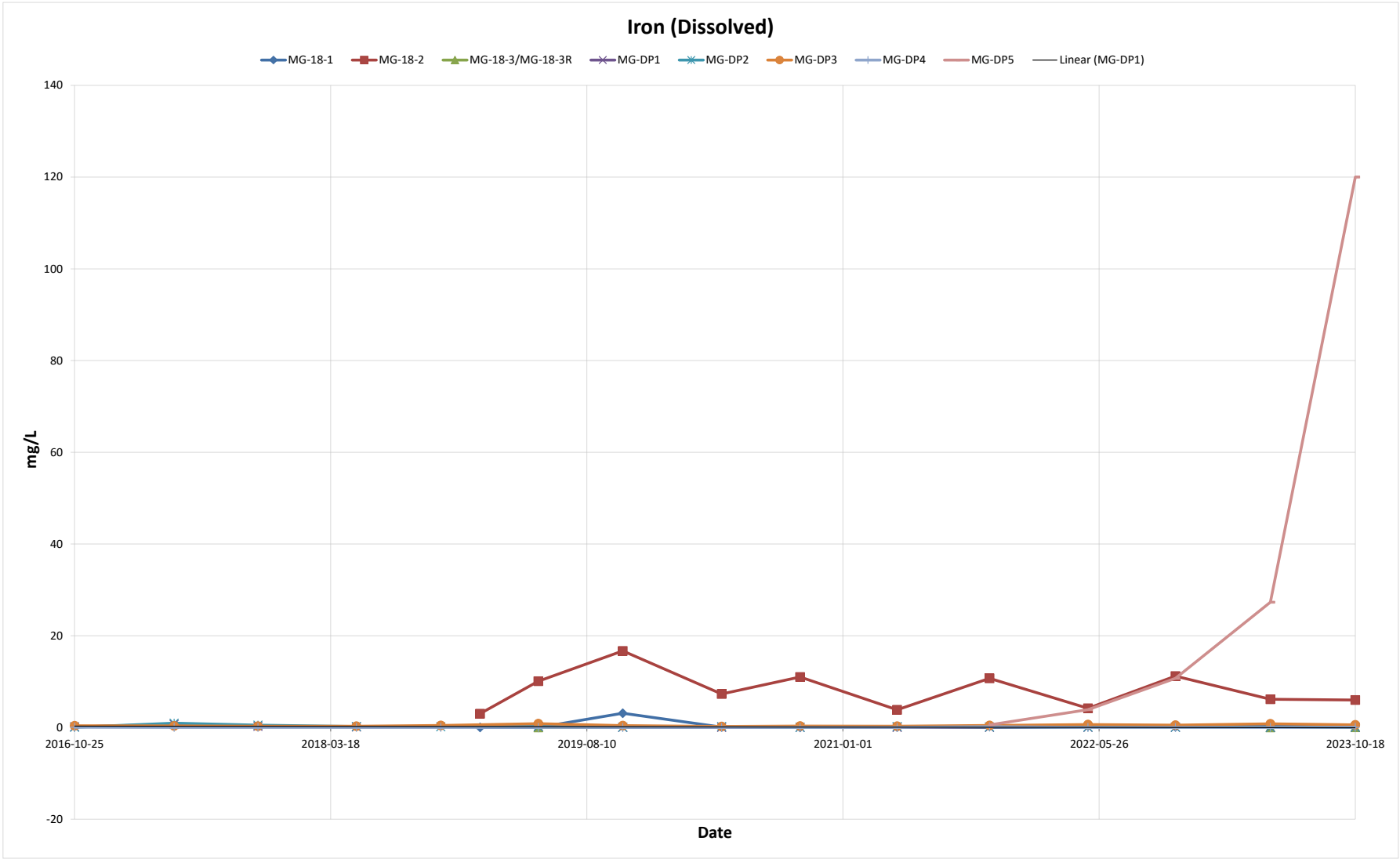
Created by: CM
Checked by: CM



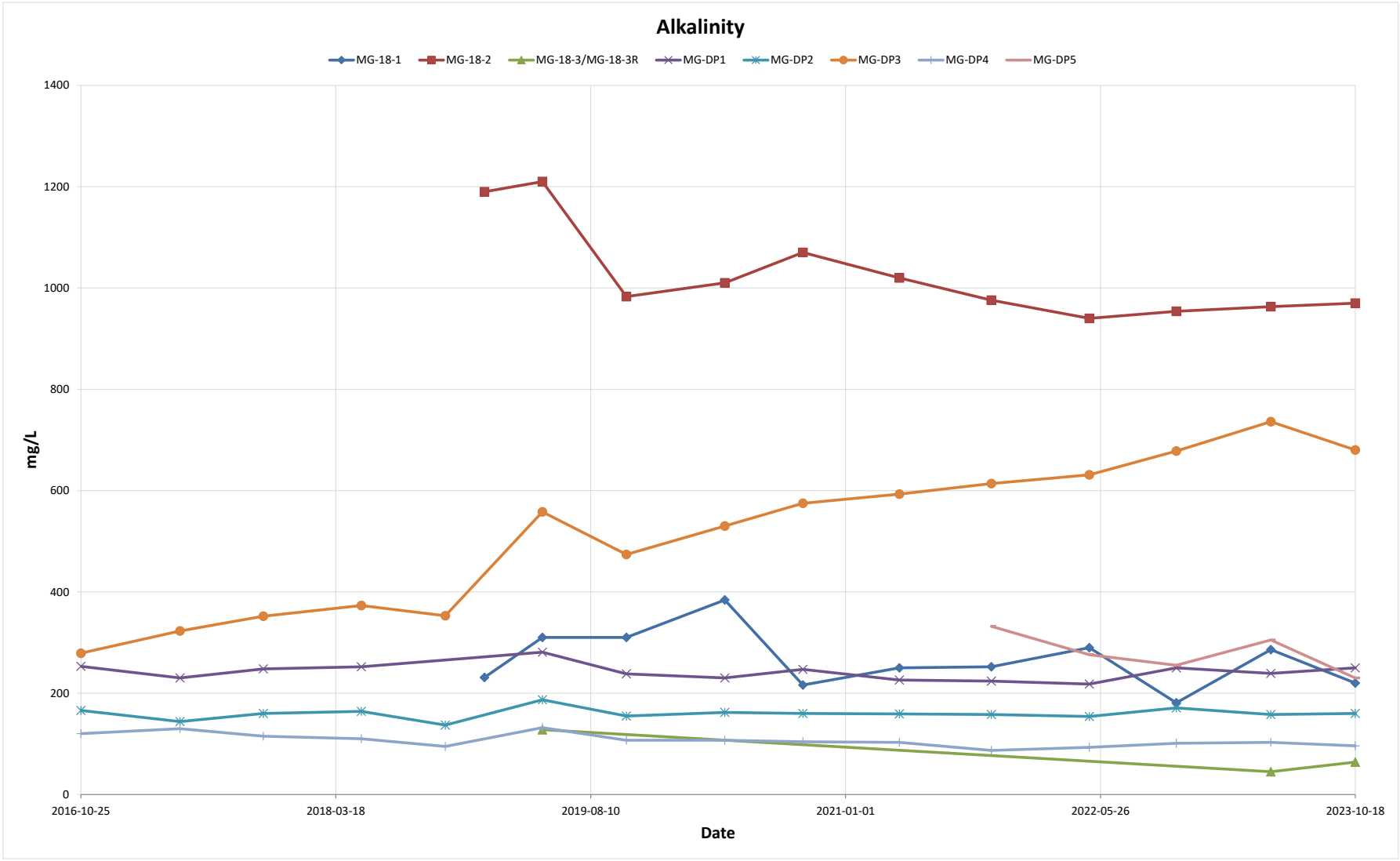
Musclow-Greenview WDS **Municipality of Hasting's Highlands**	**Graph 2** **Dissolved Boron in Groundwater**
BluMetric Proj No: 230225 **Date:** March 18, 2024	**Created by: CM** **Checked by: CM**



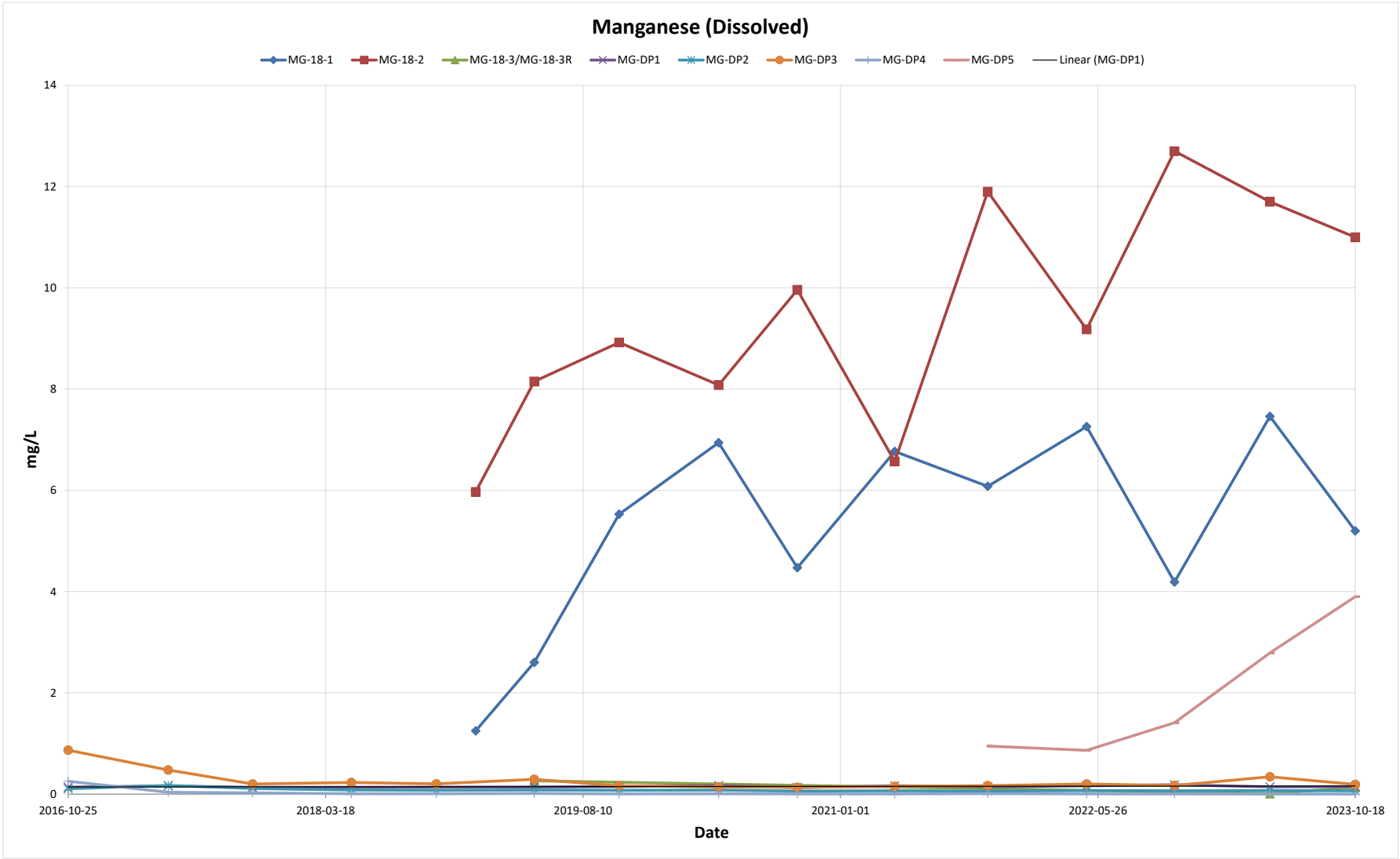
Musclow-Greenview WDS **Municipality of Hasting's Highlands**	**Graph 3** **Dissolved Cobalt in Groundwater**
BluMetric Proj No: 230225 **Date:** March 18, 2024	**Created by: CM** **Checked by: CM**



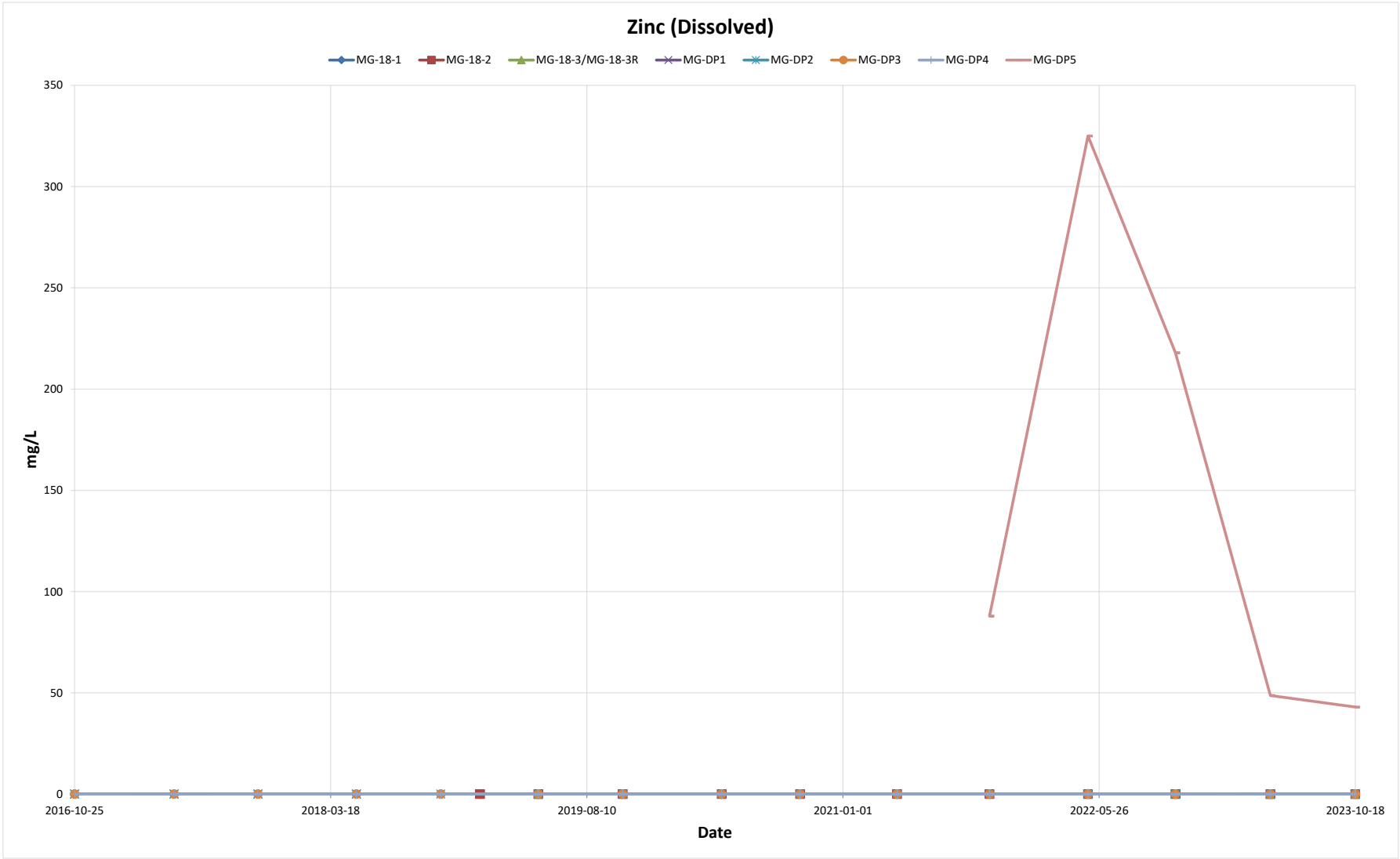
Musclow-Greenview WDS **Municipality of Hasting's Highlands**	**Graph 4** **Dissolved Iron in Groundwater**
BluMetric Proj No: 230225 **Date:** March 18, 2024	**Created by: CM** **Checked by: CM**



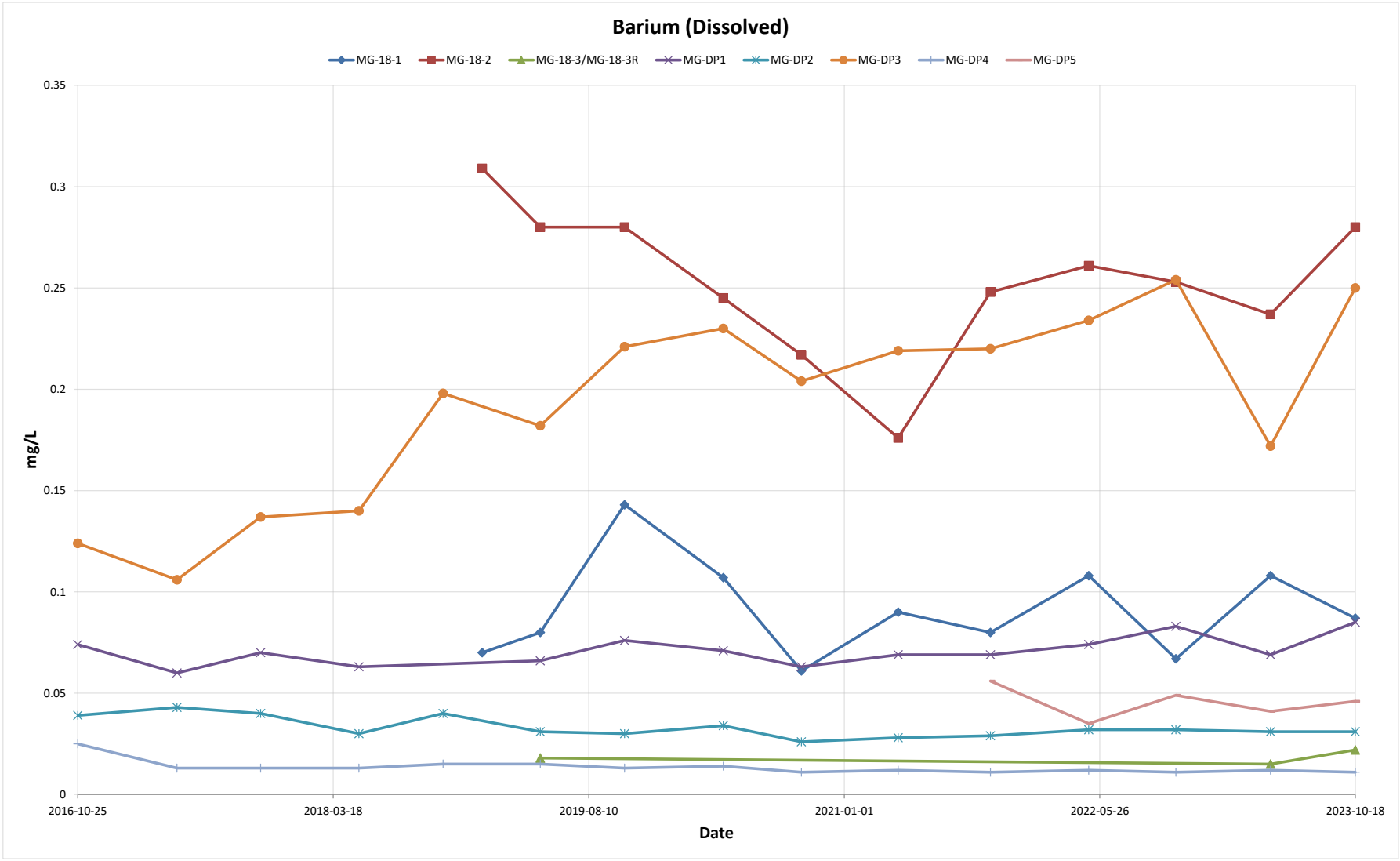
Musclow-Greenview WDS **Municipality of Hasting's Highlands**	**Graph 5** **Alkalinity in Groundwater**
BluMetric Proj No: 230225 **Date:** March 18, 2024	**Created by: CM** **Checked by: CM**



Musclow-Greenview WDS **Municipality of Hasting's Highlands**	**Graph 6** **Dissolved Manganese in Groundwater**
BluMetric Proj No: 230225 **Date:** March 18, 2024	**Created by: CM** **Checked by: CM**



Musclow-Greenview WDS **Municipality of Hasting's Highlands**	**Graph 7** **Dissolved Zinc in Groundwater**
BluMetric Proj No: 230225 **Date:** March 18, 2024	**Created by: CM** **Checked by: CM**

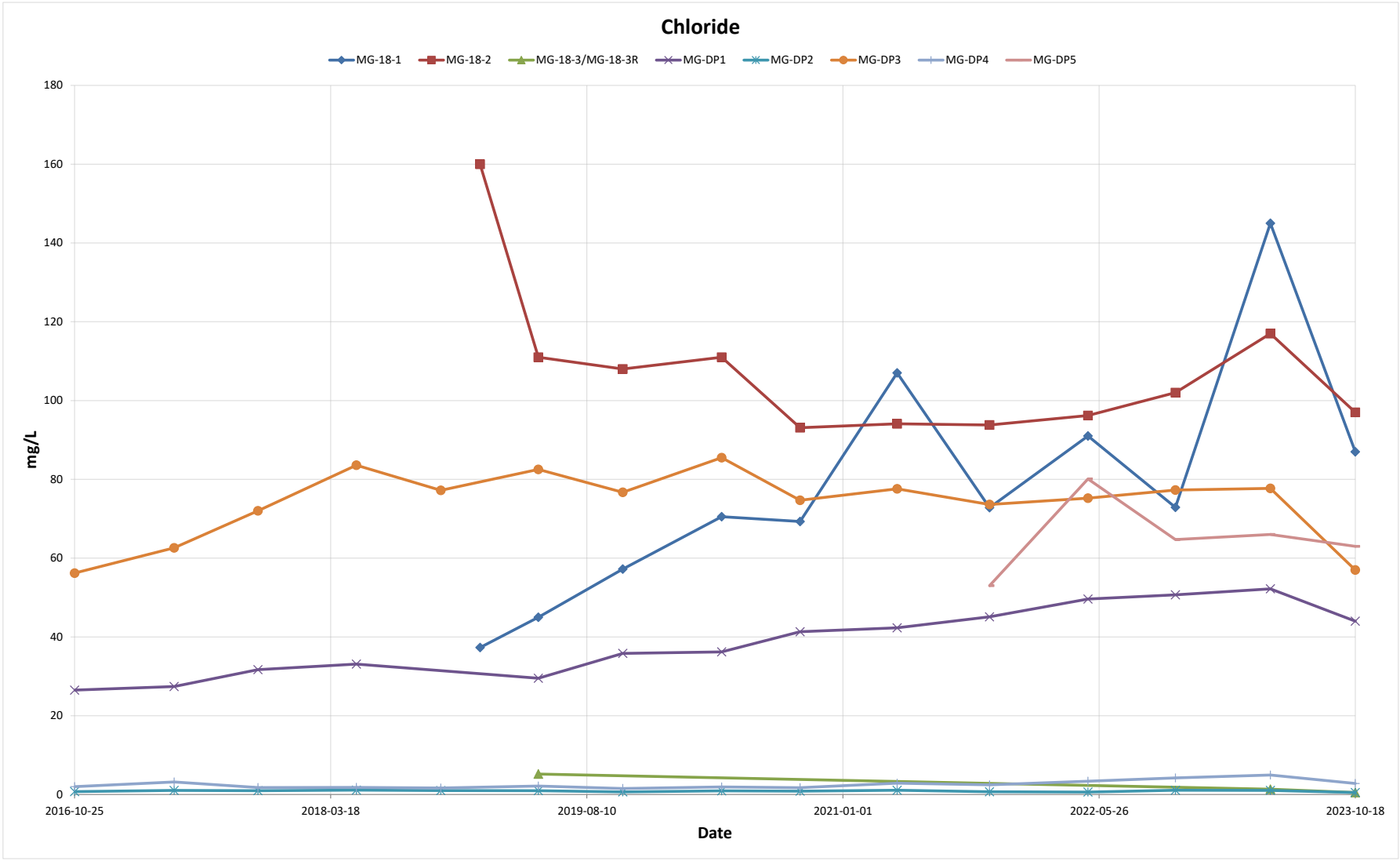


Musclow-Greenview WDS
Municipality of Hasting's Highlands

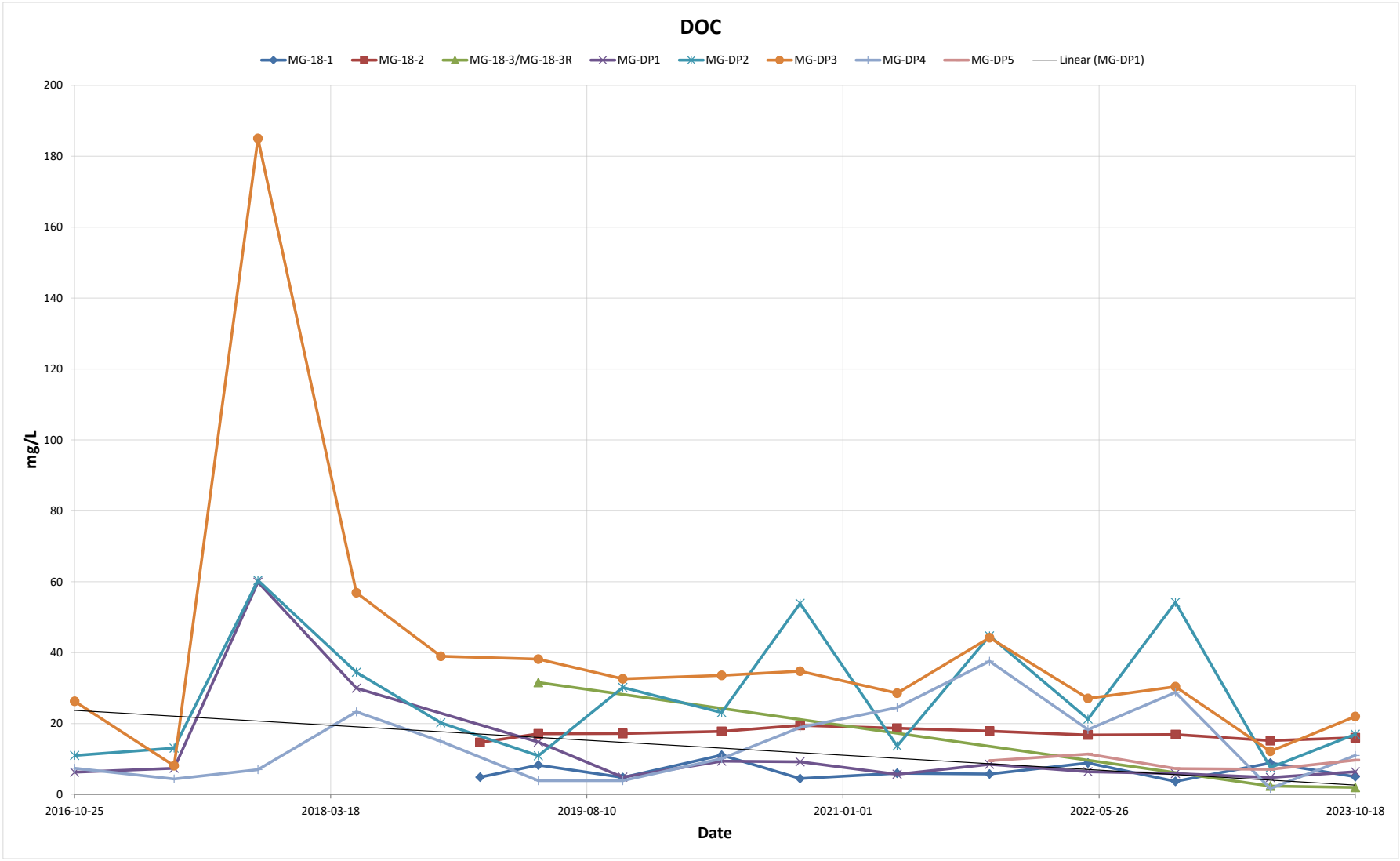
BluMetric Proj No: **230225**
Date: **March 18, 2024**

Graph 8
Dissolved Barium in Groundwater

Created by: CM
Checked by: CM



Musclow-Greenview WDS **Municipality of Hasting's Highlands**	**Graph 9** **Chloride in Groundwater**
BluMetric Proj No: 230225 **Date:** March 18, 2024	**Created by: CM** **Checked by: CM**

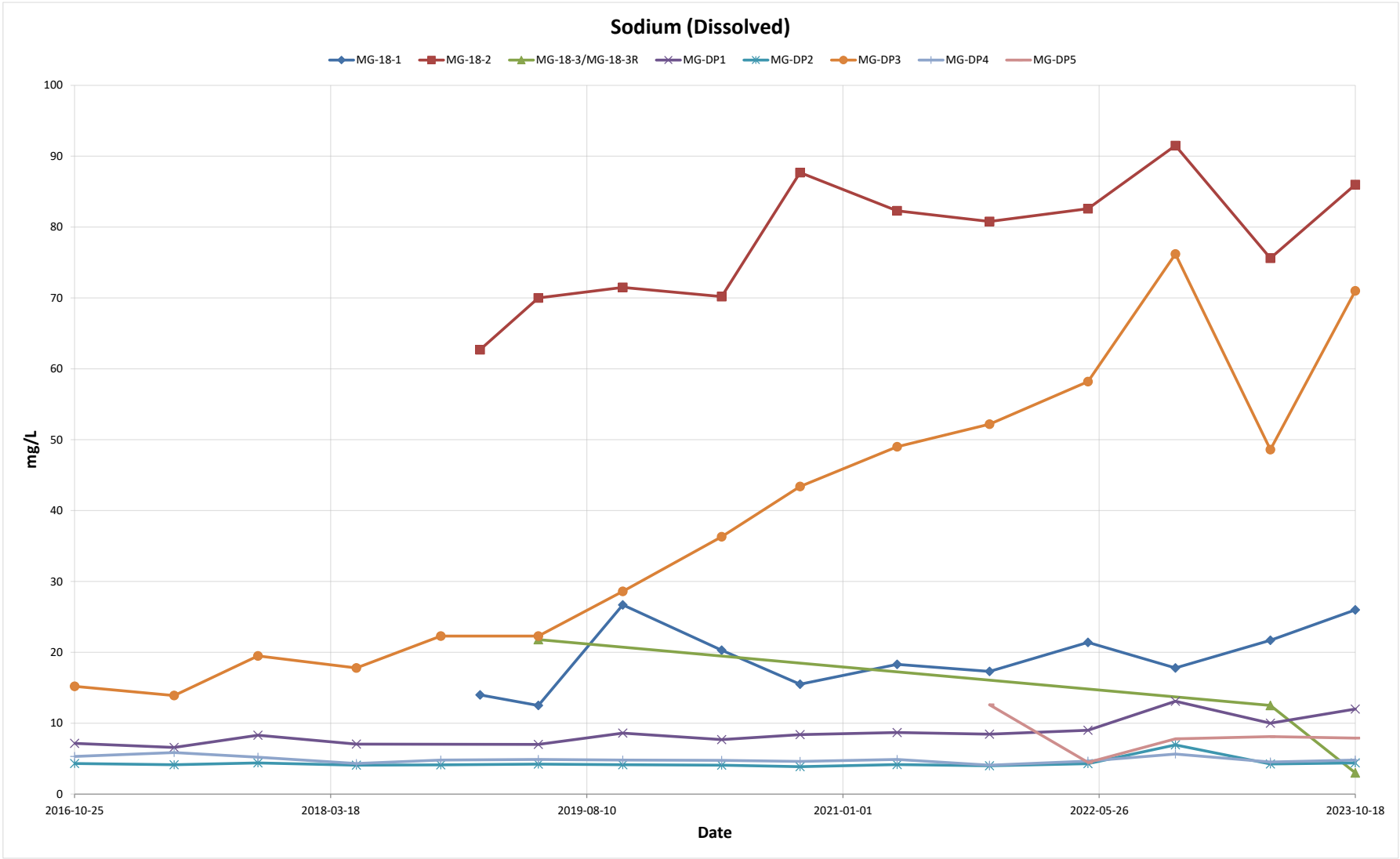


Musclow-Greenview WDS
Municipality of Hasting's Highlands

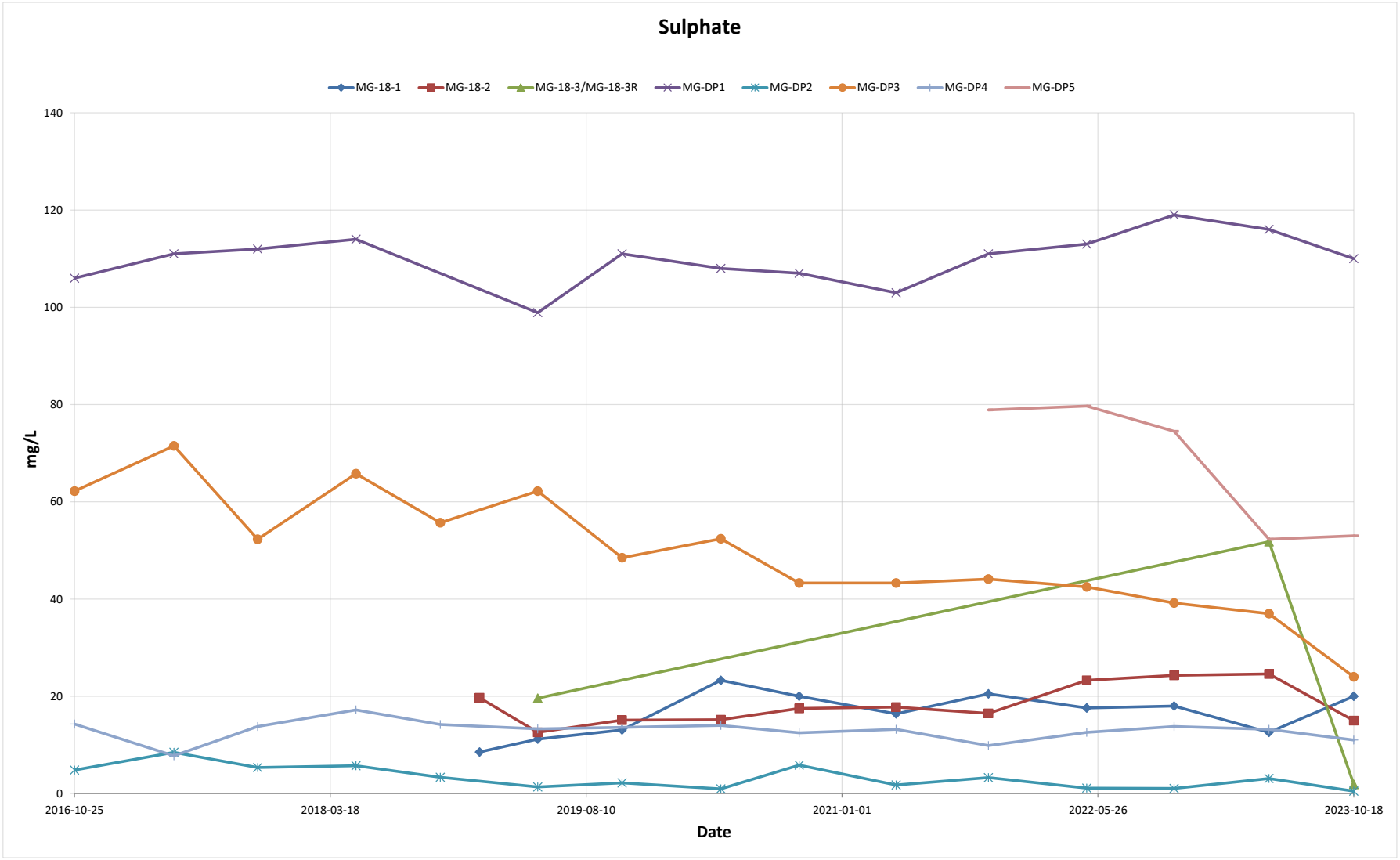
BluMetric Proj No: **230225**
Date: **March 18, 2024**

Graph 10
Dissolved Organic Carbon in Groundwater

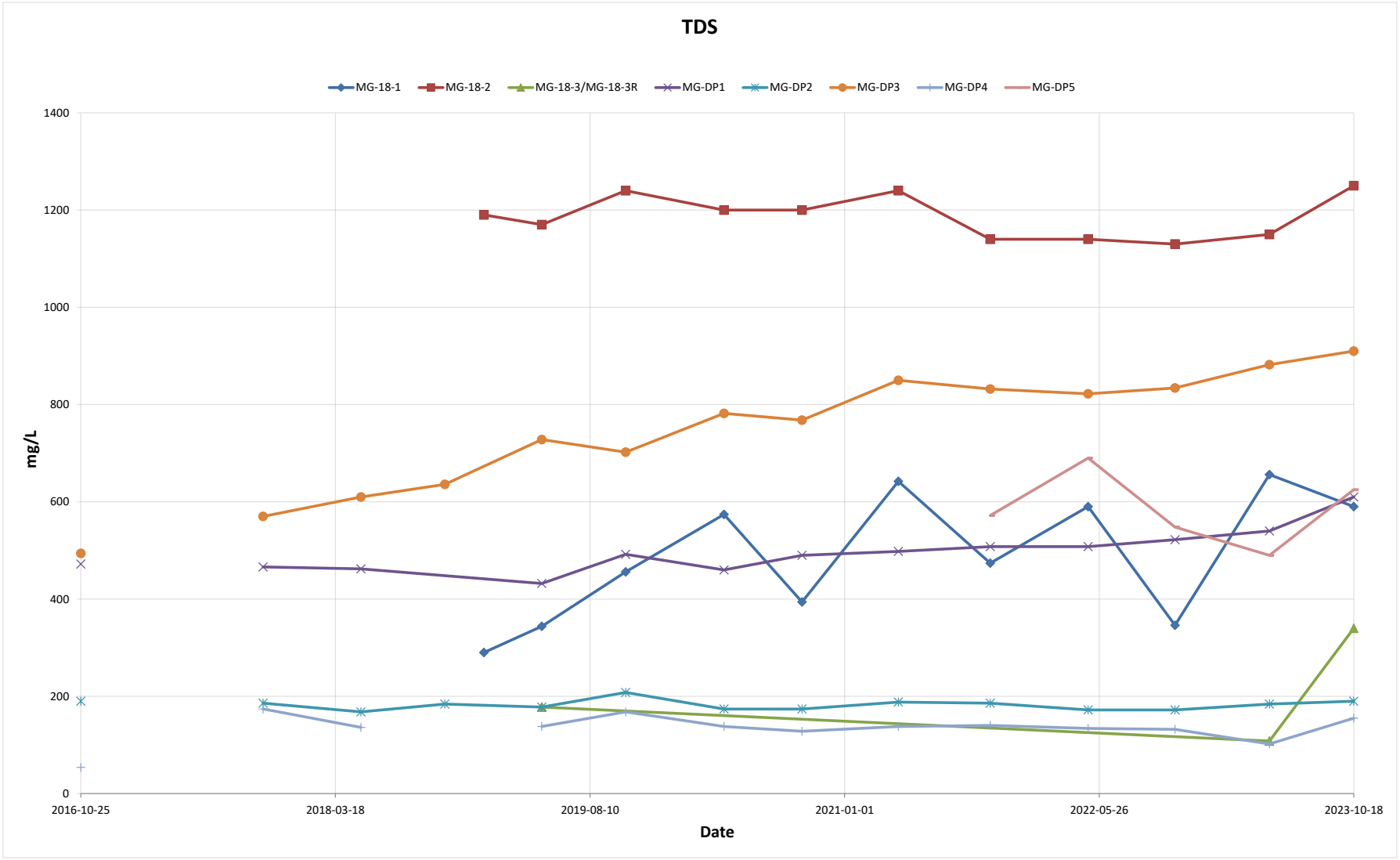
Created by: CM
Checked by: CM



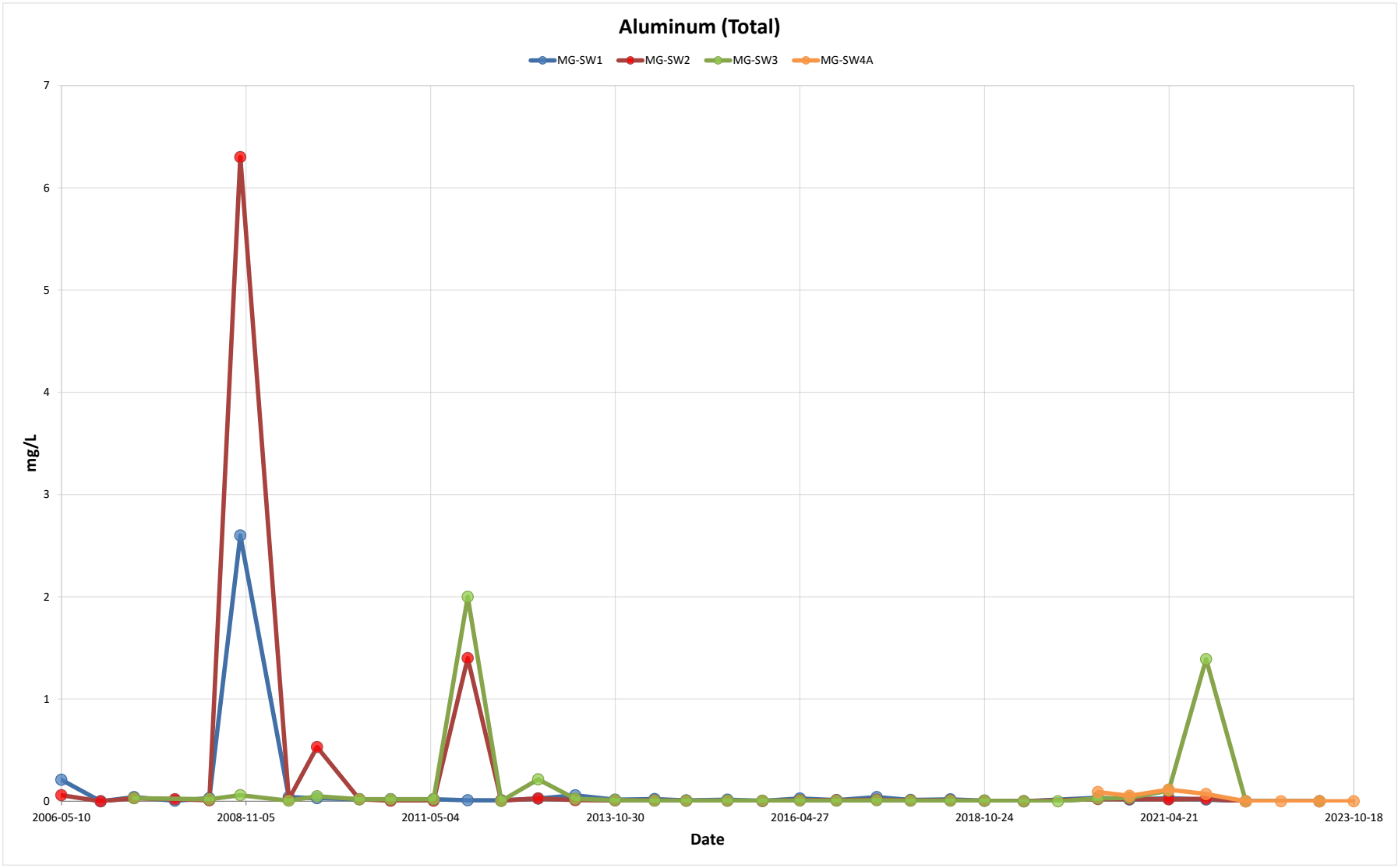
Musclow-Greenview WDS **Municipality of Hasting's Highlands**	**Graph 11** **Dissolved Sodium in Groundwater**
BluMetric Proj No: 230225 **Date:** March 18, 2024	**Created by: CM** **Checked by: CM**



Musclow-Greenview WDS **Municipality of Hasting's Highlands**	**Graph 12** **Sulphate in Groundwater**
BluMetric Proj No: 230225 **Date:** March 18, 2024	**Created by: CM** **Checked by: CM**



Musclow-Greenview WDS **Municipality of Hasting's Highlands**	**Graph 13** **Total Dissolved Solids in Groundwater**
BluMetric Proj No: **230225** **Date:** **March 18, 2024**	**Created by: CM** **Checked by: CM**

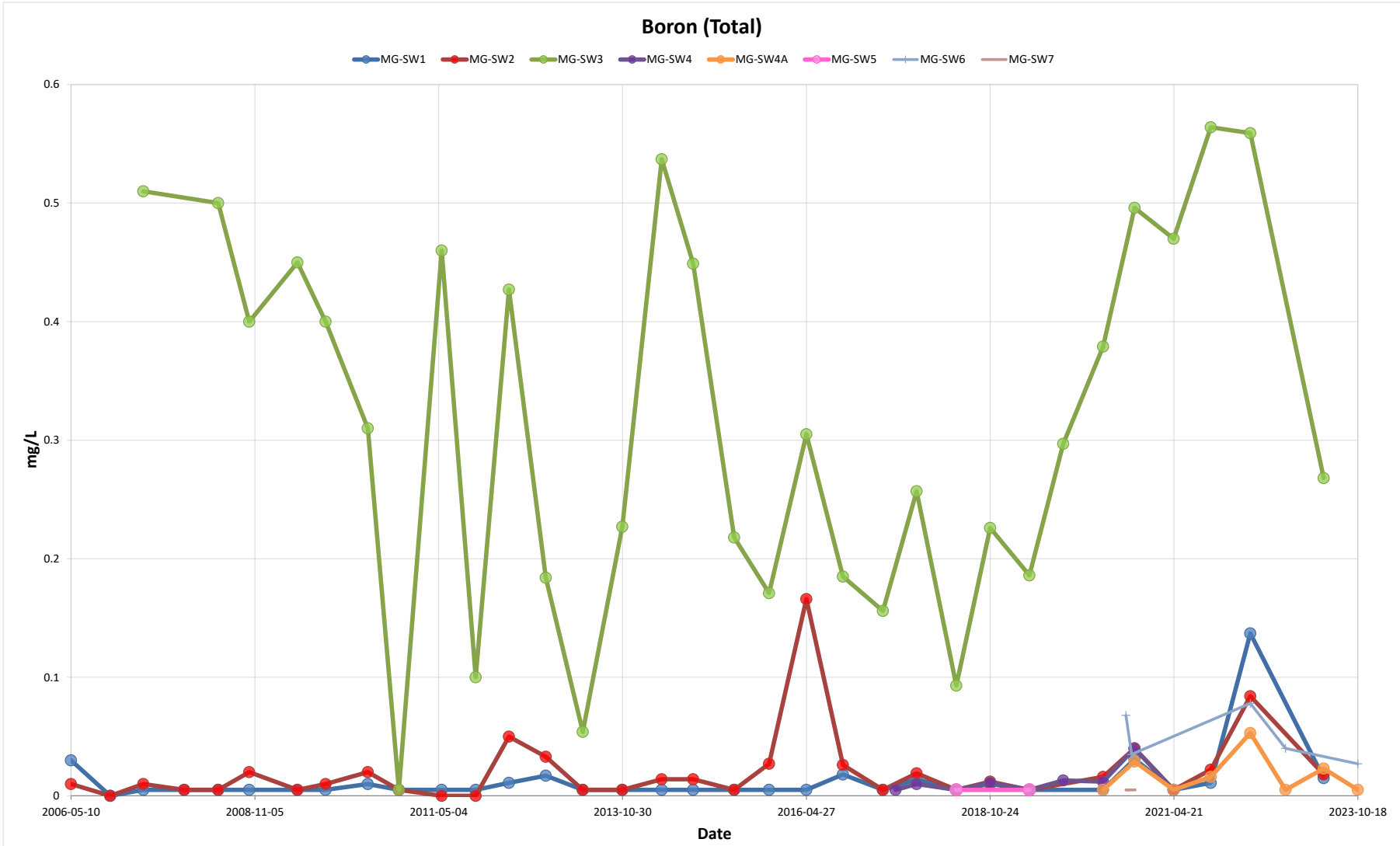


Musclow-Greenview WDS
Municipality of Hasting's Highlands

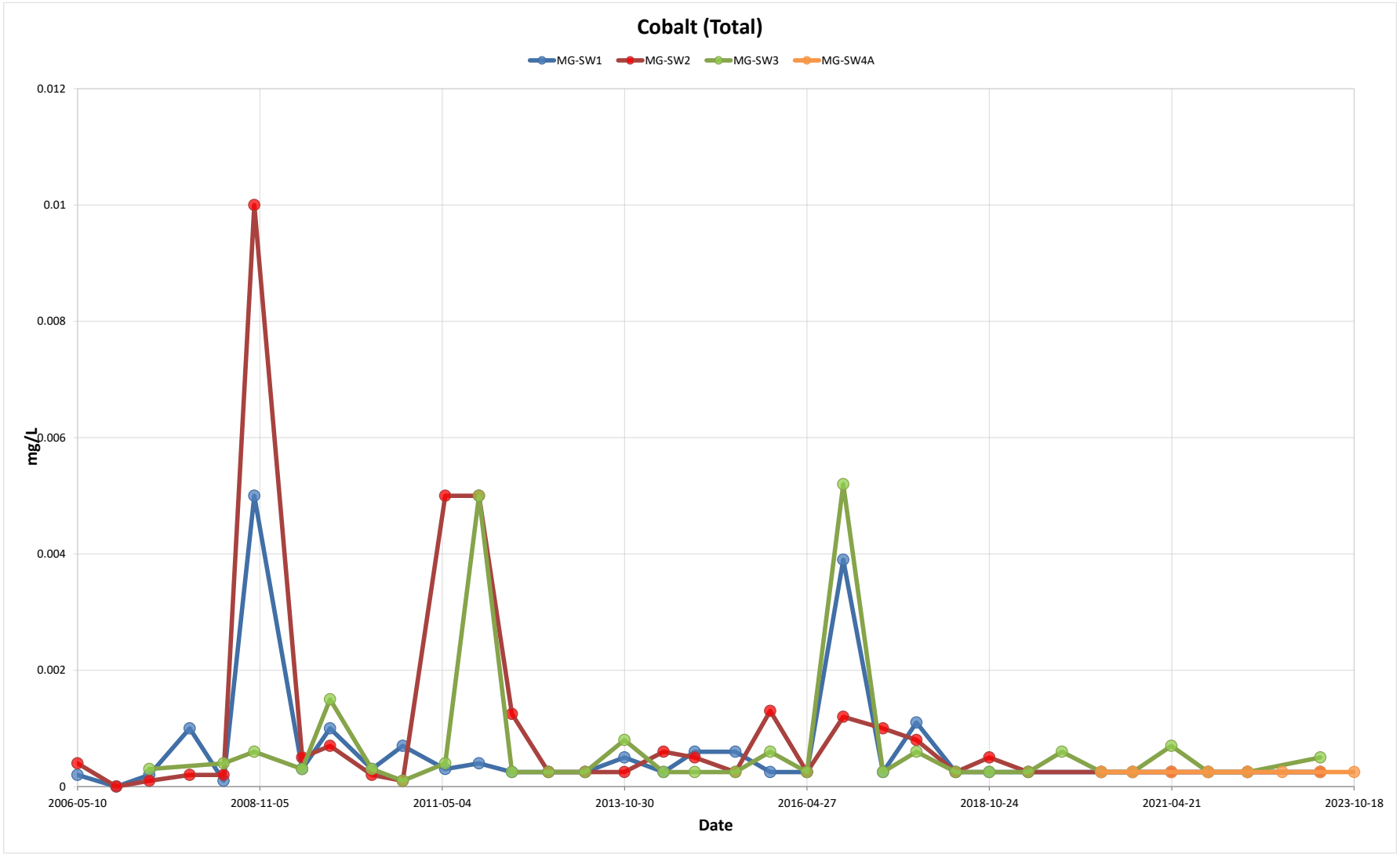
BluMetric Proj No: **230225**
Date: **March 18, 2024**

Graph 14
Total Aluminum in Surface Water

Created by: CM
Checked by: CM



Musclow-Greenview WDS **Municipality of Hasting's Highlands**	**Graph 15** **Total Boron in Surface Water**
BluMetric Proj No: 230225 **Date:** March 18, 2024	**Created by: CM** **Checked by: CM**

