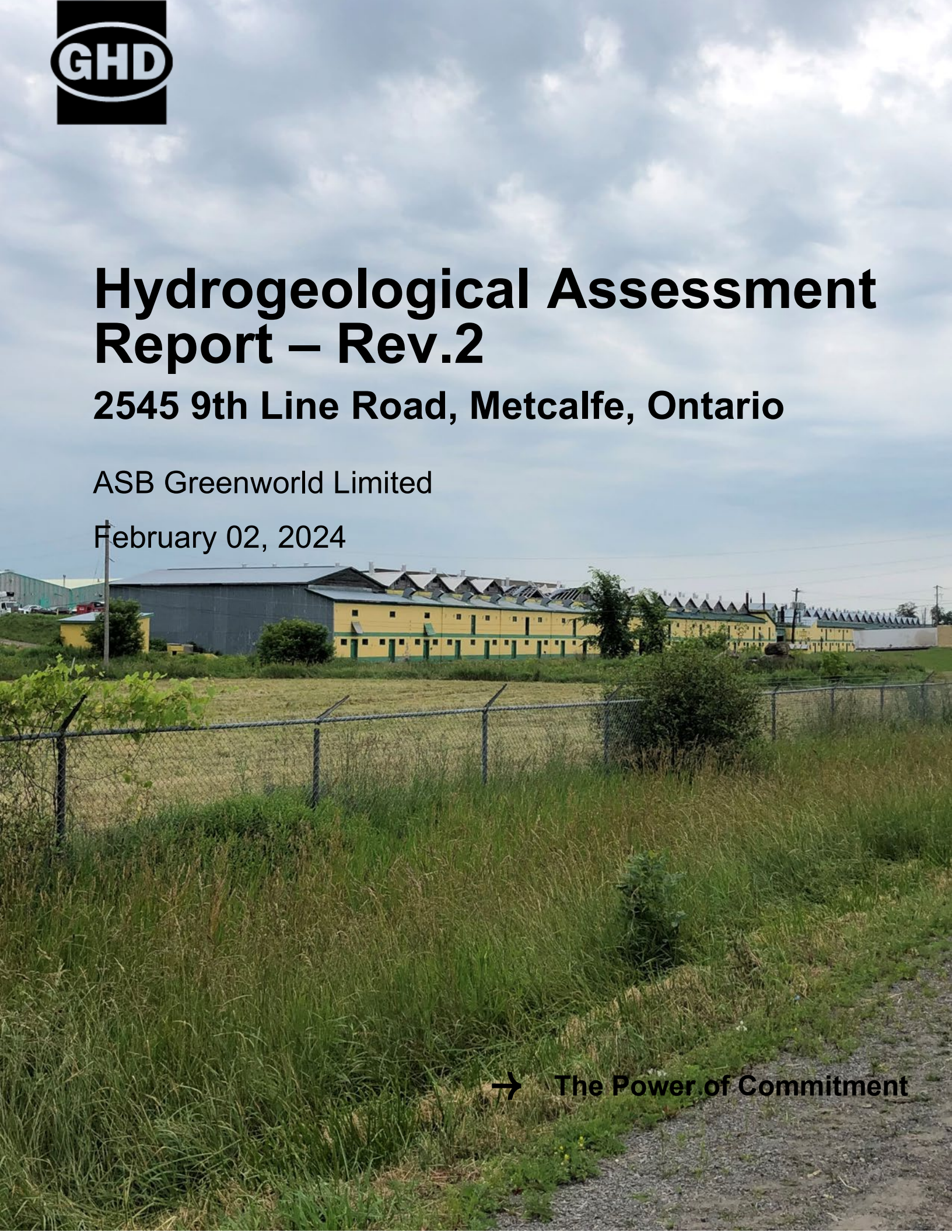
Hydrogeological Assessment Report – Rev.2

2545 9th Line Road, Metcalfe, Ontario

ASB Greenworld Limited

February 02, 2024



→ The Power of Commitment

Contents

Table Index

Figure Index

Appendices

1. Introduction

GHD Limited (GHD) was retained by ASB Greenworld Limited (ASB or "the Client") to complete a hydrogeological assessment in support of a proposed development of the property located at 2545 9th Line Road, in Metcalfe, Ontario (herein referred to as "the Site"). The Site is approximately 14.3 hectares (ha) in size and is located east of 9th Line Road. The Site and surrounding properties are located in an area of Ottawa that is zoned Rural Use. The location of the Site is provided on the **Site Location Plan, Figure 1**.

The Site is currently developed with several buildings and warehouses with asphalt and gravel parking areas and agricultural fields that is serviced by drilled wells and a septic system. Historically, the Site has been used for agricultural, commercial, and residential purposes since at least 1945. ASB proposes to use the Site for storage and distribution of their garden products.

This report has been prepared for the purposes of examining the hydrogeological characteristics of the Site and assessing the capacity of selected Site wells to supply the proposed development. The scope of work completed to achieve the aforementioned purposes included:

– A desktop review of available geological and groundwater mapping, and statistical assessment of Ministry of the Environment, Conservation and Parks (MECP) well records;
– Aquifer performance testing to evaluate the hydraulic properties of two previously drilled water supply wells at the Site (denoted as TW-1 and TW-2 for this report) and hydraulic monitoring of another Site drilled well (M-1); and
– Groundwater sampling to characterize the water quality of the aquifer(s) tapped into by TW-1 and TW-2.

A septic assessment was completed concurrently with the hydrogeological assessment and the findings of the septic assessment are presented under separate cover.

This report is organized into the following sections:

Section 1.0 – Introduction: Outlines the purpose, scope of work, and presents the report organization.

Section 2.0 – Background: Provides a description of the existing Site conditions, background information and surrounding land uses, as well as an outline of the proposed development. The regional environmental setting, including the physiography, topography, surface water features in the vicinity and regional geology is presented.

Section 3.0 – Methodology: Describes the field activities and methodologies used to assess the groundwater quantity and quality.

Section 4.0 – Geology and Hydrogeology: Provides a detailed description of the Site geology, hydrogeology, and the hydraulic properties of the underlying stratigraphy and aquifer.

Section 5.0 – Water Usage Assessment: Provides details on the expected water usage of the proposed development.

Section 6.0 - Impact Assessment: Provides details on a predictive assessment for Industrial/Commercial development

Section 7.0 – Summary and Recommendations: Provides a summary of the assessment findings.

Sections 8 and 9 provide References and the Statement of Limitations, respectively. The Figures and Appendices are provided following the text of this report, as indicated in the Table of Contents. Tabulated data is presented in tables within the text.

The factual data, interpretations and recommendations contained in this report pertain to a specific project as described in the report and are not applicable to any other project or site location. This report should be read in conjunction with the Statement of Limitations appended to this report. The reader's attention is specifically drawn to this information, as it is essential for the proper use and interpretation of this report.

2. Background

2.1 Site Description

The Site covers an area of approximately 14.3 ha and is located roughly 500 metres (m) north of the intersection of Victoria Street and 9th Line Road Street in Metcalfe, Ontario which is within the City of Ottawa limits. The parcel has the municipal address of 2545 9th Line Road and is currently developed with several buildings and warehouses, asphalt and gravel parking areas, private drilled water wells, private septic systems and agricultural fields as depicted in the **Well Locations Plan, Figure 2**. The Site is zoned Rural Countryside Zone as per the City of Ottawa Zoning By-Law No. 2008-250. Historically, the Site has been used for agricultural, commercial and residential purposes since at least 1945. It is understood that ASB proposes to use the Site for storage and distribution of their garden products.

The surrounding area is supported by private services for water and septic, is zoned for Rural Use and generally consist of vacant / wooded land, agricultural land, and / or rural residential lots.

2.2 Regional Setting

The Site is relatively flat with local topography sloping radially outward from the central developed area. Mapping indicates topographic relief is on the order of 10 m across the Site. Regional topography is provided as **Figure 3**. Stormwater generated at the Site either infiltrates the ground surface or is directed by overland flow towards the Site boundaries and various drainage features at the Site.

The Site is situated within the physiographic region known as the Russell and Prescott Sand Plains. In the United Counties of Prescott and Russell, and the Regional Municipality of Ottawa-Carleton, there is a group of large sand plains separated by the clays of the lower Ottawa Valley. The plains cover an area of nearly 1500 square kilometers and a ground surface of about 85 metres above sea level (masl). The plains were originally a continuous delta that was built by the Ottawa River into the Champlain Sea. The plains are as thick as 6 to 10 m in some areas (Chapman and Putnam, 1984). The local physiography is illustrated on **Figure 4** showing the Site is within a limestone plain with a clay plain to the south.

Surficial geology mapping on **Figure 5** indicates the Site is a mix of Paleozoic bedrock, littoral-foreshore deposits and stone-poor, carbonate-derived silty to sandy till.

The Quaternary geology (**Figure 6**) indicates the Site is a mix of bedrock; undifferentiated carbonate and clastic sedimentary rock, exposed at surface or covered by a discontinuous, thin layer of drift and till; undifferentiated, predominantly sandy silt to silt matrix, commonly rich in clasts, often high in total matrix carbonate content. Bedrock outcrops were not observed on the Site.

The underlying bedrock is dolostone, sandstone of the Beekmantown group (**Figure 7**). Based upon water well records within 500 m of the Site, bedrock was found varying from surface to 4 metres below ground surface (mbgs).

2.3 Existing Local Water Supplies

Information regarding groundwater characteristics of the immediate area was obtained from a search of the publicly available inventory of existing MECP well records. A total of twenty (20) wells were identified within 500 m of the Site, with seven (7) detailing well decommissioning or monitoring well installations with limited information. Based on location data provided in the well records, ten (10) of the well records are depicted on the Site consisting of four (4) abandonment records and six (6) as water supply wells. The MECP well records are provided in **Appendix A** with the data summarized in **Table 2.1**.

The well records indicate a mix of overburden materials (e.g., sand, clay, boulders) which overlays bedrock interpreted to be limestone and / or sandstone. Based upon the well records, bedrock was encountered at surface and up to depths of approximately 4 m. All of the drilled water wells in this area tap into the limestone and sandstone aquifers,

respectively. Eight (8) well records indicated wells that terminated within the underlying bedrock formation at depths ranging from about 14 m to 29 m. The remaining five (5) well records indicated wells that terminated within the underlying bedrock formation at depths ranging from about 76 m to 93 m.

The groundwater in the well records was generally described as “fresh”. The bedrock wells encountered water at an average depth of 36.5 m with an average static depth of 5.7 m with one (1) flowing artesian well identified (Well ID # 1513409) located southwest of the Site (well drilled to a depth of 18.3 m into sandstone bedrock with fresh water being found at 16.8 m). Pumping rates from the well records reviewed averaged about 56 L/min.

For the well records depicted to be located on the Site, bedrock was reported at depths ranging from 1 m to 3 m. Three (3) of the wells were completed to depths ranging from 20m to 27m and the remaining three (3) were completed to depths of 76m to 93m. The Site wells are discussed further in section 3.3.

No dug / bored wells or drilled overburden wells were identified in our review of available records. **Table 2.1** summarizes the data reviewed in the well records within 500 m of the Site:

Table 2.1 Summary of MECP Well Record Data

Well Use	Well Type/Unit	No. Wells	Well Depth Min – Max (Avg) (mbgs)	Water Encountered Depth Min – Max (Avg) (mbgs)	Static WL Min – Max (mbgs)	Yield Min – Max (Avg) (L/min)
Water Supply	Overburden – Dug/Bored	0 (0%)	--	--	--	--
Water Supply	Overburden – Drilled	0 (0%)	--	--	--	--
Water Supply	Bedrock	13 (100%)	14.0 – 93.0 (45.2)	8.5 – 90.5 (36.5)	0 – 10.7 (5.7)	7.6 – 151 (56.2)
Total		**13**				
Abandoned or Monitoring Wells	Drilled	7	NA	NA	NA	NA

Notes: Data based on MECP well record information (refer to **Appendix A** for well information).

2.3.1 MECP Well Records On-Site

As previously indicated, ten (10) of the well records are depicted to be on the Site based upon a search of the publicly available MECP well records. The records consist of four (4) abandonment records and six (6) water supply wells. During the fieldwork of this hydrogeological assessment, GHD observed four (4) water supply wells on Site. These wells are denoted as TW-1, M-1, TW-2 and Donut Factory Well based upon the locations observed by GHD and graphically illustrated on the **Well Locations Plan, Figure 2**.

Well records were not provided to GHD for the water supply wells located on the Site. GHD attempted to match the MECP database well records with the wells located on the Site. Without well tags on the wells on site, GHD was not able to exactly match the well records within the MECP database with the four (4) supply wells observed at the Site. It should be noted that coordinates provided for historical well records are typically not of survey grade quality, thus the locations shown on the well records may not always be accurate. **Table 2.2** summarizes the well records from the MECP database that are indicated to be on the Site.

Table 2.2 Summary of On-Site MECP Well Record Data

Well ID	Well Tag	Date Completed (yyyy/mm/dd)	Status	Use	Well Type	Casing			Well Depth (m)	Yield Min – Max (Avg) (L/min)
						Dia. (m)	Material	Depth (m)		
7045997	A035017	2007/05/31	Abandoned	No Data	No Data	0.15	No Data			
7046030	A035018	2007/05/30	Abandoned	No Data	No Data	0.20	No Data			
1507664	No Data	1961/01/10	Water Supply	Domestic	Bedrock	0.15	No Data	4.3	22.9	11.3
1512297	No Data	1972/09/08	Water Supply	Irrigation	Bedrock	0.15	Steel	6.4	87.5	26.5
1512298	No Data	1972/09/12	Water Supply	Commercial	Bedrock	0.15	Steel	6.7	93.0	68.0
1514164	No Data	1974/05/27	Water Supply	Industrial	Bedrock	0.15	Steel	6.7	27.4	45.4
1514335	No Data	1974/10/07	Abandoned	Supply well	Bedrock	0.15	Steel	6.7	68.6	No Data
1514336	No Data	1974/10/09	Water Supply	Industrial	Bedrock	0.15	Steel	6.4	76.2	75.6
1516652	No Data	1978/08/04	Water Supply	Commercial	Bedrock	0.20	Steel	6.1	19.8	18.9
1535357	A012448	2004/10/28	Abandoned	No Data	No Data	No Data				

2.4 Previous Investigations

The draft report entitled “Terrain and Hydrogeological Assessment, Proposed Replacement Septic Sewage Disposal Systems, Continental Mushroom Corp” prepared by Golder Associates in May 1996 was reviewed as part of this investigation. The test pits documented in this report were utilized, where applicable, in this hydrogeological assessment.

3. Field Methodology

To achieve the purposes of this assessment, the following field activities were undertaken:

– Prepared and implemented a Health and Safety Plan for the field activities;
– Conducted a Site inspection of the Site water supply wells and conditions;
– Completed aquifer performance testing of two (2) water supply wells (denoted as TW-1 and TW-2 in this report) and conducted water level monitoring of observation wells; and
– Collected groundwater samples for parameters prescribed in the City of Ottawa’s document *Hydrogeological and Terrain Analysis Guidelines,* dated March 2021.

3.1 Health and Safety

For projects that incorporate field activities, GHD conducts Health and Safety planning. For this project, a site-specific Health and Safety Plan (HASP) was prepared and implemented during the field activities. The HASP presents the visually observed Site conditions to identify potential physical hazards to field personnel. Required personal protective equipment was also listed in the HASP. It is mandatory for GHD personnel involved in the field program, to read and have a copy of the HASP available at the Site.

3.2 Site Inspection

GHD observed the general surficial characteristics of the Site and neighbouring lands on October 14, 2022. The Site consisted of various structures, warehouses, asphalt and gravel parking areas while the surrounding area was observed to consist of forested areas, agricultural fields and few residential lots. Photographs are provided in **Appendix B**.

GHD observed three (3) drilled water supply wells on the Site during our site inspection. Two (2) drilled wells were located within well pits and one (1) was located above grade within a pump house.

An unnamed tributary of the North Castor River is located along the eastern and northern portions of the Site. Five (5) surface water and compost wastewater lagoons are located in the central portion of the Site. Wetland areas, as indicated by the Canadian Wetland Inventory (CWI) database, are located on the northern portion of the Site and adjacent to the east of the Site. Visual observations at the time of the assessment noted that the wetlands indicated along the northern portion of the Site were not immediately apparent and may no longer exist as a result of local agricultural operations.

The nearest surface water body is the Middle Castor River located approximately 1.8 km southeast of the Site.

3.3 Aquifer Performance Testing

GHD conducted pumping tests of existing wells, denoted as TW-1 and TW-2 for this report, on October 26 and 27, 2022. The following sections provide details regarding the aquifer performance testing.

3.3.1 Test Well Information

Two (2) drilled wells on the Site were utilized for assessment of the local aquifer via pumping tests. Well records were not provided to GHD for TW-1 and TW-2. There are MECP Well records for the Site plotted in general proximity of the observed well locations; however, some of the wells were installed prior to the requirement for a well identification tag to be affixed to the well casing. GHD was not able to definitively match the well record information to the measured data collected from the wells. A third well was used as an observation well, labelled as M-1 for this assessment, with water level monitoring completed during the testing activities. The locations of TW-1, TW-2 and M-1 as identified in the field by GHD are illustrated on **Figure 2**.

Test well TW-1 was observed to be a drilled well located with a concrete well pit that extended above grade by 0.2 m. The measured well depth was approximately 47.7 mbgs. An existing submersible pump was outfitted in the well and installed to an unknown depth. Adjacent to the well pit was a pump house that housed the plumbing and pressure tank for water distribution.

Test well TW-2 was observed to be a drilled well extending above grade by 0.4 m and was located in a pump house. The measured well depth was 98.6 mbgs. An existing submersible pump was outfitted in the well and installed to an unknown depth. Inside the pump house was the plumbing and pressure tank for water distribution.

Observation well M-1 was observed to be a drilled well located with a concrete well pit that extended above grade by 0.2 m. The well depth was measured to be 47.7 mbgs.

As previously mentioned, well records were not provided to GHD for TW-1, TW-2 or M-1. With regards to construction details of the test wells and to assess compliance with Ontario Regulation 903[1], GHD was unable to reconcile the well records indicated to be on the Site with the actual test wells on Site. The well records indicate construction dates in the 1970s, prior to Ontario Regulation 903. Based upon the wells outlined in Table 2.2, the well records indicate that the wells installed and mapped to the Site were constructed with 0.15 m diameter steel casings that were installed to depths of 6 m or greater.

[1] Ontario Ministry of the Environment, 1990. Ontario Regulation 903: Wells (Ontario Water Resources Act, as amended).

It is understood that TW-1 and M-1 will be abandoned by a licensed well contractor and replaced with a new drilled well located closer to the office building which will increase the separation from the office septic system. The new well should be constructed in accordance with Ontario Regulation 903 with consideration of the hydrogeological sensitivity of the Site. The casing will be extended at least 12 m with a minimum of 6 m cased into competent bedrock. If after advancing 12 m into the bedrock, a minimum of 6 m of competent rock has not encountered, the well casing will be advanced further until this minimum requirement is met. The new well should target the same aquifer as TW-2 as this well is of a more desirable quality and quantity.

TW-2 should be inspected by a licensed well contractor for compliance with Ontario Regulation 903 and for casing length. It is anticipated that the casing extends to 6 m meeting the requirement in Ontario Regulation 903 however it may need to be extended similar to the considerations for the replacement well for TW-1 due to the hydrological sensitivity of the site.

Ontario Regulation 903 requires that the well owner must maintain the well at all times after the completion of the well's structural stage in a way that prevents surface water and other foreign materials from entering the well. Future changes or alternations to the wells will need to be completed in accordance with Ontario Regulation 903. Based on our observations, it is recommended that the wells constructed within pits be outfitted with pitless adaptors, the casings raised above the ground surface a minimum of 40 cm and fitted with vermin proof lids, and the ground surface graded away from the well. The well located within the pump house should have a new vermin proof well seal installed with any holes sealed or plugged. Wells that are not being used or maintained for future use as a well should be abandoned in accordance with Ontario Regulation 903.

3.3.2 Pumping Test Methodology

GHD completed a constant rate pumping test of well TW-1 on October 26, 2022, and TW-2 on October 27, 2022. The pumping tests were conducted to assess aquifer conditions and evaluate the availability of a suitable groundwater resource for the proposed storage and distribution of garden product development.

It is understood by GHD that the current proposed usage will be a warehouse that will be utilized to store and distribute garden products, with no processing on-site that would require greater water usage. Therefore, the water usage would be related to general cleaning, washroom or kitchen purposes. Staffing is proposed to consist of 2 to 5 staff with growth potential to have 10 to 15 staff. The proponent has indicated that this would be a maximum number of staff and that the planned processes, current and future, do not require water.

To assess the potential water usage, reference is made to Section 8 of the Ontario Building Code (Subsection 8.2.1.3. – Sewage System Design Flows). Water usage for a warehouse with 15 staff, three (3) loading bays and a 260 m^2 of office space would yield a maximum water usage on the order of 2,550 litres per day (L/day). Supporting calculations are provided in Section 5 of this report. The pumping tests for each test well were conducted for six (6) hours at a constant rate of 26.5 L/min (7 US gpm) which equates to a volume of 9,540 L of water pumped from each test well and is nearly four (4) times the estimated water usage that is expected to be required when the operation is fully staffed. Recovery measurements were collected after the pumping was completed.

The existing submersible pumps installed in the wells were used to conduct the testing. Water levels in the pumped water wells and observation well were monitored throughout the aquifer performance testing. Measurements were collected manually and using data loggers to evaluate drawdown, recovery and the potential of mutual interference. The discharge water was directed away from the pumped wells a distance of about 30 m downgradient and away from wells used for observation monitoring. This practice safeguards against artificial recharge of the wells from occurring during the pumping tests.

The pumped water wells were chlorinated in advance of the pumping test. Non-detect chlorine levels were confirmed in the field prior to bacteria sampling conducted at the water wells.

Water samples were collected throughout the testing and submitted to ALS Limited (ALS) in Ottawa, a CALA accredited analytical laboratory for the testing. Water samples were collected after 1 hour and 6 hours of testing for the following parameters:

- Polycyclic aromatic hydrocarbons (sampled after 6 hours of pumping);
- Volatile organic compounds (sampled after 6 hours of pumping);
- Petroleum hydrocarbons fractions F1 – F4 (sampled after 6 hours of pumping);
- Organochlorine (OC) pesticides (sampled after 6 hours of pumping);
- Trace metals (filtered) (sampled after 1 and 6 hours of pumping);
- Bacteriological parameters including total coliform and E.coli (sampled after 6 hours of pumping); and
- General chemistry parameters (sampled after 6 hours of pumping).

Field measurements of methane, pH, temperature, free chlorine, turbidity, and conductivity were completed with a Horiba multiparameter meter, colorimeter and methane meter. Water levels were collected from the wells using audible water level meters and data loggers.

4. Geology and Hydrogeology

The following sections provide a detailed description of the geology and hydrogeology of the Site based on available information.

4.1 Site Geology

GHD did not conduct a subsurface soil investigation as part of this assessment. Based upon information reviewed from the water well records, the local geology generally consists of overburden comprised of clay with sand and boulders underlain by limestone and sandstone bedrock. Overburden thickness in the area appears to range from surface to about 4 mbgs.

A draft Terrain and Hydrogeological Assessment was previously completed at the Site by Golder Associates in 1996. The Terrain and Hydrogeological Assessment involved a subsurface investigation program that explored the subsurface soil conditions by advancing thirteen (13) test pits throughout the Site. Test pits were advanced to 0.9 to 1.4 mbgs near the main office/shipping building and 0.3 to 1.8 mbgs near the production house building at the back of the Site.

The test pits advanced near the main office/shipping building generally encountered topsoil at the surface, underlain by a silty sand till over bedrock. Groundwater was indicated to be encountered at 1 mbgs and was reported to flow towards the north.

The test pits advanced near the production house building at the back of the Site encountered either topsoil or fill at the surface, underlain by either a silty sand or a sand with gravel till over bedrock. Groundwater was reported to conform with the topography in this area which is towards the southeast.

Due to shallow soils over bedrock, the Site would be considered to be hydrogeologically sensitive resulting in an anticipated higher risk for shallow sources of contamination impacting the underlying water resources or downgradient receptors. The Site is within a highly vulnerable aquifer suggesting that contamination from surface sources may impact underlying groundwater due to a lack of sufficient soil above. The primary source of contamination for the development would be the septic system. Mitigative measures include extending the well casing, as discussed in Section 3.3.1, or installation of advanced treatment equipment to improve the quality of the septic effluent.

4.2 Site Hydrogeology

4.2.1 Hydrostratigraphic Units

The hydrostratigraphic units (i.e. aquifer/aquitard unit) underlying the Site include the following based on well records reviewed:

- Thin veneer of overburden generally consisting of topsoil, clay with sand and boulders (not expected to be water bearing).
- Limestone aquifer from about 14 m to 29 m.
- Sandstone aquifer from about 76 m to 93 m.

4.2.2 Groundwater Levels

Water levels were obtained from test wells TW-1 and TW-2, and observation well M-1 on October 26 and 27, 2022 prior to the commencement of the pumping tests. The data is summarized in **Table 4.1**. Based upon the potentiometric groundwater elevations computed from estimated ground elevations, the groundwater flow appears to be in a southeasterly direction. Shallow groundwater flow tapped by monitoring wells was not assessed (note: groundwater elevations are based upon regional topographic contours and are for the purposes of evaluation potentiometric elevations only).

Table 4.1 Water Level Summary

Location	Description	Ground Elevation* (m)	Depth of Well (mbgs)	Water Level (mbgs)		Potentiometric Elevation (masl)
				10/26/22	10/27/22	
TW-1	Drilled Water Supply Well	~91	47.7	8.30	9.05	~83
TW-2	Drilled Water Supply Well	~95	98.6	9.69	9.74	~85
M-1	Drilled Observation Well	~90	47.7	8.83	9.08	~81

Notes:
masl = metres above sea level
*Elevations estimated from regional topographic contours provided on **Figure 3**. The elevations provided are for the purposes of evaluating potentiometric elevations and should not be relied upon as a legal survey or topographic elevation survey.

4.3 Aquifer Performance Assessment

The following sections discuss the pumping test results and coefficients, well interference and water quality.

4.3.1 Pumping Test – TW-1

The pumping test was commenced on October 26, 2022. The results of the constant rate pumping test including field testing data are graphically presented in **Appendix C, Figures C-1 to C-4**.

The water level during the pumping test at TW-1 is illustrated on **Figures C-1** and **C-2** showing water level versus time. The plot shows a minimal drawdown of the water level over the course of the 6-hour test conducted at a constant rate of 26.5 L/min. After 6 hours of pumping, the water level was 11.0 metres below top of pipe (mbtp). The maximum drawdown was about 2.4 m over the course of the testing with about 37.0 m of available drawdown remaining above the bottom of the well. Approximately 6% of the available drawdown was used during the pumping test. A total groundwater volume of about 9,540 L was pumped during the testing.

Recovery measurements were collected manually for 60 minutes after pumping ceased. The water level recovered about 65% in 1 hour and recovered to about 80% in 24 hours. The estimated transmissivity of the pumped water well was 33.6 m^2/day (2253 gpd/ft) based on the drawdown and 12.0 m^2/day (805 gpd/ft) based on the recovery period and

represents a moderate transmissivity. The specific capacity for this well is calculated to be 11.1 L/min/m based upon the pumping test completed.

The plotted data indicates the aquifer that this well is tapped into can safely provide long-term quantities of groundwater at a pumping rate of 26.5 L/min (7 US gpm) and adequate recovery is provided between uses.

TW-1 and M-1 are to be abandoned and a replacement well constructed closer to the office building. This will increase the setback distance from the septic system. The new well should be constructed as per the considerations in Section 3.3.1. Extending the well casing and the increased setback distance from the septic system are suitable mitigative measures in a hydrogeologically sensitive area. The new well should be pump tested for quantity and quality as per MECP D-5-5 and City of Ottawa requirements. The pumping rate should be compared to the potential water usage demand for current and future uses.

4.3.2 Pumping Test – TW-2

The pumping test was commenced on October 27, 2022. The results of the constant rate pumping test including field testing data are graphically presented in **Appendix C, Figures C-5 to C-8**.

The water level during the pumping test at TW-2 is illustrated on **Figures C-1** and **C-2** showing water level versus time. The plot shows the water level drop and then recovery quickly within the first 10 minutes. This is the result of flow rate adjustments occurring at the wellhead to obtain a constant rate of 26.5 L/min. At 10 minutes, the rate was adjusted to 26.5 L/min which was maintained for the remaining 6 hours. After six (6) hours of constant pumping, the water level was about 10.7 mbtp. The drawdown was about 0.5 m over the course of the testing with about 88.3 m of available drawdown remaining above the bottom of the well. Approximately 0.5% of the available drawdown was used during the pumping test. A total groundwater volume of about 9,540 L was pumped during the testing.

Recovery measurements were collected manually for 60 minutes after pumping ceased. The water level recovered about 76% in 1 hour and fully recovered 100% in 4 hours and 50 minutes. The estimated transmissivity for TW-2 was 83.9 m^2/day (5633 gpd/ft) based on the drawdown and 186.5 m^2/day (12517 gpd/ft) based on the recovery period and represents a high transmissivity. The specific capacity for this well is calculated to be 52.9 L/min/m based upon the pumping test completed.

The plotted data indicates the aquifer that this well is tapped into can safely provide long-term quantities of groundwater at a pumping rate of 26.5 L/min (7 US gpm) based upon the pumping test completed.

4.3.3 Summary of Aquifer Performance

Table 4.2 summarizes the data and coefficients obtained from the pumping tests.

Table 4.2 Aquifer Performance Testing Summary

Well No.	Step No.	Yield		Test Type	Time	Maximum drawdown		Available Drawdown*		Specific Capacity		Estimated Transmissivity	
		gpm	L/min		min	feet	metres	feet	metres	gpm/ft	L/min/m	gpd/ft	m^2/day
TW-1	1	0	0	Static	0	0	0	129.3	39.4	--	--	--	--
	2	7	26.5	Const.	360	7.8	2.4	121.5	37.0	0.9	11.1	2253	33.6
	3	0	0	Recvy.	65% recovery in 1 hour; 80% recovery in 24 hours							805	12.0
TW-2	1	0	0	Static	0	0	0	291.3	88.8	--	--	--	--
	2	various		--	10	--	--	--	--	--	--	--	--
	3	7	26.5	Const.	360	1.6	0.5	289.7	88.3	4.27	52.9	5633	84.0
	4	0	0	Recvy.	76% recovery in 1 hour; 100% recovery in 4 hours 50 minutes							12517	186.5

Notes:
gpm = US gallons per minute; gpd/ft = gallons per day per foot

"Recvy" refers to Recovery measurements; "Const" refers to the Constant Rate test conducted for 360 minutes.
*Available Drawdown refers to the height of water in the well above the bottom.
Static water level at the pumped well TW-1 was 8.54 mbtp (8.30 mbgs) at the start of the testing
Static water level at the pumped well TW-2 was 10.16 mbtp (9.74 mbgs) at the start of the testing.

4.3.4 Water Quality

Groundwater samples from the pumped well were obtained for laboratory testing during the course of the pumping test for the purpose of water quality analyses. The wells were sampled after one (1) hour and at six (6) hours at the end of the constant rate test on October 26 and 27, 2022. The water samples were delivered to ALS in Ottawa. Certificates of chemical analyses are presented in **Appendix D**. The water quality data are summarized and compared with the Ontario Drinking Water Standards (ODWS)[2] in **Table 4.3**.

Table 4.3 Test Well Water Quality Summary – TW-1 and TW-2

Parameter	Pumped Water Well TW-1		Pumped Water Well TW-2		ODWS	
	1 hr (GW-001)	6 hrs (GW-002)	1 hr (GW-003)	6 hr (GW-004)	MAC / IMAC	AO/OG
Bacteriological (Colony Forming Units)						
Total Coliform	--	8	--	<1	<6*	NS
E.coli	--	<1	--	<1	0	NS
Background	--	3	--	1	NS	NS
Heterotrophic Plate Count	--	78	--	1	NS	NS
Semi-Volatile Organic Compounds (µg/L)						
Acenaphthene	--	<0.20	--	<0.20	NS	NS
Acenaphthylene	--	<0.20	--	<0.20	NS	NS
Anthracene	--	<0.20	--	<0.20	NS	NS
Benzo(a)anthracene	--	<0.20	--	<0.20	NS	NS
Benzo(a)pyrene	--	<0.044	--	<0.044	0.01	NS
Benzo(b+j)fluoranthene	--	<0.10	--	<0.10	NS	NS
Benzo(ghi)perylene	--	<0.20	--	<0.20	NS	NS
Benzo(k)fluoranthene	--	<0.10	--	<0.10	NS	NS
Chrysene	--	<0.10	--	<0.10	NS	NS
Dibenzo(a,h)anthracene	--	<0.20	--	<0.20	NS	NS
Fluoranthene	--	<0.20	--	<0.20	NS	NS
Fluorene	--	<0.20	--	<0.20	NS	NS
Indeno(1,2,3-cd)pyrene	--	<0.20	--	<0.20	NS	NS
1-Methylnaphthalene	--	<0.40	--	<0.40	NS	NS
2-Methylnaphthalene	--	<0.40	--	<0.40	NS	NS
Naphthalene	--	<0.20	--	<0.20	NS	NS
Phenanthrene	--	<0.20	--	<0.20	NS	NS
Pyrene	--	<0.20	--	<0.20	NS	NS
Volatile Organic Compounds (µg/L)						
Acetone	--	<20	--	<20	NS	NS

[2] Technical Support Document for Ontario Drinking Water Standards, Objectives and Guidelines. June 2003, revised June 2006.

Parameter	Pumped Water Well TW-1		Pumped Water Well TW-2		ODWS	
	1 hr (GW-001)	6 hrs (GW-002)	1 hr (GW-003)	6 hr (GW-004)	MAC / IMAC	AO/OG
Bromomethane	--	<0.50	--	<0.50	NS	NS
Carbon tetrachloride	--	<0.20	--	<0.20	5	NS
Chlorobenzene	--	<0.50	--	<0.50	NS	NS
Chloroform	--	<0.50	--	<0.50	NS	NS
1,2-Dichlorobenzene	--	<0.50	--	<0.50	20	3
1,3-Dichlorobenzene	--	<0.50	--	<0.50	NS	NS
1,4-Dichlorobenzene	--	<0.50	--	<0.50	5	1
Dichlorofluoromethane	--	<0.50	--	<0.50	NS	NS
1,1-Dichloroethane	--	<0.50	--	<0.50	NS	NS
1,2-Dichloroethane	--	<0.50	--	<0.50	5	NS
1,1-Dichloroethylene	--	<0.50	--	<0.50	NS	NS
trans-1,2-Dichloroethane	--	<0.50	--	<0.50	NS	NS
cis-1,2-Dichloroethane	--	<0.50	--	<0.50	NS	NS
1,2-Dichloropropane	--	<0.50	--	<0.50	NS	NS
Ethylene Dibromide	--	<0.20	--	<0.20	NS	NS
Hexane	--	<0.50	--	<0.50	NS	NS
Methyl Ethyl Ketone	--	<20	--	<20	NS	NS
Methyl Isobutyl Ketone	--	<20	--	<20	NS	NS
Methyl Tert-Butyl Ether	--	<0.50	--	<0.50	NS	NS
Methylene Chloride	--	<1.0	--	<1.0	NS	NS
Styrene	--	<0.50	--	<0.50	NS	NS
Tetrachloroethylene	--	<0.50	--	<0.50	30	NS
1,1,1,2-Tetrachloroethane	--	<0.50	--	<0.50	NS	NS
1,1,2,2-Tetrachloroethane	--	<0.50	--	<0.50	NS	NS
1,1,1-Trichloroethane	--	<0.50	--	<0.50	NS	NS
1,1,2-Trichloroethane	--	<0.50	--	<0.50	NS	NS
Trichloroethylene	--	<0.50	--	<0.50	5	NS
Trichlorofluoromethane	--	<0.50	--	<0.50	NS	NS
Vinyl Chloride	--	<0.50	--	<0.50	2	NS
Benzene	--	<0.50	--	<0.50	5	NS
Toluene	--	<0.50	--	<0.50	NS	24
Ethylbenzene	--	<0.50	--	<0.50	NS	2.4
Xylenes	--	<0.50	--	<0.50	NS	300
Bromodichloromethane	--	<0.50	--	<0.50	NS	NS
Bromoform	--	<0.50	--	<0.50	NS	NS
Dibromochloromethane	--	<0.50	--	<0.50	NS	NS
Petroleum Hydrocarbons						
PHC F1 (C_6 – C_{10})	--	<25	--	<25	NS	NS

Parameter	Pumped Water Well TW-1		Pumped Water Well TW-2		ODWS	
	1 hr (GW-001)	6 hrs (GW-002)	1 hr (GW-003)	6 hr (GW-004)	MAC / IMAC	AO/OG
PHC F2 (C_{10} – C_{16})	--	<100	--	<100	NS	NS
PHC F3 (C_{16} – C_{34})	--	<250	--	<250	NS	NS
PHC F4 (C_{34} – C_{50})	--	<250	--	<250	NS	NS
Trace Metals (dissolved) (mg/L)						
Aluminum	0.0011	<0.0010	<0.0010	<0.0010	NS	0.1
Arsenic	0.00099	0.00071	<0.0010	<0.0010	0.025	NS
Boron	0.039	0.029	0.077	0.077	5	NS
Barium	0.209	0.212	0.149	0.149	1	NS
Beryllium	<0.000020	<0.000020	<0.000020	<0.000020	NS	NS
Cobalt	0.00059	0.00047	<0.00010	<0.00010	NS	NS
Calcium	113	127	97.5	96.9	NS	NS
Cadmium	0.0000118	0.00000064	<0.0000050	<0.0000050	0.005	NS
Copper	0.00139	0.00048	0.00115	0.00035	NS	1
Chromium	<0.00050	<0.00050	<0.00050	<0.00050	0.05	NS
Magnesium	42.8	46.7	35.5	36.1	NS	NS
Manganese	**0.0501**	**0.0762**	0.0413	0.0420	NS	0.05
Molybdenum	0.0178	0.0204	0.00593	0.00604	NS	NS
Nickel	0.00225	0.00176	0.00063	<0.00050	NS	NS
Sodium	107	109	28.0	28.8	NS	200 (20*)
Lead	0.000408	0.000992	0.000103	<0.000050	0.01	NS
Silver	<0.000010	<0.000010	<0.000010	<0.000010	NS	NS
Strontium	1.50	1.32	2.06	2.05	NS	NS
Thallium	<0.000010	<0.000010	<0.000010	<0.000010	NS	NS
Antimony	0.00012	<0.00010	<0.00010	<0.00010	0.006	NS
Selenium	0.000050	0.000099	0.000110	0.000141	0.01	NS
Uranium	0.00405	0.00462	0.000249	0.000246	0.02	NS
Vanadium	<0.00050	<0.00050	<0.00050	<0.00050	NS	NS
Zinc	0.0016	<0.0010	0.0137	0.0066	NS	5
General Chemistry Parameters (units listed per parameter)						
Tannin + Lignin (mg phenol/L)	--	1.21	--	0.86	NS	NS
Alkalinity (mg/L as $CaCO_3$)	--	345	--	269	NS	30 – 500
pH	--	8.15	--	8.43	NS	6.5 – 8.5
Conductivity (µS/cm)	--	1420	--	790	NS	NS
Total Dissolved Solids (mg/L)	--	**792**	--	495	NS	500
Colour (TCU)	--	2.4	--	2.9	NS	5
Turbidity (NTU)	--	1.04	--	0.10	NS	5
Total Kjeldahl Nitrogen (mg/L)	--	0.180	--	0.194	NS	NS
Ammonia + Ammonium (mg/L)	--	0.0353	--	0.125	NS	NS

Parameter	Pumped Water Well TW-1		Pumped Water Well TW-2		ODWS	
	1 hr (GW-001)	6 hrs (GW-002)	1 hr (GW-003)	6 hr (GW-004)	MAC / IMAC	AO/OG
Nitrite (as N mg/L)	--	<0.050	--	<0.020	1	NS
Nitrate (as N mg/L)	--	<0.100	--	<0.010	10	NS
Chloride (mg/L)	--	208	--	67.0	NS	250
Hydrogen Sulphide	--	<0.011	--	0.019	NS	0.05
Sulphide (mg/L)	--	<0.010	--	0.018	NS	NS
Sulphate (mg/L)	--	111	--	62.5	NS	500
Dissolved Organic Carbon (mg/L)	--	**17.4**	--	1.98	NS	5
Hardness (mg/L as $CaCO_3$)	--	**509**	--	**391**	NS	80 – 100
Potassium	6.81	6.14	--	5.14	NS	NS
OC Pesticides						
Diazinon	--	<0.10	--	<0.10	NS	NS

Notes:
"<" indicates concentrations are less than laboratory reporting limits
MAC = maximum acceptable concentration; IMAC – Interim MAC; AO / OG = aesthetic objective / operational guideline
Bold / shaded indicates the concentration exceeds the ODWS
*The aesthetic objective for sodium in drinking water is 200 mg/L. When the sodium concentration exceeds 20 mg/L, this information should be communicated to those on sodium restricted diets.

The laboratory analyses indicated that the health-related parameter of total coliform was in exceedance of the ODWS at TW-1. No other health-related parameters were in exceedance of the ODWS. In general, the test results indicate the majority of parameters meet the ODWS for TW-1 and TW-2 with the exception of the aesthetic objectives for:

– Manganese (TW-1);
– Total Dissolved Solids (TW-1);
– Dissolved Organic Carbon (TW-1); and
– Hardness (TW-1 and TW-2).

Sample results for VOCs, PAHs, PHCs and OC Pesticides were reported below detection limits.