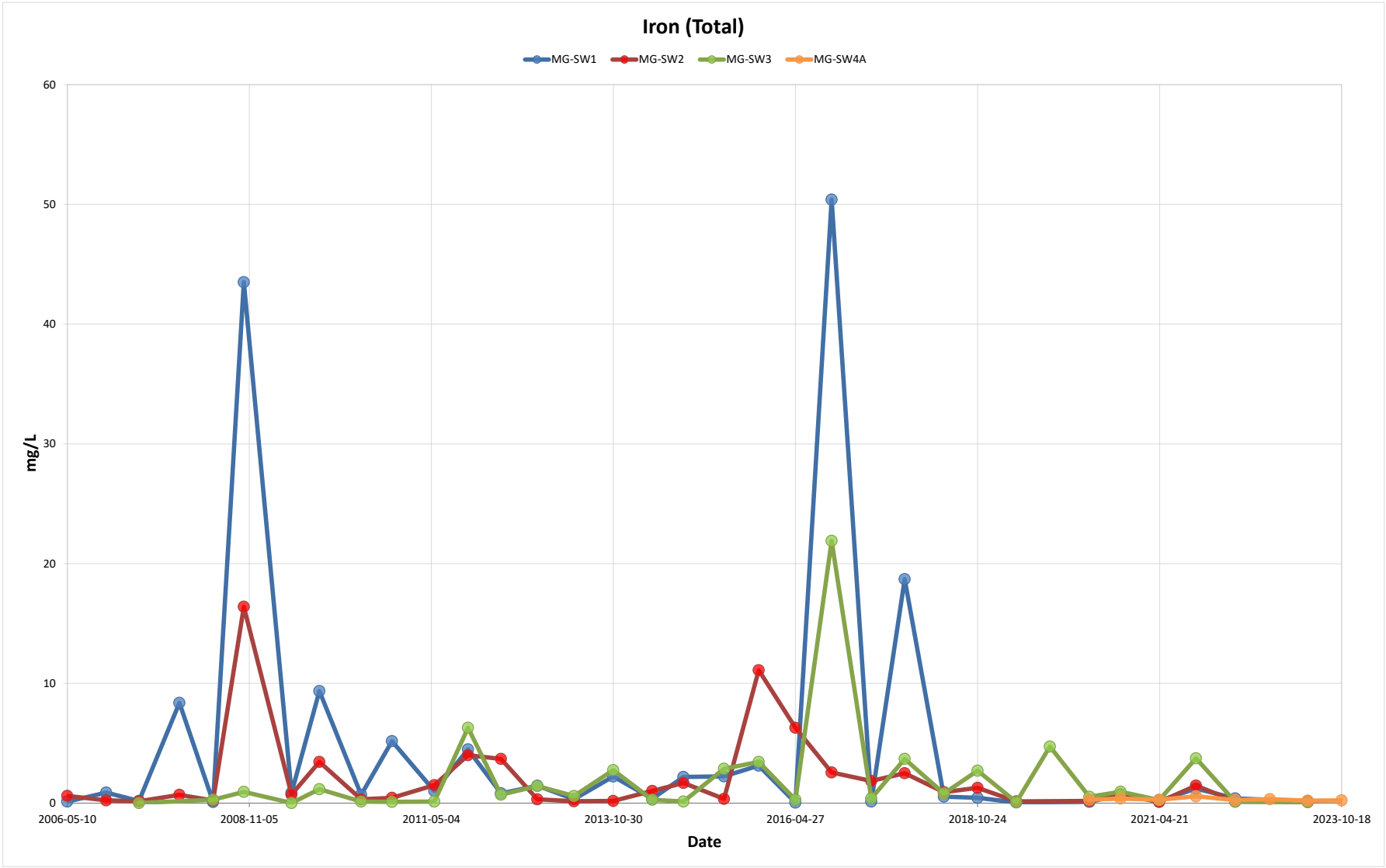


Musclow-Greenview WDS
Municipality of Hasting's Highlands

BluMetric Proj No: 230225
Date: March 18, 2024

Graph 16
Total Cobalt in Surface Water

Created by: CM
Checked by: CM

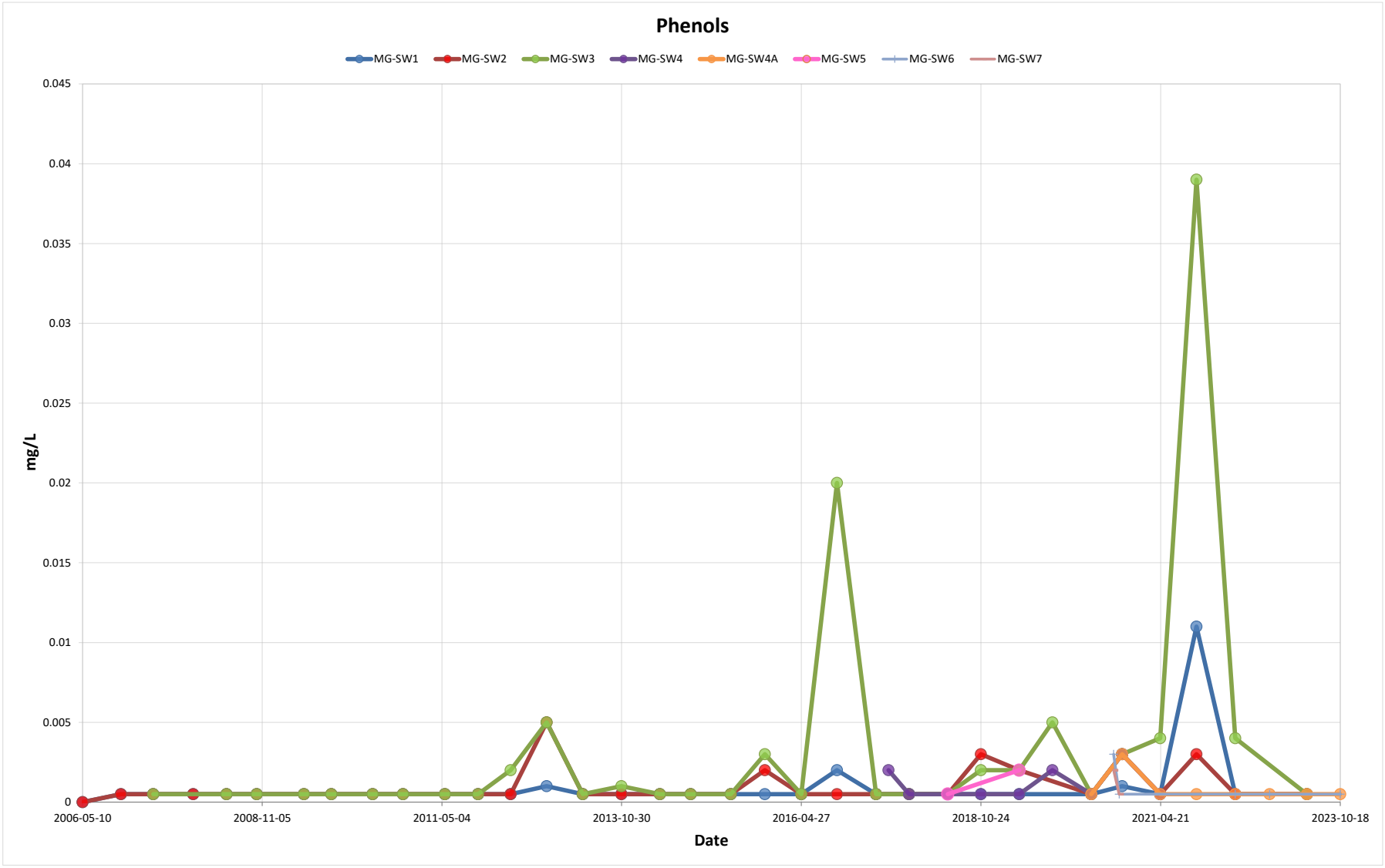


Musclow-Greenview WDS
Municipality of Hasting's Highlands

BluMetric Proj No: **230225**
Date: **March 18, 2024**

Graph 17
Total Iron in Surface Water

Created by: CM
Checked by: CM

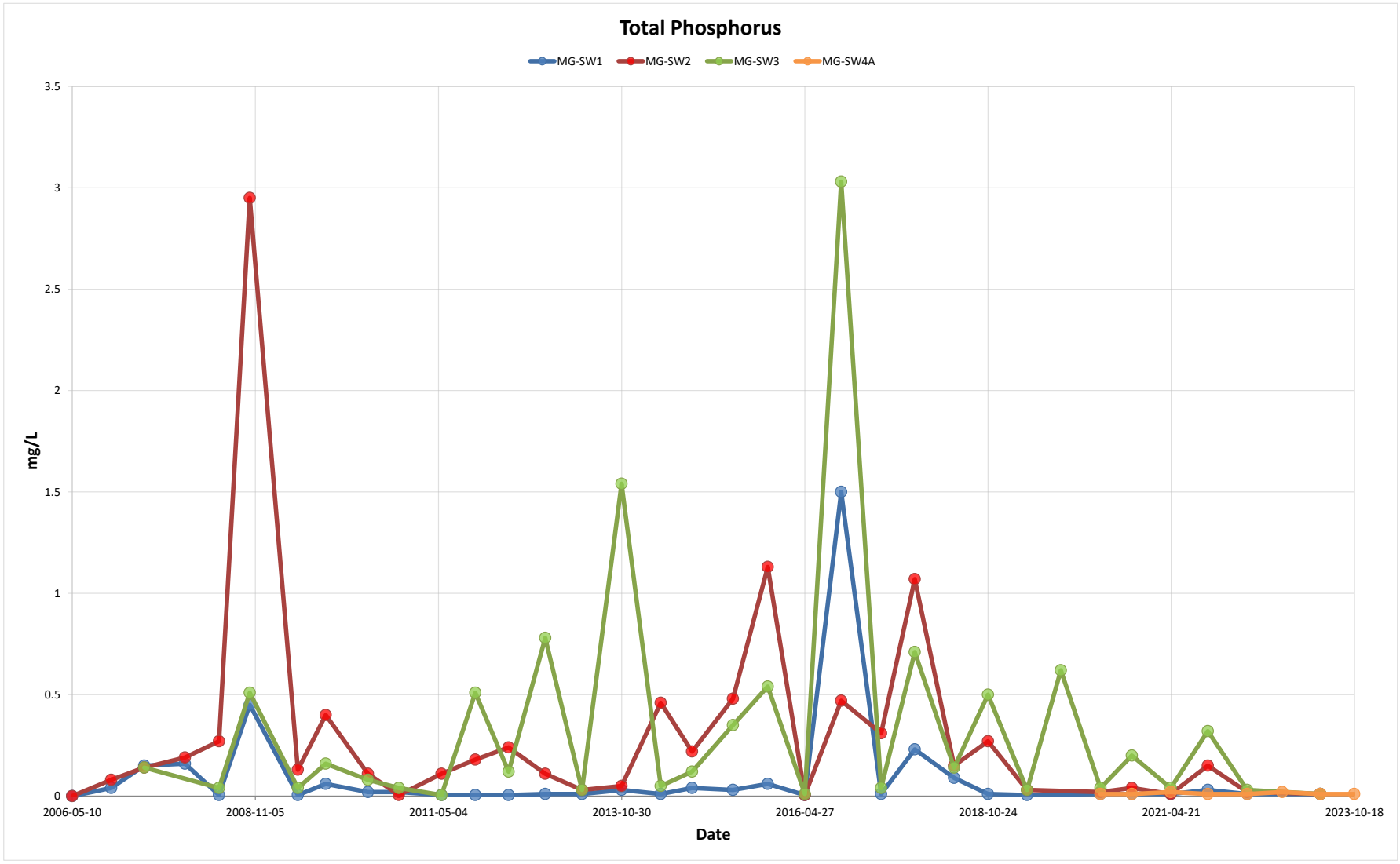


Musclow-Greenview WDS
Municipality of Hasting's Highlands

BluMetric Proj No: 230225
Date: March 18, 2024

Graph 18
Phenols in Surface Water

Created by: CM
Checked by: CM

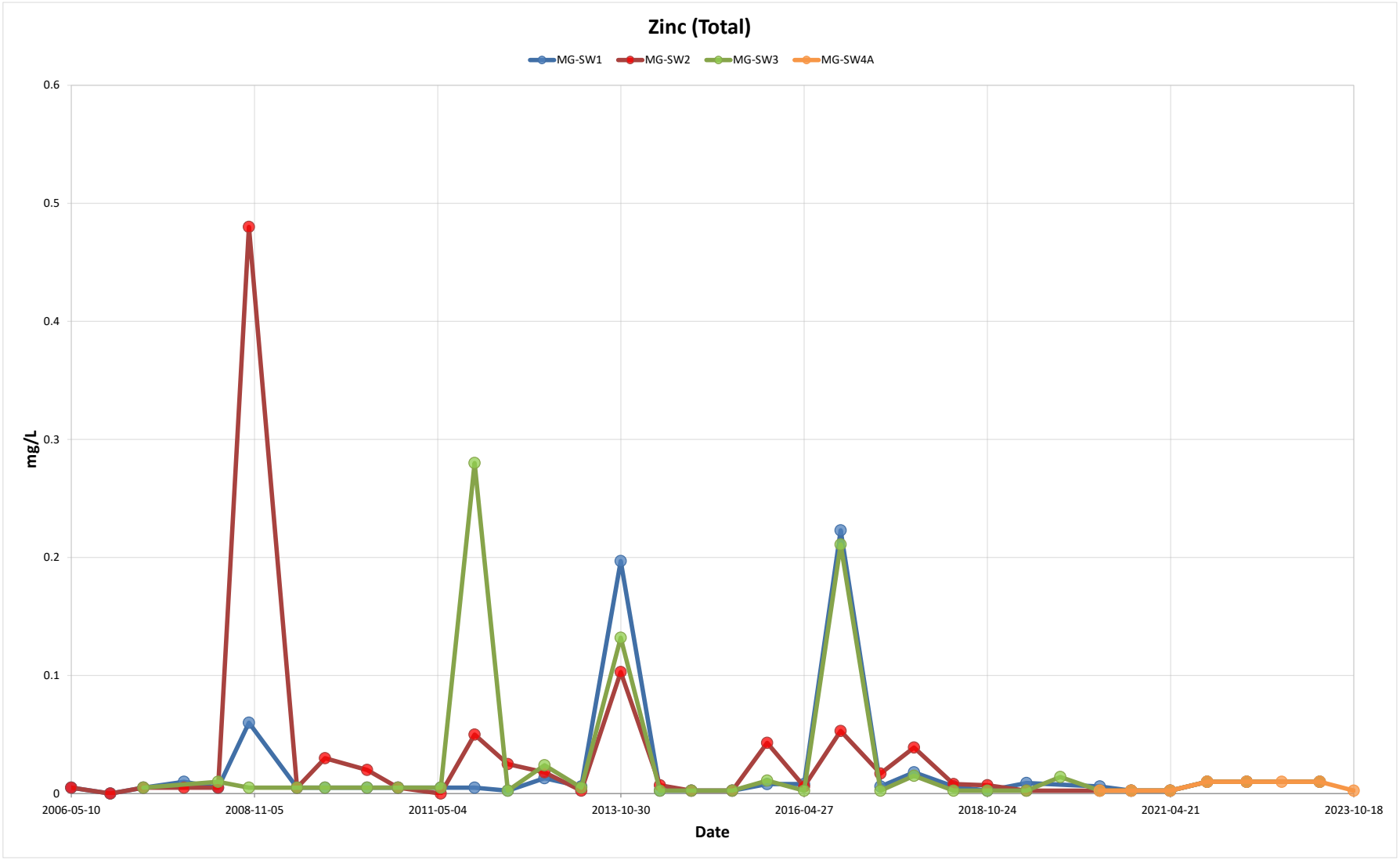


Musclow-Greenview WDS
Municipality of Hasting's Highlands

BluMetric Proj No: 230225
Date: March 18, 2024

Graph 19
Total Phosphorus in Surface Water

Created by: CM
Checked by: CM



Musclow-Greenview WDS **Municipality of Hasting's Highlands**	**Graph 20** **Total Zinc in Surface Water**
BluMetric Proj No: 230225 **Date:** March 18, 2024	**Created by: CM** **Checked by: CM**

Appendix A

A-1 Environmental Compliance Approval

Ontario

Ministry of the Environment and Climate Change
Ministère de l'Environnement et de l'Action en matière de changement climatique

AMENDED ENVIRONMENTAL COMPLIANCE APPROVAL
NUMBER A362303
Issue Date: April 27, 2018

The Corporation of the Municipality of Hastings Highlands
33011 Highway 62 N
Post Office Box, No. 130
Maynooth, Ontario
K0L 2S0

Site Location: Musclow-Greenview WDS
3375 Musclow-Greenview Road
Lot Part of 11, Concession 11
Hastings Highlands Municipality, County of Hastings

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

the use and operation of 1 hectare waste disposal/transfer site within a total site area of 2 hectares.

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

- *"Approval"* means this Environmental Compliance Approval and any Schedules to it, including the application and supporting documentation listed in Schedule "A";
- *"Contaminating Life Span"* means contaminating life span as defined in Ontario Regulation 232/98;
- *"Director"* means any *Ministry* employee appointed in writing by the Minister pursuant to section 5 of the EPA as a Director for the purposes of Part II.1 of the *EPA;*
- *"District Manager"* means the District Manager of the local district office of the *Ministry* in which the *Site* is geographically located;
- *"EPA"* means *Environmental Protection Act* , R.S.O. 1990, c. E. 19, as amended;

- *"HHW"* means household hazardous waste;

- *"Ministry"* means the Ontario Ministry of the Environment and Climate Change;

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

- *"Ontario Drinking Water Quality Standards"* means Ontario Regulation 169/03 (Ontario Drinking Water Quality Standards) as amended;

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

- *"Owner"* means any person that is responsible for the establishment or operation of the *Site* being approved by this *Approval,* and includes the Corporation of the Municipality of Hastings Highlands and its successors and assigns;

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

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

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

- *"Refrigerant Appliances"* means household appliances which use, or may use refrigerants, and which include, but is not restricted to, refrigerators, freezers and air-conditioning systems;

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

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

- *"Regulation 903"* means Regulation 903, R.R.O. 1990, made under the *OWRA,* as amended;

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

- *"Site"* means the entire waste disposal site, including the buffer lands, and contaminant attenuation zone at Musclow-Greenview WDS, 3375 Musclow-Greenview Road; and

- *"Trained Personnel"* means personnel knowledgeable in the following through instruction and/or practice:
  - relevant waste management legislation, regulations and guidelines;
  - major environmental concerns pertaining to the waste to be handled;

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

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

TERMS AND CONDITIONS

1. GENERAL

Compliance

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

(2) Any person authorized to carry out work on or operate any aspect of the *Site* shall comply with the conditions of this *Approval.*

In Accordance

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

Interpretation

(4) Where there is a conflict between a provision of any document listed in Schedule "A" in this *Approval,* and the conditions of this *Approval,* the conditions in this *Approval* shall take precedence.

(5) Where there is a conflict between the application and a provision in any document listed in Schedule "A", the application shall take precedence, unless it is clear that the purpose of the document was to amend the application and that the *Ministry* approved the

amendment.

(6) Where there is a conflict between any two documents listed in Schedule "A", the document bearing the most recent date shall take precedence.

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

Other Legal Obligations

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

Adverse Effect

(9) The *Owner* and *Operator* shall take steps to minimize and ameliorate any adverse effect on the natural environment or impairment of water quality resulting from the *Site,* including such accelerated or additional monitoring as may be necessary to determine the nature and extent of the effect or impairment.

(10) Despite an *Owner, Operator* or any other person fulfilling any obligations imposed by this *Approval* the person remains responsible for any contravention of any other condition of this *Approval* or any applicable statute, regulation, or other legal requirement resulting from any act or omission that caused the adverse effect to the natural environment or impairment of water quality.

Change of Ownership

(11) The *Owner* shall notify the *Director,* in writing, and forward a copy of the notification to the *District Manager,* within 30 days of the occurrence of any changes in the following information:
- (a) the ownership of the *Site;*
- (b) the *Operator* of the *Site;*
- (c) the address of the *Owner or Operator;* and
- (d) the partners, where the *Owner or Operator* is or at any time becomes a partnership and a copy of the most recent declaration filed under the *Business Names Act* , R. S. O. 1990, c. B.17, shall be included in the notification.

(12) No portion of this *Site* shall be transferred or encumbered prior to or after closing of the

Site unless the *Director* is notified in advance and sufficient financial assurance is deposited with the *Ministry* to ensure that these conditions will be carried out.

(13) In the event of any change in ownership of the *Site,* other than change to a successor municipality, the *Owner* shall notify the successor of and provide the successor with a copy of this *Approval,* and the *Owner* shall provide a copy of the notification to the *District Manager* and the *Director.*

Registration on Title Requirement

(14) Prior to dealing with the property in any way, the *Owner* shall provide a copy of this *Approval* and any amendments, to any person who will acquire an interest in the property as a result of the dealing.

(15) (a) Within thirty (30) calendar days from the date of issuance of this *Approval,* the *Owner* shall submit to the *Director* a completed Certificate of Requirement which shall include:

(i) a plan of survey prepared, signed and sealed by an Ontario Land Surveyor, which shows the area of the *Site* where waste has been or is to be deposited at the *Site;*

(ii) proof of ownership of the *Site;*

(iii) a letter signed by a member of the Law Society of Upper Canada or other qualified legal practitioner acceptable to the *Director,* verifying the legal description provided in the Certificate of Requirement;

(iv) the legal abstract of the property; and

(v) any supporting documents including a registerable description of the *Site.*

(b) Within thirty (30) calendar days of receiving a Certificate of Requirement authorized by the *Director,* the *Owner* shall:

(i) register the Certificate of Requirement in the appropriate Land Registry Office on the title to the property; and

(ii) submit to the *Director* and the District Manager, written verification that the Certificate of Requirement has been registered on title.

Inspections by the *Ministry*

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

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

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

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

(d) to inspect the practices, procedures, or operations required by the conditions of

this *Approval;* and

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

Information and Record Retention

(17) (a) Except as authorized in writing by the *Director*, all records required by this *Approval* shall be retained at the *Site* for a minimum of two (2) years from their date of creation.

(b) The *Owner* shall retain all documentation listed in Schedule "A" for as long as this *Approval* is valid.

(c) All monthly summary reports of waste records collected are to be kept at the *Site* until they are included in the Annual Report.

(d) The *Owner* shall retain employee training records as long as the employee is working at the *Site*.

(e) The *Owner* shall make all of the above documents available for inspection upon request of *Ministry* staff.

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

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

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

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

(20) Any information related to this *Approval* and contained in *Ministry* files may be made available to the public in accordance with the provisions of the Freedom of Information and Protection of Privacy Act, RSO 1990, CF-31.

2. SITE OPERATION

Operation

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

Signs

(2) A sign shall be installed and maintained at the main entrance/exit to the *Site* which legibly display the following information:

(a) the name of the *Site* and *Owner;*
(b) the number of the *Approval;*
(c) the name of the *Operator;*
(d) the normal hours of operation;
(e) the allowable and prohibited waste types;
(f) the telephone number to which complaints may be directed;
(g) a warning against unauthorized access;
(h) a twenty-four (24) hour emergency telephone number (if different from above); and
(i) a warning against dumping outside the *Site.*

(3) The *Owner* shall install and maintain signs to direct vehicles to working face and recycling areas.

(4) The *Owner* shall provide signs at recycling depot informing users what materials are acceptable and directing users to appropriate storage areas.

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

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

Burning Waste Prohibited

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

(b) Notwithstanding Condition 2. (6) (a) above, burning of segregated, clean wood and brush at the landfill may be carried out in strict compliance with the Ministry of the Environment Document titled "Guideline C-7, Burning at Landfill Sites" dated April 1994.

Site Access

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

Winter (Thanksgiving Day to Victoria Day)

Sunday	:	12:00 p.m. - 5:00 p.m.

Summer (Victoria Day to Thanksgiving Day)

Saturday	:	7:00 a.m. - 12:00 p.m.
Sunday	:	12:00 p.m. - 5:00 p.m.
Statutory Holiday Monday	:	12:00 p.m. - 5:00 p.m.

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

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

Site Security

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

(b) Waste/recyclables relocated on-site or removed from the *Site* by a registered/licensed waste hauler shall be carried out by trained personnel during the hours of 7 a.m. and 5 p.m. Monday to Friday.

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

3. EMPLOYEE TRAINING

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

4. COMPLAINTS RESPONSE PROCEDURE

(1) If at any time the *Owner* receives complaints regarding the operation of the *Site,* the

Owner shall respond to these complaints according to the following procedure:

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

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

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

5. EMERGENCY RESPONSE

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

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

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

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

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

6. INSPECTIONS, RECORD KEEPING AND REPORTING

Daily Log Book

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

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

Daily Inspections and Log Book

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

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

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

Annual Report

(6) A written report on the development, operation and monitoring of the *Site,* shall be completed annually (the "Annual Report"). The Annual Report shall be submitted to the *District Manager,* by March 31st of the year following the period being reported upon.

(7) The Annual Report shall include but not be limited to the following information:

(a) the results and an interpretive analysis of the results of all leachate, groundwater surface water and landfill gas monitoring, including an assessment of the need to amend the monitoring programs;

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

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

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

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

(f) a summary of the weekly and total annual quantity (volume or tonnes) of waste received at the *Site;*

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

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

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

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

(k) any other information with respect to the *Site* which the *District Manager* may require from time to time.

7. LANDFILL DESIGN AND DEVELOPMENT

Approved Waste Types

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

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

(3) The *Owner* shall ensure that all loads of waste are properly inspected by *Trained personnel* prior to acceptance at the *Site* and that the waste vehicles are directed to the appropriate areas for disposal or transfer of the waste. The *Owner* shall notify the *District*

Manager, in writing, of load rejections at the *Site* within one (1) business day from their occurrence.

Capacity

(4) The approved volumetric capacity of the *Site,* consisting of the waste, daily cover and intermediate cover, but excluding the final cover is 27,500 cubic metres.

(5) This approval is for the design, operation and use of 27,500 cubic meters as described in the Development and Operations Plan dated November 2017 prepared by BlueMetric Environmental included in Schedule "A". This volume includes the historical waste volume of 11,680 cubic meters as of July 2017.

Service Area

(6) Only waste that is generated within the boundaries of the Municipality of Hastings Highlands may be accepted at the *Site.*

(7) Waste from Universal Seal Incorporated shall not be deposited at the *Site.*

Cover

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

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

(9) Cover material shall be applied as follows:

(a) **Periodic Cover** - Weather permitting, deposited waste shall be covered **at the end of each third week** in a manner acceptable to the *District Manager* so that no waste is exposed to the atmosphere. If this frequency creates nuisance effects the *Owner* shall apply more frequent cove as directed by the *District Manager;*
(b) Intermediate Cover - In areas where landfilling has been temporarily discontinued for six (6) months or more, a minimum thickness of 300 millimetre of soil cover or an approved thickness of alternative cover material shall be placed; and
(c) Final Cover - In areas where landfilling has been completed to final contours, a

minimum 600 millimetre thick layer of soil of medium permeability and 150 millimetres of top soil (vegetative cover) shall be placed. Fill areas shall be progressively completed and rehabilitated as landfill development reaches final contours.

8. LANDFILL MONITORING

Landfill Gas

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

Compliance

(2) The *Site* shall be operated in such a way as to ensure compliance with the following:

(a) Reasonable Use Guideline B-7 for the protection of the groundwater at the *Site;* and

(b) Provincial Water Quality Objectives included in the July 1994 publication entitled *Water Management Policies, Guidelines, Provincial Water Quality Objectives,* as amended from time to time or limits set by the *Regional Director,* for the protection of the surface water at and off the *Site.*

(c) *Ontario Drinking Water Quality Standards,* as amended from time to time or limits set by the Regional Director, for the protection of the groundwater at and off the *Site.*

Surface Water and Groundwater

(3) The *Owner* shall monitor surface water and ground water in accordance with Schedules "B" and "C".

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

Groundwater Wells and Monitors

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

(6) Where landfilling is to proceed around monitoring wells, suitable extensions shall be added to the wells and the wells shall be properly re-secured.

(7) Any groundwater monitoring well included in the on-going monitoring program that is damaged shall be assessed, repaired, replaced or decommissioned by the *Owner,* as required.

(a) The *Owner* shall repair or replace any monitoring well which is destroyed or in any way made to be inoperable for sampling such that no more than one regular sampling event is missed.

(b) All monitoring wells which are no longer required as part of the groundwater monitoring program, and have been approved by the *Director* for abandonment, shall be decommissioned by the *Owner,* as required, in accordance with *O.Reg. 903,* to prevent contamination through the abandoned well. A report on the decommissioning of the well shall be included in the Annual Report for the period during which the well was decommissioned.

Trigger Mechanisms and Contingency Plans

(8) (a) Trigger mechanisms shall be in accordance with Appendix F (revised March 13, 2018), the Development and Operations Plan dated November 2017 prepared by BlueMetric Environmental included in Schedule "A".

(b) Within six (6) months from the date of this *Approval,* the *Owner* shall submit to the *Director* for *Approval* a detailed contingency plan for surface water and groundwater in the event of a confirmed exceedance of a site-specific trigger level relating to leachate mounding or groundwater or surface water impacts due to leachate.

(9) Within twelve (12) months from the date of this ECA *Approval,* the *Owner* shall conduct further investigations into surface water impacts at the site, and provide a summary of the findings in the 2018 Annual Monitoring Report (to be submitted by March 31, 2019). The summary of the findings shall include alternatives for potential mitigations measures and the associated schedules for their implementation, should they be required.

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

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

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

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

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

Changes to the Monitoring Plan

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

(13) Within fourteen (14) days of receiving the written correspondence from the *District Manager* confirming that the *District Manager* is in agreement with the proposed changes to the environmental monitoring program, the *Owner* shall forward a letter identifying the proposed changes and a copy of the correspondences from the *District Manager* and all other correspondences and responses related to the changes to the monitoring program, to the *Director* requesting the *Approval* be amended to approve the proposed changes to the environmental monitoring plan prior to implementation.

(14) In the event any other changes to the environmental monitoring program are proposed outside of the recommendation of the annual report, the *Owner* shall follow current *Ministry* procedures for seeking approval for amending the *Approval.*

9. CLOSURE PLAN

(1) At least three (3) years prior to the anticipated date of closure of this *Site,* the *Owner* shall submit to the *Director* for approval, with copies to the *District Manager,* a detailed *Site* closure plan pertaining to the termination of landfilling operations at this *Site,* post-closure inspection, maintenance and monitoring, and end use. The plan shall include but not be limited to the following information:

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

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

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

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

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

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

(iv) *Site* security;
(v) removal of unnecessary landfill-related structures, buildings and facilities;
(vi) final construction of any control, treatment, disposal and monitoring facilities for leachate, groundwater, surface water and landfill gas; and
(vii) a schedule indicating the time-period for implementing sub-conditions (i) to (vi) above;

(d) descriptions of the procedures for post-closure care of the *Site,* including:
(i) operation, inspection and maintenance of the control, treatment, disposal and monitoring facilities for leachate, groundwater, surface water and landfill gas;
(ii) record keeping and reporting; and
(iii) complaint contact and response procedures;

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

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

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

10. WASTE DIVERSION

(1) The *Owner* shall ensure that:
(a) all bins and waste storage areas are clearly labelled;
(b) all lids or doors on bins shall be kept closed during non-operating hours and during high wind events; and
(c) if necessary to prevent litter, waste storage areas shall be covered during high winds events.

(2) The *Owner* shall provide a segregated area for the storage of *Refrigerant Appliances* so that the following are ensured:
(a) all *Refrigerant Appliances* have been tagged to indicate that the refrigerant has been removed by a licensed technician. The tag number shall be recorded in the log book and shall remain affixed to the appliance until transferred from the *Site;* **or**
(b) all *Refrigerant Appliances* accepted at the *Site,* which have not been tagged by a licensed technician to verify that the equipment no longer contains refrigerants, are stored segregated, in a clearly marked area, in an upright position and in a manner which allows for the safe handling and transfer from the *Site* for removal of refrigerants as required by O.Reg. 189; and
(c) all *Refrigerant Appliances* received on-site shall either have the refrigerant removed prior to being transferred from the *Site* or shall be shipped off-site only to facilities where the refrigerants can be removed by a licensed technician in accordance with O.Reg. 189.

(3) The *Owner* shall transfer waste and recyclable materials from the *Site* as follows:
   (a) recyclable materials shall be transferred off-site once their storage bins are full;
   (b) scrap metal shall be transferred off-site at least twice a year;
   (c) tires shall be transferred off-site as soon as a load for the contractor hired by the *Owner* has accumulated or as soon as the accumulated volume exceeds the storage capacity of its bunker; and
   (d) immediately, in the event that waste is creating an odour or vector problem.

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

(5) Collection, storage and transfer of Waste Electrical and Electronic Equipment shall be in accordance with the documents in the Schedule "A". If there is any discrepancy between the guideline titled "Collection Site Organizing & Operating Waste Electrical and Electronic Equipment (WEEE) Guidebook" dated November 2012 as amended prepared by Ontario Electronic Stewardship and the documents in Schedule "A", the guideline shall take precedence.

SCHEDULE "A"

1. Application for Provisional Certificate of Approval for a Waste disposal Site dated June 21, 1989.

2. Letter from J.W. Tooley, MOE, to E.N. Tulley, Township of Monteagle, dated November 21, 1989.

3. Letter from E.N. Tulley, Township of Monteagle, to J.W. Tooley, MOE, dated December 8, 1989.

4. Agreement dated August 4, 1992, between The Centre & South Hastings Waste Management Board and the Corporation of the Township of Monteagle of the Province of Ontario, Re: Recycling facility.

5. Letter dated February 18, 1993, from Eleanor N. Tully, Monteagle Township, to Jim Mulder, Ministry of the Environment and Energy, Re: Application for a Transfer Site to allow recycling site at landfill.

6. Letter dated March 3, 1993, from Eleanor N. Tully, Monteagle Township, to Brian Nickel, Ministry of the Environment and Energy, Re: Reply to Brian Nickel's faxed letter of March 3, 1993.

7. Ministry of Natural Resources Land Us Permit No. LUP 5201075 dated March 26, 1993.

8. Letter dated July 20, 1993, from Eleanor N. Tully, Monteagle Township, to D.E. Graham, Ministry of the Environment and Energy, Re: Submission of application requirements as requested by D.E. Graham's letter of May 7, 1993.

9. Application for a Certificate of Approval for a waste disposal site (transfer) dated July 20, 1993.

10. Letter dated July 26, 1994, from Eleanor N. Tully, Monteagle Township, to Ed Tarvicz, Ministry of the Environment and Energy, Re: Withdrawal of application.

11. Letter dated November 6, 1996, from Eleanor N. Tully, Monteagle Township, to D.E. Graham, Ministry of the Environment and Energy, Re: Re-submission of application package previously returned by the Ministry.

12. Letter and application form dated December 13, 1996, from Eleanor N. Tully, Monteagle Township, to Jim Mulder, Ministry of Environment and Energy, Re: Submission of application form to amend Certificate of Approval.

13. Environmental Compliance Approval Application dated November 29, 2017 and signed by Pat Pilgrim, CAO, the Corporation of the Municipality of Hastings Highlands, including the attached supporting documentation.

14. Report titled "Development and Operations Plan, Musclow-Greenview Waste Disposal Site" dated November 2017 and prepared by BluMetric Environmental Inc.

15. Letter report dated April 18, 2018 from Iris O'Connor, BluMetric Environmental Inc. to Ranjani Munasinghe, Ministry of the Environment and Climate Change responding to comments from Technical Support Section, Ministry of the Environment and Climate Change for the Development and Operations Plan dated November 2017.

SCHEDULE "B"
Surface Water Monitoring Plan

Monitoring Locations	Parameters
SW1, SW2, SW3, new background	Biological Oxygen Demand (BOD_5), Phenols, Total Phosphorus, Total Kejdahl Nitrogen (TKN), Ammonia, Chloride, Nitrate, Nitrite, Sodium, Calcium, Magnesium, Sulphate, Alkalinity, Potassium, Aluminum, Barium, Boron, Cadmium, Copper, Cobalt, Iron, Lead, Manganese, Zinc, Chemical Oxygen Demand (COD), Conductivity, pH, Total Dissolved Solids (TDS), Total Suspended Solids (TSS), Hardness

SCHEDULE "C"
Groundwater Monitoring Plan

Monitoring Locations	Parameters
MG-DP1, MG-DP2, MG-DP3, MG-DP4	Dissolved Organic Carbon (DOC), Biological Oxygen Demand (BOD_5), Ammonia, Chloride, Nitrate, Sodium, Calcium, Magnesium, Sulphate, Alkalinity, Aluminum (dissolved), Barium, Boron, Cadmium, Chromium, Cobalt, Iron, Lead, Manganese, Silver, Zinc, Chemical Oxygen Demand (COD), Conductivity, pH, Total Dissolved Solids (TDS), Total Suspended Solids (TSS)

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

GENERAL

- The reason for Conditions 1(1), (2), (4), (5), (6), (7), (8), (9), (10), (17), (18) and (19) is to clarify the legal rights and responsibilities of the *Owner* and *Operator* under this *Approval.*

- The reasons for Condition 1(3) are to ensure that the *Site* is designed, operated, monitored and maintained in accordance with the application and supporting documentation submitted by the *Owner,* and not in a manner which the *Director* has not been asked to consider.

- The reasons for Condition 1(11) are to ensure that the *Site* is operated under the corporate name which appears on the application form submitted for this *approval* and to ensure that the *Director* is informed of any changes.

- The reasons for Condition 1(12) are to restrict potential transfer or encumbrance of the *Site* without the approval of the *Director* and to ensure that any transfer of encumbrance can be made only on the basis that it will not endanger compliance with this *Approval* .

- The reason for Condition 1(13) is to ensure that the successor is aware of its legal responsibilities.

- The reasons for Conditions 1(14) and (15) are that the Part II.1 *Director* is an individual with authority pursuant to Section 197 of the Environmental Protection Act to require registration on title and provide any person with an interest in property before dealing with the property in any way to give a copy of the *Approval* to any person who will acquire an interest in the property as a result of the dealing.

- The reason for Condition 1(16) is to ensure that appropriate Ministry staff has ready access to the

Site for inspection of facilities, equipment, practices and operations required by the conditions in this *Approval.* This Condition is supplementary to the powers of entry afforded a Provincial Officer pursuant to the *Act,* the *OWRA,* the *PA,* the *NMA* and the *SDWA.*

- Condition 1 (20) has been included in order to clarify what information may be subject to the *Freedom of Information Act.*

SITE OPERATION

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

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

- The reasons for Condition 2(6) (a) and (b) are open burning of municipal waste is unacceptable because of concerns with air emissions, smoke and other nuisance effects, and the potential fire hazard and to make sure burning of brush and wood are carried out in accordance with Ministry guidelines.

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

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

EMPLOYEE TRAINING

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

COMPLAINTS RESPONSE PROCEDURE

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

EMERGENCY RESPONSE

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

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

RECORD KEEPING AND REPORTING

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

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

- The reasons for Conditions 6(6) and 6(7) are to ensure that regular review of site development, operations and monitoring data is documented and any possible improvements to site design, operations or monitoring programs are identified. An annual report is an important tool used in reviewing site activities and for determining the effectiveness of site design.

LANDFILL DESIGN AND DEVELOPMENT

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

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

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

LANDFILL MONITORING

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

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

- Conditions 8(3) and 8(4) are included to require the *Owner* to demonstrate that the *Site* is performing as designed and the impacts on the natural environment are acceptable. Regular monitoring allows for the analysis of trends over time and ensures that there is an early warning

of potential problems so that any necessary remedial/contingency action can be taken.

- Conditions 8(5), 8(6) and 8(7) are included to ensure the integrity of the groundwater monitoring network so that accurate monitoring results are achieved and the natural environment is protected.

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

- Conditions 8(12), 8(13) and 8(14) are included to streamline the approval of the changes to the monitoring plan.

CLOSURE PLAN

- The reasons for Condition 9 are to ensure that final closure of the *Site* is completed in an aesthetically pleasing manner, in accordance with Ministry standards, and to ensure the long-term protection of the health and safety of the public and the environment.

WASTE DIVERSION

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

Upon issuance of the environmental compliance approval, I hereby revoke Approval No(s). A362303 issued on April 24, 1991 as amended.

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
Toronto, Ontario
M5G 1E5

AND

The Director appointed for the purposes of Part II.1 of the Environmental Protection Act
Ministry of the Environment and Climate Change
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 27th day of April, 2018

THIS APPROVAL WAS MAILED
ON MAY 01 2018
(Signed)

Dale D. Gable

Dale Gable, P.Eng.
Director
appointed for the purposes of Part II.1 of the
Environmental Protection Act

RM/
c: Area Manager, MOECC Belleville
c: District Manager, MOECC Kingston - District
Iris O' Connor, BluMetric Environmental Inc.

Appendix A

A-2 Land Transfer Information

Ontario ServiceOntario

PARCEL REGISTER (ABBREVIATED) FOR PROPERTY IDENTIFIER

LAND REGISTRY OFFICE #21

40034-0210 (LT)

PREPARED FOR Cassidyl

ON 2017/08/28 AT 14:59:56

* CERTIFIED IN ACCORDANCE WITH THE LAND TITLES ACT * SUBJECT TO RESERVATIONS IN CROWN GRANT *

PROPERTY DESCRIPTION: PT LT 11 CON 11 MONTEAGLE PT 1 21R663; HASTINGS HIGHLANDS ; COUNTY OF HASTINGS

PROPERTY REMARKS:

ESTATE/QUALIFIER:
FEE SIMPLE
LT CONVERSION QUALIFIED

RECENTLY:
FIRST CONVERSION FROM BOOK

PIN CREATION DATE:
2008/03/17

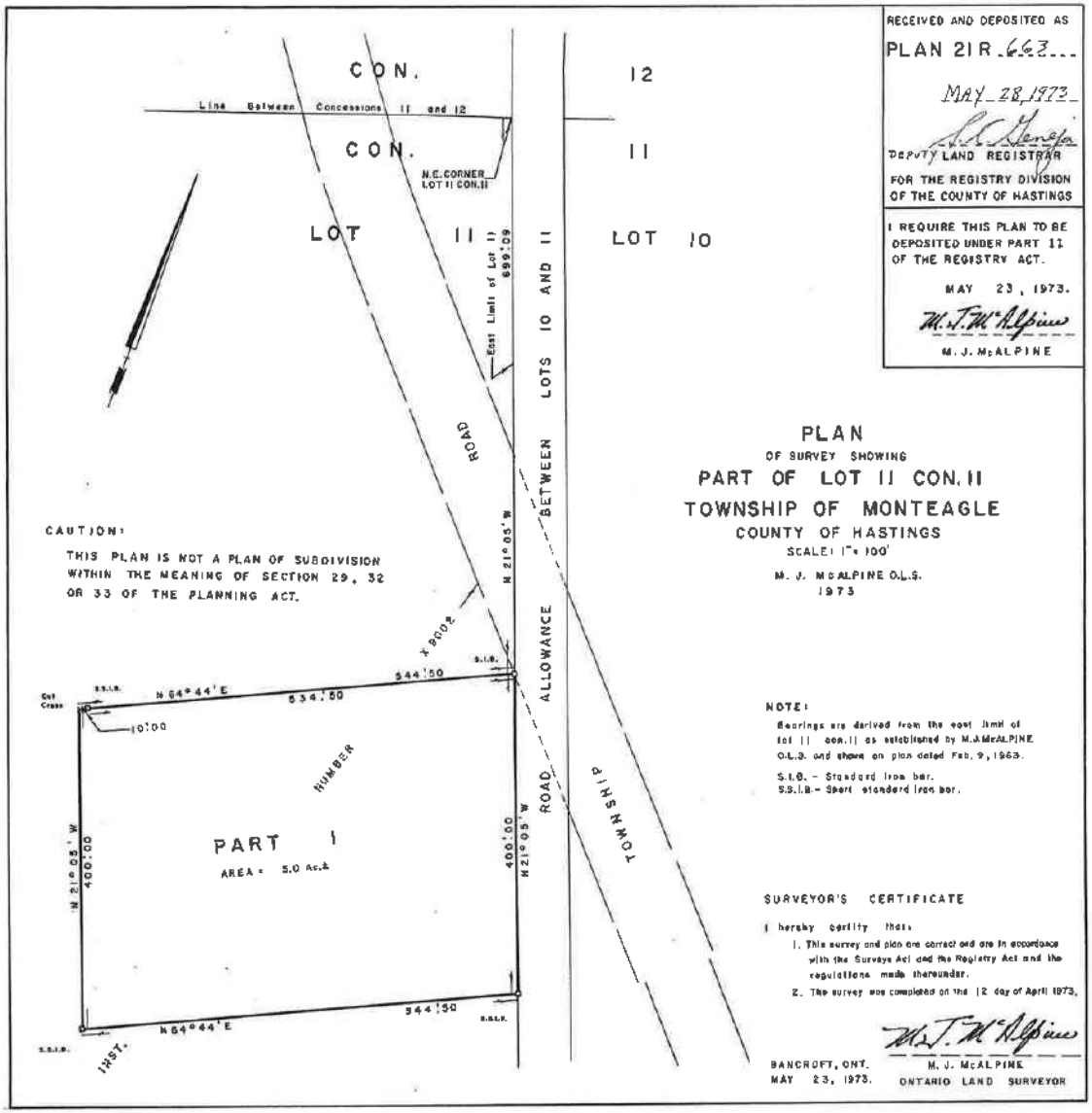
OWNERS' NAMES
THE CORPORATION OF THE TOWNSHIP OF MONTEAGLE

CAPACITY SHARE
ROWN

REG. NUM.	DATE	INSTRUMENT TYPE	AMOUNT	PARTIES FROM	PARTIES TO	CERT/ CHKD
** PRINTOUT INCLUDES ALL DOCUMENT TYPES AND DELETED INSTRUMENTS SINCE 2008/03/14 **						
**SUBJECT, ON FIRST REGISTRATION UNDER THE LAND TITLES ACT, TO:						
**	SUBSECTION 44(1) OF THE LAND TITLES ACT, EXCEPT PARAGRAPH 11, PARAGRAPH 14, PROVINCIAL SUCCESSION DUTIES *					
**	AND ESCHEATS OR FORFEITURE TO THE CROWN.					
**	THE RIGHTS OF ANY PERSON WHO WOULD, BUT FOR THE LAND TITLES ACT, BE ENTITLED TO THE LAND OR ANY PART OF					
**	IT THROUGH LENGTH OF ADVERSE POSSESSION, PRESCRIPTION, MISDESCRIPTION OR BOUNDARIES SETTLED BY					
**	CONVENTION.					
**	ANY LEASE TO WHICH THE SUBSECTION 70(2) OF THE REGISTRY ACT APPLIES.					
**DATE OF CONVERSION TO LAND TITLES: 2008/03/17 **						
21R663	1973/05/28	PLAN REFERENCE				C
QR284199	1980/07/02	TRANSFER	$2		THE CORPORATION OF THE TOWNSHIP OF MONTEAGLE	C
QR284200	1980/07/02	NOTICE			CORPORATION OF THE TOWNSHIP OF MONTEAGLE	C

NOTE: ADJOINING PROPERTIES SHOULD BE INVESTIGATED TO ASCERTAIN DESCRIPTIVE INCONSISTENCIES, IF ANY, WITH DESCRIPTION REPRESENTED FOR THIS PROPERTY.
NOTE: ENSURE THAT YOUR PRINTOUT STATES THE TOTAL NUMBER OF PAGES AND THAT YOU HAVE PICKED THEM ALL UP.

21R-663



RECEIVED AND DEPOSITED AS
PLAN 21R-663
MAY 28, 1973
DEPUTY LAND REGISTRAR
FOR THE REGISTRY DIVISION
OF THE COUNTY OF HASTINGS

I REQUIRE THIS PLAN TO BE DEPOSITED UNDER PART II OF THE REGISTRY ACT.
MAY 23, 1973.
M. J. McALPINE

PLAN
OF SURVEY SHOWING
PART OF LOT 11 CON. II
TOWNSHIP OF MONTEAGLE
COUNTY OF HASTINGS
SCALE: 1" = 100'

M. J. McALPINE O.L.S.
1973

CAUTION:
THIS PLAN IS NOT A PLAN OF SUBDIVISION WITHIN THE MEANING OF SECTION 29, 32 OR 33 OF THE PLANNING ACT.

NOTE:
Bearings are derived from the east limit of lot 11 con. II as established by M.J.McALPINE O.L.S. and shown on plan dated Feb. 9, 1963.

S.I.B. - Standard iron bar.
S.S.I.B. - Short standard iron bar.

SURVEYOR'S CERTIFICATE

I hereby certify that:
1. This survey and plan are correct and are in accordance with the Surveys Act and the Registry Act and the regulations made thereunder.
2. The survey was completed on the 12 day of April 1973.

BANCROFT, ONT.
MAY 23, 1973.

M. J. McALPINE
ONTARIO LAND SURVEYOR

Deed — *Without* Spousal Consent
(Amended July, 1979)

BY A CORPORATION
FORM NO. 13

28499

This Indenture

made in duplicate the Seventh day of May,
one thousand nine hundred and eighty.

In Pursuance of the Short Forms of Conveyances Act:

Between

ARNOLD CLIFFORD KELUSKY, Farmer, and MAMIE KELUSKY, his wife, both of the Township of Monteagle, in the County of Hastings,

Hereinafter called the GRANTORS,

of the FIRST PART;

- and -

THE CORPORATION OF THE TOWNSHIP OF MONTEAGLE,

Hereinafter called the GRANTEE,

of the SECOND PART;

Witnesseth that in consideration of other good and valuable consideration and the sum of TWO----------($2.00)----------DOLLARS now paid by the said Grantee to the said Grantor, the receipt whereof is hereby by him acknowledged, he the said Grantor DOTH GRANT unto the said Grantee in fee simple

THOSE lands and premises located in the following municipality, namely, in the Township of Monteagle, in the County of Hastings, and being composed of Part of Lot 11 in Concession 11 of the said Township of Monteagle, and which said parcel or tract of land is more particularly described as PART 1 according to Plan 21R-663 now deposited in the Registry Office for the Registry Division of Hastings.

COMPARED

DYE & DURHAM CO. LIMITED
FORM NO. 2

TO HAVE AND TO HOLD unto the said Grantee, his heirs, executors, administrators, successors and assigns to and for their sole and only use forever;
SUBJECT NEVERTHELESS to the reservations, limitations, provisoes and conditions expressed in the original grant thereof from the Crown.

The said Grantor COVENANTS with the said Grantee that he has the right to convey the said lands to the said Grantee notwithstanding any act of the said Grantor.

AND that the said Grantee shall have quiet possession of the said lands free from all encumbrances.

AND the said Grantor COVENANTS with the said Grantee that he will execute such further assurances of the said lands as may be requisite.

AND the said Grantor COVENANTS with the said Grantee that he has done no act to encumber the said lands.

AND the said Grantor RELEASES to the said Grantee ALL his claims upon the said lands.

PROVIDED that in construing these presents the words "Grantor" and "Grantee" and the pronouns "he", "his" or "him" relating thereto and used therewith shall be read and construed as "Grantor" or "Grantors", "Grantee" or "Grantees", and "he", "she", "it" or "they", "his", "her", "its" or "their", or "him", "her", "it" or "them", respectively, as the number and gender of the party or parties referred to in each case require, and the number of the verb agreeing therewith shall be construed as agreeing with the said word or pronoun so substituted.

IN WITNESS WHEREOF the said parties hereto have hereunto set their hands and seals.

SIGNED, SEALED AND DELIVERED
In the Presence of

Emmanuel Blazek

Arnold Clifford Kelusky (SEAL)
ARNOLD CLIFFORD KELUSKY

Mamie Kelusky (SEAL)
MAMIE KELUSKY

...Instructions
...se Side

BY A. DURHAM CO. LIMITED
FORM NO. 999

Form 1

The Land Transfer Tax Act, 1974

AFFIDAVIT OF RESIDENCE AND OF VALUE OF THE CONSIDERATION

IN THE MATTER OF THE CONVEYANCE OF *(insert brief description of land)* PT. LOT 11, CONCESSION 11, PART 1, PLAN 21R-663, TOWNSHIP OF MONTEAGLE, COUNTY OF HASTINGS

BY *(print names of all transferors in full)* ARNOLD CLIFFORD KELUSKY & MANIE KELUSKY

TO *(see instruction 2 and print names of all transferees in full)* THE CORPORATION OF THE TOWNSHIP OF MONTEAGLE

I, *(see instruction 2 and print name(s) in full)* O. GREGORY ANDERSON, OF THE VILLAGE OF BANCROFT, IN THE COUNTY OF HASTINGS,

MAKE OATH AND SAY THAT:

1. I am *(place a clear mark within the square opposite that one of the following paragraphs that describes the capacity of the deponent(s))*: *(see instruction 2)*
   - ☐ (a) A person in trust for whom the land conveyed in the above-described conveyance is being conveyed;
   - ☐ (b) A trustee named in the above-described conveyance to whom the land is being conveyed;
   - ☐ (c) A transferee named in the above-described conveyance;
   - ☒ (d) The ~~[illegible]~~ solicitor acting in this transaction for *(insert name(s) of principal(s))* The Corporation of the Township of Monteagle described in paragraph ~~[illegible]~~ (c) above; *(strike out references to inapplicable paragraphs)*
   - ☐ (e) The President, Vice-President, Manager, Secretary, Director, or Treasurer authorized to act for *(insert name(s) of corporation(s))* ..... described in paragraph(s) (a), (b), (c) above. *(strike out references to inapplicable paragraphs)*
   - ☐ (f) A transferee described in paragraph ( ) *(insert only one of paragraph (a), (b) or (c) above, as applicable)* and am making this affidavit on my own behalf and on behalf of *(insert name of spouse)* ..... who is my spouse described in paragraph ( ), *(insert only one of paragraph (a), (b) or (c) above, as applicable)*

   and as such, I have personal knowledge of the facts herein deposed to.
2. I have read and considered the definitions of "non-resident corporation" and "non-resident person" set out respectively in clauses f and g of subsection 1 of section 1 of the Act. *(see instruction 3)*
3. The following persons to whom or in trust for whom the land conveyed in the above-described conveyance is being conveyed are non-resident persons within the meaning of the Act. *(see instruction 4)* NONE
4. THE TOTAL CONSIDERATION FOR THIS TRANSACTION IS ALLOCATED AS FOLLOWS:

(a) Monies paid or to be paid in cash	$ 350.00	
(b) Mortgages (i) Assumed *(show principal and interest to be credited against purchase price)*	$ nil	
(ii) Given back to vendor	$ nil	
(c) Property transferred in exchange *(detail below)*	$ nil	
(d) Securities transferred to the value of *(detail below)*	$ nil	
(e) Liens, legacies, annuities and maintenance charges to which transfer is subject	$ nil	
(f) Other valuable consideration subject to land transfer tax *(detail below)*	$ nil	
(g) VALUE OF LAND, BUILDING, FIXTURES AND GOODWILL SUBJECT TO LAND TRANSFER TAX *(TOTAL OF (a) to (f))*	$ 350.00	$ 350.00
(h) VALUE OF ALL CHATTELS – Items of tangible personal property *(Retail Sales Tax is payable on the value of all chattels unless exempt under the provisions of The Retail Sales Tax Act, R.S.O. 1970, c 415, as amended)*		$ nil
(i) Other consideration for transaction not included in (g) or (h) above		$ nil
(j) TOTAL CONSIDERATION		$ 350.00

ALL BLANKS MUST BE FILLED IN. INSERT "NIL" WHERE APPLICABLE.

5. If consideration is nominal, describe relationship between transferor and transferee and state purpose of conveyance. *(see instruction 5)* n/a
6. Other remarks and explanations, if necessary n/a

SWORN before me at the Village of Bancroft, in the County of Hastings, this 20th day of May, 1980.

A Commissioner for taking Affidavits, etc.
Barrister, a Commissioner, etc.

(signature(s))
O. GREGORY ANDERSON

Hastings County, for O. Gregory Anderson Q.C.
Expires December 31, 1982

PROPERTY INFORMATION RECORD

A. Describe nature of instrument: Deed

B. (i) Address of property being conveyed *(if available)* R. R. #1, MAPLE LEAF, Ontario. KOL 2RO

(ii) Assessment Roll No. *(if available)* N/A

C. Mailing address(es) for future Notices of Assessment under The Assessment Act for property being conveyed *(see instruction 6)* R. R. #1, Maple Leaf, Ontario. KOL 2RO

D. (i) Registration number for last conveyance of property being conveyed *(if available)* 11516

(ii) Legal description of property conveyed: Same as in D(i) above. Yes ☐ No ☒ Not Known ☐

E. Name(s) and address(es) of each transferee's solicitor O. Gregory Anderson, Q.C., Barrister & Solicitor, P.O. Box 700, BANCROFT, Ontario. KOL 1C0

For Land Registry Office use only
REGISTRATION NO.
Land Registry Office No.
Registration Date

AFFIDAVIT OF SUBSCRIBING WITNESS

I, Annemarie Blaszyk

of the Village of Bancroft,

in the County of Hastings, Secretary,

make oath and say:

I am a subscribing witness to the attached instrument and I was present and saw it executed

*See footnote — at Bancroft, Ontario by ARNOLD CLIFFORD KELUSKY & MAMIE KELUSKY

*See footnote — I verily believe that each person whose signature I witnessed is the party of the same name referred to in the instrument.

SWORN before me at the Village of Bancroft, in the County of Hastings, this 20th day of ~~May~~ June 1980.

Annemarie Blaszyk

[signature]
A COMMISSIONER FOR TAKING AFFIDAVITS, ETC.

* Where a party is unable to read the instrument or where a party signs by making his mark or in foreign characters add "after the instrument had been read to him and he appeared fully to understand it". Where executed under a power of attorney insert "(name of attorney) as attorney for (name of party)"; and for next clause substitute "I verily believe that the person whose signature I witnessed was authorized to execute the instrument as attorney for (name)".

AFFIDAVIT AS TO AGE AND SPOUSAL STATUS

~~I~~/WE ARNOLD CLIFFORD KELUSKY & MAMIE KELUSKY,

both of the Township of Monteagle,

in the County of Hastings,

*If attorney see footnote — make oath and say: When we executed the attached instrument,

~~I~~/WE were at least eighteen years old.

Within the meaning of section 1(f) of The Family Law Reform Act, 1978:—

Strike out inapplicable clauses. — ~~a) XXXXXXXXXXXXXXXXXX~~

AB b) We were spouses of one another.

~~XX~~ ~~XXXXXXXX~~

**Not a Matrimonial Home, etc. see footnote. — We are not non-residents of Canada within the meaning of Sections 115 and 116 of The Income Tax Act.

Resident of Canada, etc.

(SEVERALLY) SWORN before me at the Village of Bancroft, in the County of Hastings, this 20th day of ~~May~~ June 1980.

Annemarie Blaszyk
A COMMISSIONER FOR TAKING AFFIDAVITS, ETC.

Annemarie Blaszyk, a Commissioner, etc., Hastings County, for O. Gregory Anderson, Q.C., expires December 30, 1982.

Arnold Clifford Kelusky
ARNOLD CLIFFORD KELUSKY

Mamie Kelusky
MAMIE KELUSKY

*Where affidavit is made by attorney substitute: "When I executed the attached instrument as attorney for (name), he/she was (insert statement, if applicable, name of spouse) within the meaning of Section 1(f) of The Family Law Reform Act, 1978, and when he/she executed the power of attorney, he/she had attained the age of majority".

**Where spouse does not join in or consent, see Section 42(2) of The Family Law Reform Act, 1978 for complete separate affidavit.

AFFIDAVIT OF SUBSCRIBING WITNESS

I,

of the

in the

make oath and say:

I am a subscribing witness to the attached instrument and I was present and saw it executed

*See footnote at by

*See footnote I verily believe that each person whose signature I witnessed is the party of the same name referred to in the instrument.

SWORN before me at the

this day of 19

A COMMISSIONER FOR TAKING AFFIDAVITS, ETC.

* Where a party is unable to read the instrument or where a party signs by making his mark or in foreign characters add "after the instrument had been read to him and he appeared fully to understand it". Where executed under a power of attorney insert "(name of attorney) as attorney for (name of party)"; and for last clause substitute "I verily believe that the person whose signature I witnessed was authorized to execute the instrument as attorney for (name)".

284199

Dated May 7, 19 80

ARNOLD CLIFFORD KELUSKY
and
MARIE KELUSKY

TO

THE CORPORATION OF THE TOWNSHIP OF MONTEAGLE

Address: R. R. #1,
MAPLE LEAF, Ontario.
KOL 2RO

Deed of Land

SITUATE
in the Township of Monteagle,
in the County of Hastings.

DYE & BURMAN CO. LIMITED

ASSESSMENT ROLL NO.

ADDRESS OF PROPERTY:

O. GREGORY ANDERSON, Q.C.,
Barrister & Solicitor,
P.O. Box 700,
BANCROFT, Ontario.
KOL 1CO

FOR RESPONSIBLE FOR NOTE OR DESCRIPTION REFER

REGISTRATION FEE	15.00
LAND TRANSFER TAX	1.40
RETAIL SALES TAX	

I CERTIFY THAT THIS instrument was received for REGISTRATION IN THE REGISTRY DIVISION OF HASTINGS (21) AT BELLEVILLE, ONTARIO

1980 JUL -2 PM 1: 34

LAND REGISTRAR

284199

PROPERTY OF THE REGISTRY OFFICE

ENTERED IN BOOK
FOR
ENTERED BY
CHECKED BY

284200

THE REGISTRY ACT

DECLARATION UNDER SECTION 23 OF THE ACT

I, OSWALD GREGORY ANDERSON, of the Village of Bancroft, in the County of Hastings, Solicitor, do solemnly declare that I am the Solicitor for The Corporation of the Township of Monteagle which is a party to the Provisional Certificate of Approval for a Waste Disposal Site hereto attached. The said instrument affects land within the Registry Division of the County of Hastings and more particularly THOSE lands and premises located in the following municipality, namely, in the Township of Monteagle, in the County of Hastings, and being composed of Part of Lot 11 in Concession 11 of the said Township of Monteagle, and which said parcel or tract of land is more particularly described as Part 1 according to Plan 21R-663 now deposited in the Registry Office for the Registry Division of Hastings.

I make this solemn declaration conscientiously believing it to be true and knowing that it is of the same force and effect as if made under oath.

DECLARED before me)
at the Village of Bancroft,)
in the County of Hastings,)
this 23rd day of June, 1980)

Annemarie [signature]
A Commissioner, etc.

Annemarie Meuph, a Commissioner, etc.
Hastings County, for O. Gregory Anderson Q.C.
Expires December 30, 19 82

[signature]
OSWALD GREGORY ANDERSON

Ontario

Ministry of the Environment

NOTICE

TO: Corporation of the Township of Monteagle
R.R. # 1
Maple Leaf, Ontario
K0L 2R0

You are hereby notified that Provisional Certificate of Approval No. A 362303 has been issued to you subject to the conditions outlined therein.

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

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

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

This Notice should be served upon:

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

AND

The Director,
Section 39
Ministry of the Environment,

DATED this 31st day of March , 1980 .

Director,
Section 39
Ministry of the Environment.

MOE 1044 6/78

DATED THE 31st DAY OF

MARCH, 1980

BETWEEN

THE DIRECTOR

-and-

CORPORATION OF THE TOWNSHIP OF MONTEAGLE

PROVISIONAL CERTIFICATE

OF APPROVAL

UNDER

THE ENVIRONMENTAL

PROTECTION ACT, 1971

N. PART LOT 11, CONCESSION 11
TOWNSHIP OF MONTEAGLE
COUNTY OF HASTINGS

CORPORATION OF THE TOWNSHIP OF MONTEAGLE
MAPLE LEAF, ONTARIO
K0L 2R0

Ministry of the Environment
Ontario

Provisional Certificate No. A 362303

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:

Corporation of the Township of Monteagle
R.R. # 1
Maple Leaf, Ontario
K0L 2R0

for the use and operation of a 1.0 hectare landfilling site within a total site area of 2.0 hectares.

all in accordance with the following plans and specifications:

Located: N. Part Lot 11, Concession II
Township of Monteagle
County of Hastings

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

and subject to the following conditions:

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

Dated this 31st day of March, 19 80.

Director, Section 39,
The Environmental Protection Act, 1971

284200

PROPERTY OF THE REGISTRY OFFICE
ENTERED IN BOOK 4
FOR Deseronto
ENTERED BY
CHECKED BY

DATED MAY A.D. 1980

IN THE MATTER OF Part of
Lot 11, Concession 11
in the Township of Faraday
being Part 1, Plan 21R-663
County of Hastings

NOTICE RE: WASTE DISPOSAL
SITE

LAND REGISTRY OFFICE
OF BELLEVILLE
ONTARIO
1980 JUL -2 PM 1: 35
L. C. Flanagan
LAND REGISTRAR

I CERTIFY THAT THIS
INSTRUMENT IS
REGISTERED IN THE
284200
REGISTRY DIVISION OF
HASTINGS (21)

5

O.GREGORY ANDERSON,Q.C.
Barrister & Solicitor,
P.O. Box 700
BANCROFT, Ontario
K0L 1C0

15.00

Appendix B

Monitoring and Screening Checklist (MECP/MOE)

Appendix D-Monitoring and Screening Checklist
General Information and Instructions

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

Definition of Groundwater CEP:
For groundwater, the CEP must have expertise in hydrogeology and meet one of the following:
(a) the person holds a licence, limited licence or temporary licence under the *Professional Engineers Act*; or
(b) the person holds a certificate of registration under the *Professional Geoscientists Act, 2000* and is a practicing member, temporary, member or limited member of the Association of Professional Geoscientists of Ontario. O. Reg. 66/08, s. 2..
Definition of Surface water CEP:
A CEP for surface water assessments is a scientist, professional engineer or professional geoscientist as described in (a) and (b) above with demonstrated experience and post-secondary education, either a diploma or degree, in hydrology, aquatic ecology, limnology, aquatic biology, physical geography with specialization in surface water, and/or water resource management.

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

Monitoring Report and Site Information	
Waste Disposal Site Name	Musclow-Greenview Waste Disposal Site
Location (e.g. street address, lot, concession)	3375 Musclow Greenview Road
GPS Location (taken within the property boundary at front gate/ front entry)	279,927 m E, 5,010,658 m N
Municipality	Former Geographic Township of Monteagle
Client and/or Site Owner	Corporation of the Municipality of Hastings Highlands
Monitoring Period (Year)	2023
This Monitoring Report is being submitted under the following:	
Environmental Compliance Approval Number:	A362303
Director's Order No.:	
Provincial Officer's Order No.:	
Other:	

Report Submission Frequency	◉ **Annual** ○ **Other**	March 31st of year following reporting period	
The site is: **(Operation Status)**	◉ **Open** ○ **Inactive** ○ **Closed**		
Does your Site have a Total Approved Capacity?	◉ **Yes** ○ **No**		
If yes, please specify Total Approved Capacity	27,500	*Units*	Cubic Metres
Does your Site have a Maximum Approved Fill Rate?	○ **Yes** ◉ **No**		
If yes, please specify Maximum Approved Fill Rate	0	*Units*	
Total Waste Received within Monitoring Period (Year)	179.3	*Units*	Tonnes
Total Waste Received within Monitoring Period (Year) *Methodology*	Estimation		
Estimated Remaining Capacity	13,780	*Units*	Cubic Metres
Estimated Remaining Capacity *Methodology*	Estimation based on topographic survey completed on Nov 9, 2022 and 2023 waste received		
Estimated Remaining Capacity *Date Last Determined*	9-Nov-2022		
Non-Hazardous Approved Waste Types	☒ Domestic ☒ Industrial, Commercial & Institutional (IC&I) ☒ Source Separated Organics (Green Bin) ☒ Tires	☒ Contaminated Soil ☒ Wood Waste ☒ Blue Box Material ☐ Processed Organics ☒ Leaf and Yard Waste	☐ Food Processing/Preparation Operations Waste ☐ Hauled Sewage Other:
Subject Waste Approved Waste Classes: Hazardous & Liquid Industrial *(separate waste classes by comma)*			
Year Site Opened *(enter the Calendar Year only)*		**Current ECA Issue Date**	3/21/2018
Is your Site required to submit Financial Assurance?		○ **Yes** ◉ **No**	
Describe how your Landfill is designed.		◉ Natural Attenuation only ○ Fully engineered Facility ○ Partially engineered Facility	
Does your Site have an approved Contaminant Attenuation Zone?		○ **Yes** ◉ **No**	

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

Has the nature of the operations at the site changed during this monitoring period?	○ **Yes** ◉ **No**
If yes, provide details:	
Have any measurements been taken since the last reporting period that indicate landfill gas volumes have exceeded the MOE limits for subsurface or adjacent buildings? (i.e. exceeded the LEL for methane)	○ Yes ◉ No

Groundwater WDS Verification:

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

Sampling and Monitoring Program Status:

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

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

3) a) Is landfill gas being monitored or controlled at the site?	◉ **Yes** ○ **No**	
If yes to 3(a), please answer the next two questions below.		
b) Have any measurements been taken since the last reporting period that indicate landfill gas is present in the subsurface at levels exceeding criteria established for the site?	○ **Yes** ◉ **No**	
c) Has the sampling and monitoring identified under 3(a) for the monitoring period being reported on was successfully completed in accordance with established protocols, frequencies, locations, and parameters developed as per the Technical Guidance Document:	◉ **Yes** ○ **No** ○ **Not Applicable**	If no, list exceptions below or attach additional information.

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

4) All field work for groundwater investigations was done in accordance with standard operating procedures as established/outlined per the Technical Guidance Document (including internal/external QA/QC requirements) (Note: A SOP can be from a published source, developed internally by the site owner's consultant, or adopted by the consultant from another organization):	◉ **Yes** ○ **No**	

Sampling and Monitoring Program Results/WDS Conditions and Assessment:

5) The site has an adequate buffer, Contaminant Attenuation Zone (CAZ) and/or contingency plan in place. Design and operational measures, including the size and configuration of any CAZ, are adequate to prevent potential human health impacts and impairment of the environment.	○ **Yes** ◉ **No**	No CAZ has been established for the Site. Additional work is concurrently being reported on and action items have been identified to minimize environmental impacts. Groundwater is believed to be discharging to surface water and Contingency Plans are being updated for surface water triggers.	
6) The site meets compliance and assessment criteria.	○ **Yes** ◉ **No**	See above.	
7) The site continues to perform as anticipated. There have been no unusual trends/ changes in measured leachate and groundwater levels or concentrations.	◉ **Yes** ○ **No**	New drive-point piezometer DP5 had exceedances further to the west of the WDS, including notable zinc exceedances. Boron concentrations to the west of the Site at SW3 are on an increasing trend.	
1) Is one or more of the following risk reduction practices in place at the site: ***(a)*** **There is minimal reliance on natural attenuation of leachate due to the presence of an effective waste liner and active leachate collection/ treatment; or** ***(b)*** **There is a predictive monitoring program in-place (modeled indicator concentrations projected over time for key locations); or** ***(c)*** **The site meets the following two conditions (typically achieved after 15 years or longer of site operation):** ***i.*** **The site has developed stable leachate mound(s) and stable leachate plume geometry/concentrations; and** ***ii.*** **Seasonal and annual water levels and water quality fluctuations are well understood.**	○ **Yes** ◉ **No**	**Note which practice(s):**	☐ **(a)** ☐ **(b)** ☐ **(c)**
9) Have trigger values for contingency plans or site remedial actions been exceeded (where they exist):	○ **Yes** ○ **No** ◉ **Not Applicable**		

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:**	Measures are still required to set groundwater triggers.
○ **No Changes to site design and operation are recommended**	
◉ **The following change(s) to the site design and operation is/ are recommended:**	A new surface water diversion ditch/berm was installed in the fall of 2019. Operations should ensure this is kept clear, is flowing properly around the Site and is protected against erosion. Operations at the Site should be assessed in 2024 and an action plan to minimize water infiltration made at the Site.

Name:	Mark Somers		
Seal:			
Signature:		**Date:**	25-Mar-2024
CEP Contact Information:			
Company:	BluMetric Environmental Inc.		
Address:	1682 Woodward Drive, Ottawa, ON, K2C 3R8		
Telephone No.:	877-487-8436 ext. 246	Fax No. :	
E-mail Address:	msomers@blumetric.ca		
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)	Un-named Lake, Goodkey Creek
Distance(s)	0.25 km, 0.6 km

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

Sampling and Monitoring Program Status:

1) The current surface water monitoring program continues to effectively characterize the surface water conditions, and includes data that relates upstream/background and downstream receiving water conditions:	(●) Yes ( ) No	After several years of work, SW4A has now been determined to be the best locations for monitoring background surface water.
2) All surface water sampling for the monitoring period being reported was successfully completed in accordance with the Certificate(s) of Approval or relevant authorizing/control document(s) (if applicable):	( ) Yes (●) No ( ) **Not applicable (No C of A, authorizing / control document applies)**	If no, specify below or provide details in an attachment.

Surface Water Sampling Location	Description/Explanation for change (change in name or location, additions, deletions)	Date
MG-SW1	Dry	18-Oct-2023
MG-SW2	Dry	18-Oct-2023
MG-SW3	Dry	18-Oct-2023
MG-SW6	Dry	18-Oct-2023

3) a) Some or all surface water sampling and monitoring program requirements for the monitoring period have been established outside of a ministry C of A or authorizing/control document.	◉ **Yes** ○ **No** ○ **Not Applicable**	
b) If yes, all surface water sampling and monitoring identified under 3 (a) was successfully completed in accordance with the established program from the site, including sampling protocols, frequencies, locations and parameters) as developed per the Technical Guidance Document:	◉ **Yes** ○ **No** ○ **Not Applicable**	If no, specify below or provide details in an attachment.

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

4) All field work for surface water investigations was done in accordance with standard operating procedures, including internal/external QA/QC requirements, as established/outlined as per the Technical Guidance Document, MOE 2010, or as amended. (Note: A SOP can be from a published source, developed internally by the site owner's consultant, or adopted by the consultant from another organization):	◉ **Yes** ○ **No**	Not applicable

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
SEE SW ATTACHMENT		.
6) In my opinion, any exceedances listed in Question 5 are the result of non-WDS related influences (such as background, road salting, sampling site conditions)?	○ **Yes** ◉ **No**	

7) All monitoring program surface water parameter concentrations fall within a stable or decreasing trend. The site is not characterized by historical ranges of concentrations above assessment and compliance criteria.	○ **Yes** ◉ **No**	Cross gradient and downgradient concentrations remain above criteria for many parameters (iron, total phosphorous, lead) when compared to background.
8) For the monitoring program parameters, does the water quality in the groundwater zones adjacent to surface water receivers exceed assessment or compliance criteria (e.g. , PWQOs, CWQGs, or toxicity values for aquatic biota (APVs)):	◉ Yes ○ No ○ Not Known ○ Not Applicable	Boron, cobalt, iron, zinc exceeds the PWQO.
9) Have trigger values for contingency plans or site remedial actions been exceeded (where they exist):	○ **Yes** ◉ **No** ○ **Not Applicable**	Toxicity sampling at SW3 was initiated as regular sampling and if passes no further sampling is required. Both spring and fall toxicity sampling passed in 2023.

Surface Water CEP Declaration:

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

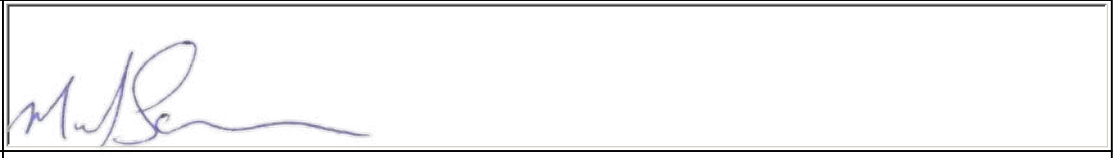
I have examined the applicable Certificate of Approval and any other environmental authorizing or control documents that apply to the site. I have read and followed the Monitoring and Reporting for Waste Disposal Sites Groundwater and Surface Water Technical Guidance Document (MOE, 2010, or as amended)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

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

Recommendations:

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

◉ **No Changes to the monitoring program are recommended**	Sampling to be done at SW1, SW2, SW3, and SW4A, and SW6 in 2024.
○ **The following change(s) to the monitoring program is/are recommended:**	
○ **No changes to the site design and operation are recommended**	Operations are to be evaluated and additional measures should be taken to reduce infiltration, run -off.
◉ **The following change(s) to the site design and operation is/are recommended:**	

CEP Signature	
Relevant Discipline	Professional Engineer
Date:	25-Mar-2024
CEP Contact Information:	Mark Somers, M.Eng., P.Eng.
Company:	BluMetric Environmental Inc.
Address:	1682 Woodward Drive, Ottawa, ON, K2C 3R8
Telephone No.:	877-487-8436 ext. 246
Fax No. :	
E-mail Address:	msomers@blumetric.ca

Save As		**Print Form**

MECP Checklist – SW – 2023 PWQO Exceedances

Location	PWQO Exceedance	PWQO Value (mg/L)	Sampling Event	% above PWQO
MG-SW1	Dissolved Aluminum (0.088 mg/L)	0.075	May 2	17
MG-SW3	Boron (0.268 mg/L)	0.2	May 2	34
MG-SW4A	Dissolved Aluminum (0.092 mg/L)	0.075	May 2	23
MG-SW6	Total Phosphorus (0.05 mg/L)	0.03	May 2	67

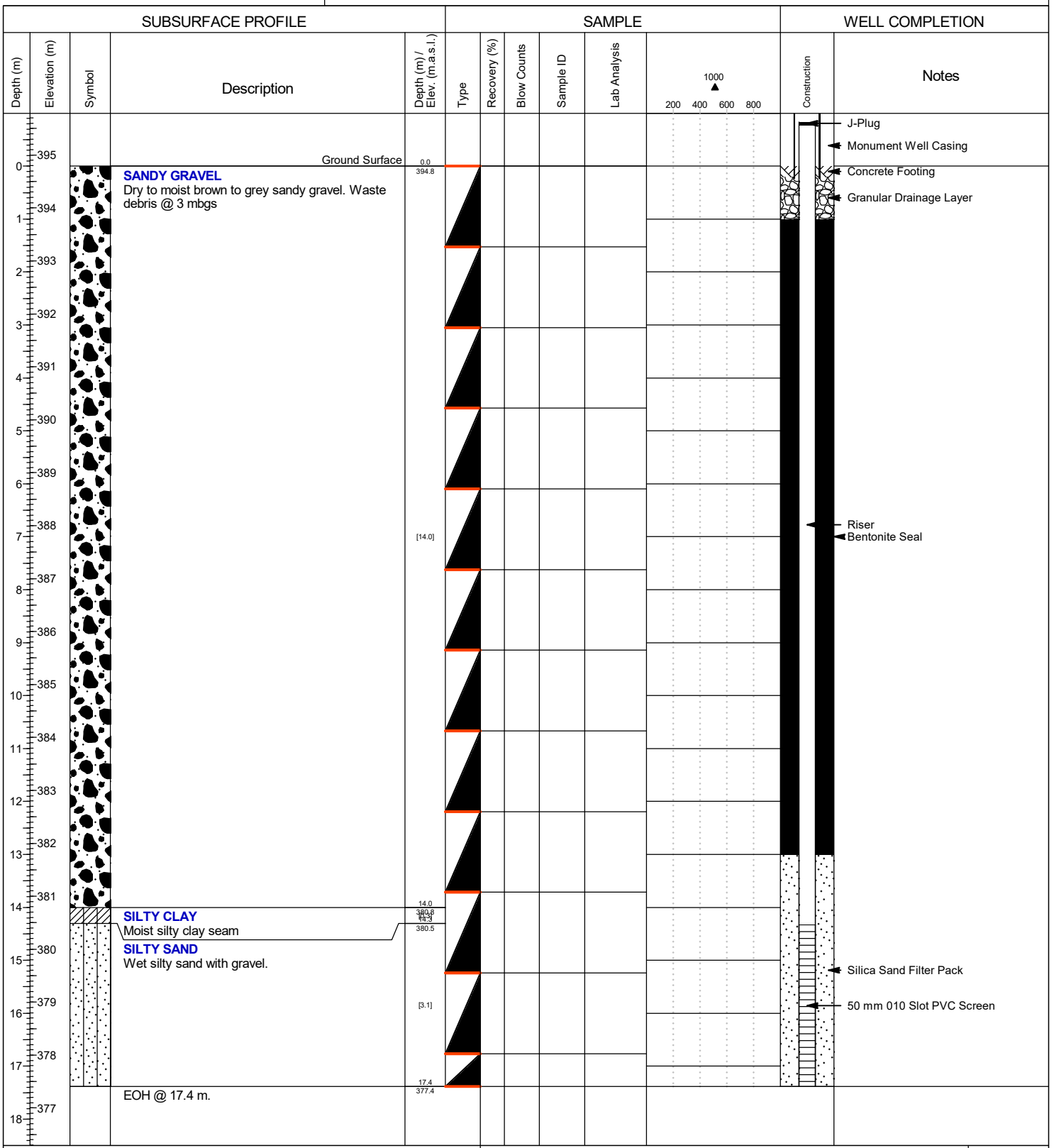
Appendix C

Monitoring Well Logs

Monitoring Well ID: MG18-1

Project No.: 180580-01
Client: MHH
Report: Musclow Greenview WDS
Site Address: Musclow Greenview
Ontario

Elevation Ground: *394.79 m*
TOP: *395.57 m*



Drill Date: December 19, 2018
Drilled By: Orbit Garant
Drilling Method: Hollow Stem Auger

Hole Diameter (OD): 0.20 m
Logged By: AB
Checked By: CM

AUGER SAMPLE
Perched Groundwater Strike / Unstabilized Groundwater Level
True Groundwater Strike / Stabilized Groundwater Level

Sheet
1 of 1

BH MW OB LOG 230226 - MG UPDATED.GPJ BLUMETRIC STANDARD.GDT 2/2/24

Monitoring Well ID: MG18-2

Project No.: 180580-01
Client: MHH
Report: Musclow Greenview WDS
Site Address: Musclow Greenview
Ontario

Elevation Ground: *390.61 m*
TOP: *391.33 m*

Depth (m)	Elevation (m)	Description	Depth (m) / Elev. (m.a.s.l.)
		Ground Surface	0.0 / 390.6
0	391	**SAND & GRAVEL** Dry	[1.5]
1	390		1.5 / 389.1
2	389	**WASTE MATERIAL** Dry, decomposed waste material and organic matter	[1.5]
3	388		3.0 / 387.6
4	387	**SAND & GRAVEL** Moist sand and gravel	[1.5]
5	386		4.5 / 386.1
6	385	**WASTE MATERIAL** Decomposed waste and plastic, moist	
7	384		
8	383		[6.1]
9	382		
10	381		10.6 / 380.0
11	380	**SILTY SAND** Moist to wet silty sand	
12	379		
13	378		
14	377		
15	376		
16	375		[10.9]
17	374		
18	373		
19	372		
20	371		
21	370		21.5 / 369.1
	369	EOH @ 21.5 mbgs. MOE Well Tag # A255638	

SAMPLE: Type | Recovery (%) | Blow Counts | Sample ID | Lab Analysis | 1000 (200 400 600 800)

WELL COMPLETION: Construction | Notes

- J-Plug
- Monument Well Casing
- Concrete Footing
- Granular Drainage Layer
- Riser
- Bentonite Seal
- Silica Sand Filter Pack
- 50 mm 010 Slot PVC Screen

Drill Date: December 18, 2018
Drilled By: Orbit Garant
Drilling Method: Hollow Stem Auger
Hole Diameter (OD): 0.20 m
Logged By: AB
Checked By: CM

AUGER SAMPLE
Perched Groundwater Strike / Unstabilized Groundwater Level
True Groundwater Strike / Stabilized Groundwater Level

Monitoring Well ID: MG18-3R

Project No.: 230226
Client: MHH
Report: Musclow Greenview WDS
Site Address: Musclow Greenview
Ontario

Elevation Ground: *389.94 m*
TOP: *390.78 m*

Depth (m)	Elevation (m)	Description	Depth (m) / Elev. (m.a.s.l.)
		Ground Surface	0.0 / 389.9
0–6	390–384	**SANDY SILT** Dry, brown to grey sandy silt with trace cobbles	[6.1]
6–12	384–378	**SANDY SILT** Moist, grey sandy silt with gravel and trace cobbles	6.1 / 383.8 – [6.1] – 12.2 / 377.8
12–16	378–374	**SANDY SILT** Wet to saturated, grey sandy silt with gravel and trace cobble	[4.0] – 16.1 / 373.8
16–17	374–373	EOH @ 16.2 m. Auger refusal @ EOH in assumed cobbles. MOE Tag A361505	

SAMPLE: Type, Recovery (%), Blow Counts, Sample ID, Lab Analysis; 1000 ▲ (200 400 600 800)

WELL COMPLETION: Construction; Notes

- J-Plug
- Monument Well Casing
- Concrete Footing
- Native Backfill
- Riser
- Bentonite Seal
- Silica Sand Filter Pack
- 50 mm 010 Slot PVC Screen

Drill Date: September 18, 2023
Drilled By: Canadian Environmental
Drilling Method: Hollow Stem Auger
Hole Diameter (OD): 0.20 m
Logged By: BM
Checked By: CM

AUGER SAMPLE
Perched Groundwater Strike / Unstabilized Groundwater Level
True Groundwater Strike / Stabilized Groundwater Level

Sheet 1 of 1

BH MW OB LOG 230226 - MG UPDATED.GPJ BLUMETRIC STANDARD.GDT 2/2/24

Appendix D

Inspection Forms, Laboratory Reports, and Chain of Custody Records

Appendix D

D-1 Operation and Inspection Forms

SMALL LANDFILL
OPERATION AND INSPECTION FORM

BluMetric Environmental

Site Name: Musclow-Greenview WDS, MHHs	Date: May 2, 2023	Weather: Overcast, occasional rain / sleet Sun / Cloud 8°C
Project #: 230225-07	BluMetric Staff: BM / MD	

Photographs of each item below should be collected during site visits.

OVERALL INSPECTION AND OPERATION REVIEW

☐ Signage in good condition	Yes ✓	No _	
☐ ECA and emergency numbers on signage	Yes ✓	No _	
☐ Hour of operation observed	Yes ✓	No _	
☐ Site open under normal operating hours	Yes _	No ✓	Closed under normal hours
☐ Perimeter fencing and gate in good condition	Yes ✓	No _	
☐ Gate locked if closed	Yes _	No ✓	Township hauling cover material and working site - compacting + build new cell

DESIGNATED WASTE AREA

☐ Working active/trench area (moderate size, daily cover, compacted)	Yes ✓	No _
☐ Designated waste areas are properly signed and easily accessed by public	Yes ✓	No _

RECYCLING OPERATION (if applicable)

☐ Proper signage and bins present	Yes ✓	No _
☐ Clearly signed	Yes ✓	No _
☐ Overall neat in appearance	Yes ✓	No _

SEGREGATED SCRAP PILES (metal, tires, brush, etc.)

☐ Metals neat and appropriate size	Yes _	No ✓	Metals + Bulk need spring pickup/removal
☐ Tires neat and appropriate size	Yes ✓	No _	
☐ Bulky Items neat and appropriate size	Yes _	No ✓	
☐ Brush pile neat and appropriate size	Yes _	No _	Berms between cells should be improved
☐ Construction Debris neat and appropriate size	Yes _	No _	

MONITORING WELL CONDITION

☐ Casing conditions (frost heave, lock, cap)	Yes ✓	No _
☐ Monitor condition (capped, vented)	Yes ✓	No _
☐ Wells clearly labeled (re-label as required)	Yes ✓	No _
☐ Well clearly visible (clear brush if necessary)	Yes ✓	No _

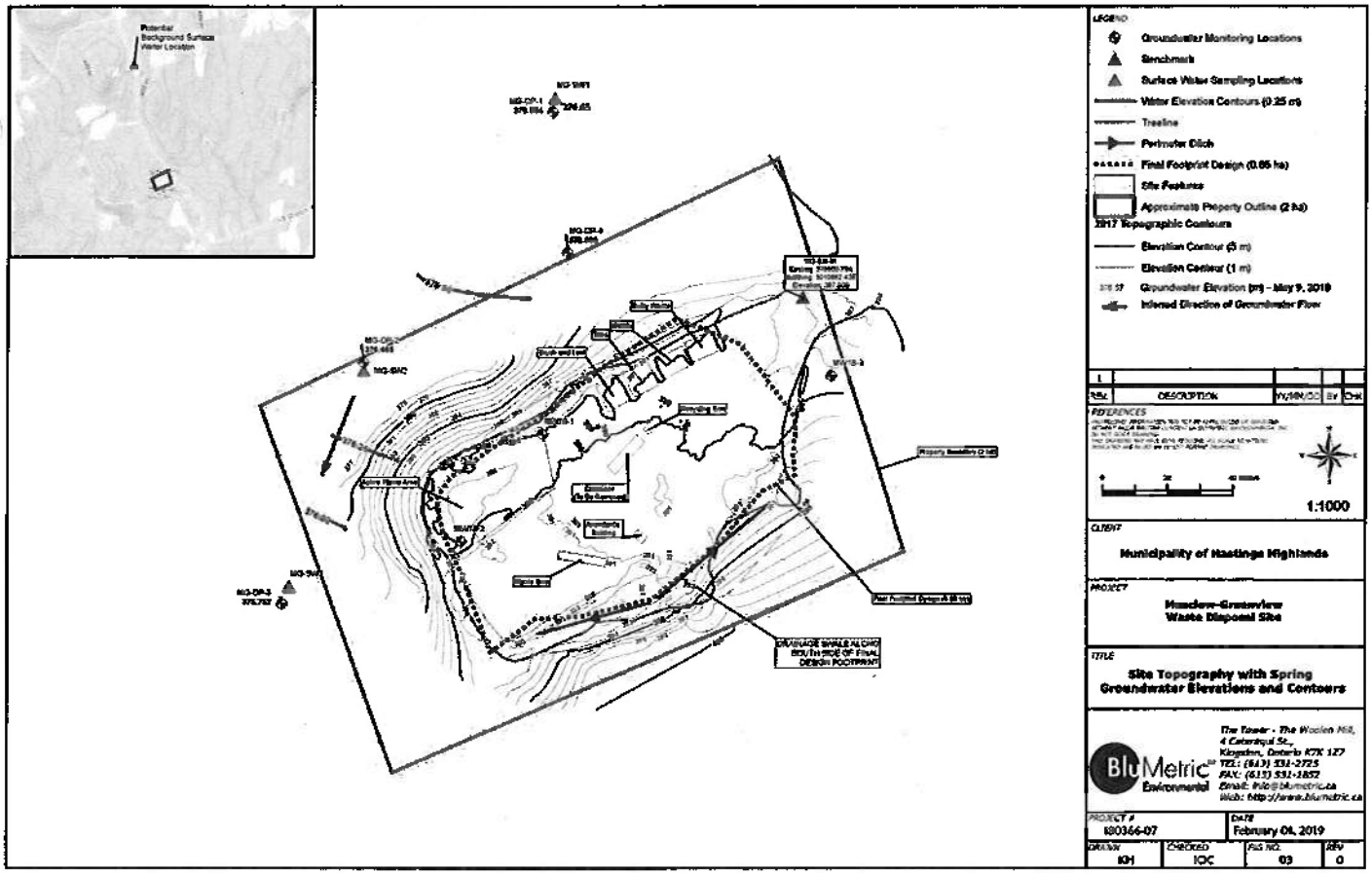
LANDFILL GAS MONITORING

☐ Conducted at structures	Yes ✓	No _
☐ Conducted at monitoring wells	Yes ✓	No _

REPAIRS: Provide details of repairs made or materials required for repairs upon next site visit:

OBSERVATIONS OF PHYSICAL ENVIRONMENT: Please comment on any changes to the local environment (e.g. settling or slumping of waste/cover, new or altered drainage, presence of seeps, changes in vegetation cover, etc.)

This form is intended as a general reminder of information that should recorded during monitoring activities. The above information is a minimum guide. Any information deemed important should be recorded in the field notes for each site.



Identify any changes to site layout on drawing and/or comment:

This form is intended as a general reminder of information that should recorded during monitoring activities. The above information is a minimum guide. Any information deemed important should be recorded in the field notes for each site.

SMALL LANDFILL
OPERATION AND INSPECTION FORM

BluMetric™ Environmental

Site Name: Musclow-Greenview WDS, MHHs	Date: Oct 18, 2023	Weather: Overcast 10°C
Project #: 230225-07	BluMetric Staff: BM | MD	

Photographs of each item below should be collected during site visits.

OVERALL INSPECTION AND OPERATION REVIEW

☐ Signage in good condition	Yes ✓	No _	
☐ ECA and emergency numbers on signage	Yes ✓	No _	
☐ Hour of operation observed	Yes ✓	No _	
☐ Site open under normal operating hours	Yes _	No ✓	
☐ Perimeter fencing and gate in good condition	Yes ✓	No _	
☐ Gate locked if closed	Yes ✓	No _	

DESIGNATED WASTE AREA

☐ Working active/trench area (moderate size, daily cover, compacted)	Yes ✓	No _	Waste not compacted or covered
☐ Designated waste areas are properly signed and easily accessed by public	Yes ✓	No _	

RECYCLING OPERATION (if applicable)

☐ Proper signage and bins present	Yes ✓	No _	
☐ Clearly signed	Yes ✓	No _	
☐ Overall neat in appearance	Yes ✓	No _	

SEGREGATED SCRAP PILES (metal, tires, brush, etc.)

☐ Metals neat and appropriate size	Yes ✓	No _	Better separation between piles could be achieved
☐ Tires neat and appropriate size	Yes ✓	No _	
☐ Bulky Items neat and appropriate size	Yes ✓	No _	Large
☐ Brush pile neat and appropriate size	Yes ✓	No _	Large
☐ Construction Debris neat and appropriate size	Yes _	No _	NA ✓

MONITORING WELL CONDITION

☐ Casing conditions (frost heave, lock, cap)	Yes ✓	No _	
☐ Monitor condition (capped, vented)	Yes ✓	No _	
☐ Wells clearly labeled (re-label as required)	Yes ✓	No _	
☐ Well clearly visible (clear brush if necessary)	Yes ✓	No _	

LANDFILL GAS MONITORING

☐ Conducted at structures	Yes ✓	No _	Oppm @ Attendant Building
☐ Conducted at monitoring wells	Yes ✓	No _	

REPAIRS: Provide details of repairs made or materials required for repairs upon next site visit:

OBSERVATIONS OF PHYSICAL ENVIRONMENT: Please comment on any changes to the local environment (e.g. settling or slumping of waste/cover, new or altered drainage, presence of seeps, changes in vegetation cover, etc.)

This form is intended as a general reminder of information that should recorded during monitoring activities. The above information is a minimum guide. Any information deemed important should be recorded in the field notes for each site.

Appendix D

D-2 Groundwater Laboratory Reports

AGAT Laboratories

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

CLIENT NAME: BLUMETRIC ENVIRONMENTAL INC.
4 Cataraqui Street
Kingston, ON K7K1Z7
(613) 531-2725
ATTENTION TO: Carolyn Miller
PROJECT: 230225-07
AGAT WORK ORDER: 23T021057
WATER ANALYSIS REVIEWED BY: Nivine Basily, Inorganics Report Writer
DATE REPORTED: May 18, 2023
PAGES (INCLUDING COVER): 8
VERSION*: 1

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

*Notes

Disclaimer:

- *All work conducted herein has been done using accepted standard protocols, and generally accepted practices and methods. AGAT test methods may incorporate modifications from the specified reference methods to improve performance.*
- *All samples will be disposed of within 30 days after receipt unless a Long Term Storage Agreement is signed and returned. Some specialty analysis may be exempt, please contact your Client Project Manager for details.*
- *AGAT's liability in connection with any delay, performance or non-performance of these services is only to the Client and does not extend to any other third party. Unless expressly agreed otherwise in writing, AGAT's liability is limited to the actual cost of the specific analysis or analyses included in the services.*
- *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.*
- *For environmental samples in the Province of Quebec: The analysis is performed on and results apply to samples as received. A temperature above 6°C upon receipt, as indicated in the Sample Reception Notification (SRN), could indicate the integrity of the samples has been compromised if the delay between sampling and submission to the laboratory could not be minimized.*

AGAT Laboratories

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CANADA L4Z 1Y2
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Certificate of Analysis

AGAT WORK ORDER: 23T021057

PROJECT: 230225-07

CLIENT NAME: BLUMETRIC ENVIRONMENTAL INC.

ATTENTION TO: Carolyn Miller

SAMPLING SITE:Musclow Greenview

SAMPLED BY:

BOD5

DATE RECEIVED: 2023-05-04

DATE REPORTED: 2023-05-18

		SAMPLE DESCRIPTION:		MG-DP1	MG-DP2	MG-DP3	MG-DP4		MG-DP5		MG-18-1
		SAMPLE TYPE:		Water	Water	Water	Water		Water		Water
		DATE SAMPLED:		2023-05-02 10:55	2023-05-02 12:15	2023-05-02 15:20	2023-05-02 12:55		2023-05-02 10:05		2023-05-02 14:15
Parameter	Unit	G / S	RDL	4961342	4961346	4961347	4961348	RDL	4961349	RDL	4961350
Biochemical Oxygen Demand, Total	mg/L		2	<2	<2	<2	<2	6	<6	2	<2

		SAMPLE DESCRIPTION:		MG-18-2	MG-18-3	MG-QAQC-GW1
		SAMPLE TYPE:		Water	Water	Water
		DATE SAMPLED:		2023-05-02 14:35	2023-05-02 13:43	2023-05-02 14:15
Parameter	Unit	G / S	RDL	4961351	4961352	4961353
Biochemical Oxygen Demand, Total	mg/L		2	<2	<2	<2

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

4961349 BOD is reported as less than (<) due to complete depletion of DO at selected dilution levels.

Analysis performed at AGAT Halifax (unless marked by *)

Certified By:

AGAT Laboratories

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Certificate of Analysis

AGAT WORK ORDER: 23T021057

PROJECT: 230225-07

CLIENT NAME: BLUMETRIC ENVIRONMENTAL INC.

ATTENTION TO: Carolyn Miller

SAMPLING SITE:Musclow Greenview

SAMPLED BY:

Musclow-Greenview Landfill - Groundwater Parameters

DATE RECEIVED: 2023-05-04

DATE REPORTED: 2023-05-18

		SAMPLE DESCRIPTION:		MG-DP1		MG-DP2		MG-DP3		MG-DP4
		SAMPLE TYPE:		Water		Water		Water		Water
		DATE SAMPLED:		2023-05-02 10:55		2023-05-02 12:15		2023-05-02 15:20		2023-05-02 12:55
Parameter	Unit	G / S	RDL	4961342	RDL	4961346	RDL	4961347	RDL	4961348
pH	pH Units		NA	7.65	NA	7.25	NA	6.99	NA	7.85
Alkalinity (as CaCO3)	mg/L		5	239	5	158	5	736	5	103
Electrical Conductivity	µS/cm		2	812	2	306	2	1480	2	229
Total Dissolved Solids	mg/L		10	540	10	184	10	882	10	102
Total Suspended Solids	mg/L		10	11	10	<10	10	<10	10	14
Chloride	mg/L		0.10	52.2	0.10	1.04	0.12	77.7	0.10	4.94
Nitrate as N	mg/L		0.05	<0.05	0.05	<0.05	0.05	<0.05	0.05	0.12
Sulphate	mg/L		0.10	116	0.10	3.09	0.10	37.0	0.10	13.2
Ammonia as N	mg/L		0.02	0.19	0.03	5.65	0.02	0.05	0.02	<0.02
Chemical Oxygen Demand	mg/L		5	<5	5	13	5	25	5	18
Dissolved Organic Carbon	mg/L		0.5	4.8	0.5	7.6	0.5	12.2	0.5	1.7
Dissolved Calcium	mg/L		0.05	140	0.05	47.4	0.25	250	0.05	33.3
Dissolved Magnesium	mg/L		0.05	11.4	0.05	4.42	0.05	31.3	0.05	4.79
Dissolved Sodium	mg/L		0.05	10.0	0.05	4.26	0.05	48.6	0.05	4.52
Dissolved Aluminum	mg/L		0.004	<0.004	0.004	0.006	0.004	<0.004	0.004	<0.004
Dissolved Barium	mg/L		0.002	0.069	0.002	0.031	0.002	0.172	0.002	0.012
Dissolved Boron	mg/L		0.010	0.061	0.010	0.038	0.010	0.520	0.010	0.015
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 Cobalt	mg/L		0.0005	<0.0005	0.0005	<0.0005	0.0005	0.0038	0.0005	<0.0005
Dissolved Lead	mg/L		0.0005	<0.0005	0.0005	<0.0005	0.0005	<0.0005	0.0005	<0.0005
Dissolved Iron	mg/L		0.010	0.016	0.010	0.018	0.010	0.796	0.010	<0.010
Dissolved Manganese	mg/L		0.002	0.144	0.002	0.068	0.002	0.343	0.002	<0.002
Dissolved Silver	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	0.008	0.005	<0.005	0.005	<0.005

Certified By:

AGAT Laboratories

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FAX (905)712-5122
http://www.agatlabs.com

Certificate of Analysis

AGAT WORK ORDER: 23T021057

PROJECT: 230225-07

CLIENT NAME: BLUMETRIC ENVIRONMENTAL INC.

ATTENTION TO: Carolyn Miller

SAMPLING SITE:Musclow Greenview

SAMPLED BY:

Musclow-Greenview Landfill - Groundwater Parameters

DATE RECEIVED: 2023-05-04

DATE REPORTED: 2023-05-18

		SAMPLE DESCRIPTION:		MG-DP5		MG-18-1		MG-18-2		MG-18-3	MG-QAQC-GW1
		SAMPLE TYPE:		Water		Water		Water		Water	Water
		DATE SAMPLED:		2023-05-02 10:05		2023-05-02 14:15		2023-05-02 14:35		2023-05-02 13:43	2023-05-02 14:15
Parameter	Unit	G / S	RDL	4961349	RDL	4961350	RDL	4961351	RDL	4961352	4961353
pH	pH Units		NA	6.87	NA	6.93	NA	7.03	NA	7.42	6.99
Alkalinity (as CaCO3)	mg/L		5	305	5	284	5	963	5	45	286
Electrical Conductivity	µS/cm		2	791	2	949	2	1950	2	218	958
Total Dissolved Solids	mg/L		10	490	10	558	10	1150	10	108	656
Total Suspended Solids	mg/L		10	73	10	4940	10	1500	10	10500	5760
Chloride	mg/L		0.10	66.0	0.10	145	0.12	117	0.10	1.36	134
Nitrate as N	mg/L		0.05	<0.05	0.05	<0.05	0.05	<0.05	0.05	3.18	<0.05
Sulphate	mg/L		0.10	52.3	0.10	11.4	0.10	24.6	0.10	51.8	12.6
Ammonia as N	mg/L		0.02	0.06	0.02	<0.02	0.02	0.08	0.02	<0.02	<0.02
Chemical Oxygen Demand	mg/L		5	25	5	11	5	42	5	<5	23
Dissolved Organic Carbon	mg/L		0.5	7.1	0.5	8.9	0.5	15.2	0.5	2.4	8.8
Dissolved Calcium	mg/L		0.05	113	0.05	116	0.05	297	0.05	22.2	121
Dissolved Magnesium	mg/L		0.05	11.3	0.05	27.1	0.05	53.0	0.05	4.75	26.0
Dissolved Sodium	mg/L		0.05	8.12	0.05	21.7	0.05	75.6	0.05	12.5	21.1
Dissolved Aluminum	mg/L		0.004	<0.004	0.004	0.004	0.004	0.007	0.004	<0.004	<0.004
Dissolved Barium	mg/L		0.002	0.041	0.002	0.108	0.002	0.237	0.002	0.015	0.103
Dissolved Boron	mg/L		0.010	0.031	0.010	0.148	0.010	1.22	0.010	0.015	0.140
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 Cobalt	mg/L		0.0005	0.0680	0.0005	0.0354	0.0005	0.0449	0.0005	<0.0005	0.0348
Dissolved Lead	mg/L		0.0005	<0.0005	0.0005	0.0005	0.0005	<0.0005	0.0005	<0.0005	<0.0005
Dissolved Iron	mg/L		0.010	27.3	0.010	0.354	0.010	6.15	0.010	<0.010	0.357
Dissolved Manganese	mg/L		0.002	2.79	0.002	7.46	0.002	11.7	0.002	0.010	7.33
Dissolved Silver	mg/L		0.0001	<0.0001	0.0001	<0.0001	0.0001	<0.0001	0.0001	<0.0001	<0.0001
Dissolved Zinc	mg/L		0.025	48.7	0.005	<0.005	0.005	<0.005	0.005	<0.005	<0.005

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

4961342-4961353 Dilution required, RDL has been increased accordingly.

Analysis performed at AGAT Toronto (unless marked by *)

Certified By:

AGAT Laboratories

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MISSISSAUGA, ONTARIO
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Quality Assurance

CLIENT NAME: BLUMETRIC ENVIRONMENTAL INC.

AGAT WORK ORDER: 23T021057

PROJECT: 230225-07

ATTENTION TO: Carolyn Miller

SAMPLING SITE:Musclow Greenview

SAMPLED BY:

Water Analysis

RPT Date: May 18, 2023			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Musclow-Greenview Landfill - Groundwater Parameters															
pH	4963228		7.88	7.94	0.8%	NA	100%	90%	110%						
Alkalinity (as CaCO3)	4963228		246	249	1.2%	< 5	95%	80%	120%						
Electrical Conductivity	4963228		532	529	0.6%	< 2	105%	90%	110%						
Total Dissolved Solids	4966062		452	468	3.5%	< 10	102%	80%	120%						
Total Suspended Solids	4961348	4961348	14	16	NA	< 10	98%	80%	120%						
Chloride	4961347	4961347	77.7	76.2	1.9%	< 0.10	95%	70%	130%	100%	80%	120%	100%	70%	130%
Nitrate as N	4961347	4961347	<0.05	<0.05	NA	< 0.05	95%	70%	130%	95%	80%	120%	97%	70%	130%
Sulphate	4961347	4961347	37.0	36.6	1.1%	< 0.10	95%	70%	130%	96%	80%	120%	100%	70%	130%
Ammonia as N	4961342	4961342	0.19	0.19	0.0%	< 0.02	108%	70%	130%	101%	80%	120%	87%	70%	130%
Chemical Oxygen Demand	4961342	4961342	<5	8	NA	< 5	110%	80%	120%	104%	90%	110%	102%	70%	130%
Dissolved Organic Carbon	4961342	4961342	4.8	5.0	4.1%	< 0.5	99%	90%	110%	96%	90%	110%	91%	80%	120%
Dissolved Calcium	4964150		141	142	0.7%	< 0.05	99%	70%	130%	107%	80%	120%	103%	70%	130%
Dissolved Magnesium	4964150		20.3	20.5	1.0%	< 0.05	104%	70%	130%	109%	80%	120%	99%	70%	130%
Dissolved Sodium	4964150		57.8	59.1	2.2%	< 0.05	99%	70%	130%	105%	80%	120%	98%	70%	130%
Dissolved Aluminum	4964150		0.006	0.012	NA	< 0.004	97%	70%	130%	99%	80%	120%	94%	70%	130%
Dissolved Barium	4964150		0.104	0.105	1.0%	< 0.002	103%	70%	130%	105%	80%	120%	106%	70%	130%
Dissolved Boron	4964150		0.041	0.036	NA	< 0.010	100%	70%	130%	109%	80%	120%	102%	70%	130%
Dissolved Cadmium	4964150		<0.0001	<0.0001	NA	< 0.0001	100%	70%	130%	104%	80%	120%	105%	70%	130%
Dissolved Chromium	4964150		<0.002	<0.002	NA	< 0.002	90%	70%	130%	99%	80%	120%	93%	70%	130%
Dissolved Cobalt	4964150		<0.0005	<0.0005	NA	< 0.0005	90%	70%	130%	96%	80%	120%	92%	70%	130%
Dissolved Lead	4964150		0.0007	<0.0005	NA	< 0.0005	98%	70%	130%	94%	80%	120%	93%	70%	130%
Dissolved Iron	4964150		<0.010	<0.010	NA	< 0.010	98%	70%	130%	102%	80%	120%	97%	70%	130%
Dissolved Manganese	4964150		0.090	0.092	2.2%	< 0.002	91%	70%	130%	96%	80%	120%	92%	70%	130%
Dissolved Silver	4964150		<0.0001	<0.0001	NA	< 0.0001	92%	70%	130%	95%	80%	120%	93%	70%	130%
Dissolved Zinc	4964150		0.018	0.019	NA	< 0.005	96%	70%	130%	100%	80%	120%	99%	70%	130%

Comments: NA signifies Not Applicable.
Duplicate NA: results are under 5X the RDL and will not be calculated.

Musclow-Greenview Landfill - Groundwater Parameters															
pH	4961346	4961346	7.25	7.25	0.0%	NA	100%	90%	110%						
Alkalinity (as CaCO3)	4961346	4961346	158	160	0.9%	< 5	101%	80%	120%						
Electrical Conductivity	4961346	4961346	306	305	0.3%	< 2	97%	90%	110%						

Comments: NA signifies Not Applicable.

BOD5															
Biochemical Oxygen Demand, Total	4961349	4961349	<6	5	NA	< 2	86%	70%	130%						

Comments: If RPD value is NA, the results of the duplicates are less than 5x the RDL and the RPD will not be calculated.

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Quality Assurance

CLIENT NAME: BLUMETRIC ENVIRONMENTAL INC.

AGAT WORK ORDER: 23T021057

PROJECT: 230225-07

ATTENTION TO: Carolyn Miller

SAMPLING SITE:Musclow Greenview

SAMPLED BY:

Water Analysis (Continued)

RPT Date: May 18, 2023			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper

Certified By:

AGAT Laboratories

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MISSISSAUGA, ONTARIO
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Method Summary

CLIENT NAME: BLUMETRIC ENVIRONMENTAL INC.

AGAT WORK ORDER: 23T021057

PROJECT: 230225-07

ATTENTION TO: Carolyn Miller

SAMPLING SITE:Musclow Greenview

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Water Analysis			
Biochemical Oxygen Demand, Total	INOR-121-6023	SM 5210 B	INCUBATOR
pH	INOR-93-6000	modified from SM 4500-H+ B	PC TITRATE
Alkalinity (as CaCO3)	INOR-93-6000	Modified from SM 2320 B	PC TITRATE
Electrical Conductivity	INOR-93-6000	modified from SM 2510 B	PC TITRATE
Total Dissolved Solids	INOR-93-6028	modified from EPA 1684,ON MOECC E3139,SM 2540C,D	BALANCE
Total Suspended Solids	INOR-93-6028	modified from EPA 1684,ON MOECC E3139,SM 2540C,D	BALANCE
Chloride	INOR-93-6004	modified from SM 4110 B	ION CHROMATOGRAPH
Nitrate as N	INOR-93-6004	modified from 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-NH3 H	LACHAT FIA
Chemical Oxygen Demand	INOR-93-6042	modified from SM 5220 A and SM 5220 D	SPECTROPHOTOMETER
Dissolved Organic Carbon	INOR-93-6049	modified from SM 5310 B	SHIMADZU CARBON ANALYZER
Dissolved Calcium	MET-93-6103	modified from EPA 200.8 and EPA 3005A	ICP/MS
Dissolved Magnesium	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP/MS
Dissolved Sodium	MET-93-6103	modified from EPA 200.8 and EPA 3005A	ICP/MS
Dissolved Aluminum	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 Cobalt	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 Iron	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 Silver	MET-93-6103	modified from EPA 200.8 and EPA 3005A	ICP-MS
Dissolved Zinc	MET-93-6103	modified from EPA 200.8 and EPA 3005A	ICP-MS

AGAT Laboratories

5835 Coopers Avenue
Mississauga, Ontario L4Z 1Y2
Ph: 905.712.5100 Fax: 905.712.5122
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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: BluMetric
Contact: Carolyn Miller
Address: 4 Cataraqui St
Kingston, ON, K7K1Z7
Phone: 613-328-0243 Fax:
Reports to be sent to:
1. Email: cmiller@blumetric.ca
2. Email: cbandler@blumetric.ca

Project Information:

Project: 230225-07
Site Location: Musclow Greenview
Sampled By:
AGAT Quote #: 740803 PO: 230225-07
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: ap@blumetric.ca

Regulatory Requirements:

(Please check all applicable boxes)

☐ Regulation 153/04
Table ____ *Indicate One*
☐ Ind/Com
☐ Res/Park
☐ Agriculture
Soil Texture *(Check One)*
☐ Coarse
☐ Fine

☐ Excess Soils R406
Table ____ *Indicate One*
☐ Regulation 558
☐ CCME

☐ Sewer Use ☐ Sanitary ☐ Storm
____ *Region*
☐ Prov. Water Quality Objectives (PWQO)
☐ Other
____ *Indicate One*

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

Report Guideline on *Certificate of Analysis* ☐ Yes ☒ No

Sample Matrix Legend

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

Laboratory Use Only

Work Order #: 23T021057
Cooler Quantity: 1 med + 1 large
Arrival Temperatures: 5.4 | 8.1 | 8.9
Custody Seal Intact: ☐ Yes ☐ No ☒ N/A
Notes: bagged ice

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

Sample Identification	Date Sampled	Time Sampled	# of Containers	Sample Matrix	Comments/ Special Instructions	Field Filtered (Metals, Hg, CrVI, DOC) Y/N	O. Reg 153: Metals & Inorganics	Metals - ☐CrVI, ☐Hg, ☐HWSB	BTEX, F1-F4 PHCs Analyze F4G if required ☐Yes ☐No	PAHs	PCBs	VOC	O. Reg 558: Landfill Disposal Characterization TCLP: ☐M&I ☐VOCs ☐ABNs ☐B(a)P ☐PCBs	Excess Soils SPLP Rainwater Leach SPLP: ☐Metals ☐VOCs ☐SVOCs	Excess Soils Characterization Package pH, ICPMS Metals, BTEX, F1-F4	Salt - EC/SAR	93-263 Groundwater		121-405 BOD					Potentially Hazardous or High Concentration (Y/N)
MG-DP1	May 2/23	10:55 AM/PM	6	GW		Y											☑		☑					
MG-DP2	May 2/23	12:15 AM/PM	6	GW	Field Filter: Metals, DOC	Y											☑		☑					
MG-DP3	May 2/23	15:20 AM/PM	6	GW		Y											☑		☑					
MG-DP4	May 2/23	12:55 AM/PM	6	GW		Y											☑		☑					
MG-DP5	May 2/23	10:05 AM/PM	6	GW		Y											☑		☑					
MG-18-1	May 2/23	14:15 AM/PM	6	GW		Y											☑		☑					
MG-18-2	May 2/23	14:35 AM/PM	6	GW		Y											☑		☑					
MG-18-3	May 2/23	13:43 AM/PM	6	GW		Y											☑		☑					
MG-QAQC-GW1	May 2/23	14:15 AM/PM	6	GW		Y											☑		☑					
		AM/PM																						
		AM/PM																						

Samples Relinquished By (Print Name and Sign):	Date	Time	Samples Received By (Print Name and Sign):	Date	Time
Brad McCallum / Brad McCal	2023/May/03	8:00	Andy T Andy T	5/4/23	8:30 AM
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 1
N°:

Your Project #: 230225-07
Site Location: Musclow Greenview
Your C.O.C. #: 781226

Attention: Cecilia Bandler

BluMetric Environmental Inc
The Tower - The Woolen Mill
4 Cataraqui St
Kingston, ON
CANADA K7K 1Z7

Report Date: 2023/11/02
Report #: R7891372
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BUREAU VERITAS JOB #: C3W8341
Received: 2023/10/20, 08:35

Sample Matrix: Water
Samples Received: 9

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Alkalinity	9	N/A	2023/10/25	CAM SOP-00448	SM 23 2320 B m
Biochemical Oxygen Demand (BOD)	9	2023/10/21	2023/10/26	CAM SOP-00427	SM 23 5210B m
Chloride by Automated Colourimetry	9	N/A	2023/10/26	CAM SOP-00463	SM 23 4500-Cl E m
Chemical Oxygen Demand	9	N/A	2023/10/26	CAM SOP-00416	SM 23 5220 D m
Conductivity	9	N/A	2023/10/25	CAM SOP-00414	SM 23 2510 m
Dissolved Organic Carbon (DOC) (1)	6	N/A	2023/10/24	CAM SOP-00446	SM 23 5310 B m
Dissolved Organic Carbon (DOC) (1)	3	N/A	2023/10/27	CAM SOP-00446	SM 23 5310 B m
Dissolved Metals by ICPMS	8	N/A	2023/10/24	CAM SOP-00447	EPA 6020B m
Dissolved Metals by ICPMS	1	N/A	2023/11/01	CAM SOP-00447	EPA 6020B m
Total Ammonia-N	4	N/A	2023/10/26	CAM SOP-00441	USGS I-2522-90 m
Total Ammonia-N	5	N/A	2023/10/27	CAM SOP-00441	USGS I-2522-90 m
Nitrate & Nitrite as Nitrogen in Water (2)	9	N/A	2023/10/25	CAM SOP-00440	SM 23 4500-NO3I/NO2B
pH	9	2023/10/21	2023/10/25	CAM SOP-00413	SM 4500H+ B m
Sulphate by Automated Turbidimetry	9	N/A	2023/10/26	CAM SOP-00464	SM 23 4500-SO42- E m
Total Dissolved Solids	5	2023/10/25	2023/10/26	CAM SOP-00428	SM 23 2540C m
Total Dissolved Solids	4	2023/10/26	2023/10/27	CAM SOP-00428	SM 23 2540C m
Total Suspended Solids	9	2023/10/25	2023/10/26	CAM SOP-00428	SM 23 2540D m

Remarks:

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

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

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

Your Project #: 230225-07
Site Location: Musclow Greenview
Your C.O.C. #: 781226

Attention: Cecilia Bandler

BluMetric Environmental Inc
The Tower - The Woolen Mill
4 Cataraqui St
Kingston, ON
CANADA K7K 1Z7

Report Date: 2023/11/02
Report #: R7891372
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BUREAU VERITAS JOB #: C3W8341

Received: 2023/10/20, 08:35

otherwise agreed in writing. Bureau Veritas is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by Bureau Veritas, results relate to the supplied samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.
Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
(1) Dissolved Organic Carbon (DOC) present in the sample should be considered as non-purgeable DOC.
(2) Values for calculated parameters may not appear to add up due to rounding of raw data and significant figures.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to:
Christine Gripton, Senior Project Manager
Email: Christine.Gripton@bureauveritas.com
Phone# (519)652-9444

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Bureau Veritas Job #: C3W8341
Report Date: 2023/11/02

BluMetric Environmental Inc
Client Project #: 230225-07
Site Location: Musclow Greenview
Sampler Initials: BM

RESULTS OF ANALYSES OF WATER

Bureau Veritas ID		XJA301		XJA302			XJA302		
Sampling Date		2023/10/18 11:30		2023/10/18 13:40			2023/10/18 13:40		
COC Number		781226		781226			781226		
	UNITS	MG-DP1	QC Batch	MG-DP2	RDL	QC Batch	MG-DP2 Lab-Dup	RDL	QC Batch
Inorganics									
Total Ammonia-N	mg/L	0.29	9004018	5.9	0.050	9004018			
Total BOD	mg/L	ND	8997246	5	2	8997246			
Total Chemical Oxygen Demand (COD)	mg/L	17	9004854	36	4.0	9004854	38	4.0	9004854
Conductivity	umho/cm	830	8998053	330	1.0	8998053			
Total Dissolved Solids	mg/L	610	9005092	190	10	9007416			
Dissolved Organic Carbon	mg/L	6.4	8999285	17	0.4	8999285			
pH	pH	8.02	8998054	7.71		8998054			
Total Suspended Solids	mg/L	ND	9004459	ND	10	9001999			
Dissolved Sulphate (SO4)	mg/L	110	8998062	ND	1.0	8998062			
Alkalinity (Total as CaCO3)	mg/L	250	8998052	160	1.0	8998052			
Dissolved Chloride (Cl-)	mg/L	44	8998061	ND	1.0	8998061			
Nitrate (N)	mg/L	ND	8998056	ND	0.10	8998056			

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate
ND = Not Detected at a concentration equal or greater than the indicated Detection Limit.