As indicated previously TW-1 is to be abandoned and replaced with a new well. The new well should target the same aquifer as TW-2 as this water bearing zone is of a more desirable quality and quantity. Discussion of the water quality encountered in the two (2) wells and treatment options is provided in the following paragraphs.

Aesthetic objectives (AO) are established for parameters that may impair the taste, odour or colour of water or which may interfere with good water quality control practices. Operational guidelines (OG) are established for parameters that, if not controlled, may negatively affect the efficient and effective treatment, disinfection and distribution of the water.

Overall, the analytical results indicate TW-2, the deeper bedrock well, to have better water quality with only hardness (391 mg/L) above its respective AO of the ODWS. Elevated hardness is related to the overburden materials containing calcium and to a lesser extent, magnesium. Elevated hardness is a common trait of groundwater supplies in Southern Ontario and can be treated using commercially available treatment equipment such as a water softener. Although hardness in excess of 300 mg/L at TW-1 and TW-2 and is considered very hard, a maximum treatable value is not provided within the D-5-5 Guideline. However, the Ontario Drinking Water Objective states that water with hardness in excess of 500 mg/L (TW-1) is unacceptable for most domestic purposes.

If TW-1 was to be used as a potential water source, treatment is recommended. Total dissolved solids (TDS) were elevated above its aesthetic objective of 500 mg/L. TDS may be the result of hard water including calcium and / or

magnesium as well as other constituents such as sodium and chloride. TDS can be treated with commercially available reverse osmosis systems.

The colour related aesthetic objective for manganese in drinking water is 0.05 mg/L. Manganese is objectionable in water supplies because it stains laundry and fixtures black, and at excessive concentrations causes undesirable tastes in beverages. Manganese is present in some groundwater due to chemically reducing underground conditions coupled with the presence of manganese mineral deposits. Manganese staining can be addressed through increased cleaning or reduced through treatment such as a greensand filter.

For the bacteriological parameters tested at TW-1, there were eight (8) bacteriological colony forming units (CFUs) of total coliform reported. Total coliform are bacteria that occur naturally in nature within, for example, soil, decaying vegetation and as well as within the intestines of warm-blooded animals. Many coliforms do not pose a risk to human health; however, they are used as an indicator as to whether potentially harmful bacteria may also be present such as E. *coli*. E. *coli* concentrations were less than the laboratory reporting limit of 1 CFU within the water sample collected and tested at the end of the pumping test. Therefore, sewage contamination is not expected to be the source of the detected coliform at TW-1. Also, ammonia, nitrite and nitrate are often indications of sewage effluent contamination, and they were reported at low concentrations or below detection limits. TW-1 is to be abandoned and replaced with a new well that will be constructed closer to the office building increasing the setback from the septic system. There were no bacteriological parameters detected within the water sample collected and tested at the end of pumping within test well TW-2.

As a proactive measure, GHD recommends that bacteriological treatment (i.e. ultraviolet (UV) treatment) to be used at wells that will be connected to potable water plumbing.

Dissolved organic carbon (DOC) in the sample collected from TW-1 was elevated compared to the AO value of 5 mg/L. Elevated DOC is an indicator of potential water quality deterioration during storage and distribution and an indicator of potential chlorination by-product problems. Elevated DOC can be reduced using coagulant treatment or a high-pressure membrane treatment. If desired, taste and odour can be treated with commercially available equipment such as an activated carbon filter.

To supplement the analytical data, field measurements were obtained throughout the pumping test by GHD as shown on Figures C-3 and C-7 and Tables 4.4 and 4.5. Future water quality testing should be expanded to include colour and hydrogen sulphide (using the methylene blue method).

Table 4.4 Field Parameters TW-1

Parameter	Units	Reading at 1hr	Reading at 6hr
pH	pH units	8.84	8.04
Temperature	°C	11.6	11.5
Conductivity	mS/cm	1.83	1.96
Turbidity	NTU	12.2	0.00
Free Chlorine	mg/L	0.00	0.00
Methane	% LEL	0	0

Table 4.5 Field Parameters TW-2

Parameter	Units	Reading at 1hr	Reading at 6hr
pH	pH units	8.25	8.20
Temperature	°C	10.5	10.9
Conductivity	mS/cm	1.15	1.11
Turbidity	NTU	0.00	0.00
Free Chlorine	mg/L	0.00	0.00
Methane	% LEL	0	0

4.3.5 Well Interference

In order to assess the potential for hydraulic connection between the pumped water supply wells and local area wells, monitoring was conducted of the drilled test wells and drilled observation well throughout the pumping tests. Data loggers were installed within TW-1, TW-2 and M-1. The data is provided in **Appendix E**.

The approximate linear distances between the pumped water wells and observation well are provided in **Table 4.4** based upon the locations plotted on **Figure 2**.

Table 4.6 Distance Between Pumping Well and Observation Wells

Location	Distances between Pumped Water Wells and Observation Wells (metres)		
	TW-1	TW-2	M-1
Pumped well – TW-1	--	150	19
Pumped Well – TW-2	150	--	157
Observation Well – M-1	19	157	--

Notes:
Distances based upon locations identified on **Well Locations Plan, Figure 2**.

The following table provides the maximum water level drawdowns observed during the pumping tests.

Table 4.7 Maximum Drawdowns in Pumping and Observation Wells

Pumped Well Location	Drawdown (m)		
		TW-2	M-1
TW-1	-2.4 (drawdown during pump test)	0	-0.13
TW-2	-0.03	-0.6 (drawdown during pump test)	0

Notes:
Negative drawdown (denoted by minus sign and shaded cell) indicates water level lowered during the testing
Zero drawdown denoted by BLACK text

4.3.5.1 Interference Assessment

There was minimal drawdown observed during the pumping tests conducted at the wells indicating there is little hydraulic connection between the wells within the bedrock aquifer.

As daily usage is expected to be well below the volumes pumped during the testing conducted, it is our opinion that there is sufficient water quantity below the Site for the planned development without significant interference risk to future and existing neighbouring wells.

5. Water Usage Assessment

It is understood by GHD that the current proposed usage will be a warehouse that will be utilized to store and distribute garden products, with no processing on-site that would require greater water usage. As per the City of Ottawa Zoning By-law No. 2008-250, the usage would be considered Rural General Industrial Zone designation with the Site being considered a warehouse. The water usage would be related to general cleaning, washroom or kitchen purposes. Staffing is proposed to consist of 2 to 5 staff to start with a potential growth of 10 to 15 staff. The proponent has indicated that this would be a maximum number of staff and that the planned processes, current and future, do not require water.

To assess the potential water usage reference is made to Section 8 of the Ontario Building Code, subsection 8.2.1.3. – Sewage System Design Flows. Water usage for a warehouse with 15 staff, three (3) loading bays and 260m^2 of office space water usage would be on the order of 2,550 litres per day. It is to be noted that designs flows are generally conservative in nature with actual daily usage typically 2 to 3 times less. **Table 5.1** provides the calculations that were utilized to estimate the maximum daily water usage of the proposed development.

Table 5.1 Water Usage

Volume (L)	Establishment	Quantity	Water Usage (L)
75	Office Building: per each 9.3 m^2 of floor space	260 m^2 / 9.3 m^2 ≈ 28	2,100
150	Warehouse: Per loading bay	3	450
		TOTAL:	2,550

Based upon our understanding of the Ottawa Design Guidelines Water Distribution maximum daily demand for industrial use and MECP(Section 3.4.4 Industrial Water Demands), industrial water demands expressed in terms of water requirements per gross hectare of industrial development is 35 cubic metres per hectare per day (m^3/ha/d). For a 14.3 ha site, the daily water demand is on the order of 500,000 L/day.

Utilizing TW-2 and the information from our pumping test (i.e. pumping rate of 26.5 L/min resulting in a specific capacity of 52.9 L/m/min and drawdown of 0.5 m), we can use a simplistic approach (specific capacity = flow rate / drawdown) to theoretically estimate the approximate potential yield given that there was an available drawdown of approximately 88 m during our pumping test. At an estimated flow rate of 4698 L/min, the resultant drawdown would be 88 m. Thus, theoretically and ideally, the aquifer that this well is tapping into is capable of producing on the order of 6.76 million litres per day based upon the information from our testing and is therefore indicating that the underlying aquifer below this Site is capable of producing sufficient water to meet potential future industrial water demands, should this be required.

6. Impact Assessment

A Predictive Assessment for an Industrial / Commercial Development (Section 5.6.3 of the MOE D-5-4 Individual On-Site Sewage Systems: Water Quality Impact Risk Assessment) was completed. This guideline only applies to industrial / commercial developments which have an average daily flow of less than 4,500 L/day/lot. The current system design indicates 2,550 L/day. The sewage assessed for the Site is to consist of domestic wastes only, no industrial / commercial cooling or process wastewater was considered.

For the purposes of calculating the potential impact of the proposed development, 2,550 L/day for the warehouse is considered to be the design septic effluent loading rate. Appendices 9.3.1 and 9.3.2 of the MOEE's "Manual of Policy, Procedures and Guidelines for On-Site Sewage Systems indicate daily sewage flow data for factory or plant workers per day or per shift with no showers or industrial waste at 75 litres. It is understood that there are to be 5 to 10

employees with one shift each, resulting in flow data of 375 to 750 litres per day. This is less than the design flow of 2,550 L/day. The maximum number of users based off 2,550 L/day and utilizing 75 litres per day would be 34.

While most constituents in septic effluent are usually removed within a short distance of movement within soil, mobile constituents such as chlorides and nitrates will require sustained dilution to meet the drinking water standards of 10 mg/L N for nitrate.

The MECP normally considers sewage from a Class 4 waste disposal system will contain 40 mg/L of nitrate. For the purpose of assessing the impact of projected nitrate loading, the dilution requirement of 4:1 was utilized in the impact computations.

A summary of the applicable parameters that were considered in the waste disposal evaluation and the computation of the projected nitrate concentration are presented below. The detailed calculations can be reviewed in **Appendix F**. The calculations used a recharge rate of 175 mm/year, considered to be applicable for silty sand material based upon the soils encountered within the test pits advanced previously. The maximum allowable flow rate was calculated by dividing the recharge rate by a factor of three as per D-5-4. Nitrate concentrations from the test wells were non-detect. Nitrate impacts to the water bearing aquifers from the development are not expected.

Using dilution only, the nitrate concentration generated from sewage at the Site is calculated to be 4 mg/L indicating that nitrate impacts from septic effluent will not be an issue. The proposed development meets the 10 mg/L drinking water standard for nitrate. The nitrate dilution calculations ignore losses to surface through shallow groundwater discharge, denitrification in the soil and any dilution within the water below the Site. The actual nitrate concentration is expected to be less than the projected nitrate concentration.

The property is within a highly vulnerable aquifer area and would be considered to be a hydraulically sensitive site due to thin soil cover. No karst, areas of fractured bedrock at surface or highly permeable soils were identified at the Site. The proponent has retained a septic installer that reviewed the existing septic system and has proposed a replacement system. The proposed replacement system is an advanced septic treatment (Norweco HK 3020L-3M) and will utilize the existing septic bed. The advanced treatment system is capable of reducing the nitrates to 7.9mg/L0 this would result in a nitrate value of 0.85mg/L after dilution.

7. Summary and Recommendations

Supporting data upon which our conclusions and recommendations are based have been presented in the foregoing sections of this report. The following conclusions and recommendations are governed by the physical properties of the subsurface materials that were encountered at the Site and assume that they are representative of the overall Site conditions. It should be noted that these conclusions and recommendations are intended for use by the designers only. Contractors bidding on or undertaking any work at the Site should examine the factual results of the assessment, satisfy themselves as to the adequacy of the information for construction, and make their own interpretation of this factual data as it affects their proposed construction techniques, equipment capabilities, costs, sequencing, and the like. Comments, techniques, or recommendations pertaining to construction should not be construed as instructions to the contractor.

Each test well at the Site was visually inspected and observed to be secure and in good working order. As previously mentioned, well records were not provided to GHD for TW-1, TW-2 or M-1 and GHD was not able to definitively match any of the MECP database well records to the Site wells. With regards to construction details of the test wells and to assess compliance with the Ontario Regulation 903, the well records indicate construction dates in the 1970s, prior to Ontario Regulation 903. Based upon the wells outlined in Table 2.2, the well records indicate that the wells installed and mapped to the Site were constructed with 0.15 m diameter steel casings that were installed to depths of 6 m or greater. Ontario Regulation 903 requires that the well owner must maintain the well at all times after the completion of the well's structural stage in a way that prevents surface water and other foreign materials from entering the well. TW-1 and M-1 are to be abandoned and replaced with a new well located closer to the office building and meet minimum casing requirements outlined in this document. TW-2 is located within the pump house should have a new vermin

proof well seal installed with any holes sealed or plugged. Future changes or alternations to the wells will need to be completed in accordance with Ontario Regulation 903. Wells that are not being used or maintained for future use as a well should be abandoned in accordance with Ontario Regulation 903.

Based on the proposed current and future development details provided to GHD, the maximum daily water usage of the proposed development is estimated to be 2,550 L/day that would include up to 15 staff. The pumping tests for each test well were conducted for six (6) hours at a constant rate of 26.5 L/min (7 US gpm), providing a total water volume of 9,540 L of water, which substantially exceeds the estimated maximum daily water usage.

Based on the results of the hydrogeological assessment, the pumped water wells had sufficient water of good quality, in particular TW-2. With the exception of total coliform at TW-1, which are at low levels and can be addressed with treatment, each well can provide ample supply of groundwater for the proposed development with minimal draw on the aquifer complex and insignificant interference to area wells anticipated. Water quality is discussed in **Section 4.3.4** with TW-2 having the more desirable water quality and quantity to support development. The only elevated water quality parameter for TW-2 was hardness that can result in a buildup of material on plumbing fixtures be reduced through installation of a commercially available water softener. As a proactive measure, GHD recommends that bacteriological treatment (i.e. ultraviolet (UV) treatment) to be used at wells that will be connected to potable water plumbing.

It is our professional opinion that the hydrogeologic assessment completed at the Site supports the groundwater needs of ASB's proposed warehouse that will be utilized to store and distribute garden products.

We trust this report meets your immediate needs. Should any questions arise regarding any aspect of our report, please contact our office.

All of Which is Respectfully Submitted,

GHD

Steve Gagne, H.S.Bc.
Associate, Project Director

Robert Neck, P.Geo. (Limited)
Senior Geoscientist, Project Director

PROFESSIONAL GEOSCIENTIST
LIMITED MEMBER
ROBERT W. NECK
2262 RN
ONTARIO

8. References

Chapman and Putnam, 1984. The Physiography of Southern Ontario, 3rd Edition. Ministry of Natural Resources.

City of Ottawa, March 2021. Hydrogeological and Terrain Analysis Guidelines.

Environmental Protection Act, R.S.O. 1990, and associated regulations.

Fetter, C.W., 1994. Applied Hydrogeology, 3rd Edition.

Freeze, R.A. and J.A. Cherry. 1979. Groundwater.

Occupational Health and Safety Act, R.S.O. 1990, and associated regulations.

Ontario Geological Survey, 2003. Surficial Geology of Southern Ontario.

Ontario Ministry of the Environment, 2011. Ontario Regulation 153/04: Records of Site Condition Part XV.1 of the Act (*Environmental Protection Act* 153/04, as amended).

Ontario Ministry of the Environment. June 2003. Revised June 2006. Technical Support Document for Ontario Drinking Water Standards, Objectives and Guidelines.

Ontario Ministry of the Environment and Energy. August 1996. D-5-4 Individual On-Site Sewage Systems: Water Quality Impact Risk Assessment.

Ontario Ministry of the Environment and Energy. August 1996. D-5-5 Private Wells: Water Supply Assessment.

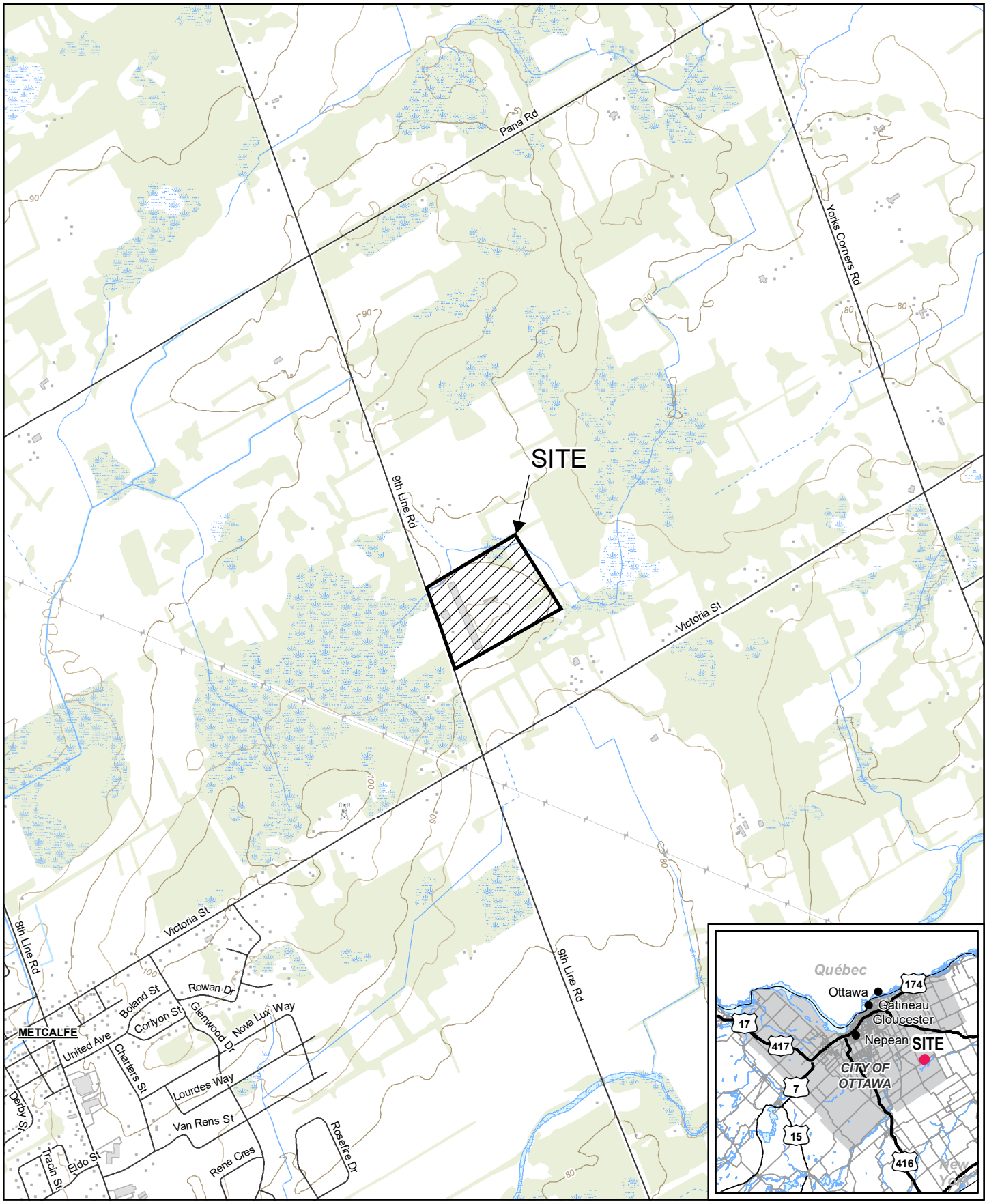
9. Statement of Limitations

This report is intended solely for ASB Greenworld Limited in assessing the hydrogeological aspects of the Site (2545 9th Line Road, Metcalfe, Ontario) and is prohibited for use by others without GHD's prior written consent. This report is considered GHD's professional work product and shall remain the sole property of GHD. Any unauthorized reuse, redistribution of or reliance on the report shall be at the Client and recipient's sole risk, without liability to GHD. Client shall defend, indemnify and hold GHD harmless from any liability arising from or related to Client's unauthorized distribution of the report. No portion of this report may be used as a separate entity; it is to be read in its entirety and shall include all supporting drawings and appendices.

The recommendations made in this report are in accordance with our present understanding of the project, the current site use, ground surface elevations and conditions, and are based on the work scope approved by the Client and described in the report. The services were performed in a manner consistent with that level of care and skill ordinarily exercised by members of hydrogeological engineering professions currently practicing under similar conditions in the same locality. No other representations, and no warranties or representations of any kind, either expressed or implied, are made. Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties.

All details of design and construction are rarely known at the time of completion of a hydrogeological study. The recommendations and comments made in the study report are based on our subsurface investigation and resulting understanding of the project, as defined at the time of the study. We should be retained to review our recommendations when the drawings and specifications are complete. Without this review, GHD will not be liable for any misunderstanding of our recommendations or their application and adaptation into the final design.

Figures



Paper Size ANSI A

0 130 260 390 520

Metres

Map Projection: Transverse Mercator
Horizontal Datum: North American 1983
Grid: NAD 1983 UTM Zone 18N

N

GHD

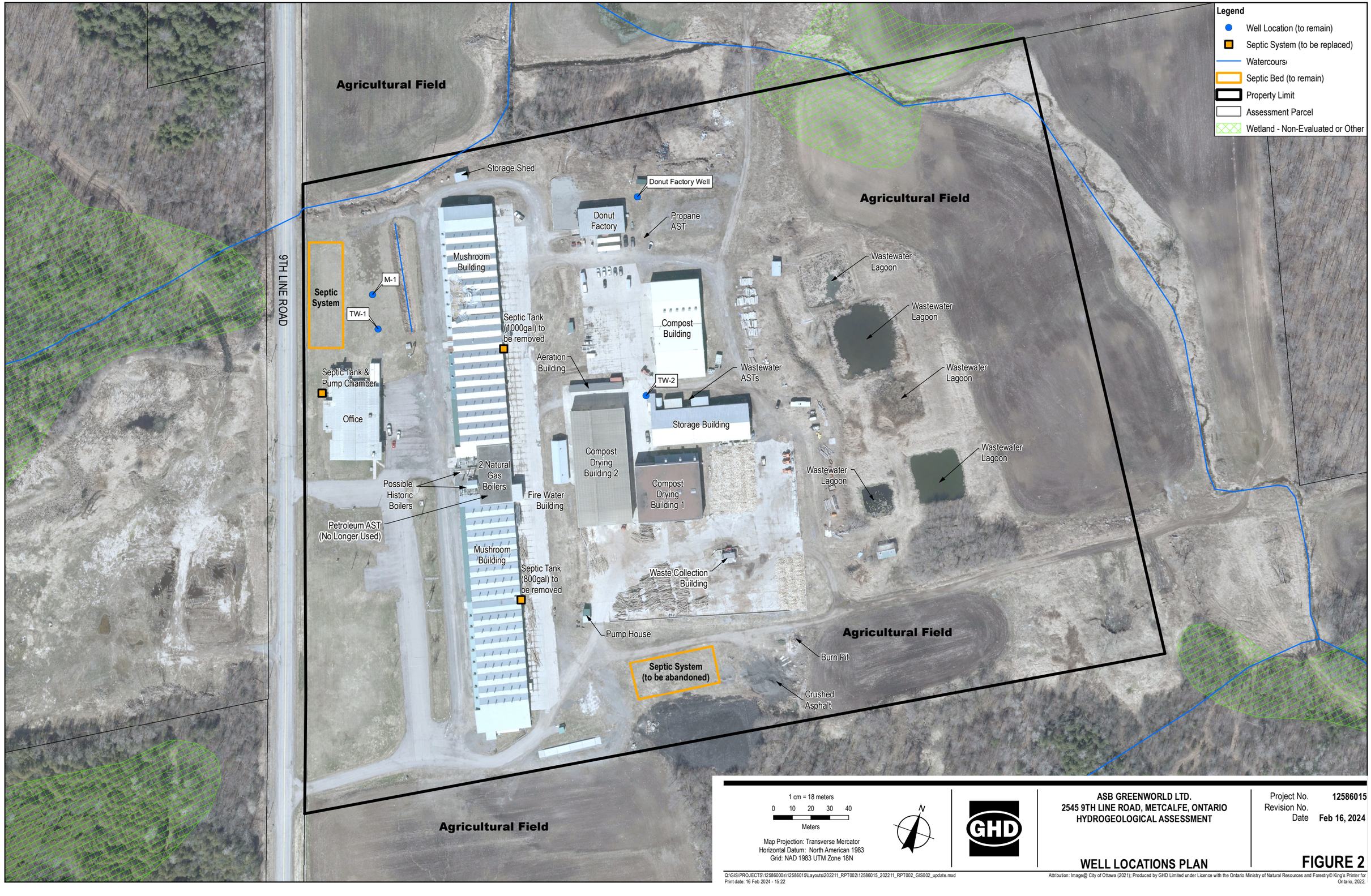
ASB GREENWORD LTD.
2545 9TH LINE ROAD, METCALFE, ONTARIO
HYDROGEOLOGICAL ASSESSMENT

Project No. **12586015**
Revision No. **-**
Date **Nov 15, 2022**

SITE LOCATION MAP

FIGURE 1

O:\GIS\PROJECTS\12586000s\12586015\Layouts\202211_RPT002\12586015_202211_RPT002_GIS001.mxd
Print date: 15 Nov 2022 - 13:50



1 cm = 18 meters

0 10 20 30 40

Meters

Map Projection: Transverse Mercator
Horizontal Datum: North American 1983
Grid: NAD 1983 UTM Zone 18N

N

GHD

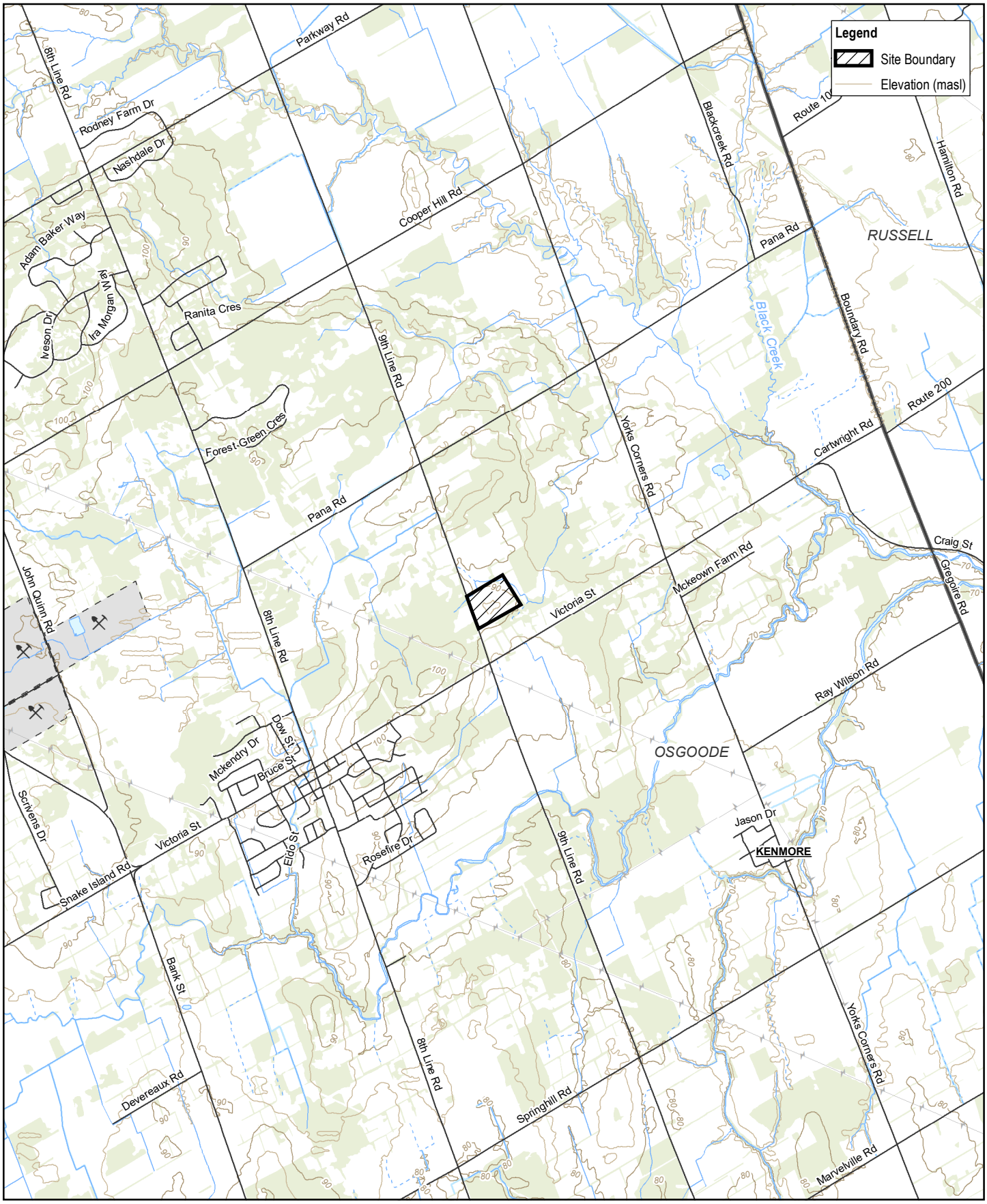
ASB GREENWORLD LTD.
2545 9TH LINE ROAD, METCALFE, ONTARIO
HYDROGEOLOGICAL ASSESSMENT

Project No. **12586015**
Revision No.
Date **Feb 16, 2024**

WELL LOCATIONS PLAN

FIGURE 2

Q:\GIS\PROJECTS\12586000s\12586015\Layouts\202211_RPT002\12586015_202211_RPT002_GIS002_update.mxd
Print date: 16 Feb 2024 - 15:22



Paper Size ANSI A

0 330 660 990 1,320

Metres

Map Projection: Transverse Mercator
Horizontal Datum: North American 1983
Grid: NAD 1983 UTM Zone 18N

N

GHD

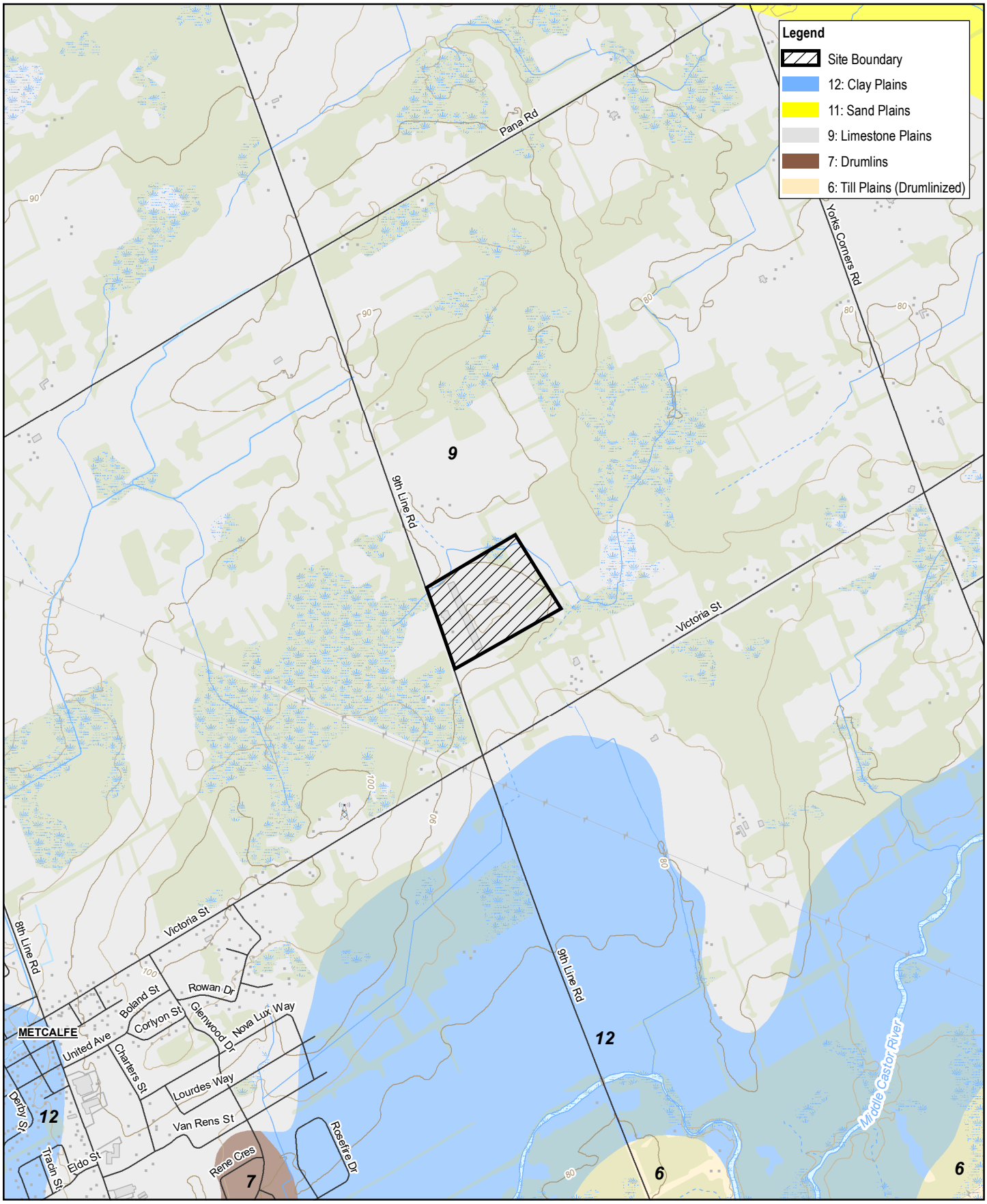
ASB GREENWORD LTD.
2545 9TH LINE ROAD, METCALFE, ONTARIO
HYDROGEOLOGICAL ASSESSMENT

Project No. **12586015**
Revision No. **-**
Date **Nov 17, 2022**

REGIONAL TOPOGRAPHY PLAN

FIGURE 3

O:\GIS\PROJECTS\12586000s\12586015\Layouts\202211_RPT002\12586015_202211_RPT002_GIS003.mxd
Print date: 17 Nov 2022 - 12:08



Paper Size ANSI A

0 130 260 390 520

Metres

Map Projection: Transverse Mercator
Horizontal Datum: North American 1983
Grid: NAD 1983 UTM Zone 18N

N

GHD

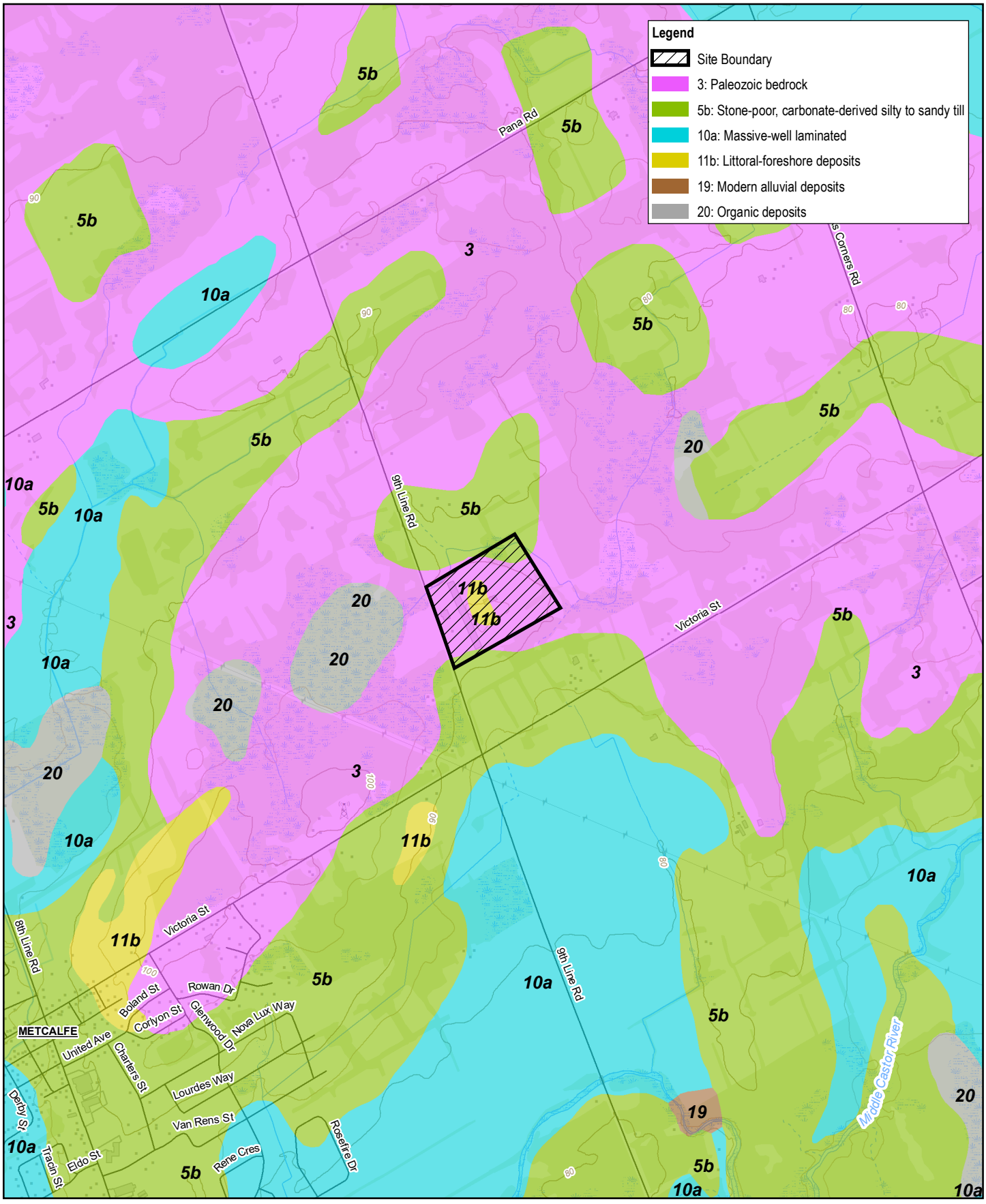
ASB GREENWORD LTD.
2545 9TH LINE ROAD, METCALFE, ONTARIO
HYDROGEOLOGICAL ASSESSMENT

Project No. **12586015**
Revision No. **-**
Date **Nov 15, 2022**

PHYSIOGRAPHIC PLAN

FIGURE 4

O:\GIS\PROJECTS\12586000s\12586015\Layouts\202211_RPT002\12586015_202211_RPT002_GIS004.mxd
Print date: 15 Nov 2022 - 14:03



Paper Size ANSI A

0 130 260 390 520

Metres

Map Projection: Transverse Mercator
Horizontal Datum: North American 1983
Grid: NAD 1983 UTM Zone 18N

N

GHD

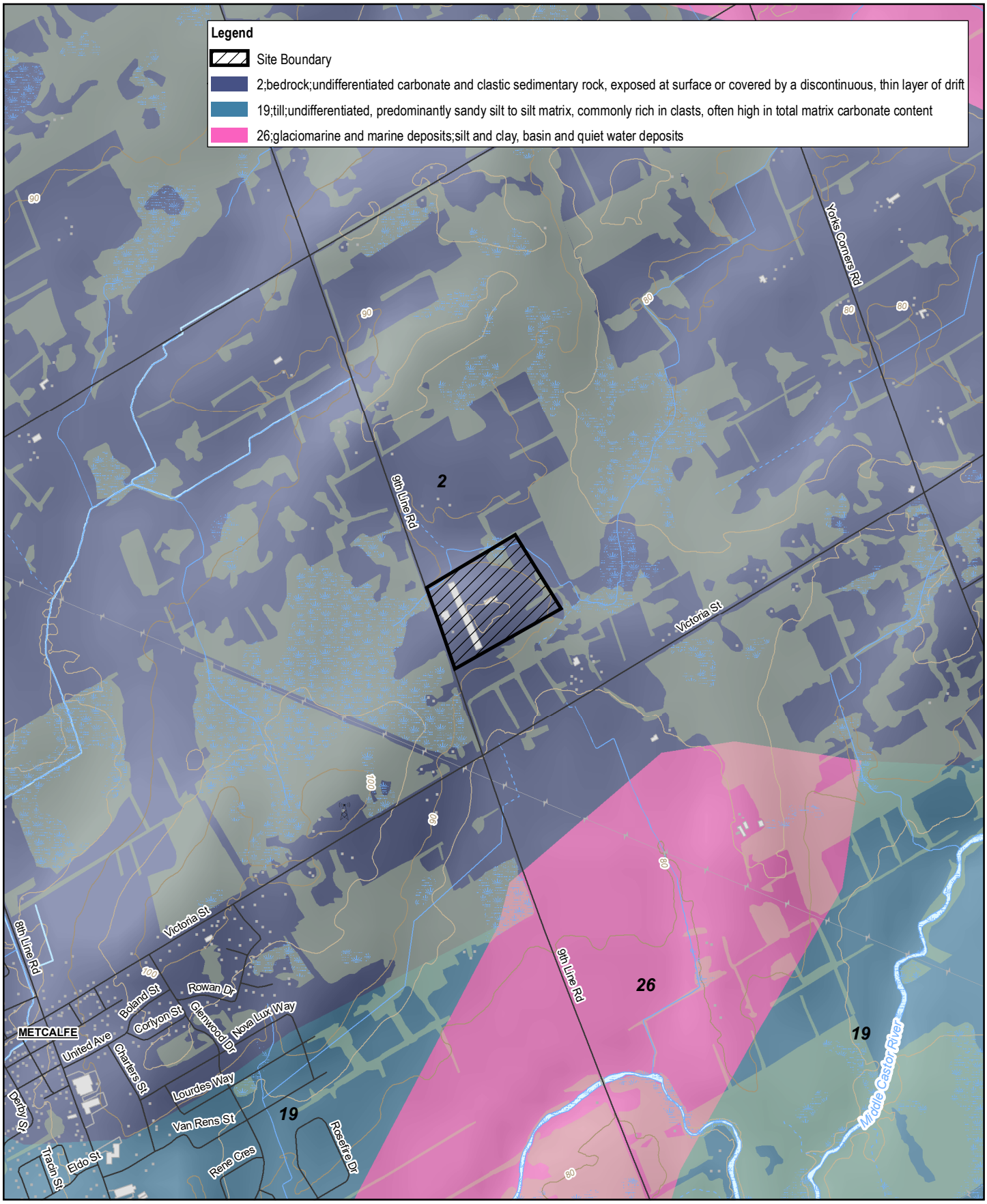
ASB GREENWORD LTD.
2545 9TH LINE ROAD, METCALFE, ONTARIO
HYDROGEOLOGICAL ASSESSMENT