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Bureau Veritas Job #: C3W8341
Report Date: 2023/11/02

BluMetric Environmental Inc
Client Project #: 230225-07
Site Location: Musclow Greenview
Sampler Initials: BM

RESULTS OF ANALYSES OF WATER

Bureau Veritas ID		XJA303	XJA304			XJA305		
Sampling Date		2023/10/18 15:20	2023/10/18 14:15			2023/10/18 10:45		
COC Number		781226	781226			781226		
	UNITS	MG-DP3	MG-DP4	RDL	QC Batch	MG-DP5	RDL	QC Batch
Inorganics								
Total Ammonia-N	mg/L	0.53	ND	0.050	9003912	0.078	0.050	9003912
Total BOD	mg/L	ND	12	2	8997246	7	2	8997246
Total Chemical Oxygen Demand (COD)	mg/L	54	29	4.0	9004854	42	4.0	9004854
Conductivity	umho/cm	1500	230	1.0	8998053	750	1.0	8998053
Total Dissolved Solids	mg/L	910	155	10	9007416	625	10	9005092
Dissolved Organic Carbon	mg/L	22	11	0.4	8999550	9.7	0.4	8999285
pH	pH	7.59	7.96		8998054	7.06		8998054
Total Suspended Solids	mg/L	ND	82	10	9001999	340	50	9004459
Dissolved Sulphate (SO4)	mg/L	24	11	1.0	8998062	53	1.0	8998062
Alkalinity (Total as CaCO3)	mg/L	680	96	1.0	8998052	230	1.0	8998052
Dissolved Chloride (Cl-)	mg/L	57	2.8	1.0	8998061	63	1.0	8998061
Nitrate (N)	mg/L	ND	0.13	0.10	8998056	ND	0.10	8998056

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Bureau Veritas Job #: C3W8341
Report Date: 2023/11/02

BluMetric Environmental Inc
Client Project #: 230225-07
Site Location: Musclow Greenview
Sampler Initials: BM

RESULTS OF ANALYSES OF WATER

Bureau Veritas ID		XJA305			XJA306			XJA307		
Sampling Date		2023/10/18 10:45			2023/10/18 14:15			2023/10/18 12:00		
COC Number		781226			781226			781226		
	UNITS	MG-DP5 Lab-Dup	RDL	QC Batch	MG-18-1	RDL	QC Batch	MG-18-2	RDL	QC Batch
Inorganics										
Total Ammonia-N	mg/L	0.061	0.050	9003912	0.073	0.050	9004018	0.46	0.050	9004018
Total BOD	mg/L				2	2	8997246	ND	2	8997246
Total Chemical Oxygen Demand (COD)	mg/L				16	4.0	9004854	52	4.0	9004854
Conductivity	umho/cm				760	1.0	8998053	2100	1.0	8998053
Total Dissolved Solids	mg/L				590	10	9005092	1250	10	9007416
Dissolved Organic Carbon	mg/L				5.0	0.4	8999550	16	0.4	8999550
pH	pH				7.55		8998054	7.47		8998054
Total Suspended Solids	mg/L				13000	100	9004459	11000	200	9004459
Dissolved Sulphate (SO4)	mg/L				20	1.0	8998062	15	1.0	8998062
Alkalinity (Total as CaCO3)	mg/L				220	1.0	8998052	970	1.0	8998052
Dissolved Chloride (Cl-)	mg/L				87	1.0	8998061	97	1.0	8998061
Nitrate (N)	mg/L				ND	0.10	8998056	ND	0.10	8998056

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QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate
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Bureau Veritas Job #: C3W8341
Report Date: 2023/11/02

BluMetric Environmental Inc
Client Project #: 230225-07
Site Location: Musclow Greenview
Sampler Initials: BM

RESULTS OF ANALYSES OF WATER

Bureau Veritas ID		XJA308		XJA309		
Sampling Date		2023/10/18 12:45		2023/10/18 12:45		
COC Number		781226		781226		
	UNITS	MG-18-3R	QC Batch	MG-QAQC-GW1	RDL	QC Batch
Inorganics						
Total Ammonia-N	mg/L	0.059	9004018	0.052	0.050	9003912
Total BOD	mg/L	ND	8997246	ND	2	8997246
Total Chemical Oxygen Demand (COD)	mg/L	8.2	9004854	ND	4.0	9004854
Conductivity	umho/cm	140	8998053	140	1.0	8998053
Total Dissolved Solids	mg/L	340	9005092	340	10	9005092
Dissolved Organic Carbon	mg/L	2.0	8999550	1.5	0.4	8999550
pH	pH	7.59	8998054	7.66		8998054
Total Suspended Solids	mg/L	38000	9004459	50000	200	9004459
Dissolved Sulphate (SO4)	mg/L	1.9	8998062	5.5	1.0	8998062
Alkalinity (Total as CaCO3)	mg/L	64	8998052	65	1.0	8998052
Dissolved Chloride (Cl-)	mg/L	ND	8998061	ND	1.0	8998061
Nitrate (N)	mg/L	ND	8998056	ND	0.10	8998056

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
ND = Not Detected at a concentration equal or greater than the indicated Detection Limit.

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Bureau Veritas Job #: C3W8341
Report Date: 2023/11/02

BluMetric Environmental Inc
Client Project #: 230225-07
Site Location: Musclow Greenview
Sampler Initials: BM

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Bureau Veritas ID		XJA301	XJA302	XJA303	XJA304			XJA305		
Sampling Date		2023/10/18 11:30	2023/10/18 13:40	2023/10/18 15:20	2023/10/18 14:15			2023/10/18 10:45		
COC Number		781226	781226	781226	781226			781226		
	UNITS	MG-DP1	MG-DP2	MG-DP3	MG-DP4	RDL	QC Batch	MG-DP5	RDL	QC Batch
Metals										
Dissolved Aluminum (Al)	ug/L	ND	ND	ND	ND	4.9	8998920	ND	4.9	9015963
Dissolved Barium (Ba)	ug/L	85	31	250	11	2.0	8998920	46	2.0	9015963
Dissolved Boron (B)	ug/L	72	45	810	14	10	8998920	38	10	9015963
Dissolved Cadmium (Cd)	ug/L	ND	ND	ND	ND	0.090	8998920	ND	0.090	9015963
Dissolved Calcium (Ca)	ug/L	150000	47000	260000	31000	200	8998920	120000	200	9015963
Dissolved Chromium (Cr)	ug/L	ND	ND	ND	ND	5.0	8998920	ND	5.0	9015963
Dissolved Cobalt (Co)	ug/L	ND	ND	3.4	ND	0.50	8998920	100	0.50	9015963
Dissolved Iron (Fe)	ug/L	ND	ND	570	ND	100	8998920	120000	500	9015963
Dissolved Lead (Pb)	ug/L	ND	ND	ND	ND	0.50	8998920	ND	0.50	9015963
Dissolved Magnesium (Mg)	ug/L	11000	4000	33000	4600	50	8998920	9800	50	9015963
Dissolved Manganese (Mn)	ug/L	150	67	190	ND	2.0	8998920	3900	2.0	9015963
Dissolved Silver (Ag)	ug/L	ND	ND	ND	ND	0.090	8998920	ND	0.090	9015963
Dissolved Sodium (Na)	ug/L	12000	4400	71000	4800	100	8998920	7900	100	9015963
Dissolved Zinc (Zn)	ug/L	ND	ND	ND	ND	5.0	8998920	43000	25	9015963

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

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Bureau Veritas Job #: C3W8341
Report Date: 2023/11/02

BluMetric Environmental Inc
Client Project #: 230225-07
Site Location: Musclow Greenview
Sampler Initials: BM

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Bureau Veritas ID		XJA306		XJA307		XJA308	XJA309		
Sampling Date		2023/10/18 14:15		2023/10/18 12:00		2023/10/18 12:45	2023/10/18 12:45		
COC Number		781226		781226		781226	781226		
	UNITS	MG-18-1	RDL	MG-18-2	RDL	MG-18-3R	MG-QAQC-GW1	RDL	QC Batch
Metals									
Dissolved Aluminum (Al)	ug/L	ND	4.9	ND	4.9	ND	ND	4.9	8998920
Dissolved Barium (Ba)	ug/L	87	2.0	280	2.0	22	22	2.0	8998920
Dissolved Boron (B)	ug/L	190	10	1200	10	10	ND	10	8998920
Dissolved Cadmium (Cd)	ug/L	0.11	0.090	0.48	0.090	ND	ND	0.090	8998920
Dissolved Calcium (Ca)	ug/L	92000	200	330000	200	22000	21000	200	8998920
Dissolved Chromium (Cr)	ug/L	ND	5.0	ND	5.0	ND	ND	5.0	8998920
Dissolved Cobalt (Co)	ug/L	25	0.50	49	0.50	1.1	1.1	0.50	8998920
Dissolved Iron (Fe)	ug/L	360	100	6000	100	ND	ND	100	8998920
Dissolved Lead (Pb)	ug/L	ND	0.50	ND	0.50	ND	ND	0.50	8998920
Dissolved Magnesium (Mg)	ug/L	20000	50	58000	50	1600	1600	50	8998920
Dissolved Manganese (Mn)	ug/L	5200	2.0	11000	10	130	130	2.0	8998920
Dissolved Silver (Ag)	ug/L	ND	0.090	ND	0.090	ND	ND	0.090	8998920
Dissolved Sodium (Na)	ug/L	26000	100	86000	100	3000	3100	100	8998920
Dissolved Zinc (Zn)	ug/L	26	5.0	ND	5.0	ND	ND	5.0	8998920

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Bureau Veritas Job #: C3W8341
Report Date: 2023/11/02

BluMetric Environmental Inc
Client Project #: 230225-07
Site Location: Musclow Greenview
Sampler Initials: BM

TEST SUMMARY

Bureau Veritas ID: XJA301
Sample ID: MG-DP1
Matrix: Water

Collected: 2023/10/18
Shipped:
Received: 2023/10/20

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	8998052	N/A	2023/10/25	Nachiketa Gohil
Biochemical Oxygen Demand (BOD)	DO	8997246	2023/10/21	2023/10/26	Gurjot Kaur
Chloride by Automated Colourimetry	KONE	8998061	N/A	2023/10/26	Alina Dobreanu
Chemical Oxygen Demand	SPEC	9004854	N/A	2023/10/26	Nimarta Singh
Conductivity	AT	8998053	N/A	2023/10/25	Nachiketa Gohil
Dissolved Organic Carbon (DOC)	TOCV/NDIR	8999285	N/A	2023/10/27	Gyulshen Idriz
Dissolved Metals by ICPMS	ICP/MS	8998920	N/A	2023/10/24	Indira HarryPaul
Total Ammonia-N	LACH/NH4	9004018	N/A	2023/10/27	Prabhjot Kaur
Nitrate & Nitrite as Nitrogen in Water	LACH	8998056	N/A	2023/10/25	Chandra Nandlal
pH	AT	8998054	2023/10/21	2023/10/25	Nachiketa Gohil
Sulphate by Automated Turbidimetry	KONE	8998062	N/A	2023/10/26	Alina Dobreanu
Total Dissolved Solids	BAL	9005092	2023/10/25	2023/10/26	Razieh Tabesh
Total Suspended Solids	BAL	9004459	2023/10/25	2023/10/26	Shaneil Hall

Bureau Veritas ID: XJA302
Sample ID: MG-DP2
Matrix: Water

Collected: 2023/10/18
Shipped:
Received: 2023/10/20

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	8998052	N/A	2023/10/25	Nachiketa Gohil
Biochemical Oxygen Demand (BOD)	DO	8997246	2023/10/21	2023/10/26	Gurjot Kaur
Chloride by Automated Colourimetry	KONE	8998061	N/A	2023/10/26	Alina Dobreanu
Chemical Oxygen Demand	SPEC	9004854	N/A	2023/10/26	Nimarta Singh
Conductivity	AT	8998053	N/A	2023/10/25	Nachiketa Gohil
Dissolved Organic Carbon (DOC)	TOCV/NDIR	8999285	N/A	2023/10/27	Gyulshen Idriz
Dissolved Metals by ICPMS	ICP/MS	8998920	N/A	2023/10/24	Indira HarryPaul
Total Ammonia-N	LACH/NH4	9004018	N/A	2023/10/27	Prabhjot Kaur
Nitrate & Nitrite as Nitrogen in Water	LACH	8998056	N/A	2023/10/25	Chandra Nandlal
pH	AT	8998054	2023/10/21	2023/10/25	Nachiketa Gohil
Sulphate by Automated Turbidimetry	KONE	8998062	N/A	2023/10/26	Alina Dobreanu
Total Dissolved Solids	BAL	9007416	2023/10/26	2023/10/27	Darshan Patel
Total Suspended Solids	BAL	9001999	2023/10/25	2023/10/26	Razieh Tabesh

Bureau Veritas ID: XJA302 Dup
Sample ID: MG-DP2
Matrix: Water

Collected: 2023/10/18
Shipped:
Received: 2023/10/20

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Chemical Oxygen Demand	SPEC	9004854	N/A	2023/10/26	Nimarta Singh

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Bureau Veritas Job #: C3W8341
Report Date: 2023/11/02

BluMetric Environmental Inc
Client Project #: 230225-07
Site Location: Musclow Greenview
Sampler Initials: BM

TEST SUMMARY

Bureau Veritas ID: XJA303
Sample ID: MG-DP3
Matrix: Water

Collected: 2023/10/18
Shipped:
Received: 2023/10/20

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	8998052	N/A	2023/10/25	Nachiketa Gohil
Biochemical Oxygen Demand (BOD)	DO	8997246	2023/10/21	2023/10/26	Gurjot Kaur
Chloride by Automated Colourimetry	KONE	8998061	N/A	2023/10/26	Alina Dobreanu
Chemical Oxygen Demand	SPEC	9004854	N/A	2023/10/26	Nimarta Singh
Conductivity	AT	8998053	N/A	2023/10/25	Nachiketa Gohil
Dissolved Organic Carbon (DOC)	TOCV/NDIR	8999550	N/A	2023/10/24	Gyulshen Idriz
Dissolved Metals by ICPMS	ICP/MS	8998920	N/A	2023/10/24	Indira HarryPaul
Total Ammonia-N	LACH/NH4	9003912	N/A	2023/10/26	Prabhjot Kaur
Nitrate & Nitrite as Nitrogen in Water	LACH	8998056	N/A	2023/10/25	Chandra Nandlal
pH	AT	8998054	2023/10/21	2023/10/25	Nachiketa Gohil
Sulphate by Automated Turbidimetry	KONE	8998062	N/A	2023/10/26	Alina Dobreanu
Total Dissolved Solids	BAL	9007416	2023/10/26	2023/10/27	Darshan Patel
Total Suspended Solids	BAL	9001999	2023/10/25	2023/10/26	Razieh Tabesh

Bureau Veritas ID: XJA304
Sample ID: MG-DP4
Matrix: Water

Collected: 2023/10/18
Shipped:
Received: 2023/10/20

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	8998052	N/A	2023/10/25	Nachiketa Gohil
Biochemical Oxygen Demand (BOD)	DO	8997246	2023/10/21	2023/10/26	Gurjot Kaur
Chloride by Automated Colourimetry	KONE	8998061	N/A	2023/10/26	Alina Dobreanu
Chemical Oxygen Demand	SPEC	9004854	N/A	2023/10/26	Nimarta Singh
Conductivity	AT	8998053	N/A	2023/10/25	Nachiketa Gohil
Dissolved Organic Carbon (DOC)	TOCV/NDIR	8999550	N/A	2023/10/24	Gyulshen Idriz
Dissolved Metals by ICPMS	ICP/MS	8998920	N/A	2023/10/24	Indira HarryPaul
Total Ammonia-N	LACH/NH4	9003912	N/A	2023/10/26	Prabhjot Kaur
Nitrate & Nitrite as Nitrogen in Water	LACH	8998056	N/A	2023/10/25	Chandra Nandlal
pH	AT	8998054	2023/10/21	2023/10/25	Nachiketa Gohil
Sulphate by Automated Turbidimetry	KONE	8998062	N/A	2023/10/26	Alina Dobreanu
Total Dissolved Solids	BAL	9007416	2023/10/26	2023/10/27	Darshan Patel
Total Suspended Solids	BAL	9001999	2023/10/25	2023/10/26	Razieh Tabesh

Bureau Veritas ID: XJA305
Sample ID: MG-DP5
Matrix: Water

Collected: 2023/10/18
Shipped:
Received: 2023/10/20

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	8998052	N/A	2023/10/25	Nachiketa Gohil
Biochemical Oxygen Demand (BOD)	DO	8997246	2023/10/21	2023/10/26	Gurjot Kaur
Chloride by Automated Colourimetry	KONE	8998061	N/A	2023/10/26	Alina Dobreanu
Chemical Oxygen Demand	SPEC	9004854	N/A	2023/10/26	Nimarta Singh
Conductivity	AT	8998053	N/A	2023/10/25	Nachiketa Gohil
Dissolved Organic Carbon (DOC)	TOCV/NDIR	8999285	N/A	2023/10/27	Gyulshen Idriz

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Bureau Veritas Job #: C3W8341
Report Date: 2023/11/02

BluMetric Environmental Inc
Client Project #: 230225-07
Site Location: Musclow Greenview
Sampler Initials: BM

TEST SUMMARY

Bureau Veritas ID: XJA305
Sample ID: MG-DP5
Matrix: Water

Collected: 2023/10/18
Shipped:
Received: 2023/10/20

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Dissolved Metals by ICPMS	ICP/MS	9015963	N/A	2023/11/01	Indira HarryPaul
Total Ammonia-N	LACH/NH4	9003912	N/A	2023/10/26	Prabhjot Kaur
Nitrate & Nitrite as Nitrogen in Water	LACH	8998056	N/A	2023/10/25	Chandra Nandlal
pH	AT	8998054	2023/10/21	2023/10/25	Nachiketa Gohil
Sulphate by Automated Turbidimetry	KONE	8998062	N/A	2023/10/26	Alina Dobreanu
Total Dissolved Solids	BAL	9005092	2023/10/25	2023/10/26	Razieh Tabesh
Total Suspended Solids	BAL	9004459	2023/10/25	2023/10/26	Shaneil Hall

Bureau Veritas ID: XJA305 Dup
Sample ID: MG-DP5
Matrix: Water

Collected: 2023/10/18
Shipped:
Received: 2023/10/20

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Total Ammonia-N	LACH/NH4	9003912	N/A	2023/10/26	Prabhjot Kaur

Bureau Veritas ID: XJA306
Sample ID: MG-18-1
Matrix: Water

Collected: 2023/10/18
Shipped:
Received: 2023/10/20

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	8998052	N/A	2023/10/25	Nachiketa Gohil
Biochemical Oxygen Demand (BOD)	DO	8997246	2023/10/21	2023/10/26	Gurjot Kaur
Chloride by Automated Colourimetry	KONE	8998061	N/A	2023/10/26	Alina Dobreanu
Chemical Oxygen Demand	SPEC	9004854	N/A	2023/10/26	Nimarta Singh
Conductivity	AT	8998053	N/A	2023/10/25	Nachiketa Gohil
Dissolved Organic Carbon (DOC)	TOCV/NDIR	8999550	N/A	2023/10/24	Gyulshen Idriz
Dissolved Metals by ICPMS	ICP/MS	8998920	N/A	2023/10/24	Indira HarryPaul
Total Ammonia-N	LACH/NH4	9004018	N/A	2023/10/27	Prabhjot Kaur
Nitrate & Nitrite as Nitrogen in Water	LACH	8998056	N/A	2023/10/25	Chandra Nandlal
pH	AT	8998054	2023/10/21	2023/10/25	Nachiketa Gohil
Sulphate by Automated Turbidimetry	KONE	8998062	N/A	2023/10/26	Alina Dobreanu
Total Dissolved Solids	BAL	9005092	2023/10/25	2023/10/26	Razieh Tabesh
Total Suspended Solids	BAL	9004459	2023/10/25	2023/10/26	Shaneil Hall

Bureau Veritas ID: XJA307
Sample ID: MG-18-2
Matrix: Water

Collected: 2023/10/18
Shipped:
Received: 2023/10/20

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	8998052	N/A	2023/10/25	Nachiketa Gohil
Biochemical Oxygen Demand (BOD)	DO	8997246	2023/10/21	2023/10/26	Gurjot Kaur
Chloride by Automated Colourimetry	KONE	8998061	N/A	2023/10/26	Alina Dobreanu
Chemical Oxygen Demand	SPEC	9004854	N/A	2023/10/26	Nimarta Singh
Conductivity	AT	8998053	N/A	2023/10/25	Nachiketa Gohil

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TEST SUMMARY

Bureau Veritas ID: XJA307
Sample ID: MG-18-2
Matrix: Water

Collected: 2023/10/18
Shipped:
Received: 2023/10/20

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Dissolved Organic Carbon (DOC)	TOCV/NDIR	8999550	N/A	2023/10/24	Gyulshen Idriz
Dissolved Metals by ICPMS	ICP/MS	8998920	N/A	2023/10/24	Indira HarryPaul
Total Ammonia-N	LACH/NH4	9004018	N/A	2023/10/27	Prabhjot Kaur
Nitrate & Nitrite as Nitrogen in Water	LACH	8998056	N/A	2023/10/25	Chandra Nandlal
pH	AT	8998054	2023/10/21	2023/10/25	Nachiketa Gohil
Sulphate by Automated Turbidimetry	KONE	8998062	N/A	2023/10/26	Alina Dobreanu
Total Dissolved Solids	BAL	9007416	2023/10/26	2023/10/27	Darshan Patel
Total Suspended Solids	BAL	9004459	2023/10/25	2023/10/26	Shaneil Hall

Bureau Veritas ID: XJA308
Sample ID: MG-18-3R
Matrix: Water

Collected: 2023/10/18
Shipped:
Received: 2023/10/20

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	8998052	N/A	2023/10/25	Nachiketa Gohil
Biochemical Oxygen Demand (BOD)	DO	8997246	2023/10/21	2023/10/26	Gurjot Kaur
Chloride by Automated Colourimetry	KONE	8998061	N/A	2023/10/26	Alina Dobreanu
Chemical Oxygen Demand	SPEC	9004854	N/A	2023/10/26	Nimarta Singh
Conductivity	AT	8998053	N/A	2023/10/25	Nachiketa Gohil
Dissolved Organic Carbon (DOC)	TOCV/NDIR	8999550	N/A	2023/10/24	Gyulshen Idriz
Dissolved Metals by ICPMS	ICP/MS	8998920	N/A	2023/10/24	Indira HarryPaul
Total Ammonia-N	LACH/NH4	9004018	N/A	2023/10/27	Prabhjot Kaur
Nitrate & Nitrite as Nitrogen in Water	LACH	8998056	N/A	2023/10/25	Chandra Nandlal
pH	AT	8998054	2023/10/21	2023/10/25	Nachiketa Gohil
Sulphate by Automated Turbidimetry	KONE	8998062	N/A	2023/10/26	Alina Dobreanu
Total Dissolved Solids	BAL	9005092	2023/10/25	2023/10/26	Razieh Tabesh
Total Suspended Solids	BAL	9004459	2023/10/25	2023/10/26	Shaneil Hall

Bureau Veritas ID: XJA309
Sample ID: MG-QAQC-GW1
Matrix: Water

Collected: 2023/10/18
Shipped:
Received: 2023/10/20

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	8998052	N/A	2023/10/25	Nachiketa Gohil
Biochemical Oxygen Demand (BOD)	DO	8997246	2023/10/21	2023/10/26	Gurjot Kaur
Chloride by Automated Colourimetry	KONE	8998061	N/A	2023/10/26	Alina Dobreanu
Chemical Oxygen Demand	SPEC	9004854	N/A	2023/10/26	Nimarta Singh
Conductivity	AT	8998053	N/A	2023/10/25	Nachiketa Gohil
Dissolved Organic Carbon (DOC)	TOCV/NDIR	8999550	N/A	2023/10/24	Gyulshen Idriz
Dissolved Metals by ICPMS	ICP/MS	8998920	N/A	2023/10/24	Indira HarryPaul
Total Ammonia-N	LACH/NH4	9003912	N/A	2023/10/26	Prabhjot Kaur
Nitrate & Nitrite as Nitrogen in Water	LACH	8998056	N/A	2023/10/25	Chandra Nandlal
pH	AT	8998054	2023/10/21	2023/10/25	Nachiketa Gohil
Sulphate by Automated Turbidimetry	KONE	8998062	N/A	2023/10/26	Alina Dobreanu

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Bureau Veritas Job #: C3W8341
Report Date: 2023/11/02

BluMetric Environmental Inc
Client Project #: 230225-07
Site Location: Musclow Greenview
Sampler Initials: BM

TEST SUMMARY

Bureau Veritas ID: XJA309
Sample ID: MG-QAQC-GW1
Matrix: Water

Collected: 2023/10/18
Shipped:
Received: 2023/10/20

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Total Dissolved Solids	BAL	9005092	2023/10/25	2023/10/26	Razieh Tabesh
Total Suspended Solids	BAL	9004459	2023/10/25	2023/10/26	Shaneil Hall

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GENERAL COMMENTS

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

Package 1	3.3°C

TDS Analysis: Analysis was performed past sample holding time. This may increase the variability associated with these results.

Sample XJA305 [MG-DP5] : TSS Analysis: Due to the nature of the sample, a smaller than usual portion of the sample was used.

Sample XJA306 [MG-18-1] : TSS Analysis: Due to the nature of the sample, a smaller than usual portion of the sample was used.

Sample XJA307 [MG-18-2] : TSS Analysis: Due to the nature of the sample, a smaller than usual portion of the sample was used.

Sample XJA308 [MG-18-3R] : TSS Analysis: Due to the nature of the sample, a smaller than usual portion of the sample was used.

Sample XJA309 [MG-QAQC-GW1] : TSS Analysis: Due to the nature of the sample, a smaller than usual portion of the sample was used.

Results relate only to the items tested.

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QUALITY ASSURANCE REPORT

			Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
8997246	Total BOD	2023/10/26					ND,RDL=2	mg/L	5.4	30	94	80 - 120
8998052	Alkalinity (Total as CaCO3)	2023/10/25			98	85 - 115	ND, RDL=1.0	mg/L	0.58	20		
8998053	Conductivity	2023/10/25			102	85 - 115	ND, RDL=1.0	umho/cm	0.31	10		
8998054	pH	2023/10/25			102	98 - 103			0.43	N/A		
8998056	Nitrate (N)	2023/10/25	92	80 - 120	91	80 - 120	ND, RDL=0.10	mg/L	NC	20		
8998061	Dissolved Chloride (Cl-)	2023/10/26	88	80 - 120	98	80 - 120	ND, RDL=1.0	mg/L	11	20		
8998062	Dissolved Sulphate (SO4)	2023/10/26	88	75 - 125	95	80 - 120	ND, RDL=1.0	mg/L	1.6	20		
8998920	Dissolved Aluminum (Al)	2023/10/24	105	80 - 120	100	80 - 120	ND, RDL=4.9	ug/L				
8998920	Dissolved Barium (Ba)	2023/10/24	104	80 - 120	102	80 - 120	ND, RDL=2.0	ug/L	0.94	20		
8998920	Dissolved Boron (B)	2023/10/24	93	80 - 120	98	80 - 120	ND, RDL=10	ug/L	3.8	20		
8998920	Dissolved Cadmium (Cd)	2023/10/24	104	80 - 120	101	80 - 120	ND, RDL=0.090	ug/L	NC	20		
8998920	Dissolved Calcium (Ca)	2023/10/24	NC	80 - 120	101	80 - 120	ND, RDL=200	ug/L	4.8	20		
8998920	Dissolved Chromium (Cr)	2023/10/24	94	80 - 120	95	80 - 120	ND, RDL=5.0	ug/L	NC	20		
8998920	Dissolved Cobalt (Co)	2023/10/24	98	80 - 120	97	80 - 120	ND, RDL=0.50	ug/L				
8998920	Dissolved Iron (Fe)	2023/10/24	100	80 - 120	97	80 - 120	ND, RDL=100	ug/L	NC	20		
8998920	Dissolved Lead (Pb)	2023/10/24	100	80 - 120	98	80 - 120	ND, RDL=0.50	ug/L	NC	20		
8998920	Dissolved Magnesium (Mg)	2023/10/24	NC	80 - 120	99	80 - 120	ND, RDL=50	ug/L	1.4	20		
8998920	Dissolved Manganese (Mn)	2023/10/24	98	80 - 120	98	80 - 120	ND, RDL=2.0	ug/L	6.2	20		
8998920	Dissolved Silver (Ag)	2023/10/24	96	80 - 120	102	80 - 120	ND, RDL=0.090	ug/L				
8998920	Dissolved Sodium (Na)	2023/10/24	NC	80 - 120	98	80 - 120	ND, RDL=100	ug/L	1.4	20		
8998920	Dissolved Zinc (Zn)	2023/10/24	96	80 - 120	98	80 - 120	ND, RDL=5.0	ug/L	3.7	20		
8999285	Dissolved Organic Carbon	2023/10/27	90	80 - 120	94	80 - 120	ND, RDL=0.4	mg/L	0.44	20		
8999550	Dissolved Organic Carbon	2023/10/24	93	80 - 120	98	80 - 120	ND, RDL=0.4	mg/L	0.17	20		
9001999	Total Suspended Solids	2023/10/26			98	85 - 115	ND, RDL=10	mg/L	NC	20		
9003912	Total Ammonia-N	2023/10/26	100	75 - 125	102	80 - 120	ND, RDL=0.050	mg/L	NC	20		
9004018	Total Ammonia-N	2023/10/27	100	75 - 125	101	80 - 120	ND, RDL=0.050	mg/L	NC	20		
9004459	Total Suspended Solids	2023/10/26			96	85 - 115	ND, RDL=10	mg/L	10	20		

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QUALITY ASSURANCE REPORT(CONT'D)

			Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
9004854	Total Chemical Oxygen Demand (COD)	2023/10/26	90	80 - 120	100	80 - 120	ND, RDL=4.0	mg/L	3.7	20		
9005092	Total Dissolved Solids	2023/10/26			97	90 - 110	ND, RDL=10	mg/L	2.4	20		
9007416	Total Dissolved Solids	2023/10/27			98	90 - 110	ND, RDL=10	mg/L	1.7	20		
9015963	Dissolved Aluminum (Al)	2023/11/01	91	80 - 120	96	80 - 120	ND, RDL=4.9	ug/L				
9015963	Dissolved Barium (Ba)	2023/11/01	89	80 - 120	93	80 - 120	ND, RDL=2.0	ug/L				
9015963	Dissolved Boron (B)	2023/11/01	88	80 - 120	92	80 - 120	ND, RDL=10	ug/L				
9015963	Dissolved Cadmium (Cd)	2023/11/01	91	80 - 120	94	80 - 120	ND, RDL=0.090	ug/L				
9015963	Dissolved Calcium (Ca)	2023/11/01	NC	80 - 120	97	80 - 120	ND, RDL=200	ug/L	1.8	20		
9015963	Dissolved Chromium (Cr)	2023/11/01	90	80 - 120	93	80 - 120	ND, RDL=5.0	ug/L				
9015963	Dissolved Cobalt (Co)	2023/11/01	90	80 - 120	94	80 - 120	ND, RDL=0.50	ug/L				
9015963	Dissolved Iron (Fe)	2023/11/01	93	80 - 120	96	80 - 120	ND, RDL=100	ug/L				
9015963	Dissolved Lead (Pb)	2023/11/01	89	80 - 120	92	80 - 120	ND, RDL=0.50	ug/L	1.2	20		
9015963	Dissolved Magnesium (Mg)	2023/11/01	NC	80 - 120	96	80 - 120	ND, RDL=50	ug/L	0.52	20		
9015963	Dissolved Manganese (Mn)	2023/11/01	91	80 - 120	94	80 - 120	ND, RDL=2.0	ug/L				
9015963	Dissolved Silver (Ag)	2023/11/01	90	80 - 120	95	80 - 120	ND, RDL=0.090	ug/L				
9015963	Dissolved Sodium (Na)	2023/11/01	NC	80 - 120	96	80 - 120	ND, RDL=100	ug/L				
9015963	Dissolved Zinc (Zn)	2023/11/01	89	80 - 120	93	80 - 120	ND, RDL=5.0	ug/L				

N/A = Not Applicable

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

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

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

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

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

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

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

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Bureau Veritas Job #: C3W8341
Report Date: 2023/11/02

BluMetric Environmental Inc
Client Project #: 230225-07
Site Location: Musclow Greenview
Sampler Initials: BM

VALIDATION SIGNATURE PAGE

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

Anastassia Hamanov, Scientific Specialist

Cristina Carriere, Senior Scientific Specialist

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

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Custody Tracking Form

T781226

Please use this form for custody tracking when submitting the work instructions via eCOC (electronic Chain of Custody). Please ensure your form has a barcode or a Bureau Veritas eCOC confirmation number in the top right hand side. This number links your electronic submission to your samples. This form should be placed in the cooler with your samples.

First Sample: MG-DP1
Last Sample: MG-QAQC-GW1
Sample Count: 9

Relinquished By				Received By			
Print: Brad McCallum	Sign: Brad M/L	Date	2023/10/19	Print: NIRAL PATEL	Sign: Niral	Date	2023/10/20
		Time (24 HR)	08:00			Time (24 HR)	08:35
Print	Sign	Date	YYYY/MM/DD	Print	Sign	Date	YYYY/MM/DD
		Time (24 HR)	HH:MM			Time (24 HR)	HH:MM
Print	Sign	Date	YYYY/MM/DD	Print	Sign	Date	YYYY/MM/DD
		Time (24 HR)	HH:MM			Time (24 HR)	HH:MM

Unless otherwise agreed to, submissions and use of services are governed by Bureau Veritas' standard terms and conditions which can be found at www.bvna.com.

Triage Information

Sampled By (Print): Brad McCallum / Matt DeGeer

# of Coolers/Pkgs: 1

Rush ☐ Immediate Test ☐ Food Residue ☐

Micro ☐ Food Chemistry ☐

*** LABORATORY USE ONLY ***

Received At

Labeled By

Verified By

Lab Comments:

20-Oct-23 08:35
Christine Gripton
C3W8341
AJH ENV-1594

Custody Seal		Cooling Media	Temperature °C		
Present (Y/N)	Intact (Y/N)	Present (Y/N)	1	2	3
Y	Y	Y	5	2	3
Drinking Water Metals Preservation Check Done (Circle)				YES	NO

COR FCD-00383/4

Page 1 of 1

Appendix D

D-3 Surface Water Laboratory Reports (Including Toxicity)

AGAT Laboratories

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

CLIENT NAME: BLUMETRIC ENVIRONMENTAL INC.
4 Cataraqui Street
Kingston, ON K7K1Z7
(613) 531-2725
ATTENTION TO: Carolyn Miller
PROJECT: 230225-07
AGAT WORK ORDER: 23T021055
WATER ANALYSIS REVIEWED BY: Chuandi Zhang, Lab Team Lead
DATE REPORTED: May 26, 2023
PAGES (INCLUDING COVER): 8
VERSION*: 2

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

*Notes

VERSION 2:V2 issued 2023-05-26. Total Phenols data removed by client request. Supersedes previous version. (LB)

AGAT Laboratories

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

Certificate of Analysis

AGAT WORK ORDER: 23T021055

PROJECT: 230225-07

CLIENT NAME: BLUMETRIC ENVIRONMENTAL INC.

ATTENTION TO: Carolyn Miller

SAMPLING SITE:Musclow-Greenview

SAMPLED BY:

BOD5

DATE RECEIVED: 2023-05-04

DATE REPORTED: 2023-05-26

				SAMPLE DESCRIPTION:	MG-SW1	MG-SW2	MG-SW3	MG-SW4A	MG-SW6	MG-QAQC-SW1
				SAMPLE TYPE:	Water	Water	Water	Water	Water	Water
				DATE SAMPLED:	2023-05-02 10:25	2023-05-02 11:50	2023-05-02 15:00	2023-05-02 09:10	2023-05-02 09:38	2023-05-02 09:10
Parameter	Unit	G / S	RDL		4961611	4961639	4961640	4961641	4961642	4961643
Biochemical Oxygen Demand, Total	mg/L		2		<2	<2	<2	<2	<2	<2

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

Analysis performed at AGAT Halifax (unless marked by *)

Certified By:

AGAT Laboratories

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

Certificate of Analysis

AGAT WORK ORDER: 23T021055

PROJECT: 230225-07

CLIENT NAME: BLUMETRIC ENVIRONMENTAL INC.

ATTENTION TO: Carolyn Miller

SAMPLING SITE:Musclow-Greenview

SAMPLED BY:

Musclow-Greenview Landfill - Surface Water Parameters

DATE RECEIVED: 2023-05-04

DATE REPORTED: 2023-05-26

		SAMPLE DESCRIPTION:		MG-SW1	MG-SW2	MG-SW3	MG-SW4A	MG-SW6	MG-QAQC-SW1
		SAMPLE TYPE:		Water	Water	Water	Water	Water	Water
		DATE SAMPLED:		2023-05-02 10:25	2023-05-02 11:50	2023-05-02 15:00	2023-05-02 09:10	2023-05-02 09:38	2023-05-02 09:10
Parameter	Unit	G / S	RDL	4961611	4961639	4961640	4961641	4961642	4961643
pH	pH Units		NA	7.42	7.16	7.80	7.01	7.44	6.91
Alkalinity (as CaCO3)	mg/L		5	82	34	182	16	54	16
Electrical Conductivity	µS/cm		2	281	94	468	63	159	63
Hardness (as CaCO3) (Calculated)	mg/L		0.5	85.6	20.8	133	17.3	53.6	20.2
Total Dissolved Solids	mg/L		10	180	74	256	64	98	56
Total Suspended Solids	mg/L		10	<10	<10	<10	<10	<10	<10
Chloride	mg/L		0.10	21.0	5.40	18.0	3.42	8.96	3.37
Nitrate as N	mg/L		0.05	<0.05	<0.05	0.72	<0.05	<0.05	<0.05
Nitrite as N	mg/L		0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Sulphate	mg/L		0.10	30.5	4.49	33.1	4.96	11.0	4.94
Ammonia as N	mg/L		0.02	<0.02	<0.02	0.15	<0.02	<0.02	<0.02
Ammonia-Un-ionized (Calculated)	mg/L		0.000002	<0.000002	<0.000002	0.192	<0.000002	<0.000002	<0.000002
Total Kjeldahl Nitrogen	mg/L		0.10	0.40	0.23	0.47	0.29	0.32	0.28
Total Phosphorus	mg/L		0.02	<0.02	<0.02	<0.02	<0.02	0.05	<0.02
Chemical Oxygen Demand	mg/L		5	26	19	27	31	28	28
Total Calcium	mg/L		0.20	31.8	6.50	43.2	5.03	18.8	6.51
Total Magnesium	mg/L		0.10	1.51	1.11	6.16	1.15	1.61	0.97
Total Potassium	mg/L		0.50	0.94	<0.50	4.79	0.73	0.95	0.74
Total Sodium	mg/L		0.10	12.0	6.15	12.0	2.51	5.83	2.01
Aluminum-dissolved	mg/L		0.004	0.088	0.057	0.062	0.034	0.046	0.092
Total Barium	mg/L		0.002	0.031	0.010	0.041	0.011	0.015	0.012
Total Boron	mg/L		0.010	0.015	0.018	0.268	0.023	0.027	0.022
Total Cadmium	mg/L		0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Total Cobalt	mg/L		0.0005	<0.0005	<0.0005	0.0005	<0.0005	<0.0005	<0.0005
Total Copper	mg/L		0.001	0.002	<0.001	<0.001	<0.001	<0.001	0.004
Total Iron	mg/L		0.010	0.156	0.091	0.094	0.195	0.077	0.208
Total Lead	mg/L		0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Total Manganese	mg/L		0.002	0.009	0.006	0.019	0.005	0.030	0.007
Total Zinc	mg/L		0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020

Certified By:

AGAT Laboratories

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

Certificate of Analysis

AGAT WORK ORDER: 23T021055

PROJECT: 230225-07

CLIENT NAME: BLUMETRIC ENVIRONMENTAL INC.

ATTENTION TO: Carolyn Miller

SAMPLING SITE:Musclow-Greenview

SAMPLED BY:

Musclow-Greenview Landfill - Surface Water Parameters

DATE RECEIVED: 2023-05-04

DATE REPORTED: 2023-05-26

				SAMPLE DESCRIPTION:	MG-SW1	MG-SW2	MG-SW3	MG-SW4A	MG-SW6	MG-QAQC-SW1
				SAMPLE TYPE:	Water	Water	Water	Water	Water	Water
				DATE SAMPLED:	2023-05-02 10:25	2023-05-02 11:50	2023-05-02 15:00	2023-05-02 09:10	2023-05-02 09:38	2023-05-02 09:10
Parameter	Unit	G / S	RDL		4961611	4961639	4961640	4961641	4961642	4961643
Lab Filtration Aluminum Dissolved					2023/05/09	2023/05/09	2023/05/09	2023/05/09	2023/05/09	2023/05/09

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

4961611-4961643 The calculation of Un-ionized Ammonia: was based on field measured parameters (pH and temperature); Value is reported as calculated.

Un-ionized Ammonia detection limit is a calculated RDL

Analysis performed at AGAT Toronto (unless marked by *)

Certified By:

AGAT Laboratories

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

Quality Assurance

CLIENT NAME: BLUMETRIC ENVIRONMENTAL INC.
AGAT WORK ORDER: 23T021055
PROJECT: 230225-07
ATTENTION TO: Carolyn Miller
SAMPLING SITE:Musclow-Greenview
SAMPLED BY:

Water Analysis

RPT Date: May 26, 2023

PARAMETER	Batch	Sample Id	DUPLICATE Dup #1	Dup #2	RPD	Method Blank	REFERENCE MATERIAL Measured Value	Acceptable Limits Lower	Upper	METHOD BLANK SPIKE Recovery	Acceptable Limits Lower	Upper	MATRIX SPIKE Recovery	Acceptable Limits Lower	Upper
Musclow-Greenview Landfill - Surface Water Parameters															
pH	4963228		7.88	7.94	0.8%	NA	100%	90%	110%						
Alkalinity (as CaCO3)	4963228		246	249	1.2%	< 5	95%	80%	120%						
Electrical Conductivity	4963228		532	529	0.6%	< 2	105%	90%	110%						
Total Dissolved Solids	4961611	4961611	180	174	3.4%	< 10	96%	80%	120%						
Total Suspended Solids	4961611	4961611	<10	<10	NA	< 10	94%	80%	120%						
Chloride	4961347		77.7	76.2	1.9%	< 0.10	95%	70%	130%	100%	80%	120%	100%	70%	130%
Nitrate as N	4961347		<0.05	<0.05	NA	< 0.05	95%	70%	130%	95%	80%	120%	97%	70%	130%
Nitrite as N	4961347		<0.05	<0.05	NA	< 0.05	103%	70%	130%	108%	80%	120%	107%	70%	130%
Sulphate	4961347		37.0	36.6	1.1%	< 0.10	95%	70%	130%	96%	80%	120%	100%	70%	130%
Ammonia as N	4968497		<0.02	<0.02	NA	< 0.02	100%	70%	130%	103%	80%	120%	100%	70%	130%
Total Kjeldahl Nitrogen	4957885		6.35	6.33	0.3%	< 0.10	101%	70%	130%	101%	80%	120%	NA	70%	130%
Total Phosphorus	4978434		<0.02	<0.02	NA	< 0.02	102%	70%	130%	105%	80%	120%	100%	70%	130%
Chemical Oxygen Demand	4957938		12	14	NA	< 5	111%	80%	120%	109%	90%	110%	108%	70%	130%
Total Calcium	4954825		93.9	84.8	10.2%	< 0.20	89%	70%	130%	110%	80%	120%	97%	70%	130%
Total Magnesium	4954825		45.3	41.6	8.5%	< 0.10	105%	70%	130%	114%	80%	120%	116%	70%	130%
Total Potassium	4954825		10.1	12.0	17.2%	< 0.50	82%	70%	130%	102%	80%	120%	99%	70%	130%
Total Sodium	4954825		61.0	58.8	3.7%	< 0.10	104%	70%	130%	116%	80%	120%	121%	70%	130%
Aluminum-dissolved	4957371		0.008	<0.004	NA	< 0.004	102%	70%	130%	99%	80%	120%	89%	70%	130%
Total Barium	4954825		0.034	0.033	3.0%	< 0.002	101%	70%	130%	103%	80%	120%	99%	70%	130%
Total Boron	4954825		0.171	0.192	11.6%	< 0.010	109%	70%	130%	104%	80%	120%	106%	70%	130%
Total Cadmium	4954825		<0.0001	<0.0001	NA	< 0.0001	100%	70%	130%	102%	80%	120%	97%	70%	130%
Total Cobalt	4954825		0.0010	0.0011	NA	< 0.0005	103%	70%	130%	100%	80%	120%	106%	70%	130%
Total Copper	4954825		0.008	0.010	NA	< 0.001	97%	70%	130%	97%	80%	120%	97%	70%	130%
Total Iron	4954825		0.667	0.726	8.5%	< 0.010	100%	70%	130%	100%	80%	120%	102%	70%	130%
Total Lead	4954825		0.002	0.002	NA	< 0.001	104%	70%	130%	102%	80%	120%	107%	70%	130%
Total Manganese	4954825		0.199	0.234	16.2%	< 0.002	108%	70%	130%	103%	80%	120%	108%	70%	130%
Total Zinc	4954825		<0.020	<0.020	NA	< 0.020	98%	70%	130%	98%	80%	120%	103%	70%	130%

Comments: NA signifies Not Applicable.
Duplicate NA: results are under 5X the RDL and will not be calculated.

Matrix spike NA: Spike level < native concentration. Matrix spike acceptance limits do not apply and are not calculated.

BOD5															
Biochemical Oxygen Demand, Total	4961349		<6	5	NA	< 2	86%	70%	130%						

Comments: If RPD value is NA, the results of the duplicates are less than 5x the RDL and the RPD will not be calculated.

Certified By:

AGAT Laboratories

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

Quality Assurance

CLIENT NAME: BLUMETRIC ENVIRONMENTAL INC.

AGAT WORK ORDER: 23T021055

PROJECT: 230225-07

ATTENTION TO: Carolyn Miller

SAMPLING SITE:Musclow-Greenview

SAMPLED BY:

Water Analysis (Continued)

RPT Date: May 26, 2023			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper

AGAT Laboratories

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

Method Summary

CLIENT NAME: BLUMETRIC ENVIRONMENTAL INC.

AGAT WORK ORDER: 23T021055

PROJECT: 230225-07

ATTENTION TO: Carolyn Miller

SAMPLING SITE:Musclow-Greenview

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Water Analysis			
Biochemical Oxygen Demand, Total	INOR-121-6023	SM 5210 B	INCUBATOR
pH	INOR-93-6000	modified from SM 4500-H+ B	PC TITRATE
Alkalinity (as CaCO3)	INOR-93-6000	Modified from SM 2320 B	PC TITRATE
Electrical Conductivity	INOR-93-6000	modified from SM 2510 B	PC TITRATE
Hardness (as CaCO3) (Calculated)	MET-93-6105	modified from EPA SW-846 6010C & 200.7 & SM 2340 B	CALCULATION
Total Dissolved Solids	INOR-93-6028	modified from EPA 1684,ON MOECC E3139,SM 2540C,D	BALANCE
Total Suspended Solids	INOR-93-6028	modified from EPA 1684,ON MOECC E3139,SM 2540C,D	BALANCE
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	modified from 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-NH3 H	LACHAT FIA
Ammonia-Un-ionized (Calculated)		MOE REFERENCE, PWQOs Tab 2	CALCULATION
Total Kjeldahl Nitrogen	INOR-93-6048	modified from EPA 351.2 and SM 4500-NORG D	LACHAT FIA
Total Phosphorus	INOR-93-6022	modified from SM 4500-P B and SM 4500-P E	SPECTROPHOTOMETER
Chemical Oxygen Demand	INOR-93-6042	modified from SM 5220 A and SM 5220 D	SPECTROPHOTOMETER
Total Calcium	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP/MS
Total Magnesium	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP/MS
Total Potassium	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP/MS
Total Sodium	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP/MS
Aluminum-dissolved	MET-93-6103	modified from EPA 200.8 and EPA 3005A	ICP-MS
Total Barium	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Boron	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Cadmium	MET -93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Cobalt	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Copper	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Iron	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Lead	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Manganese	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Zinc	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Lab Filtration Aluminum Dissolved	SR-78-9001		FILTRATION

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

Chain of Custody Record

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

Laboratory Use Only
Work Order #: 23T021055
Cooler Quantity: 2 large
Arrival Temperatures: 4.2 | 4.1 | 4.9
Custody Seal Intact: ☐ Yes ☐ No ☒ N/A
Notes: bagged ice

Report Information:
Company: BluMetric
Contact: Carolyn Miller
Address: 4 Cataraqui St
Kingston, ON, K7K1Z7
Phone: 613-328-0243 Fax:
Reports to be sent to:
1. Email: cmiller@blumetric.ca
2. Email: cbandler@blumetric.ca

Regulatory Requirements:
(Please check all applicable boxes)
☐ Regulation 153/04 — Table (Indicate One) ☐ Ind/Com ☐ Res/Park ☐ Agriculture; Soil Texture (Check One) ☐ Coarse ☐ Fine
☐ Excess Soils R406 — Table (Indicate One)
☐ Regulation 558
☐ CCME
☐ Sewer Use ☐ Sanitary ☐ Storm — Region
☑ Prov. Water Quality Objectives (PWQO)
☐ Other — Indicate One

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

Report Guideline on *Certificate of Analysis* ☑ Yes ☐ No

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

Project Information:
Project: 230225-07
Site Location: Musclow-Greenview
Sampled By:
AGAT Quote #: 740803 PO: 230225-07
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: ap@blumetric.ca

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

Sample Identification	Date Sampled	Time Sampled	# of Containers	Sample Matrix	Comments/ Special Instructions	Field Filtered - Metals, Hg, CrVI, DOC Y/N	O. Reg 153: Metals & Inorganics	O. Reg 153: Metals - ☐ CrVI, ☐ Hg, ☐ HWSB	O. Reg 153: BTEX, F1-F4 PHCs	O. Reg 153: Analyze F4G if required ☐ Yes ☐ No	O. Reg 153: PAHs	O. Reg 153: PCBs	O. Reg 153: VOC	O. Reg 558: Landfill Disposal Characterization TCLP: ☐ TCLP: ☐ M&I ☐ VOCs ☐ A&Ns ☐ B(a)P ☐ PCBs	O. Reg 406: Excess Soils SPLP Rainwater Leach ☐ SPLP: ☐ Metals ☐ VOCs ☐ SVOCs	O. Reg 406: Excess Soils Characterization Package pH, ICPMS Metals, BTEX, F1-F4	Salt - EC/SAR	93-262 Surface water	121-405 BOD		Field Temp		Field pH		Potentially Hazardous or High Concentration (Y/N)
MG-SW1	May 2/23	10:25 AM/PM	8	SW		N												☑	☑		6.2		6.96		
MG-SW2	May 2/23	11:50 AM/PM	8	SW		N												☑	☑		7.6		6.85		
MG-SW3	May 2/23	15:00 AM/PM	8	SW	Lab Filter: Diss. Aluminium	N												☑	☑		9.2		7.50		
MG-SW4A	May 2/23	9:10 AM/PM	8	SW		N												☑	☑		5.6		6.11		
MG-SW6	May 2/23	9:30 AM/PM	8	SW		N												☑	☑		5.8		6.76		
MG-QAQC-SW1	May 2/23	9:10 AM/PM	8	SW		N												☑	☑		5.6		6.11		
		AM/PM																							
		AM/PM																							
		AM/PM																							
		AM/PM																							
		AM/PM																							

Samples Relinquished By (Print Name and Sign)	Date	Time	Samples Received By (Print Name and Sign)	Date	Time
Brad McCallum / Brad McCallum	May 3, 2023	8:00 AM	Andy T Andy	5/4/23	8:30 AM
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 1
No:

Your P.O. #: 230301-00
Site#: 700
Your C.O.C. #: 930470-04-01

Attention: Cecilia Bandler

BluMetric Environmental Inc
The Tower - The Woolen Mill
4 Cataraqui St
Kingston, ON
CANADA K7K 1Z7

Report Date: 2023/05/15
Report #: R7629536
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BUREAU VERITAS JOB #: C3D0942
Received: 2023/05/09, 09:08

Sample Matrix: Water
Samples Received: 6

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Phenols (4AAP)	6	N/A	2023/05/11	CAM SOP-00444	OMOE E3179 m

Remarks:

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

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

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

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by Bureau Veritas, results relate to the supplied samples tested.

Reference Method suffix “m” indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

Your P.O. #: 230301-00
Site#: 700
Your C.O.C. #: 930470-04-01

Attention: Cecilia Bandler

BluMetric Environmental Inc
The Tower - The Woolen Mill
4 Cataraqui St
Kingston, ON
CANADA K7K 1Z7

Report Date: 2023/05/15
Report #: R7629536
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BUREAU VERITAS JOB #: C3D0942
Received: 2023/05/09, 09:08

Encryption Key

Please direct all questions regarding this Certificate of Analysis to:
Christine Gripton, Senior Project Manager
Email: Christine.Gripton@bureauveritas.com
Phone# (519)652-9444

==========

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

Bureau Veritas Job #: C3D0942
Report Date: 2023/05/15

BluMetric Environmental Inc
Your P.O. #: 230301-00
Sampler Initials: BM

RESULTS OF ANALYSES OF WATER

Bureau Veritas ID		VTJ584	VTJ585	VTJ586	VTJ587	VTJ588	VTJ589		
Sampling Date		2023/05/02 10:25	2023/05/02 11:50	2023/05/02 15:00	2023/05/02 09:10	2023/05/02 09:38	2023/05/02 09:10		
COC Number		930470-04-01	930470-04-01	930470-04-01	930470-04-01	930470-04-01	930470-04-01		
	UNITS	**MG-SW1**	**MG-SW2**	**MG-SW3**	**MG-SW4A**	**MG-SW6**	**MG-QAQC-SW1**	**RDL**	**QC Batch**
Inorganics									
Phenols-4AAP	mg/L	ND	ND	ND	ND	ND	ND	0.0010	8660578

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
ND = Not Detected at a concentration equal or greater than the indicated Detection Limit.

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

TEST SUMMARY

Bureau Veritas ID: VTJ584 **Collected:** 2023/05/02
Sample ID: MG-SW1 **Shipped:**
Matrix: Water **Received:** 2023/05/09

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Phenols (4AAP)	TECH/PHEN	8660578	N/A	2023/05/11	Mandeep Kaur

Bureau Veritas ID: VTJ585 **Collected:** 2023/05/02
Sample ID: MG-SW2 **Shipped:**
Matrix: Water **Received:** 2023/05/09

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Phenols (4AAP)	TECH/PHEN	8660578	N/A	2023/05/11	Mandeep Kaur

Bureau Veritas ID: VTJ586 **Collected:** 2023/05/02
Sample ID: MG-SW3 **Shipped:**
Matrix: Water **Received:** 2023/05/09

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Phenols (4AAP)	TECH/PHEN	8660578	N/A	2023/05/11	Mandeep Kaur

Bureau Veritas ID: VTJ587 **Collected:** 2023/05/02
Sample ID: MG-SW4A **Shipped:**
Matrix: Water **Received:** 2023/05/09

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Phenols (4AAP)	TECH/PHEN	8660578	N/A	2023/05/11	Mandeep Kaur

Bureau Veritas ID: VTJ588 **Collected:** 2023/05/02
Sample ID: MG-SW6 **Shipped:**
Matrix: Water **Received:** 2023/05/09

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Phenols (4AAP)	TECH/PHEN	8660578	N/A	2023/05/11	Mandeep Kaur

Bureau Veritas ID: VTJ589 **Collected:** 2023/05/02
Sample ID: MG-QAQC-SW1 **Shipped:**
Matrix: Water **Received:** 2023/05/09

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Phenols (4AAP)	TECH/PHEN	8660578	N/A	2023/05/11	Mandeep Kaur

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GENERAL COMMENTS

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

Package 1	8.0°C

Results relate only to the items tested.

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

Bureau Veritas Job #: C3D0942
Report Date: 2023/05/15

QUALITY ASSURANCE REPORT

BluMetric Environmental Inc
Your P.O. #: 230301-00
Sampler Initials: BM

			Matrix Spike		SPIKED BLANK		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
8660578	Phenols-4AAP	2023/05/11	100	80 - 120	97	80 - 120	ND, RDL=0.0010	mg/L	5.7	20

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

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

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

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

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VALIDATION SIGNATURE PAGE

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

Cristina Carriere, Senior Scientific Specialist

Bureau Veritas has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation, please refer to the Validation Signatures page if included, otherwise available by request. For Department specific Analyst/Supervisor validation names, please refer to the Test Summary section if included, otherwise available by request. This report is authorized by {0}, {1} responsible for {2} {3} laboratory operations.

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

IMMEDIATE

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

Page 1 of 1

CHAIN OF CUSTODY RECORD

INVOICE TO:		REPORT TO:		PROJECT INFORMATION:		Laboratory Use Only:	
Company Name:	#1192 BluMetric Environmental Inc	Company Name:	#5638 BluMetric Environmental Inc	Quotation #:	C30114	Bureau Veritas Job #:	Bottle Order #: 930470
Attention:	Accounts Payable	Attention:	Cecilia Bandler	P.O. #:	236361-06		
Address:	1682 Woodward Drive	Address:	The Tower - The Woolen Mill 4 Cataraqui St	Project:		COC #:	Project Manager:
	Ottawa ON K2C 3R8		Kingston ON K7K 1Z7	Project Name:		C#930470-04-01	Christine Gripton
Tel:	(613) 839-3053 Fax: (613) 839-5376	Tel:	(613) 531-2725 Fax:	Site #:	700		
Email:	ap@blumetric.ca	Email:	cbandler@blumetric.ca	Sampled By:	BM / MD		

MOE REGULATED DRINKING WATER OR WATER INTENDED FOR HUMAN CONSUMPTION MUST BE SUBMITTED ON THE BUREAU VERITAS DRINKING WATER CHAIN OF CUSTODY

Regulation 153 (2011)	Other Regulations	Special Instructions
☐ Table 1 ☐ Res/Park ☐ Medium/Fine	☐ CCME ☐ Sanitary Sewer Bylaw	
☐ Table 2 ☐ Ind/Comm ☐ Coarse	☐ Reg 558 ☐ Storm Sewer Bylaw	
☐ Table 3 ☐ Agri/Other ☐ For RSC	☐ MISA Municipality	
☐ Table ___	☒ PWQO ☐ Reg 406 Table	
	☐ Other	

Include Criteria on Certificate of Analysis (Y/N)? ___

ANALYSIS REQUESTED (PLEASE BE SPECIFIC)

Turnaround Time (TAT) Required:
Please provide advance notice for rush projects

Regular (Standard) TAT: X
(will be applied if Rush TAT is not specified)
Standard TAT = 5-7 Working days for most tests.
Please note: Standard TAT for certain tests such as BOD and Dioxins/Furans are > 5 days - contact your Project Manager for details.

Job Specific Rush TAT (if applies to entire submission)
Date Required: ___ Time Required: ___
Rush Confirmation Number: ___ *(call lab for #)*

	Sample Barcode Label	Sample (Location) Identification	Date Sampled	Time Sampled	Matrix	Field Filtered (please circle): Metals / Hg / Cr VI	Phenols (4AAP)									# of Bottles	Comments
1		MG-SW1	May 2/23	10:25	SW	N	✓									1	
2		MG-SW2	May 2/23	11:50	SW	N	✓									1	
3		MG-SW3	May 2/23	15:00	SW	N	✓									1	
4		MG-SW4A	May 2/23	9:10	SW	N	✓									1	
5		MG-SW6	May 2/23	9:38	SW	N	✓									1	
6		MG-QAQC-SW1	May 2/23	9:10	SW	N	✓									1	
7																	
8																	
9																	
10																	

09-May-23 09:08
Christine Gripton
C3D0942
AK0 ENV-1231

* RELINQUISHED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	RECEIVED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	# jars used and not submitted
Brad M'Lud / Brad M'Cullum	2023/05					

Laboratory Use Only

Time Sensitive	Temperature (°C) on Recei	Custody Seal	Yes	No
	8 9 7	Present		
		Intact		

* UNLESS OTHERWISE AGREED TO IN WRITING, WORK SUBMITTED ON THIS CHAIN OF CUSTODY IS SUBJECT TO BUREAU VERITAS'S STANDARD TERMS AND CONDITIONS. SIGNING OF THIS CHAIN OF CUSTODY DOCUMENT IS ACKNOWLEDGMENT AND ACCEPTANCE OF OUR TERMS WHICH ARE AVAILABLE FOR VIEWING AT WWW.BVNA.COM/ENVIRONMENTAL-LABORATORIES/RESOURCES/COC-TERMS-AND-CONDITIONS.

* IT IS THE RESPONSIBILITY OF THE RELINQUISHER TO ENSURE THE ACCURACY OF THE CHAIN OF CUSTODY RECORD. AN INCOMPLETE CHAIN OF CUSTODY MAY RESULT IN ANALYTICAL TAT DELAYS.

** SAMPLE CONTAINER, PRESERVATION, HOLD TIME AND PACKAGE INFORMATION CAN BE VIEWED AT WWW.BVNA.COM/ENVIRONMENTAL-LABORATORIES/RESOURCES/CHAIN-CUSTODY-FORMS-COCS.

SAMPLES MUST BE KEPT COOL (< 10° C) FROM TIME OF SAMPLING UNTIL DELIVERY TO BUREAU VERITAS

White: Bureau Veritas Yellow: Client

Bureau Veritas Canada (2019) Inc.

CADUCEON ENVIRONMENTAL LABORATORIES
Client committed. Quality assured. Canadian owned.

CERTIFICATE OF ANALYSIS

Final Report

C.O.C.: -

REPORT No: 23-010848 - Rev. 0

Report To:
Blumetric Environmental
3108 Carp Rd
PO Box 430
Carp, ON K0A 1L0

CADUCEON Environmental Laboratories
285 Dalton Ave
Kingston, ON K7K 6Z1

Attention: Cecilia Bandler

DATE RECEIVED: 2023-May-05
DATE REPORTED: 2023-May-19
SAMPLE MATRIX: Surface Water

CUSTOMER PROJECT: Musclow Greenview - 230225-07
P.O. NUMBER: 230301-00

Analyses	Qty	Site Analyzed	Authorized	Date Analyzed	Lab Method	Reference Method
Phenols (Liquid)	6	KINGSTON	JMACINNES	2023-May-18	PHEN-01	MECP E3179

R.L. = Reporting Limit
NC = Not Calculated
Test methods may be modified from specified reference method unless indicated by an *

			Client I.D.	MG-SW1	MG-SW2	MG-SW3	MG-SW4A	MG-SW6
			Sample I.D.	23-010848-1	23-010848-2	23-010848-3	23-010848-4	23-010848-5
			Date Collected	2023-05-02	2023-05-02	2023-05-02	2023-05-02	2023-05-02
Parameter	**Units**	**R.L.**		-	-	-	-	-
Phenolics	mg/L	0.001		<0.001	<0.001	<0.001	<0.001	<0.001

			Client I.D.	MG-QAQC-SW1
			Sample I.D.	23-010848-6
			Date Collected	2023-05-02
Parameter	**Units**	**R.L.**		-
Phenolics	mg/L	0.001		<0.001

Richard Lecompte
Laboratory Supervisor

NAUTILUS ENVIRONMENTAL

Certificate of Analysis

ACUTE LETHALITY BIOASSAY REPORT
(Single-Concentration Test)

CLIENT:

BluMetric Environmental, 4 Cataraqui St., Kingston, ON K7K 1Z7

TEST RESULTS:

Sample Name[1]	Sample Number	Date Collected	Date Received	Date Tested	Test Species[2]	Percent Mortality[3]	Method Deviations
MG-SW3	6500-0012305	02-May-23	04-May-23	04-May-23 04-May-23	RBT DM	0% 0%	None None

1 - Results relate only to the sample tested. Tested as received from client.

2 - Test Type and Species RBT = Rainbow Trout 96-hour 100% Effluent Concentration Acute Lethality Test
DM = *Daphnia magna* 48-hour 100% Effluent Concentration Acute Lethality Test

3 - Most regulations regard ≤50% mortality to be a "pass". Check your applicable regulatory requirements.

TEST PROTOCOLS:

Environment Canada, "Biological Test Method: Reference Method for Determining Acute Lethality of Effluents to Rainbow Trout", Environmental Technology Centre, Ottawa, Ontario, Report EPS 1/RM/13 Second Edition - December 2000, including May 2007 and February 2016 Amendments. (Nautilus Test Method RT-SC-R1.7)

Environment Canada, "Biological Test Method: Reference Method for Determining Acute Lethality of Effluents to *Daphnia magna*", Environmental Technology Centre, Ottawa, Ontario, Report EPS 1/RM/14 Second Edition - December 2000, including February 2016 Amendment. (Nautilus Test Method DM-SC-R1.7)

REFERENCE/HEALTH DATA:

Trout

Date Reference Test Initiated: 06-Apr-23 **Reference Chemical:** Zinc **Fish Lot #:** LF150323-1
96-Hour LC50: 0.27 mg/L **95% Confidence Limits:** 0.21 mg/L; 0.35 mg/L
Historic Geometric Mean LC50: 0.33 mg/L **Historic Warning Limits (± 2 SD):** 0.14 mg/L; 0.78 mg/L

Daphnia magna

Date Reference Test Initiated: 02-May-23 **Reference Chemical:** Zinc
48-Hour LC50: 0.84 mg/L **95% Confidence Limits:** 0.73 mg/L; 0.98 mg/L
Historic Geometric Mean LC50: 1.02 mg/L **Historic Warning Limits (± 2 SD):** 0.39 mg/L; 2.63 mg/L

TEST RESULTS APPROVED BY:

Date: May 10, 2023

C. D'Andrea

Carol D'Andrea
Laboratory Supervisor

Y:\bioassays\2023\6000\6500-001\6500-0012305 TD

704 Mara Street Point Edward, ON N7V 1X4
519-339-8787

NAUTILUS ENVIRONMENTAL RAINBOW TROUT TOXICITY TEST BENCH SHEET

Sample Information		Test Information			
Sample Method: Composite (Grab)/Other		Test Type: Single Concentration / LC50 / TIE / Screen			
Account 6500.001	Sample Number 6500.0012305	Date/Time Started 04.05.23 / 1445	Analyst Starting Test MC		
Client Blumetric	Sample Name MG-SW3	Date/Time Ended 08.05.23 / 14:45	Fish Lot # LF150323		
Person Collecting Sample BM/MD	Temperature Upon Receipt 13.0 °C	Test Volume 20 L Per Vessel	Number of Fish Per Vessel 10	Number of Vessels Per Conc. (1) 2	
Date/Time Collected 02.05.23 / 1500		Pre-Aeration No (Yes)	Pre-Aeration Duration 30 min	Pre-Aeration Rate 6.5 ±0.26 ml/min·L⁻¹	
Date/Time Received in Lab 04.05.23 / 1100		Rate of Aeration During Test 6.5 ±0.26 ml/min·L⁻¹	Dilution Water dechlor	Sample pH Adjustment (No) Yes	
Sample Description clear, yellow	Sample Type Description surface water	Sample Point Description: MISA Other		Storage Temperature — °C	

Initial Sample Measurements Before Aeration - Cond.: ~~209~~ 215 µmhos D.O: 9.6 mg/L 98 % Temp: 16 °C pH: 7.2 Air Flow Meter Reading: 0.150 L/min.
Instrument Identification- M/P #: 7/8 M/P #: 7/5 M/P #: 13/91 Meter #: 7

TOXICANT	CONC %	TOTAL NUMBER DEAD # OF HOURS FROM START OF TEST					Initial Measurements After Pre-Aeration					Meter/Probe			Initials	Final Measurements						Meter/Probe		Initials
		2	24	48	72	96	Time	Cond (umhos)	D.O. (mg/L)/%		°C	pH (units)	Cond	D.O./ Temp	pH		Date	Time	°C	D.O. (mg/L)/%		pH (units)	D.O./ Temp	pH	
Control		0	0	0	0	0	1435	222	10.1	100	15	7.9	7/8	7/5	13/91	MC	08.05.23	14:45	15	9.5	96	7.9	7/5	13/91	KK
(1)	100%	0	0	0	0	0	↓	215	9.6	98	16	7.4	↓	↓	↓	↓	↓	↓	15	9.4	95	7.9	↓	↓	KK
Time Initials		1700 MC	1040 MC	10:00 CF	11:20 CF	14:45 KK	Number of Control Fish Showing Atypical Behaviour: <24h: 0			24h: 0		48h: 0		72h: 0		96h: 0								

Percent Mortality	0 %	LENGTH (mm)		WEIGHT (g) Initials: CS	Holding Mortalities 7-days Preceding Test
LC50 (Lower; Upper Limit)	—	Mean (SD)	45.5 (4.3)	Mean (SD) 0.84 (0.27)	Number Dead (recorded daily for 7 days) 0 + 0 + 0 + 0 + 0 + 0 + 0
Method	—	Min/Max	41 / 53	Min/Max 0.59 / 1.35	Total Number Dead for 7 days Preceding Test = 0
Verified By (initials)	QP	Sample Size	10	Loading Density 0.92 g/L	7-Day Holding Mortality ([total number dead/number of fish in batch] x 100) 0

Number of Fish in Batch at Day (-)7: 873

Observations and notes:

Nautilus *Daphnia magna* To[illegible]city Test Bench Sheet

Sample Information		Test Information			
Sample Method: Composite (Grab) Other		Test Type: (Single Concentration) LC50 TIE Screen			
Account Number 6500.001	Sample # 6500.001.2305	Date Started/Time	04.05.23 14:15	Analyst Starting Test	KK / KP
Client BLU METRIC	Sample Name MG SW3	Date Ended/Time	06/05/23 14:15	#Neonates/Vessel	10
Person Collecting Sample N/A	Temperature Upon Receipt 13 °C	Test Volume	250 mL/Vessel	mL Solution/Daphnid	25 mL
Date/Time Sampled	02.05.23 / 15:00	Pre-aeration	no (yes)	Pre-aeration Duration	30 min
Date/Time Received	04.05.23 / 11:00	Pre-aeration Rate	40-8 ±2 mL/min L⁻¹	Sample Hardness Adjustment	(no) yes
Sample Description	CLEAR, YELLOW	Dilution H_2O #	DW2335	Sample pH Adjustment	(no) yes
Sample Type Description	~~CLEAR, YELLOW~~ SURFACE WATER	Sample Point Description: MISA (other)		Storage Temperature	NONE °C
LC50 Randomization Template:	———	Test Row(s):	8		

Initial Sample Measurements: pH 7.3 Dissolved O_2 9.3 mg/L 105.3 % Conductivity 224 µmhos Temperature 21 °C
Instrument Identification: Meter/Probe # 13/91 Meter/Probe # 7/5 Meter/Probe # 7/8 Meter/Probe # 7/5

Concentration (% Volume)	pH			Dissolved Oxygen					Cond. (µmhos)	Hard. (mg/L)	Temperature (°C)		
	Initial	Final	Final M/P	Initial (mg/L)	Initial (%)	Final (mg/L)	Final (%)	Final M/P	Initial	Initial	Initial	Final	Final M/P
Control	8.0	7.8	14/90	8.4	95	9.3	100	6/4	694	182	21	21	6/4
100%	7.6	7.6	↓	8.4	96	8.8	98	↓	227	72	21	21	↓
Initials	KK	D		KK		D			KK	aO	KK	C	

BROOD CULTURE HEALTH INFORMATION

Brood Culture #	71 P C				
Culture age (days)	24				
Days to 1st Brood (≤12)	9				
Average # of Neonates/Brood (≥15)	37.7				
Previous 7 Days Mortality in Culture (≤25%)	0				

NEONATE SOURCE AND OBSERVATIONS OF NUMBER IMMOBILE AND DEAD

	Control				100%												Init
	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	
Brood culture #	71 D C	→			71 P C	→											KK
24-Hr. # Immobile	0	0	0		0	0	0										KK
48-Hr. # Immobile	0	0	0		0	0	0										
48-Hr. # Dead	0	0	0		0	0	0										0
Total # Immobile		0				0											
Total # Dead		0				0											

Percent Mortality 0 % Standard Deviation of Control Survival 0 Standard Deviation of Test Survival 0 Verified By (Initials) aO Notes ———

Your Project #: 230225-07
Site Location: Musclow Greenview
Your C.O.C. #: 781228

Attention: Cecilia Bandler

BluMetric Environmental Inc
The Tower - The Woolen Mill
4 Cataraqui St
Kingston, ON
CANADA K7K 1Z7

Report Date: 2023/11/01
Report #: R7890008
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BUREAU VERITAS JOB #: C3W8335
Received: 2023/10/20, 08:35

Sample Matrix: Water
Samples Received: 2

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Dissolved Aluminum (0.2 u, clay free)	1	N/A	2023/10/25	CAM SOP-00447	EPA 6020B m
Dissolved Aluminum (0.2 u, clay free)	1	N/A	2023/10/26	CAM SOP-00447	EPA 6020B m
Alkalinity	2	N/A	2023/10/25	CAM SOP-00448	SM 23 2320 B m
Biochemical Oxygen Demand (BOD)	2	2023/10/21	2023/10/26	CAM SOP-00427	SM 23 5210B m
Chloride by Automated Colourimetry	2	N/A	2023/10/26	CAM SOP-00463	SM 23 4500-Cl E m
Chemical Oxygen Demand	2	N/A	2023/10/26	CAM SOP-00416	SM 23 5220 D m
Conductivity	2	N/A	2023/10/25	CAM SOP-00414	SM 23 2510 m
Hardness (calculated as CaCO3)	2	N/A	2023/10/26	CAM SOP 00102/00408/00447	SM 2340 B
Total Metals Analysis by ICPMS	2	2023/10/25	2023/10/25	CAM SOP-00447	EPA 6020B m
Total Ammonia-N	2	N/A	2023/10/26	CAM SOP-00441	USGS I-2522-90 m
Nitrate & Nitrite as Nitrogen in Water (1)	2	N/A	2023/10/25	CAM SOP-00440	SM 23 4500-NO3I/NO2B
pH	2	2023/10/23	2023/10/25	CAM SOP-00413	SM 4500H+ B m
Phenols (4AAP)	2	N/A	2023/10/23	CAM SOP-00444	OMOE E3179 m
Field Measured pH (2)	2	N/A	2023/10/20		Field pH Meter
Sulphate by Automated Turbidimetry	2	N/A	2023/10/26	CAM SOP-00464	SM 23 4500-SO42- E m
Total Dissolved Solids	1	2023/10/26	2023/10/27	CAM SOP-00428	SM 23 2540C m
Total Dissolved Solids	1	2023/10/30	2023/11/01	CAM SOP-00428	SM 23 2540C m
Field Temperature (2)	2	N/A	2023/10/24		Field Thermometer
Total Kjeldahl Nitrogen in Water	2	2023/10/25	2023/10/26	CAM SOP-00938	OMOE E3516 m
Total Phosphorus (Colourimetric)	2	2023/10/25	2023/10/26	CAM SOP-00407	SM 23 4500-P I
Total Suspended Solids	2	2023/10/25	2023/10/26	CAM SOP-00428	SM 23 2540D m
Un-ionized Ammonia (3)	2	2023/10/20	2023/10/27	Auto Calc.	PWQO

Remarks:

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

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

Your Project #: 230225-07
Site Location: Musclow Greenview
Your C.O.C. #: 781228

Attention: Cecilia Bandler

BluMetric Environmental Inc
The Tower - The Woolen Mill
4 Cataraqui St
Kingston, ON
CANADA K7K 1Z7

Report Date: 2023/11/01
Report #: R7890008
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BUREAU VERITAS JOB #: C3W8335
Received: 2023/10/20, 08:35

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

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

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by Bureau Veritas, results relate to the supplied samples tested.

Reference Method suffix “m” indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
(1) Values for calculated parameters may not appear to add up due to rounding of raw data and significant figures.
(2) This is a field test, therefore, the results relate to items that were not analysed at Bureau Veritas.
(3) Un-ionized ammonia is calculated using the total ammonia result and field data provided by the client for pH and temperature.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to:
Christine Gripton, Senior Project Manager
Email: Christine.Gripton@bureauveritas.com
Phone# (519)652-9444

==========

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Bureau Veritas Job #: C3W8335
Report Date: 2023/11/01

BluMetric Environmental Inc
Client Project #: 230225-07
Site Location: Musclow Greenview
Sampler Initials: BM

RESULTS OF ANALYSES OF WATER

Bureau Veritas ID		XJA273		XJA274		
Sampling Date		2023/10/18 09:46		2023/10/18 09:46		
COC Number		781228		781228		
	UNITS	MG-SW4A	QC Batch	MG-QAQC-SW1	RDL	QC Batch
Calculated Parameters						
Hardness (CaCO3)	mg/L	62	8996363	59	1.0	8996363
Total Un-ionized Ammonia	mg/L	ND	8995547	ND	0.00052	8995547
Field Measurements						
Field Temperature	Celsius	6.4	ONSITE	6.4	N/A	ONSITE
Field Measured pH	pH	7.79	ONSITE	7.79		ONSITE
Inorganics						
Total Ammonia-N	mg/L	ND	9003912	ND	0.050	9003912
Total BOD	mg/L	ND	8997246	ND	2	8997246
Total Chemical Oxygen Demand (COD)	mg/L	15	9004854	12	4.0	9004854
Conductivity	umho/cm	140	8999884	140	1.0	8999884
Total Dissolved Solids	mg/L	95	9005967	105	10	9013589
Total Kjeldahl Nitrogen (TKN)	mg/L	0.20	9004843	0.21	0.10	9004843
pH	pH	7.74	8999883	7.71		8999883
Phenols-4AAP	mg/L	ND	8999765	ND	0.0010	8999765
Total Phosphorus	mg/L	ND	9004850	ND	0.020	9004850
Total Suspended Solids	mg/L	ND	9004459	ND	10	9004459
Dissolved Sulphate (SO4)	mg/L	12	8999376	12	1.0	8999376
Alkalinity (Total as CaCO3)	mg/L	42	8999879	44	1.0	8999879
Dissolved Chloride (Cl-)	mg/L	5.7	8999357	5.6	1.0	8999357
Nitrite (N)	mg/L	ND	8998930	ND	0.010	8998930
Nitrate (N)	mg/L	ND	8998930	ND	0.10	8998930
Nitrate + Nitrite (N)	mg/L	ND	8998930	ND	0.10	8998930

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
ND = Not Detected at a concentration equal or greater than the indicated Detection Limit.
N/A = Not Applicable

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Bureau Veritas Job #: C3W8335
Report Date: 2023/11/01

BluMetric Environmental Inc
Client Project #: 230225-07
Site Location: Musclow Greenview
Sampler Initials: BM

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Bureau Veritas ID		XJA273		XJA274			XJA274		
Sampling Date		2023/10/18 09:46		2023/10/18 09:46			2023/10/18 09:46		
COC Number		781228		781228			781228		
	UNITS	MG-SW4A	QC Batch	MG-QAQC-SW1	RDL	QC Batch	MG-QAQC-SW1 Lab-Dup	RDL	QC Batch
Metals									
Dissolved (0.2u) Aluminum (Al)	ug/L	10	8999957	9	5	9002562			
Total Barium (Ba)	ug/L	16	9004326	16	2.0	9004326	16	2.0	9004326
Total Boron (B)	ug/L	ND	9004326	ND	10	9004326	ND	10	9004326
Total Cadmium (Cd)	ug/L	ND	9004326	ND	0.090	9004326	ND	0.090	9004326
Total Calcium (Ca)	ug/L	18000	9004326	18000	200	9004326	18000	200	9004326
Total Cobalt (Co)	ug/L	ND	9004326	ND	0.50	9004326	ND	0.50	9004326
Total Copper (Cu)	ug/L	ND	9004326	ND	0.90	9004326	ND	0.90	9004326
Total Iron (Fe)	ug/L	230	9004326	230	100	9004326	230	100	9004326
Total Lead (Pb)	ug/L	ND	9004326	ND	0.50	9004326	ND	0.50	9004326
Total Magnesium (Mg)	ug/L	2600	9004326	2600	50	9004326	2600	50	9004326
Total Manganese (Mn)	ug/L	5.0	9004326	5.2	2.0	9004326	5.1	2.0	9004326
Total Potassium (K)	ug/L	1400	9004326	1400	200	9004326	1300	200	9004326
Total Sodium (Na)	ug/L	4100	9004326	4200	100	9004326	3900	100	9004326
Total Zinc (Zn)	ug/L	ND	9004326	ND	5.0	9004326	ND	5.0	9004326

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate
ND = Not Detected at a concentration equal or greater than the indicated Detection Limit.

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Bureau Veritas Job #: C3W8335
Report Date: 2023/11/01

BluMetric Environmental Inc
Client Project #: 230225-07
Site Location: Musclow Greenview
Sampler Initials: BM

TEST SUMMARY

Bureau Veritas ID: XJA273
Sample ID: MG-SW4A
Matrix: Water

Collected: 2023/10/18
Shipped:
Received: 2023/10/20

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Dissolved Aluminum (0.2 u, clay free)	ICP/MS	8999957	N/A	2023/10/25	Azita Fazaeli
Alkalinity	AT	8999879	N/A	2023/10/25	Nachiketa Gohil
Biochemical Oxygen Demand (BOD)	DO	8997246	2023/10/21	2023/10/26	Gurjot Kaur
Chloride by Automated Colourimetry	KONE	8999357	N/A	2023/10/26	Alina Dobreanu
Chemical Oxygen Demand	SPEC	9004854	N/A	2023/10/26	Nimarta Singh
Conductivity	AT	8999884	N/A	2023/10/25	Nachiketa Gohil
Hardness (calculated as CaCO3)		8996363	N/A	2023/10/26	Automated Statchk
Total Metals Analysis by ICPMS	ICP/MS	9004326	2023/10/25	2023/10/25	Indira HarryPaul
Total Ammonia-N	LACH/NH4	9003912	N/A	2023/10/26	Prabhjot Kaur
Nitrate & Nitrite as Nitrogen in Water	LACH	8998930	N/A	2023/10/25	Chandra Nandlal
pH	AT	8999883	2023/10/23	2023/10/25	Nachiketa Gohil
Phenols (4AAP)	TECH/PHEN	8999765	N/A	2023/10/23	Chloe Pollock
Field Measured pH	PH	ONSITE	N/A	2023/10/20	Jimmy Liu
Sulphate by Automated Turbidimetry	KONE	8999376	N/A	2023/10/26	Alina Dobreanu
Total Dissolved Solids	BAL	9005967	2023/10/26	2023/10/27	Darshan Patel
Field Temperature	PH	ONSITE	N/A	2023/10/24	Christine Gripton
Total Kjeldahl Nitrogen in Water	SKAL	9004843	2023/10/25	2023/10/26	Rajni Tyagi
Total Phosphorus (Colourimetric)	SKAL/P	9004850	2023/10/25	2023/10/26	Sachi Patel
Total Suspended Solids	BAL	9004459	2023/10/25	2023/10/26	Shaneil Hall
Un-ionized Ammonia	CALC/NH3	8995547	2023/10/27	2023/10/27	Automated Statchk

Bureau Veritas ID: XJA274
Sample ID: MG-QAQC-SW1
Matrix: Water

Collected: 2023/10/18
Shipped:
Received: 2023/10/20

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Dissolved Aluminum (0.2 u, clay free)	ICP/MS	9002562	N/A	2023/10/26	Azita Fazaeli
Alkalinity	AT	8999879	N/A	2023/10/25	Nachiketa Gohil
Biochemical Oxygen Demand (BOD)	DO	8997246	2023/10/21	2023/10/26	Gurjot Kaur
Chloride by Automated Colourimetry	KONE	8999357	N/A	2023/10/26	Alina Dobreanu
Chemical Oxygen Demand	SPEC	9004854	N/A	2023/10/26	Nimarta Singh
Conductivity	AT	8999884	N/A	2023/10/25	Nachiketa Gohil
Hardness (calculated as CaCO3)		8996363	N/A	2023/10/26	Automated Statchk
Total Metals Analysis by ICPMS	ICP/MS	9004326	2023/10/25	2023/10/25	Indira HarryPaul
Total Ammonia-N	LACH/NH4	9003912	N/A	2023/10/26	Prabhjot Kaur
Nitrate & Nitrite as Nitrogen in Water	LACH	8998930	N/A	2023/10/25	Chandra Nandlal
pH	AT	8999883	2023/10/23	2023/10/25	Nachiketa Gohil
Phenols (4AAP)	TECH/PHEN	8999765	N/A	2023/10/23	Chloe Pollock
Field Measured pH	PH	ONSITE	N/A	2023/10/20	Jimmy Liu
Sulphate by Automated Turbidimetry	KONE	8999376	N/A	2023/10/26	Alina Dobreanu
Total Dissolved Solids	BAL	9013589	2023/10/30	2023/11/01	Razieh Tabesh
Field Temperature	PH	ONSITE	N/A	2023/10/24	Christine Gripton
Total Kjeldahl Nitrogen in Water	SKAL	9004843	2023/10/25	2023/10/26	Rajni Tyagi
Total Phosphorus (Colourimetric)	SKAL/P	9004850	2023/10/25	2023/10/26	Sachi Patel

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Bureau Veritas Job #: C3W8335
Report Date: 2023/11/01

BluMetric Environmental Inc
Client Project #: 230225-07
Site Location: Musclow Greenview
Sampler Initials: BM

TEST SUMMARY

Bureau Veritas ID: XJA274
Sample ID: MG-QAQC-SW1
Matrix: Water

Collected: 2023/10/18
Shipped:
Received: 2023/10/20

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Total Suspended Solids	BAL	9004459	2023/10/25	2023/10/26	Shaneil Hall
Un-ionized Ammonia	CALC/NH3	8995547	2023/10/27	2023/10/27	Automated Statchk

Bureau Veritas ID: XJA274 Dup
Sample ID: MG-QAQC-SW1
Matrix: Water

Collected: 2023/10/18
Shipped:
Received: 2023/10/20

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Total Metals Analysis by ICPMS	ICP/MS	9004326	2023/10/25	2023/10/25	Indira HarryPaul

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GENERAL COMMENTS

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

Package 1	4.0°C

Sample XJA273 [MG-SW4A] : TDS Analysis: Analysis was performed past sample holding time. This may increase the variability associated with these results.

Sample XJA274 [MG-QAQC-SW1] : TDS Analysis: Analysis was performed past sample holding time. This may increase the variability associated with these results.

Results relate only to the items tested.

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QUALITY ASSURANCE REPORT

			Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
8997246	Total BOD	2023/10/26					ND,RDL=2	mg/L	5.4	30	94	80 - 120
8998930	Nitrate (N)	2023/10/25	97	80 - 120	97	80 - 120	ND, RDL=0.10	mg/L	NC	20		
8998930	Nitrite (N)	2023/10/25	105	80 - 120	107	80 - 120	ND, RDL=0.010	mg/L	NC	20		
8999357	Dissolved Chloride (Cl-)	2023/10/26	95	80 - 120	96	80 - 120	ND, RDL=1.0	mg/L	0.37	20		
8999376	Dissolved Sulphate (SO4)	2023/10/26	87	75 - 125	96	80 - 120	ND, RDL=1.0	mg/L	1.0	20		
8999765	Phenols-4AAP	2023/10/23	100	80 - 120	97	80 - 120	ND, RDL=0.0010	mg/L	8.7	20		
8999879	Alkalinity (Total as CaCO3)	2023/10/25			96	85 - 115	ND, RDL=1.0	mg/L	0.30	20		
8999883	pH	2023/10/25			102	98 - 103			0.11	N/A		
8999884	Conductivity	2023/10/25			102	85 - 115	ND, RDL=1.0	umho/cm	0.39	10		
8999957	Dissolved (0.2u) Aluminum (Al)	2023/10/25	103	80 - 120	102	80 - 120	ND,RDL=5	ug/L	NC	20		
9002562	Dissolved (0.2u) Aluminum (Al)	2023/10/26	98	80 - 120	97	80 - 120	ND,RDL=5	ug/L	0.66	20		
9003912	Total Ammonia-N	2023/10/26	100	75 - 125	102	80 - 120	ND, RDL=0.050	mg/L	NC	20		
9004326	Total Barium (Ba)	2023/10/25	99	80 - 120	95	80 - 120	ND, RDL=2.0	ug/L	3.6	20		
9004326	Total Boron (B)	2023/10/25	100	80 - 120	94	80 - 120	ND, RDL=10	ug/L	NC	20		
9004326	Total Cadmium (Cd)	2023/10/25	96	80 - 120	94	80 - 120	ND, RDL=0.090	ug/L	NC	20		
9004326	Total Calcium (Ca)	2023/10/25	96	80 - 120	96	80 - 120	ND, RDL=200	ug/L	1.0	20		
9004326	Total Cobalt (Co)	2023/10/25	100	80 - 120	94	80 - 120	ND, RDL=0.50	ug/L	NC	20		
9004326	Total Copper (Cu)	2023/10/25	96	80 - 120	94	80 - 120	ND, RDL=0.90	ug/L	NC	20		
9004326	Total Iron (Fe)	2023/10/25	98	80 - 120	93	80 - 120	ND, RDL=100	ug/L	0.25	20		
9004326	Total Lead (Pb)	2023/10/25	94	80 - 120	93	80 - 120	ND, RDL=0.50	ug/L	NC	20		
9004326	Total Magnesium (Mg)	2023/10/25	98	80 - 120	97	80 - 120	ND, RDL=50	ug/L	1.8	20		
9004326	Total Manganese (Mn)	2023/10/25	96	80 - 120	94	80 - 120	ND, RDL=2.0	ug/L	2.7	20		
9004326	Total Potassium (K)	2023/10/25	98	80 - 120	96	80 - 120	ND, RDL=200	ug/L	2.9	20		
9004326	Total Sodium (Na)	2023/10/25	93	80 - 120	95	80 - 120	ND, RDL=100	ug/L	6.8	20		
9004326	Total Zinc (Zn)	2023/10/25	98	80 - 120	95	80 - 120	ND, RDL=5.0	ug/L	NC	20		
9004459	Total Suspended Solids	2023/10/26			96	85 - 115	ND, RDL=10	mg/L	10	20		
9004843	Total Kjeldahl Nitrogen (TKN)	2023/10/26	106	80 - 120	103	80 - 120	ND, RDL=0.10	mg/L	15	20	96	N/A

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QUALITY ASSURANCE REPORT(CONT'D)

			Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
9004850	Total Phosphorus	2023/10/26	101	80 - 120	103	80 - 120	ND, RDL=0.020	mg/L	NC	20	97	80 - 120
9004854	Total Chemical Oxygen Demand (COD)	2023/10/26	90	80 - 120	100	80 - 120	ND, RDL=4.0	mg/L	3.7	20		
9005967	Total Dissolved Solids	2023/10/27			102	90 - 110	ND, RDL=10	mg/L	2.0	20		
9013589	Total Dissolved Solids	2023/11/01			95	90 - 110	ND, RDL=10	mg/L	13	20		

N/A = Not Applicable

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

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

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

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

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

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

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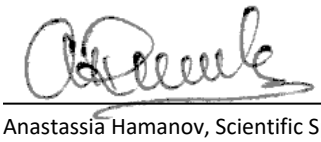
Bureau Veritas Job #: C3W8335
Report Date: 2023/11/01

BluMetric Environmental Inc
Client Project #: 230225-07
Site Location: Musclow Greenview
Sampler Initials: BM

VALIDATION SIGNATURE PAGE

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



Anastassia Hamanov, Scientific Specialist

Christine Gripton, Senior Project Manager

Cristina Carriere, Senior Scientific Specialist

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IMMEDIATE

Custody Tracking Form

T781228

Please use this form for custody tracking when submitting the work instructions via eCOC (electronic Chain of Custody). Please ensure your form has a barcode or a Bureau Veritas eCOC confirmation number in the top right hand side. This number links your electronic submission to your samples. This form should be placed in the cooler with your samples.

First Sample: MG-SW1
Last Sample: MG-QAQC-SW1
Sample Count: 6

Relinquished By				Received By			
Brad McCallum	Brad McCallum	Date	2023/10/19	NIRAL PATEL	Niral	Date	2023/10/20
		Time (24 HR)	08:00			Time (24 HR)	08:35
Print	Sign	Date	YYYY/MM/DD	Print	Sign	Date	YYYY/MM/DD
		Time (24 HR)	HH:MM			Time (24 HR)	HH:MM
Print	Sign	Date	YYYY/MM/DD	Print	Sign	Date	YYYY/MM/DD
		Time (24 HR)	HH:MM			Time (24 HR)	HH:MM

Unless otherwise agreed to, submissions and use of services are governed by Bureau Veritas' standard terms and conditions which can be found at www.bvna.com.

Triage Information

Sampled By (Print): Brad McCallum / Matt DeGeer

# of Coolers/Pkgs: 1

Rush ☐ Immediate Test ☐ Food Residue ☐

Micro ☐ Food Chemistry ☐

*** LABORATORY USE ONLY ***

Received At

Labeled By

Verified By

Lab Comments:

20-Oct-23 08:35
Christine Gripton
C3W8335
AJH ENV-1594

Custody Seal		Cooling Media	Temperature °C		
Present (Y/N)	Intact (Y/N)	Present (Y/N)	1	2	3
Y	Y	Y	4	5	3

Drinking Water Metals Preservation Check Done (Circle) **YES** **NO**

COR FCD-00383/4

Page 1 of 1

Appendix D

D-4 QAQC Results

2023 Groundwater Sampling Quality Assurance and Quality Control
(Spring)

Sample Description		RDL	MG-18-1	MG-QAQC-GW1	Relative Percent Difference
Date Sampled			02-May-23	02-May-23	
Parameter	Unit				
Chloride	mg/L	0.1	145	134	8%
Nitrate as N	mg/L	0.05	<0.05	<0.05	NA
Sulphate	mg/L	0.1	11.4	12.6	10%
Calcium (diss)	mg/L	0.05	116	121	4%
Magnesium (diss)	mg/L	0.05	27.1	26	4%
Sodium (diss)	mg/L	0.05	21.7	21.1	3%
Alkalinity (as CaCO3)	mg/L	1	284	286	1%
Ammonia as N	mg/L	0.02	<0.02	<0.02	NA
Biochemical Oxygen Demand	mg/L	2	<2	<2	NA
Chemical Oxygen Demand	mg/L	4	11	23	NA
Dissolved Organic Carbon	mg/L	0.4	8.9	8.8	1%
Electrical Conductivity	uS/cm	1	949	958	1%
pH	pH units		6.93	6.99	1%
Total Dissolved Solids	mg/L	10	558	656	16%
Total Suspended Solids	mg/L	10	4940	5760	15%
Aluminum (diss)	mg/L	0.004	0.004	<0.004	NA
Barium (diss)	mg/L	0.002	0.108	0.103	5%
Boron (diss)	mg/L	0.01	0.148	0.14	6%
Cadmium (diss)	mg/L	0.0001	<0.0001	<0.0001	NA
Chromium (diss)	mg/L	0.002	<0.002	<0.002	NA
Cobalt (diss)	mg/L	0.0005	0.0354	0.0348	2%
Iron (diss)	mg/L	0.01	0.354	0.357	1%
Lead (diss)	mg/L	0.0005	0.0005	<0.0005	NA
Manganese (diss)	mg/L	0.002	7.46	7.33	2%
Silver (diss)	mg/L	0.0001	<0.0001	<0.0001	NA
Zinc (diss)	mg/L	0.005	<0.005	<0.005	NA

Yellow shading indicates RPD value is above the percentage for a high level of reproducibility:

10% for electrical conductivity

20% for metals and inorganics

30% for BTEX and PHC.

2023 Surface Water Sampling Quality Assurance and Quality Control
(Spring)

Sample Description		RDL	MG-SW4A	MG-QAQC-SW1	Relative Percent Difference
Date Sampled			02-May-23	02-May-23	
Parameter	Unit				
Chloride	mg/L	0.1	3.42	3.37	1%
Nitrate as N	mg/L	0.05	<0.05	<0.05	NA
Nitrite as N	mg/L	0.05	<0.05	<0.05	NA
Sulphate	mg/L	0.1	4.96	4.94	0%
Calcium (tot)	mg/L	0.2	5.03	6.51	26%
Magnesium (tot)	mg/L	0.05	1.15	0.97	17%
Potassium (tot)	mg/L	0.2	0.73	0.74	NA
Sodium (tot)	mg/L	0.1	2.51	2.01	22%
Alkalinity (as CaCO3)	mg/L	1	16	16	0%
Ammonia as N	mg/L	0.02	<0.02	<0.02	NA
Biochemical Oxygen Demand	mg/L	2	<2	<2	NA
Chemical Oxygen Demand	mg/L	4	31	28	10%
Electrical Conductivity	uS/cm	1	63	63	0%
pH	pH units		7.01	6.91	1%
Phenols-4AAP	mg/L	0.001	<0.001	<0.001	NA
Total Dissolved Solids	mg/L	10	64	56	13%
Total Hardness (as CaCO3)	mg/L	0.5	17.3	20.2	15%
Total Kjeldahl Nitrogen	mg/L	0.1	0.29	0.28	NA
Total Phosphorus	mg/L	0.02	<0.02	<0.02	NA
Total Suspended Solids	mg/L	10	<10	<10	NA
Unionized Ammonia (Calc)	mg/L	0.000002	<0.000002	<0.000002	NA
Aluminum (diss, PWQO)	mg/L	0.004	0.034	0.092	92%
Barium (tot)	mg/L	0.002	0.011	0.012	9%
Boron (tot)	mg/L	0.01	0.023	0.022	NA
Cadmium (tot)	mg/L	0.0001	<0.0001	<0.0001	NA
Cobalt (tot)	mg/L	0.0005	<0.0005	<0.0005	NA
Copper (tot)	mg/L	0.001	<0.001	0.004	NA
Iron (tot)	mg/L	0.01	0.195	0.208	6%
Lead (tot)	mg/L	0.001	<0.001	<0.001	NA
Manganese (tot)	mg/L	0.002	0.005	0.007	NA
Zinc (tot)	mg/L	0.02	<0.02	<0.02	NA

Yellow shading indicates RPD value is above the percentage for a high level of reproducibility:

10% for electrical conductivity

20% for metals and inorganics

30% for BTEX and PHC.

2023 Groundwater Sampling Quality Assurance and Quality Control
(Fall)

Sample Description		RDL	MG-18-3R	MG-QAQC-GW1	Relative Percent Difference
Date Sampled			18-Oct-23	18-Oct-23	
Parameter	Unit				
Chloride	mg/L	1	<1	<1	NA
Nitrate as N	mg/L	0.1	<0.1	<0.1	NA
Sulphate	mg/L	0.1	1.9	5.5	97%
Calcium (diss)	mg/L	0.05	22	21	5%
Magnesium (diss)	mg/L	0.05	1.6	1.6	0%
Sodium (diss)	mg/L	0.05	3	3.1	3%
Alkalinity (as CaCO3)	mg/L	1	64	65	2%
Ammonia as N	mg/L	0.02	0.059	0.052	NA
Biochemical Oxygen Demand	mg/L	2	<2	<2	NA
Chemical Oxygen Demand	mg/L	4	8.2	<4	NA
Dissolved Organic Carbon	mg/L	0.4	2	1.5	NA
Electrical Conductivity	uS/cm	1	140	140	0%
pH	pH units		7.59	7.66	1%
Total Dissolved Solids	mg/L	10	340	340	0%
Total Suspended Solids	mg/L	10	38000	50000	27%
Aluminum (diss)	mg/L	0.0049	<0.0049	<0.0049	NA
Barium (diss)	mg/L	0.002	0.022	0.022	0%
Boron (diss)	mg/L	0.01	0.01	<0.01	NA
Cadmium (diss)	mg/L	0.00009	<0.00009	<0.00009	NA
Chromium (diss)	mg/L	0.005	<0.005	<0.005	NA
Cobalt (diss)	mg/L	0.0005	0.0011	0.0011	NA
Iron (diss)	mg/L	0.1	<0.1	<0.1	NA
Lead (diss)	mg/L	0.0005	<0.0005	<0.0005	NA
Manganese (diss)	mg/L	0.002	0.13	0.13	0%
Silver (diss)	mg/L	0.00009	<0.00009	<0.00009	NA
Zinc (diss)	mg/L	0.005	<0.005	<0.005	NA

Yellow shading indicates RPD value is above the percentage for a high level of reproducibility:

10% for electrical conductivity

20% for metals and inorganics

30% for BTEX and PHC.

2023 Surface Water Sampling Quality Assurance and Quality Control
(Fall)

Sample Description		RDL	MG-SW4A	MG-QAQC-SW1	Relative Percent Difference
Date Sampled			18-Oct-23	18-Oct-23	
Parameter	Unit				
Chloride	mg/L	0.1	5.7	5.6	2%
Nitrate as N	mg/L	0.1	<0.1	<0.1	NA
Nitrite as N	mg/L	0.01	<0.01	<0.01	NA
Sulphate	mg/L	0.1	12	12	0%
Calcium (tot)	mg/L	0.2	18	18	0%
Magnesium (tot)	mg/L	0.05	2.6	2.6	0%
Potassium (tot)	mg/L	0.2	1.4	1.4	0%
Sodium (tot)	mg/L	0.1	4.1	4.2	2%
Alkalinity (as CaCO3)	mg/L	1	42	44	5%
Ammonia as N	mg/L	0.05	<0.05	<0.05	NA
Biochemical Oxygen Demand	mg/L	2	<2	<2	NA
Chemical Oxygen Demand	mg/L	4	15	12	NA
Electrical Conductivity	uS/cm	1	140	140	0%
pH	pH units		7.74	7.71	0%
Phenols-4AAP	mg/L	0.001	<0.001	<0.001	NA
Total Dissolved Solids	mg/L	10	95	105	10%
Total Hardness (as CaCO3)	mg/L	0.5	62	59	5%
Total Kjeldahl Nitrogen	mg/L	0.1	0.2	0.21	NA
Total Phosphorus	mg/L	0.02	<0.02	<0.02	NA
Total Suspended Solids	mg/L	10	<10	<10	NA
Unionized Ammonia (Calc)	mg/L	0.00052	<0.00052	<0.00052	NA
Aluminum (diss, PWQO)	mg/L	0.004	0.01	0.009	NA
Barium (tot)	mg/L	0.002	0.016	0.016	0%
Boron (tot)	mg/L	0.01	<0.01	<0.01	NA
Cadmium (tot)	mg/L	0.00009	<0.00009	<0.00009	NA
Cobalt (tot)	mg/L	0.0005	<0.0005	<0.0005	NA
Copper (tot)	mg/L	0.0009	<0.0009	<0.0009	NA
Iron (tot)	mg/L	0.01	0.23	0.23	0%
Lead (tot)	mg/L	0.0005	<0.0005	<0.0005	NA
Manganese (tot)	mg/L	0.002	0.005	0.0052	NA
Zinc (tot)	mg/L	0.005	<0.005	<0.005	NA

Yellow shading indicates RPD value is above the percentage for a high level of reproducibility:

10% for electrical conductivity

20% for metals and inorganics

30% for BTEX and PHC.