Project No. **12586015**
Revision No. **-**
Date **Nov 17, 2022**

SURFICIAL GEOLOGY

FIGURE 5

O:\GIS\PROJECTS\12586000s\12586015\Layouts\202211_RPT002\12586015_202211_RPT002_GIS005.mxd
Print date: 17 Nov 2022 - 12:31



Paper Size ANSI A

0 130 260 390 520

Metres

Map Projection: Transverse Mercator
Horizontal Datum: North American 1983
Grid: NAD 1983 UTM Zone 18N

N

GHD

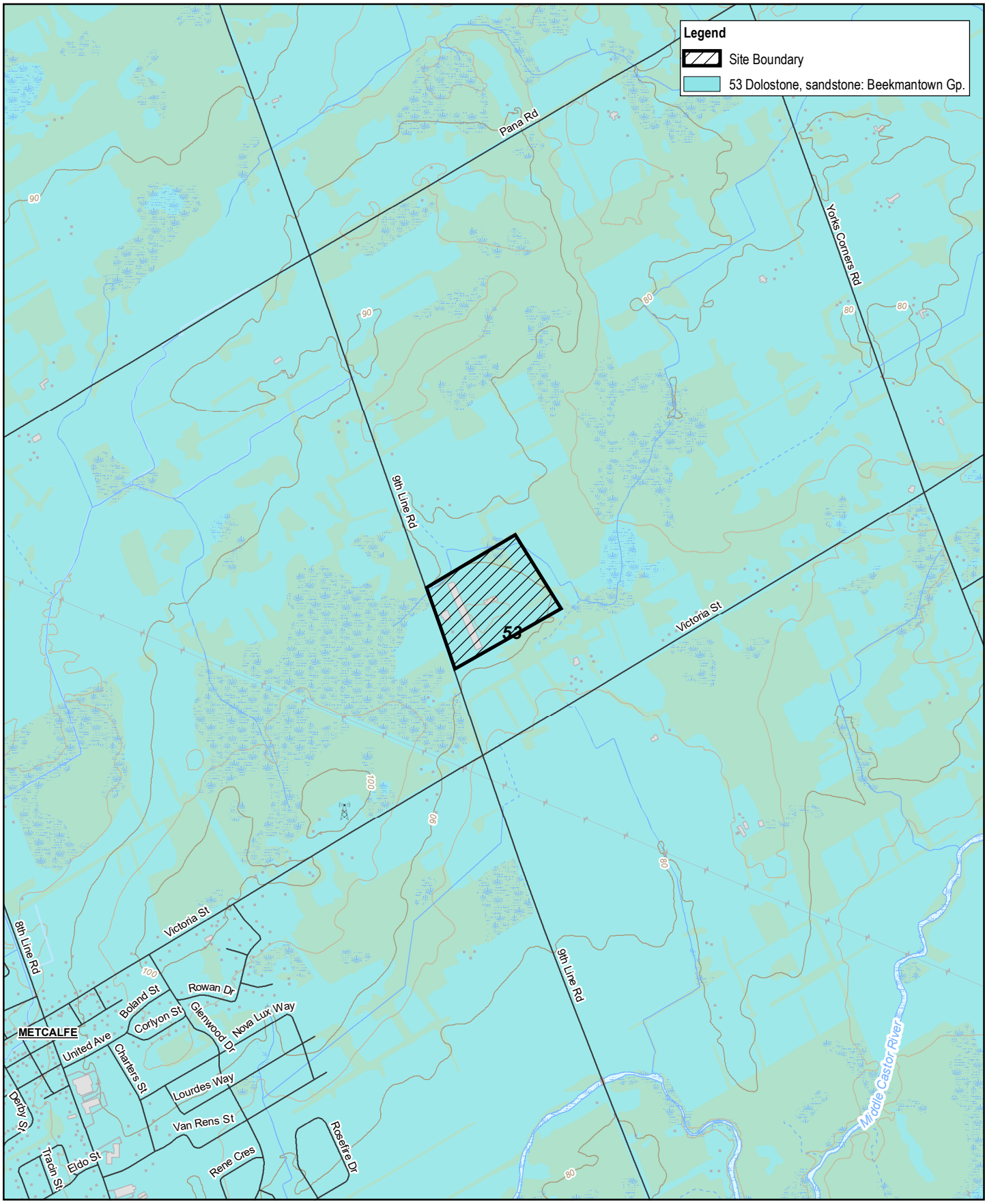
ASB GREENWORD LTD.
2545 9TH LINE ROAD, METCALFE, ONTARIO
HYDROGEOLOGICAL ASSESSMENT

Project No. **12586015**
Revision No. **-**
Date **Nov 15, 2022**

QUATERNARY GEOLOGY

FIGURE 6

O:\GIS\PROJECTS\12586000s\12586015\Layouts\202211_RPT002\12586015_202211_RPT002_GIS006.mxd
Print date: 15 Nov 2022 - 14:11



Paper Size ANSI A

0 130 260 390 520

Metres

Map Projection: Transverse Mercator
Horizontal Datum: North American 1983
Grid: NAD 1983 UTM Zone 18N

N

GHD

ASB GREENWORD LTD.
2545 9TH LINE ROAD, METCALFE, ONTARIO
HYDROGEOLOGICAL ASSESSMENT

Project No. **12586015**
Revision No. **-**
Date **Dec 5, 2022**

BEDROCK GEOLOGY

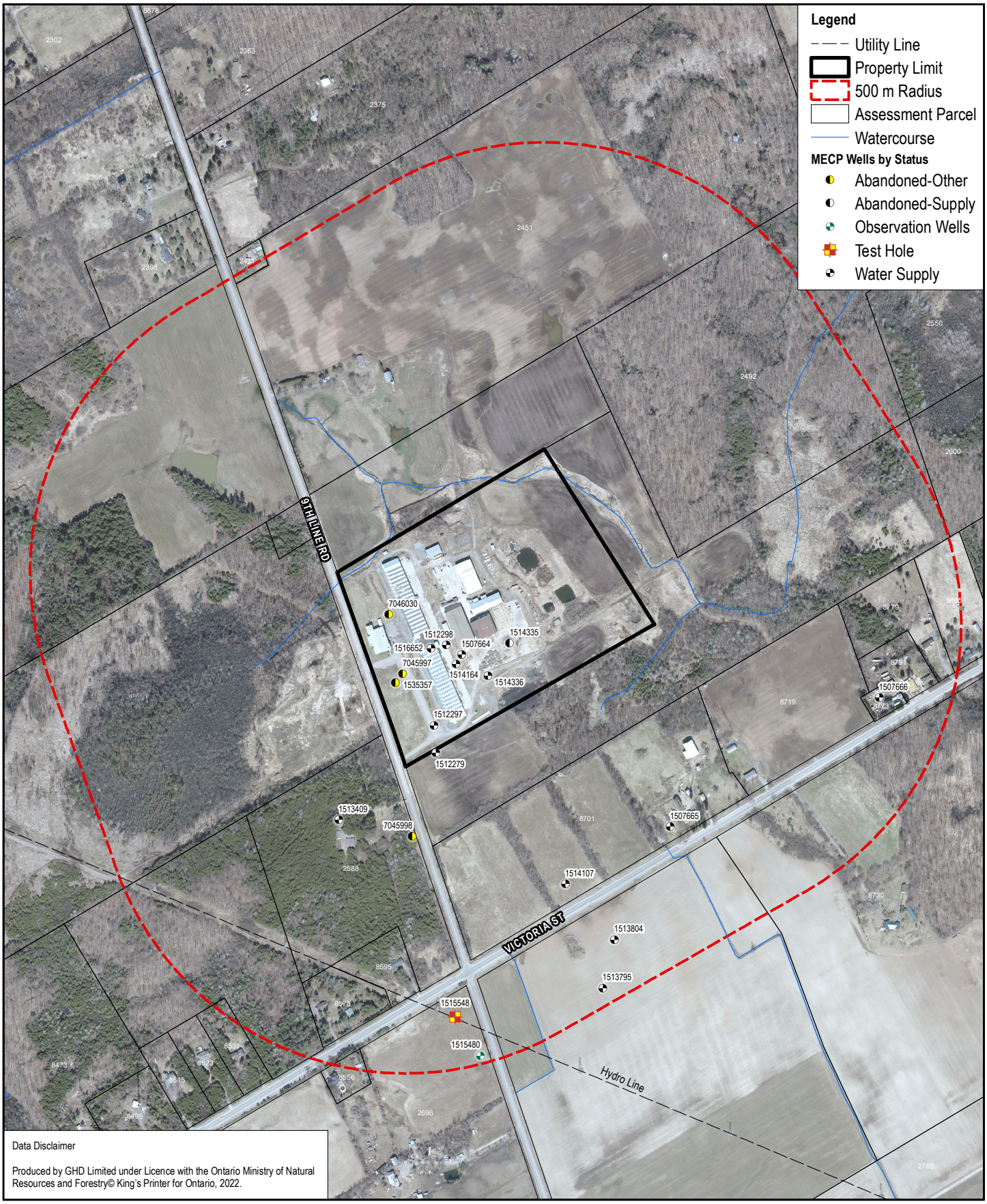
FIGURE 7

O:\GIS\PROJECTS\12586000s\12586015\Layouts\202211_RPT002\12586015_202211_RPT002_GIS007.mxd
Print date: 05 Dec 2022 - 14:34

Appendices

Appendix A

MECP Well Records



1 cm = 84 meters

0 60 120 180 240

Metres

Map Projection: Transverse Mercator
Horizontal Datum: North American 1983
Grid: NAD 1983 UTM Zone 18N

N

GHD

ASB GREENWORD LTD.
2545 9TH LINE ROAD, METCALFE, ON
HYDROGEOLOGICAL ASSESSMENT

Project No. 12567037
Revision No.
Date Dec 2, 2022

MECP WELL LOCATION PLAN

APPENDIX A

Q:\GIS\PROJECTS\12586000s\12586015\Layouts\202211_RPT002\12586015_202211_RPT002_GIS00A - MECP Well Location Plan.mxd
Print date: 02 Dec 2022 - 05:56

Data source: Water Well Information System (WWIS). Ministry of the Environment, Conservation, and Parks. 2021., Image © City of Ottawa, 2021.

MECP WELL RECORD LISTINGS

Ministry of the Environment, Conservation & Parks (MECP)

18

Easting:	464580.80
Northing:	5010792.00
Elev (masl):	94.93

Latitude: 45.249731
Longitude: -75.45136

Well ID: 1507664

LOCATION

Lot: 019
Con: 09
Municipality: OTTAWA-CARLETON
Township: OSGOODE TOWNSHIP
Street:
City: n/a

WELL

Well Status: Water Supply
Prim. Use: n/a
Sec. Use: n/a
Boring Method: Diamond

PUMP TEST

Test Method: CLEAR
Pump Set (m): n/a
SWL (ft) 13
Final Level: 57 ft
Pump Rate: 3 GPM
Recom. Rate: n/a GPM

Tag:
Audit No:
Contractor License: 1802
Well Completion Date: 01/09/1961
Received Date: 02/24/1961

Well Depth (m): 22.86
Depth to Bedrock (m): 10
Depth to Water: ft
Water Kind: FRESH

Pipe ID: 10578269
Pump Test ID 991507664
Flowing: N
Pump Duration (hr): 1
Pump Duration (m): 0

CASING DETAILS

Layer Value of "0" denotes a Null value and cannot be stratified and ordered.

Layer	Case ID	Casing Diamter	Diamter Units	Material	Top Depth	Bottom Depth
1	930052076	6	inch	STEEL	n/a	14 ft
2	930052077	6	inch	OPEN HOLE	n/a	75 ft

FORMATION DETAILS

Layer Value of "0" denotes a Null value and cannot be stratified and ordered.

Layer	Material	Material 2	Material 3	Colour	Top Depth	Bottom Depth
1	BOULDERS	CLAY	n/a	n/a	0	10 ft
2	ROCK	LIMESTONE	n/a	n/a	10	75 ft

End of Record

18

Easting:	464920.80
Northing:	5010512.00
Elev (masl):	84.66

Latitude: 45.247227
Longitude: -75.447008

Well ID: 1507665

LOCATION

Lot: 020
Con: 09
Municipality: OTTAWA-CARLETON
Township: OSGOODE TOWNSHIP
Street:
City: n/a

WELL

Well Status: Water Supply
Prim. Use: n/a
Sec. Use: n/a
Boring Method: Cable Tool

PUMP TEST

Test Method: CLEAR
Pump Set (m): n/a
SWL (ft) 9
Final Level: 19 ft
Pump Rate: 2 GPM
Recom. Rate: n/a GPM

Tag:
Audit No:
Contractor License: 1526
Well Completion Date: 12/30/1955
Received Date: 01/06/1956

Well Depth (m): 14.0208
Depth to Bedrock (m): 2
Depth to Water: ft
Water Kind: Not stated

Pipe ID: 10578270
Pump Test ID 991507665
Flowing: N
Pump Duration (hr): 2
Pump Duration (m): 0

CASING DETAILS

Layer Value of "0" denotes a Null value and cannot be stratified and ordered.

Layer	Case ID	Casing Diamter	Diamter Units	Material	Top Depth	Bottom Depth
1	930052078	4	inch	STEEL	n/a	7 ft
2	930052079	4	inch	OPEN HOLE	n/a	46 ft

FORMATION DETAILS

Layer Value of "0" denotes a Null value and cannot be stratified and ordered.

Layer	Material	Material 2	Material 3	Colour	Top Depth	Bottom Depth
1	TOPSOIL	n/a	n/a	n/a	0	2 ft
2	LIMESTONE	n/a	n/a	n/a	2	46 ft

End of Record

18

Easting:	465260.80
Northing:	5010722.00
Elev (masl):	88.22

Latitude: 45.249134
Longitude: -75.44269

Well ID: 1507666

LOCATION

Lot: 020
Con: 09
Municipality: OTTAWA-CARLETON
Township: OSGOODE TOWNSHIP
Street:
City: n/a

Tag:
Audit No:
Contractor License: 3601
Well Completion Date: 04/23/1963
Received Date: 05/21/1963

WELL

Well Status: Water Supply
Prim. Use: n/a
Sec. Use: n/a
Boring Method: Cable Tool

Well Depth (m): 15.5448
Depth to Bedrock (m): 10
Depth to Water: ft
Water Kind: FRESH

PUMP TEST

Test Method: CLEAR
Pump Set (m): n/a
SWL (ft) 14
Final Level: 16 ft
Pump Rate: 6 GPM
Recom. Rate: 5 GPM

Pipe ID: 10578271
Pump Test ID 991507666
Flowing: N
Pump Duration (hr): 1
Pump Duration (m): 0

CASING DETAILS

Layer Value of "0" denotes a Null value and cannot be stratified and ordered.

Layer	Case ID	Casing Diamter	Diamter Units	Material	Top Depth	Bottom Depth
1	930052080	4	inch	STEEL	n/a	21 ft
2	930052081	4	inch	OPEN HOLE	n/a	51 ft

FORMATION DETAILS

Layer Value of "0" denotes a Null value and cannot be stratified and ordered.

Layer	Material	Material 2	Material 3	Colour	Top Depth	Bottom Depth
1	CLAY	TOPSOIL	n/a	n/a	0	10 ft
2	LIMESTONE	n/a	n/a	n/a	10	51 ft

End of Record

18

Easting:	464538.80
Northing:	5010632.00
Elev (masl):	90.89

Latitude: 45.248288
Longitude: -75.451884

Well ID: 1512279

LOCATION

Lot: 020
Con: 09
Municipality: OTTAWA-CARLETON
Township: OSGOODE TOWNSHIP
Street:
City: n/a

Tag:
Audit No:
Contractor License: 1836
Well Completion Date: 11/17/1972
Received Date: 01/10/1973

WELL

Well Status: Water Supply
Prim. Use: n/a
Sec. Use: n/a
Boring Method: Rotary (Air)

Well Depth (m): 28.956
Depth to Bedrock (m): 0
Depth to Water: ft
Water Kind: FRESH

PUMP TEST

Test Method: n/a
Pump Set (m): n/a
SWL (ft) 20
Final Level: 95 ft
Pump Rate: 20 GPM
Recom. Rate: 15 GPM

Pipe ID: 10582841
Pump Test ID 991512279
Flowing: N
Pump Duration (hr): 1
Pump Duration (m): 0

CASING DETAILS

Layer Value of "0" denotes a Null value and cannot be stratified and ordered.

Layer	Case ID	Casing Diamter	Diamter Units	Material	Top Depth	Bottom Depth
1	930060766	6	inch	STEEL	n/a	21 ft

FORMATION DETAILS

Layer Value of "0" denotes a Null value and cannot be stratified and ordered.

Layer	Material	Material 2	Material 3	Colour	Top Depth	Bottom Depth

1	LIMESTONE	n/a	n/a	GREY	0	95	ft

End of Record

18

Easting:	464535.80
Northing:	5010677.00
Elev (masl):	91.17

Latitude: 45.248693
Longitude: -75.451925

Well ID: 1512297

LOCATION

Lot: 020
Con: 09
Municipality: OTTAWA-CARLETON
Township: OSGOODE TOWNSHIP
Street:
City: n/a

Tag:
Audit No:
Contractor License: 1505
Well Completion Date: 09/08/1972
Received Date: 02/07/1973

WELL

Well Status: Water Supply
Prim. Use: n/a
Sec. Use: n/a
Boring Method: Rotary (Air)

Well Depth (m): 87.4776
Depth to Bedrock (m): 3
Depth to Water: ft
Water Kind: FRESH

PUMP TEST

Test Method: CLEAR
Pump Set (m): n/a
SWL (ft) 18
Final Level: 120 ft
Pump Rate: 7 GPM
Recom. Rate: 7 GPM

Pipe ID: 10582859
Pump Test ID 991512297
Flowing: N
Pump Duration (hr): 10
Pump Duration (m): 0

CASING DETAILS

Layer Value of "0" denotes a Null value and cannot be stratified and ordered.

Layer	Case ID	Casing Diamter	Diamter Units	Material	Top Depth	Bottom Depth
1	930060792	6	inch	STEEL	n/a	21 ft

FORMATION DETAILS

Layer Value of "0" denotes a Null value and cannot be stratified and ordered.

Layer	Material	Material 2	Material 3	Colour	Top Depth	Bottom Depth
1	TOPSOIL	SAND	n/a	BROWN	0	3 ft
2	LIMESTONE	SANDSTONE	n/a	GREY	3	287 ft

End of Record

18

Easting:	464555.80
Northing:	5010807.00
Elev (masl):	94.29

Latitude: 45.249864
Longitude: -75.45168

Well ID: 1512298

LOCATION

Lot: 019
Con: 09
Municipality: OTTAWA-CARLETON
Township: OSGOODE TOWNSHIP
Street:
City: n/a

Tag:
Audit No:
Contractor License: 1505
Well Completion Date: 09/12/1972
Received Date: 02/07/1973

WELL

Well Status: Water Supply
Prim. Use: n/a
Sec. Use: Industrial
Boring Method: Rotary (Air)

Well Depth (m): 92.964
Depth to Bedrock (m): 4
Depth to Water: ft
Water Kind: FRESH

PUMP TEST

Test Method: CLEAR
Pump Set (m): n/a
SWL (ft) 21
Final Level: 120 ft
Pump Rate: 18 GPM
Recom. Rate: 18 GPM

Pipe ID: 10582860
Pump Test ID 991512298
Flowing: N
Pump Duration (hr): 10
Pump Duration (m): 0

CASING DETAILS

Layer Value of "0" denotes a Null value and cannot be stratified and ordered.

Layer	Case ID	Casing Diamter	Diamter Units	Material	Top Depth	Bottom Depth
1	930060793	6	inch	STEEL	n/a	22 ft

FORMATION DETAILS

Layer Value of "0" denotes a Null value and cannot be stratified and ordered.

Layer	Material	Material 2	Material 3	Colour	Top Depth	Bottom Depth
1	TOPSOIL	SAND	n/a	BROWN	0	4 ft
2	LIMESTONE	SANDSTONE	n/a	GREY	4	305 ft

End of Record

18

Easting:	464380.80
Northing:	5010523.00
Elev (masl):	93.30

Latitude: 45.247299
Longitude: -75.453889

Well ID: 1513409

LOCATION

Lot: 020
Con: 08
Municipality: OTTAWA-CARLETON
Township: OSGOODE TOWNSHIP
Street:
City: n/a

Tag:
Audit No:
Contractor License: 1517
Well Completion Date: 08/15/1973
Received Date: 09/10/1973

WELL

Well Status: Water Supply
Prim. Use: n/a
Sec. Use: n/a
Boring Method: Cable Tool

Well Depth (m): 18.288
Depth to Bedrock (m): 4
Depth to Water: ft
Water Kind: FRESH

PUMP TEST

Test Method: CLOUDY
Pump Set (m): n/a
SWL (ft) -20
Final Level: 35 ft
Pump Rate: 10 GPM
Recom. Rate: 5 GPM

Pipe ID: 10583965
Pump Test ID 991513409
Flowing: Y
Pump Duration (hr): 1
Pump Duration (m): 10

CASING DETAILS

Layer Value of "0" denotes a Null value and cannot be stratified and ordered.

Layer	Case ID	Casing Diamter	Diamter Units	Material	Top Depth	Bottom Depth
1	930062677	5	inch	STEEL	n/a	11 ft

FORMATION DETAILS

Layer Value of "0" denotes a Null value and cannot be stratified and ordered.

Layer	Material	Material 2	Material 3	Colour	Top Depth	Bottom Depth
1	SAND	n/a	n/a	YELLOW	0	4 ft
2	SANDSTONE	n/a	n/a	BLACK	4	60 ft

End of Record

18

Easting:	464810.80
Northing:	5010249.00
Elev (masl):	82.84

Latitude: 45.244855
Longitude: -75.448391

Well ID: 1513795

LOCATION

Lot: 021
Con: 09
Municipality: OTTAWA-CARLETON
Township: OSGOODE TOWNSHIP
Street:
City: n/a

Tag:
Audit No:
Contractor License: 3658
Well Completion Date: 07/27/1973
Received Date: 02/11/1974

WELL

Well Status: Water Supply
Prim. Use: n/a
Sec. Use: n/a
Boring Method: Air Percussion

Well Depth (m): 82.296
Depth to Bedrock (m): 3
Depth to Water: ft
Water Kind: FRESH

PUMP TEST

Test Method: n/a
Pump Set (m): n/a
SWL (ft) 22
Final Level: 50 ft
Pump Rate: 40 GPM
Recom. Rate: 5 GPM

Pipe ID: 10584347
Pump Test ID 991513795
Flowing: N
Pump Duration (hr): 2
Pump Duration (m): 0

CASING DETAILS

Layer Value of "0" denotes a Null value and cannot be stratified and ordered.

Layer	Case ID	Casing Diamter	Diamter Units	Material	Top Depth	Bottom Depth
1	930063266	6	inch	STEEL	n/a	19 ft
2	930063267	6	inch	OPEN HOLE	n/a	270 ft

FORMATION DETAILS

Layer Value of "0" denotes a Null value and cannot be stratified and ordered.

Layer	Material	Material 2	Material 3	Colour	Top Depth	Bottom Depth
1	CLAY	TOPSOIL	n/a	BROWN	0	3 ft
2	LIMESTONE	n/a	n/a	GREY	3	260 ft
3	SANDSTONE	n/a	n/a	GREY	260	270 ft

End of Record

18

Easting:	464829.80
Northing:	5010328.00
Elev (masl):	83.40

Latitude: 45.245567
Longitude: -75.448154

Well ID: 1513804

LOCATION

Lot: 021
Con: 09
Municipality: OTTAWA-CARLETON
Township: OSGOODE TOWNSHIP
Street:
City: n/a

Tag:
Audit No:
Contractor License: 3658
Well Completion Date: 06/10/1973
Received Date: 02/11/1974

WELL

Well Status: Water Supply
Prim. Use: n/a
Sec. Use: n/a
Boring Method: Air Percussion

Well Depth (m): 86.5632
Depth to Bedrock (m): 3
Depth to Water: ft
Water Kind: FRESH

PUMP TEST

Test Method: CLEAR
Pump Set (m): n/a
SWL (ft) 28
Final Level: 90 ft
Pump Rate: 15 GPM
Recom. Rate: 5 GPM

Pipe ID: 10584356
Pump Test ID 991513804
Flowing: N
Pump Duration (hr): 2
Pump Duration (m): 0

CASING DETAILS

Layer Value of "0" denotes a Null value and cannot be stratified and ordered.

Layer	Case ID	Casing Diamter	Diamter Units	Material	Top Depth	Bottom Depth
1	930063282	6	inch	STEEL	n/a	21 ft
2	930063283	6	inch	OPEN HOLE	n/a	284 ft

FORMATION DETAILS

Layer Value of "0" denotes a Null value and cannot be stratified and ordered.

Layer	Material	Material 2	Material 3	Colour	Top Depth	Bottom Depth
1	CLAY	GRAVEL	SAND	BROWN	0	3 ft
2	LIMESTONE	n/a	n/a	GREY	3	262 ft
3	SANDSTONE	n/a	n/a	GREY	262	284 ft

End of Record

18

Easting:	464749.80
Northing:	5010418.00
Elev (masl):	85.60

Latitude: 45.246373
Longitude: -75.44918

Well ID: 1514107

LOCATION

Lot: 020
Con: 09
Municipality: OTTAWA-CARLETON
Township: OSGOODE TOWNSHIP
Street:
City: n/a

Tag:
Audit No:
Contractor License: 2308
Well Completion Date: 06/20/1974
Received Date: 07/02/1974

WELL

Well Status: Water Supply
Prim. Use: n/a
Sec. Use: n/a
Boring Method: Cable Tool

Well Depth (m): 15.24
Depth to Bedrock (m): 8
Depth to Water: ft
Water Kind: FRESH

PUMP TEST

Test Method: CLEAR
Pump Set (m): n/a
SWL (ft) 10
Final Level: 30 ft
Pump Rate: 20 GPM
Recom. Rate: 5 GPM

Pipe ID: 10584656
Pump Test ID 991514107
Flowing: N
Pump Duration (hr): 2
Pump Duration (m): 0

CASING DETAILS

Layer Value of "0" denotes a Null value and cannot be stratified and ordered.

Layer	Case ID	Casing Diamter	Diamter Units	Material	Top Depth	Bottom Depth
1	930063750	5	inch	STEEL	n/a	19 ft
2	930063751	5	inch	OPEN HOLE	n/a	50 ft

FORMATION DETAILS

Layer Value of "0" denotes a Null value and cannot be stratified and ordered.

Layer	Material	Material 2	Material 3	Colour	Top Depth	Bottom Depth
1	HARDPAN	n/a	n/a	n/a	0	8 ft
2	LIMESTONE	n/a	n/a	n/a	8	50 ft

End of Record

18

Easting:	464571.80
Northing:	5010777.00
Elev (masl):	94.49

Latitude: 45.249595
Longitude: -75.451474

Well ID: 1514164

LOCATION

Lot: 019
Con: 09
Municipality: OTTAWA-CARLETON
Township: OSGOODE TOWNSHIP
Street:
City: n/a

Tag:
Audit No:
Contractor License: 1836
Well Completion Date: 05/27/1974
Received Date: 08/01/1974

WELL

Well Status: Water Supply
Prim. Use: n/a
Sec. Use: n/a
Boring Method: Rotary (Air)

Well Depth (m): 27.432
Depth to Bedrock (m): 3
Depth to Water: ft
Water Kind: FRESH

PUMP TEST

Test Method: CLEAR
Pump Set (m): n/a
SWL (ft) 35
Final Level: 85 ft
Pump Rate: 15 GPM
Recom. Rate: 12 GPM

Pipe ID: 10584711
Pump Test ID 991514164
Flowing: N
Pump Duration (hr): 1
Pump Duration (m): 0

CASING DETAILS

Layer Value of "0" denotes a Null value and cannot be stratified and ordered.

Layer	Case ID	Casing Diamter	Diamter Units	Material	Top Depth	Bottom Depth
1	930063848	6	inch	STEEL	n/a	22 ft
2	930063849	6	inch	OPEN HOLE	n/a	90 ft

FORMATION DETAILS

Layer Value of "0" denotes a Null value and cannot be stratified and ordered.

Layer	Material	Material 2	Material 3	Colour	Top Depth	Bottom Depth
1	BOULDERS	n/a	n/a	n/a	0	3 ft
2	LIMESTONE	n/a	n/a	n/a	3	90 ft

End of Record

18

Easting:	464659.80
Northing:	5010811.00
Elev (masl):	94.26

Latitude: 45.249906
Longitude: -75.450355

Well ID: 1514335

LOCATION

Lot: 019
Con: 09
Municipality: OTTAWA-CARLETON
Township: OSGOODE TOWNSHIP
Street:
City: n/a

Tag:
Audit No:
Contractor License: 1836
Well Completion Date: 10/07/1974
Received Date: 10/23/1974

WELL

Well Status: Abandoned-Supply
Prim. Use: n/a
Sec. Use: n/a
Boring Method: Rotary (Air)

Well Depth (m): 68.58
Depth to Bedrock (m): 0
Depth to Water:
Water Kind:

PUMP TEST

Test Method:
Pump Set (m):
SWL (ft)
Final Level:
Pump Rate:
Recom. Rate:

Pipe ID:
Pump Test ID
Flowing:
Pump Duration (hr):
Pump Duration (m):

CASING DETAILS

Layer Value of "0" denotes a Null value and cannot be stratified and ordered.

Layer	Case ID	Casing Diamter	Diamter Units	Material	Top Depth	Bottom Depth
1	930064168	6	inch	STEEL	n/a	22 ft

FORMATION DETAILS

Layer Value of "0" denotes a Null value and cannot be stratified and ordered.

Layer	Material	Material 2	Material 3	Colour	Top Depth	Bottom Depth
1	LIMESTONE	n/a	n/a	n/a	0	225 ft

End of Record

18

Easting:	464623.80
Northing:	5010757.00
Elev (masl):	

Latitude: 45.249418
Longitude: -75.45081

Well ID: 1514336

Elev (masl):	94.06

LOCATION

Lot:	019	**Tag:**	
Con:	09	**Audit No:**	
Municipality:	OTTAWA-CARLETON	**Contractor License:**	1836
Township:	OSGOODE TOWNSHIP	**Well Completion Date:**	10/09/1974
Street:		**Received Date:**	10/23/1974
City:	n/a		

WELL

Well Status:	Water Supply	**Well Depth (m):**	76.2
Prim. Use:	n/a	**Depth to Bedrock (m):**	4
Sec. Use:	n/a	**Depth to Water:**	ft
Boring Method:	Rotary (Air)	**Water Kind:**	FRESH

PUMP TEST

Test Method:	CLEAR	**Pipe ID:**	10584881
Pump Set (m):	n/a	**Pump Test ID**	991514336
SWL (ft)	22	**Flowing:**	N
Final Level:	230 ft	**Pump Duration (hr):**	1
Pump Rate:	25 GPM	**Pump Duration (m):**	0
Recom. Rate:	20 GPM		

CASING DETAILS

Layer Value of "0" denotes a Null value and cannot be stratified and ordered.

Layer	Case ID	Casing Diamter	Diamter Units	Material	Top Depth	Bottom Depth
1	930064169	6	inch	STEEL	n/a	21 ft
2	930064170	6	inch	OPEN HOLE	n/a	250 ft

FORMATION DETAILS

Layer Value of "0" denotes a Null value and cannot be stratified and ordered.

Layer	Material	Material 2	Material 3	Colour	Top Depth	Bottom Depth
1	GRAVEL	n/a	n/a	n/a	0	4 ft
2	LIMESTONE	n/a	n/a	n/a	4	220 ft
3	SANDSTONE	n/a	n/a	n/a	220	250 ft

End of Record

18

Easting:	464611.80
Northing:	5010139.00
Elev (masl):	83.14

Latitude: 45.243854
Longitude: -75.450919

Well ID: **1515480**

LOCATION

Lot:	021	**Tag:**	
Con:	08	**Audit No:**	
Municipality:	OTTAWA-CARLETON	**Contractor License:**	1505
Township:	OSGOODE TOWNSHIP	**Well Completion Date:**	06/16/1976
Street:		**Received Date:**	07/28/1976
City:	n/a		

WELL

Well Status:	Observation Wells	**Well Depth (m):**	19.812
Prim. Use:	n/a	**Depth to Bedrock (m):**	13
Sec. Use:	n/a	**Depth to Water:**	
Boring Method:	Rotary (Air)	**Water Kind:**	

PUMP TEST

Test Method:	n/a	**Pipe ID:**	10585996
Pump Set (m):	n/a	**Pump Test ID**	991515480
SWL (ft)	7	**Flowing:**	N
Final Level:	n/a ft	**Pump Duration (hr):**	n/a
Pump Rate:	n/a GPM	**Pump Duration (m):**	n/a
Recom. Rate:	n/a GPM		

CASING DETAILS

Layer Value of "0" denotes a Null value and cannot be stratified and ordered.

Layer	Case ID	Casing Diamter	Diamter Units	Material	Top Depth	Bottom Depth
1	930066030	6	inch	STEEL	n/a	13 ft

FORMATION DETAILS

Layer Value of "0" denotes a Null value and cannot be stratified and ordered.

Layer	Material	Material 2	Material 3	Colour	Top Depth	Bottom Depth
1	SAND	GRAVEL	HARDPAN	BROWN	0	3 ft
2	BOULDERS	n/a	n/a	GREY	3	4 ft
3	SAND	GRAVEL	HARDPAN	BROWN	4	13 ft
4	LIMESTONE	n/a	n/a	GREY	13	65 ft

End of Record

18

Easting:	464570.80
Northing:	5010202.00
Elev (masl):	84.35

Latitude: 45.244419
Longitude: -75.451445

Well ID: **1515548**

LOCATION

Lot:
Con: 08
Municipality: OTTAWA-CARLETON
Township: OSGOODE TOWNSHIP
Street:
City: n/a

Tag:
Audit No:
Contractor License: 1505
Well Completion Date: 06/16/1976
Received Date: 08/19/1976

WELL

Well Status: Test Hole
Prim. Use: n/a
Sec. Use: n/a
Boring Method: Rotary (Air)

Well Depth (m): 43.8912
Depth to Bedrock (m): 3
Depth to Water: ft
Water Kind: SULPHUR

PUMP TEST

Test Method: n/a
Pump Set (m): n/a
SWL (ft) n/a
Final Level: n/a ft
Pump Rate: n/a GPM
Recom. Rate: n/a GPM

Pipe ID: 10586064
Pump Test ID 991515548
Flowing: N
Pump Duration (hr): n/a
Pump Duration (m): n/a

CASING DETAILS

Layer Value of "0" denotes a Null value and cannot be stratified and ordered.

Layer	Case ID	Casing Diamter	Diamter Units	Material	Top Depth	Bottom Depth
1	930066146	6	inch	STEEL	n/a	19 ft

FORMATION DETAILS

Layer Value of "0" denotes a Null value and cannot be stratified and ordered.

Layer	Material	Material 2	Material 3	Colour	Top Depth	Bottom Depth
1	SAND	GRAVEL	TILL	BROWN	0	3 ft
2	LIMESTONE	BOULDERS	n/a	GREY	3	4 ft
3	SAND	GRAVEL	TILL	BROWN	4	13 ft
4	GRAVEL	SAND	TILL	BROWN	13	16 ft
5	LIMESTONE	n/a	n/a	GREY	16	144 ft

End of Record

18

Easting:	464530.80
Northing:	5010802.00
Elev (masl):	92.96

Latitude: 45.249818
Longitude: -75.451998

Well ID: **1516652**

LOCATION

Lot: 019
Con: 09
Municipality: OTTAWA-CARLETON
Township: OSGOODE TOWNSHIP
Street:
City: n/a

Tag:
Audit No:
Contractor License: 1558
Well Completion Date: 08/04/1978
Received Date: 09/08/1978

WELL

Well Status: Water Supply
Prim. Use: n/a
Sec. Use: n/a
Boring Method: Cable Tool

Well Depth (m): 19.812
Depth to Bedrock (m): 9
Depth to Water: ft
Water Kind: FRESH

PUMP TEST

Test Method: CLOUDY
Pump Set (m): n/a
SWL (ft) 30
Final Level: 30 ft
Pump Rate: 30 GPM
Recom. Rate: 5 GPM

Pipe ID: 10587128
Pump Test ID 991516652
Flowing: N
Pump Duration (hr): 1
Pump Duration (m): 0

CASING DETAILS

Layer Value of "0" denotes a Null value and cannot be stratified and ordered.

Layer	Case ID	Casing Diamter	Diamter Units	Material	Top Depth	Bottom Depth
1	930067730	8	inch	STEEL	n/a	20 ft
2	930067731	8	inch	OPEN HOLE	n/a	65 ft

FORMATION DETAILS

Layer Value of "0" denotes a Null value and cannot be stratified and ordered.

Layer	Material	Material 2	Material 3	Colour	Top Depth	Bottom Depth
1	CLAY	SAND	BOULDERS	BROWN	0	9 ft
2	LIMESTONE	n/a	n/a	GREY	9	20 ft
3	LIMESTONE	VERY	HARD	GREY	20	50 ft
4	LIMESTONE	HARD	n/a	BLACK	50	65 ft

End of Record

18

Easting:	464474.00
Northing:	5010746.00
Elev (masl):	92.06

Latitude: 45.249311
Longitude: -75.452718

Well ID: **1535357**

LOCATION

Lot: n/a
Con: n/a
Municipality: OTTAWA-CARLETON
Township: OSGOODE TOWNSHIP
Street: 9TH LINE
City: METCALF

Tag: A012448
Audit No: Z12517
Contractor License: 1517
Well Completion Date: 10/28/2004
Received Date: 01/14/2005

WELL

Well Status: Abandoned-Other
Prim. Use: n/a
Sec. Use: n/a
Boring Method: n/a

Well Depth (m): 0
Depth to Bedrock (m): n/a
Depth to Water:
Water Kind:

PUMP TEST

Test Method:
Pump Set (m):
SWL (ft)
Final Level:
Pump Rate:
Recom. Rate:

Pipe ID:
Pump Test ID
Flowing:
Pump Duration (hr):
Pump Duration (m):

CASING DETAILS

Layer Value of "0" denotes a Null value and cannot be stratified and ordered.

Layer	Case ID	Casing Diamter	Diamter Units	Material	Top Depth	Bottom Depth

FORMATION DETAILS

Layer Value of "0" denotes a Null value and cannot be stratified and ordered.

Layer	Material	Material 2	Material 3	Colour	Top Depth	Bottom Depth

End of Record

18

Easting:	464485.00
Northing:	5010761.00
Elev (masl):	91.58

Latitude: 45.249447
Longitude: -75.452579

Well ID: **7045997**

LOCATION

Lot: 019
Con: 09
Municipality: OTTAWA-CARLETON
Township: OSGOODE TOWNSHIP
Street: 2545 9TH LINE ROAD
City: METCALF

Tag: A035017
Audit No: Z38810
Contractor License: 1517
Well Completion Date: 05/31/2007
Received Date: 07/03/2007

WELL

Well Status: Abandoned-Other
Prim. Use: n/a
Sec. Use: n/a
Boring Method:

Well Depth (m): 0
Depth to Bedrock (m): n/a
Depth to Water:
Water Kind:

PUMP TEST

Test Method:
Pump Set (m):
SWL (ft)
Final Level:
Pump Rate:
Recom. Rate:

Pipe ID:
Pump Test ID
Flowing:
Pump Duration (hr):
Pump Duration (m):

CASING DETAILS

Layer Value of "0" denotes a Null value and cannot be stratified and ordered.

Layer	Case ID	Casing Diamter	Diamter Units	Material	Top Depth	Bottom Depth

FORMATION DETAILS

Layer Value of "0" denotes a Null value and cannot be stratified and ordered.

Layer	Material	Material 2	Material 3	Colour	Top Depth	Bottom Depth

End of Record

18

Easting:	464501.00
Northing:	5010496.00
Elev (masl):	89.57

Latitude: 45.247062
Longitude: -75.452356

Well ID: **7045998**

LOCATION

Lot:
Con:
Municipality: OTTAWA-CARLETON
Township: OSGOODE TOWNSHIP
Street: 9TH LINE 2540
City: METCALF

Tag: A035019
Audit No: Z38812
Contractor License: 1517
Well Completion Date: 05/01/2007
Received Date: 07/03/2007

WELL

Well Status: Abandoned-Other
Prim. Use: n/a
Sec. Use: n/a
Boring Method:

Well Depth (m): 0
Depth to Bedrock (m): n/a
Depth to Water:
Water Kind:

PUMP TEST

Test Method:
Pump Set (m):
SWL (ft)
Final Level:
Pump Rate:
Recom. Rate:

Pipe ID:
Pump Test ID
Flowing:
Pump Duration (hr):
Pump Duration (m):

CASING DETAILS

Layer Value of "0" denotes a Null value and cannot be stratified and ordered.

Layer	Case ID	Casing Diamter	Diamter Units	Material	Top Depth	Bottom Depth

FORMATION DETAILS

Layer Value of "0" denotes a Null value and cannot be stratified and ordered.