Appendix E

Historical Chemistry Data

Appendix E

E-1 Historical Groundwater Data

Appendix E-1: Historical Groundwater Data						Location	MG-18-1	MG-18-1	MG-18-1	MG-18-1	MG-18-1	MG-18-1	MG-18-1	MG-18-1	MG-18-1	MG-18-1	MG-18-1	MG-18-1	MG-18-1	MG-18-1	MG-18-1
Parameter	Units	RUV-MG	ODWQS-ALL-MERGED	PWQO-GENERAL	PWQO-INTERIM	Sample ID	MG-18-1	MG-18-1	1-QAQC-S19 (M	MG-18-1	MG-18-1	1-QAQC-S20 (M	MG-18-1	MG-18-1	QC GW-S21 (M	MG-18-1	QC GW-F21 (M	MG-18-1	QC GW-S22 (M	MG-18-1	MG-18-1	MG-18-1
						Sample Date	2019-Jan-10	2019-May-06	2019-May-06	2019-Oct-21	2020-May-05	2020-May-05	2020-Oct-08	2021-Apr-19	2021-Apr-19	2021-Oct-20	2021-Oct-20	2022-May-04	2022-May-04	2022-Oct-25	2023-May-02	2023-May-02	2023-Oct-18
Anions						Detection Limit																	
Chloride	mg/L	125.68	250	-	-	0.1	37.3	44.8	45	57.2	70.5	70.4	69.3	101	107	72.3	72.8	88.3	91	72.9	145	134	87
Nitrate as N	mg/L	2.5375	10	-	-	0.05	<0.05	<0.05	<0.05	<0.25	<0.25	<0.25	<0.1	<0.25	<0.25	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.1
Sulphate	mg/L	259.8	500	-	-	0.1	8.55	11.1	11.2	13.1	23.3	22.9	20	16.3	16.4	20.5	20.4	17.6	15.5	18	11.4	12.6	20
Cations																							
Calcium (diss)	mg/L	-	-	-	-	0.05	71.5	85.5	85.5	91.6	121	123	78.5	104	102	86.1	86.5	97.4	107	62.8	116	121	92
Magnesium (diss)	mg/L	-	-	-	-	0.05	13.6	17.1	17.1	19.5	24	24.7	14.8	22.1	21.6	17.6	17.8	21.2	23	15.6	27.1	26	20
Potassium (diss)	mg/L	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sodium (diss)	mg/L	106.25	200	-	-	0.05	14	12.5	12.5	26.7	20	20.3	15.5	18.3	17.9	17.1	17.3	19.7	21.4	17.8	21.7	21.1	26
General Chemistry																							
Alkalinity (as CaCO3)	mg/L	47 - 282	30 - 500	See Factsheet	-	1	231	305	310	310	381	384	216	248	250	233	252	290	290	181	284	286	220
Ammonia as N	mg/L	-	-	-	-	0.02	0.08	<0.02	<0.02	0.06	<0.02	<0.02	<0.02	<0.02	<0.02	0.02	0.02	<0.02	<0.02	0.03	<0.02	<0.02	0.073
Biochemical Oxygen Demand	mg/L	-	-	-	-	2	<5	<5	<5	<5	<5	<5	<2	<2	<2	<2	<2	3	4	<2	<2	<2	2
Chemical Oxygen Demand	mg/L	-	-	-	-	4	7	11	10	<5	25	18	20	<5	9	8	7	18	23	<5	11	23	16
Dissolved Organic Carbon	mg/L	3.7	5	-	-	0.4	4.9	4	8.3	4.8	10.9	11.1	4.5	6	5.6	5.6	5.8	8.9	8.6	3.7	8.9	8.8	5
Electrical Conductivity	uS/cm	-	-	-	-	1	505	645	642	726	1170	1160	613	862	866	718	720	841	845	591	949	958	760
pH	pH units	6.96 - 7.96	6.5 - 8.5	6.5 - 8.5	-		8.02	7.61	7.55	7.64	6.94	6.98	7.42	6.94	6.95	7.23	7.3	6.91	6.98	7.39	6.93	6.99	7.55
Total Dissolved Solids	mg/L	339	500	-	-	5	290	344	344	456	570	574	394	642	628	474	468	524	590	346	558	656	590
Total Hardness (as CaCO3)	mg/L	-	80 - 100	-	-		234.5	283.9	283.9	309	401	408.8	257	350.7	343.6	287.5	289.3	330.5	361.9	221.1	-	-	-
Total Suspended Solids	mg/L	-	-	-	-	10	68700	23500	33500	26500	5370	8860	15500	9410	10200	284	8890	7440	6370	8980	4940	5760	13000
Unionized Ammonia (Calc)	mg/L	-	-	-	-	0.1	-	0.0000092	0.0000092	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Metals																							
Aluminum (diss)	mg/L	0.051225	0.1	-	Calculated	0.004	0.006	<0.004	0.006	2.33	0.017	0.006	0.009	0.011	0.012	0.008	<0.004	0.009	0.013	0.021	0.004	<0.004	<0.0049
Barium (diss)	mg/L	0.2635	1	-	-	0.002	0.07	0.08	0.076	0.143	0.107	0.105	0.061	0.089	0.09	0.08	0.078	0.108	0.106	0.067	0.108	0.103	0.087
Beryllium (diss)	mg/L	-	-	Calculated	-	0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Boron (diss)	mg/L	1.25825	5	-	0.2	0.01	0.093	0.082	0.079	0.147	0.172	0.186	0.136	0.133	0.141	0.142	0.14	0.165	0.173	0.132	0.148	0.14	0.19
Cadmium (diss)	mg/L	0.0012875	0.005	-	Calculated	0.00009	<0.002	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	<0.0001	0.0001	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.00011
Chromium (diss)	mg/L	0.013625	0.05	-	-	0.002	<0.003	<0.003	<0.003	0.006	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.002	<0.002	<0.002	<0.005
Cobalt (diss)	mg/L	-	-	-	0.0009	0.0005	0.011	0.0125	0.0121	0.031	0.0313	0.0312	0.0204	0.0291	0.0256	0.0275	0.0266	0.0358	0.0356	0.0208	0.0354	0.0348	0.025
Copper (diss)	mg/L	-	1	-	Calculated	0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Iron (diss)	mg/L	0.1525	0.3	0.3	-	0.01	<0.01	<0.01	<0.01	3.11	0.099	0.092	<0.01	0.095	0.064	0.28	0.311	0.458	0.441	0.182	0.354	0.357	0.36
Lead (diss)	mg/L	0.0026875	0.01	-	Calculated	0.0005	<0.001	<0.001	<0.001	0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0005	0.0005	<0.0005	<0.0005
Manganese (diss)	mg/L	0.09	0.05	-	-	0.002	1.25	2.6	2.51	5.53	6.94	6.92	4.47	6.62	6.77	6.08	5.82	7.26	7.08	4.19	7.46	7.33	5.2
Molybdenum (diss)	mg/L	-	-	-	0.04	0.005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nickel (diss)	mg/L	-	-	0.025	-	0.005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Silicon (diss)	mg/L	-	-	-	-	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Silver (diss)	mg/L	-	-	0.0001	-	0.00009	<0.002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.00009
Strontium (diss)	mg/L	-	-	-	-	0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Thallium (diss)	mg/L	-	-	-	0.0003	0.0001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Titanium (diss)	mg/L	-	-	-	-	0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Vanadium (diss)	mg/L	-	-	-	0.006	0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zinc (diss)	mg/L	2.50125	5	-	0.02	0.005	<0.005	<0.005	<0.005	0.017	<0.005	<0.005	<0.005	<0.005	<0.005	0.008	<0.005	0.137	0.006	0.006	<0.005	<0.005	0.026

Appendix E-1: Historical Groundwater Data						Location	MG-18-1	MG-18-1	MG-18-1	MG-18-1	MG-18-1	MG-18-1	MG-18-1	MG-18-1	MG-18-1	MG-18-1	MG-18-1	MG-18-1	MG-18-1	MG-18-1	MG-18-1	MG-18-1
Parameter	Units	RUV-MG	ODWQS-ALL-MERGED	PWQO-GENERAL	PWQO-INTERIM	Sample ID	MG-18-1	MG-18-1	1-QAQC-S19 (M	MG-18-1	MG-18-1	1-QAQC-S20 (M	MG-18-1	MG-18-1	QC GW-S21 (M	MG-18-1	QC GW-F21 (M	MG-18-1	QC GW-S22 (M	MG-18-1	MG-18-1	QAQC-GW1 (MG	MG-18-1
						Sample Date	2019-Jan-10	2019-May-06	2019-May-06	2019-Oct-21	2020-May-05	2020-May-05	2020-Oct-08	2021-Apr-19	2021-Apr-19	2021-Oct-20	2021-Oct-20	2022-May-04	2022-May-04	2022-Oct-25	2023-May-02	2023-May-02	2023-Oct-18
VOCs																							
1,1,1,2-Tetrachloroethane	mg/L	-	-	-	0.02	0.0001	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.0001	-	-	-
1,1,1-Trichloroethane	mg/L	-	-	-	0.01	0.0003	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.0003	-	-	-
1,1,2,2-Tetrachloroethane	mg/L	-	-	-	0.07	0.0001	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.0001	-	-	-
1,1,2-Trichloroethane	mg/L	-	-	-	0.8	0.0002	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.0002	-	-	-
1,1-Dichloroethane	mg/L	-	-	-	0.2	0.0003	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.0003	-	-	-
1,1-Dichloroethylene	mg/L	-	0.014	-	0.04	0.0002	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.0002	-	-	-
1,2,4-Trichlorobenzene	mg/L	-	-	0.0005	-	0.0003	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.0003	-	-	-
1,2-Dichlorobenzene	mg/L	-	0.003	0.0025	-	0.0001	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.0001	-	-	-
1,2-Dichloroethane	mg/L	-	0.005	-	0.1	0.0002	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.0002	-	-	-
1,2-Dichloropropane	mg/L	-	-	-	0.0007	0.0002	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.0002	-	-	-
1,3-Dichlorobenzene	mg/L	-	-	0.0025	-	0.0001	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.0001	-	-	-
1,3-Dichloropropene (Cis + Tra	mg/L	-	-	-	-	0.0003	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.0003	-	-	-
1,4-Dichlorobenzene	mg/L	-	0.001	0.004	-	0.0001	-	-	-	<0.0001	-	-	<0.0001	-	-	<0.0002	-	<0.0001	-	<0.0001	-	-	-
2-Hexanone	mg/L	-	-	-	-	0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.001	-	-	-
Acetone	mg/L	-	-	-	-	0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.001	-	-	-
Benzene	mg/L	-	0.001	-	0.1	0.0002	-	-	-	0.00036	-	-	<0.0002	-	-	0.0004	-	<0.0002	-	<0.0002	-	-	-
Bromodichloromethane	mg/L	-	-	-	0.2	0.0002	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.0002	-	-	-
Bromoform	mg/L	-	-	-	0.06	0.0001	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.0001	-	-	-
Bromomethane	mg/L	-	-	-	0.0009	0.0002	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.0002	-	-	-
Carbon Tetrachloride	mg/L	-	0.002	-	-	0.0002	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.0002	-	-	-
Chlorobenzene	mg/L	-	-	0.015	-	0.0001	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.0001	-	-	-
Chloroethane	mg/L	-	-	-	-	0.0002	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.0002	-	-	-
Chloroform	mg/L	-	-	-	-	0.0002	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.0002	-	-	-
Chloromethane	mg/L	-	-	-	0.7	0.0002	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.0002	-	-	-
cis-1,2-Dichloroethylene	mg/L	-	-	-	-	0.0002	-	-	-	-	-	-	-	-	-	-	-	-	-	0.001	-	-	-
cis-1,3-Dichloropropene	mg/L	-	-	-	-	0.0002	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.0002	-	-	-
Dibromochloromethane	mg/L	-	-	-	-	0.0001	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.0001	-	-	-
Dichlorodifluoromethane	mg/L	-	-	-	-	0.0004	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.0004	-	-	-
Dichloromethane	mg/L	-	0.05	-	-	0.0003	-	-	-	-	-	-	-	-	-	-	-	<0.0003	-	-	-	-	-
Ethylbenzene	mg/L	-	0.0016	-	0.008	0.0001	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.0001	-	-	-
Ethylene Dibromide	mg/L	-	-	-	0.005	0.0001	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.0001	-	-	-
m & p-Xylene	mg/L	-	-	-	-	0.0002	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.0002	-	-	-
Methylene Chloride	mg/L	-	-	-	0.1	0.0003	-	-	-	<0.0003	-	-	<0.0003	-	-	<0.0006	-	-	-	<0.0003	-	-	-
Methyl Ethyl Ketone	mg/L	-	-	-	0.4	0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.001	-	-	-
Methyl Isobutyl Ketone	mg/L	-	-	-	-	0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.001	-	-	-
Methyl tertiary-butyl ether (MT	mg/L	-	0.015	-	0.2	0.0002	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.0002	-	-	-
n-Hexane	mg/L	-	-	-	-	0.0002	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.0002	-	-	-
o-Xylene	mg/L	-	-	-	0.04	0.0001	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.0001	-	-	-
Styrene	mg/L	-	-	-	0.004	0.0001	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.0001	-	-	-
Tetrachloroethylene	mg/L	-	0.01	-	0.05	0.0002	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.0002	-	-	-
Toluene	mg/L	-	0.024	-	0.0008	0.0002	-	-	-	<0.0002	-	-	<0.0002	-	-	<0.0004	-	<0.0002	-	<0.0002	-	-	-
trans-1,2-Dichloroethylene	mg/L	-	-	-	-	0.0002	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.0002	-	-	-
trans-1,3-Dichloropropene	mg/L	-	-	-	-	0.0003	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.0003	-	-	-
Trichloroethylene	mg/L	-	0.005	-	0.02	0.0002	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.0002	-	-	-
Trichlorofluoromethane	mg/L	-	-	-	-	0.0004	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.0004	-	-	-
Vinyl Chloride	mg/L	-	0.001	-	0.6	0.00017	-	-	-	<0.00017	-	-	<0.00017	-	-	<0.00034	-	<0.00017	-	<0.00017	-	-	-
Xylene Mixture	mg/L	-	0.02	-	-	0.0002	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.0002	-	-	-

-LEGEND-

Detection Limit	DL: May vary between sample locations and events
DL exceeds criteria	
Concentration exceeds RUV-MG	Reasonable Use Values Musclow Greenview
Concentration exceeds ODWQS-ALL-MERGED	Ontario Drinking Water Quality Standards All Types Merged
Concentration exceeds PWQO-GENERAL	Provincial Water Quality Objectives General
Concentration exceeds PWQO-INTERIM	Provincial Water Quality Objectives Interim

Appendix E-1: Historical Groundwater Data						Location	MG-18-2	MG-18-2	MG-18-2	MG-18-2	MG-18-2	MG-18-2	MG-18-2	MG-18-2	MG-18-2	MG-18-2	MG-18-2	MG-18-2	MG-18-2	MG-18-3	MG-18-3	MG-18-3R	MG-18-3R
Parameter	Units	RUV-MG	ODWQS-ALL-MERGED	PWQO-GENERAL	PWQO-INTERIM	Sample ID	MG-18-2	MG-18-2	MG-18-2	2-QAQC-F19 (M	MG-18-2	2-QAQC-F20 (M	MG-18-2	MG-18-2	MG-18-2	MG-18-2	MG-18-2	MG-18-2	MG-18-2	MG-18-3	MG-18-3	MG-18-3R	AQC-GW1 (MG-
						Sample Date	2019-Jan-10	2019-May-06	2019-Oct-21	2019-Oct-21	2020-May-05	2020-Oct-08	2020-Oct-08	2021-Apr-19	2021-Oct-20	2022-May-04	2022-Oct-25	2023-May-02	2023-Oct-18	2019-May-06	2023-May-02	2023-Oct-18	2023-Oct-18
Anions						Detection Limit																	
Chloride	mg/L	125.68	250	-	-	0.1	160	111	108	105	111	93.1	90.2	94.1	93.8	96.2	102	117	97	5.19	1.36	<1	<1
Nitrate as N	mg/L	2.5375	10	-	-	0.05	<0.5	<0.25	<0.25	<0.25	<1	<0.5	<0.5	<0.5	<0.07	<0.07	<0.07	<0.05	<0.1	<0.05	3.18	<0.1	<0.1
Sulphate	mg/L	259.8	500	-	-	0.1	19.7	12.6	14.6	15.1	15.2	17.5	17.2	17.8	16.5	23.3	24.3	24.6	15	19.6	51.8	1.9	5.5
Cations																							
Calcium (diss)	mg/L	-	-	-	-	0.05	329	291	269	273	269	296	294	297	272	285	307	297	330	23.5	22.2	22	21
Magnesium (diss)	mg/L	-	-	-	-	0.05	61.2	56.2	52.7	52	49.1	53.5	53.3	56.2	49	52	55.1	53	58	5.44	4.75	1.6	1.6
Potassium (diss)	mg/L	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sodium (diss)	mg/L	106.25	200	-	-	0.05	62.7	70	71.4	71.5	70.2	87.7	87.5	82.3	80.8	82.6	91.5	75.6	86	21.8	12.5	3	3.1
General Chemistry																							
Alkalinity (as CaCO3)	mg/L	47 - 282	30 - 500	See Factsheet	-	1	1190	1210	978	983	1010	1070	1050	1020	976	940	954	963	970	128	45	64	65
Ammonia as N	mg/L	-	-	-	-	0.02	<0.02	<0.02	0.03	0.04	<0.02	<0.02	<0.02	<0.02	0.06	<0.02	0.17	0.08	0.46	<0.02	<0.02	0.059	0.052
Biochemical Oxygen Demand	mg/L	-	-	-	-	2	<5	<5	<5	<5	<5	2	<2	4	4	4	4	<2	<2	<5	<2	<2	<2
Chemical Oxygen Demand	mg/L	-	-	-	-	4	57	41	35	41	36	47	41	35	38	42	25	42	52	177	<5	8.2	<4
Dissolved Organic Carbon	mg/L	3.7	5	-	-	0.4	14.7	17.1	14.7	17.2	17.8	19.5	18.9	18.7	17.9	16.8	16.9	15.2	16	31.6	2.4	2	1.5
Electrical Conductivity	uS/cm	-	-	-	-	1	2120	2010	1830	1830	2520	1880	1850	2100	1920	1890	1830	1950	2100	271	218	140	140
pH	pH units	6.96 - 7.96	6.5 - 8.5	6.5 - 8.5	-		7.49	7.58	7.54	7.5	6.99	7.56	7.54	7	7.47	7.1	7.16	7.03	7.47	7.18	7.42	7.59	7.66
Total Dissolved Solids	mg/L	339	500	-	-	5	1190	1170	1190	1240	1200	1200	1190	1240	1140	1140	1130	1150	1250	178	108	340	340
Total Hardness (as CaCO3)	mg/L	-	80 - 100	-	-		1073.5	958.1	888.7	895.8	873.9	959.4	953.6	973	881	925.8	993.5	-	-	81.1	-	-	-
Total Suspended Solids	mg/L	-	-	-	-	10	16500	12100	7460	5020	4780	2310	2440	3100	4880	5210	2760	1500	11000	4320	10500	38000	50000
Unionized Ammonia (Calc)	mg/L	-	-	-	-	0.1	-	0.0000088	-	-	-	-	-	-	-	-	-	-	-	0.0000725	-	-	-
Metals																							
Aluminum (diss)	mg/L	0.051225	0.1	-	Calculated	0.004	<0.004	<0.004	0.084	0.097	0.005	0.011	0.013	<0.004	<0.004	0.017	0.023	0.007	<0.0049	0.006	<0.004	<0.0049	<0.0049
Barium (diss)	mg/L	0.2635	1	-	-	0.002	0.309	0.28	0.28	0.278	0.245	0.217	0.217	0.176	0.248	0.261	0.253	0.237	0.28	0.018	0.015	0.022	0.022
Beryllium (diss)	mg/L	-	-	Calculated	-	0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Boron (diss)	mg/L	1.25825	5	-	0.2	0.01	0.49	0.509	0.761	0.76	0.762	1.03	1.11	0.833	1.21	1.11	1.33	1.22	1.2	0.011	0.015	0.01	<0.01
Cadmium (diss)	mg/L	0.0012875	0.005	-	Calculated	0.00009	<0.002	<0.0001	<0.0001	<0.0001	0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.00048	<0.0001	<0.0001	<0.00009	<0.00009
Chromium (diss)	mg/L	0.013625	0.05	-	-	0.002	<0.003	0.008	<0.003	<0.003	0.004	0.003	<0.003	<0.003	<0.003	<0.003	<0.002	<0.002	<0.005	<0.003	<0.002	<0.005	<0.005
Cobalt (diss)	mg/L	-	-	-	0.0009	0.0005	0.028	0.0364	0.0399	0.0392	0.0387	0.0421	0.0424	0.0307	0.0508	0.0446	0.0654	0.0449	0.049	0.0006	<0.0005	0.0011	0.0011
Copper (diss)	mg/L	-	1	-	Calculated	0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Iron (diss)	mg/L	0.1525	0.3	0.3	-	0.01	3.02	10.1	16.7	16.5	7.29	11	10.9	3.85	10.7	4.2	11.2	6.15	6	<0.01	<0.01	<0.1	<0.1
Lead (diss)	mg/L	0.0026875	0.01	-	Calculated	0.0005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0005	<0.0005	<0.0005	<0.001	<0.0005	<0.0005	<0.0005
Manganese (diss)	mg/L	0.09	0.05	-	-	0.002	5.97	8.15	8.92	8.69	8.08	9.96	9.93	6.57	11.9	9.18	12.7	11.7	11	0.263	0.01	0.13	0.13
Molybdenum (diss)	mg/L	-	-	-	0.04	0.005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nickel (diss)	mg/L	-	-	0.025	-	0.005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Silicon (diss)	mg/L	-	-	-	-	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Silver (diss)	mg/L	-	-	0.0001	-	0.00009	<0.002	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	<0.0001	**0.0002**	<0.0001	<0.0001	<0.0001	<0.0001	<0.00009	<0.0001	<0.0001	<0.00009	<0.00009
Strontium (diss)	mg/L	-	-	-	-	0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Thallium (diss)	mg/L	-	-	-	0.0003	0.0001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Titanium (diss)	mg/L	-	-	-	-	0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Vanadium (diss)	mg/L	-	-	-	0.006	0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zinc (diss)	mg/L	2.50125	5	-	0.02	0.005	0.009	0.007	0.006	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005

Appendix E-1: Historical Groundwater Data						Location	MG-18-2	MG-18-2	MG-18-2	MG-18-2	MG-18-2	MG-18-2	MG-18-2	MG-18-2	MG-18-2	MG-18-2	MG-18-2	MG-18-2	MG-18-2	MG-18-3	MG-18-3	MG-18-3R	MG-18-3R
Parameter	Units	RUV-MG	ODWQS-ALL-MERGED	PWQO-GENERAL	PWQO-INTERIM	Sample ID	MG-18-2	MG-18-2	MG-18-2	2-QAQC-F19 (M	MG-18-2	MG-18-2	2-QAQC-F20 (M	MG-18-2	MG-18-2	MG-18-2	MG-18-2	MG-18-2	MG-18-2	MG-18-3	MG-18-3	MG-18-3R	AQC-GW1 (MG-
						Sample Date	2019-Jan-10	2019-May-06	2019-Oct-21	2019-Oct-21	2020-May-05	2020-Oct-08	2020-Oct-08	2021-Apr-19	2021-Oct-20	2022-May-04	2022-Oct-25	2023-May-02	2023-Oct-18	2019-May-06	2023-May-02	2023-Oct-18	2023-Oct-18
VOCs																							
1,1,1,2-Tetrachloroethane	mg/L	-	-	-	0.02	0.0001	-	-	-	-	-	-	-	-	-	-	<0.0001	-	-	-	-	-	-
1,1,1-Trichloroethane	mg/L	-	-	-	0.01	0.0003	-	-	-	-	-	-	-	-	-	-	<0.0003	-	-	-	-	-	-
1,1,2,2-Tetrachloroethane	mg/L	-	-	-	0.07	0.0001	-	-	-	-	-	-	-	-	-	-	<0.0001	-	-	-	-	-	-
1,1,2-Trichloroethane	mg/L	-	-	-	0.8	0.0002	-	-	-	-	-	-	-	-	-	-	<0.0002	-	-	-	-	-	-
1,1-Dichloroethane	mg/L	-	-	-	0.2	0.0003	-	-	-	-	-	-	-	-	-	-	0.00096	-	-	-	-	-	-
1,1-Dichloroethylene	mg/L	-	0.014	-	0.04	0.0002	-	-	-	-	-	-	-	-	-	-	<0.0002	-	-	-	-	-	-
1,2,4-Trichlorobenzene	mg/L	-	-	0.0005	-	0.0003	-	-	-	-	-	-	-	-	-	-	<0.0003	-	-	-	-	-	-
1,2-Dichlorobenzene	mg/L	-	0.003	0.0025	-	0.0001	-	-	-	-	-	-	-	-	-	-	<0.0001	-	-	-	-	-	-
1,2-Dichloroethane	mg/L	-	0.005	-	0.1	0.0002	-	-	-	-	-	-	-	-	-	-	0.001	-	-	-	-	-	-
1,2-Dichloropropane	mg/L	-	-	-	0.0007	0.0002	-	-	-	-	-	-	-	-	-	-	<0.0002	-	-	-	-	-	-
1,3-Dichlorobenzene	mg/L	-	-	0.0025	-	0.0001	-	-	-	-	-	-	-	-	-	-	<0.0001	-	-	-	-	-	-
1,3-Dichloropropene (Cis + Tra	mg/L	-	-	-	-	0.0003	-	-	-	-	-	-	-	-	-	-	<0.0003	-	-	-	-	-	-
1,4-Dichlorobenzene	mg/L	-	0.001	0.004	-	0.0001	-	-	<0.0004	-	-	<0.0004	-	-	<0.0004	<0.0004	<0.0001	-	-	-	-	-	-
2-Hexanone	mg/L	-	-	-	-	0.001	-	-	-	-	-	-	-	-	-	-	<0.001	-	-	-	-	-	-
Acetone	mg/L	-	-	-	-	0.001	-	-	-	-	-	-	-	-	-	-	<0.001	-	-	-	-	-	-
Benzene	mg/L	-	0.001	-	0.1	0.0002	-	-	0.0044	-	-	<0.0008	-	-	0.0039	0.00297	0.00515	-	-	-	-	-	-
Bromodichloromethane	mg/L	-	-	-	0.2	0.0002	-	-	-	-	-	-	-	-	-	-	<0.0002	-	-	-	-	-	-
Bromoform	mg/L	-	-	-	0.06	0.0001	-	-	-	-	-	-	-	-	-	-	<0.0001	-	-	-	-	-	-
Bromomethane	mg/L	-	-	-	0.0009	0.0002	-	-	-	-	-	-	-	-	-	-	<0.0002	-	-	-	-	-	-
Carbon Tetrachloride	mg/L	-	0.002	-	-	0.0002	-	-	-	-	-	-	-	-	-	-	<0.0002	-	-	-	-	-	-
Chlorobenzene	mg/L	-	-	0.015	-	0.0001	-	-	-	-	-	-	-	-	-	-	<0.0001	-	-	-	-	-	-
Chloroethane	mg/L	-	-	-	-	0.0002	-	-	-	-	-	-	-	-	-	-	0.014	-	-	-	-	-	-
Chloroform	mg/L	-	-	-	-	0.0002	-	-	-	-	-	-	-	-	-	-	<0.0002	-	-	-	-	-	-
Chloromethane	mg/L	-	-	-	0.7	0.0002	-	-	-	-	-	-	-	-	-	-	<0.0002	-	-	-	-	-	-
cis-1,2-Dichloroethylene	mg/L	-	-	-	-	0.0002	-	-	-	-	-	-	-	-	-	-	0.018	-	-	-	-	-	-
cis-1,3-Dichloropropene	mg/L	-	-	-	-	0.0002	-	-	-	-	-	-	-	-	-	-	<0.0002	-	-	-	-	-	-
Dibromochloromethane	mg/L	-	-	-	-	0.0001	-	-	-	-	-	-	-	-	-	-	<0.0001	-	-	-	-	-	-
Dichlorodifluoromethane	mg/L	-	-	-	-	0.0004	-	-	-	-	-	-	-	-	-	-	<0.0004	-	-	-	-	-	-
Dichloromethane	mg/L	-	0.05	-	-	0.0003	-	-	-	-	-	-	-	-	-	<0.0012	-	-	-	-	-	-	-
Ethylbenzene	mg/L	-	0.0016	-	0.008	0.0001	-	-	-	-	-	-	-	-	-	-	<0.0001	-	-	-	-	-	-
Ethylene Dibromide	mg/L	-	-	-	0.005	0.0001	-	-	-	-	-	-	-	-	-	-	<0.0001	-	-	-	-	-	-
m & p-Xylene	mg/L	-	-	-	-	0.0002	-	-	-	-	-	-	-	-	-	-	<0.0002	-	-	-	-	-	-
Methylene Chloride	mg/L	-	-	-	0.1	0.0003	-	-	<0.0012	-	-	<0.0012	-	-	<0.0012	-	<0.0003	-	-	-	-	-	-
Methyl Ethyl Ketone	mg/L	-	-	-	0.4	0.001	-	-	-	-	-	-	-	-	-	-	<0.001	-	-	-	-	-	-
Methyl Isobutyl Ketone	mg/L	-	-	-	-	0.001	-	-	-	-	-	-	-	-	-	-	<0.001	-	-	-	-	-	-
Methyl tertiary-butyl ether (MT	mg/L	-	0.015	-	0.2	0.0002	-	-	-	-	-	-	-	-	-	-	<0.0002	-	-	-	-	-	-
n-Hexane	mg/L	-	-	-	-	0.0002	-	-	-	-	-	-	-	-	-	-	<0.0002	-	-	-	-	-	-
o-Xylene	mg/L	-	-	-	0.04	0.0001	-	-	-	-	-	-	-	-	-	-	<0.0001	-	-	-	-	-	-
Styrene	mg/L	-	-	-	0.004	0.0001	-	-	-	-	-	-	-	-	-	-	<0.0001	-	-	-	-	-	-
Tetrachloroethylene	mg/L	-	0.01	-	0.05	0.0002	-	-	-	-	-	-	-	-	-	-	<0.0002	-	-	-	-	-	-
Toluene	mg/L	-	0.024	-	0.0008	0.0002	-	-	<0.0008	-	-	<0.0008	-	-	<0.0008	<0.0008	<0.0002	-	-	-	-	-	-
trans-1,2-Dichloroethylene	mg/L	-	-	-	-	0.0002	-	-	-	-	-	-	-	-	-	-	<0.0002	-	-	-	-	-	-
trans-1,3-Dichloropropene	mg/L	-	-	-	-	0.0003	-	-	-	-	-	-	-	-	-	-	<0.0003	-	-	-	-	-	-
Trichloroethylene	mg/L	-	0.005	-	0.02	0.0002	-	-	-	-	-	-	-	-	-	-	<0.0002	-	-	-	-	-	-
Trichlorofluoromethane	mg/L	-	-	-	-	0.0004	-	-	-	-	-	-	-	-	-	-	<0.0004	-	-	-	-	-	-
Vinyl Chloride	mg/L	-	0.001	-	0.6	0.00017	-	-	<0.00068	-	-	<0.00068	-	-	<0.00068	0.00211	0.00299	-	-	-	-	-	-
Xylene Mixture	mg/L	-	0.02	-	-	0.0002	-	-	-	-	-	-	-	-	-	-	<0.0002	-	-	-	-	-	-

-LEGEND-

Detection Limit	DL: May vary between sample locations and events
DL exceeds criteria	
Concentration exceeds RUV-MG	Reasonable Use Values Musclow Greenview
Concentration exceeds ODWQS-ALL-MERGED	Ontario Drinking Water Quality Standards All Types Merged
Concentration exceeds PWQO-GENERAL	Provincial Water Quality Objectives General
Concentration exceeds PWQO-INTERIM	Provincial Water Quality Objectives Interim

Appendix E-1: Historical Groundwater Data						Location	MG-DP1	MG-DP1	MG-DP1	MG-DP1	MG-DP1	MG-DP1	MG-DP1	MG-DP1	MG-DP1	MG-DP1	MG-DP1	MG-DP1	MG-DP1	MG-DP1	MG-DP2	MG-DP2	MG-DP2
Parameter	Units	RUV-MG	ODWQS-ALL-MERGED	PWQO-GENERAL	PWQO-INTERIM	Sample ID	MG-DP1	MG-DP1	MG-DP1	MG-DP1	MG-DP1	MG-DP1	MG-DP1	MG-DP1	MG-DP1	MG-DP1	MG-DP1	MG-DP1	MG-DP1	MG-DP1	MG-DP2	MG-DP2	MG-DP2
						Sample Date	2016-Oct-25	2017-May-11	2017-Oct-25	2018-May-09	2019-May-06	2019-Oct-21	2020-May-05	2020-Oct-08	2021-Apr-19	2021-Oct-20	2022-May-04	2022-Oct-25	2023-May-02	2023-Oct-18	2016-Oct-25	2017-May-11	2017-Oct-25
Anions						Detection Limit																	
Chloride	mg/L	125.68	250	-	-	0.1	26.5	27.4	31.7	33.1	29.5	35.8	36.2	41.3	42.3	45.1	49.6	50.7	52.2	44	0.74	1.05	0.95
Nitrate as N	mg/L	2.5375	10	-	-	0.05	<0.25	<0.1	<0.1	<0.1	<0.25	<0.25	<0.25	<0.1	<0.1	<0.05	<0.05	<0.05	<0.05	<0.1	<0.05	<0.05	<0.05
Sulphate	mg/L	259.8	500	-	-	0.1	106	111	112	114	98.9	111	108	107	103	111	113	119	116	110	4.82	8.48	5.34
Cations																							
Calcium (diss)	mg/L	-	-	-	-	0.05	126	123	135	126	122	120	122	128	131	120	130	172	140	150	44.7	41.3	45.3
Magnesium (diss)	mg/L	-	-	-	-	0.05	9.46	9.82	10.4	9.21	9.25	9.62	9.41	9.55	10.5	9.34	10.6	12	11.4	11	3.7	3.67	3.91
Potassium (diss)	mg/L	-	-	-	-	1	5.88	-	-	-	-	-	-	-	-	-	-	-	-	-	2.33	-	-
Sodium (diss)	mg/L	106.25	200	-	-	0.05	7.15	6.58	8.3	7.05	7.02	8.6	7.69	8.38	8.69	8.45	9	13.1	10	12	4.31	4.15	4.39
General Chemistry																							
Alkalinity (as CaCO3)	mg/L	47 - 282	30 - 500	See Factsheet	-	1	253	230	248	252	281	238	230	247	226	224	218	250	239	250	166	144	160
Ammonia as N	mg/L	-	-	-	-	0.02	0.22	0.17	0.17	0.17	0.15	0.24	0.13	0.15	0.18	0.06	0.14	0.19	0.19	0.29	5.9	5.5	5.3
Biochemical Oxygen Demand	mg/L	-	-	-	-	2	-	-	<5	<5	<5	<5	8	<2	<6	<2	<2	<2	<2	<2	-	6	<5
Chemical Oxygen Demand	mg/L	-	-	-	-	4	9	10	30	13	25	14	17	15	7	11	23	12	<5	17	18	20	59
Dissolved Organic Carbon	mg/L	3.7	5	-	-	0.4	6.3	7.4	59.9	30	14.8	4.9	9.4	9.2	5.7	8.5	6.4	5.9	4.8	6.4	11	13.1	60.4
Electrical Conductivity	uS/cm	-	-	-	-	1	709	783	659	687	717	707	904	721	791	752	777	800	812	830	316	320	281
pH	pH units	6.96 - 7.96	6.5 - 8.5	6.5 - 8.5	-		7.59	8.09	8.13	7.93	7.89	7.77	7.6	7.96	7.57	7.69	7.48	7.86	7.65	8.02	6.85	7.69	7.68
Total Dissolved Solids	mg/L	339	500	-	-	5	472	-	466	462	432	492	460	490	498	508	508	522	540	610	190	-	186
Total Hardness (as CaCO3)	mg/L	-	80 - 100	-	-		353.6	347.6	379.9	352.5	342.7	339.3	343.4	358.9	370.3	338.1	368.3	478.9	-	-	126.9	118.2	129.2
Total Suspended Solids	mg/L	-	-	-	-	10	-	-	<10	<10	1180	82	12	10	11	48	<10	22	11	<10	-	-	70
Unionized Ammonia (Calc)	mg/L	-	-	-	-	0.1	0.001276674	0.06324381	0.000692518	0.000763647	0.000284	-	-	-	-	-	-	-	-	-	0.006313934	0.002803349	0.00250746
Metals																							
Aluminum (diss)	mg/L	0.051225	0.1	-	Calculated	0.004	<0.004	0.01	0.009	<0.004	0.006	0.022	0.008	0.013	0.021	0.012	0.013	0.016	<0.004	<0.0049	<0.004	0.011	0.007
Barium (diss)	mg/L	0.2635	1	-	-	0.002	0.074	0.06	0.07	0.063	0.066	0.076	0.071	0.063	0.069	0.069	0.074	0.083	0.069	0.085	0.039	0.043	0.04
Beryllium (diss)	mg/L	-	-	Calculated	-	0.001	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.001	-	-
Boron (diss)	mg/L	1.25825	5	-	0.2	0.01	0.087	0.063	0.077	0.066	0.05	0.097	0.06	0.081	0.059	0.067	0.049	0.078	0.061	0.072	0.063	0.576	0.258
Cadmium (diss)	mg/L	0.0012875	0.005	-	Calculated	0.00009	<0.001	<0.001	<0.001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.00009	<0.001	<0.001	<0.001
Chromium (diss)	mg/L	0.013625	0.05	-	-	0.002	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.002	<0.002	<0.005	<0.003	0.006	0.003
Cobalt (diss)	mg/L	-	-	-	0.0009	0.0005	<0.001	<0.001	<0.001	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.001	<0.001	<0.001
Copper (diss)	mg/L	-	1	-	Calculated	0.001	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.003	-	-
Iron (diss)	mg/L	0.1525	0.3	0.3	-	0.01	0.158	**0.675**	0.239	0.125	0.226	<0.01	<0.01	<0.01	0.033	0.028	0.026	0.04	0.016	<0.1	0.039	**0.946**	**0.518**
Lead (diss)	mg/L	0.0026875	0.01	-	Calculated	0.0005	<0.002	<0.002	<0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0005	<0.0005	<0.0005	<0.002	<0.002	<0.002
Manganese (diss)	mg/L	0.09	0.05	-	-	0.002	0.138	0.161	0.134	0.134	0.141	0.149	0.166	0.13	0.163	0.144	0.163	0.185	0.144	0.15	0.104	0.171	0.111
Molybdenum (diss)	mg/L	-	-	-	0.04	0.005	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.002	-	-
Nickel (diss)	mg/L	-	-	0.025	-	0.005	0.004	-	-	-	-	-	-	-	-	-	-	-	-	-	0.004	-	-
Silicon (diss)	mg/L	-	-	-	-	0.1	11.4	-	-	-	-	-	-	-	-	-	-	-	-	-	13	-	-
Silver (diss)	mg/L	-	-	0.0001	-	0.00009	<0.002	<0.002	<0.002	<0.002	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.00009	<0.002	<0.002	<0.002
Strontium (diss)	mg/L	-	-	-	-	0.001	2.07	-	-	-	-	-	-	-	-	-	-	-	-	-	0.379	-	-
Thallium (diss)	mg/L	-	-	-	0.0003	0.0001	<0.006	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.006	-	-
Titanium (diss)	mg/L	-	-	-	-	0.002	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.002	-	-
Vanadium (diss)	mg/L	-	-	-	0.006	0.001	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.002	-	-
Zinc (diss)	mg/L	2.50125	5	-	0.02	0.005	0.006	0.036	0.006	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005

Appendix E-1: Historical Groundwater Data						Location	MG-DP1	MG-DP1	MG-DP1	MG-DP1	MG-DP1	MG-DP1	MG-DP1	MG-DP1	MG-DP1	MG-DP1	MG-DP1	MG-DP1	MG-DP1	MG-DP2	MG-DP2	MG-DP2
Parameter	Units	RUV-MG	ODWQS-ALL-MERGED	PWQO-GENERAL	PWQO-INTERIM	Sample ID	MG-DP1	MG-DP1	MG-DP1	MG-DP1	MG-DP1	MG-DP1	MG-DP1	MG-DP1	MG-DP1	MG-DP1	MG-DP1	MG-DP1	MG-DP1	MG-DP2	MG-DP2	MG-DP2
						Sample Date	2016-Oct-25	2017-May-11	2017-Oct-25	2018-May-09	2019-May-06	2019-Oct-21	2020-May-05	2020-Oct-08	2021-Apr-19	2021-Oct-20	2022-May-04	2022-Oct-25	2023-May-02	2023-Oct-18	2016-Oct-25	2017-May-11	2017-Oct-25
VOCs																						
1,1,1,2-Tetrachloroethane	mg/L	-	-	-	0.02	0.0001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,1,1-Trichloroethane	mg/L	-	-	-	0.01	0.0003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,1,2,2-Tetrachloroethane	mg/L	-	-	-	0.07	0.0001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,1,2-Trichloroethane	mg/L	-	-	-	0.8	0.0002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,1-Dichloroethane	mg/L	-	-	-	0.2	0.0003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,1-Dichloroethylene	mg/L	-	0.014	-	0.04	0.0002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,2,4-Trichlorobenzene	mg/L	-	-	0.0005	-	0.0003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,2-Dichlorobenzene	mg/L	-	0.003	0.0025	-	0.0001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,2-Dichloroethane	mg/L	-	0.005	-	0.1	0.0002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,2-Dichloropropane	mg/L	-	-	-	0.0007	0.0002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,3-Dichlorobenzene	mg/L	-	-	0.0025	-	0.0001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,3-Dichloropropene (Cis + Tra	mg/L	-	-	-	-	0.0003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,4-Dichlorobenzene	mg/L	-	0.001	0.004	-	0.0001	-	-	-	<0.0000001	-	-	-	-	-	-	-	-	-	-	-	-
2-Hexanone	mg/L	-	-	-	-	0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Acetone	mg/L	-	-	-	-	0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Benzene	mg/L	-	0.001	-	0.1	0.0002	-	-	-	<0.0000002	-	-	-	-	-	-	-	-	-	-	-	-
Bromodichloromethane	mg/L	-	-	-	0.2	0.0002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bromoform	mg/L	-	-	-	0.06	0.0001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bromomethane	mg/L	-	-	-	0.0009	0.0002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Carbon Tetrachloride	mg/L	-	0.002	-	-	0.0002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chlorobenzene	mg/L	-	-	0.015	-	0.0001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chloroethane	mg/L	-	-	-	-	0.0002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chloroform	mg/L	-	-	-	-	0.0002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chloromethane	mg/L	-	-	-	0.7	0.0002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
cis-1,2-Dichloroethylene	mg/L	-	-	-	-	0.0002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
cis-1,3-Dichloropropene	mg/L	-	-	-	-	0.0002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dibromochloromethane	mg/L	-	-	-	-	0.0001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dichlorodifluoromethane	mg/L	-	-	-	-	0.0004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dichloromethane	mg/L	-	0.05	-	-	0.0003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ethylbenzene	mg/L	-	0.0016	-	0.008	0.0001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ethylene Dibromide	mg/L	-	-	-	0.005	0.0001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
m & p-Xylene	mg/L	-	-	-	-	0.0002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Methylene Chloride	mg/L	-	-	-	0.1	0.0003	-	-	-	<0.0000003	-	-	-	-	-	-	-	-	-	-	-	-
Methyl Ethyl Ketone	mg/L	-	-	-	0.4	0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Methyl Isobutyl Ketone	mg/L	-	-	-	-	0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Methyl tertiary-butyl ether (MT	mg/L	-	0.015	-	0.2	0.0002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
n-Hexane	mg/L	-	-	-	-	0.0002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
o-Xylene	mg/L	-	-	-	0.04	0.0001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Styrene	mg/L	-	-	-	0.004	0.0001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Tetrachloroethylene	mg/L	-	0.01	-	0.05	0.0002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Toluene	mg/L	-	0.024	-	0.0008	0.0002	-	-	-	0.0000002	-	-	-	-	-	-	-	-	-	-	-	-
trans-1,2-Dichloroethylene	mg/L	-	-	-	-	0.0002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
trans-1,3-Dichloropropene	mg/L	-	-	-	-	0.0003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Trichloroethylene	mg/L	-	0.005	-	0.02	0.0002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Trichlorofluoromethane	mg/L	-	-	-	-	0.0004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Vinyl Chloride	mg/L	-	0.001	-	0.6	0.00017	-	-	-	<0.0000002	-	-	-	-	-	-	-	-	-	-	-	-
Xylene Mixture	mg/L	-	0.02	-	-	0.0002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

-LEGEND-

Detection Limit	DL: May vary between sample locations and events
DL exceeds criteria	
Concentration exceeds RUV-MG	Reasonable Use Values Musclow Greenview
Concentration exceeds ODWQS-ALL-MERGED	Ontario Drinking Water Quality Standards All Types Merged
Concentration exceeds PWQO-GENERAL	Provincial Water Quality Objectives General
Concentration exceeds PWQO-INTERIM	Provincial Water Quality Objectives Interim

Appendix E-1: Historical Groundwater Data						Location	MG-DP2	MG-DP2	MG-DP2	MG-DP2	MG-DP2	MG-DP2	MG-DP2	MG-DP2	MG-DP2	MG-DP2	MG-DP2	MG-DP3	MG-DP3	MG-DP3	MG-DP3	MG-DP3
Parameter	Units	RUV-MG	ODWQS-ALL-MERGED	PWQO-GENERAL	PWQO-INTERIM	Sample ID	MG-DP2	MG-DP2	MG-DP2	MG-DP2	MG-DP2	MG-DP2	MG-DP2	MG-DP2	MG-DP2	MG-DP2	MG-DP2	MG-DP3	MG-DP3	MG-DP3	MG-DP3	MG-DP3
						Sample Date	2018-May-09	2018-Oct-24	2019-May-06	2019-Oct-21	2020-May-05	2020-Oct-08	2021-Apr-19	2021-Oct-20	2022-May-04	2022-Oct-25	2023-May-02	2023-Oct-18	2016-Oct-25	2017-May-11	2017-Oct-25	2018-May-09	2018-Oct-24
Anions						Detection Limit																	
Chloride	mg/L	125.68	250	-	-	0.1	1.11	0.99	0.97	0.64	0.92	0.86	1.06	0.68	0.63	1.07	1.04	<1	56.2	62.6	72	83.6	77.2
Nitrate as N	mg/L	2.5375	10	-	-	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.11	<0.05	<0.05	<0.1	<0.25	<0.1	<0.25	<0.25	<0.25
Sulphate	mg/L	259.8	500	-	-	0.1	5.73	3.34	1.37	2.2	0.96	5.84	1.78	3.29	1.12	1.05	3.09	<1	62.2	71.5	52.3	65.8	55.7
Cations																							
Calcium (diss)	mg/L	-	-	-	-	0.05	45.6	43.2	45.3	41.7	42.7	41.6	43.1	42.6	43.4	49.3	47.4	47	121	132	152	155	158
Magnesium (diss)	mg/L	-	-	-	-	0.05	3.72	3.57	3.94	3.67	3.68	3.42	3.82	3.5	3.76	4.58	4.42	4	13.7	15.6	18.1	17.9	19
Potassium (diss)	mg/L	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	4.69	-	-	-	-
Sodium (diss)	mg/L	106.25	200	-	-	0.05	4.09	4.12	4.23	4.14	4.07	3.87	4.17	3.99	4.29	6.94	4.26	4.4	15.2	13.9	19.5	17.8	22.3
General Chemistry																							
Alkalinity (as CaCO3)	mg/L	47 - 282	30 - 500	See Factsheet	-	1	164	137	187	155	162	160	159	158	154	171	158	160	279	323	352	373	353
Ammonia as N	mg/L	-	-	-	-	0.02	6.48	5.56	5.08	5.73	5.88	5.46	6.16	0.25	5.32	5.61	5.65	5.9	0.21	0.05	0.21	0.09	0.27
Biochemical Oxygen Demand	mg/L	-	-	-	-	2	10	<5	9	<5	11	<2	5	<2	<2	<2	<2	5	-	-	<5	<5	<5
Chemical Oxygen Demand	mg/L	-	-	-	-	4	27	25	32	18	20	54	93	31	32	27	13	36	15	13	47	56	122
Dissolved Organic Carbon	mg/L	3.7	5	-	-	0.4	34.5	20.2	10.9	30.2	23.1	53.9	13.7	44.7	21.3	54.2	7.6	17	26.3	8.1	185	56.9	39
Electrical Conductivity	uS/cm	-	-	-	-	1	302	336	317	295	391	296	333	308	316	321	306	330	776	915	828	915	112
pH	pH units	6.96 - 7.96	6.5 - 8.5	6.5 - 8.5	-		7.67	7.74	7.48	7.5	7.09	7.64	7.14	7.48	7.12	7.45	7.25	7.71	6.72	7.97	7.78	7.79	7.53
Total Dissolved Solids	mg/L	339	500	-	-	5	168	184	178	208	174	174	188	186	172	172	184	190	494	-	570	610	636
Total Hardness (as CaCO3)	mg/L	-	80 - 100	-	-		129.2	122.6	129.3	119.2	121.8	118	123.4	120.8	123.9	142	-	-	358.6	393.8	454.1	460.7	472.8
Total Suspended Solids	mg/L	-	-	-	-	10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	-	-	<10	<10	<10
Unionized Ammonia (Calc)	mg/L	-	-	-	-	0.1	0.005358495	-	0.00435	-	-	-	-	-	-	-	-	-	0.000156516	0.0000216	0.0000941	0.0000159	0.000045
Metals																							
Aluminum (diss)	mg/L	0.051225	0.1	-	Calculated	0.004	0.006	0.018	0.006	0.008	0.008	0.013	<0.004	0.011	0.013	0.014	0.006	<0.0049	<0.004	0.005	0.014	<0.004	<0.004
Barium (diss)	mg/L	0.2635	1	-	-	0.002	0.03	0.04	0.031	0.03	0.034	0.026	0.028	0.029	0.032	0.032	0.031	0.031	0.124	0.106	0.137	0.14	0.198
Beryllium (diss)	mg/L	-	-	Calculated	-	0.001	-	-	-	-	-	-	-	-	-	-	-	-	<0.001	-	-	-	-
Boron (diss)	mg/L	1.25825	5	-	0.2	0.01	0.09	0.073	0.05	0.065	0.036	0.043	0.029	0.034	0.017	0.037	0.038	0.045	0.158	0.155	0.239	0.214	0.254
Cadmium (diss)	mg/L	0.0012875	0.005	-	Calculated	0.00009	<0.0001	0.0003	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.00009	<0.001	<0.001	<0.001	<0.0001	<0.0001
Chromium (diss)	mg/L	0.013625	0.05	-	-	0.002	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.002	<0.002	<0.005	<0.003	<0.003	<0.003	0.006	<0.003
Cobalt (diss)	mg/L	-	-	-	0.0009	0.0005	<0.001	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.005	<0.0005	<0.0005	<0.0005	<0.0005	0.001	0.001	0.002	0.002	<0.002
Copper (diss)	mg/L	-	1	-	Calculated	0.001	-	-	-	-	-	-	-	-	-	-	-	-	<0.003	-	-	-	-
Iron (diss)	mg/L	0.1525	0.3	0.3	-	0.01	0.223	0.16	0.204	0.057	0.204	<0.01	0.215	0.106	0.098	0.05	0.018	<0.1	0.372	0.333	0.284	0.291	0.453
Lead (diss)	mg/L	0.0026875	0.01	-	Calculated	0.0005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0005	<0.0005	<0.0005	<0.002	<0.002	<0.002	<0.001	<0.001
Manganese (diss)	mg/L	0.09	0.05	-	-	0.002	0.082	0.074	0.08	0.075	0.079	0.06	0.067	0.06	0.07	0.065	0.068	0.067	0.867	0.475	0.199	0.23	0.203
Molybdenum (diss)	mg/L	-	-	-	0.04	0.005	-	-	-	-	-	-	-	-	-	-	-	-	<0.002	-	-	-	-
Nickel (diss)	mg/L	-	-	0.025	-	0.005	-	-	-	-	-	-	-	-	-	-	-	-	0.006	-	-	-	-
Silicon (diss)	mg/L	-	-	-	-	0.1	-	-	-	-	-	-	-	-	-	-	-	-	15.4	-	-	-	-
Silver (diss)	mg/L	-	-	0.0001	-	0.00009	<0.002	<0.002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.00009	<0.002	<0.002	<0.002	<0.002	<0.002
Strontium (diss)	mg/L	-	-	-	-	0.001	-	-	-	-	-	-	-	-	-	-	-	-	0.748	-	-	-	-
Thallium (diss)	mg/L	-	-	-	0.0003	0.0001	-	-	-	-	-	-	-	-	-	-	-	-	<0.006	-	-	-	-
Titanium (diss)	mg/L	-	-	-	-	0.002	-	-	-	-	-	-	-	-	-	-	-	-	<0.002	-	-	-	-
Vanadium (diss)	mg/L	-	-	-	0.006	0.001	-	-	-	-	-	-	-	-	-	-	-	-	<0.002	-	-	-	-
Zinc (diss)	mg/L	2.50125	5	-	0.02	0.005	<0.005	0.013	0.008	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.006	0.008	<0.005	<0.005	<0.005	0.005	0.006	0.018

Appendix E-1: Historical Groundwater Data						Location	MG-DP2	MG-DP2	MG-DP2	MG-DP2	MG-DP2	MG-DP2	MG-DP2	MG-DP2	MG-DP2	MG-DP2	MG-DP2	MG-DP3	MG-DP3	MG-DP3	MG-DP3	MG-DP3
Parameter	Units	RUV-MG	ODWQS-ALL-MERGED	PWQO-GENERAL	PWQO-INTERIM	Sample ID	MG-DP2	MG-DP2	MG-DP2	MG-DP2	MG-DP2	MG-DP2	MG-DP2	MG-DP2	MG-DP2	MG-DP2	MG-DP2	MG-DP3	MG-DP3	MG-DP3	MG-DP3	MG-DP3
						Sample Date	2018-May-09	2018-Oct-24	2019-May-06	2019-Oct-21	2020-May-05	2020-Oct-08	2021-Apr-19	2021-Oct-20	2022-May-04	2022-Oct-25	2023-May-02	2023-Oct-18	2016-Oct-25	2017-May-11	2017-Oct-25	2018-May-09	2018-Oct-24
VOCs																							
1,1,1,2-Tetrachloroethane	mg/L	-	-	-	0.02	0.0001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,1,1-Trichloroethane	mg/L	-	-	-	0.01	0.0003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,1,2,2-Tetrachloroethane	mg/L	-	-	-	0.07	0.0001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,1,2-Trichloroethane	mg/L	-	-	-	0.8	0.0002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,1-Dichloroethane	mg/L	-	-	-	0.2	0.0003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,1-Dichloroethylene	mg/L	-	0.014	-	0.04	0.0002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,2,4-Trichlorobenzene	mg/L	-	-	0.0005	-	0.0003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,2-Dichlorobenzene	mg/L	-	0.003	0.0025	-	0.0001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,2-Dichloroethane	mg/L	-	0.005	-	0.1	0.0002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,2-Dichloropropane	mg/L	-	-	-	0.0007	0.0002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,3-Dichlorobenzene	mg/L	-	-	0.0025	-	0.0001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,3-Dichloropropene (Cis + Tra	mg/L	-	-	-	-	0.0003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,4-Dichlorobenzene	mg/L	-	0.001	0.004	-	0.0001	<0.0000001	<0.0000004	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.0000004	<0.0000004
2-Hexanone	mg/L	-	-	-	-	0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Acetone	mg/L	-	-	-	-	0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Benzene	mg/L	-	0.001	-	0.1	0.0002	<0.0000002	<0.0000008	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.0000008	<0.0000008
Bromodichloromethane	mg/L	-	-	-	0.2	0.0002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bromoform	mg/L	-	-	-	0.06	0.0001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bromomethane	mg/L	-	-	-	0.0009	0.0002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Carbon Tetrachloride	mg/L	-	0.002	-	-	0.0002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chlorobenzene	mg/L	-	-	0.015	-	0.0001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chloroethane	mg/L	-	-	-	-	0.0002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chloroform	mg/L	-	-	-	-	0.0002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chloromethane	mg/L	-	-	-	0.7	0.0002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
cis-1,2-Dichloroethylene	mg/L	-	-	-	-	0.0002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
cis-1,3-Dichloropropene	mg/L	-	-	-	-	0.0002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dibromochloromethane	mg/L	-	-	-	-	0.0001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dichlorodifluoromethane	mg/L	-	-	-	-	0.0004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dichloromethane	mg/L	-	0.05	-	-	0.0003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ethylbenzene	mg/L	-	0.0016	-	0.008	0.0001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ethylene Dibromide	mg/L	-	-	-	0.005	0.0001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
m & p-Xylene	mg/L	-	-	-	-	0.0002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Methylene Chloride	mg/L	-	-	-	0.1	0.0003	<0.0000003	<0.0000012	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.0000012	<0.0000012
Methyl Ethyl Ketone	mg/L	-	-	-	0.4	0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Methyl Isobutyl Ketone	mg/L	-	-	-	-	0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Methyl tertiary-butyl ether (MT	mg/L	-	0.015	-	0.2	0.0002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
n-Hexane	mg/L	-	-	-	-	0.0002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
o-Xylene	mg/L	-	-	-	0.04	0.0001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Styrene	mg/L	-	-	-	0.004	0.0001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Tetrachloroethylene	mg/L	-	0.01	-	0.05	0.0002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Toluene	mg/L	-	0.024	-	0.0008	0.0002	<0.0000002	<0.0000008	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.0000008	<0.0000008
trans-1,2-Dichloroethylene	mg/L	-	-	-	-	0.0002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
trans-1,3-Dichloropropene	mg/L	-	-	-	-	0.0003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Trichloroethylene	mg/L	-	0.005	-	0.02	0.0002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Trichlorofluoromethane	mg/L	-	-	-	-	0.0004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Vinyl Chloride	mg/L	-	0.001	-	0.6	0.00017	<0.0000002	<0.0000007	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.0000007	<0.0000007
Xylene Mixture	mg/L	-	0.02	-	-	0.0002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

-LEGEND-

Detection Limit	DL: May vary between sample locations and events
DL exceeds criteria	
Concentration exceeds RUV-MG	Reasonable Use Values Musclow Greenview
Concentration exceeds ODWQS-ALL-MERGED	Ontario Drinking Water Quality Standards All Types Merged
Concentration exceeds PWQO-GENERAL	Provincial Water Quality Objectives General
Concentration exceeds PWQO-INTERIM	Provincial Water Quality Objectives Interim

Appendix E-1: Historical Groundwater Data						Location	MG-DP3	MG-DP3	MG-DP3	MG-DP3	MG-DP3	MG-DP3	MG-DP3	MG-DP3	MG-DP3	MG-DP3	MG-DP4	MG-DP4	MG-DP4	MG-DP4	MG-DP4	MG-DP4	MG-DP4
Parameter	Units	RUV-MG	ODWQS-ALL-MERGED	PWQO-GENERAL	PWQO-INTERIM	Sample ID	MG-DP3	MG-DP3	MG-DP3	MG-DP3	MG-DP3	MG-DP3	MG-DP3	MG-DP3	MG-DP3	MG-DP3	MG-DP4	MG-DP4	MG-DP4	MG-DP4	MG-DP4	MG-DP4	MG-DP4
						Sample Date	2019-May-06	2019-Oct-21	2020-May-05	2020-Oct-08	2021-Apr-19	2021-Oct-20	2022-May-04	2022-Oct-25	2023-May-02	2023-Oct-18	2016-Oct-25	2017-May-11	2017-Oct-25	2018-May-09	2018-Oct-24	2019-May-06	2019-Oct-21
Anions						Detection Limit																	
Chloride	mg/L	125.68	250	-	-	0.1	82.5	76.7	85.5	74.7	77.6	73.6	75.2	77.3	77.7	57	2.01	3.19	1.78	1.82	1.64	2.16	1.52
Nitrate as N	mg/L	2.5375	10	-	-	0.05	<0.25	<0.25	<0.25	<0.25	<0.25	<0.05	1.8	<0.05	<0.05	<0.1	<0.05	<0.05	0.08	<0.05	0.06	<0.05	<0.05
Sulphate	mg/L	259.8	500	-	-	0.1	62.2	48.5	52.4	43.3	43.3	44.1	42.5	39.2	37	24	14.3	7.77	13.8	17.2	14.2	13.3	13.6
Cations																							
Calcium (diss)	mg/L	-	-	-	-	0.05	193	183	212	223	234	225	231	279	250	260	33.7	37.6	36.2	32.7	33.8	36.6	32
Magnesium (diss)	mg/L	-	-	-	-	0.05	23	25.3	25	24.8	29.4	26.8	28.8	33.5	31.3	33	4.54	5.33	5.12	4.27	4.69	5.1	4.68
Potassium (diss)	mg/L	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	2.83	-	-	-	-	-	-
Sodium (diss)	mg/L	106.25	200	-	-	0.05	22.3	28.6	36.3	43.4	49	52.2	58.2	76.2	48.6	71	5.32	5.86	5.2	4.31	4.81	4.89	4.8
General Chemistry																							
Alkalinity (as CaCO3)	mg/L	47 - 282	30 - 500	See Factsheet	-	1	558	474	530	575	593	614	631	678	736	680	120	130	115	110	95	132	107
Ammonia as N	mg/L	-	-	-	-	0.02	0.09	0.36	0.08	0.22	0.07	5.28	<0.02	0.21	0.05	0.53	0.1	0.07	<0.02	0.04	<0.02	<0.02	0.02
Biochemical Oxygen Demand	mg/L	-	-	-	-	2	<5	<5	<5	2	<2	3	4	3	<2	<2	-	-	6	<5	<5	<5	<5
Chemical Oxygen Demand	mg/L	-	-	-	-	4	61	23	56	34	52	15	47	41	25	54	9	19	7	23	25	13	45
Dissolved Organic Carbon	mg/L	3.7	5	-	-	0.4	38.2	32.6	33.6	34.8	28.6	44.2	27.1	30.4	12.2	22	7.4	4.4	7	23.3	15	3.9	3.9
Electrical Conductivity	uS/cm	-	-	-	-	1	1180	1090	1580	1200	1440	1360	1410	1360	1480	1500	242	297	215	227	256	251	223
pH	pH units	6.96 - 7.96	6.5 - 8.5	6.5 - 8.5	-		7.6	7.41	7.02	7.55	6.89	7.34	7.11	7.17	6.99	7.59	7.41	7.92	7.65	7.4	7.49	7.43	7.41
Total Dissolved Solids	mg/L	339	500	-	-	5	728	702	782	768	850	832	822	834	882	910	54	-	174	136	-	138	168
Total Hardness (as CaCO3)	mg/L	-	80 - 100	-	-		576.6	561.1	632.3	659	705.4	672.2	695.4	834.6	-	-	102.8	115.8	111.5	99.2	103.7	112.4	99.2
Total Suspended Solids	mg/L	-	-	-	-	10	52	29	<10	<10	<10	<10	<10	<10	<10	<10	-	-	2360	40	-	134	204
Unionized Ammonia (Calc)	mg/L	-	-	-	-	0.1	0.0000304	-	-	-	-	-	-	-	-	-	0.001171107	0.000517427	0.000515454	-	-	-	-
Metals																							
Aluminum (diss)	mg/L	0.051225	0.1	-	Calculated	0.004	0.009	0.005	0.006	0.01	<0.004	0.011	0.024	0.01	<0.004	<0.0049	0.04	0.006	0.018	0.005	0.008	0.007	0.006
Barium (diss)	mg/L	0.2635	1	-	-	0.002	0.182	0.221	0.23	0.204	0.219	0.22	0.234	0.254	0.172	0.25	0.025	0.013	0.013	0.013	0.015	0.015	0.013
Beryllium (diss)	mg/L	-	-	Calculated	-	0.001	-	-	-	-	-	-	-	-	-	-	<0.001	-	-	-	-	-	-
Boron (diss)	mg/L	1.25825	5	-	0.2	0.01	0.261	0.359	0.459	0.447	0.551	0.541	0.664	0.8	0.52	0.81	0.086	0.137	0.024	0.026	0.026	0.016	0.042
Cadmium (diss)	mg/L	0.0012875	0.005	-	Calculated	0.00009	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.00009	<0.001	<0.001	<0.001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium (diss)	mg/L	0.013625	0.05	-	-	0.002	0.006	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.002	<0.002	<0.005	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Cobalt (diss)	mg/L	-	-	-	0.0009	0.0005	0.0025	0.0025	0.0029	0.0025	0.003	0.0025	0.0039	0.0038	0.0038	0.0034	0.001	<0.001	<0.001	<0.001	<0.001	<0.0005	<0.0005
Copper (diss)	mg/L	-	1	-	Calculated	0.001	-	-	-	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-
Iron (diss)	mg/L	0.1525	0.3	0.3	-	0.01	0.84	0.428	0.229	0.314	0.288	0.448	0.628	0.498	0.796	0.57	0.046	<0.01	<0.01	0.029	<0.01	<0.01	<0.01
Lead (diss)	mg/L	0.0026875	0.01	-	Calculated	0.0005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0005	<0.0005	<0.0005	<0.002	<0.002	<0.002	<0.001	<0.001	<0.001	<0.001
Manganese (diss)	mg/L	0.09	0.05	-	-	0.002	0.292	0.163	0.139	0.133	0.151	0.166	0.201	0.169	0.343	0.19	0.254	0.036	0.023	0.007	0.005	0.011	<0.002
Molybdenum (diss)	mg/L	-	-	-	0.04	0.005	-	-	-	-	-	-	-	-	-	-	0.003	-	-	-	-	-	-
Nickel (diss)	mg/L	-	-	0.025	-	0.005	-	-	-	-	-	-	-	-	-	-	0.005	-	-	-	-	-	-
Silicon (diss)	mg/L	-	-	-	-	0.1	-	-	-	-	-	-	-	-	-	-	11.1	-	-	-	-	-	-
Silver (diss)	mg/L	-	-	0.0001	-	0.00009	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.00009	<0.002	<0.002	<0.002	<0.002	<0.002	<0.0001	<0.0001
Strontium (diss)	mg/L	-	-	-	-	0.001	-	-	-	-	-	-	-	-	-	-	0.228	-	-	-	-	-	-
Thallium (diss)	mg/L	-	-	-	0.0003	0.0001	-	-	-	-	-	-	-	-	-	-	<0.006	-	-	-	-	-	-
Titanium (diss)	mg/L	-	-	-	-	0.002	-	-	-	-	-	-	-	-	-	-	0.003	-	-	-	-	-	-
Vanadium (diss)	mg/L	-	-	-	0.006	0.001	-	-	-	-	-	-	-	-	-	-	<0.002	-	-	-	-	-	-
Zinc (diss)	mg/L	2.50125	5	-	0.02	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.005	<0.005	0.013	0.011	<0.005

Appendix E-1: Historical Groundwater Data						Location	MG-DP3	MG-DP3	MG-DP3	MG-DP3	MG-DP3	MG-DP3	MG-DP3	MG-DP3	MG-DP3	MG-DP3	MG-DP4	MG-DP4	MG-DP4	MG-DP4	MG-DP4	MG-DP4	MG-DP4
Parameter	Units	RUV-MG	ODWQS-ALL-MERGED	PWQO-GENERAL	PWQO-INTERIM	Sample ID	MG-DP3	MG-DP3	MG-DP3	MG-DP3	MG-DP3	MG-DP3	MG-DP3	MG-DP3	MG-DP3	MG-DP3	MG-DP4	MG-DP4	MG-DP4	MG-DP4	MG-DP4	MG-DP4	MG-DP4
						Sample Date	2019-May-06	2019-Oct-21	2020-May-05	2020-Oct-08	2021-Apr-19	2021-Oct-20	2022-May-04	2022-Oct-25	2023-May-02	2023-Oct-18	2016-Oct-25	2017-May-11	2017-Oct-25	2018-May-09	2018-Oct-24	2019-May-06	2019-Oct-21
VOCs																							
1,1,1,2-Tetrachloroethane	mg/L	-	-	-	0.02	0.0001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,1,1-Trichloroethane	mg/L	-	-	-	0.01	0.0003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,1,2,2-Tetrachloroethane	mg/L	-	-	-	0.07	0.0001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,1,2-Trichloroethane	mg/L	-	-	-	0.8	0.0002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,1-Dichloroethane	mg/L	-	-	-	0.2	0.0003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,1-Dichloroethylene	mg/L	-	0.014	-	0.04	0.0002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,2,4-Trichlorobenzene	mg/L	-	-	0.0005	-	0.0003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,2-Dichlorobenzene	mg/L	-	0.003	0.0025	-	0.0001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,2-Dichloroethane	mg/L	-	0.005	-	0.1	0.0002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,2-Dichloropropane	mg/L	-	-	-	0.0007	0.0002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,3-Dichlorobenzene	mg/L	-	-	0.0025	-	0.0001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,3-Dichloropropene (Cis + Tra	mg/L	-	-	-	-	0.0003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,4-Dichlorobenzene	mg/L	-	0.001	0.004	-	0.0001	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.0000004	<0.0000004	-	-
2-Hexanone	mg/L	-	-	-	-	0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Acetone	mg/L	-	-	-	-	0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Benzene	mg/L	-	0.001	-	0.1	0.0002	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.0000008	<0.0000008	-	-
Bromodichloromethane	mg/L	-	-	-	0.2	0.0002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bromoform	mg/L	-	-	-	0.06	0.0001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bromomethane	mg/L	-	-	-	0.0009	0.0002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Carbon Tetrachloride	mg/L	-	0.002	-	-	0.0002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chlorobenzene	mg/L	-	-	0.015	-	0.0001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chloroethane	mg/L	-	-	-	-	0.0002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chloroform	mg/L	-	-	-	-	0.0002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chloromethane	mg/L	-	-	-	0.7	0.0002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
cis-1,2-Dichloroethylene	mg/L	-	-	-	-	0.0002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
cis-1,3-Dichloropropene	mg/L	-	-	-	-	0.0002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dibromochloromethane	mg/L	-	-	-	-	0.0001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dichlorodifluoromethane	mg/L	-	-	-	-	0.0004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dichloromethane	mg/L	-	0.05	-	-	0.0003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ethylbenzene	mg/L	-	0.0016	-	0.008	0.0001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ethylene Dibromide	mg/L	-	-	-	0.005	0.0001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
m & p-Xylene	mg/L	-	-	-	-	0.0002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Methylene Chloride	mg/L	-	-	-	0.1	0.0003	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.0000012	<0.0000012	-	-
Methyl Ethyl Ketone	mg/L	-	-	-	0.4	0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Methyl Isobutyl Ketone	mg/L	-	-	-	-	0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Methyl tertiary-butyl ether (MT	mg/L	-	0.015	-	0.2	0.0002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
n-Hexane	mg/L	-	-	-	-	0.0002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
o-Xylene	mg/L	-	-	-	0.04	0.0001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Styrene	mg/L	-	-	-	0.004	0.0001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Tetrachloroethylene	mg/L	-	0.01	-	0.05	0.0002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Toluene	mg/L	-	0.024	-	0.0008	0.0002	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.0000008	<0.0000008	-	-
trans-1,2-Dichloroethylene	mg/L	-	-	-	-	0.0002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
trans-1,3-Dichloropropene	mg/L	-	-	-	-	0.0003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Trichloroethylene	mg/L	-	0.005	-	0.02	0.0002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Trichlorofluoromethane	mg/L	-	-	-	-	0.0004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Vinyl Chloride	mg/L	-	0.001	-	0.6	0.00017	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.0000007	<0.0000007	-	-
Xylene Mixture	mg/L	-	0.02	-	-	0.0002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

-LEGEND-

Detection Limit	DL: May vary between sample locations and events
DL exceeds criteria	
Concentration exceeds RUV-MG	Reasonable Use Values Musclow Greenview
Concentration exceeds ODWQS-ALL-MERGED	Ontario Drinking Water Quality Standards All Types Merged
Concentration exceeds PWQO-GENERAL	Provincial Water Quality Objectives General
Concentration exceeds PWQO-INTERIM	Provincial Water Quality Objectives Interim

Appendix E-1: Historical Groundwater Data						Location	MG-DP4	MG-DP4	MG-DP4	MG-DP4	MG-DP4	MG-DP4	MG-DP4	MG-DP4	MG-DP5	MG-DP5	MG-DP5	MG-DP5	MG-DP5	MG-DP5
Parameter	Units	RUV-MG	ODWQS-ALL-MERGED	PWQO-GENERAL	PWQO-INTERIM	Sample ID	MG-DP4	MG-DP4	MG-DP4	MG-DP4	MG-DP4	MG-DP4	MG-DP4	MG-DP4	MG-DP5	MG-DP5	MG-DP5	QC GW1-F22 (M	MG-DP5	MG-DP5
						Sample Date	2020-May-05	2020-Oct-08	2021-Apr-19	2021-Oct-20	2022-May-04	2022-Oct-25	2023-May-02	2023-Oct-18	2021-Oct-20	2022-May-04	2022-Oct-25	2022-Oct-25	2023-May-02	2023-Oct-18
Anions						Detection Limit														
Chloride	mg/L	125.68	250	-	-	0.1	1.9	1.73	2.89	2.46	3.36	4.2	4.94	2.8	53	80.1	64.4	64.7	66	63
Nitrate as N	mg/L	2.5375	10	-	-	0.05	<0.05	<0.05	0.08	<0.05	<0.05	0.12	0.12	0.13	<0.05	<0.05	<0.05	<0.05	<0.05	<0.1
Sulphate	mg/L	259.8	500	-	-	0.1	14	12.5	13.2	9.86	12.6	13.8	13.2	11	78.9	79.7	74.5	74	52.3	53
Cations																				
Calcium (diss)	mg/L	-	-	-	-	0.05	33.8	29.1	33.2	26.4	29.4	29.5	33.3	31	127	58.6	79.5	80.1	113	120
Magnesium (diss)	mg/L	-	-	-	-	0.05	4.92	4.51	5.11	4.11	4.75	5.2	4.79	4.6	10.2	6.02	6.84	6.69	11.3	9.8
Potassium (diss)	mg/L	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sodium (diss)	mg/L	106.25	200	-	-	0.05	4.76	4.62	4.88	4.08	4.66	5.65	4.52	4.8	12.6	4.47	7.8	5.45	8.12	7.9
General Chemistry																				
Alkalinity (as CaCO3)	mg/L	47 - 282	30 - 500	See Factsheet	-	1	107	104	103	87	93	101	103	96	332	276	255	254	305	230
Ammonia as N	mg/L	-	-	-	-	0.02	<0.02	<0.02	<0.02	0.15	<0.02	<0.02	<0.02	<0.05	0.11	0.05	0.06	0.05	0.06	0.078
Biochemical Oxygen Demand	mg/L	-	-	-	-	2	<5	2	<2	<2	3	7	<2	12	2	3	<2	2	<6	7
Chemical Oxygen Demand	mg/L	-	-	-	-	4	13	<5	62	70	14	7	18	29	10	27	9	<5	25	42
Dissolved Organic Carbon	mg/L	3.7	5	-	-	0.4	10.1	18.9	24.5	37.6	18.3	28.8	1.7	11	9.5	11.4	7.3	7.1	7.1	9.7
Electrical Conductivity	uS/cm	-	-	-	-	1	283	209	249	188	214	233	229	230	899	892	758	749	791	750
pH	pH units	6.96 - 7.96	6.5 - 8.5	6.5 - 8.5	-		7.74	7.23	7.85	7.67	7.48	7.96	7.85	7.96	7.29	6.9	7.33	7.19	6.87	7.06
Total Dissolved Solids	mg/L	339	500	-	-	5	138	128	138	140	134	132	102	155	572	690	548	546	490	625
Total Hardness (as CaCO3)	mg/L	-	80 - 100	-	-		104.7	91.2	103.9	82.8	93	95.1	-	-	359.1	171.1	226.7	227.6	-	-
Total Suspended Solids	mg/L	-	-	-	-	10	59	<10	122	113	167	111	14	82	134	41	28	26	73	340
Unionized Ammonia (Calc)	mg/L	-	-	-	-	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Metals																				
Aluminum (diss)	mg/L	0.051225	0.1	-	Calculated	0.004	0.008	0.016	<0.004	0.01	0.013	0.086	<0.004	<0.0049	0.01	0.02	0.01	0.007	<0.004	<0.0049
Barium (diss)	mg/L	0.2635	1	-	-	0.002	0.014	0.011	0.012	0.011	0.012	0.011	0.012	0.011	0.056	0.035	0.049	0.046	0.041	0.046
Beryllium (diss)	mg/L	-	-	Calculated	-	0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Boron (diss)	mg/L	1.25825	5	-	0.2	0.01	0.022	0.045	0.018	0.03	<0.01	0.024	0.015	0.014	0.08	0.014	0.028	0.037	0.031	0.038
Cadmium (diss)	mg/L	0.0012875	0.005	-	Calculated	0.00009	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.00009	<0.0001	<0.0001	0.0005	<0.0001	<0.0001	<0.00009
Chromium (diss)	mg/L	0.013625	0.05	-	-	0.002	<0.003	<0.003	<0.003	<0.003	0.003	<0.002	<0.002	<0.005	<0.003	<0.003	<0.002	<0.002	<0.002	<0.005
Cobalt (diss)	mg/L	-	-	-	0.0009	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0037	0.0122	0.0627	0.0557	0.068	0.1
Copper (diss)	mg/L	-	1	-	Calculated	0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Iron (diss)	mg/L	0.1525	0.3	0.3	-	0.01	<0.01	<0.01	<0.01	0.178	0.012	<0.01	<0.01	<0.1	0.568	3.9	10.7	10.4	27.3	120
Lead (diss)	mg/L	0.0026875	0.01	-	Calculated	0.0005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0005	<0.0005	<0.0005	0.001	<0.001	<0.0005	<0.0005	<0.0005	<0.0005
Manganese (diss)	mg/L	0.09	0.05	-	-	0.002	0.005	0.003	<0.002	0.009	0.004	<0.002	<0.002	<0.002	0.95	0.864	1.41	1.27	2.79	3.9
Molybdenum (diss)	mg/L	-	-	-	0.04	0.005	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nickel (diss)	mg/L	-	-	0.025	-	0.005	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Silicon (diss)	mg/L	-	-	-	-	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Silver (diss)	mg/L	-	-	0.0001	-	0.00009	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.00009	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.00009
Strontium (diss)	mg/L	-	-	-	-	0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Thallium (diss)	mg/L	-	-	-	0.0003	0.0001	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Titanium (diss)	mg/L	-	-	-	-	0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Vanadium (diss)	mg/L	-	-	-	0.006	0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zinc (diss)	mg/L	2.50125	5	-	0.02	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	87.9	325	206	218	48.7	43

Appendix E-1: Historical Groundwater Data						Location	MG-DP4	MG-DP4	MG-DP4	MG-DP4	MG-DP4	MG-DP4	MG-DP4	MG-DP4	MG-DP5	MG-DP5	MG-DP5	MG-DP5	MG-DP5	MG-DP5
Parameter	Units	RUV-MG	ODWQS-ALL-MERGED	PWQO-GENERAL	PWQO-INTERIM	Sample ID	MG-DP4	MG-DP4	MG-DP4	MG-DP4	MG-DP4	MG-DP4	MG-DP4	MG-DP4	MG-DP5	MG-DP5	MG-DP5	QC GW1-F22 (M	MG-DP5	MG-DP5
						Sample Date	2020-May-05	2020-Oct-08	2021-Apr-19	2021-Oct-20	2022-May-04	2022-Oct-25	2023-May-02	2023-Oct-18	2021-Oct-20	2022-May-04	2022-Oct-25	2022-Oct-25	2023-May-02	2023-Oct-18
VOCs																				
1,1,1,2-Tetrachloroethane	mg/L	-	-	-	0.02	0.0001	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,1,1-Trichloroethane	mg/L	-	-	-	0.01	0.0003	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,1,2,2-Tetrachloroethane	mg/L	-	-	-	0.07	0.0001	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,1,2-Trichloroethane	mg/L	-	-	-	0.8	0.0002	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,1-Dichloroethane	mg/L	-	-	-	0.2	0.0003	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,1-Dichloroethylene	mg/L	-	0.014	-	0.04	0.0002	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,2,4-Trichlorobenzene	mg/L	-	-	0.0005	-	0.0003	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,2-Dichlorobenzene	mg/L	-	0.003	0.0025	-	0.0001	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,2-Dichloroethane	mg/L	-	0.005	-	0.1	0.0002	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,2-Dichloropropane	mg/L	-	-	-	0.0007	0.0002	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,3-Dichlorobenzene	mg/L	-	-	0.0025	-	0.0001	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,3-Dichloropropene (Cis + Tra	mg/L	-	-	-	-	0.0003	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,4-Dichlorobenzene	mg/L	-	0.001	0.004	-	0.0001	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2-Hexanone	mg/L	-	-	-	-	0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Acetone	mg/L	-	-	-	-	0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Benzene	mg/L	-	0.001	-	0.1	0.0002	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bromodichloromethane	mg/L	-	-	-	0.2	0.0002	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bromoform	mg/L	-	-	-	0.06	0.0001	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bromomethane	mg/L	-	-	-	0.0009	0.0002	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Carbon Tetrachloride	mg/L	-	0.002	-	-	0.0002	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chlorobenzene	mg/L	-	-	0.015	-	0.0001	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chloroethane	mg/L	-	-	-	-	0.0002	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chloroform	mg/L	-	-	-	-	0.0002	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chloromethane	mg/L	-	-	-	0.7	0.0002	-	-	-	-	-	-	-	-	-	-	-	-	-	-
cis-1,2-Dichloroethylene	mg/L	-	-	-	-	0.0002	-	-	-	-	-	-	-	-	-	-	-	-	-	-
cis-1,3-Dichloropropene	mg/L	-	-	-	-	0.0002	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dibromochloromethane	mg/L	-	-	-	-	0.0001	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dichlorodifluoromethane	mg/L	-	-	-	-	0.0004	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dichloromethane	mg/L	-	0.05	-	-	0.0003	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ethylbenzene	mg/L	-	0.0016	-	0.008	0.0001	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ethylene Dibromide	mg/L	-	-	-	0.005	0.0001	-	-	-	-	-	-	-	-	-	-	-	-	-	-
m & p-Xylene	mg/L	-	-	-	-	0.0002	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Methylene Chloride	mg/L	-	-	-	0.1	0.0003	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Methyl Ethyl Ketone	mg/L	-	-	-	0.4	0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Methyl Isobutyl Ketone	mg/L	-	-	-	-	0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Methyl tertiary-butyl ether (MT	mg/L	-	0.015	-	0.2	0.0002	-	-	-	-	-	-	-	-	-	-	-	-	-	-
n-Hexane	mg/L	-	-	-	-	0.0002	-	-	-	-	-	-	-	-	-	-	-	-	-	-
o-Xylene	mg/L	-	-	-	0.04	0.0001	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Styrene	mg/L	-	-	-	0.004	0.0001	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Tetrachloroethylene	mg/L	-	0.01	-	0.05	0.0002	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Toluene	mg/L	-	0.024	-	0.0008	0.0002	-	-	-	-	-	-	-	-	-	-	-	-	-	-
trans-1,2-Dichloroethylene	mg/L	-	-	-	-	0.0002	-	-	-	-	-	-	-	-	-	-	-	-	-	-
trans-1,3-Dichloropropene	mg/L	-	-	-	-	0.0003	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Trichloroethylene	mg/L	-	0.005	-	0.02	0.0002	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Trichlorofluoromethane	mg/L	-	-	-	-	0.0004	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Vinyl Chloride	mg/L	-	0.001	-	0.6	0.00017	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Xylene Mixture	mg/L	-	0.02	-	-	0.0002	-	-	-	-	-	-	-	-	-	-	-	-	-	-

-LEGEND-

Detection Limit	DL: May vary between sample locations and events
DL exceeds criteria	
Concentration exceeds RUV-MG	Reasonable Use Values Musclow Greenview
Concentration exceeds ODWQS-ALL-MERGED	Ontario Drinking Water Quality Standards All Types Merged
Concentration exceeds PWQO-GENERAL	Provincial Water Quality Objectives General
Concentration exceeds PWQO-INTERIM	Provincial Water Quality Objectives Interim

Appendix E

E-2 Historical Surface Water Data

Appendix E-2: Historical Surface Water Data						Location	MG-SW1	MG-SW1	MG-SW1	MG-SW1	MG-SW1	MG-SW1	MG-SW1	MG-SW1	MG-SW1	MG-SW1	MG-SW1	MG-SW1	MG-SW1	MG-SW1	MG-SW1
Parameter	Units	PWQO-GENERAL	PWQO-INTERIM	MECP-GD-TA	MECP-GD-TB	Sample ID	MG-SW1	MG-SW1	MG-SW1	MG-SW1	MG-SW1	MG-SW1	MG-SW1	MG-SW1	MG-SW1	MG-SW1	MG-SW1	MG-SW1	MG-SW1	MG-SW1	MG-SW1
						Sample Date	2006-May-10	2006-Nov-20	2007-May-03	2007-Nov-21	2008-May-08	2008-Oct-08	2009-Jun-04	2009-Oct-21	2010-May-18	2010-Oct-19	2011-May-19	2011-Nov-03	2012-Apr-16	2012-Oct-15	2013-Apr-16	2013-Oct-29
Anions						Detection Limit																
Chloride	mg/L	-	-	180	128	0.1	-	10	13	17	11	17	12	14	26	22	17	18	23	29	19.2	30.3
Nitrate + Nitrite	mg/L	-	-	-	-	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nitrate as N	mg/L	-	-	-	-	0.05	<0.1	<0.1	<0.1	0.04	<0.1	<0.1	<0.1	<0.1	0.14	<0.1	<0.1	<0.1	<0.1	<0.0001	0.57	<0.05
Nitrite as N	mg/L	-	-	-	-	0.01	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.05	<0.05	<0.05	<0.05
Sulphate	mg/L	-	-	100	-	0.1	64	60	41	52	42	41	24	28	26	26	33	54	46	42	25.7	43.4
Cations																						
Calcium (tot)	mg/L	-	-	-	-	0.05	68	-	52	68	50	89	55	80	65	98	58	92	57	20.6	34.5	89.5
Magnesium (tot)	mg/L	-	-	-	-	0.05	2	-	2	3	2	3	2	3	2	3	2	3	2.45	2.25	1.69	4.29
Potassium (tot)	mg/L	-	-	-	-	0.05	<1	-	<1	<1	1	1	<1	1	1	2	1	2	1.84	2.43	1.67	2.39
Sodium (tot)	mg/L	-	-	-	-	0.05	12	-	10	10	10	12	9	11	14	13	9	12	11.4	9.95	10.5	15.7
General Chemistry																						
Alkalinity (as CaCO3)	mg/L	See Factsheet	-	-	-	1	119	125	95	132	82	199	128	188	144	235	123	211	128	70	56	178
Ammonia as N	mg/L	-	-	-	-	0.02	-	0.04	0.09	<0.1	<0.02	0.1	0.03	0.13	<0.02	0.14	0.06	0.16	0.05	0.02	0.17	<0.02
Biochemical Oxygen Demand	mg/L	-	-	-	-	2	-	<1	<1	3	<1	8	<1	2	13	<1	<1	2	4	<2	<5	<5
Chemical Oxygen Demand	mg/L	-	-	-	-	4	-	26	9	18	22	48	25	18	30	33	23	28	39	18	17	27
Colour	TCU	-	-	-	-	2.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Electrical Conductivity	uS/cm	-	-	-	-	1	415	393	311	411	295	512	334	450	417	557	369	536	466	296	231	521
pH	pH units	6.5 - 8.5	-	6 - 9	-		7.77	7.86	6.88	7.58	7.98	7.52	7.51	7.63	7.61	7.81	7.9	7.38	8.1	6.8	7.36	7.9
Phenols	mg/L	0.001	-	0.04	0.004	0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	<0.001
Phenols-4AAP	mg/L	-	-	-	-	0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Dissolved Solids	mg/L	-	-	-	-	10	-	255	202	267	192	333	217	293	271	362	240	348	437	201	138	296
Total Kjeldahl Nitrogen	mg/L	-	-	-	-	0.1	-	0.39	0.74	0.26	0.41	0.8	0.35	0.55	0.17	0.41	0.3	0.28	0.3	0.4	0.39	0.43
Total Phosphorus	mg/L	0.03	-	-	-	0.01	-	0.04	0.15	0.16	<0.01	0.45	<0.01	0.06	0.02	0.02	<0.01	<0.01	<0.01	0.01	<0.02	0.03
Total Suspended Solids	mg/L	-	-	-	-	10	-	20	<2	314	<2	434	3	23	2	10	3	15	11	16	<10	13
Turbidity	NTU	-	-	-	-	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Unionized Ammonia (Calc)	mg/L	-	-	-	-	0.000002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Metals																						
Aluminum (diss)	mg/L	-	Calculated	-	-	0.004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aluminum (diss, PWQO)	mg/L	-	Calculated	-	-	0.004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aluminum (tot)	mg/L	-	-	-	-	0.004	0.21	-	0.04	<0.01	0.03	2.6	0.04	0.03	0.02	0.02	0.02	0.01	0.01	0.027	0.058	0.016
Arsenic (tot)	mg/L	-	0.005	-	-	0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Barium (tot)	mg/L	-	-	2.3	-	0.002	0.03	-	0.02	0.05	0.02	0.15	0.03	0.05	0.03	0.05	0.03	0.05	0.037	0.041	0.02	0.037
Beryllium (tot)	mg/L	Calculated	-	-	-	0.01	<0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.001	<0.001
Boron (tot)	mg/L	-	0.2	3.55	1.5	0.01	0.03	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	0.011	0.017	<0.01	<0.01
Cadmium (tot)	mg/L	-	Calculated	0.00021	0.000017	0.00009	<0.0001	-	<0.0001	<0.0001	<0.0001	<0.01	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium (tot)	mg/L	-	-	0.064	-	0.001	0.001	-	<0.001	0.001	0.002	<0.05	<0.001	0.001	<0.001	<0.001	0.001	0.001	0.001	<0.001	<0.003	<0.003
Cobalt (tot)	mg/L	-	0.0009	-	-	0.0005	0.0002	-	0.0002	0.001	<0.0002	<0.01	0.0003	0.001	0.0003	0.0007	0.0003	0.0004	<0.0005	<0.0005	<0.0005	0.0005
Copper (tot)	mg/L	-	Calculated	0.0069	-	0.0009	0.001	-	0.001	0.002	0.001	**0.01**	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0006	0.0008	<0.002	<0.002
Iron (tot)	mg/L	0.3	-	1	-	0.01	0.13	0.88	0.19	**8.37**	0.1	**43.5**	0.86	**9.36**	0.69	**5.18**	**1.02**	**4.49**	0.822	**1.45**	0.34	**2.22**
Lead (tot)	mg/L	-	Calculated	0.002	-	0.0005	<0.001	-	<0.001	0.001	<0.001	<0.01	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0001	<0.0001	<0.001	<0.001
Manganese (tot)	mg/L	-	-	-	-	0.002	0.04	-	0.07	0.22	0.01	0.97	0.11	1.06	0.11	1.14	0.22	0.76	0.165	0.09	0.104	0.337
Mercury (diss)	mg/L	0.0002	-	-	-	0.0001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Molybdenum (tot)	mg/L	-	0.04	-	-	0.004	<0.005	-	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.0005	<0.0005	<0.002	<0.002
Nickel (tot)	mg/L	0.025	-	-	-	0.003	<0.005	-	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.002	0.001	<0.003	<0.003
Selenium (tot)	mg/L	0.1	-	-	-	0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Silicon (tot)	mg/L	-	-	-	-	0.002	4.1	-	4	5.1	4.1	7.7	4.5	6.4	4.4	6	4.6	5.2	4.2	3.75	3.48	5.52
Silver (tot)	mg/L	0.0001	-	-	-	0.0001	<0.0001	-	<0.0001	<0.0001	<0.0001	<0.01	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Strontium (tot)	mg/L	-	-	-	-	0.01	0.352	-	0.288	0.369	0.246	0.49	0.365	0.553	0.434	0.659	0.333	0.552	0.394	0.275	0.166	0.469
Thallium (tot)	mg/L	-	0.0003	-	-	0.0001	<0.0001	-	0.0003	<0.0001	<0.0001	<0.01	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0003	<0.0003
Titanium (tot)	mg/L	-	-	-	-	0.003	<0.01	-	<0.01	0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.005	<0.005	0.002	<0.002
Vanadium (tot)	mg/L	-	0.006	-	-	0.0005	0.002	-	<0.001	0.004	<0.001	<0.05	0.001	0.002	<0.001	<0.001	<0.001	0.001	<0.0005	<0.0005	<0.002	<0.002
Zinc (tot)	mg/L	-	0.02	0.089	0.03	0.001	<0.01	-	<0.01	0.01	<0.01	0.06	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.005	0.013	0.006	**0.197**

-LEGEND-

Detection Limit	DL: May vary between sample locations and events
DL exceeds criteria	
Concentration exceeds PWQO-GENERAL	Provincial Water Quality Objectives General
Concentration exceeds PWQO-INTERIM	Provincial Water Quality Objectives Interim
Concentration exceeds MECP-GD-TA	MECP Guidance Document Table A
Concentration exceeds MECP-GD-TB	MECP Guidance Document Table B

*Please double check with Factsheet for all calculated criteria/guidelines.

Appendix E-2: Historical Surface Water Data						Location	MG-SW1	MG-SW1	MG-SW1	MG-SW1	MG-SW1	MG-SW1	MG-SW1	MG-SW1	MG-SW1	MG-SW1	MG-SW1	MG-SW1	MG-SW1	MG-SW1	MG-SW1
Parameter	Units	PWQO-GENERAL	PWQO-INTERIM	MECP-GD-TA	MECP-GD-TB	Sample ID	MG-SW1	MG-SW1	MG-SW1	MG-SW1	MG-SW1	MG-SW1	MG-SW1	MG-SW1	MG-SW1	MG-SW1	MG-SW1	MG-SW1	MG-SW1	MG-SW1	MG-SW1
						Sample Date	2014-May-12	2014-Oct-15	2015-May-06	2015-Oct-26	2016-Apr-27	2016-Oct-25	2017-May-11	2017-Oct-25	2018-May-09	2018-Oct-24	2019-May-06	2020-May-05	2020-Oct-08	2021-Apr-19	2021-Oct-20	2022-May-04
Anions						**Detection Limit**																
Chloride	mg/L	-	-	180	128	0.1	36.1	39.5	32.8	55.9	32.6	68.1	32.8	58.9	39.8	66.1	49.2	41.1	81.8	31.1	48.6	41.9
Nitrate + Nitrite	mg/L	-	-	-	-	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nitrate as N	mg/L	-	-	-	-	0.05	<0.05	<0.05	0.05	<0.25	0.07	<0.05	<0.05	<0.1	<0.05	<0.05	0.1	<0.05	<0.05	<0.05	<0.05	0.05
Nitrite as N	mg/L	-	-	-	-	0.01	<0.05	<0.05	<0.05	<0.25	<0.05	<0.05	<0.05	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Sulphate	mg/L	-	-	100	-	0.1	43.3	18.4	37.7	10.7	34.8	11.8	40.4	23.2	30.6	4.18	39.1	43.1	3.14	49.8	32.9	28.7
Cations																						
Calcium (tot)	mg/L	-	-	-	-	0.05	60	83.6	59.6	77.8	47	68.4	45.4	98	48.6	66.4	49	57.23	79.19	62.4	106	52.6
Magnesium (tot)	mg/L	-	-	-	-	0.05	2.17	3.91	2.04	3.86	2.28	4.12	1.88	4.09	2.12	3.78	2.52	2.62	5.34	2.75	6.2	3.14
Potassium (tot)	mg/L	-	-	-	-	0.05	1.67	3.05	1.36	2.81	1.68	2.6	1.35	2.6	1.58	2.11	1.69	1.66	2.99	1.49	2.92	2.08
Sodium (tot)	mg/L	-	-	-	-	0.05	15.4	19.1	14.1	21.3	17.7	21.8	16.5	26.3	18.7	23.5	21.1	22.1	28.71	22.2	33.9	23.7
General Chemistry																						
Alkalinity (as CaCO3)	mg/L	See Factsheet	-	-	-	1	96	192	103	176	91	150	87	226	103	135	93	101	182	118	234	107
Ammonia as N	mg/L	-	-	-	-	0.02	0.02	0.2	0.16	<0.02	<0.02	0.07	<0.02	0.15	0.14	<0.02	<0.02	<0.02	<0.02	<0.02	0.1	<0.02
Biochemical Oxygen Demand	mg/L	-	-	-	-	2	<5	<5	<5	<5	<5	46	<5	<5	<5	<5	<5	<5	2	<2	<2	2
Chemical Oxygen Demand	mg/L	-	-	-	-	4	19	18	16	57	23	645	24	77	14	8	19	22	34	20	21	24
Colour	TCU	-	-	-	-	2.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Electrical Conductivity	uS/cm	-	-	-	-	1	394	535	388	525	335	497	386	563	359	541	397	518	572	453	654	388
pH	pH units	6.5 - 8.5	-	6 - 9	-		7.61	7.88	7.62	7.92	7.95	7.72	7.8	7.91	7.3	7.82	7.31	7.42	7.78	7.49	7.75	7.49
Phenols	mg/L	0.001	-	0.04	0.004	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	0.011	<0.001
Phenols-4AAP	mg/L	-	-	-	-	0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Dissolved Solids	mg/L	-	-	-	-	10	268	344	266	278	218	318	204	386	220	338	254	256	384	266	396	218
Total Kjeldahl Nitrogen	mg/L	-	-	-	-	0.1	0.52	0.69	0.79	1.44	0.34	26	0.39	1.55	0.7	0.25	<0.1	0.41	0.37	0.33	0.43	0.33
Total Phosphorus	mg/L	0.03	-	-	-	0.01	<0.02	0.04	0.03	0.06	<0.01	1.5	0.01	0.23	0.09	<0.02	<0.01	<0.02	<0.02	<0.02	0.03	<0.02
Total Suspended Solids	mg/L	-	-	-	-	10	<10	10	<10	<10	<10	2250	30	36	<10	<10	<10	<10	<10	<10	<10	<10
Turbidity	NTU	-	-	-	-	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Unionized Ammonia (Calc)	mg/L	-	-	-	-	0.000002	-	-	-	-	-	-	-	-	-	-	0.0000066	-	-	-	-	-
Metals																						
Aluminum (diss)	mg/L	-	Calculated	-	-	0.004	-	-	-	-	-	-	-	-	-	-	0.023	0.024	0.004	0.017	0.012	0.022
Aluminum (diss, PWQO)	mg/L	-	Calculated	-	-	0.004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aluminum (tot)	mg/L	-	-	-	-	0.004	0.022	0.009	0.016	0.004	0.028	0.011	0.04	0.013	0.018	0.005	-	0.034	0.017	0.03	0.017	-
Arsenic (tot)	mg/L	-	0.005	-	-	0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Barium (tot)	mg/L	-	-	2.3	-	0.002	0.03	0.049	0.033	0.049	0.023	0.151	0.027	0.082	0.035	0.043	0.038	0.034	0.053	0.033	0.062	0.041
Beryllium (tot)	mg/L	Calculated	-	-	-	0.01	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	-	-	-	-	-	-	-	-	-
Boron (tot)	mg/L	-	0.2	3.55	1.5	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.018	<0.01	0.014	<0.01	0.01	<0.01	<0.01	0.031	<0.01	0.011	0.137
Cadmium (tot)	mg/L	-	Calculated	0.00021	0.000017	0.00009	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	**0.0005**	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium (tot)	mg/L	-	-	0.064	-	0.001	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-
Cobalt (tot)	mg/L	-	0.0009	-	-	0.0005	<0.0005	0.0006	0.0006	<0.0005	<0.0005	0.0039	<0.0005	0.0011	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Copper (tot)	mg/L	-	Calculated	0.0069	-	0.0009	<0.002	<0.002	<0.002	<0.002	<0.002	**0.02**	<0.002	0.001	<0.001	<0.001	0.001	<0.002	<0.002	<0.002	<0.002	<0.002
Iron (tot)	mg/L	0.3	-	1	-	0.01	0.37	**2.19**	**2.24**	**3.13**	0.05	**50.4**	0.14	**18.7**	0.55	0.44	0.054	0.109	0.679	0.186	**1.22**	0.398
Lead (tot)	mg/L	-	Calculated	0.002	-	0.0005	<0.001	<0.001	<0.001	<0.001	<0.001	**0.008**	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Manganese (tot)	mg/L	-	-	-	-	0.002	0.061	0.685	0.481	0.332	0.016	0.679	0.013	1.43	0.461	0.244	0.024	0.019	0.336	0.029	0.567	0.073
Mercury (diss)	mg/L	0.0002	-	-	-	0.0001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Molybdenum (tot)	mg/L	-	0.04	-	-	0.004	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-	-	-	-	-	-
Nickel (tot)	mg/L	0.025	-	-	-	0.003	<0.003	<0.003	<0.003	<0.003	<0.003	0.009	-	-	-	-	-	-	-	-	-	-
Selenium (tot)	mg/L	0.1	-	-	-	0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Silicon (tot)	mg/L	-	-	-	-	0.002	3.96	6.03	3.64	5.34	3.67	8.92	-	-	-	-	-	-	-	-	-	-
Silver (tot)	mg/L	0.0001	-	-	-	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	-	-	-	-	-	-	-	-	-	-
Strontium (tot)	mg/L	-	-	-	-	0.01	0.328	0.488	0.335	0.542	0.27	0.577	-	-	-	-	-	-	-	-	-	-
Thallium (tot)	mg/L	-	0.0003	-	-	0.0001	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	-	-	-	-	-	-	-	-	-	-
Titanium (tot)	mg/L	-	-	-	-	0.003	<0.002	<0.002	<0.002	0.006	<0.002	0.088	-	-	-	-	-	-	-	-	-	-
Vanadium (tot)	mg/L	-	0.006	-	-	0.0005	<0.002	<0.002	<0.002	<0.002	<0.002	0.013	-	-	-	-	-	-	-	-	-	-
Zinc (tot)	mg/L	-	0.02	0.089	0.03	0.001	<0.005	<0.005	<0.005	0.008	0.008	**0.223**	0.006	0.018	0.006	<0.005	0.009	0.006	<0.005	<0.005	<0.02	<0.02

-LEGEND-

Detection Limit	DL: May vary between sample locations and events
DL exceeds criteria	
Concentration exceeds PWQO-GENERAL	Provincial Water Quality Objectives General
Concentration exceeds PWQO-INTERIM	Provincial Water Quality Objectives Interim
Concentration exceeds MECP-GD-TA	MECP Guidance Document Table A
Concentration exceeds MECP-GD-TB	MECP Guidance Document Table B

*Please double check with Factsheet for all calculated criteria/guidelines.

Appendix E-2: Historical Surface Water Data						Location	MG-SW1	MG-SW2	MG-SW2	MG-SW2	MG-SW2	MG-SW2	MG-SW2	MG-SW2	MG-SW2	MG-SW2	MG-SW2	MG-SW2	MG-SW2	MG-SW2	MG-SW2
Parameter	Units	PWQO-GENERAL	PWQO-INTERIM	MECP-GD-TA	MECP-GD-TB	Sample ID	MG-SW1	MG-SW2	MG-SW2	MG-SW2	MG-SW2	MG-SW2	MG-SW2	MG-SW2	MG-SW2	MG-SW2	MG-SW2	MG-SW2	MG-SW2	MG-SW2	MG-SW2
						Sample Date	2023-May-02	2006-May-10	2006-Nov-20	2007-May-03	2007-Nov-21	2008-May-08	2008-Oct-08	2009-Jun-04	2009-Oct-21	2010-May-18	2010-Oct-19	2011-May-19	2011-Nov-03	2012-Apr-16	2012-Oct-15	2013-Apr-16
Anions						**Detection Limit**																
Chloride	mg/L	-	-	180	128	0.1	21	-	10	9	11	6	9	8	9	11	11	7	7	14	11	8.73
Nitrate + Nitrite	mg/L	-	-	-	-	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nitrate as N	mg/L	-	-	-	-	0.05	<0.05	<0.1	<0.1	<0.1	0.12	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.0001	<0.1	0.06
Nitrite as N	mg/L	-	-	-	-	0.01	<0.05	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.05	<0.05	<0.05
Sulphate	mg/L	-	-	100	-	0.1	30.5	16	18	16	8	14	2	3	1	3	2	3	1	9	25	9.66
Cations																						
Calcium (tot)	mg/L	-	-	-	-	0.05	31.8	31	-	31	29	21	40	27	35	32	37	23	37	26.8	13.4	21.7
Magnesium (tot)	mg/L	-	-	-	-	0.05	1.51	2	-	2	2	2	4	2	4	3	5	2	6	3.17	3.02	1.73
Potassium (tot)	mg/L	-	-	-	-	0.05	0.94	<1	-	1	<1	<1	2	1	3	2	2	2	5	1.74	1.73	1.17
Sodium (tot)	mg/L	-	-	-	-	0.05	12	7	-	6	0.01	6	8	5	6	8	6	5	5	8.41	5.54	5.01
General Chemistry																						
Alkalinity (as CaCO3)	mg/L	See Factsheet	-	-	-	1	82	61	54	70	87	48	126	81	119	91	118	77	121	63	57	45
Ammonia as N	mg/L	-	-	-	-	0.02	<0.02	-	0.04	0.05	<0.1	<0.02	0.38	0.02	0.17	<0.02	<0.02	0.05	0.16	0.06	<0.01	0.22
Biochemical Oxygen Demand	mg/L	-	-	-	-	2	<2	-	1	<1	8	2	24	6	13	16	1	26	9	8	3	<5
Chemical Oxygen Demand	mg/L	-	-	-	-	4	26	-	23	10	36	46	50	18	21	20	25	80	200	117	54	<5
Colour	TCU	-	-	-	-	2.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Electrical Conductivity	uS/cm	-	-	-	-	1	281	200	178	197	217	143	278	183	256	218	254	169	243	210	200	141
pH	pH units	6.5 - 8.5	-	6 - 9	-		7.42	7.11	7.07	6.72	7.4	7.3	7.32	7.27	7.41	7.46	7.48	7.52	6.72	7.6	6.8	7.28
Phenols	mg/L	0.001	-	0.04	0.004	0.001	-	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.005	<0.001
Phenols-4AAP	mg/L	-	-	-	-	0.001	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Dissolved Solids	mg/L	-	-	-	-	10	180	-	116	128	141	93	181	119	166	142	165	110	158	194	160	88
Total Kjeldahl Nitrogen	mg/L	-	-	-	-	0.1	0.4	-	0.57	0.47	0.7	0.51	1.74	0.82	2	0.95	0.33	1.34	7.39	1.6	1	0.19
Total Phosphorus	mg/L	0.03	-	-	-	0.01	<0.02	-	0.08	0.14	0.19	0.27	2.95	0.13	0.4	0.11	<0.01	0.11	0.18	0.24	0.11	0.03
Total Suspended Solids	mg/L	-	-	-	-	10	<10	-	180	40	129	39	3230	43	272	129	30	312	331	88	70	<10
Turbidity	NTU	-	-	-	-	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Unionized Ammonia (Calc)	mg/L	-	-	-	-	0.000002	<0.000002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Metals																						
Aluminum (diss)	mg/L	-	Calculated	-	-	0.004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aluminum (diss, PWQO)	mg/L	-	Calculated	-	-	0.004	0.088	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aluminum (tot)	mg/L	-	-	-	-	0.004	-	0.06	-	0.03	0.02	0.01	6.3	0.02	0.53	0.02	<0.01	<0.01	1.4	0.007	0.027	0.0118
Arsenic (tot)	mg/L	-	0.005	-	-	0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Barium (tot)	mg/L	-	-	2.3	-	0.002	0.031	0.03	-	0.02	0.02	0.02	0.2	0.03	0.06	0.03	0.02	0.03	0.05	0.047	0.021	0.012
Beryllium (tot)	mg/L	Calculated	-	-	-	0.01	-	<0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.01	0.0025	<0.0005	<0.001
Boron (tot)	mg/L	-	0.2	3.55	1.5	0.01	0.015	0.01	-	0.01	<0.01	<0.01	0.02	<0.01	0.01	0.02	<0.01	<0.1	<0.1	0.05	0.033	<0.01
Cadmium (tot)	mg/L	-	Calculated	0.00021	0.000017	0.00009	<0.0001	<0.0001	-	<0.0001	<0.0001	0.001	<0.01	<0.0001	0.0002	<0.0001	<0.0001	<0.01	<0.01	<0.0005	<0.0001	<0.0001
Chromium (tot)	mg/L	-	-	0.064	-	0.001	-	<0.001	-	<0.001	<0.001	0.001	<0.05	<0.001	<0.001	<0.001	<0.001	<0.05	<0.05	0.005	<0.001	<0.0003
Cobalt (tot)	mg/L	-	0.0009	-	-	0.0005	<0.0005	0.0004	-	<0.0002	0.0002	0.0002	0.01	0.0005	0.0007	0.0002	<0.0002	<0.01	<0.01	<0.0025	<0.0005	<0.0005
Copper (tot)	mg/L	-	Calculated	0.0069	-	0.0009	0.002	<0.001	-	<0.001	<0.001	<0.001	0.04	<0.001	0.002	<0.001	<0.001	<0.01	<0.01	0.0026	<0.0005	<0.002
Iron (tot)	mg/L	0.3	-	1	-	0.01	0.156	0.61	0.24	0.16	0.7	0.22	16.4	0.72	3.45	0.32	0.44	1.5	4	3.69	0.325	0.16
Lead (tot)	mg/L	-	Calculated	0.002	-	0.0005	<0.001	0.001	-	<0.001	<0.001	0.001	0.06	<0.001	0.007	<0.001	<0.001	<0.01	<0.01	0.005	0.0006	<0.001
Manganese (tot)	mg/L	-	-	-	-	0.002	0.009	0.36	-	0.07	0.25	0.21	1.4	0.51	0.46	0.24	0.26	0.25	0.46	1.15	0.073	0.154
Mercury (diss)	mg/L	0.0002	-	-	-	0.0001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Molybdenum (tot)	mg/L	-	0.04	-	-	0.004	-	<0.005	-	<0.005	<0.005	<0.005	0.01	<0.005	<0.005	<0.005	<0.005	<0.01	<0.01	0.0025	<0.0005	<0.002
Nickel (tot)	mg/L	0.025	-	-	-	0.003	-	<0.005	-	<0.005	<0.005	<0.005	0.02	<0.005	<0.005	<0.005	<0.005	<0.01	<0.01	0.005	<0.001	<0.003
Selenium (tot)	mg/L	0.1	-	-	-	0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Silicon (tot)	mg/L	-	-	-	-	0.002	-	4.9	-	4	7.5	4.4	10.4	4.3	9.1	4.9	7.7	4	8	4.79	3.93	2.72
Silver (tot)	mg/L	0.0001	-	-	-	0.0001	-	<0.0001	-	<0.0001	<0.0001	<0.0001	<0.01	<0.0001	<0.0001	<0.0001	<0.0001	<0.01	<0.01	<0.0005	<0.0001	<0.0001
Strontium (tot)	mg/L	-	-	-	-	0.01	-	0.19	-	0.189	0.203	0.304	0.41	0.19	0.298	0.202	0.244	0.14	0.25	0.177	0.151	0.112
Thallium (tot)	mg/L	-	0.0003	-	-	0.0001	-	<0.0001	-	0.0004	<0.0001	<0.0001	<0.01	<0.0001	<0.0001	<0.0001	<0.0001	<0.01	<0.01	<0.0005	<0.0001	<0.0003
Titanium (tot)	mg/L	-	-	-	-	0.003	-	<0.01	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.1	<0.1	0.025	<0.005	<0.002
Vanadium (tot)	mg/L	-	0.006	-	-	0.0005	-	<0.001	-	<0.001	0.001	<0.001	<0.05	<0.001	0.002	<0.001	<0.001	<0.05	<0.05	0.0025	<0.0005	<0.002
Zinc (tot)	mg/L	-	0.02	0.089	0.03	0.001	<0.02	<0.01	-	<0.01	<0.01	<0.01	0.48	<0.01	0.03	0.02	<0.01	<0.05	0.05	0.025	0.018	<0.005

-LEGEND-

Detection Limit	DL: May vary between sample locations and events
DL exceeds criteria	
Concentration exceeds PWQO-GENERAL	Provincial Water Quality Objectives General
Concentration exceeds PWQO-INTERIM	Provincial Water Quality Objectives Interim
Concentration exceeds MECP-GD-TA	MECP Guidance Document Table A
Concentration exceeds MECP-GD-TB	MECP Guidance Document Table B

*Please double check with Factsheet for all calculated criteria/guidelines.