Layer	Material	Material 2	Material 3	Colour	Top Depth	Bottom Depth

End of Record

18

Easting:	464463.00
Northing:	5010857.00
Elev (masl):	90.94

Latitude: 45.25031
Longitude: -75.452866

Well ID: 7046030

LOCATION

Lot: 019
Con: 09
Municipality: OTTAWA-CARLETON
Township: OSGOODE TOWNSHIP
Street: 9TH LINE ROAD 2545
City: METCALF

Tag: A035018
Audit No: Z38811
Contractor License: 1517
Well Completion Date: 05/31/2007
Received Date: 07/03/2007

WELL

Well Status: Abandoned-Other
Prim. Use: n/a
Sec. Use: n/a
Boring Method:

Well Depth (m): 0
Depth to Bedrock (m): n/a
Depth to Water:
Water Kind:

PUMP TEST

Test Method:
Pump Set (m):
SWL (ft)
Final Level:
Pump Rate:
Recom. Rate:

Pipe ID:
Pump Test ID
Flowing:
Pump Duration (hr):
Pump Duration (m):

CASING DETAILS

Layer Value of "0" denotes a Null value and cannot be stratified and ordered.

Layer	Case ID	Casing Diamter	Diamter Units	Material	Top Depth	Bottom Depth

FORMATION DETAILS

Layer Value of "0" denotes a Null value and cannot be stratified and ordered.

Layer	Material	Material 2	Material 3	Colour	Top Depth	Bottom Depth

End of Record

Appendix B

Photographs

Photo 1 - View of drilled water well TW-1 and pump shed/building.

Photo 2 - Interior view of well pit of drilled water well TW-1.

Site Photographs

Photo 3 - Location of drilled well M-1 used as an observation well.

Photo 4 - Interior view of well pit of drilled water well M-1.

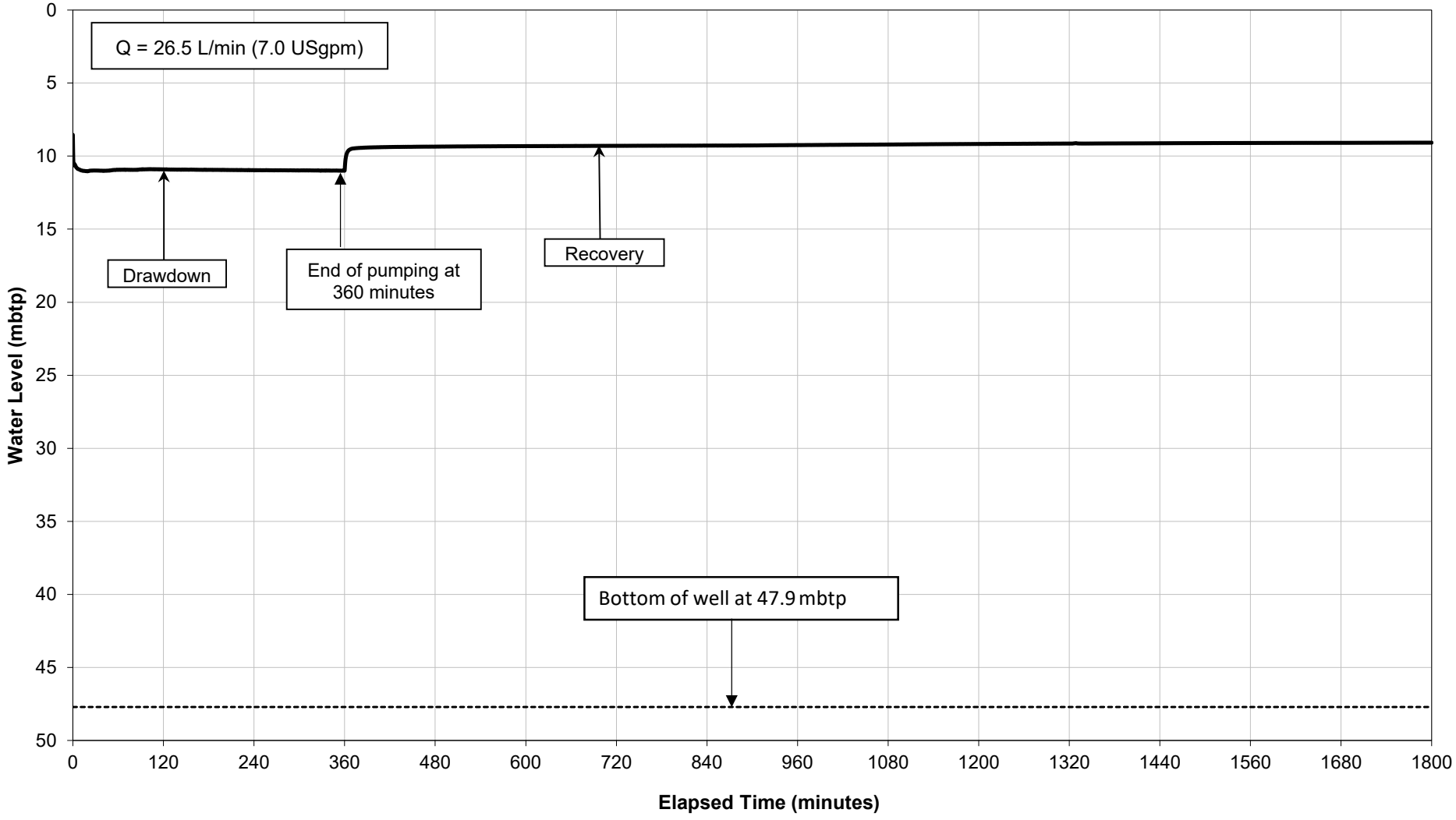
Photo 5 - View of building that houses drilled water well TW-2.

Photo 6 – Drilled water well TW-2 located inside pump house.

Appendix C

Aquifer Performance Testing

PUMP HISTORY CURVE
TW-1: October 26-27, 2022



PUMP HISTORY CURVE

Drilled Well
MECP Well ID: Unknown
Static Level = 8.54 mbtp (8.30 mbgs)

Note: m = metres; mbtp = metres below top of pipe; mbgs = metres below ground surface; Stick up = 0.24 m

DATE: December 2022

LOCATION: 2545 9th Line, Metcalfe, Ontario

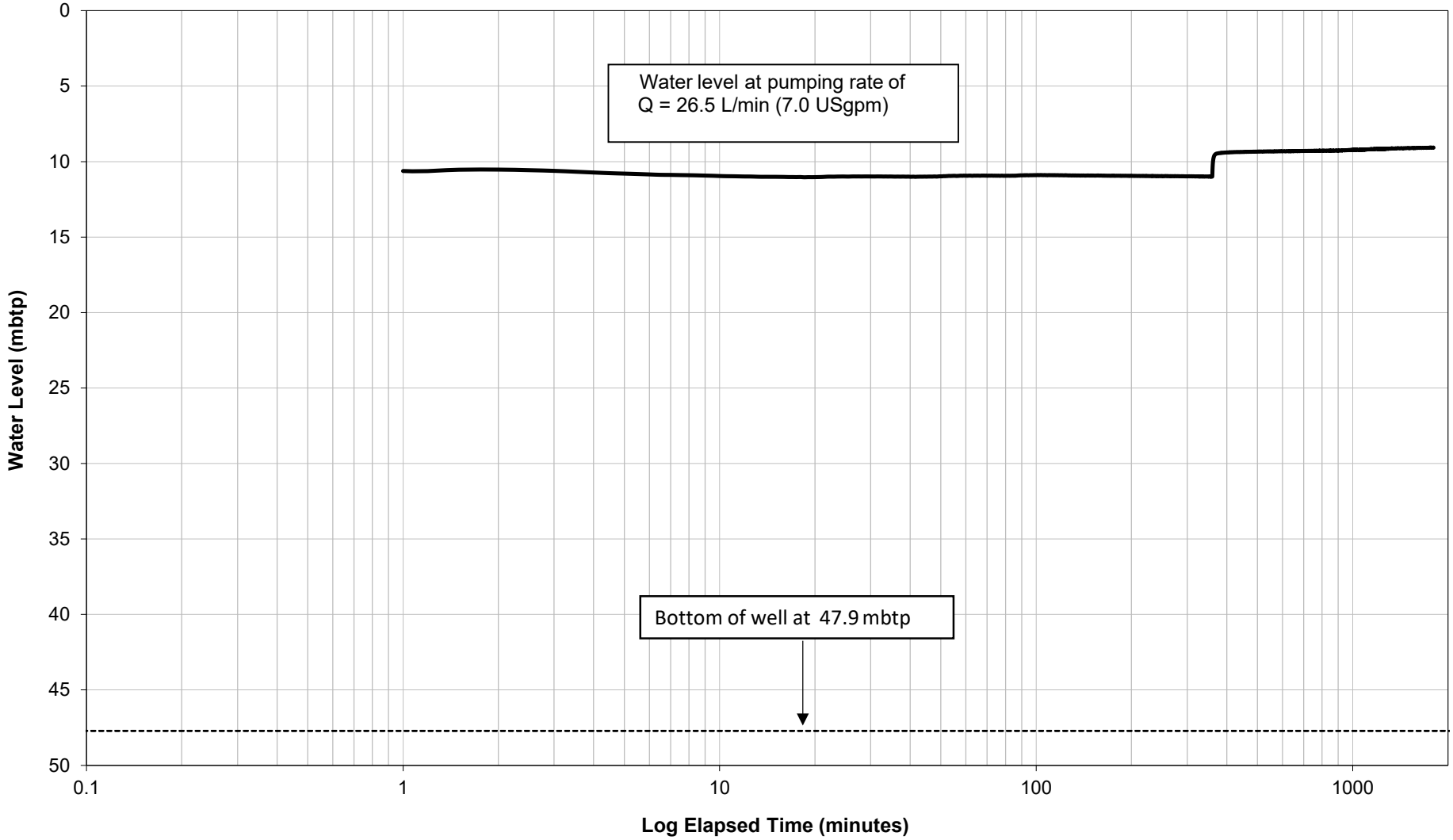
JOB NUMBER: 12586015

DRAWING NUMBER: C-1

GHD

347 PIDO ROAD, UNIT 29
PETERBOROUGH, ON K9J 6X7
www.ghd.com

CONSTANT RATE TEST: WATER LEVEL vs. LOG ELAPSED TIME
TW-1: October 26-27, 2022



CONSTANT RATE

Drilled Well

MECP Well ID: Unknown

Static Level = 8.54 mbtp (8.30 mbgs)

Note: m = metres; mbtp = metres below top of pipe; mbgs = metres below ground surface; Stick up = 0.24 m

DATE: December 2022

LOCATION: 2545 9th Line, Metcalfe, Ontario

JOB NUMBER: 12586015

DRAWING NUMBER: C-2

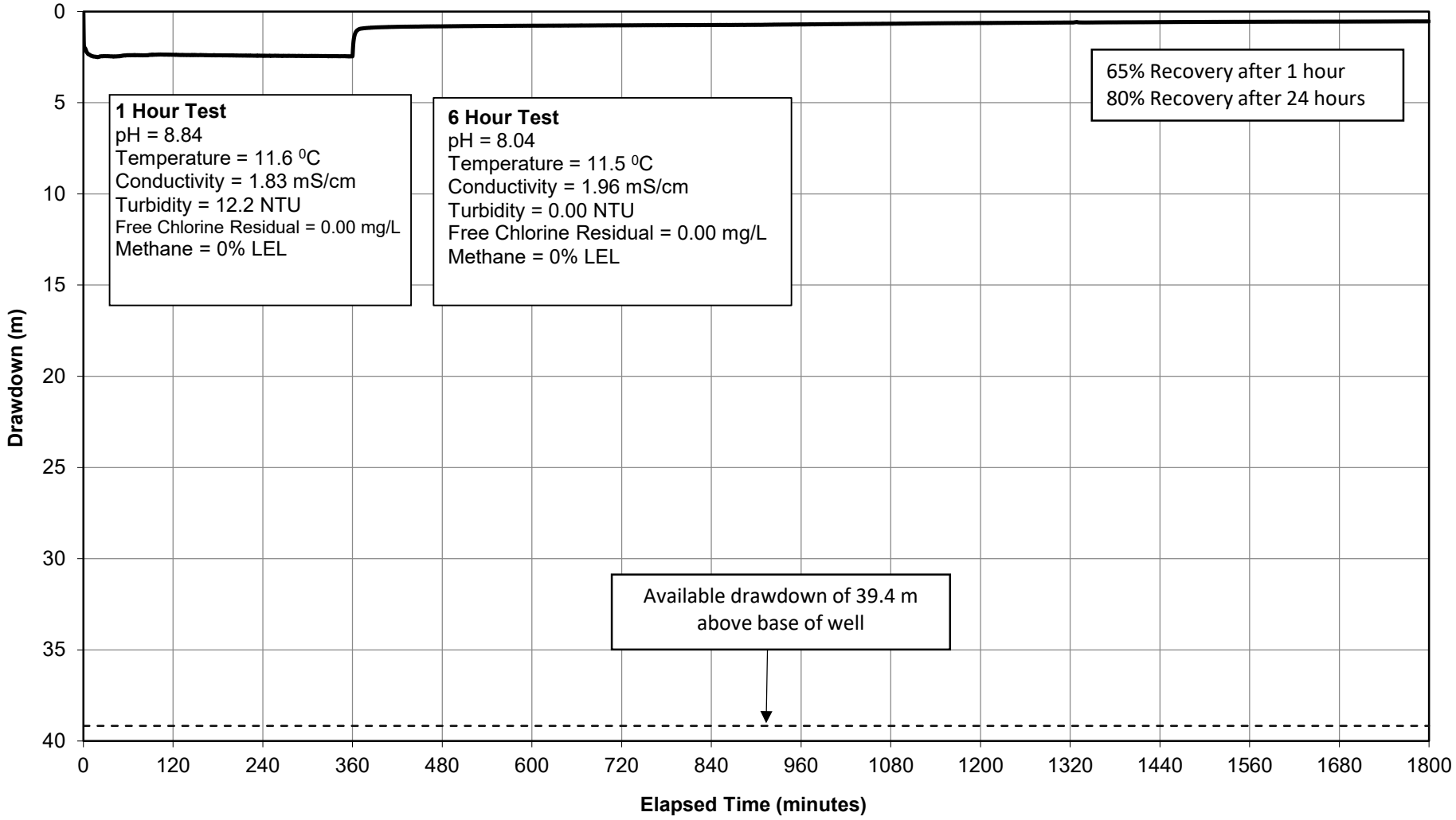
GHD

347 PIDO ROAD, UNIT 29

PETERBOROUGH, ON K9J 6X7

www.ghd.com

CONSTANT RATE DRAWDOWN, RECOVERY AND TESTING DETAILS
TW-1: October 26-27, 2022



CONSTANT RATE DRAWDOWN

Drilled Well
MECP Well ID: Unknown
Static Level = 8.54 mbtp (8.30 mbgs)

Note: m = metres; mbtp = metres below top of pipe; mbgs = metres below ground surface; Stick up = 0.24 m

DATE: December 2022

LOCATION: 2545 9th Line, Metcalfe, Ontario

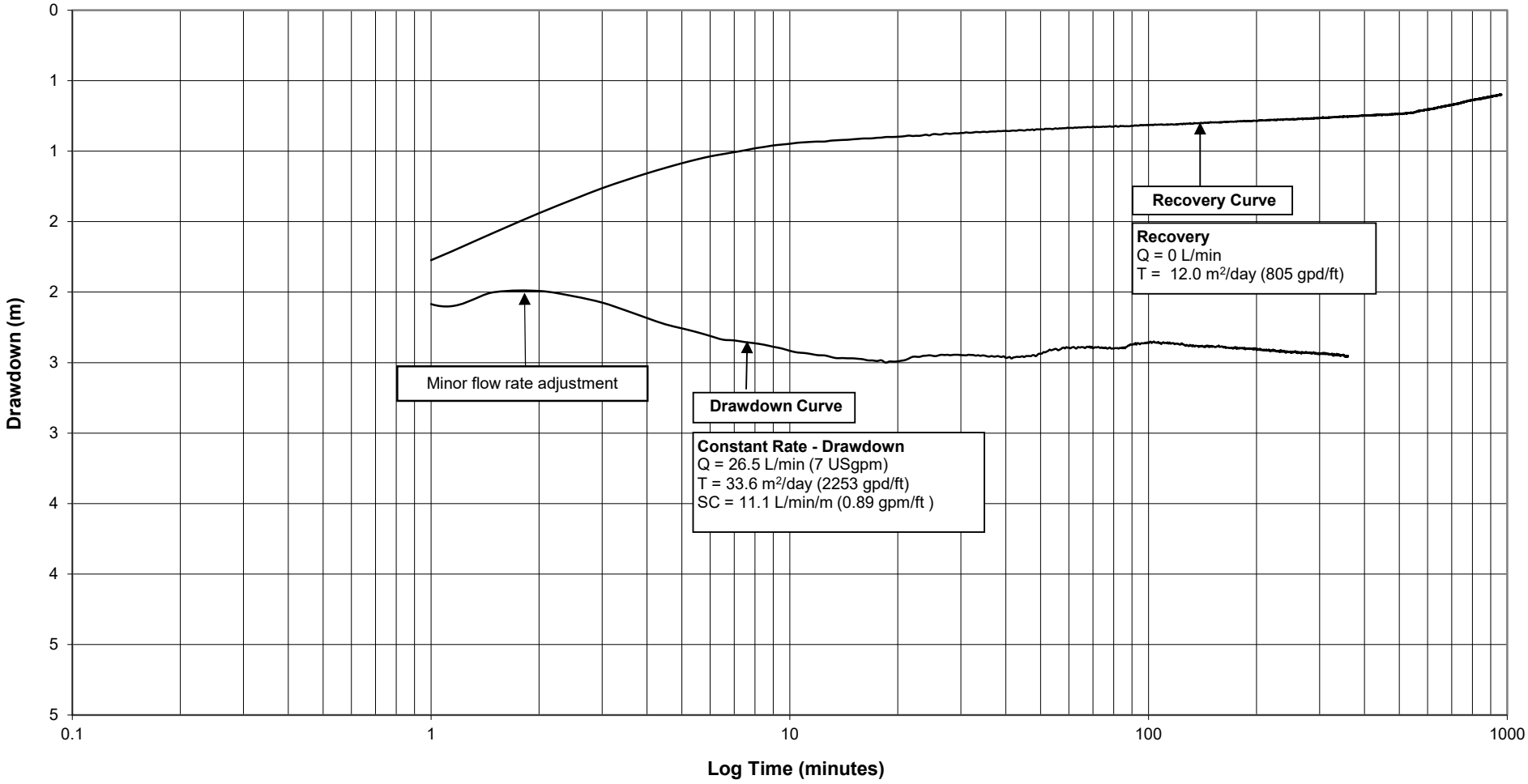
JOB NUMBER: 12586015

DRAWING NUMBER: C-3

GHD

347 PIDO ROAD, UNIT 29
PETERBOROUGH, ON K9J 6X7
www.ghd.com

CONSTANT RATE: DRAWDOWN and RECOVERY VS LOG TIME
TW-1: October 26-27, 2022



TRANSMISSIVITY

Drilled Well
MECP Well ID: Unknown
Static Level = 8.54 mbtp (8.30 mbgs)

Note: m = metres; mbtp = metres below top of pipe; mbgs = metres below ground surface; Stick up = 0.24 m

DATE: December 2022

LOCATION: 2545 9th Line, Metcalfe, Ontario

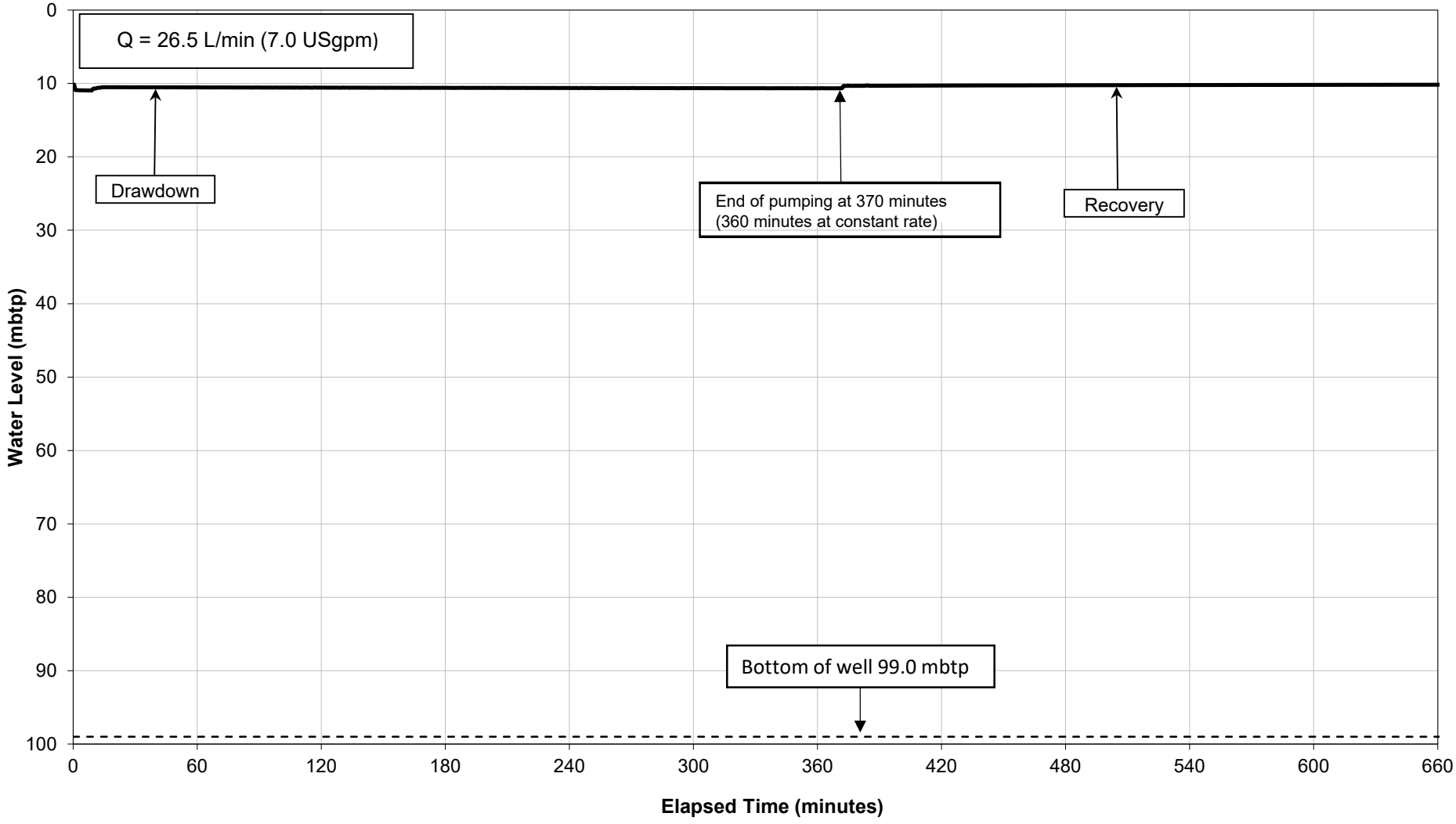
JOB NUMBER: 12586015

DRAWING NUMBER: C-4

GHD

347 PIDO ROAD, UNIT 29
PETERBOROUGH, ON K9J 6X7
www.ghd.com

PUMP HISTORY CURVE
TW-2: October 27, 2022



PUMP HISTORY CURVE

Drilled Well
MECP Well ID: Unknown
Static Level = 10.16 mbtp (9.74 mbg)

Note: m = metres; mbtp = metres below top of pipe; mbgs = metres below ground surface; Stick up = 0.42 m

DATE: December 2022

LOCATION: 2545 9th Line, Metcalfe, Ontario

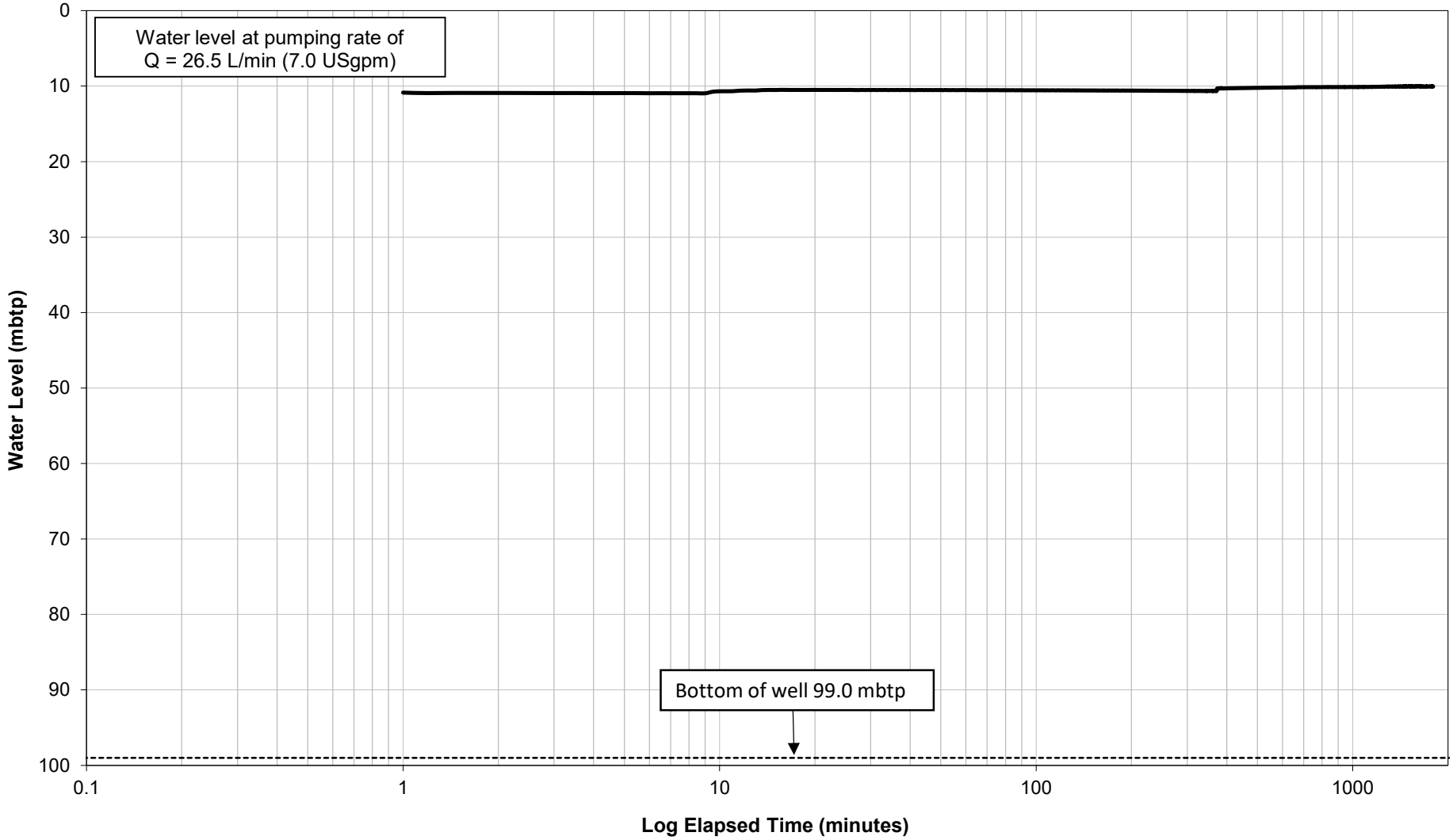
JOB NUMBER: 12586015

DRAWING NUMBER: C-5

GHD

347 PIDO ROAD, UNIT 29
PETERBOROUGH, ON K9J 6X7
www.ghd.com

CONSTANT RATE TEST: WATER LEVEL vs. LOG ELAPSED TIME
TW-2: October 27, 2022



CONSTANT RATE

Drilled Well

MECP Well ID: Unknown

Static Level = 10.16 mbtp (9.74 mbgs)

Note: m = metres; mbtp = metres below top of pipe; mbgs = metres below ground surface; Stick up = 0.42 m

DATE: December 2022

LOCATION: 2545 9th Line, Metcalfe, Ontario

JOB NUMBER: 12586015

DRAWING NUMBER: C-6

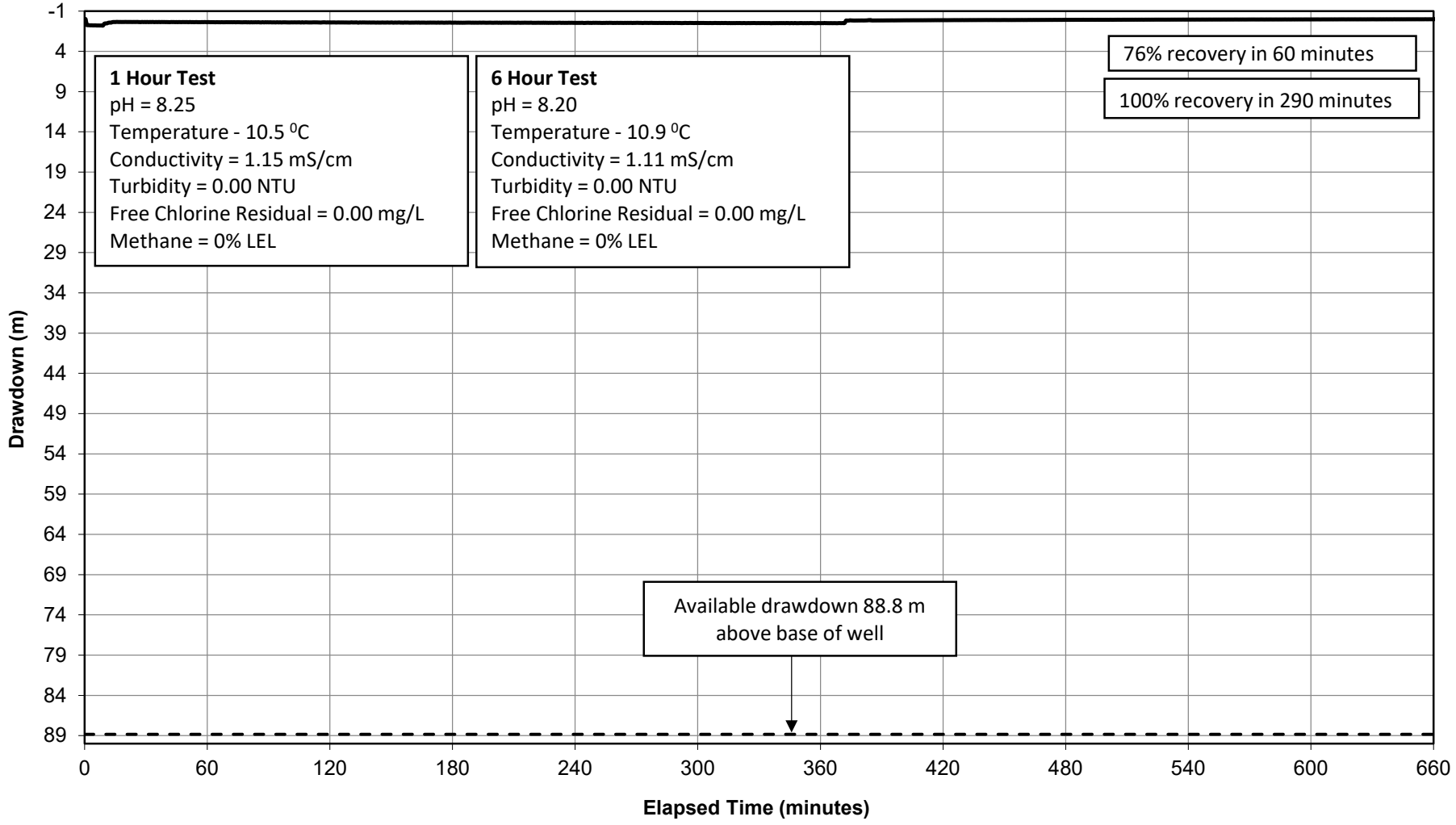
GHD

347 PIDO ROAD, UNIT 29

PETERBOROUGH, ON K9J 6X7

www.ghd.com

CONSTANT RATE DRAWDOWN, RECOVERY AND TESTING DETAILS
TW-2: October 27, 2022



CONSTANT RATE DRAWDOWN

Drilled Well
MECP Well ID: Unknown
Static Level = 10.16 mbtp (9.74 mbgs)

Note: m = metres; mbtp = metres below top of pipe; mbgs = metres below ground surface; Stick up = 0.42 m

DATE: December 2022

LOCATION: 2545 9th Line, Metcalfe, Ontario

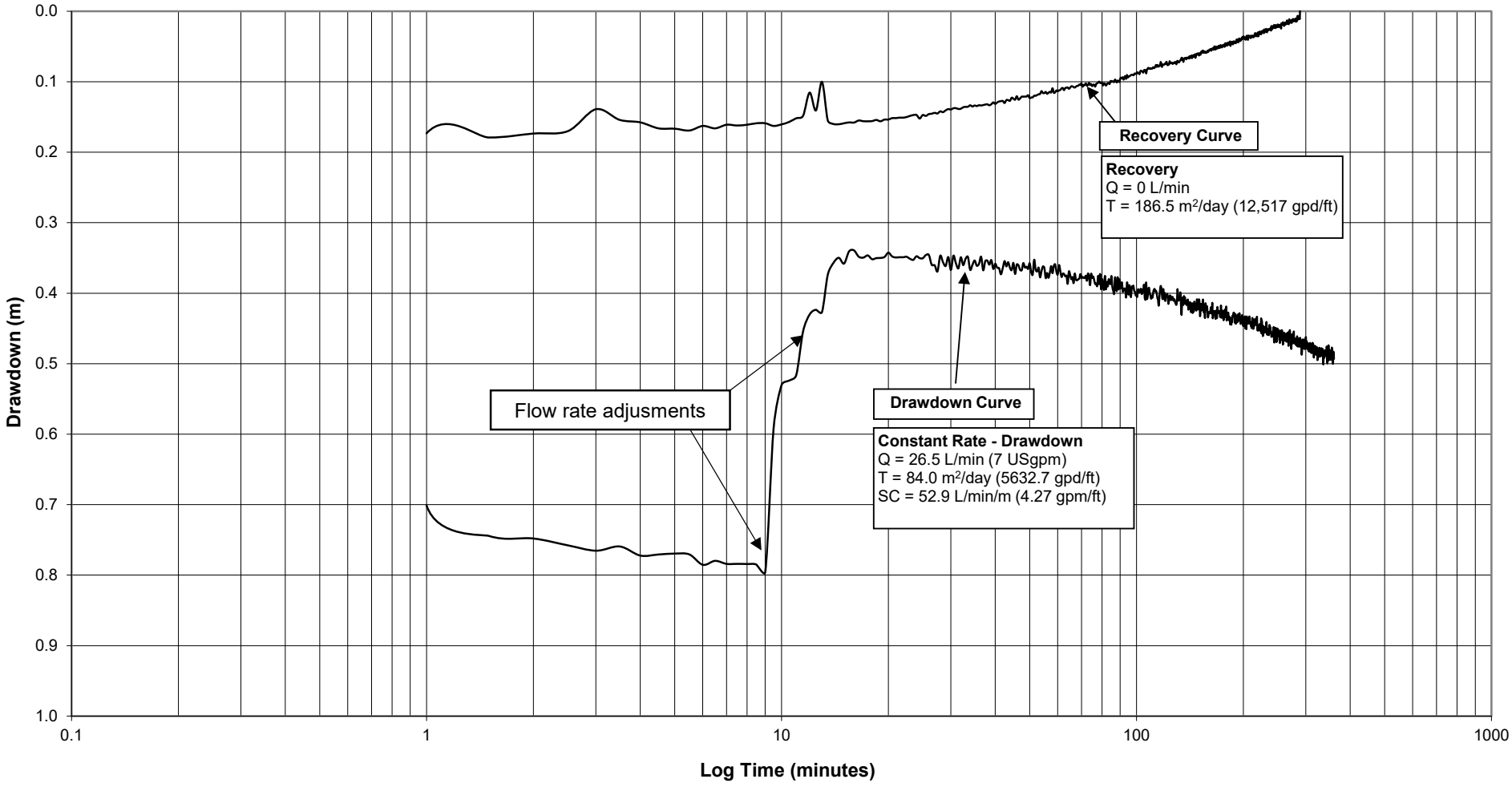
JOB NUMBER: 12586015

DRAWING NUMBER: C-7

GHD

347 PIDO ROAD, UNIT 29
PETERBOROUGH, ON K9J 6X7
www.ghd.com

CONSTANT RATE: DRAWDOWN and RECOVERY VS LOG TIME
TW-2: October 27, 2022



TRANSMISSIVITY

Drilled Well
MECP Well ID: Unknown
Static Level = 10.16 mbtp (9.74 mbgs)

Note: m = metres; mbtp = metres below top of pipe; mbgs = metres below ground surface; Stick up = 0.42 m

DATE: December 2022

LOCATION: 2545 9th Line, Metcalfe, Ontario

JOB NUMBER: 12586015

DRAWING NUMBER: C-8

GHD

347 PIDO ROAD, UNIT 29
PETERBOROUGH, ON K9J 6X7

www.ghd.com

Appendix D

Water Well Certificates of Analyses

CERTIFICATE OF ANALYSIS

Work Order	: **WT2219921**	Page	: 1 of 7
Client	: **GHD Limited**	Laboratory	: Waterloo - Environmental
Contact	: Pascal Renella	Account Manager	: Rick Hawthorne
Address	: 455 Phillip Street Waterloo ON Canada N2L 3X2	Address	: 60 Northland Road, Unit 1 Waterloo ON Canada N2V 2B8
Telephone	: 519 725 3313	Telephone	: +1 519 886 6910
Project	: 12586015-03.004	Date Samples Received	: 28-Oct-2022 10:00
PO	: 735-003748-1	Date Analysis Commenced	: 29-Oct-2022
C-O-C number	: ----	Issue Date	: 09-Nov-2022 09:28
Sampler	: ----		
Site	: ----		
Quote number	: 12586015-SSOW-735-003748-1		
No. of samples received	: 2		
No. of samples analysed	: 2		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QC Interpretive report to assist with Quality Review and Sample Receipt Notification (SRN).

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Amanda Ganouri-Lumsden	Department Manager - Microbiology and Prep	Microbiology, Waterloo, Ontario
Andrea Armstrong	Department Manager - Air Quality and Volatiles	Organics, Waterloo, Ontario
Danielle Gravel	Team Leader - Semi-Volatile Instrumentation	Organics, Waterloo, Ontario
Greg Pokocky	Supervisor - Inorganic	Inorganics, Waterloo, Ontario
Jeremy Gingras	Team Leader - Semi-Volatile Instrumentation	Organics, Waterloo, Ontario
Jon Fisher	Department Manager - Inorganics	Inorganics, Waterloo, Ontario
Jon Fisher	Department Manager - Inorganics	Metals, Waterloo, Ontario
Lindsay Gung	Supervisor - Water Chemistry	Inorganics, Burnaby, British Columbia
Ruby Sujeepan		Microbiology, Waterloo, Ontario

General Comments

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for applicable references and methodology summaries. Reference methods may incorporate modifications to improve performance.
Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Please refer to Quality Control Interpretive report (QCI) for information regarding Holding Time compliance.

Key : CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances
LOR: Limit of Reporting (detection limit).

Unit	*Description*
-	No Unit
%	percent
µg/L	micrograms per litre
µS/cm	Microsiemens per centimetre
CFU/100mL	colony forming units per 100 mL
CFU/1mL	colony forming units per 1 mL
CU	colour units (1 CU = 1 mg/L Pt)
meq/L	milliequivalents per litre
mg/L	milligrams per litre
NTU	nephelometric turbidity units
pH units	pH units

>: greater than.
<: less than.

Surrogate: An analyte that is similar in behavior to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED on SRN or QCI Report, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Sample Comments

Sample	Client Id	*Comment*
WT2219921-001	GW-002	RRR:Detection limit raised due to instrument sensitivity.

Qualifiers

Qualifier	*Description*
DLDS	*Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.*
PEHT	*Parameter exceeded recommended holding time prior to analysis.*
RRR	*Refer to report comments for issues regarding this analysis.*

Analytical Results

WT2219921-001

Sub-Matrix:**Water**
(Matrix: **Water**)

Client sample ID: GW-002
Client sampling date / time: 26-Oct-2022 16:00

Analyte	CAS Number	Result	LOR	Unit	Method	Prep Date	Analysis Date	QCLot
Physical Tests								
colour, true	----	2.4	2.0	CU	E329-L	01-Nov-2022	04-Nov-2022	724671
conductivity	----	1420	2.0	µS/cm	E100	03-Nov-2022	04-Nov-2022	728617
hardness (as CaCO3), dissolved	----	509	0.50	mg/L	EC100	-	01-Nov-2022	-
pH	----	8.15	0.10	pH units	E108	03-Nov-2022	04-Nov-2022	728618
solids, total dissolved [TDS]	----	792 DLDS,	20	mg/L	E162	-	01-Nov-2022	724936
turbidity	----	1.04	0.10	NTU	E121	-	29-Oct-2022	721148
alkalinity, total (as CaCO3)	----	345	2.0	mg/L	E290	03-Nov-2022	04-Nov-2022	728619
Anions and Nutrients								
ammonia, total (as N)	7664-41-7	0.0353	0.0050	mg/L	E298	03-Nov-2022	07-Nov-2022	729135
chloride	16887-00-6	208 DLDS,	2.50	mg/L	E235.Cl	03-Nov-2022	04-Nov-2022	728620
fluoride	16984-48-8	<0.100 DLDS,	0.100	mg/L	E235.F	03-Nov-2022	04-Nov-2022	728623
Kjeldahl nitrogen, total [TKN]	----	0.180	0.050	mg/L	E318	04-Nov-2022	04-Nov-2022	729132
nitrate (as N)	14797-55-8	<0.100 DLDS,	0.100	mg/L	E235.NO3	03-Nov-2022	04-Nov-2022	728621
nitrite (as N)	14797-65-0	<0.050 DLDS,	0.050	mg/L	E235.NO2	03-Nov-2022	04-Nov-2022	728622
sulfate (as SO4)	14808-79-8	111 DLDS,	1.50	mg/L	E235.SO4	03-Nov-2022	04-Nov-2022	728624
Organic / Inorganic Carbon								
carbon, dissolved organic [DOC]	----	17.4	0.50	mg/L	E358-L	31-Oct-2022	01-Nov-2022	723366
Total Sulfides								
sulfide, total (as H2S)	7783-06-4	<0.011	0.011	mg/L	E395-H	-	02-Nov-2022	726653
sulfide, total (as S)	18496-25-8	<0.010	0.010	mg/L	E395-H	-	02-Nov-2022	726653
Microbiological Tests								
coliforms, total	----	8 PEHT,	1	CFU/100mL	E012.TC	-	29-Oct-2022	721298
heterotrophic plate count [HPC]	----	78 PEHT,	1	CFU/1mL	E012.HPC	-	29-Oct-2022	721178
coliforms, total background	----	3	1	CFU/100mL	E012.BG.TC	-	29-Oct-2022	721299
coliforms, Escherichia coli [E. coli]	----	Not Detected	1	CFU/100mL	E012A.EC	-	29-Oct-2022	721582
Ion Balance								
anion sum	----	15.1	0.10	meq/L	EC101	-	09-Nov-2022	-
cation sum	----	15.1	0.10	meq/L	EC101	-	09-Nov-2022	-
ion balance (APHA)	----	<0.01	0.01	%	EC101	-	09-Nov-2022	-
Dissolved Metals								
aluminum, dissolved	7429-90-5	<0.0010	0.0010	mg/L	E421	31-Oct-2022	31-Oct-2022	722924
antimony, dissolved	7440-36-0	<0.00010	0.00010	mg/L	E421	31-Oct-2022	31-Oct-2022	722924
arsenic, dissolved	7440-38-2	0.00071	0.00010	mg/L	E421	31-Oct-2022	31-Oct-2022	722924
barium, dissolved	7440-39-3	0.212	0.00010	mg/L	E421	31-Oct-2022	31-Oct-2022	722924
beryllium, dissolved	7440-41-7	<0.000020	0.000020	mg/L	E421	31-Oct-2022	31-Oct-2022	722924
boron, dissolved	7440-42-8	0.029	0.010	mg/L	E421	31-Oct-2022	31-Oct-2022	722924
cadmium, dissolved	7440-43-9	0.0000064	0.0000050	mg/L	E421	31-Oct-2022	31-Oct-2022	722924
calcium, dissolved	7440-70-2	127	0.050	mg/L	E421	31-Oct-2022	31-Oct-2022	722924
chromium, dissolved	7440-47-3	<0.00050	0.00050	mg/L	E421	31-Oct-2022	31-Oct-2022	722924
cobalt, dissolved	7440-48-4	0.00047	0.00010	mg/L	E421	31-Oct-2022	31-Oct-2022	722924
copper, dissolved	7440-50-8	0.00048	0.00020	mg/L	E421	31-Oct-2022	31-Oct-2022	722924
lead, dissolved	7439-92-1	0.000408	0.000050	mg/L	E421	31-Oct-2022	31-Oct-2022	722924
magnesium, dissolved	7439-95-4	46.7	0.0050	mg/L	E421	31-Oct-2022	31-Oct-2022	722924
manganese, dissolved	7439-96-5	0.0762	0.00010	mg/L	E421	31-Oct-2022	31-Oct-2022	722924
molybdenum, dissolved	7439-98-7	0.0178	0.000050	mg/L	E421	31-Oct-2022	31-Oct-2022	722924
nickel, dissolved	7440-02-0	0.00176	0.00050	mg/L	E421	31-Oct-2022	31-Oct-2022	722924

Analytical Results

WT2219921-001

Sub-Matrix:**Water** (Matrix: **Water**)

Client sample ID: GW-002

Client sampling date / time: 26-Oct-2022 16:00

Analyte	CAS Number	Result	LOR	Unit	Method	Prep Date	Analysis Date	QCLot
Dissolved Metals								
potassium, dissolved	7440-09-7	6.14	0.050	mg/L	E421	31-Oct-2022	31-Oct-2022	722924
selenium, dissolved	7782-49-2	0.000099	0.000050	mg/L	E421	31-Oct-2022	31-Oct-2022	722924
silver, dissolved	7440-22-4	<0.000010	0.000010	mg/L	E421	31-Oct-2022	31-Oct-2022	722924
sodium, dissolved	7440-23-5	109	0.050	mg/L	E421	31-Oct-2022	31-Oct-2022	722924
strontium, dissolved	7440-24-6	1.32	0.00020	mg/L	E421	31-Oct-2022	31-Oct-2022	722924
thallium, dissolved	7440-28-0	<0.000010	0.000010	mg/L	E421	31-Oct-2022	31-Oct-2022	722924
uranium, dissolved	7440-61-1	0.00462	0.000010	mg/L	E421	31-Oct-2022	31-Oct-2022	722924
vanadium, dissolved	7440-62-2	<0.00050	0.00050	mg/L	E421	31-Oct-2022	31-Oct-2022	722924
zinc, dissolved	7440-66-6	<0.0010	0.0010	mg/L	E421	31-Oct-2022	31-Oct-2022	722924
dissolved metals filtration location	----	Field	-	-	EP421	-	31-Oct-2022	722924
Aggregate Organics								
tannin + lignin (as tannic acid)	----	1.21	0.10	mg/L	E563	-	31-Oct-2022	722654
Volatile Organic Compounds								
Acetone	67-64-1	<20	20	µg/L	E611D	03-Nov-2022	03-Nov-2022	727945
benzene	71-43-2	<0.50	0.50	µg/L	E611D	03-Nov-2022	03-Nov-2022	727945
bromodichloromethane	75-27-4	<0.50	0.50	µg/L	E611D	03-Nov-2022	03-Nov-2022	727945
bromoform	75-25-2	<0.50	0.50	µg/L	E611D	03-Nov-2022	03-Nov-2022	727945
bromomethane	74-83-9	<0.50	0.50	µg/L	E611D	03-Nov-2022	03-Nov-2022	727945
carbon tetrachloride	56-23-5	<0.20	0.20	µg/L	E611D	03-Nov-2022	03-Nov-2022	727945
chlorobenzene	108-90-7	<0.50	0.50	µg/L	E611D	03-Nov-2022	03-Nov-2022	727945
chloroform	67-66-3	<0.50	0.50	µg/L	E611D	03-Nov-2022	03-Nov-2022	727945
dibromochloromethane	124-48-1	<0.50	0.50	µg/L	E611D	03-Nov-2022	03-Nov-2022	727945
dibromoethane, 1,2-	106-93-4	<0.20	0.20	µg/L	E611D	03-Nov-2022	03-Nov-2022	727945
dichlorobenzene, 1,2-	95-50-1	<0.50	0.50	µg/L	E611D	03-Nov-2022	03-Nov-2022	727945
dichlorobenzene, 1,3-	541-73-1	<0.50	0.50	µg/L	E611D	03-Nov-2022	03-Nov-2022	727945
dichlorobenzene, 1,4-	106-46-7	<0.50	0.50	µg/L	E611D	03-Nov-2022	03-Nov-2022	727945
dichlorodifluoromethane	75-71-8	<0.50	0.50	µg/L	E611D	03-Nov-2022	03-Nov-2022	727945
dichloroethane, 1,1-	75-34-3	<0.50	0.50	µg/L	E611D	03-Nov-2022	03-Nov-2022	727945
dichloroethane, 1,2-	107-06-2	<0.50	0.50	µg/L	E611D	03-Nov-2022	03-Nov-2022	727945
dichloroethylene, 1,1-	75-35-4	<0.50	0.50	µg/L	E611D	03-Nov-2022	03-Nov-2022	727945
dichloroethylene, cis-1,2-	156-59-2	<0.50	0.50	µg/L	E611D	03-Nov-2022	03-Nov-2022	727945
dichloroethylene, trans-1,2-	156-60-5	<0.50	0.50	µg/L	E611D	03-Nov-2022	03-Nov-2022	727945
dichloromethane	75-09-2	<1.0	1.0	µg/L	E611D	03-Nov-2022	03-Nov-2022	727945
dichloropropane, 1,2-	78-87-5	<0.50	0.50	µg/L	E611D	03-Nov-2022	03-Nov-2022	727945
dichloropropylene, cis+trans-1,3-	542-75-6	<0.50	0.5	µg/L	E611D	03-Nov-2022	03-Nov-2022	727945
dichloropropylene, cis-1,3-	10061-01-5	<0.30	0.30	µg/L	E611D	03-Nov-2022	03-Nov-2022	727945
dichloropropylene, trans-1,3-	10061-02-6	<0.30	0.30	µg/L	E611D	03-Nov-2022	03-Nov-2022	727945
ethylbenzene	100-41-4	<0.50	0.50	µg/L	E611D	03-Nov-2022	03-Nov-2022	727945
hexane, n-	110-54-3	<0.50	0.50	µg/L	E611D	03-Nov-2022	03-Nov-2022	727945
methyl ethyl ketone [MEK]	78-93-3	<20	20	µg/L	E611D	03-Nov-2022	03-Nov-2022	727945
methyl isobutyl ketone [MIBK]	108-10-1	<20	20	µg/L	E611D	03-Nov-2022	03-Nov-2022	727945
methyl-tert-butyl ether [MTBE]	1634-04-4	<0.50	0.50	µg/L	E611D	03-Nov-2022	03-Nov-2022	727945
styrene	100-42-5	<0.50	0.50	µg/L	E611D	03-Nov-2022	03-Nov-2022	727945
tetrachloroethane, 1,1,1,2-	630-20-6	<0.50	0.50	µg/L	E611D	03-Nov-2022	03-Nov-2022	727945
tetrachloroethane, 1,1,2,2-	79-34-5	<0.50	0.50	µg/L	E611D	03-Nov-2022	03-Nov-2022	727945
tetrachloroethylene	127-18-4	<0.50	0.50	µg/L	E611D	03-Nov-2022	03-Nov-2022	727945

Analytical Results

WT2219921-001

Sub-Matrix:**Water**
(Matrix: **Water**)

Client sample ID: GW-002
Client sampling date / time: 26-Oct-2022 16:00

Analyte	CAS Number	Result	LOR	Unit	Method	Prep Date	Analysis Date	QCLot
Volatile Organic Compounds								
toluene	108-88-3	<0.50	0.50	µg/L	E611D	03-Nov-2022	03-Nov-2022	727945
trichloroethane, 1,1,1-	71-55-6	<0.50	0.50	µg/L	E611D	03-Nov-2022	03-Nov-2022	727945
trichloroethane, 1,1,2-	79-00-5	<0.50	0.50	µg/L	E611D	03-Nov-2022	03-Nov-2022	727945
trichloroethylene	79-01-6	<0.50	0.50	µg/L	E611D	03-Nov-2022	03-Nov-2022	727945
trichlorofluoromethane	75-69-4	<0.50	0.50	µg/L	E611D	03-Nov-2022	03-Nov-2022	727945
vinyl chloride	75-01-4	<0.50	0.50	µg/L	E611D	03-Nov-2022	03-Nov-2022	727945
xylene, m+p-	179601-23-1	<0.40	0.40	µg/L	E611D	03-Nov-2022	03-Nov-2022	727945
xylene, o-	95-47-6	<0.30	0.30	µg/L	E611D	03-Nov-2022	03-Nov-2022	727945
xylenes, total	1330-20-7	<0.50	0.50	µg/L	E611D	03-Nov-2022	03-Nov-2022	727945
BTEX, total	----	<1.0	1.0	µg/L	E611D	03-Nov-2022	03-Nov-2022	727945
Hydrocarbons								
F1 (C6-C10)	----	<25	25	µg/L	E581.F1-L	03-Nov-2022	03-Nov-2022	727946
F2 (C10-C16)	----	<100	100	µg/L	E601.SG	02-Nov-2022	08-Nov-2022	725959
F2-naphthalene	----	<100	100	µg/L	EC600SG	-	03-Nov-2022	-
F3 (C16-C34)	----	<250	250	µg/L	E601.SG	02-Nov-2022	08-Nov-2022	725959
F3-PAH	n/a	<250	250	µg/L	EC600SG	-	03-Nov-2022	-
F4 (C34-C50)	----	<250	250	µg/L	E601.SG	02-Nov-2022	08-Nov-2022	725959
F1-BTEX	----	<25	25	µg/L	EC580	-	04-Nov-2022	-
hydrocarbons, total (C6-C50)	----	<370	370	µg/L	EC581SG	-	04-Nov-2022	-
chromatogram to baseline at nC50	n/a	YES	-	-	E601.SG	02-Nov-2022	08-Nov-2022	725959
Hydrocarbons Surrogates								
bromobenzotrifluoride, 2- (F2-F4 surr)	392-83-6	82.5	1.0	%	E601.SG	02-Nov-2022	08-Nov-2022	725959
dichlorotoluene, 3,4-	97-75-0	84.7	1.0	%	E581.F1-L	03-Nov-2022	03-Nov-2022	727946
Volatile Organic Compounds Surrogates								
bromofluorobenzene, 4-	460-00-4	94.5	1.0	%	E611D	03-Nov-2022	03-Nov-2022	727945
difluorobenzene, 1,4-	540-36-3	91.0	1.0	%	E611D	03-Nov-2022	03-Nov-2022	727945
Polycyclic Aromatic Hydrocarbons								
acenaphthene	83-32-9	<0.20	0.20	µg/L	E655A	01-Nov-2022	02-Nov-2022	724805
acenaphthylene	208-96-8	<0.20	0.20	µg/L	E655A	01-Nov-2022	02-Nov-2022	724805
anthracene	120-12-7	<0.20	0.20	µg/L	E655A	01-Nov-2022	02-Nov-2022	724805
benz(a)anthracene	56-55-3	<0.20	0.20	µg/L	E655A	01-Nov-2022	02-Nov-2022	724805
benzo(a)pyrene	50-32-8	<0.044 RRR	0.044	µg/L	E655A	01-Nov-2022	02-Nov-2022	724805
benzo(b+j)fluoranthene	n/a	<0.10	0.10	µg/L	E655A	01-Nov-2022	02-Nov-2022	724805
benzo(g,h,i)perylene	191-24-2	<0.20	0.20	µg/L	E655A	01-Nov-2022	02-Nov-2022	724805
benzo(k)fluoranthene	207-08-9	<0.10	0.10	µg/L	E655A	01-Nov-2022	02-Nov-2022	724805
chrysene	218-01-9	<0.10	0.10	µg/L	E655A	01-Nov-2022	02-Nov-2022	724805
dibenz(a,h)anthracene	53-70-3	<0.20	0.20	µg/L	E655A	01-Nov-2022	02-Nov-2022	724805
fluoranthene	206-44-0	<0.20	0.20	µg/L	E655A	01-Nov-2022	02-Nov-2022	724805
fluorene	86-73-7	<0.20	0.20	µg/L	E655A	01-Nov-2022	02-Nov-2022	724805
indeno(1,2,3-c,d)pyrene	193-39-5	<0.20	0.20	µg/L	E655A	01-Nov-2022	02-Nov-2022	724805
methylnaphthalene, 1-	90-12-0	<0.40	0.40	µg/L	E655A	01-Nov-2022	02-Nov-2022	724805
methylnaphthalene, 1+2-	----	<0.60	0.6	µg/L	E655A	01-Nov-2022	02-Nov-2022	724805
methylnaphthalene, 2-	91-57-6	<0.40	0.40	µg/L	E655A	01-Nov-2022	02-Nov-2022	724805
naphthalene	91-20-3	<0.20	0.20	µg/L	E655A	01-Nov-2022	02-Nov-2022	724805
phenanthrene	85-01-8	<0.20	0.20	µg/L	E655A	01-Nov-2022	02-Nov-2022	724805
pyrene	129-00-0	<0.20	0.20	µg/L	E655A	01-Nov-2022	02-Nov-2022	724805

Analytical Results

WT2219921-001

Sub-Matrix:**Water** (Matrix: **Water**)

Client sample ID: GW-002

Client sampling date / time: 26-Oct-2022 16:00

Analyte	CAS Number	Result	LOR	Unit	Method	Prep Date	Analysis Date	QCLot
Phthalate Esters								
bis(2-ethylhexyl) phthalate [DEHP]	117-81-7	<2.0	2.0	µg/L	E655A	01-Nov-2022	02-Nov-2022	724805
diethyl phthalate	84-66-2	<0.20	0.20	µg/L	E655A	01-Nov-2022	02-Nov-2022	724805
dimethyl phthalate	131-11-3	<0.20	0.20	µg/L	E655A	01-Nov-2022	02-Nov-2022	724805
Semi-Volatile Organics								
biphenyl	92-52-4	<0.40	0.40	µg/L	E655A	01-Nov-2022	02-Nov-2022	724805
bis(2-chloroethyl) ether	111-44-4	<0.40	0.40	µg/L	E655A	01-Nov-2022	02-Nov-2022	724805
bis(2-chloroisopropyl) ether	39638-32-9	<0.40	0.40	µg/L	E655A	01-Nov-2022	02-Nov-2022	724805
chloroaniline, 4-	106-47-8	<0.40	0.40	µg/L	E655A	01-Nov-2022	02-Nov-2022	724805
dichlorobenzidine, 3,3'-	91-94-1	<0.40	0.40	µg/L	E655A	01-Nov-2022	02-Nov-2022	724805
dinitrotoluene, 2,4-	121-14-2	<0.40	0.40	µg/L	E655A	01-Nov-2022	02-Nov-2022	724805
dinitrotoluene, 2,4 + 2,6-	n/a	<0.60	0.6	µg/L	E655A	01-Nov-2022	02-Nov-2022	724805
dinitrotoluene, 2,6-	606-20-2	<0.40	0.40	µg/L	E655A	01-Nov-2022	02-Nov-2022	724805
trichlorobenzene, 1,2,4-	120-82-1	<0.40	0.40	µg/L	E655A	01-Nov-2022	02-Nov-2022	724805
Semi-Volatile Organics Surrogates								
fluorobiphenyl, 2-	321-60-8	90.6	1.0	%	E655A	01-Nov-2022	02-Nov-2022	724805
nitrobenzene-d5	4165-60-0	99.2	1.0	%	E655A	01-Nov-2022	02-Nov-2022	724805
terphenyl-d14, p-	1718-51-0	94.7	1.0	%	E655A	01-Nov-2022	02-Nov-2022	724805
Chlorinated Phenolics								
chlorophenol, 2-	95-57-8	<0.30	0.30	µg/L	E655A	01-Nov-2022	02-Nov-2022	724805
dichlorophenol, 2,4-	120-83-2	<0.30	0.30	µg/L	E655A	01-Nov-2022	02-Nov-2022	724805
pentachlorophenol [PCP]	87-86-5	<0.50	0.50	µg/L	E655A	01-Nov-2022	02-Nov-2022	724805
tetrachlorophenol, 2,3,4,6-	58-90-2	<0.50	0.50	µg/L	E651D	01-Nov-2022	02-Nov-2022	724808
trichlorophenol, 2,4,5-	95-95-4	<0.20	0.20	µg/L	E655A	01-Nov-2022	02-Nov-2022	724805
trichlorophenol, 2,4,6-	88-06-2	<0.20	0.20	µg/L	E655A	01-Nov-2022	02-Nov-2022	724805
Non-Chlorinated Phenolics								
dimethylphenol, 2,4-	105-67-9	<0.50	0.50	µg/L	E655A	01-Nov-2022	02-Nov-2022	724805
dinitrophenol, 2,4-	51-28-5	<1.0	1.0	µg/L	E655A	01-Nov-2022	02-Nov-2022	724805
phenol	108-95-2	<0.50	0.50	µg/L	E655A	01-Nov-2022	02-Nov-2022	724805
Phenolics Surrogates								
tribromophenol, 2,4,6-	118-79-6	110	1.0	%	E651D	01-Nov-2022	02-Nov-2022	724808
tribromophenol, 2,4,6-	118-79-6	110	0.22	%	E655A	01-Nov-2022	02-Nov-2022	724805
Pesticides								
diazinon	333-41-5	<0.10	0.10	µg/L	E660E-H	01-Nov-2022	04-Nov-2022	724791
Pesticides Surrogates								
fluorobiphenyl, 2-	321-60-8	94.4	0.10	%	E660E-H	01-Nov-2022	04-Nov-2022	724791
terphenyl-d14, p-	1718-51-0	109	0.10	%	E660E-H	01-Nov-2022	04-Nov-2022	724791

Please refer to the General Comments section for an explanation of any qualifiers detected.

Analytical Results

WT2219921-002

Sub-Matrix:**Water** (Matrix: **Water**)

Client sample ID: GW-001

Client sampling date / time: 26-Oct-2022 11:00

Analyte	CAS Number	Result	LOR	Unit	Method	Prep Date	Analysis Date	QCLot

Analytical Results

WT2219921-002

Sub-Matrix: **Water**
(Matrix: **Water**)

Client sample ID: GW-001
Client sampling date / time: 26-Oct-2022 11:00

Analyte	CAS Number	Result	LOR	Unit	Method	Prep Date	Analysis Date	QCLot
Dissolved Metals								
aluminum, dissolved	7429-90-5	0.0011	0.0010	mg/L	E421	31-Oct-2022	31-Oct-2022	722924
antimony, dissolved	7440-36-0	0.00012	0.00010	mg/L	E421	31-Oct-2022	31-Oct-2022	722924
arsenic, dissolved	7440-38-2	0.00099	0.00010	mg/L	E421	31-Oct-2022	31-Oct-2022	722924
barium, dissolved	7440-39-3	0.209	0.00010	mg/L	E421	31-Oct-2022	31-Oct-2022	722924
beryllium, dissolved	7440-41-7	<0.000020	0.000020	mg/L	E421	31-Oct-2022	31-Oct-2022	722924
boron, dissolved	7440-42-8	0.039	0.010	mg/L	E421	31-Oct-2022	31-Oct-2022	722924
cadmium, dissolved	7440-43-9	0.0000118	0.0000050	mg/L	E421	31-Oct-2022	31-Oct-2022	722924
calcium, dissolved	7440-70-2	113	0.050	mg/L	E421	31-Oct-2022	31-Oct-2022	722924
chromium, dissolved	7440-47-3	<0.00050	0.00050	mg/L	E421	31-Oct-2022	31-Oct-2022	722924
cobalt, dissolved	7440-48-4	0.00059	0.00010	mg/L	E421	31-Oct-2022	31-Oct-2022	722924
copper, dissolved	7440-50-8	0.00139	0.00020	mg/L	E421	31-Oct-2022	31-Oct-2022	722924
lead, dissolved	7439-92-1	0.000992	0.000050	mg/L	E421	31-Oct-2022	31-Oct-2022	722924
magnesium, dissolved	7439-95-4	42.8	0.0050	mg/L	E421	31-Oct-2022	31-Oct-2022	722924
manganese, dissolved	7439-96-5	0.0501	0.00010	mg/L	E421	31-Oct-2022	31-Oct-2022	722924
molybdenum, dissolved	7439-98-7	0.0204	0.000050	mg/L	E421	31-Oct-2022	31-Oct-2022	722924
nickel, dissolved	7440-02-0	0.00225	0.00050	mg/L	E421	31-Oct-2022	31-Oct-2022	722924
potassium, dissolved	7440-09-7	6.81	0.050	mg/L	E421	31-Oct-2022	31-Oct-2022	722924
selenium, dissolved	7782-49-2	0.000050	0.000050	mg/L	E421	31-Oct-2022	31-Oct-2022	722924
silver, dissolved	7440-22-4	<0.000010	0.000010	mg/L	E421	31-Oct-2022	31-Oct-2022	722924
sodium, dissolved	7440-23-5	107	0.050	mg/L	E421	31-Oct-2022	31-Oct-2022	722924
strontium, dissolved	7440-24-6	1.50	0.00020	mg/L	E421	31-Oct-2022	31-Oct-2022	722924
thallium, dissolved	7440-28-0	<0.000010	0.000010	mg/L	E421	31-Oct-2022	31-Oct-2022	722924
uranium, dissolved	7440-61-1	0.00405	0.000010	mg/L	E421	31-Oct-2022	31-Oct-2022	722924
vanadium, dissolved	7440-62-2	<0.00050	0.00050	mg/L	E421	31-Oct-2022	31-Oct-2022	722924
zinc, dissolved	7440-66-6	0.0016	0.0010	mg/L	E421	31-Oct-2022	31-Oct-2022	722924
dissolved metals filtration location	----	Field	-	-	EP421	-	31-Oct-2022	722924

Please refer to the General Comments section for an explanation of any qualifiers detected.

ALS Canada Ltd.

right solutions.
right partner.

QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: **WT2219921**	Page	: 1 of 15
Client	: **GHD Limited**	Laboratory	: Waterloo - Environmental
Contact	: Pascal Renella	Account Manager	: Rick Hawthorne
Address	: 455 Phillip Street Waterloo ON Canada N2L 3X2	Address	: 60 Northland Road, Unit 1 Waterloo, Ontario Canada N2V 2B8
Telephone	: 519 725 3313	Telephone	: +1 519 886 6910
Project	: 12586015-03.004	Date Samples Received	: 28-Oct-2022 10:00
PO	: 735-003748-1	Issue Date	: 09-Nov-2022 09:28
C-O-C number	: ----		
Sampler	: ----		
Site	: ----		
Quote number	: 12586015-SSOW-735-003748-1		
No. of samples received	: 2		
No. of samples analysed	: 2		

This report is automatically generated by the ALS LIMS (Laboratory Information Management System) through evaluation of Quality Control (QC) results and other QA parameters associated with this submission, and is intended to facilitate rapid data validation by auditors or reviewers. The report highlights any exceptions and outliers to ALS Data Quality Objectives, provides holding time details and exceptions, summarizes QC sample frequencies, and lists applicable methodology references and summaries.

Key

Anonymous: Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number: Chemical Abstracts Service number is a unique identifier assigned to discrete substances.
DQO: Data Quality Objective.
LOR: Limit of Reporting (detection limit).
RPD: Relative Percent Difference.

Workorder Comments

Holding times are displayed as "---" if no guidance exists from CCME, Canadian provinces, or broadly recognized international references.

Summary of Outliers

Outliers : Quality Control Samples

- No Duplicate outliers occur.
- No Matrix Spike outliers occur.
- Method Blank value outliers occur - please see following pages for full details.
- Laboratory Control Sample (LCS) outliers occur - please see following pages for full details.
- No Test sample Surrogate recovery outliers exist.

Outliers: Reference Material (RM) Samples

- No Reference Material (RM) Sample outliers occur.

Outliers : Analysis Holding Time Compliance (Breaches)

- Analysis Holding Time Outliers exist - please see following pages for full details.

Outliers : Frequency of Quality Control Samples

- Quality Control Sample Frequency Outliers occur - please see following pages for full details.

Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **Water**

Analyte Group	Laboratory sample ID	Client/Ref Sample ID	Analyte	CAS Number	Method	Result	Limits	Comment
Method Blank (MB) Values								
Polycyclic Aromatic Hydrocarbons	QC-MRG4-724802001	----	benzo(a)pyrene	50-32-8	E655A	<0.040 µg/L RRQC	0.02 µg/L	Blank result exceeds permitted value

Result Qualifiers

Qualifier	Description
RRQC	*Refer to report comments for information regarding this QC result.*

Laboratory Control Sample (LCS) Recoveries								
Semi-Volatile Organics	QC-MRG4-724802002	----	dichlorobenzidine, 3,3'-	91-94-1	E655A	25.6 % RRQC	30.0-130%	Recovery less than lower control limit
Chlorinated Phenolics	QC-MRG4-724802002	----	pentachlorophenol [PCP]	87-86-5	E655A	148 % LCS-H	50.0-140%	Recovery greater than upper control limit
Non-Chlorinated Phenolics	QC-MRG4-724802002	----	dinitrophenol, 2,4-	51-28-5	E655A	174 % LCS-H	50.0-140%	Recovery greater than upper control limit

Result Qualifiers

Qualifier	Description
LCS-H	*Lab Control Sample recovery was above ALS DQO. Non-detected sample results are considered reliable. Other results, if reported, have been qualified.*
RRQC	*Refer to report comments for information regarding this QC result.*

Analysis Holding Time Compliance

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times, which are selected to meet known provincial and /or federal requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by organizations such as CCME, US EPA, APHA Standard Methods, ASTM, or Environment Canada (where available). Dates and holding times reported below represent the first dates of extraction or analysis. If subsequent tests or dilutions exceeded holding times, qualifiers are added (refer to COA).

If samples are identified below as having been analyzed or extracted outside of recommended holding times, measurement uncertainties may be increased, and this should be taken into consideration when interpreting results.

Where actual sampling date is not provided on the chain of custody, the date of receipt with time at 00:00 is used for calculation purposes.

Where only the sample date without time is provided on the chain of custody, the sampling date at 00:00 is used for calculation purposes.

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Aggregate Organics : Tannin & Lignin in Water										
HDPE [ON MECP]										
GW-002	E563	26-Oct-2022	----	----	----		31-Oct-2022	28 days	5 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
GW-002	E298	26-Oct-2022	03-Nov-2022	----	----		04-Nov-2022	28 days	9 days	✓
Anions and Nutrients : Chloride in Water by IC										
HDPE [ON MECP]										
GW-002	E235.Cl	26-Oct-2022	03-Nov-2022	----	----		04-Nov-2022	28 days	9 days	✓
Anions and Nutrients : Fluoride in Water by IC										
HDPE [ON MECP]										
GW-002	E235.F	26-Oct-2022	03-Nov-2022	----	----		04-Nov-2022	28 days	9 days	✓
Anions and Nutrients : Nitrate in Water by IC										
HDPE [ON MECP]										
GW-002	E235.NO3	26-Oct-2022	03-Nov-2022	----	----		04-Nov-2022	7 days	9 days	× EHT
Anions and Nutrients : Nitrite in Water by IC										
HDPE [ON MECP]										
GW-002	E235.NO2	26-Oct-2022	03-Nov-2022	----	----		04-Nov-2022	7 days	9 days	× EHT
Anions and Nutrients : Sulfate in Water by IC										
HDPE [ON MECP]										
GW-002	E235.SO4	26-Oct-2022	03-Nov-2022	----	----		04-Nov-2022	28 days	9 days	✓

Matrix: **Water**

Evaluation: ✗ = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence (Low Level)										
Amber glass total (sulfuric acid) GW-002	E318	26-Oct-2022	04-Nov-2022	----	----		04-Nov-2022	28 days	9 days	✓
Chlorinated Phenolics : BNA (ON 625-511 list) by GC-MS										
Amber glass/Teflon lined cap GW-002	E655A	26-Oct-2022	01-Nov-2022	----	----		02-Nov-2022	----	----	
Chlorinated Phenolics : Phenolics (Ontario Chlorophenols List) by GC-MS										
Amber glass/Teflon lined cap GW-002	E651D	26-Oct-2022	01-Nov-2022	7 days	6 days	✓	02-Nov-2022	40 days	1 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) GW-001	E421	26-Oct-2022	31-Oct-2022	----	----		31-Oct-2022	180 days	5 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) GW-002	E421	26-Oct-2022	31-Oct-2022	----	----		31-Oct-2022	180 days	5 days	✓
Hydrocarbons : CCME PHC - F1 by Headspace GC-FID (Low Level)										
Glass vial (sodium bisulfate) GW-002	E581.F1-L	26-Oct-2022	03-Nov-2022	----	----		03-Nov-2022	14 days	8 days	✓
Hydrocarbons : Silica Gel Treated CCME PHCs - F2-F4sg by GC-FID										
Amber glass/Teflon lined cap (sodium bisulfate) GW-002	E601.SG	26-Oct-2022	02-Nov-2022	14 days	7 days	✓	08-Nov-2022	40 days	6 days	✓
Microbiological Tests : E. coli (MF-mFC-BCIG)										
Sterile HDPE (Sodium thiosulphate) [ON MECP] GW-002	E012A.EC	26-Oct-2022	----	----	----		29-Oct-2022	48 hrs	70 hrs	✗ EHTL
Microbiological Tests : Heterotrophic Plate Count by MF (MF-mHPC)										
Sterile HDPE (Sodium thiosulphate) [ON MECP] GW-002	E012.HPC	26-Oct-2022	----	----	----		29-Oct-2022	48 hrs	65 hrs	✗ EHTL

Matrix: **Water**

Evaluation: ✖ = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Microbiological Tests : Total Coliforms (MF-mEndo)										
Sterile HDPE (Sodium thiosulphate) [ON MECP]										
GW-002	E012.TC	26-Oct-2022	----	----	----		29-Oct-2022	48 hrs	65 hrs	✖ EHTL
Microbiological Tests : Total Coliforms Background (MF-mEndo)										
Sterile HDPE (Sodium thiosulphate) [ON MECP]										
GW-002	E012.BG.TC	26-Oct-2022	----	----	----		29-Oct-2022	48 hrs	65 hrs	✖ EHTL
Non-Chlorinated Phenolics : BNA (ON 625-511 list) by GC-MS										
Amber glass/Teflon lined cap										
GW-002	E655A	26-Oct-2022	01-Nov-2022	----	----		02-Nov-2022	----	----	
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (sulfuric acid)										
GW-002	E358-L	26-Oct-2022	31-Oct-2022	----	----		01-Nov-2022	28 days	6 days	✓
Pesticides : Miscellaneous Pesticides by GC-MS										
Amber glass/Teflon lined cap										
GW-002	E660E-H	26-Oct-2022	01-Nov-2022	14 days	6 days	✓	04-Nov-2022	40 days	3 days	✓
Phthalate Esters : BNA (ON 625-511 list) by GC-MS										
Amber glass/Teflon lined cap										
GW-002	E655A	26-Oct-2022	01-Nov-2022	----	----		02-Nov-2022	----	----	
Physical Tests : Alkalinity Species by Titration										
HDPE [ON MECP]										
GW-002	E290	26-Oct-2022	03-Nov-2022	----	----		04-Nov-2022	14 days	9 days	✓
Physical Tests : Colour (True) by Spectrometer (2 CU)										
HDPE [ON MECP]										
GW-002	E329-L	26-Oct-2022	01-Nov-2022	----	----		04-Nov-2022	48 hrs	121 hrs	✖ EHTL
Physical Tests : Conductivity in Water										
HDPE [ON MECP]										
GW-002	E100	26-Oct-2022	03-Nov-2022	----	----		04-Nov-2022	28 days	9 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : pH by Meter										
HDPE [ON MECP] GW-002	E108	26-Oct-2022	03-Nov-2022	----	----		04-Nov-2022	14 days	9 days	✓
Physical Tests : TDS by Gravimetry										
HDPE [ON MECP] GW-002	E162	26-Oct-2022	----	----	----		01-Nov-2022	7 days	6 days	✓
Physical Tests : Turbidity by Nephelometry										
HDPE [ON MECP] GW-002	E121	26-Oct-2022	----	----	----		29-Oct-2022	3 days	3 days	✓
Polycyclic Aromatic Hydrocarbons : BNA (ON 625-511 list) by GC-MS										
Amber glass/Teflon lined cap GW-002	E655A	26-Oct-2022	01-Nov-2022	----	----		02-Nov-2022	----	----	
Semi-Volatile Organics : BNA (ON 625-511 list) by GC-MS										
Amber glass/Teflon lined cap GW-002	E655A	26-Oct-2022	01-Nov-2022	7 days	6 days	✓	02-Nov-2022	40 days	1 days	✓
Total Sulfides : Total Sulfide by Colourimetry (Automated Flow)										
HDPE total (zinc acetate+sodium hydroxide) [ON MECP] GW-002	E395-H	26-Oct-2022	----	----	----		02-Nov-2022	7 days	7 days	✓
Volatile Organic Compounds : VOCs (Eastern Canada List) by Headspace GC-MS										
Glass vial (sodium bisulfate) GW-002	E611D	26-Oct-2022	03-Nov-2022	----	----		03-Nov-2022	14 days	8 days	✓

Legend & Qualifier Definitions

EHTL: Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.

EHT: Exceeded ALS recommended hold time prior to analysis.

Rec. HT: ALS recommended hold time (see units).

Quality Control Parameter Frequency Compliance

The following report summarizes the frequency of laboratory QC samples analyzed within the analytical batches (QC lots) in which the submitted samples were processed. The actual frequency should be greater than or equal to the expected frequency.

Matrix: **Water**

Evaluation: ✗ = QC frequency outside specification; ✓ = QC frequency within specification.

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Laboratory Duplicates (DUP)							
Alkalinity Species by Titration	E290	728619	1	14	7.1	5.0	✓
Ammonia by Fluorescence	E298	729135	1	19	5.2	5.0	✓
CCME PHC - F1 by Headspace GC-FID (Low Level)	E581.F1-L	727946	1	9	11.1	5.0	✓
Chloride in Water by IC	E235.Cl	728620	1	18	5.5	5.0	✓
Colour (True) by Spectrometer (2 CU)	E329-L	724671	1	12	8.3	5.0	✓
Conductivity in Water	E100	728617	1	16	6.2	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	722924	1	20	5.0	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	723366	1	20	5.0	5.0	✓
E. coli (MF-mFC-BCIG)	E012A.EC	721582	1	19	5.2	5.0	✓
Fluoride in Water by IC	E235.F	728623	1	1	100.0	5.0	✓
Heterotrophic Plate Count by MF (MF-mHPC)	E012.HPC	721178	0	4	0.0	5.0	✗
Nitrate in Water by IC	E235.NO3	728621	1	4	25.0	5.0	✓
Nitrite in Water by IC	E235.NO2	728622	1	4	25.0	5.0	✓
pH by Meter	E108	728618	1	20	5.0	5.0	✓
Sulfate in Water by IC	E235.SO4	728624	1	1	100.0	5.0	✓
Tannin & Lignin in Water	E563	722654	1	11	9.0	5.0	✓
TDS by Gravimetry	E162	724936	1	20	5.0	5.0	✓
Total Coliforms (MF-mEndo)	E012.TC	721298	0	3	0.0	5.0	✗
Total Coliforms Background (MF-mEndo)	E012.BG.TC	721299	0	1	0.0	5.0	✗
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	729132	1	16	6.2	5.0	✓
Total Sulfide by Colourimetry (Automated Flow)	E395-H	726653	1	6	16.6	5.0	✓
Turbidity by Nephelometry	E121	721148	1	4	25.0	5.0	✓
VOCs (Eastern Canada List) by Headspace GC-MS	E611D	727945	1	19	5.2	5.0	✓
Laboratory Control Samples (LCS)							
Alkalinity Species by Titration	E290	728619	1	14	7.1	5.0	✓
Ammonia by Fluorescence	E298	729135	1	19	5.2	5.0	✓
BNA (ON 625-511 list) by GC-MS	E655A	724805	1	2	50.0	5.0	✓
CCME PHC - F1 by Headspace GC-FID (Low Level)	E581.F1-L	727946	1	9	11.1	5.0	✓
Chloride in Water by IC	E235.Cl	728620	1	18	5.5	5.0	✓
Colour (True) by Spectrometer (2 CU)	E329-L	724671	1	12	8.3	5.0	✓
Conductivity in Water	E100	728617	1	16	6.2	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	722924	1	20	5.0	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	723366	1	20	5.0	5.0	✓
Fluoride in Water by IC	E235.F	728623	1	1	100.0	5.0	✓
Miscellaneous Pesticides by GC-MS	E660E-H	724791	1	4	25.0	5.0	✓
Nitrate in Water by IC	E235.NO3	728621	1	4	25.0	5.0	✓

Matrix: **Water**

Evaluation: × = QC frequency outside specification; ✓ = QC frequency within specification.