Appendix E-2: Historical Surface Water Data						Location	MG-SW2	MG-SW2	MG-SW2	MG-SW2	MG-SW2	MG-SW2	MG-SW2	MG-SW2	MG-SW2	MG-SW2	MG-SW2	MG-SW2	MG-SW2	MG-SW2	MG-SW2
Parameter	Units	PWQO-GENERAL	PWQO-INTERIM	MECP-GD-TA	MECP-GD-TB	Sample ID	MG-SW2	MG-SW2	MG-SW2	MG-SW2	MG-SW2	MG-SW2	MG-SW2	MG-SW2	MG-SW2	MG-SW2	MG-SW2	MG-SW2	MG-SW2	MG-SW2	MG-SW2
						Sample Date	2013-Oct-29	2014-May-12	2014-Oct-15	2015-May-06	2015-Oct-26	2016-Apr-27	2016-Oct-25	2017-May-11	2017-Oct-25	2018-May-09	2018-Oct-24	2019-May-06	2020-May-05	2020-Oct-08	2021-Apr-19	2021-Oct-20
Anions						**Detection Limit**																
Chloride	mg/L	-	-	180	128	0.1	7.36	12.5	7.95	20	9.38	9.1	14.9	10.4	16.7	17.7	21.8	30.6	26.4	26.2	40.8	30.2
Nitrate + Nitrite	mg/L	-	-	-	-	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nitrate as N	mg/L	-	-	-	-	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.32	0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Nitrite as N	mg/L	-	-	-	-	0.01	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Sulphate	mg/L	-	-	100	-	0.1	2.41	5.96	0.82	1.37	0.85	25.2	2.42	8.01	1.34	2.71	0.26	8.52	-	0.29	7.73	0.22
Cations																						
Calcium (tot)	mg/L	-	-	-	-	0.05	24.2	20.9	33.3	29.6	29.9	45.1	27.7	14.5	35.6	24.7	33.9	17.9	18.52	35.31	26.7	44.8
Magnesium (tot)	mg/L	-	-	-	-	0.05	3.03	2.47	4.65	3.59	4.8	7.67	4.14	1.65	5.11	2.97	4.77	1.82	2.17	5.05	3.16	7.17
Potassium (tot)	mg/L	-	-	-	-	0.05	1.05	1.37	2.51	1.68	2.93	8.69	2.92	0.93	2.59	2	2.44	1.13	1.28	2.33	1.3	2.84
Sodium (tot)	mg/L	-	-	-	-	0.05	6.02	7.17	6.23	9.85	6.63	10.6	6.63	6.07	6.62	8.55	7.6	14.7	13.88	10.17	19.1	8.54
General Chemistry																						
Alkalinity (as CaCO3)	mg/L	See Factsheet	-	-	-	1	67	52	95	82	94	153	86	39	108	74	89	44	50	94	51	124
Ammonia as N	mg/L	-	-	-	-	0.02	<0.02	0.04	0.11	<0.02	0.04	1.58	0.48	<0.02	0.04	0.81	0.26	<0.02	<0.02	0.03	<0.02	0.27
Biochemical Oxygen Demand	mg/L	-	-	-	-	2	<5	7	<5	<5	48	<5	13	<5	21	<5	<5	<5	<5	<2	<2	7
Chemical Oxygen Demand	mg/L	-	-	-	-	4	24	76	22	79	252	23	120	180	282	16	52	17	12	41	12	32
Colour	TCU	-	-	-	-	2.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Electrical Conductivity	uS/cm	-	-	-	-	1	165	162	220	227	212	353	213	141	232	192	280	198	244	245	266	331
pH	pH units	6.5 - 8.5	-	6 - 9	-		7.57	7.34	7.89	7.56	7.47	7.9	7.49	7.55	7.65	7.15	7.6	7.03	7.01	7.14	7.24	7.41
Phenols	mg/L	0.001	-	0.04	0.004	0.001	<0.001	<0.001	<0.001	<0.001	0.002	<0.001	<0.001	<0.001	<0.001	<0.001	0.003	0.002	<0.001	0.003	<0.001	0.003
Phenols-4AAP	mg/L	-	-	-	-	0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Dissolved Solids	mg/L	-	-	-	-	10	102	106	162	146	134	208	160	70	166	100	176	120	120	170	156	218
Total Kjeldahl Nitrogen	mg/L	-	-	-	-	0.1	0.45	2.47	1.16	2.93	10.6	2.06	3.92	0.56	9.28	0.76	0.86	0.33	0.38	0.52	0.26	0.78
Total Phosphorus	mg/L	0.03	-	-	-	0.01	0.05	0.46	0.22	0.48	1.13	<0.01	0.47	0.31	1.07	0.15	0.27	0.03	0.02	0.04	<0.02	0.15
Total Suspended Solids	mg/L	-	-	-	-	10	60	79	35	20	580	14	560	116	536	<10	<10	<10	<10	<10	<10	<10
Turbidity	NTU	-	-	-	-	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Unionized Ammonia (Calc)	mg/L	-	-	-	-	0.000002	-	-	-	-	-	-	-	-	-	-	-	0.0000305	-	-	-	-
Metals																						
Aluminum (diss)	mg/L	-	Calculated	-	-	0.004	-	-	-	-	-	-	-	-	-	-	-	0.013	0.011	0.006	0.006	0.006
Aluminum (diss, PWQO)	mg/L	-	Calculated	-	-	0.004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aluminum (tot)	mg/L	-	-	-	-	0.004	0.008	0.008	0.005	0.005	<0.004	0.011	0.01	0.015	0.009	0.008	0.006	-	0.022	0.023	0.018	0.024
Arsenic (tot)	mg/L	-	0.005	-	-	0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Barium (tot)	mg/L	-	-	2.3	-	0.002	0.014	0.021	0.027	0.02	0.127	0.043	0.045	0.032	0.063	0.021	0.033	0.017	0.014	0.029	0.017	0.041
Beryllium (tot)	mg/L	Calculated	-	-	-	0.01	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	-	-	-	-	-	-	-	-
Boron (tot)	mg/L	-	0.2	3.55	1.5	0.01	<0.01	0.014	0.014	<0.01	0.027	0.166	0.026	<0.01	0.019	<0.01	0.012	<0.01	0.016	0.04	<0.01	0.022
Cadmium (tot)	mg/L	-	Calculated	0.00021	0.000017	0.00009	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	<0.0001	0.0002	<0.0001	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium (tot)	mg/L	-	-	0.064	-	0.001	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-	-	-	-
Cobalt (tot)	mg/L	-	0.0009	-	-	0.0005	<0.0005	0.0006	0.0005	<0.0005	0.0013	<0.0005	0.0012	0.001	0.0008	<0.0005	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Copper (tot)	mg/L	-	Calculated	0.0069	-	0.0009	<0.002	<0.002	<0.002	<0.002	0.004	<0.002	<0.002	<0.002	0.002	<0.001	<0.001	<0.001	<0.002	<0.002	<0.002	<0.002
Iron (tot)	mg/L	0.3	-	1	-	0.01	0.18	**1.02**	**1.69**	0.36	**11.1**	**6.29**	**2.56**	**1.85**	**2.5**	0.92	**1.28**	0.149	0.182	0.729	0.1	**1.47**
Lead (tot)	mg/L	-	Calculated	0.002	-	0.0005	<0.001	<0.001	<0.001	<0.001	**0.006**	<0.001	**0.011**	**0.004**	**0.005**	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Manganese (tot)	mg/L	-	-	-	-	0.002	0.086	0.374	0.453	0.228	0.502	0.414	0.536	0.621	0.534	0.352	0.56	0.064	0.063	0.285	0.065	0.534
Mercury (diss)	mg/L	0.0002	-	-	-	0.0001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Molybdenum (tot)	mg/L	-	0.04	-	-	0.004	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-	-	-	-	-
Nickel (tot)	mg/L	0.025	-	-	-	0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-	-	-	-
Selenium (tot)	mg/L	0.1	-	-	-	0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Silicon (tot)	mg/L	-	-	-	-	0.002	6.15	4.03	7.66	3.62	7.84	5.14	8.75	-	-	-	-	-	-	-	-	-
Silver (tot)	mg/L	0.0001	-	-	-	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0003	<0.0001	<0.0001	-	-	-	-	-	-	-	-	-
Strontium (tot)	mg/L	-	-	-	-	0.01	0.132	0.124	0.183	0.172	0.272	0.253	0.198	-	-	-	-	-	-	-	-	-
Thallium (tot)	mg/L	-	0.0003	-	-	0.0001	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	-	-	-	-	-	-	-	-	-
Titanium (tot)	mg/L	-	-	-	-	0.003	<0.002	<0.002	<0.002	<0.002	0.004	<0.002	0.006	-	-	-	-	-	-	-	-	-
Vanadium (tot)	mg/L	-	0.006	-	-	0.0005	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-	-	-	-	-
Zinc (tot)	mg/L	-	0.02	0.089	0.03	0.001	**0.103**	0.007	<0.005	<0.005	0.043	0.006	0.053	0.017	0.039	0.008	0.007	<0.005	<0.005	<0.005	<0.005	<0.02

-LEGEND-

Detection Limit	DL: May vary between sample locations and events
DL exceeds criteria	
Concentration exceeds PWQO-GENERAL	Provincial Water Quality Objectives General
Concentration exceeds PWQO-INTERIM	Provincial Water Quality Objectives Interim
Concentration exceeds MECP-GD-TA	MECP Guidance Document Table A
Concentration exceeds MECP-GD-TB	MECP Guidance Document Table B

*Please double check with Factsheet for all calculated criteria/guidelines.

Appendix E-2: Historical Surface Water Data						Location	MG-SW2	MG-SW2	MG-SW3	MG-SW3	MG-SW3	MG-SW3	MG-SW3	MG-SW3	MG-SW3	MG-SW3	MG-SW3	MG-SW3	MG-SW3	MG-SW3	MG-SW3
Parameter	Units	PWQO-GENERAL	PWQO-INTERIM	MECP-GD-TA	MECP-GD-TB	Sample ID	MG-SW2	MG-SW2	MG-SW3	MG-SW3	MG-SW3	MG-SW3	MG-SW3	MG-SW3	MG-SW3	MG-SW3	MG-SW3	MG-SW3	MG-SW3	MG-SW3	MG-SW3
						Sample Date	2022-May-04	2023-May-02	2007-May-03	2008-May-08	2008-Oct-08	2009-Jun-04	2009-Oct-21	2010-May-18	2010-Oct-19	2011-May-19	2011-Nov-03	2012-Apr-16	2012-Oct-15	2013-Apr-16	2013-Oct-29	2014-May-12
Anions						**Detection Limit**																
Chloride	mg/L	-	-	180	128	0.1	27.2	5.4	30	21	33	29	36	48	2	32	32	23	18	6.44	39.8	27.3
Nitrate + Nitrite	mg/L	-	-	-	-	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nitrate as N	mg/L	-	-	-	-	0.05	<0.05	<0.05	1.3	1.51	0.13	2.03	<0.1	0.54	<0.1	2	0.37	0.5	0.2	0.14	0.07	0.7
Nitrite as N	mg/L	-	-	-	-	0.01	<0.05	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.08	<0.05	<0.05	<0.05	<0.25
Sulphate	mg/L	-	-	100	-	0.1	2.99	4.49	**108**	49	11	19	7	57	<1	62	5	63	50	9.57	8.12	84.8
Cations																						
Calcium (tot)	mg/L	-	-	-	-	0.05	22.3	6.5	64	55	72	67	89	58	37	62	57	59.9	24.7	22.3	80.5	84
Magnesium (tot)	mg/L	-	-	-	-	0.05	3.29	1.11	11	8	14	11	15	9	2	10	9	10.4	6.17	2.92	14.2	13.7
Potassium (tot)	mg/L	-	-	-	-	0.05	1.46	<0.5	24	15	24	20	18	5	1	12	5	16.1	9.81	2.97	12.7	18.8
Sodium (tot)	mg/L	-	-	-	-	0.05	11.8	6.15	41	26	36	28	28	18	<2	25	14	24.6	13.9	5.37	27	30.1
General Chemistry																						
Alkalinity (as CaCO3)	mg/L	See Factsheet	-	-	-	1	56	34	136	151	289	242	340	100	107	180	188	222	145	60	257	220
Ammonia as N	mg/L	-	-	-	-	0.02	<0.02	<0.02	0.07	1.36	0.63	0.27	1.94	0.06	0.16	0.05	0.37	0.38	0.15	0.11	0.24	0.55
Biochemical Oxygen Demand	mg/L	-	-	-	-	2	<2	<2	<1	1	5	2	3	2	<1	<1	6	2	4	<5	13	5
Chemical Oxygen Demand	mg/L	-	-	-	-	4	22	19	26	36	53	43	30	28	28	33	72	47	59	6	99	35
Colour	TCU	-	-	-	-	2.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Electrical Conductivity	uS/cm	-	-	-	-	1	208	94	621	479	676	604	752	486	207	606	449	616	420	161	621	689
pH	pH units	6.5 - 8.5	-	6 - 9	-		6.95	7.16	7.3	7.87	7.71	7.76	7.89	7.56	7.84	8.14	7.07	8.2	7.4	7.67	7.99	7.96
Phenols	mg/L	0.001	-	0.04	0.004	0.001	<0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.002	0.005	<0.001	0.001	<0.001
Phenols-4AAP	mg/L	-	-	-	-	0.001	-	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Dissolved Solids	mg/L	-	-	-	-	10	114	74	404	311	439	393	489	316	135	394	292	467	257	94	360	426
Total Kjeldahl Nitrogen	mg/L	-	-	-	-	0.1	0.26	0.23	0.74	1.73	1.4	0.96	3.09	0.6	0.61	0.86	0.72	0.9	2.2	0.4	4.74	1.69
Total Phosphorus	mg/L	0.03	-	-	-	0.01	0.02	<0.02	0.14	0.04	0.51	0.04	0.16	0.08	0.04	<0.01	0.51	0.12	0.78	0.03	1.54	0.05
Total Suspended Solids	mg/L	-	-	-	-	10	<10	<10	6	5	277	3	18	17	24	7	340	50	52	<10	488	51
Turbidity	NTU	-	-	-	-	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Unionized Ammonia (Calc)	mg/L	-	-	-	-	0.000002	-	<0.000002	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Metals																						
Aluminum (diss)	mg/L	-	Calculated	-	-	0.004	0.015	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aluminum (diss, PWQO)	mg/L	-	Calculated	-	-	0.004	-	0.057	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aluminum (tot)	mg/L	-	-	-	-	0.004	-	-	0.03	0.02	0.06	<0.01	0.05	0.02	0.02	0.02	2	0.003	0.215	0.025	0.012	0.006
Arsenic (tot)	mg/L	-	0.005	-	-	0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Barium (tot)	mg/L	-	-	2.3	-	0.002	0.017	0.01	0.04	0.05	0.11	0.05	0.09	0.04	0.02	0.06	0.09	0.066	0.074	0.017	0.083	0.063
Beryllium (tot)	mg/L	Calculated	-	-	-	0.01	-	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0005	<0.01	<0.0005	<0.0005	<0.001	<0.001	<0.001
Boron (tot)	mg/L	-	0.2	3.55	1.5	0.01	0.084	0.018	0.51	0.5	0.4	0.45	0.4	0.31	<0.01	0.46	0.1	0.427	0.184	0.054	0.227	0.537
Cadmium (tot)	mg/L	-	Calculated	0.00021	0.000017	0.00009	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.01	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium (tot)	mg/L	-	-	0.064	-	0.001	-	-	0.002	0.003	0.002	0.002	0.002	<0.001	<0.001	0.002	<0.05	0.004	<0.001	<0.003	<0.003	<0.003
Cobalt (tot)	mg/L	-	0.0009	-	-	0.0005	<0.0005	<0.0005	0.0003	0.0004	0.0006	0.0003	0.0015	0.0003	<0.0002	0.0004	<0.01	<0.0005	<0.0005	<0.0005	0.0008	<0.0005
Copper (tot)	mg/L	-	Calculated	0.0069	-	0.0009	<0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	0.0007	0.0018	<0.002	0.002	<0.002
Iron (tot)	mg/L	0.3	-	1	-	0.01	0.148	0.091	<0.03	0.29	0.94	<0.03	**1.17**	0.14	0.11	0.13	**6.3**	0.703	**1.43**	0.59	**2.76**	0.29
Lead (tot)	mg/L	-	Calculated	0.002	-	0.0005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	0.0005	0.002	<0.001	0.002	<0.001
Manganese (tot)	mg/L	-	-	-	-	0.002	0.008	0.006	0.05	0.4	4.71	0.08	4.58	0.38	0.14	0.12	2.55	0.547	0.321	0.186	2.54	0.216
Mercury (diss)	mg/L	0.0002	-	-	-	0.0001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Molybdenum (tot)	mg/L	-	0.04	-	-	0.004	-	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.0005	<0.0005	<0.002	<0.002	<0.002
Nickel (tot)	mg/L	0.025	-	-	-	0.003	-	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	0.002	0.002	<0.003	<0.003	<0.003
Selenium (tot)	mg/L	0.1	-	-	-	0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Silicon (tot)	mg/L	-	-	-	-	0.002	-	-	5.9	5.8	12.7	4.9	12	3.5	5.3	7.1	10	5.08	3.81	3.15	7.5	4.99
Silver (tot)	mg/L	0.0001	-	-	-	0.0001	-	-	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.01	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Strontium (tot)	mg/L	-	-	-	-	0.01	-	-	0.366	0.304	0.456	0.427	0.618	0.429	0.241	0.407	0.4	0.374	0.284	0.114	0.405	0.477
Thallium (tot)	mg/L	-	0.0003	-	-	0.0001	-	-	0.0003	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.01	<0.0001	<0.0001	<0.0003	<0.0003	<0.0003
Titanium (tot)	mg/L	-	-	-	-	0.003	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.1	<0.005	0.008	0.006	0.022	0.002
Vanadium (tot)	mg/L	-	0.006	-	-	0.0005	-	-	<0.001	0.001	0.003	0.002	0.004	<0.001	<0.001	<0.001	<0.05	0.0014	0.0007	<0.002	<0.002	<0.002
Zinc (tot)	mg/L	-	0.02	0.089	0.03	0.001	<0.02	<0.02	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	**0.28**	<0.005	0.024	0.005	**0.132**	<0.005

-LEGEND-

Detection Limit	DL: May vary between sample locations and events
DL exceeds criteria	
Concentration exceeds PWQO-GENERAL	Provincial Water Quality Objectives General
Concentration exceeds PWQO-INTERIM	Provincial Water Quality Objectives Interim
Concentration exceeds MECP-GD-TA	MECP Guidance Document Table A
Concentration exceeds MECP-GD-TB	MECP Guidance Document Table B

*Please double check with Factsheet for all calculated criteria/guidelines.

Appendix E-2: Historical Surface Water Data						Location	MG-SW3	MG-SW3	MG-SW3	MG-SW3	MG-SW3	MG-SW3	MG-SW3	MG-SW3	MG-SW3	MG-SW3	MG-SW3	MG-SW3	MG-SW3	MG-SW3	MG-SW3
Parameter	Units	PWQO-GENERAL	PWQO-INTERIM	MECP-GD-TA	MECP-GD-TB	Sample ID	MG-SW3	MG-SW3	MG-SW3	MG-SW3	MG-SW3	MG-SW3	MG-SW3	MG-SW3	MG-SW3	MG-SW3	MG-SW3	MG-SW3	MG-SW3	MG-SW3	MG-SW3
						Sample Date	2014-Oct-15	2015-May-06	2015-Oct-26	2016-Apr-27	2016-Oct-25	2017-May-11	2017-Oct-25	2018-May-09	2018-Oct-24	2019-May-06	2019-Oct-21	2020-May-05	2020-Oct-08	2021-Apr-19	2021-Oct-20	2022-May-04
Anions						Detection Limit																
Chloride	mg/L	-	-	180	128	0.1	39.3	53.2	82.7	16	104	14.2	75.7	14.1	74.6	27	66.1	28.4	47	35.3	45.8	28.8
Nitrate + Nitrite	mg/L	-	-	-	-	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nitrate as N	mg/L	-	-	-	-	0.05	0.11	<0.1	<0.25	0.59	<0.25	0.41	<0.1	<0.05	<0.25	0.19	<0.25	<0.25	<0.05	<0.25	<0.05	0.11
Nitrite as N	mg/L	-	-	-	-	0.01	<0.05	<0.1	<0.25	<0.05	<0.25	<0.05	<0.1	<0.05	<0.25	<0.05	<0.25	<0.25	<0.05	<0.25	<0.05	<0.05
Sulphate	mg/L	-	-	100	-	0.1	7.59	54.7	15.2	48.2	15	26.6	20.1	7.11	8.8	28.5	10.8	-	9.13	63.5	12	74.7
Cations																						
Calcium (tot)	mg/L	-	-	-	-	0.05	78.9	80.9	90.6	61	107	42.8	108	36.5	108	49.4	112	77.21	98.79	97.8	111	91.5
Magnesium (tot)	mg/L	-	-	-	-	0.05	13.4	12.9	14.2	9.27	16.2	6.01	20.3	4.69	19.6	6.45	20.2	12.62	19.46	18	24.6	16.2
Potassium (tot)	mg/L	-	-	-	-	0.05	18.1	6.82	4.32	9.67	4.08	6.34	5.69	4.27	4.11	7.46	4.78	9.28	6.86	8.37	7.94	11.5
Sodium (tot)	mg/L	-	-	-	-	0.05	28.2	24.2	30.2	15.3	34.5	11.9	44.3	8.81	49.2	16.3	56.1	29.68	53	45	70.4	33.6
General Chemistry																						
Alkalinity (as CaCO3)	mg/L	See Factsheet	-	-	-	1	253	193	236	173	285	129	349	122	344	158	405	224	381	296	415	248
Ammonia as N	mg/L	-	-	-	-	0.02	0.19	0.99	0.22	0.79	0.62	0.42	0.11	0.77	0.4	0.55	0.47	<0.02	0.06	<0.02	0.31	<0.02
Biochemical Oxygen Demand	mg/L	-	-	-	-	2	<5	<5	<5	<5	8	<5	<5	<5	<5	<5	<5	<5	<2	<2	7	<2
Chemical Oxygen Demand	mg/L	-	-	-	-	4	34	29	68	30	866	19	99	6	34	15	59	25	40	27	55	35
Colour	TCU	-	-	-	-	2.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Electrical Conductivity	uS/cm	-	-	-	-	1	615	640	697	454	833	376	781	273	970	405	884	813	768	818	929	702
pH	pH units	6.5 - 8.5	-	6 - 9	-		8.26	7.75	7.8	8.03	7.66	8.17	7.91	7.61	7.97	7.7	7.72	7.53	8.04	7.84	7.83	7.58
Phenols	mg/L	0.001	-	0.04	0.004	0.001	<0.001	<0.001	0.003	<0.001	0.02	<0.001	<0.001	<0.001	0.002	0.002	0.005	<0.001	0.003	0.004	0.039	0.004
Phenols-4AAP	mg/L	-	-	-	-	0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Dissolved Solids	mg/L	-	-	-	-	10	406	376	396	258	526	190	496	138	532	198	548	390	466	502	524	428
Total Kjeldahl Nitrogen	mg/L	-	-	-	-	0.1	0.98	1.8	1.64	1.33	21	0.79	2.15	1.3	1.11	0.8	1.69	0.61	0.72	0.54	1.2	0.68
Total Phosphorus	mg/L	0.03	-	-	-	0.01	0.12	0.35	0.54	0.01	3.03	0.04	0.71	0.14	0.5	0.03	0.62	0.04	0.2	0.04	0.32	0.03
Total Suspended Solids	mg/L	-	-	-	-	10	40	81	35	<10	6320	<10	210	<10	37	<10	200	<10	<10	15	54	<10
Turbidity	NTU	-	-	-	-	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Unionized Ammonia (Calc)	mg/L	-	-	-	-	0.000002	-	-	-	-	-	-	-	-	-	0.001419678	0.000905368	-	-	-	-	-
Metals																						
Aluminum (diss)	mg/L	-	Calculated	-	-	0.004	-	-	-	-	-	-	-	-	-	0.008	0.007	0.006	0.005	0.005	0.005	0.004
Aluminum (diss, PWQO)	mg/L	-	Calculated	-	-	0.004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aluminum (tot)	mg/L	-	-	-	-	0.004	0.006	0.007	0.005	0.007	0.005	0.01	0.006	0.005	0.005	-	-	0.027	0.033	0.103	1.39	-
Arsenic (tot)	mg/L	-	0.005	-	-	0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Barium (tot)	mg/L	-	-	2.3	-	0.002	0.054	0.098	0.116	0.043	0.41	0.032	0.122	0.044	0.166	0.047	0.15	0.096	0.103	0.069	0.164	0.11
Beryllium (tot)	mg/L	Calculated	-	-	-	0.01	<0.001	<0.001	<0.001	<0.001	<0.001	-	-	-	-	-	-	-	-	-	-	-
Boron (tot)	mg/L	-	0.2	3.55	1.5	0.01	0.449	0.218	0.171	0.305	0.185	0.156	0.257	0.093	0.226	0.186	0.297	0.379	0.496	0.47	0.564	0.559
Cadmium (tot)	mg/L	-	Calculated	0.00021	0.000017	0.00009	<0.0001	<0.0001	<0.0001	<0.0001	0.0009	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0015
Chromium (tot)	mg/L	-	-	0.064	-	0.001	<0.003	<0.003	<0.003	<0.003	0.007	-	-	-	-	-	-	-	-	-	-	-
Cobalt (tot)	mg/L	-	0.0009	-	-	0.0005	<0.0005	<0.0005	0.0006	<0.0005	0.0052	<0.0005	0.0006	<0.0005	<0.0005	<0.0005	0.0006	<0.0005	<0.0005	0.0007	<0.0005	<0.0005
Copper (tot)	mg/L	-	Calculated	0.0069	-	0.0009	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.002	<0.001	<0.001	<0.001	<0.002	<0.002	0.003	<0.002	0.002	<0.002
Iron (tot)	mg/L	0.3	-	1	-	0.01	0.13	**2.87**	**3.45**	0.28	**21.9**	0.39	**3.69**	0.81	**2.71**	0.09	**4.73**	0.537	0.96	0.256	**3.75**	0.109
Lead (tot)	mg/L	-	Calculated	0.002	-	0.0005	<0.001	<0.001	0.002	<0.001	0.021	<0.001	0.002	<0.001	<0.001	<0.001	0.002	<0.001	<0.001	<0.001	0.002	<0.001
Manganese (tot)	mg/L	-	-	-	-	0.002	0.253	3.04	2.67	0.098	4.91	0.125	1.6	1.2	3.74	0.221	2.58	0.782	1.18	0.156	1.39	0.1
Mercury (diss)	mg/L	0.0002	-	-	-	0.0001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Molybdenum (tot)	mg/L	-	0.04	-	-	0.004	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-	-	-	-	-	-	-
Nickel (tot)	mg/L	0.025	-	-	-	0.003	<0.003	<0.003	<0.003	<0.003	0.01	-	-	-	-	-	-	-	-	-	-	-
Selenium (tot)	mg/L	0.1	-	-	-	0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Silicon (tot)	mg/L	-	-	-	-	0.002	8.26	6.15	11	5.31	20.2	-	-	-	-	-	-	-	-	-	-	-
Silver (tot)	mg/L	0.0001	-	-	-	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	-	-	-	-	-	-	-	-	-	-	-
Strontium (tot)	mg/L	-	-	-	-	0.01	0.435	0.423	0.623	0.324	0.809	-	-	-	-	-	-	-	-	-	-	-
Thallium (tot)	mg/L	-	0.0003	-	-	0.0001	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	-	-	-	-	-	-	-	-	-	-	-
Titanium (tot)	mg/L	-	-	-	-	0.003	<0.002	0.003	0.025	<0.002	0.129	-	-	-	-	-	-	-	-	-	-	-
Vanadium (tot)	mg/L	-	0.006	-	-	0.0005	<0.002	<0.002	<0.002	<0.002	0.021	-	-	-	-	-	-	-	-	-	-	-
Zinc (tot)	mg/L	-	0.02	0.089	0.03	0.001	<0.005	<0.005	0.011	<0.005	0.211	<0.005	0.015	<0.005	<0.005	<0.005	0.014	<0.005	<0.005	<0.005	<0.02	<0.02

-LEGEND-

Detection Limit	DL: May vary between sample locations and events
DL exceeds criteria	
Concentration exceeds PWQO-GENERAL	Provincial Water Quality Objectives General
Concentration exceeds PWQO-INTERIM	Provincial Water Quality Objectives Interim
Concentration exceeds MECP-GD-TA	MECP Guidance Document Table A
Concentration exceeds MECP-GD-TB	MECP Guidance Document Table B

*Please double check with Factsheet for all calculated criteria/guidelines.

Appendix E-2: Historical Surface Water Data						Location	MG-SW3	MG-SW4	MG-SW4	MG-SW4	MG-SW4	MG-SW4	MG-SW4	MG-SW4	MG-SW4	MG-SW4	MG-SW4	MG-SW4	MG-SW4	MG-SW4A	MG-SW4A
Parameter	Units	PWQO-GENERAL	PWQO-INTERIM	MECP-GD-TA	MECP-GD-TB	Sample ID	MG-SW3	MG-SW4	MG-SW4	MG-SW4	MG-SW4	MG-SW4	W4-QAQC (MG-	MG-SW4	W4-QAQC (MG-	MG-SW4	W4-QAQC (MG-	MG-SW4	MG-SW4	AQC SW-S21 (M	MG-SW4A	MG-SW4A
						Sample Date	2023-May-02	2017-Jul-13	2017-Oct-25	2018-May-09	2018-Oct-24	2019-May-06	2019-May-06	2019-Oct-21	2019-Oct-21	2020-May-05	2020-May-05	2020-Oct-08	2021-Apr-19	2021-Apr-19	2020-May-05	2020-Oct-08
Anions						Detection Limit																
Chloride	mg/L	-	-	180	128	0.1	18	4.4	4.9	3.49	6.27	4.14	4.13	7.29	7.08	4.3	4.27	6.44	4.64	4.64	5	6.99
Nitrate + Nitrite	mg/L	-	-	-	-	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nitrate as N	mg/L	-	-	-	-	0.05	0.72	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.07	0.06	<0.05	<0.05
Nitrite as N	mg/L	-	-	-	-	0.01	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Sulphate	mg/L	-	-	100	-	0.1	33.1	1.62	2.99	5.12	6.04	5.88	5.86	17.9	17.9	-	-	5.65	6.98	6.98	-	7.01
Cations																						
Calcium (tot)	mg/L	-	-	-	-	0.05	43.2	19.2	13.8	8.79	13.3	8.72	8.37	14.7	14.7	10.18	9.77	13.97	11.2	11	10.6	14.94
Magnesium (tot)	mg/L	-	-	-	-	0.05	6.16	2.76	2.06	1.2	1.92	1.29	1.26	2.26	2.23	1.51	1.45	1.9	1.76	1.77	1.68	1.99
Potassium (tot)	mg/L	-	-	-	-	0.05	4.79	1.11	1.5	1.01	1.3	0.97	0.94	1.65	1.65	1.08	1.08	1.35	1.2	1.16	0.93	1.43
Sodium (tot)	mg/L	-	-	-	-	0.05	12	2.7	2.86	2.01	2.92	2.41	2.3	3.2	3.11	2.62	2.51	3.33	3.03	2.95	2.94	3.95
General Chemistry																						
Alkalinity (as CaCO3)	mg/L	See Factsheet	-	-	-	1	182	65	43	27	32	23	24	28	27	25	23	36	26	26	25	36
Ammonia as N	mg/L	-	-	-	-	0.02	0.15	<0.02	<0.02	0.07	<0.02	<0.02	<0.02	0.11	0.13	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Biochemical Oxygen Demand	mg/L	-	-	-	-	2	<2	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<2	<2	<2	<5	<2
Chemical Oxygen Demand	mg/L	-	-	-	-	4	27	38	16	6	6	9	12	21	13	6	<5	28	12	11	8	24
Colour	TCU	-	-	-	-	2.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Electrical Conductivity	uS/cm	-	-	-	-	1	468	140	97	71	115	70	69	119	118	102	100	99	94	93	109	104
pH	pH units	6.5 - 8.5	-	6 - 9	-		7.8	7.23	7.27	6.65	7.12	6.74	6.91	6.75	7.15	7.12	7.05	6.82	7.25	7.2	7.05	6.79
Phenols	mg/L	0.001	-	0.04	0.004	0.001	-	0.002	<0.001	<0.001	<0.001	<0.001	<0.001	0.002	0.002	<0.001	<0.001	0.003	<0.001	<0.001	<0.001	0.002
Phenols-4AAP	mg/L	-	-	-	-	0.001	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Dissolved Solids	mg/L	-	-	-	-	10	256	120	80	42	78	52	44	124	118	50	58	76	66	64	58	78
Total Kjeldahl Nitrogen	mg/L	-	-	-	-	0.1	0.47	0.64	0.36	0.52	0.36	<0.1	<0.1	0.49	0.49	0.32	0.35	0.46	0.26	0.23	0.33	0.66
Total Phosphorus	mg/L	0.03	-	-	-	0.01	<0.02	0.05	0.02	0.06	<0.02	<0.01	<0.01	0.04	0.03	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Total Suspended Solids	mg/L	-	-	-	-	10	<10	<10	<10	<10	<10	<10	<10	18	<10	<10	<10	<10	<10	<10	<10	<10
Turbidity	NTU	-	-	-	-	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Unionized Ammonia (Calc)	mg/L	-	-	-	-	0.000002	0.192	-	-	-	-	0.0000026	0.0000026	0.0000445	0.0000526	-	-	-	-	-	-	-
Metals																						
Aluminum (diss)	mg/L	-	Calculated	-	-	0.004	-	-	-	-	-	0.029	0.03	0.016	0.016	0.026	0.025	0.022	0.028	0.021	0.027	0.024
Aluminum (diss, PWQO)	mg/L	-	Calculated	-	-	0.004	0.062	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aluminum (tot)	mg/L	-	-	-	-	0.004	-	0.021	0.012	0.025	0.011	-	-	-	-	0.052	0.042	0.116	0.035	0.04	0.091	0.052
Arsenic (tot)	mg/L	-	0.005	-	-	0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Barium (tot)	mg/L	-	-	2.3	-	0.002	0.041	0.028	0.015	0.011	0.014	0.011	0.011	0.021	0.021	0.011	0.011	0.016	0.011	0.011	0.012	0.015
Beryllium (tot)	mg/L	Calculated	-	-	-	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Boron (tot)	mg/L	-	0.2	3.55	1.5	0.01	0.268	<0.01	0.01	<0.01	0.011	<0.01	<0.01	0.013	0.011	0.012	0.011	0.04	<0.01	<0.01	<0.01	0.029
Cadmium (tot)	mg/L	-	Calculated	0.00021	0.000017	0.00009	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0003	<0.0001	<0.0001	<0.0001	<0.0001
Chromium (tot)	mg/L	-	-	0.064	-	0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cobalt (tot)	mg/L	-	0.0009	-	-	0.0005	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0006	<0.0005	<0.0005	<0.0005	<0.0005
Copper (tot)	mg/L	-	Calculated	0.0069	-	0.0009	<0.001	<0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.002	<0.002	0.003	<0.002	<0.002	<0.002	<0.002
Iron (tot)	mg/L	0.3	-	1	-	0.01	0.094	**2.39**	0.59	0.19	0.35	0.095	0.081	0.69	0.7	0.254	0.246	0.767	0.114	0.186	0.281	0.371
Lead (tot)	mg/L	-	Calculated	0.002	-	0.0005	<0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	<0.001
Manganese (tot)	mg/L	-	-	-	-	0.002	0.019	0.191	0.038	0.019	0.027	0.01	0.01	0.09	0.09	0.02	0.018	0.048	0.01	0.013	0.02	0.012
Mercury (diss)	mg/L	0.0002	-	-	-	0.0001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Molybdenum (tot)	mg/L	-	0.04	-	-	0.004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nickel (tot)	mg/L	0.025	-	-	-	0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Selenium (tot)	mg/L	0.1	-	-	-	0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Silicon (tot)	mg/L	-	-	-	-	0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Silver (tot)	mg/L	0.0001	-	-	-	0.0001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Strontium (tot)	mg/L	-	-	-	-	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Thallium (tot)	mg/L	-	0.0003	-	-	0.0001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Titanium (tot)	mg/L	-	-	-	-	0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Vanadium (tot)	mg/L	-	0.006	-	-	0.0005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zinc (tot)	mg/L	-	0.02	0.089	0.03	0.001	<0.02	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.159	<0.005	<0.005	<0.005	<0.005

-LEGEND-

Detection Limit	DL: May vary between sample locations and events
DL exceeds criteria	
Concentration exceeds PWQO-GENERAL	Provincial Water Quality Objectives General
Concentration exceeds PWQO-INTERIM	Provincial Water Quality Objectives Interim
Concentration exceeds MECP-GD-TA	MECP Guidance Document Table A
Concentration exceeds MECP-GD-TB	MECP Guidance Document Table B

*Please double check with Factsheet for all calculated criteria/guidelines.

Appendix E-2: Historical Surface Water Data						Location	MG-SW4A	MG-SW4A	MG-SW4A	MG-SW4A	MG-SW4A	MG-SW4A	MG-SW4A	MG-SW4A	MG-SW4A	MG-SW4A	MG-SW4A	MG-SW4A	MG-SW4A	MG-SW5	MG-SW5	MG-SW6
Parameter	Units	PWQO-GENERAL	PWQO-INTERIM	MECP-GD-TA	MECP-GD-TB	Sample ID	V4A-QAQC (MG-	MG-SW4A	MG-SW4A	QC SW-F21 (MG	MG-SW4A	QC SW-S22 (MG	MG-SW4A	QC SW1-F22 (MG	MG-SW4A	AQC-SW1 (MG-S	AQC-SW1 (MG-	MG-SW4A	AQC-SW1 (MG-	MG-SW5	MG-SW5	MG-SW6
						Sample Date	2020-Oct-08	2021-Apr-19	2021-Oct-20	2021-Oct-20	2022-May-04	2022-May-04	2022-Oct-25	2022-Oct-25	2023-May-02	2023-May-02	2023-May-03	2023-Oct-18	2023-Oct-18	2018-May-09	2019-May-06	2020-Aug-26
Anions						Detection Limit																
Chloride	mg/L	-	-	180	128	0.1	6.97	5.08	6.24	6.24	4.8	4.84	7.48	7.96	3.42	3.37	20.5	5.7	5.6	22	20.7	29.5
Nitrate + Nitrite	mg/L	-	-	-	-	0.1	-	-	-	-	-	-	-	-	-	-	-	<0.1	<0.1	-	-	-
Nitrate as N	mg/L	-	-	-	-	0.05	<0.05	0.06	0.06	0.06	0.06	0.06	0.07	0.06	<0.05	<0.05	<0.05	<0.1	<0.1	<0.05	<0.05	<0.05
Nitrite as N	mg/L	-	-	-	-	0.01	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	<0.01	<0.05	<0.05	<0.05
Sulphate	mg/L	-	-	100	-	0.1	6.97	7.66	4.9	4.76	6.6	6.66	10.2	10.3	4.96	4.94	3.67	12	12	7.94	15.3	0.75
Cations																						
Calcium (tot)	mg/L	-	-	-	-	0.05	15.53	11.7	16.8	16.3	13	13.2	16.8	16.7	5.03	6.51	4.46	18	18	19.8	18.6	55.41
Magnesium (tot)	mg/L	-	-	-	-	0.05	2.11	1.86	2.43	2.36	1.95	1.91	2.34	2.53	1.15	0.97	0.73	2.6	2.6	1.37	1.37	5.13
Potassium (tot)	mg/L	-	-	-	-	0.05	1.52	1.31	1.62	1.37	<1.15	1.56	1.74	1.62	0.73	0.74	0.67	1.4	1.4	1.12	1.14	2.24
Sodium (tot)	mg/L	-	-	-	-	0.05	4.06	3.29	4.03	3.9	3.35	3.37	4.85	4.75	2.51	2.01	13.1	4.1	4.2	8.4	9.77	16.63
General Chemistry																						
Alkalinity (as CaCO3)	mg/L	See Factsheet	-	-	-	1	37	29	49	45	32	30	40	40	16	16	10	42	44	44	37	151
Ammonia as N	mg/L	-	-	-	-	0.02	<0.02	<0.02	0.1	0.09	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.05	<0.05	0.12	<0.02	0.03
Biochemical Oxygen Demand	mg/L	-	-	-	-	2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<5	<5	4
Chemical Oxygen Demand	mg/L	-	-	-	-	4	23	5	19	20	18	13	<5	<5	31	28	-	15	12	9	19	25
Colour	TCU	-	-	-	-	2.5	-	-	-	-	-	-	-	-	-	-	49.4	-	-	-	-	-
Electrical Conductivity	uS/cm	-	-	-	-	1	104	99	123	122	96	96	140	140	63	63	105	140	140	169	168	376
pH	pH units	6.5 - 8.5	-	6 - 9	-		6.79	7.26	7.46	7.34	6.98	6.88	7.56	7.61	7.01	6.91	6.84	7.74	7.71	6.88	7.02	7.06
Phenols	mg/L	0.001	-	0.04	0.004	0.001	0.003	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	-	-	-	-	<0.001	0.002	0.003
Phenols-4AAP	mg/L	-	-	-	-	0.001	-	-	-	-	-	-	-	-	<0.001	<0.001	-	<0.001	<0.001	-	-	-
Total Dissolved Solids	mg/L	-	-	-	-	10	82	76	76	66	66	58	110	102	64	56	86	95	105	80	102	262
Total Kjeldahl Nitrogen	mg/L	-	-	-	-	0.1	0.43	0.3	0.35	0.33	0.35	0.32	0.26	0.36	0.29	0.28	0.21	0.2	0.21	0.53	<0.1	1
Total Phosphorus	mg/L	0.03	-	-	-	0.01	<0.02	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.07	0.01	0.15
Total Suspended Solids	mg/L	-	-	-	-	10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	22
Turbidity	NTU	-	-	-	-	0.5	-	-	-	-	-	-	-	-	-	-	1.3	-	-	-	-	-
Unionized Ammonia (Calc)	mg/L	-	-	-	-	0.000002	-	-	-	-	-	-	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.00052	<0.00052	-	0.000004	-
Metals																						
Aluminum (diss)	mg/L	-	Calculated	-	-	0.004	0.024	0.024	0.021	0.021	0.027	0.021	0.016	0.013	-	-	-	-	-	-	0.05	0.013
Aluminum (diss, PWQO)	mg/L	-	Calculated	-	-	0.004	-	-	-	-	-	-	-	-	0.034	0.092	0.079	0.01	0.009	-	-	-
Aluminum (tot)	mg/L	-	-	-	-	0.004	0.054	0.114	0.067	0.072	-	-	-	-	-	-	-	-	-	0.033	-	0.017
Arsenic (tot)	mg/L	-	0.005	-	-	0.003	-	-	-	-	-	-	-	-	-	-	<0.003	-	-	-	-	-
Barium (tot)	mg/L	-	-	2.3	-	0.002	0.015	0.012	0.017	0.015	0.015	0.015	0.016	0.015	0.011	0.012	-	0.016	0.016	0.022	0.02	0.053
Beryllium (tot)	mg/L	Calculated	-	-	-	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Boron (tot)	mg/L	-	0.2	3.55	1.5	0.01	0.024	<0.01	0.016	0.012	0.053	0.04	<0.01	<0.01	0.023	0.022	0.012	<0.01	<0.01	<0.01	<0.01	0.068
Cadmium (tot)	mg/L	-	Calculated	0.00021	0.000017	0.00009	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.00009	<0.00009	<0.0001	<0.0001	<0.0001
Chromium (tot)	mg/L	-	-	0.064	-	0.001	-	-	-	-	-	-	-	-	-	-	<0.003	-	-	-	-	-
Cobalt (tot)	mg/L	-	0.0009	-	-	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Copper (tot)	mg/L	-	Calculated	0.0069	-	0.0009	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.002	<0.001	<0.001	0.004	0.001	<0.0009	<0.0009	<0.001	<0.001	<0.002
Iron (tot)	mg/L	0.3	-	1	-	0.01	0.385	0.283	0.529	0.573	0.264	0.265	0.337	0.327	0.195	0.208	0.243	0.23	0.23	<0.01	<0.01	0.472
Lead (tot)	mg/L	-	Calculated	0.002	-	0.0005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0005	<0.0005	<0.001	<0.001	<0.001
Manganese (tot)	mg/L	-	-	-	-	0.002	0.013	0.019	0.023	0.028	0.014	0.017	0.005	0.004	0.005	0.007	0.01	0.005	0.0052	0.005	0.004	1.35
Mercury (diss)	mg/L	0.0002	-	-	-	0.0001	-	-	-	-	-	-	-	-	-	-	<0.0001	-	-	-	-	-
Molybdenum (tot)	mg/L	-	0.04	-	-	0.004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nickel (tot)	mg/L	0.025	-	-	-	0.003	-	-	-	-	-	-	-	-	-	-	<0.003	-	-	-	-	-
Selenium (tot)	mg/L	0.1	-	-	-	0.002	-	-	-	-	-	-	-	-	-	-	<0.002	-	-	-	-	-
Silicon (tot)	mg/L	-	-	-	-	0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Silver (tot)	mg/L	0.0001	-	-	-	0.0001	-	-	-	-	-	-	-	-	-	-	<0.0001	-	-	-	-	-
Strontium (tot)	mg/L	-	-	-	-	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Thallium (tot)	mg/L	-	0.0003	-	-	0.0001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Titanium (tot)	mg/L	-	-	-	-	0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Vanadium (tot)	mg/L	-	0.006	-	-	0.0005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zinc (tot)	mg/L	-	0.02	0.089	0.03	0.001	<0.005	<0.005	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.005	<0.005	<0.005	0.009	<0.005

-LEGEND-

Detection Limit	DL: May vary between sample locations and events
DL exceeds criteria	
Concentration exceeds PWQO-GENERAL	Provincial Water Quality Objectives General
Concentration exceeds PWQO-INTERIM	Provincial Water Quality Objectives Interim
Concentration exceeds MECP-GD-TA	MECP Guidance Document Table A
Concentration exceeds MECP-GD-TB	MECP Guidance Document Table B

*Please double check with Factsheet for all calculated criteria/guidelines.

Appendix E-2: Historical Surface Water Data						Location	MG-SW6	MG-SW6	MG-SW6	MG-SW6	MG-SW7	MG-SW7	MG-SW7	MG-SW7
Parameter	Units	PWQO-GENERAL	PWQO-INTERIM	MECP-GD-TA	MECP-GD-TB	Sample ID	MG-SW6	MG-SW6	MG-SW6	MG-SW6	MG-SW7	W7-QAQC (MG-	MG-SW7	W7-QAQC (MG-
						Sample Date	2020-Sep-23	2022-May-04	2022-Oct-25	2023-May-02	2020-Aug-26	2020-Aug-26	2020-Sep-23	2020-Sep-23
Anions						**Detection Limit**								
Chloride	mg/L	-	-	180	128	0.1	31.2	18	33	8.96	3.87	4.01	5.52	5.34
Nitrate + Nitrite	mg/L	-	-	-	-	0.1	-	-	-	-	-	-	-	-
Nitrate as N	mg/L	-	-	-	-	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Nitrite as N	mg/L	-	-	-	-	0.01	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Sulphate	mg/L	-	-	100	-	0.1	0.31	8.51	1.56	11	8.07	8.07	14.4	14.4
Cations														
Calcium (tot)	mg/L	-	-	-	-	0.05	47.31	29.3	42.9	18.8	31.59	32.18	25.3	26.37
Magnesium (tot)	mg/L	-	-	-	-	0.05	4.61	3.2	4.7	1.61	3.35	3.4	2.92	2.97
Potassium (tot)	mg/L	-	-	-	-	0.05	3.01	2.17	4.56	0.95	1.31	1.44	0.75	0.86
Sodium (tot)	mg/L	-	-	-	-	0.05	15.08	11.1	16.5	5.83	3.29	3.29	3.89	4.13
General Chemistry														
Alkalinity (as CaCO3)	mg/L	See Factsheet	-	-	-	1	140	76	108	54	89	90	60	67
Ammonia as N	mg/L	-	-	-	-	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Biochemical Oxygen Demand	mg/L	-	-	-	-	2	3	<2	7	<2	<2	<2	5	4
Chemical Oxygen Demand	mg/L	-	-	-	-	4	54	16	<5	28	<5	<5	20	20
Colour	TCU	-	-	-	-	2.5	-	-	-	-	-	-	-	-
Electrical Conductivity	uS/cm	-	-	-	-	1	309	234	313	159	192	191	143	143
pH	pH units	6.5 - 8.5	-	6 - 9	-		7.09	7.16	7.63	7.44	6.94	6.97	6.68	6.68
Phenols	mg/L	0.001	-	0.04	0.004	0.001	<0.001	<0.001	<0.001	-	0.002	0.001	<0.001	<0.001
Phenols-4AAP	mg/L	-	-	-	-	0.001	-	-	-	<0.001	-	-	-	-
Total Dissolved Solids	mg/L	-	-	-	-	10	222	130	218	98	142	144	116	132
Total Kjeldahl Nitrogen	mg/L	-	-	-	-	0.1	0.89	0.31	0.63	0.32	0.42	0.44	0.69	0.67
Total Phosphorus	mg/L	0.03	-	-	-	0.01	0.14	0.04	0.03	0.05	<0.02	0.02	0.04	<0.02
Total Suspended Solids	mg/L	-	-	-	-	10	18	<10	185	<10	<10	<10	63	27
Turbidity	NTU	-	-	-	-	0.5	-	-	-	-	-	-	-	-
Unionized Ammonia (Calc)	mg/L	-	-	-	-	0.000002	-	-	<0.000002	<0.000002	-	-	-	-
Metals														
Aluminum (diss)	mg/L	-	Calculated	-	-	0.004	0.007	0.006	0.006	-	0.008	0.008	0.016	0.009
Aluminum (diss, PWQO)	mg/L	-	Calculated	-	-	0.004	-	-	-	0.046	-	-	-	-
Aluminum (tot)	mg/L	-	-	-	-	0.004	-	-	-	-	0.017	0.042	-	-
Arsenic (tot)	mg/L	-	0.005	-	-	0.003	-	-	-	-	-	-	-	-
Barium (tot)	mg/L	-	-	2.3	-	0.002	0.037	0.018	0.029	0.015	0.026	0.026	0.026	0.025
Beryllium (tot)	mg/L	Calculated	-	-	-	0.01	-	-	-	-	-	-	-	-
Boron (tot)	mg/L	-	0.2	3.55	1.5	0.01	0.035	0.078	0.04	0.027	<0.01	<0.01	<0.01	<0.01
Cadmium (tot)	mg/L	-	Calculated	0.00021	0.000017	0.00009	<0.0001	**0.0003**	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium (tot)	mg/L	-	-	0.064	-	0.001	-	-	-	-	-	-	-	-
Cobalt (tot)	mg/L	-	0.0009	-	-	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Copper (tot)	mg/L	-	Calculated	0.0069	-	0.0009	<0.002	<0.002	<0.001	<0.001	<0.002	<0.002	<0.002	<0.002
Iron (tot)	mg/L	0.3	-	1	-	0.01	0.318	0.045	0.094	0.077	**1.79**	**1.86**	**1.59**	**1.38**
Lead (tot)	mg/L	-	Calculated	0.002	-	0.0005	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Manganese (tot)	mg/L	-	-	-	-	0.002	0.621	0.035	0.412	0.03	0.14	0.148	0.092	0.075
Mercury (diss)	mg/L	0.0002	-	-	-	0.0001	-	-	-	-	-	-	-	-
Molybdenum (tot)	mg/L	-	0.04	-	-	0.004	-	-	-	-	-	-	-	-
Nickel (tot)	mg/L	0.025	-	-	-	0.003	-	-	-	-	-	-	-	-
Selenium (tot)	mg/L	0.1	-	-	-	0.002	-	-	-	-	-	-	-	-
Silicon (tot)	mg/L	-	-	-	-	0.002	-	-	-	-	-	-	-	-
Silver (tot)	mg/L	0.0001	-	-	-	0.0001	-	-	-	-	-	-	-	-
Strontium (tot)	mg/L	-	-	-	-	0.01	-	-	-	-	-	-	-	-
Thallium (tot)	mg/L	-	0.0003	-	-	0.0001	-	-	-	-	-	-	-	-
Titanium (tot)	mg/L	-	-	-	-	0.003	-	-	-	-	-	-	-	-
Vanadium (tot)	mg/L	-	0.006	-	-	0.0005	-	-	-	-	-	-	-	-
Zinc (tot)	mg/L	-	0.02	0.089	0.03	0.001	0.008	<0.02	<0.02	<0.02	<0.005	<0.005	<0.005	<0.005

-LEGEND-

Detection Limit	DL: May vary between sample locations and events
DL exceeds criteria	
Concentration exceeds PWQO-GENERAL	Provincial Water Quality Objectives General
Concentration exceeds PWQO-INTERIM	Provincial Water Quality Objectives Interim
Concentration exceeds MECP-GD-TA	MECP Guidance Document Table A
Concentration exceeds MECP-GD-TB	MECP Guidance Document Table B

*Please double check with Factsheet for all calculated criteria/guidelines.

Appendix F

Trigger Mechanisms and Contingency Plans

MUSCLOW GREENVIEW ROAD WASTE DISPOSAL SITE
TRIGGER MECHANISMS
(AUGUST 2019)

OBJECTIVE AND BACKGROUND

The objective of the trigger mechanisms and contingency plan for the Musclow-Greenview Road Waste Disposal Site (WDS) is to identify the off-site migration of leachate impacted surface water and groundwater, and to prevent and mitigate adverse impacts to the environment.

OBJECTIVE 1: SURFACE WATER IMPACTS

To identify migration of leachate impacted groundwater discharging to adjacent surface water bodies and to identify surface water run-off impacts to surface water bodies and ensure timely action to prevent and mitigate adverse impacts to the environment.

Further investigations at the Site were carried out in 2018 with very little new data obtained with which to re-assess the proposed triggers. The triggers are currently being revised based on the requests by the Technical surface water review (April 10, 2018 and July 16, 2019), the Technical groundwater review (July 26, 2019), and the spring 2019 sampling results.

North Property Boundary-Surface Water

Assessment Points- SW1
Assessment Criteria- Iron, Boron, Lead, Aluminum, Un-ionized Ammonia, and Zinc
Frequency-Sampling twice per year (Spring and Fall)

Contingency Plan is activated if two or more of the following triggers occur: —

- Aluminum exceeds the Provincial Water Quality Objectives (PWQOs) at the assessment point;
- Boron exceeds the PWQOs at the assessment point;
- Iron exceeds the PWQOs at the assessment point:
- Lead exceeds the PWQOs at the assessment point;
- Un-ionized Ammonia exceeds the PWQOs; and
- Zinc exceeds the PWQO at the assessment point;

West Property Boundary-Surface Water

Assessment Points- SW3
Trigger Parameter- Toxicity test (Single Concentration – Acute Lethality) collected from the assessment point.
Frequency-Sampling twice per year (Spring & Fall)

Contingency Plan is activated if test results are greater than 50% mortality and is deemed a "failure" of the test.

References:

1. Environment Canada, "Biological Test Method: Reference Method for Determining Acute Lethality of Effluents to Rainbow Trout", Environmental Technology Centre, Ottawa, Ontario, Report EPS 1/RM/13 Second Edition - December 2000, including May 2007 and February 2016 Amendments.
2. Environment Canada, "Biological Test Method: Reference Method for Determining Acute Lethality of Effluents to Daphnia magna", Environmental Technology Centre, Ottawa, Ontario, Report EPS 1/RM/14 Second Edition - December2000, including February 2016 Amendments.

Table 1 below provides the trigger values for Select Parameters for the comparison of surface water monitoring results.

Table 1: Surface Water Trigger Values for Select Parameters

Parameter	PWQO mg/L
Aluminum	**0.075**
Boron	**0.20**
Iron	**0.30**
Lead	**0.001**
Unionized Ammonia	**0.02**
Zinc	**0.02**

MUSCLOW GREENVIEW ROAD WASTE DISPOSAL SITE
SURFACE WATER CONTINGENCY PLAN

Tier 1: The semi-annual toxicity test results at SW3 will serve as the first sampling event for the Tier 1 Contingency Plan for the SW1 assessment point in addition to the SW3 assessment points. If the semi-annual toxicity tests results fail at SW3, collect a second toxicity sample within two weeks of receiving the results. Upon receipt of two consecutive failing toxicity tests results at SW3 proceed with Tier 2 measures.

Tier 2: In the event of two consecutive toxicity test failures, follow the mitigation/remediation plan for measures to prevent further surface water impacts. Tier 2 of the Contingency Plan (in the event of two consecutive toxicity test failures) and are to include:

1. Benching of the north and west side slopes of the mound is recommended to allow heavy equipment to cover the steep slopes adjacent to the footprint with a minimum of 600 mm of low permeability material to minimize infiltration of precipitation immediately adjacent to the footprint. The placement of this capping material should be monitored to ensure the minimum thickness is met and to ensure the material is placed to a minimum 95% standard proctor density.
    - Should Tier 2 Contingency Plans sampling results continue to result in two failed aquatic test results following the benching and installation of the capping material on the north and west side slopes as described in Item 1 above, then the following mitigation measures are recommended:
        (a) The Municipality should proceed with the development of a Closure Plan for the Site closure prior to reaching the current approved capacity.

- Further remedial efforts to reduced groundwater impacts, or groundwater to surface impacts, may include the following in the future if deemed necessary. These types of systems are very costly and should only be considered if determined to be absolutely necessary.
    - Design and install groundwater purge wells for the south, north, and west sides of Site. Water could be treated on-site and discharged to the wetland or collected and sent off-site for treatment.
        2. The design, approval, and installation of purge wells and treatments systems would likely be over $1,000,000 and would add several thousands of dollars to the Municipality's annual operations and maintenance cost. Thus this option is considered cost prohibitive for the Municipality to operate without provincial or federal government assistance.

OBJECTIVE 2: GROUND WATER IMPACTS TO GROUNDWATER

To identify migration of impacted groundwater downgradient impacts to potential potable groundwater to prevent and mitigate adverse impacts to the environment.

North and West Property Boundary-Groundwater

Assessment Point- Future Assessment Point to be determined if deemed necessary in consultation with the MECP
Trigger Parameters- Alkalinity, Aluminum, Boron, DOC, Iron, Lead, Manganese, TDS, Zinc
Frequency-Sampling twice per year (Spring and Fall)

Contingency Plan is activated if three or more of the following triggers occur: —

- Alkalinity exceeds the Reasonable Use Value (RUV) at the assessment point;
- Aluminum exceeds the RUV at the assessment point;
- Boron exceeds the PWQOs at the assessment point;
- DOC exceeds the RUV at the assessment point;
- Iron exceeds the RUV at the assessment point:
- Lead exceeds the RUV at the assessment point;
- Manganese exceeds the RUV at the assessment point;
- TDS exceeds the RUV; and
- Zinc exceeds the PWQO at the assessment point;

Table 2 below provides trigger criteria for future potential potable monitoring if deemed necessary in consultation with the MECP.

Table 2: Groundwater Trigger Values for Select Parameters

Parameter	RUV (mg/L)
Alkalinity	**314**
Aluminum	**110.9**
Boron	**1.26**
DOC	**18.3**
Iron	**0.16**
Lead	**0.003**
Manganese	**0.003**
TDS	**339**
Zinc	**2.5**

MUSCLOW GREENVIEW ROAD WASTE DISPOSAL SITE
GROUNDWATER CONTINGENCY PLAN

Tier 1: If the triggers are exceeded, a second sample will be collected within two weeks of receiving the laboratory report under standard turnaround submission (typically seven days). If the re-sampling tests results fail, proceed with the Tier 2 measures identified under the Surface Water Contingency Plan.

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