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Laboratory Control Samples (LCS) - Continued							
Nitrite in Water by IC	E235.NO2	728622	1	4	25.0	5.0	✓
pH by Meter	E108	728618	1	20	5.0	5.0	✓
Phenolics (Ontario Chlorophenols List) by GC-MS	E651D	724808	1	2	50.0	5.0	✓
Silica Gel Treated CCME PHCs - F2-F4sg by GC-FID	E601.SG	725959	1	13	7.6	5.0	✓
Sulfate in Water by IC	E235.SO4	728624	1	1	100.0	5.0	✓
Tannin & Lignin in Water	E563	722654	1	11	9.0	5.0	✓
TDS by Gravimetry	E162	724936	1	20	5.0	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	729132	1	16	6.2	5.0	✓
Total Sulfide by Colourimetry (Automated Flow)	E395-H	726653	1	6	16.6	5.0	✓
Turbidity by Nephelometry	E121	721148	1	4	25.0	5.0	✓
VOCs (Eastern Canada List) by Headspace GC-MS	E611D	727945	1	19	5.2	5.0	✓
Method Blanks (MB)							
Alkalinity Species by Titration	E290	728619	1	14	7.1	5.0	✓
Ammonia by Fluorescence	E298	729135	1	19	5.2	5.0	✓
BNA (ON 625-511 list) by GC-MS	E655A	724805	1	2	50.0	5.0	✓
CCME PHC - F1 by Headspace GC-FID (Low Level)	E581.F1-L	727946	1	9	11.1	5.0	✓
Chloride in Water by IC	E235.Cl	728620	1	18	5.5	5.0	✓
Colour (True) by Spectrometer (2 CU)	E329-L	724671	1	12	8.3	5.0	✓
Conductivity in Water	E100	728617	1	16	6.2	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	722924	1	20	5.0	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	723366	1	20	5.0	5.0	✓
E. coli (MF-mFC-BCIG)	E012A.EC	721582	1	19	5.2	5.0	✓
Fluoride in Water by IC	E235.F	728623	1	1	100.0	5.0	✓
Heterotrophic Plate Count by MF (MF-mHPC)	E012.HPC	721178	1	4	25.0	5.0	✓
Miscellaneous Pesticides by GC-MS	E660E-H	724791	1	4	25.0	5.0	✓
Nitrate in Water by IC	E235.NO3	728621	1	4	25.0	5.0	✓
Nitrite in Water by IC	E235.NO2	728622	1	4	25.0	5.0	✓
Phenolics (Ontario Chlorophenols List) by GC-MS	E651D	724808	1	2	50.0	5.0	✓
Silica Gel Treated CCME PHCs - F2-F4sg by GC-FID	E601.SG	725959	1	13	7.6	5.0	✓
Sulfate in Water by IC	E235.SO4	728624	1	1	100.0	5.0	✓
Tannin & Lignin in Water	E563	722654	1	11	9.0	5.0	✓
TDS by Gravimetry	E162	724936	1	20	5.0	5.0	✓
Total Coliforms (MF-mEndo)	E012.TC	721298	1	3	33.3	5.0	✓
Total Coliforms Background (MF-mEndo)	E012.BG.TC	721299	1	1	100.0	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	729132	1	16	6.2	5.0	✓
Total Sulfide by Colourimetry (Automated Flow)	E395-H	726653	1	6	16.6	5.0	✓
Turbidity by Nephelometry	E121	721148	1	4	25.0	5.0	✓
VOCs (Eastern Canada List) by Headspace GC-MS	E611D	727945	1	19	5.2	5.0	✓
Matrix Spikes (MS)							

Matrix: **Water**

Evaluation: × = *QC frequency outside specification*; ✓ = *QC frequency within specification.*

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Matrix Spikes (MS) - Continued							
Ammonia by Fluorescence	E298	729135	1	19	5.2	5.0	✓
CCME PHC - F1 by Headspace GC-FID (Low Level)	E581.F1-L	727946	1	9	11.1	5.0	✓
Chloride in Water by IC	E235.Cl	728620	1	18	5.5	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	722924	1	20	5.0	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	723366	1	20	5.0	5.0	✓
Fluoride in Water by IC	E235.F	728623	1	1	100.0	5.0	✓
Nitrate in Water by IC	E235.NO3	728621	1	4	25.0	5.0	✓
Nitrite in Water by IC	E235.NO2	728622	1	4	25.0	5.0	✓
Sulfate in Water by IC	E235.SO4	728624	1	1	100.0	5.0	✓
Tannin & Lignin in Water	E563	722654	1	11	9.0	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	729132	1	16	6.2	5.0	✓
Total Sulfide by Colourimetry (Automated Flow)	E395-H	726653	1	6	16.6	5.0	✓
VOCs (Eastern Canada List) by Headspace GC-MS	E611D	727945	1	19	5.2	5.0	✓

Methodology References and Summaries

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Reference methods may incorporate modifications to improve performance (indicated by "mod").

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Total Coliforms Background (MF-mEndo)	E012.BG.TC Waterloo - Environmental	Water	APHA 9222B (mod)	Noncoliform bacteria observed on Total Coliform plates are enumerated.
Heterotrophic Plate Count by MF (MF-mHPC)	E012.HPC Waterloo - Environmental	Water	SM 9215D	Following filtration (0.45 µm), and incubation at 35.0 ±0.5°C for 48 hours, the observed colonies are enumerated.
Total Coliforms (MF-mEndo)	E012.TC Waterloo - Environmental	Water	APHA 9222B (mod)	Following filtration (0.45 µm), and incubation at 35.0 ±0.5°C for 24 hours, colonies exhibiting characteristic morphology of the target organism are enumerated and confirmed.
E. coli (MF-mFC-BCIG)	E012A.EC Waterloo - Environmental	Water	ON E3433 (mod)	Following filtration (0.45 µm), and incubation at 44.5±0.2°C for 24 hours, colonies exhibiting characteristic morphology of the target organism are enumerated.
Conductivity in Water	E100 Waterloo - Environmental	Water	APHA 2510 (mod)	Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a water sample. Conductivity measurements are temperature-compensated to 25°C.
pH by Meter	E108 Waterloo - Environmental	Water	APHA 4500-H (mod)	pH is determined by potentiometric measurement with a pH electrode, and is conducted at ambient laboratory temperature (normally 20 ± 5°C). For high accuracy test results, pH should be measured in the field within the recommended 15 minute hold time.
Turbidity by Nephelometry	E121 Waterloo - Environmental	Water	APHA 2130 B (mod)	Turbidity is measured by the nephelometric method, by measuring the intensity of light scatter under defined conditions.
TDS by Gravimetry	E162 Waterloo - Environmental	Water	APHA 2540 C (mod)	Total Dissolved Solids (TDS) are determined by filtering a sample through a glass fibre filter, with evaporation of the filtrate at 180 ± 2°C for 16 hours or to constant weight, with gravimetric measurement of the residue.
Chloride in Water by IC	E235.Cl Waterloo - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Fluoride in Water by IC	E235.F Waterloo - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Nitrite in Water by IC	E235.NO2 Waterloo - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Nitrate in Water by IC	E235.NO3 Waterloo - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Sulfate in Water by IC	E235.SO4 Waterloo - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Alkalinity Species by Titration	E290 Waterloo - Environmental	Water	APHA 2320 B (mod)	Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.
Ammonia by Fluorescence	E298 Waterloo - Environmental	Water	Method Fialab 100, 2018	Ammonia in water is determined by automated continuous flow analysis with membrane diffusion and fluorescence detection, after reaction with OPA (ortho-phthalaldehyde). This method is approved under US EPA 40 CFR Part 136 (May 2021)
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318 Waterloo - Environmental	Water	Method Fialab 100, 2018	TKN in water is determined by automated continuous flow analysis with membrane diffusion and fluorescence detection, after reaction with OPA (ortho-phthalaldehyde). This method is approved under US EPA 40 CFR Part 136 (May 2021).
Colour (True) by Spectrometer (2 CU)	E329-L Waterloo - Environmental	Water	APHA 2120 C (mod)	Colour (True Colour) is determined by filtering a sample through a 0.45 micron membrane filter followed by analysis of the filtrate using the platinum-cobalt colourimetric method. Colour measurements can be highly pH dependent, and apply to the pH of the sample as received (at time of testing), without pH adjustment.
Dissolved Organic Carbon by Combustion (Low Level)	E358-L Waterloo - Environmental	Water	APHA 5310 B (mod)	Dissolved Organic Carbon (Non-Purgeable), also known as NPOC (dissolved), is a direct measurement of DOC after a filtered (0.45 micron) sample has been acidified and purged to remove inorganic carbon (IC). Analysis is by high temperature combustion with infrared detection of CO2. NPOC does not include volatile organic species that are purged off with IC. For samples where the majority of DC (dissolved carbon) is comprised of IC (which is common), this method is more accurate and more reliable than the DOC by subtraction method (i.e. DC minus DIC).
Total Sulfide by Colourimetry (Automated Flow)	E395-H Vancouver - Environmental	Water	APHA 4500 -S E-Auto-Colorimetry	Sulfide is determined using the gas dialysis automated methlyene blue colourimetric method. Results expressed "as H2S" if reported represent the maximum possible H2S concentration based on the total sulfide concentration in the sample. The H2S calculation converts Total Sulphide as (S2-) and reports it as Total Sulphide as (H2S)
Dissolved Metals in Water by CRC ICPMS	E421 Waterloo - Environmental	Water	APHA 3030B/EPA 6020B (mod)	Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by Collision/Reaction Cell ICPMS. Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Tannin & Lignin in Water	E563 Waterloo - Environmental	Water	APHA 5550 B-Colorimetry	This analysis is carried out using procedures adapted from APHA Method 5550 B. "Tannin & Lignin ". Both lignin and tannin contain aromatic hydroxyl groups that react with Folin phenol reagent (tungstophosphoric and molybdophosphoric acids) to form a blue color suitable for the estimation of tannin and lignin concentrations. However, the reaction is not specific for lignin or tannin, nor for compounds containing aromatic hydroxyl groups, in as much as many other reducing materials, both organic and inorganic, respond similarly.
CCME PHC - F1 by Headspace GC-FID (Low Level)	E581.F1-L Waterloo - Environmental	Water	CCME PHC in Soil - Tier 1	CCME Fraction 1 (F1) is analyzed by static headspace GC-FID. Samples are prepared in headspace vials and are heated and agitated on the headspace autosampler, causing VOCs to partition between the aqueous phase and the headspace in accordance with Henry's law.
Silica Gel Treated CCME PHCs - F2-F4sg by GC-FID	E601.SG Waterloo - Environmental	Water	CCME PHC in Soil - Tier 1	Sample extracts are subjected to in-situ silica gel treatment prior to analysis by GC-FID for CCME hydrocarbon fractions (F2-F4).
VOCs (Eastern Canada List) by Headspace GC-MS	E611D Waterloo - Environmental	Water	EPA 8260D (mod)	Volatile Organic Compounds (VOCs) are analyzed by static headspace GC-MS. Samples are prepared in headspace vials and are heated and agitated on the headspace autosampler, causing VOCs to partition between the aqueous phase and the headspace in accordance with Henry's law.
Phenolics (Ontario Chlorophenols List) by GC-MS	E651D Waterloo - Environmental	Water	EPA 8270E (mod)	Phenolics are analyzed by GC-MS.
BNA (ON 625-511 list) by GC-MS	E655A Waterloo - Environmental	Water	EPA 8270E (mod)	BNA are analyzed by GC-MS.
Miscellaneous Pesticides by GC-MS	E660E-H Waterloo - Environmental	Water	EPA 8270E (mod)	Pesticides are analyzed by GC-MS.
Dissolved Hardness (Calculated)	EC100 Waterloo - Environmental	Water	APHA 2340B	"Hardness (as CaCO3), dissolved" is calculated from the sum of dissolved Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. "Total Hardness" refers to the sum of Calcium and Magnesium Hardness. Hardness is normally or preferentially calculated from dissolved Calcium and Magnesium concentrations, because it is a property of water due to dissolved divalent cations.
Ion Balance using Dissolved Metals	EC101 Waterloo - Environmental	Water	APHA 1030E	Cation Sum, Anion Sum, and Ion Balance are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Dissolved species are used where available. Minor ions are included where data is present. Ion Balance cannot be calculated accurately for waters with very low electrical conductivity (EC).

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
F1-BTEX	EC580 Waterloo - Environmental	Water	CCME PHC in Soil - Tier 1	F1-BTEX is calculated as follows: F1-BTEX = F1 (C6-C10) minus benzene, toluene, ethylbenzene and xylenes (BTEX).
SUM F1 to F4 where F2-F4 is SG treated	EC581SG Waterloo - Environmental	Water	CCME PHC in Soil - Tier 1	Hydrocarbons, total (C6-C50) is the sum of CCME Fraction F1(C6-C10), F2(C10-C16), F3(C16-C34), and F4(C34-C50), where F2-F4 have been treated with silica gel. F4G-sg is not used within this calculation due to overlap with other fractions.
F2-F4 (sg) minus PAH	EC600SG Waterloo - Environmental	Water	CCME PHC in Soil - Tier 1	F2-F4 (sg) minus PAH is calculated as follows: F2-F4 minus PAH = Sum of CCME Fraction 2 (C10-C16), CCME Fraction 3 (C16-C34), and CCME Fraction 4 (C34-C50), minus select Polycyclic Aromatic Hydrocarbons (PAH).

Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Preparation for Ammonia	EP298 Waterloo - Environmental	Water		Sample preparation for Preserved Nutrients Water Quality Analysis.
Digestion for TKN in water	EP318 Waterloo - Environmental	Water	APHA 4500-Norg D (mod)	Samples are digested at high temperature using Sulfuric Acid with Copper catalyst, which converts organic nitrogen sources to Ammonia, which is then quantified by the analytical method as TKN. This method is unsuitable for samples containing high levels of nitrate. If nitrate exceeds TKN concentration by ten times or more, results may be biased low.
Preparation for Dissolved Organic Carbon for Combustion	EP358 Waterloo - Environmental	Water	APHA 5310 B (mod)	Preparation for Dissolved Organic Carbon
Dissolved Metals Water Filtration	EP421 Waterloo - Environmental	Water	APHA 3030B	Water samples are filtered (0.45 um), and preserved with HNO3.
VOCs Preparation for Headspace Analysis	EP581 Waterloo - Environmental	Water	EPA 5021A (mod)	Samples are prepared in headspace vials and are heated and agitated on the headspace autosampler. An aliquot of the headspace is then injected into the GC/MS-FID system.
PHCs and PAHs Hexane Extraction	EP601 Waterloo - Environmental	Water	EPA 3511 (mod)	Petroleum Hydrocarbons (PHCs) and Polycyclic Aromatic Hydrocarbons (PAHs) are extracted using a hexane liquid-liquid extraction.
Phenolics Extraction	EP651 Waterloo - Environmental	Water	EPA 3511 (mod)	Phenolics are extracted from acidic aqueous sample using DCM liquid-liquid extraction.

Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
BNA Extraction	EP655 Waterloo - Environmental	Water	EPA 3510C (mod)	SVOCs are extracted from aqueous sample using DCM liquid-liquid extraction.
Pesticides & Toxaphene Extraction by DCM	EP660D Waterloo - Environmental	Water	EPA 1699 (mod)	Samples are extracted from aqueous sample using DCM liquid-liquid extraction.

QUALITY CONTROL REPORT

Work Order	: **WT2219921**	Page	: 1 of 19
Client	: GHD Limited	Laboratory	: Waterloo - Environmental
Contact	: Pascal Renella	Account Manager	: Rick Hawthorne
Address	: 455 Phillip Street Waterloo ON Canada N2L 3X2	Address	: 60 Northland Road, Unit 1 Waterloo, Ontario Canada N2V 2B8
Telephone	:	Telephone	: +1 519 886 6910
Project	: 12586015-03.004	Date Samples Received	: 28-Oct-2022 10:00
PO	: 735-003748-1	Date Analysis Commenced	: 29-Oct-2022
C-O-C number	: ----	Issue Date	: 09-Nov-2022 09:28
Sampler	: ---- 519 725 3313		
Site	: ----		
Quote number	: 12586015-SSOW-735-003748-1		
No. of samples received	: 2		
No. of samples analysed	: 2		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percent Difference (RPD) and Data Quality Objectives
- Matrix Spike (MS) Report; Recovery and Data Quality Objectives
- Method Blank (MB) Report; Recovery and Data Quality Objectives
- Laboratory Control Sample (LCS) Report; Recovery and Data Quality Objectives

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Amanda Ganouri-Lumsden	Department Manager - Microbiology and Prep	Waterloo Microbiology, Waterloo, Ontario
Andrea Armstrong	Department Manager - Air Quality and Volatiles	Waterloo Organics, Waterloo, Ontario
Danielle Gravel	Team Leader - Semi-Volatile Instrumentation	Waterloo Organics, Waterloo, Ontario
Greg Pokocky	Supervisor - Inorganic	Waterloo Inorganics, Waterloo, Ontario
Jeremy Gingras	Team Leader - Semi-Volatile Instrumentation	Waterloo Organics, Waterloo, Ontario
Jon Fisher	Department Manager - Inorganics	Waterloo Inorganics, Waterloo, Ontario
Jon Fisher	Department Manager - Inorganics	Waterloo Metals, Waterloo, Ontario
Lindsay Gung	Supervisor - Water Chemistry	Vancouver Inorganics, Burnaby, British Columbia
Ruby Sujeepan		Waterloo Microbiology, Waterloo, Ontario

General Comments

The ALS Quality Control (QC) report is optionally provided to ALS clients upon request. ALS test methods include comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against predetermined Data Quality Objectives (DQOs) to provide confidence in the accuracy of associated test results. This report contains detailed results for all QC results applicable to this sample submission. Please refer to the ALS Quality Control Interpretation report (QCI) for applicable method references and methodology summaries.

Key :

Anonymous = Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number = Chemical Abstracts Service number is a unique identifier assigned to discrete substances.
DQO = Data Quality Objective.
LOR = Limit of Reporting (detection limit).
RPD = Relative Percent Difference
# = Indicates a QC result that did not meet the ALS DQO.

Workorder Comments

Holding times are displayed as "---" if no guidance exists from CCME, Canadian provinces, or broadly recognized international references.

Laboratory Duplicate (DUP) Report

A Laboratory Duplicate (DUP) is a randomly selected intralaboratory replicate sample. Laboratory Duplicates provide information regarding method precision and sample heterogeneity. ALS DQOs for Laboratory Duplicates are expressed as test-specific limits for Relative Percent Difference (RPD), or as an absolute difference limit of 2 times the LOR for low concentration duplicates within ~ 4-10 times the LOR (cut-off is test-specific).

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Physical Tests (QC Lot: 721148)											
WT2219921-001	GW-002	turbidity	----	E121	0.10	NTU	1.04	0.96	0.08	Diff <2x LOR	----
Physical Tests (QC Lot: 724671)											
WT2219921-001	GW-002	colour, true	----	E329-L	2.0	CU	2.4	3.5	1.1	Diff <2x LOR	----
Physical Tests (QC Lot: 724936)											
WT2219751-001	Anonymous	solids, total dissolved [TDS]	----	E162	20	mg/L	666	676	1.42%	20%	----
Physical Tests (QC Lot: 728617)											
WT2219438-001	Anonymous	conductivity	----	E100	2.0	µS/cm	1590	1580	0.316%	10%	----
Physical Tests (QC Lot: 728618)											
WT2219438-001	Anonymous	pH	----	E108	0.10	pH units	7.12	7.19	0.978%	4%	----
Physical Tests (QC Lot: 728619)											
WT2219438-001	Anonymous	alkalinity, total (as CaCO3)	----	E290	2.0	mg/L	602	610	1.40%	20%	----
Anions and Nutrients (QC Lot: 728620)											
WT2219921-001	GW-002	chloride	16887-00-6	E235.Cl	2.50	mg/L	208	208	0.360%	20%	----
Anions and Nutrients (QC Lot: 728621)											
WT2219921-001	GW-002	nitrate (as N)	14797-55-8	E235.NO3	0.100	mg/L	<0.100	<0.100	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 728622)											
WT2219921-001	GW-002	nitrite (as N)	14797-65-0	E235.NO2	0.050	mg/L	<0.050	<0.050	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 728623)											
WT2219921-001	GW-002	fluoride	16984-48-8	E235.F	0.100	mg/L	<0.100	<0.100	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 728624)											
WT2219921-001	GW-002	sulfate (as SO4)	14808-79-8	E235.SO4	1.50	mg/L	111	110	0.639%	20%	----
Anions and Nutrients (QC Lot: 729132)											
TY2203479-002	Anonymous	Kjeldahl nitrogen, total [TKN]	----	E318	0.050	mg/L	1.32	1.44	9.03%	20%	----
Anions and Nutrients (QC Lot: 729135)											
WT2219765-001	Anonymous	ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L	0.144	0.148	2.75%	20%	----
Organic / Inorganic Carbon (QC Lot: 723366)											
WT2219419-001	Anonymous	carbon, dissolved organic [DOC]	----	E358-L	0.50	mg/L	<0.50	<0.50	0	Diff <2x LOR	----
Total Sulfides (QC Lot: 726653)											
WT2219921-001	GW-002	sulfide, total (as S)	18496-25-8	E395-H	0.010	mg/L	<0.010	<0.010	0	Diff <2x LOR	----
Microbiological Tests (QC Lot: 721582)											

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Microbiological Tests (QC Lot: 721582) - continued											
WT2220039-011	Anonymous	coliforms, Escherichia coli [E. coli]	----	E012A.EC	1	CFU/100mL	<1	<1	0	Diff <2x LOR	----
Dissolved Metals (QC Lot: 722924)											
WT2219765-001	Anonymous	aluminum, dissolved	7429-90-5	E421	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	----
		antimony, dissolved	7440-36-0	E421	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		arsenic, dissolved	7440-38-2	E421	0.00010	mg/L	0.00579	0.00590	1.74%	20%	----
		barium, dissolved	7440-39-3	E421	0.00010	mg/L	0.0348	0.0340	2.32%	20%	----
		beryllium, dissolved	7440-41-7	E421	0.000020	mg/L	<0.000020	<0.000020	0	Diff <2x LOR	----
		boron, dissolved	7440-42-8	E421	0.010	mg/L	0.110	0.116	4.86%	20%	----
		cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L	<0.0000050	<0.0000050	0	Diff <2x LOR	----
		calcium, dissolved	7440-70-2	E421	0.050	mg/L	39.1	41.1	5.12%	20%	----
		chromium, dissolved	7440-47-3	E421	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		cobalt, dissolved	7440-48-4	E421	0.00010	mg/L	0.00015	0.00014	0.000004	Diff <2x LOR	----
		copper, dissolved	7440-50-8	E421	0.00020	mg/L	0.00076	0.00077	0.000008	Diff <2x LOR	----
		lead, dissolved	7439-92-1	E421	0.000050	mg/L	0.000140	0.000136	0.000004	Diff <2x LOR	----
		magnesium, dissolved	7439-95-4	E421	0.0050	mg/L	16.4	16.3	0.745%	20%	----
		manganese, dissolved	7439-96-5	E421	0.00010	mg/L	0.00888	0.00882	0.715%	20%	----
		molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L	0.0104	0.0103	1.68%	20%	----
		nickel, dissolved	7440-02-0	E421	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		potassium, dissolved	7440-09-7	E421	0.050	mg/L	0.908	0.900	0.941%	20%	----
		selenium, dissolved	7782-49-2	E421	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		silver, dissolved	7440-22-4	E421	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		sodium, dissolved	7440-23-5	E421	0.050	mg/L	36.1	36.1	0.133%	20%	----
		strontium, dissolved	7440-24-6	E421	0.00020	mg/L	1.06	1.03	2.57%	20%	----
		thallium, dissolved	7440-28-0	E421	0.000010	mg/L	0.000028	0.000025	0.000002	Diff <2x LOR	----
		uranium, dissolved	7440-61-1	E421	0.000010	mg/L	0.000271	0.000264	2.50%	20%	----
		vanadium, dissolved	7440-62-2	E421	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		zinc, dissolved	7440-66-6	E421	0.0010	mg/L	0.0165	0.0164	0.627%	20%	----
Aggregate Organics (QC Lot: 722654)											
VA22C5934-004	Anonymous	tannin + lignin (as tannic acid)	----	E563	0.10	mg/L	3.42	3.44	0.737%	20%	----
Volatile Organic Compounds (QC Lot: 727945)											
WT2219921-001	GW-002	Acetone	67-64-1	E611D	20	µg/L	<20	<20	0	Diff <2x LOR	----
		benzene	71-43-2	E611D	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
		bromodichloromethane	75-27-4	E611D	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
		bromoform	75-25-2	E611D	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Volatile Organic Compounds (QC Lot: 727945) - continued											
WT2219921-001	GW-002	bromomethane	74-83-9	E611D	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
		carbon tetrachloride	56-23-5	E611D	0.20	µg/L	<0.20	<0.20	0	Diff <2x LOR	----
		chlorobenzene	108-90-7	E611D	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
		chloroform	67-66-3	E611D	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
		dibromochloromethane	124-48-1	E611D	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
		dibromoethane, 1,2-	106-93-4	E611D	0.20	µg/L	<0.20	<0.20	0	Diff <2x LOR	----
		dichlorobenzene, 1,2-	95-50-1	E611D	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
		dichlorobenzene, 1,3-	541-73-1	E611D	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
		dichlorobenzene, 1,4-	106-46-7	E611D	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
		dichlorodifluoromethane	75-71-8	E611D	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
		dichloroethane, 1,1-	75-34-3	E611D	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
		dichloroethane, 1,2-	107-06-2	E611D	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
		dichloroethylene, 1,1-	75-35-4	E611D	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
		dichloroethylene, cis-1,2-	156-59-2	E611D	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
		dichloroethylene, trans-1,2-	156-60-5	E611D	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
		dichloromethane	75-09-2	E611D	1.0	µg/L	<1.0	<1.0	0	Diff <2x LOR	----
		dichloropropane, 1,2-	78-87-5	E611D	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
		dichloropropylene, cis-1,3-	10061-01-5	E611D	0.30	µg/L	<0.30	<0.30	0	Diff <2x LOR	----
		dichloropropylene, trans-1,3-	10061-02-6	E611D	0.30	µg/L	<0.30	<0.30	0	Diff <2x LOR	----
		ethylbenzene	100-41-4	E611D	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
		hexane, n-	110-54-3	E611D	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
		methyl ethyl ketone [MEK]	78-93-3	E611D	20	µg/L	<20	<20	0	Diff <2x LOR	----
		methyl isobutyl ketone [MIBK]	108-10-1	E611D	20	µg/L	<20	<20	0	Diff <2x LOR	----
		methyl-tert-butyl ether [MTBE]	1634-04-4	E611D	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
		styrene	100-42-5	E611D	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
		tetrachloroethane, 1,1,1,2-	630-20-6	E611D	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
		tetrachloroethane, 1,1,2,2-	79-34-5	E611D	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
		tetrachloroethylene	127-18-4	E611D	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
		toluene	108-88-3	E611D	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
		trichloroethane, 1,1,1-	71-55-6	E611D	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
		trichloroethane, 1,1,2-	79-00-5	E611D	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
		trichloroethylene	79-01-6	E611D	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
		trichlorofluoromethane	75-69-4	E611D	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
		vinyl chloride	75-01-4	E611D	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Volatile Organic Compounds (QC Lot: 727945) - continued											
WT2219921-001	GW-002	xylene, m+p-	179601-23-1	E611D	0.40	µg/L	<0.40	<0.40	0	Diff <2x LOR	----
		xylene, o-	95-47-6	E611D	0.30	µg/L	<0.30	<0.30	0	Diff <2x LOR	----
Hydrocarbons (QC Lot: 727946)											
WT2219921-001	GW-002	F1 (C6-C10)	----	E581.F1-L	25	µg/L	<25	<25	0	Diff <2x LOR	----

Method Blank (MB) Report

A Method Blank is an analyte-free matrix that undergoes sample processing identical to that carried out for test samples. Method Blank results are used to monitor and control for potential contamination from the laboratory environment and reagents. For most tests, the DQO for Method Blanks is for the result to be < LOR.

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Physical Tests (QCLot: 721148)						
turbidity	----	E121	0.1	NTU	<0.10	----
Physical Tests (QCLot: 724671)						
colour, true	----	E329-L	2	CU	<2.0	----
Physical Tests (QCLot: 724936)						
solids, total dissolved [TDS]	----	E162	10	mg/L	<10	----
Physical Tests (QCLot: 728617)						
conductivity	----	E100	1	µS/cm	<1.0	----
Physical Tests (QCLot: 728619)						
alkalinity, total (as CaCO3)	----	E290	1	mg/L	1.1	----
Anions and Nutrients (QCLot: 728620)						
chloride	16887-00-6	E235.Cl	0.5	mg/L	<0.50	----
Anions and Nutrients (QCLot: 728621)						
nitrate (as N)	14797-55-8	E235.NO3	0.02	mg/L	<0.020	----
Anions and Nutrients (QCLot: 728622)						
nitrite (as N)	14797-65-0	E235.NO2	0.01	mg/L	<0.010	----
Anions and Nutrients (QCLot: 728623)						
fluoride	16984-48-8	E235.F	0.02	mg/L	<0.020	----
Anions and Nutrients (QCLot: 728624)						
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	<0.30	----
Anions and Nutrients (QCLot: 729132)						
Kjeldahl nitrogen, total [TKN]	----	E318	0.05	mg/L	<0.050	----
Anions and Nutrients (QCLot: 729135)						
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	<0.0050	----
Organic / Inorganic Carbon (QCLot: 723366)						
carbon, dissolved organic [DOC]	----	E358-L	0.5	mg/L	<0.50	----
Total Sulfides (QCLot: 726653)						
sulfide, total (as S)	18496-25-8	E395-H	0.01	mg/L	<0.010	----
Microbiological Tests (QCLot: 721178)						
heterotrophic plate count [HPC]	----	E012.HPC	1	CFU/1mL	<1	----
Microbiological Tests (QCLot: 721298)						
coliforms, total	----	E012.TC	1	CFU/100mL	<1	----
Microbiological Tests (QCLot: 721299)						

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Microbiological Tests (QCLot: 721299) - continued						
coliforms, total background	----	E012.BG.TC	1	CFU/100mL	<1	----
Microbiological Tests (QCLot: 721582)						
coliforms, Escherichia coli [E. coli]	----	E012A.EC	1	CFU/100mL	<1	----
Dissolved Metals (QCLot: 722924)						
aluminum, dissolved	7429-90-5	E421	0.001	mg/L	<0.0010	----
antimony, dissolved	7440-36-0	E421	0.0001	mg/L	<0.00010	----
arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	<0.00010	----
barium, dissolved	7440-39-3	E421	0.0001	mg/L	<0.00010	----
beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	<0.000020	----
boron, dissolved	7440-42-8	E421	0.01	mg/L	<0.010	----
cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	<0.0000050	----
calcium, dissolved	7440-70-2	E421	0.05	mg/L	<0.050	----
chromium, dissolved	7440-47-3	E421	0.0005	mg/L	<0.00050	----
cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	<0.00010	----
copper, dissolved	7440-50-8	E421	0.0002	mg/L	<0.00020	----
lead, dissolved	7439-92-1	E421	0.00005	mg/L	<0.000050	----
magnesium, dissolved	7439-95-4	E421	0.005	mg/L	<0.0050	----
manganese, dissolved	7439-96-5	E421	0.0001	mg/L	<0.00010	----
molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	<0.000050	----
nickel, dissolved	7440-02-0	E421	0.0005	mg/L	<0.00050	----
potassium, dissolved	7440-09-7	E421	0.05	mg/L	<0.050	----
selenium, dissolved	7782-49-2	E421	0.00005	mg/L	<0.000050	----
silver, dissolved	7440-22-4	E421	0.00001	mg/L	<0.000010	----
sodium, dissolved	7440-23-5	E421	0.05	mg/L	<0.050	----
strontium, dissolved	7440-24-6	E421	0.0002	mg/L	<0.00020	----
thallium, dissolved	7440-28-0	E421	0.00001	mg/L	<0.000010	----
uranium, dissolved	7440-61-1	E421	0.00001	mg/L	<0.000010	----
vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	<0.00050	----
zinc, dissolved	7440-66-6	E421	0.001	mg/L	<0.0010	----
Aggregate Organics (QCLot: 722654)						
tannin + lignin (as tannic acid)	----	E563	0.1	mg/L	<0.10	----
Volatile Organic Compounds (QCLot: 727945)						
Acetone	67-64-1	E611D	20	µg/L	<20	----
benzene	71-43-2	E611D	0.5	µg/L	<0.50	----
bromodichloromethane	75-27-4	E611D	0.5	µg/L	<0.50	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Volatile Organic Compounds (QCLot: 727945) - continued						
bromoform	75-25-2	E611D	0.5	µg/L	<0.50	----
bromomethane	74-83-9	E611D	0.5	µg/L	<0.50	----
carbon tetrachloride	56-23-5	E611D	0.2	µg/L	<0.20	----
chlorobenzene	108-90-7	E611D	0.5	µg/L	<0.50	----
chloroform	67-66-3	E611D	0.5	µg/L	<0.50	----
dibromochloromethane	124-48-1	E611D	0.5	µg/L	<0.50	----
dibromoethane, 1,2-	106-93-4	E611D	0.2	µg/L	<0.20	----
dichlorobenzene, 1,2-	95-50-1	E611D	0.5	µg/L	<0.50	----
dichlorobenzene, 1,3-	541-73-1	E611D	0.5	µg/L	<0.50	----
dichlorobenzene, 1,4-	106-46-7	E611D	0.5	µg/L	<0.50	----
dichlorodifluoromethane	75-71-8	E611D	0.5	µg/L	<0.50	----
dichloroethane, 1,1-	75-34-3	E611D	0.5	µg/L	<0.50	----
dichloroethane, 1,2-	107-06-2	E611D	0.5	µg/L	<0.50	----
dichloroethylene, 1,1-	75-35-4	E611D	0.5	µg/L	<0.50	----
dichloroethylene, cis-1,2-	156-59-2	E611D	0.5	µg/L	<0.50	----
dichloroethylene, trans-1,2-	156-60-5	E611D	0.5	µg/L	<0.50	----
dichloromethane	75-09-2	E611D	1	µg/L	<1.0	----
dichloropropane, 1,2-	78-87-5	E611D	0.5	µg/L	<0.50	----
dichloropropylene, cis-1,3-	10061-01-5	E611D	0.3	µg/L	<0.30	----
dichloropropylene, trans-1,3-	10061-02-6	E611D	0.3	µg/L	<0.30	----
ethylbenzene	100-41-4	E611D	0.5	µg/L	<0.50	----
hexane, n-	110-54-3	E611D	0.5	µg/L	<0.50	----
methyl ethyl ketone [MEK]	78-93-3	E611D	20	µg/L	<20	----
methyl isobutyl ketone [MIBK]	108-10-1	E611D	20	µg/L	<20	----
methyl-tert-butyl ether [MTBE]	1634-04-4	E611D	0.5	µg/L	<0.50	----
styrene	100-42-5	E611D	0.5	µg/L	<0.50	----
tetrachloroethane, 1,1,1,2-	630-20-6	E611D	0.5	µg/L	<0.50	----
tetrachloroethane, 1,1,2,2-	79-34-5	E611D	0.5	µg/L	<0.50	----
tetrachloroethylene	127-18-4	E611D	0.5	µg/L	<0.50	----
toluene	108-88-3	E611D	0.5	µg/L	<0.50	----
trichloroethane, 1,1,1-	71-55-6	E611D	0.5	µg/L	<0.50	----
trichloroethane, 1,1,2-	79-00-5	E611D	0.5	µg/L	<0.50	----
trichloroethylene	79-01-6	E611D	0.5	µg/L	<0.50	----
trichlorofluoromethane	75-69-4	E611D	0.5	µg/L	<0.50	----
vinyl chloride	75-01-4	E611D	0.5	µg/L	<0.50	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Volatile Organic Compounds (QCLot: 727945) - continued						
xylene, m+p-	179601-23-1	E611D	0.4	µg/L	<0.40	----
xylene, o-	95-47-6	E611D	0.3	µg/L	<0.30	----
Hydrocarbons (QCLot: 725959)						
F2 (C10-C16)	----	E601.SG	100	µg/L	<100	----
F3 (C16-C34)	----	E601.SG	250	µg/L	<250	----
F4 (C34-C50)	----	E601.SG	250	µg/L	<250	----
Hydrocarbons (QCLot: 727946)						
F1 (C6-C10)	----	E581.F1-L	25	µg/L	<25	----
Polycyclic Aromatic Hydrocarbons (QCLot: 724805)						
acenaphthene	83-32-9	E655A	0.2	µg/L	<0.20	----
acenaphthylene	208-96-8	E655A	0.2	µg/L	<0.20	----
anthracene	120-12-7	E655A	0.2	µg/L	<0.20	----
benz(a)anthracene	56-55-3	E655A	0.2	µg/L	<0.20	----
benzo(a)pyrene	50-32-8	E655A	0.02	µg/L	# <0.040	RRQC
benzo(b+j)fluoranthene	n/a	E655A	0.1	µg/L	<0.10	----
benzo(g,h,i)perylene	191-24-2	E655A	0.2	µg/L	<0.20	----
benzo(k)fluoranthene	207-08-9	E655A	0.1	µg/L	<0.10	----
chrysene	218-01-9	E655A	0.1	µg/L	<0.10	----
dibenz(a,h)anthracene	53-70-3	E655A	0.2	µg/L	<0.20	----
fluoranthene	206-44-0	E655A	0.2	µg/L	<0.20	----
fluorene	86-73-7	E655A	0.2	µg/L	<0.20	----
indeno(1,2,3-c,d)pyrene	193-39-5	E655A	0.2	µg/L	<0.20	----
methylnaphthalene, 1-	90-12-0	E655A	0.4	µg/L	<0.40	----
methylnaphthalene, 2-	91-57-6	E655A	0.4	µg/L	<0.40	----
naphthalene	91-20-3	E655A	0.2	µg/L	<0.20	----
phenanthrene	85-01-8	E655A	0.2	µg/L	<0.20	----
pyrene	129-00-0	E655A	0.2	µg/L	<0.20	----
Phthalate Esters (QCLot: 724805)						
bis(2-ethylhexyl) phthalate [DEHP]	117-81-7	E655A	2	µg/L	<2.0	----
diethyl phthalate	84-66-2	E655A	0.2	µg/L	<0.20	----
dimethyl phthalate	131-11-3	E655A	0.2	µg/L	<0.20	----
Semi-Volatile Organics (QCLot: 724805)						
biphenyl	92-52-4	E655A	0.4	µg/L	<0.40	----
bis(2-chloroethyl) ether	111-44-4	E655A	0.4	µg/L	<0.40	----
bis(2-chloroisopropyl) ether	39638-32-9	E655A	0.4	µg/L	<0.40	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Semi-Volatile Organics (QCLot: 724805) - continued						
chloroaniline, 4-	106-47-8	E655A	0.4	µg/L	<0.40	----
dichlorobenzidine, 3,3'-	91-94-1	E655A	0.4	µg/L	<0.40	----
dinitrotoluene, 2,4-	121-14-2	E655A	0.4	µg/L	<0.40	----
dinitrotoluene, 2,6-	606-20-2	E655A	0.4	µg/L	<0.40	----
trichlorobenzene, 1,2,4-	120-82-1	E655A	0.4	µg/L	<0.40	----
Chlorinated Phenolics (QCLot: 724805)						
chlorophenol, 2-	95-57-8	E655A	0.3	µg/L	<0.30	----
dichlorophenol, 2,4-	120-83-2	E655A	0.3	µg/L	<0.30	----
pentachlorophenol [PCP]	87-86-5	E655A	0.5	µg/L	<0.50	----
trichlorophenol, 2,4,5-	95-95-4	E655A	0.2	µg/L	<0.20	----
trichlorophenol, 2,4,6-	88-06-2	E655A	0.2	µg/L	<0.20	----
Chlorinated Phenolics (QCLot: 724808)						
tetrachlorophenol, 2,3,4,6-	58-90-2	E651D	0.5	µg/L	<0.50	----
Non-Chlorinated Phenolics (QCLot: 724805)						
dimethylphenol, 2,4-	105-67-9	E655A	0.5	µg/L	<0.50	----
dinitrophenol, 2,4-	51-28-5	E655A	1	µg/L	<1.0	----
phenol	108-95-2	E655A	0.5	µg/L	<0.50	----
Pesticides (QCLot: 724791)						
diazinon	333-41-5	E660E-H	0.1	µg/L	<0.10	----

Laboratory Control Sample (LCS) Report

A Laboratory Control Sample (LCS) is an analyte-free matrix that has been fortified (spiked) with test analytes at known concentration and processed in an identical manner to test samples. LCS results are expressed as percent recovery, and are used to monitor and control test method accuracy and precision, independent of test sample matrix.

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Physical Tests (QCLot: 721148)									
turbidity	----	E121	0.1	NTU	200 NTU	92.4	85.0	115	----
Physical Tests (QCLot: 724671)									
colour, true	----	E329-L	2	CU	25 CU	97.6	85.0	115	----
Physical Tests (QCLot: 724936)									
solids, total dissolved [TDS]	----	E162	10	mg/L	1000 mg/L	105	85.0	115	----
Physical Tests (QCLot: 728617)									
conductivity	----	E100	1	µS/cm	1409 µS/cm	100	90.0	110	----
Physical Tests (QCLot: 728618)									
pH	----	E108	----	pH units	7 pH units	100	98.0	102	----
Physical Tests (QCLot: 728619)									
alkalinity, total (as CaCO3)	----	E290	1	mg/L	150 mg/L	106	85.0	115	----
Anions and Nutrients (QCLot: 728620)									
chloride	16887-00-6	E235.Cl	0.5	mg/L	100 mg/L	101	90.0	110	----
Anions and Nutrients (QCLot: 728621)									
nitrate (as N)	14797-55-8	E235.NO3	0.02	mg/L	2.5 mg/L	101	90.0	110	----
Anions and Nutrients (QCLot: 728622)									
nitrite (as N)	14797-65-0	E235.NO2	0.01	mg/L	0.5 mg/L	100	90.0	110	----
Anions and Nutrients (QCLot: 728623)									
fluoride	16984-48-8	E235.F	0.02	mg/L	1 mg/L	101	90.0	110	----
Anions and Nutrients (QCLot: 728624)									
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	100 mg/L	102	90.0	110	----
Anions and Nutrients (QCLot: 729132)									
Kjeldahl nitrogen, total [TKN]	----	E318	0.05	mg/L	4 mg/L	108	75.0	125	----
Anions and Nutrients (QCLot: 729135)									
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	0.2 mg/L	95.2	85.0	115	----
Organic / Inorganic Carbon (QCLot: 723366)									
carbon, dissolved organic [DOC]	----	E358-L	0.5	mg/L	8.57 mg/L	105	80.0	120	----
Total Sulfides (QCLot: 726653)									
sulfide, total (as H2S)	7783-06-4	E395-H	----	mg/L	0.085 mg/L	103	80.0	120	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Laboratory Control Sample (LCS) Report: Spike Concentration	Recovery (%): LCS	Recovery Limits (%): Low	Recovery Limits (%): High	Qualifier
Total Sulfides (QCLot: 726653) - continued									
sulfide, total (as S)	18496-25-8	E395-H	0.01	mg/L	0.08 mg/L	102	80.0	120	----
Dissolved Metals (QCLot: 722924)									
aluminum, dissolved	7429-90-5	E421	0.001	mg/L	0.1 mg/L	99.3	80.0	120	----
antimony, dissolved	7440-36-0	E421	0.0001	mg/L	0.05 mg/L	97.3	80.0	120	----
arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	0.05 mg/L	103	80.0	120	----
barium, dissolved	7440-39-3	E421	0.0001	mg/L	0.0125 mg/L	100.0	80.0	120	----
beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	0.005 mg/L	92.8	80.0	120	----
boron, dissolved	7440-42-8	E421	0.01	mg/L	0.05 mg/L	91.1	80.0	120	----
cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	0.005 mg/L	102	80.0	120	----
calcium, dissolved	7440-70-2	E421	0.05	mg/L	2.5 mg/L	99.7	80.0	120	----
chromium, dissolved	7440-47-3	E421	0.0005	mg/L	0.0125 mg/L	96.6	80.0	120	----
cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	0.0125 mg/L	97.7	80.0	120	----
copper, dissolved	7440-50-8	E421	0.0002	mg/L	0.0125 mg/L	96.8	80.0	120	----
lead, dissolved	7439-92-1	E421	0.00005	mg/L	0.025 mg/L	104	80.0	120	----
magnesium, dissolved	7439-95-4	E421	0.005	mg/L	2.5 mg/L	103	80.0	120	----
manganese, dissolved	7439-96-5	E421	0.0001	mg/L	0.0125 mg/L	101	80.0	120	----
molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	0.0125 mg/L	96.6	80.0	120	----
nickel, dissolved	7440-02-0	E421	0.0005	mg/L	0.025 mg/L	98.3	80.0	120	----
potassium, dissolved	7440-09-7	E421	0.05	mg/L	2.5 mg/L	95.0	80.0	120	----
selenium, dissolved	7782-49-2	E421	0.00005	mg/L	0.05 mg/L	103	80.0	120	----
silver, dissolved	7440-22-4	E421	0.00001	mg/L	0.005 mg/L	100	80.0	120	----
sodium, dissolved	7440-23-5	E421	0.05	mg/L	2.5 mg/L	100	80.0	120	----
strontium, dissolved	7440-24-6	E421	0.0002	mg/L	0.0125 mg/L	100	80.0	120	----
thallium, dissolved	7440-28-0	E421	0.00001	mg/L	0.05 mg/L	101	80.0	120	----
uranium, dissolved	7440-61-1	E421	0.00001	mg/L	0.00025 mg/L	108	80.0	120	----
vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	0.025 mg/L	98.3	80.0	120	----
zinc, dissolved	7440-66-6	E421	0.001	mg/L	0.025 mg/L	98.6	80.0	120	----
Aggregate Organics (QCLot: 722654)									
tannin + lignin (as tannic acid)	----	E563	0.1	mg/L	5 mg/L	103	85.0	115	----
Volatile Organic Compounds (QCLot: 727945)									
Acetone	67-64-1	E611D	20	µg/L	100 µg/L	118	70.0	130	----
benzene	71-43-2	E611D	0.5	µg/L	100 µg/L	106	70.0	130	----
bromodichloromethane	75-27-4	E611D	0.5	µg/L	100 µg/L	104	70.0	130	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
					Concentration	LCS	Low	High	Qualifier
Volatile Organic Compounds (QCLot: 727945) - continued									
bromoform	75-25-2	E611D	0.5	µg/L	100 µg/L	94.8	70.0	130	----
bromomethane	74-83-9	E611D	0.5	µg/L	100 µg/L	96.8	60.0	140	----
carbon tetrachloride	56-23-5	E611D	0.2	µg/L	100 µg/L	85.6	70.0	130	----
chlorobenzene	108-90-7	E611D	0.5	µg/L	100 µg/L	97.5	70.0	130	----
chloroform	67-66-3	E611D	0.5	µg/L	100 µg/L	99.4	70.0	130	----
dibromochloromethane	124-48-1	E611D	0.5	µg/L	100 µg/L	90.5	70.0	130	----
dibromoethane, 1,2-	106-93-4	E611D	0.2	µg/L	100 µg/L	82.9	70.0	130	----
dichlorobenzene, 1,2-	95-50-1	E611D	0.5	µg/L	100 µg/L	92.9	70.0	130	----
dichlorobenzene, 1,3-	541-73-1	E611D	0.5	µg/L	100 µg/L	94.0	70.0	130	----
dichlorobenzene, 1,4-	106-46-7	E611D	0.5	µg/L	100 µg/L	94.3	70.0	130	----
dichlorodifluoromethane	75-71-8	E611D	0.5	µg/L	100 µg/L	98.9	60.0	140	----
dichloroethane, 1,1-	75-34-3	E611D	0.5	µg/L	100 µg/L	103	70.0	130	----
dichloroethane, 1,2-	107-06-2	E611D	0.5	µg/L	100 µg/L	110	70.0	130	----
dichloroethylene, 1,1-	75-35-4	E611D	0.5	µg/L	100 µg/L	100.0	70.0	130	----
dichloroethylene, cis-1,2-	156-59-2	E611D	0.5	µg/L	100 µg/L	86.2	70.0	130	----
dichloroethylene, trans-1,2-	156-60-5	E611D	0.5	µg/L	100 µg/L	102	70.0	130	----
dichloromethane	75-09-2	E611D	1	µg/L	100 µg/L	95.9	70.0	130	----
dichloropropane, 1,2-	78-87-5	E611D	0.5	µg/L	100 µg/L	102	70.0	130	----
dichloropropylene, cis-1,3-	10061-01-5	E611D	0.3	µg/L	100 µg/L	104	70.0	130	----
dichloropropylene, trans-1,3-	10061-02-6	E611D	0.3	µg/L	100 µg/L	111	70.0	130	----
ethylbenzene	100-41-4	E611D	0.5	µg/L	100 µg/L	100	70.0	130	----
hexane, n-	110-54-3	E611D	0.5	µg/L	100 µg/L	100.0	70.0	130	----
methyl ethyl ketone [MEK]	78-93-3	E611D	20	µg/L	100 µg/L	114	70.0	130	----
methyl isobutyl ketone [MIBK]	108-10-1	E611D	20	µg/L	100 µg/L	103	70.0	130	----
methyl-tert-butyl ether [MTBE]	1634-04-4	E611D	0.5	µg/L	100 µg/L	106	70.0	130	----
styrene	100-42-5	E611D	0.5	µg/L	100 µg/L	96.7	70.0	130	----
tetrachloroethane, 1,1,1,2-	630-20-6	E611D	0.5	µg/L	100 µg/L	83.5	70.0	130	----
tetrachloroethane, 1,1,2,2-	79-34-5	E611D	0.5	µg/L	100 µg/L	104	70.0	130	----
tetrachloroethylene	127-18-4	E611D	0.5	µg/L	100 µg/L	96.8	70.0	130	----
toluene	108-88-3	E611D	0.5	µg/L	100 µg/L	107	70.0	130	----
trichloroethane, 1,1,1-	71-55-6	E611D	0.5	µg/L	100 µg/L	93.0	70.0	130	----
trichloroethane, 1,1,2-	79-00-5	E611D	0.5	µg/L	100 µg/L	96.0	70.0	130	----
trichloroethylene	79-01-6	E611D	0.5	µg/L	100 µg/L	81.7	70.0	130	----
trichlorofluoromethane	75-69-4	E611D	0.5	µg/L	100 µg/L	97.0	60.0	140	----
vinyl chloride	75-01-4	E611D	0.5	µg/L	100 µg/L	90.3	60.0	140	----
xylene, m+p-	179601-23-1	E611D	0.4	µg/L	200 µg/L	97.8	70.0	130	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Laboratory Control Sample (LCS) Report: Spike Concentration	Recovery (%): LCS	Recovery Limits (%): Low	Recovery Limits (%): High	Qualifier
Volatile Organic Compounds (QCLot: 727945) - continued									
xylene, o-	95-47-6	E611D	0.3	µg/L	100 µg/L	102	70.0	130	----
Hydrocarbons (QCLot: 725959)									
F2 (C10-C16)	----	E601.SG	100	µg/L	5190.11 µg/L	102	70.0	130	----
F3 (C16-C34)	----	E601.SG	250	µg/L	6225.68 µg/L	102	70.0	130	----
F4 (C34-C50)	----	E601.SG	250	µg/L	6014.63 µg/L	96.3	70.0	130	----
Hydrocarbons (QCLot: 727946)									
F1 (C6-C10)	----	E581.F1-L	25	µg/L	2000 µg/L	108	80.0	120	----
Polycyclic Aromatic Hydrocarbons (QCLot: 724805)									
acenaphthene	83-32-9	E655A	0.2	µg/L	1.6 µg/L	94.8	50.0	140	----
acenaphthylene	208-96-8	E655A	0.2	µg/L	1.6 µg/L	97.1	50.0	140	----
anthracene	120-12-7	E655A	0.2	µg/L	1.6 µg/L	105	50.0	140	----
benz(a)anthracene	56-55-3	E655A	0.2	µg/L	1.6 µg/L	119	50.0	140	----
benzo(a)pyrene	50-32-8	E655A	0.02	µg/L	1.6 µg/L	109	50.0	140	----
benzo(b+j)fluoranthene	n/a	E655A	0.1	µg/L	1.6 µg/L	74.0	50.0	140	----
benzo(g,h,i)perylene	191-24-2	E655A	0.2	µg/L	1.6 µg/L	67.9	50.0	140	----
benzo(k)fluoranthene	207-08-9	E655A	0.1	µg/L	1.6 µg/L	105	50.0	140	----
chrysene	218-01-9	E655A	0.1	µg/L	1.6 µg/L	95.1	50.0	140	----
dibenz(a,h)anthracene	53-70-3	E655A	0.2	µg/L	1.6 µg/L	73.3	50.0	140	----
fluoranthene	206-44-0	E655A	0.2	µg/L	1.6 µg/L	90.1	50.0	140	----
fluorene	86-73-7	E655A	0.2	µg/L	1.6 µg/L	89.8	50.0	140	----
indeno(1,2,3-c,d)pyrene	193-39-5	E655A	0.2	µg/L	1.6 µg/L	66.4	50.0	140	----
methylnaphthalene, 1-	90-12-0	E655A	0.4	µg/L	1.6 µg/L	97.7	50.0	140	----
methylnaphthalene, 2-	91-57-6	E655A	0.4	µg/L	1.6 µg/L	86.6	50.0	140	----
naphthalene	91-20-3	E655A	0.2	µg/L	1.6 µg/L	87.4	50.0	140	----
phenanthrene	85-01-8	E655A	0.2	µg/L	1.6 µg/L	93.6	50.0	140	----
pyrene	129-00-0	E655A	0.2	µg/L	1.6 µg/L	86.4	50.0	140	----
Phthalate Esters (QCLot: 724805)									
bis(2-ethylhexyl) phthalate [DEHP]	117-81-7	E655A	2	µg/L	6.4 µg/L	116	50.0	140	----
diethyl phthalate	84-66-2	E655A	0.2	µg/L	6.4 µg/L	100	50.0	140	----
dimethyl phthalate	131-11-3	E655A	0.2	µg/L	6.4 µg/L	107	50.0	140	----
Semi-Volatile Organics (QCLot: 724805)									
biphenyl	92-52-4	E655A	0.4	µg/L	1.6 µg/L	97.1	50.0	140	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
					Concentration	LCS	Low	High	Qualifier
Semi-Volatile Organics (QCLot: 724805) - continued									
bis(2-chloroethyl) ether	111-44-4	E655A	0.4	µg/L	1.6 µg/L	85.5	50.0	140	----
bis(2-chloroisopropyl) ether	39638-32-9	E655A	0.4	µg/L	1.6 µg/L	89.4	50.0	140	----
chloroaniline, 4-	106-47-8	E655A	0.4	µg/L	1.6 µg/L	61.4	30.0	130	----
dichlorobenzidine, 3,3'-	91-94-1	E655A	0.4	µg/L	1.6 µg/L	# 25.6	30.0	130	RRQC
dinitrotoluene, 2,4-	121-14-2	E655A	0.4	µg/L	1.6 µg/L	121	50.0	140	----
dinitrotoluene, 2,6-	606-20-2	E655A	0.4	µg/L	1.6 µg/L	118	50.0	140	----
trichlorobenzene, 1,2,4-	120-82-1	E655A	0.4	µg/L	1.6 µg/L	72.0	50.0	140	----
Chlorinated Phenolics (QCLot: 724805)									
chlorophenol, 2-	95-57-8	E655A	0.3	µg/L	4.8 µg/L	87.6	50.0	140	----
dichlorophenol, 2,4-	120-83-2	E655A	0.3	µg/L	4.8 µg/L	106	50.0	140	----
pentachlorophenol [PCP]	87-86-5	E655A	0.5	µg/L	4.8 µg/L	# 148	50.0	140	LCS-H
trichlorophenol, 2,4,5-	95-95-4	E655A	0.2	µg/L	4.8 µg/L	115	50.0	140	----
trichlorophenol, 2,4,6-	88-06-2	E655A	0.2	µg/L	4.8 µg/L	114	50.0	140	----
Chlorinated Phenolics (QCLot: 724808)									
tetrachlorophenol, 2,3,4,6-	58-90-2	E651D	0.5	µg/L	4.8 µg/L	115	50.0	140	----
Non-Chlorinated Phenolics (QCLot: 724805)									
dimethylphenol, 2,4-	105-67-9	E655A	0.5	µg/L	4.8 µg/L	98.8	30.0	130	----
dinitrophenol, 2,4-	51-28-5	E655A	1	µg/L	4.8 µg/L	# 174	50.0	140	LCS-H
phenol	108-95-2	E655A	0.5	µg/L	4.8 µg/L	114	50.0	140	----
Pesticides (QCLot: 724791)									
diazinon	333-41-5	E660E-H	0.1	µg/L	0.2 µg/L	94.8	60.0	130	----

Qualifiers

Qualifier	Description
LCS-H	*Lab Control Sample recovery was above ALS DQO. Non-detected sample results are considered reliable. Other results, if reported, have been qualified.*
RRQC	*Refer to report comments for information regarding this QC result.*

Matrix Spike (MS) Report

A Matrix Spike (MS) is a randomly selected intra-laboratory replicate sample that has been fortified (spiked) with test analytes at known concentration, and processed in an identical manner to test samples. Matrix Spikes provide information regarding analyte recovery and potential matrix effects. MS DQO exceedances due to sample matrix may sometimes be unavoidable; in such cases, test results for the associated sample (or similar samples) may be subject to bias. ND – Recovery not determined, background level >= 1x spike level.

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Anions and Nutrients (QCLot: 728620)										
WT2219921-001	GW-002	chloride	16887-00-6	E235.Cl	492 mg/L	500 mg/L	98.5	75.0	125	----
Anions and Nutrients (QCLot: 728621)										
WT2219921-001	GW-002	nitrate (as N)	14797-55-8	E235.NO3	12.1 mg/L	12.5 mg/L	96.7	75.0	125	----
Anions and Nutrients (QCLot: 728622)										
WT2219921-001	GW-002	nitrite (as N)	14797-65-0	E235.NO2	2.44 mg/L	2.5 mg/L	97.6	75.0	125	----
Anions and Nutrients (QCLot: 728623)										
WT2219921-001	GW-002	fluoride	16984-48-8	E235.F	4.97 mg/L	5 mg/L	99.5	75.0	125	----
Anions and Nutrients (QCLot: 728624)										
WT2219921-001	GW-002	sulfate (as SO4)	14808-79-8	E235.SO4	494 mg/L	500 mg/L	98.7	75.0	125	----
Anions and Nutrients (QCLot: 729132)										
TY2203479-002	Anonymous	Kjeldahl nitrogen, total [TKN]	----	E318	2.82 mg/L	2.5 mg/L	113	70.0	130	----
Anions and Nutrients (QCLot: 729135)										
WT2219765-001	Anonymous	ammonia, total (as N)	7664-41-7	E298	ND mg/L	0.1 mg/L	ND	75.0	125	----
Organic / Inorganic Carbon (QCLot: 723366)										
WT2219419-001	Anonymous	carbon, dissolved organic [DOC]	----	E358-L	5.93 mg/L	5 mg/L	118	70.0	130	----
Total Sulfides (QCLot: 726653)										
WT2219958-001	Anonymous	sulfide, total (as S)	18496-25-8	E395-H	1.08 mg/L	1 mg/L	108	75.0	125	----
Dissolved Metals (QCLot: 722924)										
WT2219907-001	Anonymous	aluminum, dissolved	7429-90-5	E421	ND mg/L	0.1 mg/L	ND	70.0	130	----
		antimony, dissolved	7440-36-0	E421	0.0505 mg/L	0.05 mg/L	101	70.0	130	----
		arsenic, dissolved	7440-38-2	E421	0.0537 mg/L	0.05 mg/L	107	70.0	130	----
		barium, dissolved	7440-39-3	E421	0.0118 mg/L	0.0125 mg/L	94.4	70.0	130	----
		beryllium, dissolved	7440-41-7	E421	0.00472 mg/L	0.005 mg/L	94.4	70.0	130	----
		boron, dissolved	7440-42-8	E421	0.043 mg/L	0.05 mg/L	86.2	70.0	130	----
		cadmium, dissolved	7440-43-9	E421	0.00515 mg/L	0.005 mg/L	103	70.0	130	----
		calcium, dissolved	7440-70-2	E421	ND mg/L	2.5 mg/L	ND	70.0	130	----
		chromium, dissolved	7440-47-3	E421	0.0120 mg/L	0.0125 mg/L	96.2	70.0	130	----
		cobalt, dissolved	7440-48-4	E421	0.0122 mg/L	0.0125 mg/L	97.6	70.0	130	----
		copper, dissolved	7440-50-8	E421	0.0120 mg/L	0.0125 mg/L	95.9	70.0	130	----

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Dissolved Metals (QCLot: 722924) - continued										
WT2219907-001	Anonymous	lead, dissolved	7439-92-1	E421	0.0252 mg/L	0.025 mg/L	101	70.0	130	----
		magnesium, dissolved	7439-95-4	E421	ND mg/L	2.5 mg/L	ND	70.0	130	----
		manganese, dissolved	7439-96-5	E421	0.0117 mg/L	0.0125 mg/L	93.3	70.0	130	----
		molybdenum, dissolved	7439-98-7	E421	0.0120 mg/L	0.0125 mg/L	95.6	70.0	130	----
		nickel, dissolved	7440-02-0	E421	0.0239 mg/L	0.025 mg/L	95.7	70.0	130	----
		potassium, dissolved	7440-09-7	E421	2.31 mg/L	2.5 mg/L	92.5	70.0	130	----
		selenium, dissolved	7782-49-2	E421	0.0578 mg/L	0.05 mg/L	116	70.0	130	----
		silver, dissolved	7440-22-4	E421	0.00440 mg/L	0.005 mg/L	88.0	70.0	130	----
		sodium, dissolved	7440-23-5	E421	2.22 mg/L	2.5 mg/L	88.7	70.0	130	----
		strontium, dissolved	7440-24-6	E421	ND mg/L	0.0125 mg/L	ND	70.0	130	----
		thallium, dissolved	7440-28-0	E421	0.0496 mg/L	0.05 mg/L	99.1	70.0	130	----
		uranium, dissolved	7440-61-1	E421	0.000263 mg/L	0.00025 mg/L	105	70.0	130	----
		vanadium, dissolved	7440-62-2	E421	0.0242 mg/L	0.025 mg/L	96.9	70.0	130	----
		zinc, dissolved	7440-66-6	E421	0.0244 mg/L	0.025 mg/L	97.5	70.0	130	----
Aggregate Organics (QCLot: 722654)										
VA22C5934-004	Anonymous	tannin + lignin (as tannic acid)	----	E563	ND mg/L	1.96 mg/L	ND	70.0	130	----
Volatile Organic Compounds (QCLot: 727945)										
WT2219921-001	GW-002	Acetone	67-64-1	E611D	90 µg/L	100 µg/L	90.5	60.0	140	----
		benzene	71-43-2	E611D	98.1 µg/L	100 µg/L	98.1	60.0	140	----
		bromodichloromethane	75-27-4	E611D	94.3 µg/L	100 µg/L	94.3	60.0	140	----
		bromoform	75-25-2	E611D	82.5 µg/L	100 µg/L	82.5	60.0	140	----
		bromomethane	74-83-9	E611D	85.0 µg/L	100 µg/L	85.0	60.0	140	----
		carbon tetrachloride	56-23-5	E611D	80.3 µg/L	100 µg/L	80.3	60.0	140	----
		chlorobenzene	108-90-7	E611D	91.4 µg/L	100 µg/L	91.4	60.0	140	----
		chloroform	67-66-3	E611D	92.1 µg/L	100 µg/L	92.1	60.0	140	----
		dibromochloromethane	124-48-1	E611D	81.2 µg/L	100 µg/L	81.2	60.0	140	----
		dibromoethane, 1,2-	106-93-4	E611D	73.4 µg/L	100 µg/L	73.4	60.0	140	----
		dichlorobenzene, 1,2-	95-50-1	E611D	91.0 µg/L	100 µg/L	91.0	60.0	140	----
		dichlorobenzene, 1,3-	541-73-1	E611D	95.1 µg/L	100 µg/L	95.1	60.0	140	----
		dichlorobenzene, 1,4-	106-46-7	E611D	94.5 µg/L	100 µg/L	94.5	60.0	140	----
		dichlorodifluoromethane	75-71-8	E611D	76.6 µg/L	100 µg/L	76.6	60.0	140	----
		dichloroethane, 1,1-	75-34-3	E611D	93.9 µg/L	100 µg/L	93.9	60.0	140	----
		dichloroethane, 1,2-	107-06-2	E611D	97.7 µg/L	100 µg/L	97.7	60.0	140	----
		dichloroethylene, 1,1-	75-35-4	E611D	92.8 µg/L	100 µg/L	92.8	60.0	140	----
		dichloroethylene, cis-1,2-	156-59-2	E611D	78.8 µg/L	100 µg/L	78.8	60.0	140	----

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Volatile Organic Compounds (QCLot: 727945) - continued										
WT2219921-001	GW-002	dichloroethylene, trans-1,2-	156-60-5	E611D	95.5 µg/L	100 µg/L	95.5	60.0	140	----
		dichloromethane	75-09-2	E611D	84.7 µg/L	100 µg/L	84.7	60.0	140	----
		dichloropropane, 1,2-	78-87-5	E611D	92.7 µg/L	100 µg/L	92.7	60.0	140	----
		dichloropropylene, cis-1,3-	10061-01-5	E611D	93.6 µg/L	100 µg/L	93.6	60.0	140	----
		dichloropropylene, trans-1,3-	10061-02-6	E611D	101 µg/L	100 µg/L	101	60.0	140	----
		ethylbenzene	100-41-4	E611D	99.9 µg/L	100 µg/L	99.9	60.0	140	----
		hexane, n-	110-54-3	E611D	92.6 µg/L	100 µg/L	92.6	60.0	140	----
		methyl ethyl ketone [MEK]	78-93-3	E611D	85 µg/L	100 µg/L	84.9	60.0	140	----
		methyl isobutyl ketone [MIBK]	108-10-1	E611D	78 µg/L	100 µg/L	77.8	60.0	140	----
		methyl-tert-butyl ether [MTBE]	1634-04-4	E611D	97.5 µg/L	100 µg/L	97.5	60.0	140	----
		styrene	100-42-5	E611D	92.2 µg/L	100 µg/L	92.2	60.0	140	----
		tetrachloroethane, 1,1,1,2-	630-20-6	E611D	77.6 µg/L	100 µg/L	77.6	60.0	140	----
		tetrachloroethane, 1,1,2,2-	79-34-5	E611D	90.9 µg/L	100 µg/L	90.9	60.0	140	----
		tetrachloroethylene	127-18-4	E611D	93.9 µg/L	100 µg/L	93.9	60.0	140	----
		toluene	108-88-3	E611D	105 µg/L	100 µg/L	105	60.0	140	----
		trichloroethane, 1,1,1-	71-55-6	E611D	88.3 µg/L	100 µg/L	88.3	60.0	140	----
		trichloroethane, 1,1,2-	79-00-5	E611D	86.9 µg/L	100 µg/L	86.9	60.0	140	----
		trichloroethylene	79-01-6	E611D	79.8 µg/L	100 µg/L	79.8	60.0	140	----
		trichlorofluoromethane	75-69-4	E611D	89.5 µg/L	100 µg/L	89.5	60.0	140	----
		vinyl chloride	75-01-4	E611D	78.8 µg/L	100 µg/L	78.8	60.0	140	----
		xylene, m+p-	179601-23-1	E611D	194 µg/L	200 µg/L	96.8	60.0	140	----
		xylene, o-	95-47-6	E611D	100 µg/L	100 µg/L	100	60.0	140	----
Hydrocarbons (QCLot: 727946)										
WT2219921-001	GW-002	F1 (C6-C10)	----	E581.F1-L	1850 µg/L	2000 µg/L	92.6	60.0	140	----

10/26/2022 Front Well

Chain of Custody (COC) / Analytical Request Form

COC Number: 20 -

Canada Toll Free: 1 800 668 9878

Page 1 of 1

www.alsglobal.com

Environmental Division Waterloo
Work Order Reference
WT2219921

Telephone : +1 519 886 6910

Report To	Contact and company name below will appear on the final report
Company:	GHD Ltd. (GHDL100)
Contact:	Pascal Renella
Phone:	519-884-0510
	Company address below will appear on the final report
Street:	455 Phillip St.
City/Province:	Waterloo, ON
Postal Code:	N2L 3X2
Invoice To	Same as Report To ☑ YES ☐ NO
	Copy of Invoice with Report ☐ YES ☑ NO
Company:	GHD Ltd. (GHDL100)
Contact:	

Reports / Recipients

Select Report Format: ☑ PDF ☑ EXCEL ☑ EDD (DIGITAL)
Merge QC/QCI Reports with COA ☐ YES ☐ NO ☐ N/A
☐ Compare Results to Criteria on Report - provide details below if box checked
Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax: pascal.renella@ghd.com
Email 2: See SSOW/PO
Email 3:

Invoice Recipients

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax: Invoicing-Canada@ghd.com
Email 2:

Turnaround Time (TAT) Requested

☒ Routine [R] if received by 3pm M-F - no surcharges apply
☐ 4 day [P4] if received by 3pm M-F - 20% rush surcharge minimun
☐ 3 day [P3] if received by 3pm M-F - 25% rush surcharge minimu
☐ 2 day [P2] if received by 3pm M-F - 50% rush surcharge minimu
☐ 1 day [E] if received by 3pm M-F - 100% rush surcharge minimun
Same day [E2] if received by 10am M-S - 200% rush surcharge. A
fees may apply to rush resuests on weekends, statutory holidays an
routine tests

Date and Time Required for all E&P TATs:
For tests that can not be performed according to the

Project Information

ALS Account # / Quote #:	WT2022GHDL1000126
Job #:	12586015
PO / AFE:	
LSD:	

Oil and Gas Required Fields (client use)

AFE/Cost Center:	PO#
Major/Minor Code:	Routing Code:
Requisitioner:	
Location:	

ALS Lab Work Order # (lab use only):

ALS Contact: Rick H

Sampler:

Analysis Requ

Indicate Filtered (F), Preserved (P) or Filtered and P

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	NUMBER OF CONTAINERS: Groundwater Parameters Routine	includes: Anions, Alk, Colour, EC	TC,EC,TCB,HPC	Semivols (incl Phenols CPs,PAHs)	Dissolved Metals (field filter)	Sulphide/H2S, NH3	TKN,pH, Turbidity	VOCs/PHC F1-F4	TDS, Tannins/Lignins	OP Pesticides (Diazinon)	Ion Balance (calc)	Hardness (Calc)	DOC (Field Filter)	VOC,F1 Trip Blank	SAMPLES ON HOLD	EXTENDED STORAGE REQUIR	SUSPECTED HAZARD (see not
	GW-12586015- GW-002	26-OCT-22	16h00	WATER	R	R	R	R	R	R	R	R	R	R	R	R	R	R			
	~~GW-12586015-~~			~~WATER~~	~~R~~																
	GW-12586015- GW-001	26-OCT-22	11h00	WATER					R												
	~~GW-12586015-~~			~~WATER~~					~~R~~												
	~~GW-12586015-~~			~~WATER~~					~~R~~												
	~~GW-12586015-~~			~~WATER~~					~~R~~												
	~~Trip Blank~~			~~WATER~~														~~R~~			
		MB																			

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System?
☐ YES ☑ NO
Are samples for human consumption/ use?
☑ YES ☐ NO

Notes / Specify Limits for result evaluation by selecting from drop-down below (Excel COC only)

Minor edits to CoC by N. Bouvard, GHD e MLS
"R" = checkmark

SAMPLE RECEIPT DETAILS (lab use only)

Cooling Method: ☐ NONE ☐ ICE ☑ ICE PACKS ☐ FROZEN ☐ COOLING INITIATED
Submission Comments identified on Sample Receipt Notification: ☐ YES ☐ NO
Cooler Custody Seals Intact: ☐ YES ☐ N/A Sample Custody Seals Intact: ☑ YES ☐ N/A

INITIAL COOLER TEMPERATURES °C	FINAL COOLER TEMPERATURES °C
7.4	3.5

SHIPMENT RELEASE (client use)

Released by:	Date:	Time:
G. Bocin	Oct 26/22	5pm

INITIAL SHIPMENT RECEPTION (lab use only)

Received by:	Date:	Time:
	27/10/22	7:45

FINAL SHIPMENT RECEPTION (lab use only)

Received by:	Date:	Time:
	10/28/22	10:00

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

AUG 2020 FRONT

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.

OR-425
MA 05-474 MM-363 G656 N356 VW-012

CERTIFICATE OF ANALYSIS

Work Order	: **WT2220058**	Page	: 1 of 8
Client	: **GHD Limited**	Laboratory	: Waterloo - Environmental
Contact	: Pascal Renella	Account Manager	: Rick Hawthorne
Address	: 455 Phillip Street Waterloo ON Canada N2L 3X2	Address	: 60 Northland Road, Unit 1 Waterloo ON Canada N2V 2B8
Telephone	: 519 725 3313	Telephone	: +1 519 886 6910
Project	: 12586015-03.004	Date Samples Received	: 28-Oct-2022 07:40
PO	: 735-003748-1	Date Analysis Commenced	: 29-Oct-2022
C-O-C number	: ----	Issue Date	: 09-Nov-2022 10:59
Sampler	: ----		
Site	: ----		
Quote number	: 12586015-SSOW-735-003748-1		
No. of samples received	: 3		
No. of samples analysed	: 3		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QC Interpretive report to assist with Quality Review and Sample Receipt Notification (SRN).

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Amanda Ganouri-Lumsden	Department Manager - Microbiology and Prep	Microbiology, Waterloo, Ontario
Danielle Gravel	Team Leader - Semi-Volatile Instrumentation	Organics, Waterloo, Ontario
Greg Pokocky	Supervisor - Inorganic	Inorganics, Waterloo, Ontario
Jeremy Gingras	Team Leader - Semi-Volatile Instrumentation	Organics, Waterloo, Ontario
Jon Fisher	Department Manager - Inorganics	Inorganics, Waterloo, Ontario
Jon Fisher	Department Manager - Inorganics	Metals, Waterloo, Ontario
Kelsey Hesch	Analyst	Organics, Waterloo, Ontario
Lindsay Gung	Supervisor - Water Chemistry	Inorganics, Burnaby, British Columbia
Ruby Sujeepan		Microbiology, Waterloo, Ontario

General Comments

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for applicable references and methodology summaries. Reference methods may incorporate modifications to improve performance.
Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Please refer to Quality Control Interpretive report (QCI) for information regarding Holding Time compliance.

Key : CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances
LOR: Limit of Reporting (detection limit).

Unit	*Description*
-	No Unit
%	percent
µg/L	micrograms per litre
µS/cm	Microsiemens per centimetre
CFU/100mL	colony forming units per 100 mL
CFU/1mL	colony forming units per 1 mL
CU	colour units (1 CU = 1 mg/L Pt)
meq/L	milliequivalents per litre
mg/L	milligrams per litre
NTU	nephelometric turbidity units
pH units	pH units

>: greater than.
<: less than.

Surrogate: An analyte that is similar in behavior to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED on SRN or QCI Report, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Workorder Comments

RRR - Detection limit raised due to suspected laboratory contamination.

Sample Comments

Sample	Client Id	*Comment*
WT2220058-001	GW-12586015-GW-004	RRR:Detection limit raised due to instrument sensitivity.

Qualifiers

Qualifier	*Description*
DLDS	*Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.*
RRR	*Refer to report comments for issues regarding this analysis.*

Analytical Results

WT2220058-001

Sub-Matrix:**Water**
(Matrix: **Water**)

Client sample ID: GW-12586015-GW-004
Client sampling date / time: 27-Oct-2022 14:30

Analyte	CAS Number	Result	LOR	Unit	Method	Prep Date	Analysis Date	QCLot
Physical Tests								
colour, true	----	2.9	2.0	CU	E329-L	01-Nov-2022	04-Nov-2022	724671
conductivity	----	790	2.0	µS/cm	E100	03-Nov-2022	06-Nov-2022	729186
hardness (as CaCO3), dissolved	----	391	0.50	mg/L	EC100	-	02-Nov-2022	-
pH	----	8.43	0.10	pH units	E108	03-Nov-2022	06-Nov-2022	729184
solids, total dissolved [TDS]	----	495 DLDS	20	mg/L	E162	-	02-Nov-2022	726629
turbidity	----	0.10	0.10	NTU	E121	-	04-Nov-2022	730340
alkalinity, total (as CaCO3)	----	269	2.0	mg/L	E290	03-Nov-2022	06-Nov-2022	729185
Anions and Nutrients								
ammonia, total (as N)	7664-41-7	0.125	0.0050	mg/L	E298	02-Nov-2022	04-Nov-2022	726698
chloride	16887-00-6	67.0	0.50	mg/L	E235.Cl	03-Nov-2022	04-Nov-2022	729182
fluoride	16984-48-8	0.192	0.020	mg/L	E235.F	03-Nov-2022	04-Nov-2022	729179
Kjeldahl nitrogen, total [TKN]	----	0.194	0.050	mg/L	E318	02-Nov-2022	03-Nov-2022	726029
nitrate (as N)	14797-55-8	<0.020	0.020	mg/L	E235.NO3	03-Nov-2022	04-Nov-2022	729180
nitrite (as N)	14797-65-0	<0.010	0.010	mg/L	E235.NO2	03-Nov-2022	04-Nov-2022	729181
sulfate (as SO4)	14808-79-8	62.5	0.30	mg/L	E235.SO4	03-Nov-2022	04-Nov-2022	729183
Organic / Inorganic Carbon								
carbon, dissolved organic [DOC]	----	1.98	0.50	mg/L	E358-L	31-Oct-2022	01-Nov-2022	723488
Total Sulfides								
sulfide, total (as H2S)	7783-06-4	0.019	0.011	mg/L	E395-H	-	02-Nov-2022	727164
sulfide, total (as S)	18496-25-8	0.018	0.010	mg/L	E395-H	-	02-Nov-2022	727164
Microbiological Tests								
coliforms, total	----	Not Detected	1	CFU/100mL	E012.TC	-	29-Oct-2022	721574
heterotrophic plate count [HPC]	----	1	1	CFU/1mL	E012.HPC	-	29-Oct-2022	721573
coliforms, total background	----	1	1	CFU/100mL	E012.BG.TC	-	29-Oct-2022	721575
coliforms, Escherichia coli [E. coli]	----	Not Detected	1	CFU/100mL	E012A.EC	-	29-Oct-2022	721578
Ion Balance								
anion sum	----	8.58	0.10	meq/L	EC101	-	09-Nov-2022	-
cation sum	----	9.20	0.10	meq/L	EC101	-	09-Nov-2022	-
ion balance (APHA)	----	3.49	0.01	%	EC101	-	09-Nov-2022	-
Dissolved Metals								
aluminum, dissolved	7429-90-5	<0.0010	0.0010	mg/L	E421	01-Nov-2022	01-Nov-2022	724874
antimony, dissolved	7440-36-0	<0.00010	0.00010	mg/L	E421	01-Nov-2022	01-Nov-2022	724874
arsenic, dissolved	7440-38-2	<0.00010	0.00010	mg/L	E421	01-Nov-2022	01-Nov-2022	724874
barium, dissolved	7440-39-3	0.149	0.00010	mg/L	E421	01-Nov-2022	01-Nov-2022	724874
beryllium, dissolved	7440-41-7	<0.000020	0.000020	mg/L	E421	01-Nov-2022	01-Nov-2022	724874
boron, dissolved	7440-42-8	0.077	0.010	mg/L	E421	01-Nov-2022	01-Nov-2022	724874
cadmium, dissolved	7440-43-9	<0.0000050	0.0000050	mg/L	E421	01-Nov-2022	01-Nov-2022	724874
calcium, dissolved	7440-70-2	96.9	0.050	mg/L	E421	01-Nov-2022	01-Nov-2022	724874
chromium, dissolved	7440-47-3	<0.00050	0.00050	mg/L	E421	01-Nov-2022	01-Nov-2022	724874
cobalt, dissolved	7440-48-4	<0.00010	0.00010	mg/L	E421	01-Nov-2022	01-Nov-2022	724874
copper, dissolved	7440-50-8	0.00035	0.00020	mg/L	E421	01-Nov-2022	01-Nov-2022	724874
lead, dissolved	7439-92-1	<0.000050	0.000050	mg/L	E421	01-Nov-2022	01-Nov-2022	724874
magnesium, dissolved	7439-95-4	36.1	0.0050	mg/L	E421	01-Nov-2022	01-Nov-2022	724874
manganese, dissolved	7439-96-5	0.0420	0.00010	mg/L	E421	01-Nov-2022	01-Nov-2022	724874
molybdenum, dissolved	7439-98-7	0.00604	0.000050	mg/L	E421	01-Nov-2022	01-Nov-2022	724874
nickel, dissolved	7440-02-0	<0.00050	0.00050	mg/L	E421	01-Nov-2022	01-Nov-2022	724874

Analytical Results

WT2220058-001

Sub-Matrix:**Water**
(Matrix: **Water**)

Client sample ID: GW-12586015-GW-004
Client sampling date / time: 27-Oct-2022 14:30

Analyte	CAS Number	Result	LOR	Unit	Method	Prep Date	Analysis Date	QCLot
Dissolved Metals								
potassium, dissolved	7440-09-7	5.14	0.050	mg/L	E421	01-Nov-2022	01-Nov-2022	724874
selenium, dissolved	7782-49-2	0.000141	0.000050	mg/L	E421	01-Nov-2022	01-Nov-2022	724874
silver, dissolved	7440-22-4	<0.000010	0.000010	mg/L	E421	01-Nov-2022	01-Nov-2022	724874
sodium, dissolved	7440-23-5	28.8	0.050	mg/L	E421	01-Nov-2022	01-Nov-2022	724874
strontium, dissolved	7440-24-6	2.05	0.00020	mg/L	E421	01-Nov-2022	01-Nov-2022	724874
thallium, dissolved	7440-28-0	<0.000010	0.000010	mg/L	E421	01-Nov-2022	01-Nov-2022	724874
uranium, dissolved	7440-61-1	0.000246	0.000010	mg/L	E421	01-Nov-2022	01-Nov-2022	724874
vanadium, dissolved	7440-62-2	<0.00050	0.00050	mg/L	E421	01-Nov-2022	01-Nov-2022	724874
zinc, dissolved	7440-66-6	0.0066	0.0010	mg/L	E421	01-Nov-2022	01-Nov-2022	724874
dissolved metals filtration location	----	Field	-	-	EP421	-	01-Nov-2022	724874
Aggregate Organics								
tannin + lignin (as tannic acid)	----	0.86	0.10	mg/L	E563	-	31-Oct-2022	722654
Volatile Organic Compounds								
Acetone	67-64-1	<20	20	µg/L	E611D	03-Nov-2022	03-Nov-2022	728063
benzene	71-43-2	<0.50	0.50	µg/L	E611D	03-Nov-2022	03-Nov-2022	728063
bromodichloromethane	75-27-4	<0.50	0.50	µg/L	E611D	03-Nov-2022	03-Nov-2022	728063
bromoform	75-25-2	<0.50	0.50	µg/L	E611D	03-Nov-2022	03-Nov-2022	728063
bromomethane	74-83-9	<0.50	0.50	µg/L	E611D	03-Nov-2022	03-Nov-2022	728063
carbon tetrachloride	56-23-5	<0.20	0.20	µg/L	E611D	03-Nov-2022	03-Nov-2022	728063
chlorobenzene	108-90-7	<0.50	0.50	µg/L	E611D	03-Nov-2022	03-Nov-2022	728063
chloroform	67-66-3	<0.50	0.50	µg/L	E611D	03-Nov-2022	03-Nov-2022	728063
dibromochloromethane	124-48-1	<0.50	0.50	µg/L	E611D	03-Nov-2022	03-Nov-2022	728063
dibromoethane, 1,2-	106-93-4	<0.20	0.20	µg/L	E611D	03-Nov-2022	03-Nov-2022	728063
dichlorobenzene, 1,2-	95-50-1	<0.50	0.50	µg/L	E611D	03-Nov-2022	03-Nov-2022	728063
dichlorobenzene, 1,3-	541-73-1	<0.50	0.50	µg/L	E611D	03-Nov-2022	03-Nov-2022	728063
dichlorobenzene, 1,4-	106-46-7	<0.50	0.50	µg/L	E611D	03-Nov-2022	03-Nov-2022	728063
dichlorodifluoromethane	75-71-8	<0.50	0.50	µg/L	E611D	03-Nov-2022	03-Nov-2022	728063
dichloroethane, 1,1-	75-34-3	<0.50	0.50	µg/L	E611D	03-Nov-2022	03-Nov-2022	728063
dichloroethane, 1,2-	107-06-2	<0.50	0.50	µg/L	E611D	03-Nov-2022	03-Nov-2022	728063
dichloroethylene, 1,1-	75-35-4	<0.50	0.50	µg/L	E611D	03-Nov-2022	03-Nov-2022	728063
dichloroethylene, cis-1,2-	156-59-2	<0.50	0.50	µg/L	E611D	03-Nov-2022	03-Nov-2022	728063
dichloroethylene, trans-1,2-	156-60-5	<0.50	0.50	µg/L	E611D	03-Nov-2022	03-Nov-2022	728063
dichloromethane	75-09-2	<1.0	1.0	µg/L	E611D	03-Nov-2022	03-Nov-2022	728063
dichloropropane, 1,2-	78-87-5	<0.50	0.50	µg/L	E611D	03-Nov-2022	03-Nov-2022	728063
dichloropropylene, cis+trans-1,3-	542-75-6	<0.50	0.5	µg/L	E611D	03-Nov-2022	03-Nov-2022	728063
dichloropropylene, cis-1,3-	10061-01-5	<0.30	0.30	µg/L	E611D	03-Nov-2022	03-Nov-2022	728063
dichloropropylene, trans-1,3-	10061-02-6	<0.30	0.30	µg/L	E611D	03-Nov-2022	03-Nov-2022	728063
ethylbenzene	100-41-4	<0.50	0.50	µg/L	E611D	03-Nov-2022	03-Nov-2022	728063
hexane, n-	110-54-3	<0.50	0.50	µg/L	E611D	03-Nov-2022	03-Nov-2022	728063
methyl ethyl ketone [MEK]	78-93-3	<20	20	µg/L	E611D	03-Nov-2022	03-Nov-2022	728063
methyl isobutyl ketone [MIBK]	108-10-1	<20	20	µg/L	E611D	03-Nov-2022	03-Nov-2022	728063
methyl-tert-butyl ether [MTBE]	1634-04-4	<0.50	0.50	µg/L	E611D	03-Nov-2022	03-Nov-2022	728063
styrene	100-42-5	<0.50	0.50	µg/L	E611D	03-Nov-2022	03-Nov-2022	728063
tetrachloroethane, 1,1,1,2-	630-20-6	<0.50	0.50	µg/L	E611D	03-Nov-2022	03-Nov-2022	728063
tetrachloroethane, 1,1,2,2-	79-34-5	<0.50	0.50	µg/L	E611D	03-Nov-2022	03-Nov-2022	728063
tetrachloroethylene	127-18-4	<0.50	0.50	µg/L	E611D	03-Nov-2022	03-Nov-2022	728063

Analytical Results

WT2220058-001

Sub-Matrix:**Water**
(Matrix: **Water**)

Client sample ID: GW-12586015-GW-004
Client sampling date / time: 27-Oct-2022 14:30

Analyte	CAS Number	Result	LOR	Unit	Method	Prep Date	Analysis Date	QCLot
Volatile Organic Compounds								
toluene	108-88-3	<0.50	0.50	µg/L	E611D	03-Nov-2022	03-Nov-2022	728063
trichloroethane, 1,1,1-	71-55-6	<0.50	0.50	µg/L	E611D	03-Nov-2022	03-Nov-2022	728063
trichloroethane, 1,1,2-	79-00-5	<0.50	0.50	µg/L	E611D	03-Nov-2022	03-Nov-2022	728063
trichloroethylene	79-01-6	<0.50	0.50	µg/L	E611D	03-Nov-2022	03-Nov-2022	728063
trichlorofluoromethane	75-69-4	<0.50	0.50	µg/L	E611D	03-Nov-2022	03-Nov-2022	728063
vinyl chloride	75-01-4	<0.50	0.50	µg/L	E611D	03-Nov-2022	03-Nov-2022	728063
xylene, m+p-	179601-23-1	<0.40	0.40	µg/L	E611D	03-Nov-2022	03-Nov-2022	728063
xylene, o-	95-47-6	<0.30	0.30	µg/L	E611D	03-Nov-2022	03-Nov-2022	728063
xylenes, total	1330-20-7	<0.50	0.50	µg/L	E611D	03-Nov-2022	03-Nov-2022	728063
BTEX, total	----	<1.0	1.0	µg/L	E611D	03-Nov-2022	03-Nov-2022	728063
Hydrocarbons								
F1 (C6-C10)	----	<25	25	µg/L	E581.F1-L	03-Nov-2022	03-Nov-2022	728064
F2 (C10-C16)	----	<100	100	µg/L	E601.SG	02-Nov-2022	08-Nov-2022	725961
F2-naphthalene	----	<100	100	µg/L	EC600SG	-	03-Nov-2022	-
F3 (C16-C34)	----	<250	250	µg/L	E601.SG	02-Nov-2022	08-Nov-2022	725961
F3-PAH	n/a	<250	250	µg/L	EC600SG	-	03-Nov-2022	-
F4 (C34-C50)	----	<250	250	µg/L	E601.SG	02-Nov-2022	08-Nov-2022	725961
F1-BTEX	----	<25	25	µg/L	EC580	-	04-Nov-2022	-
hydrocarbons, total (C6-C50)	----	<370	370	µg/L	EC581SG	-	04-Nov-2022	-
chromatogram to baseline at nC50	n/a	YES	-	-	E601.SG	02-Nov-2022	08-Nov-2022	725961
Hydrocarbons Surrogates								
bromobenzotrifluoride, 2- (F2-F4 surr)	392-83-6	77.6	1.0	%	E601.SG	02-Nov-2022	08-Nov-2022	725961
dichlorotoluene, 3,4-	97-75-0	107	1.0	%	E581.F1-L	03-Nov-2022	03-Nov-2022	728064
Volatile Organic Compounds Surrogates								
bromofluorobenzene, 4-	460-00-4	109	1.0	%	E611D	03-Nov-2022	03-Nov-2022	728063
difluorobenzene, 1,4-	540-36-3	99.6	1.0	%	E611D	03-Nov-2022	03-Nov-2022	728063
Polycyclic Aromatic Hydrocarbons								
acenaphthene	83-32-9	<0.20	0.20	µg/L	E655A	01-Nov-2022	02-Nov-2022	724805
acenaphthylene	208-96-8	<0.20	0.20	µg/L	E655A	01-Nov-2022	02-Nov-2022	724805
anthracene	120-12-7	<0.20	0.20	µg/L	E655A	01-Nov-2022	02-Nov-2022	724805
benz(a)anthracene	56-55-3	<0.20	0.20	µg/L	E655A	01-Nov-2022	02-Nov-2022	724805
benzo(a)pyrene	50-32-8	<0.044 RRR.	0.044	µg/L	E655A	01-Nov-2022	02-Nov-2022	724805
benzo(b+j)fluoranthene	n/a	<0.10	0.10	µg/L	E655A	01-Nov-2022	02-Nov-2022	724805
benzo(g,h,i)perylene	191-24-2	<0.20	0.20	µg/L	E655A	01-Nov-2022	02-Nov-2022	724805
benzo(k)fluoranthene	207-08-9	<0.10	0.10	µg/L	E655A	01-Nov-2022	02-Nov-2022	724805
chrysene	218-01-9	<0.10	0.10	µg/L	E655A	01-Nov-2022	02-Nov-2022	724805
dibenz(a,h)anthracene	53-70-3	<0.20	0.20	µg/L	E655A	01-Nov-2022	02-Nov-2022	724805
fluoranthene	206-44-0	<0.20	0.20	µg/L	E655A	01-Nov-2022	02-Nov-2022	724805
fluorene	86-73-7	<0.20	0.20	µg/L	E655A	01-Nov-2022	02-Nov-2022	724805
indeno(1,2,3-c,d)pyrene	193-39-5	<0.20	0.20	µg/L	E655A	01-Nov-2022	02-Nov-2022	724805
methylnaphthalene, 1-	90-12-0	<0.40	0.40	µg/L	E655A	01-Nov-2022	02-Nov-2022	724805
methylnaphthalene, 1+2-	----	<0.60	0.6	µg/L	E655A	01-Nov-2022	02-Nov-2022	724805
methylnaphthalene, 2-	91-57-6	<0.40	0.40	µg/L	E655A	01-Nov-2022	02-Nov-2022	724805
naphthalene	91-20-3	<0.20	0.20	µg/L	E655A	01-Nov-2022	02-Nov-2022	724805
phenanthrene	85-01-8	<0.20	0.20	µg/L	E655A	01-Nov-2022	02-Nov-2022	724805
pyrene	129-00-0	<0.20	0.20	µg/L	E655A	01-Nov-2022	02-Nov-2022	724805

Analytical Results

WT2220058-001

Sub-Matrix:**Water** (Matrix: **Water**)

Client sample ID: GW-12586015-GW-004

Client sampling date / time: 27-Oct-2022 14:30

Analyte	CAS Number	Result	LOR	Unit	Method	Prep Date	Analysis Date	QCLot
Phthalate Esters								
bis(2-ethylhexyl) phthalate [DEHP]	117-81-7	<2.0	2.0	µg/L	E655A	01-Nov-2022	02-Nov-2022	724805
diethyl phthalate	84-66-2	<0.20	0.20	µg/L	E655A	01-Nov-2022	02-Nov-2022	724805
dimethyl phthalate	131-11-3	<0.20	0.20	µg/L	E655A	01-Nov-2022	02-Nov-2022	724805
Semi-Volatile Organics								
biphenyl	92-52-4	<0.40	0.40	µg/L	E655A	01-Nov-2022	02-Nov-2022	724805
bis(2-chloroethyl) ether	111-44-4	<0.40	0.40	µg/L	E655A	01-Nov-2022	02-Nov-2022	724805
bis(2-chloroisopropyl) ether	39638-32-9	<0.40	0.40	µg/L	E655A	01-Nov-2022	02-Nov-2022	724805
chloroaniline, 4-	106-47-8	<0.40	0.40	µg/L	E655A	01-Nov-2022	02-Nov-2022	724805
dichlorobenzidine, 3,3'-	91-94-1	<0.40	0.40	µg/L	E655A	01-Nov-2022	02-Nov-2022	724805
dinitrotoluene, 2,4-	121-14-2	<0.40	0.40	µg/L	E655A	01-Nov-2022	02-Nov-2022	724805
dinitrotoluene, 2,4 + 2,6-	n/a	<0.60	0.6	µg/L	E655A	01-Nov-2022	02-Nov-2022	724805
dinitrotoluene, 2,6-	606-20-2	<0.40	0.40	µg/L	E655A	01-Nov-2022	02-Nov-2022	724805
trichlorobenzene, 1,2,4-	120-82-1	<0.40	0.40	µg/L	E655A	01-Nov-2022	02-Nov-2022	724805
Semi-Volatile Organics Surrogates								
fluorobiphenyl, 2-	321-60-8	87.2	1.0	%	E655A	01-Nov-2022	02-Nov-2022	724805
nitrobenzene-d5	4165-60-0	95.0	1.0	%	E655A	01-Nov-2022	02-Nov-2022	724805
terphenyl-d14, p-	1718-51-0	96.2	1.0	%	E655A	01-Nov-2022	02-Nov-2022	724805
Chlorinated Phenolics								
chlorophenol, 2-	95-57-8	<0.30	0.30	µg/L	E655A	01-Nov-2022	02-Nov-2022	724805
dichlorophenol, 2,4-	120-83-2	<0.30	0.30	µg/L	E655A	01-Nov-2022	02-Nov-2022	724805
pentachlorophenol [PCP]	87-86-5	<0.50	0.50	µg/L	E655A	01-Nov-2022	02-Nov-2022	724805
tetrachlorophenol, 2,3,4,6-	58-90-2	<0.50	0.50	µg/L	E651D	01-Nov-2022	02-Nov-2022	724808
trichlorophenol, 2,4,5-	95-95-4	<0.20	0.20	µg/L	E655A	01-Nov-2022	02-Nov-2022	724805
trichlorophenol, 2,4,6-	88-06-2	<0.20	0.20	µg/L	E655A	01-Nov-2022	02-Nov-2022	724805
Non-Chlorinated Phenolics								
dimethylphenol, 2,4-	105-67-9	<0.50	0.50	µg/L	E655A	01-Nov-2022	02-Nov-2022	724805
dinitrophenol, 2,4-	51-28-5	<1.0	1.0	µg/L	E655A	01-Nov-2022	02-Nov-2022	724805
phenol	108-95-2	<0.50	0.50	µg/L	E655A	01-Nov-2022	02-Nov-2022	724805
Phenolics Surrogates								
tribromophenol, 2,4,6-	118-79-6	101	1.0	%	E651D	01-Nov-2022	02-Nov-2022	724808
tribromophenol, 2,4,6-	118-79-6	101	0.22	%	E655A	01-Nov-2022	02-Nov-2022	724805
Pesticides								
diazinon	333-41-5	<0.10	0.10	µg/L	E660E-H	01-Nov-2022	04-Nov-2022	724791
Pesticides Surrogates								
fluorobiphenyl, 2-	321-60-8	100	0.10	%	E660E-H	01-Nov-2022	04-Nov-2022	724791
terphenyl-d14, p-	1718-51-0	111	0.10	%	E660E-H	01-Nov-2022	04-Nov-2022	724791

Please refer to the General Comments section for an explanation of any qualifiers detected.

Analytical Results

WT2220058-002

Sub-Matrix:**Water** (Matrix: **Water**)

Client sample ID: GW-12586015-GW-003 -

Client sampling date / time: 27-Oct-2022 09:30

Analyte	CAS Number	Result	LOR	Unit	Method	Prep Date	Analysis Date	QCLot

Analytical Results

WT2220058-002

Sub-Matrix:**Water** (Matrix: **Water**)

Client sample ID: GW-12586015-GW-003 -

Client sampling date / time: 27-Oct-2022 09:30

Analyte	CAS Number	Result	LOR	Unit	Method	Prep Date	Analysis Date	QCLot
Dissolved Metals								
aluminum, dissolved	7429-90-5	<0.0010	0.0010	mg/L	E421	01-Nov-2022	01-Nov-2022	724874
antimony, dissolved	7440-36-0	<0.00010	0.00010	mg/L	E421	01-Nov-2022	01-Nov-2022	724874
arsenic, dissolved	7440-38-2	<0.00010	0.00010	mg/L	E421	01-Nov-2022	01-Nov-2022	724874
barium, dissolved	7440-39-3	0.149	0.00010	mg/L	E421	01-Nov-2022	01-Nov-2022	724874
beryllium, dissolved	7440-41-7	<0.000020	0.000020	mg/L	E421	01-Nov-2022	01-Nov-2022	724874
boron, dissolved	7440-42-8	0.077	0.010	mg/L	E421	01-Nov-2022	01-Nov-2022	724874
cadmium, dissolved	7440-43-9	<0.0000050	0.0000050	mg/L	E421	01-Nov-2022	01-Nov-2022	724874
calcium, dissolved	7440-70-2	97.5	0.050	mg/L	E421	01-Nov-2022	01-Nov-2022	724874
chromium, dissolved	7440-47-3	<0.00050	0.00050	mg/L	E421	01-Nov-2022	01-Nov-2022	724874
cobalt, dissolved	7440-48-4	<0.00010	0.00010	mg/L	E421	01-Nov-2022	01-Nov-2022	724874
copper, dissolved	7440-50-8	0.00115	0.00020	mg/L	E421	01-Nov-2022	01-Nov-2022	724874
lead, dissolved	7439-92-1	0.000103	0.000050	mg/L	E421	01-Nov-2022	01-Nov-2022	724874
magnesium, dissolved	7439-95-4	35.5	0.0050	mg/L	E421	01-Nov-2022	01-Nov-2022	724874
manganese, dissolved	7439-96-5	0.0413	0.00010	mg/L	E421	01-Nov-2022	01-Nov-2022	724874
molybdenum, dissolved	7439-98-7	0.00593	0.000050	mg/L	E421	01-Nov-2022	01-Nov-2022	724874
nickel, dissolved	7440-02-0	0.00063	0.00050	mg/L	E421	01-Nov-2022	01-Nov-2022	724874
potassium, dissolved	7440-09-7	5.09	0.050	mg/L	E421	01-Nov-2022	01-Nov-2022	724874
selenium, dissolved	7782-49-2	0.000110	0.000050	mg/L	E421	01-Nov-2022	01-Nov-2022	724874
silver, dissolved	7440-22-4	<0.000010	0.000010	mg/L	E421	01-Nov-2022	01-Nov-2022	724874
sodium, dissolved	7440-23-5	28.0	0.050	mg/L	E421	01-Nov-2022	01-Nov-2022	724874
strontium, dissolved	7440-24-6	2.06	0.00020	mg/L	E421	01-Nov-2022	01-Nov-2022	724874
thallium, dissolved	7440-28-0	<0.000010	0.000010	mg/L	E421	01-Nov-2022	01-Nov-2022	724874
uranium, dissolved	7440-61-1	0.000249	0.000010	mg/L	E421	01-Nov-2022	01-Nov-2022	724874
vanadium, dissolved	7440-62-2	<0.00050	0.00050	mg/L	E421	01-Nov-2022	01-Nov-2022	724874
zinc, dissolved	7440-66-6	0.0137	0.0010	mg/L	E421	01-Nov-2022	01-Nov-2022	724874
dissolved metals filtration location	----	Field	-	-	EP421	-	01-Nov-2022	724874

Please refer to the General Comments section for an explanation of any qualifiers detected.

Analytical Results

WT2220058-003

Sub-Matrix:**Water** (Matrix: **Water**)

Client sample ID: Trip Blank

Client sampling date / time: 27-Oct-2022 14:30

Analyte	CAS Number	Result	LOR	Unit	Method	Prep Date	Analysis Date	QCLot
Volatile Organic Compounds								
Acetone	67-64-1	<20	20	µg/L	E611D	03-Nov-2022	03-Nov-2022	728063
benzene	71-43-2	<0.50	0.50	µg/L	E611D	03-Nov-2022	03-Nov-2022	728063
bromodichloromethane	75-27-4	<0.50	0.50	µg/L	E611D	03-Nov-2022	03-Nov-2022	728063
bromoform	75-25-2	<0.50	0.50	µg/L	E611D	03-Nov-2022	03-Nov-2022	728063
bromomethane	74-83-9	<0.50	0.50	µg/L	E611D	03-Nov-2022	03-Nov-2022	728063
carbon tetrachloride	56-23-5	<0.20	0.20	µg/L	E611D	03-Nov-2022	03-Nov-2022	728063
chlorobenzene	108-90-7	<0.50	0.50	µg/L	E611D	03-Nov-2022	03-Nov-2022	728063
chloroform	67-66-3	<0.50	0.50	µg/L	E611D	03-Nov-2022	03-Nov-2022	728063
dibromochloromethane	124-48-1	<0.50	0.50	µg/L	E611D	03-Nov-2022	03-Nov-2022	728063

Analytical Results

WT2220058-003

Sub-Matrix:**Water** (Matrix: **Water**)

Client sample ID: Trip Blank

Client sampling date / time: 27-Oct-2022 14:30

Analyte	CAS Number	Result	LOR	Unit	Method	Prep Date	Analysis Date	QCLot
Volatile Organic Compounds								
dibromoethane, 1,2-	106-93-4	<0.20	0.20	µg/L	E611D	03-Nov-2022	03-Nov-2022	728063
dichlorobenzene, 1,2-	95-50-1	<0.50	0.50	µg/L	E611D	03-Nov-2022	03-Nov-2022	728063
dichlorobenzene, 1,3-	541-73-1	<0.50	0.50	µg/L	E611D	03-Nov-2022	03-Nov-2022	728063
dichlorobenzene, 1,4-	106-46-7	<0.50	0.50	µg/L	E611D	03-Nov-2022	03-Nov-2022	728063
dichlorodifluoromethane	75-71-8	<0.50	0.50	µg/L	E611D	03-Nov-2022	03-Nov-2022	728063
dichloroethane, 1,1-	75-34-3	<0.50	0.50	µg/L	E611D	03-Nov-2022	03-Nov-2022	728063
dichloroethane, 1,2-	107-06-2	<0.50	0.50	µg/L	E611D	03-Nov-2022	03-Nov-2022	728063
dichloroethylene, 1,1-	75-35-4	<0.50	0.50	µg/L	E611D	03-Nov-2022	03-Nov-2022	728063
dichloroethylene, cis-1,2-	156-59-2	<0.50	0.50	µg/L	E611D	03-Nov-2022	03-Nov-2022	728063
dichloroethylene, trans-1,2-	156-60-5	<0.50	0.50	µg/L	E611D	03-Nov-2022	03-Nov-2022	728063
dichloromethane	75-09-2	<1.3 RRR.	1.3	µg/L	E611D	03-Nov-2022	04-Nov-2022	728063
dichloropropane, 1,2-	78-87-5	<0.50	0.50	µg/L	E611D	03-Nov-2022	03-Nov-2022	728063
dichloropropylene, cis+trans-1,3-	542-75-6	<0.50	0.5	µg/L	E611D	03-Nov-2022	03-Nov-2022	728063
dichloropropylene, cis-1,3-	10061-01-5	<0.30	0.30	µg/L	E611D	03-Nov-2022	03-Nov-2022	728063
dichloropropylene, trans-1,3-	10061-02-6	<0.30	0.30	µg/L	E611D	03-Nov-2022	03-Nov-2022	728063
ethylbenzene	100-41-4	<0.50	0.50	µg/L	E611D	03-Nov-2022	03-Nov-2022	728063
hexane, n-	110-54-3	<0.50	0.50	µg/L	E611D	03-Nov-2022	03-Nov-2022	728063
methyl ethyl ketone [MEK]	78-93-3	<20	20	µg/L	E611D	03-Nov-2022	03-Nov-2022	728063
methyl isobutyl ketone [MIBK]	108-10-1	<20	20	µg/L	E611D	03-Nov-2022	03-Nov-2022	728063
methyl-tert-butyl ether [MTBE]	1634-04-4	<0.50	0.50	µg/L	E611D	03-Nov-2022	03-Nov-2022	728063
styrene	100-42-5	<0.50	0.50	µg/L	E611D	03-Nov-2022	03-Nov-2022	728063
tetrachloroethane, 1,1,1,2-	630-20-6	<0.50	0.50	µg/L	E611D	03-Nov-2022	03-Nov-2022	728063
tetrachloroethane, 1,1,2,2-	79-34-5	<0.50	0.50	µg/L	E611D	03-Nov-2022	03-Nov-2022	728063
tetrachloroethylene	127-18-4	<0.50	0.50	µg/L	E611D	03-Nov-2022	03-Nov-2022	728063
toluene	108-88-3	<0.50	0.50	µg/L	E611D	03-Nov-2022	03-Nov-2022	728063
trichloroethane, 1,1,1-	71-55-6	<0.50	0.50	µg/L	E611D	03-Nov-2022	03-Nov-2022	728063
trichloroethane, 1,1,2-	79-00-5	<0.50	0.50	µg/L	E611D	03-Nov-2022	03-Nov-2022	728063
trichloroethylene	79-01-6	<0.50	0.50	µg/L	E611D	03-Nov-2022	03-Nov-2022	728063
trichlorofluoromethane	75-69-4	<0.50	0.50	µg/L	E611D	03-Nov-2022	03-Nov-2022	728063
vinyl chloride	75-01-4	<0.50	0.50	µg/L	E611D	03-Nov-2022	03-Nov-2022	728063
xylene, m+p-	179601-23-1	<0.40	0.40	µg/L	E611D	03-Nov-2022	03-Nov-2022	728063
xylene, o-	95-47-6	<0.30	0.30	µg/L	E611D	03-Nov-2022	03-Nov-2022	728063
xylenes, total	1330-20-7	<0.50	0.50	µg/L	E611D	03-Nov-2022	03-Nov-2022	728063
BTEX, total	----	<1.0	1.0	µg/L	E611D	03-Nov-2022	03-Nov-2022	728063
Hydrocarbons								
F1 (C6-C10)	----	<25	25	µg/L	E581.F1-L	03-Nov-2022	03-Nov-2022	728064
F1-BTEX	----	<25	25	µg/L	EC580	-	04-Nov-2022	-
Hydrocarbons Surrogates								
dichlorotoluene, 3,4-	97-75-0	92.3	1.0	%	E581.F1-L	03-Nov-2022	03-Nov-2022	728064
Volatile Organic Compounds Surrogates								
bromofluorobenzene, 4-	460-00-4	105	1.0	%	E611D	03-Nov-2022	03-Nov-2022	728063
difluorobenzene, 1,4-	540-36-3	101	1.0	%	E611D	03-Nov-2022	03-Nov-2022	728063

Please refer to the General Comments section for an explanation of any qualifiers detected.

ALS Canada Ltd.

right solutions.
right partner.

QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: **WT2220058**	Page	: 1 of 16
Client	: **GHD Limited**	Laboratory	: Waterloo - Environmental
Contact	: Pascal Renella	Account Manager	: Rick Hawthorne
Address	: 455 Phillip Street Waterloo ON Canada N2L 3X2	Address	: 60 Northland Road, Unit 1 Waterloo, Ontario Canada N2V 2B8
Telephone	: 519 725 3313	Telephone	: +1 519 886 6910
Project	: 12586015-03.004	Date Samples Received	: 28-Oct-2022 07:40
PO	: 735-003748-1	Issue Date	: 09-Nov-2022 10:59
C-O-C number	: ----		
Sampler	: ----		
Site	: ----		
Quote number	: 12586015-SSOW-735-003748-1		
No. of samples received	: 3		
No. of samples analysed	: 3		

This report is automatically generated by the ALS LIMS (Laboratory Information Management System) through evaluation of Quality Control (QC) results and other QA parameters associated with this submission, and is intended to facilitate rapid data validation by auditors or reviewers. The report highlights any exceptions and outliers to ALS Data Quality Objectives, provides holding time details and exceptions, summarizes QC sample frequencies, and lists applicable methodology references and summaries.

Key

Anonymous: Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number: Chemical Abstracts Service number is a unique identifier assigned to discrete substances.
DQO: Data Quality Objective.
LOR: Limit of Reporting (detection limit).
RPD: Relative Percent Difference.

Workorder Comments

Holding times are displayed as "---" if no guidance exists from CCME, Canadian provinces, or broadly recognized international references.

Summary of Outliers

Outliers : Quality Control Samples

- No Duplicate outliers occur.
- Method Blank value outliers occur - please see following pages for full details.
- Laboratory Control Sample (LCS) outliers occur - please see following pages for full details.
- Matrix Spike outliers occur - please see following pages for full details.
- No Test sample Surrogate recovery outliers exist.

Outliers: Reference Material (RM) Samples

- No Reference Material (RM) Sample outliers occur.

Outliers : Analysis Holding Time Compliance (Breaches)

- Analysis Holding Time Outliers exist - please see following pages for full details.

Outliers : Frequency of Quality Control Samples

- No Quality Control Sample Frequency Outliers occur.

Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **Water**

Analyte Group	Laboratory sample ID	Client/Ref Sample ID	Analyte	CAS Number	Method	Result	Limits	Comment
Method Blank (MB) Values								
Physical Tests	QC-MRG2-729185001	----	alkalinity, total (as CaCO3)	----	E290	2.6 mg/L	2 mg/L	Blank result exceeds permitted value
Polycyclic Aromatic Hydrocarbons	QC-MRG4-724802001	----	benzo(a)pyrene	50-32-8	E655A	<0.040 µg/L RRQC	0.02 µg/L	Blank result exceeds permitted value

Result Qualifiers

Qualifier	Description
RRQC	*Refer to report comments for information regarding this QC result.*

Laboratory Control Sample (LCS) Recoveries								
Semi-Volatile Organics	QC-MRG4-724802002	----	dichlorobenzidine, 3,3'-	91-94-1	E655A	25.6 % RRQC	30.0-130%	Recovery less than lower control limit
Chlorinated Phenolics	QC-MRG4-724802002	----	pentachlorophenol [PCP]	87-86-5	E655A	148 % LCS-H	50.0-140%	Recovery greater than upper control limit
Non-Chlorinated Phenolics	QC-MRG4-724802002	----	dinitrophenol, 2,4-	51-28-5	E655A	174 % LCS-H	50.0-140%	Recovery greater than upper control limit

Result Qualifiers

Qualifier	Description
LCS-H	*Lab Control Sample recovery was above ALS DQO. Non-detected sample results are considered reliable. Other results, if reported, have been qualified.*
RRQC	*Refer to report comments for information regarding this QC result.*

Matrix Spike (MS) Recoveries								
Dissolved Metals	WT2220058-002	GW-12586015-GW-003	silver, dissolved	7440-22-4	E421	56.1 % MS-Ag	70.0-130%	Recovery less than lower data quality objective

Result Qualifiers

Qualifier	Description
MS-Ag	*MS-Ag: Matrix Spike recovery for silver was marginally below DQO (40 to <60%) due to its instability in the sample matrix. Silver was not detected. Reported result (< LOR) is reliable*

Analysis Holding Time Compliance

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times, which are selected to meet known provincial and /or federal requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by organizations such as CCME, US EPA, APHA Standard Methods, ASTM, or Environment Canada (where available). Dates and holding times reported below represent the first dates of extraction or analysis. If subsequent tests or dilutions exceeded holding times, qualifiers are added (refer to COA).

If samples are identified below as having been analyzed or extracted outside of recommended holding times, measurement uncertainties may be increased, and this should be taken into consideration when interpreting results.

Where actual sampling date is not provided on the chain of custody, the date of receipt with time at 00:00 is used for calculation purposes.

Where only the sample date without time is provided on the chain of custody, the sampling date at 00:00 is used for calculation purposes.

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Aggregate Organics : Tannin & Lignin in Water										
HDPE [ON MECP]										
GW-12586015-GW-004	E563	27-Oct-2022	----	----	----		31-Oct-2022	28 days	4 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
GW-12586015-GW-004	E298	27-Oct-2022	02-Nov-2022	----	----		03-Nov-2022	28 days	7 days	✓
Anions and Nutrients : Chloride in Water by IC										
HDPE [ON MECP]										
GW-12586015-GW-004	E235.Cl	27-Oct-2022	03-Nov-2022	----	----		04-Nov-2022	28 days	8 days	✓
Anions and Nutrients : Fluoride in Water by IC										
HDPE [ON MECP]										
GW-12586015-GW-004	E235.F	27-Oct-2022	03-Nov-2022	----	----		04-Nov-2022	28 days	8 days	✓
Anions and Nutrients : Nitrate in Water by IC										
HDPE [ON MECP]										
GW-12586015-GW-004	E235.NO3	27-Oct-2022	03-Nov-2022	----	----		04-Nov-2022	7 days	8 days	× EHT
Anions and Nutrients : Nitrite in Water by IC										
HDPE [ON MECP]										
GW-12586015-GW-004	E235.NO2	27-Oct-2022	03-Nov-2022	----	----		04-Nov-2022	7 days	8 days	× EHT
Anions and Nutrients : Sulfate in Water by IC										
HDPE [ON MECP]										
GW-12586015-GW-004	E235.SO4	27-Oct-2022	03-Nov-2022	----	----		04-Nov-2022	28 days	8 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence (Low Level)										
Amber glass total (sulfuric acid) GW-12586015-GW-004	E318	27-Oct-2022	02-Nov-2022	----	----		03-Nov-2022	28 days	7 days	✓
Chlorinated Phenolics : BNA (ON 625-511 list) by GC-MS										
Amber glass/Teflon lined cap (sodium bisulfate) GW-12586015-GW-004	E655A	27-Oct-2022	01-Nov-2022	----	----		02-Nov-2022	----	----	
Chlorinated Phenolics : Phenolics (Ontario Chlorophenols List) by GC-MS										
Amber glass/Teflon lined cap GW-12586015-GW-004	E651D	27-Oct-2022	01-Nov-2022	7 days	5 days	✓	02-Nov-2022	40 days	1 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) GW-12586015-GW-003	E421	27-Oct-2022	01-Nov-2022	----	----		01-Nov-2022	180 days	5 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) GW-12586015-GW-004	E421	27-Oct-2022	01-Nov-2022	----	----		01-Nov-2022	180 days	5 days	✓
Hydrocarbons : CCME PHC - F1 by Headspace GC-FID (Low Level)										
Glass vial (sodium bisulfate) GW-12586015-GW-004	E581.F1-L	27-Oct-2022	03-Nov-2022	----	----		03-Nov-2022	14 days	7 days	✓
Hydrocarbons : CCME PHC - F1 by Headspace GC-FID (Low Level)										
Glass vial (sodium bisulfate) Trip Blank	E581.F1-L	27-Oct-2022	03-Nov-2022	----	----		03-Nov-2022	14 days	7 days	✓
Hydrocarbons : Silica Gel Treated CCME PHCs - F2-F4sg by GC-FID										
Amber glass/Teflon lined cap (sodium bisulfate) GW-12586015-GW-004	E601.SG	27-Oct-2022	02-Nov-2022	14 days	6 days	✓	08-Nov-2022	40 days	6 days	✓
Microbiological Tests : E. coli (MF-mFC-BCIG)										
Sterile HDPE (Sodium thiosulphate) [ON MECP] GW-12586015-GW-004	E012A.EC	27-Oct-2022	----	----	----		29-Oct-2022	48 hrs	47 hrs	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Microbiological Tests : Heterotrophic Plate Count by MF (MF-mHPC)										
Sterile HDPE (Sodium thiosulphate) [ON MECP] GW-12586015-GW-004	E012.HPC	27-Oct-2022	----	----	----		29-Oct-2022	48 hrs	47 hrs	✓
Microbiological Tests : Total Coliforms (MF-mEndo)										
Sterile HDPE (Sodium thiosulphate) [ON MECP] GW-12586015-GW-004	E012.TC	27-Oct-2022	----	----	----		29-Oct-2022	48 hrs	47 hrs	✓
Microbiological Tests : Total Coliforms Background (MF-mEndo)										
Sterile HDPE (Sodium thiosulphate) [ON MECP] GW-12586015-GW-004	E012.BG.TC	27-Oct-2022	----	----	----		29-Oct-2022	48 hrs	47 hrs	✓
Non-Chlorinated Phenolics : BNA (ON 625-511 list) by GC-MS										
Amber glass/Teflon lined cap (sodium bisulfate) GW-12586015-GW-004	E655A	27-Oct-2022	01-Nov-2022	----	----		02-Nov-2022	----	----	
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (sulfuric acid) GW-12586015-GW-004	E358-L	27-Oct-2022	31-Oct-2022	----	----		01-Nov-2022	28 days	5 days	✓
Pesticides : Miscellaneous Pesticides by GC-MS										
Amber glass/Teflon lined cap GW-12586015-GW-004	E660E-H	27-Oct-2022	01-Nov-2022	14 days	5 days	✓	04-Nov-2022	40 days	3 days	✓
Phthalate Esters : BNA (ON 625-511 list) by GC-MS										
Amber glass/Teflon lined cap (sodium bisulfate) GW-12586015-GW-004	E655A	27-Oct-2022	01-Nov-2022	----	----		02-Nov-2022	----	----	
Physical Tests : Alkalinity Species by Titration										
HDPE [ON MECP] GW-12586015-GW-004	E290	27-Oct-2022	03-Nov-2022	----	----		06-Nov-2022	14 days	10 days	✓
Physical Tests : Colour (True) by Spectrometer (2 CU)										
HDPE [ON MECP] GW-12586015-GW-004	E329-L	27-Oct-2022	01-Nov-2022	----	----		04-Nov-2022	48 hrs	123 hrs	× EHT

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : Conductivity in Water										
HDPE [ON MECP] GW-12586015-GW-004	E100	27-Oct-2022	03-Nov-2022	----	----		06-Nov-2022	28 days	10 days	✓
Physical Tests : pH by Meter										
HDPE [ON MECP] GW-12586015-GW-004	E108	27-Oct-2022	03-Nov-2022	----	----		06-Nov-2022	14 days	10 days	✓
Physical Tests : TDS by Gravimetry										
HDPE [ON MECP] GW-12586015-GW-004	E162	27-Oct-2022	----	----	----		02-Nov-2022	7 days	6 days	✓
Physical Tests : Turbidity by Nephelometry										
HDPE [ON MECP] GW-12586015-GW-004	E121	27-Oct-2022	----	----	----		04-Nov-2022	3 days	8 days	× EHT
Polycyclic Aromatic Hydrocarbons : BNA (ON 625-511 list) by GC-MS										
Amber glass/Teflon lined cap (sodium bisulfate) GW-12586015-GW-004	E655A	27-Oct-2022	01-Nov-2022	----	----		02-Nov-2022	----	----	
Semi-Volatile Organics : BNA (ON 625-511 list) by GC-MS										
Amber glass/Teflon lined cap (sodium bisulfate) GW-12586015-GW-004	E655A	27-Oct-2022	01-Nov-2022	14 days	5 days	✓	02-Nov-2022	40 days	1 days	✓
Total Sulfides : Total Sulfide by Colourimetry (Automated Flow)										
HDPE total (zinc acetate+sodium hydroxide) GW-12586015-GW-004	E395-H	27-Oct-2022	----	----	----		02-Nov-2022	7 days	6 days	✓
Volatile Organic Compounds : VOCs (Eastern Canada List) by Headspace GC-MS										
Glass vial (sodium bisulfate) GW-12586015-GW-004	E611D	27-Oct-2022	03-Nov-2022	----	----		03-Nov-2022	14 days	7 days	✓
Volatile Organic Compounds : VOCs (Eastern Canada List) by Headspace GC-MS										
Glass vial (sodium bisulfate) Trip Blank	E611D	27-Oct-2022	03-Nov-2022	----	----		03-Nov-2022	14 days	7 days	✓

Legend & Qualifier Definitions

EHT: Exceeded ALS recommended hold time prior to analysis.

Rec. HT: ALS recommended hold time (see units).

Quality Control Parameter Frequency Compliance

The following report summarizes the frequency of laboratory QC samples analyzed within the analytical batches (QC lots) in which the submitted samples were processed. The actual frequency should be greater than or equal to the expected frequency.

Matrix: **Water**

Evaluation: × = QC frequency outside specification; ✓ = QC frequency within specification.

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Laboratory Duplicates (DUP)							
Alkalinity Species by Titration	E290	729185	1	14	7.1	5.0	✓
Ammonia by Fluorescence	E298	726698	1	20	5.0	5.0	✓
CCME PHC - F1 by Headspace GC-FID (Low Level)	E581.F1-L	728064	1	13	7.6	5.0	✓
Chloride in Water by IC	E235.Cl	729182	1	18	5.5	5.0	✓
Colour (True) by Spectrometer (2 CU)	E329-L	724671	1	12	8.3	5.0	✓
Conductivity in Water	E100	729186	1	12	8.3	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	724874	1	19	5.2	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	723488	1	20	5.0	5.0	✓
E. coli (MF-mFC-BCIG)	E012A.EC	721578	1	10	10.0	5.0	✓
Fluoride in Water by IC	E235.F	729179	1	4	25.0	5.0	✓
Heterotrophic Plate Count by MF (MF-mHPC)	E012.HPC	721573	1	5	20.0	5.0	✓
Nitrate in Water by IC	E235.NO3	729180	1	14	7.1	5.0	✓
Nitrite in Water by IC	E235.NO2	729181	1	4	25.0	5.0	✓
pH by Meter	E108	729184	1	17	5.8	5.0	✓
Sulfate in Water by IC	E235.SO4	729183	1	7	14.2	5.0	✓
Tannin & Lignin in Water	E563	722654	1	11	9.0	5.0	✓
TDS by Gravimetry	E162	726629	1	20	5.0	5.0	✓
Total Coliforms (MF-mEndo)	E012.TC	721574	1	9	11.1	5.0	✓
Total Coliforms Background (MF-mEndo)	E012.BG.TC	721575	1	3	33.3	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	726029	1	20	5.0	5.0	✓
Total Sulfide by Colourimetry (Automated Flow)	E395-H	727164	1	20	5.0	5.0	✓
Turbidity by Nephelometry	E121	730340	1	20	5.0	5.0	✓
VOCs (Eastern Canada List) by Headspace GC-MS	E611D	728063	1	20	5.0	5.0	✓
Laboratory Control Samples (LCS)							
Alkalinity Species by Titration	E290	729185	1	14	7.1	5.0	✓
Ammonia by Fluorescence	E298	726698	1	20	5.0	5.0	✓
BNA (ON 625-511 list) by GC-MS	E655A	724805	1	2	50.0	5.0	✓
CCME PHC - F1 by Headspace GC-FID (Low Level)	E581.F1-L	728064	1	13	7.6	5.0	✓
Chloride in Water by IC	E235.Cl	729182	1	18	5.5	5.0	✓
Colour (True) by Spectrometer (2 CU)	E329-L	724671	1	12	8.3	5.0	✓
Conductivity in Water	E100	729186	1	12	8.3	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	724874	1	19	5.2	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	723488	1	20	5.0	5.0	✓
Fluoride in Water by IC	E235.F	729179	1	4	25.0	5.0	✓
Miscellaneous Pesticides by GC-MS	E660E-H	724791	1	4	25.0	5.0	✓
Nitrate in Water by IC	E235.NO3	729180	1	14	7.1	5.0	✓

Matrix: **Water**

Evaluation: × = QC frequency outside specification; ✓ = QC frequency within specification.

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Laboratory Control Samples (LCS) - Continued							
Nitrite in Water by IC	E235.NO2	729181	1	4	25.0	5.0	✓
pH by Meter	E108	729184	1	17	5.8	5.0	✓
Phenolics (Ontario Chlorophenols List) by GC-MS	E651D	724808	1	2	50.0	5.0	✓
Silica Gel Treated CCME PHCs - F2-F4sg by GC-FID	E601.SG	725961	1	11	9.0	5.0	✓
Sulfate in Water by IC	E235.SO4	729183	1	7	14.2	5.0	✓
Tannin & Lignin in Water	E563	722654	1	11	9.0	5.0	✓
TDS by Gravimetry	E162	726629	1	20	5.0	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	726029	1	20	5.0	5.0	✓
Total Sulfide by Colourimetry (Automated Flow)	E395-H	727164	1	20	5.0	5.0	✓
Turbidity by Nephelometry	E121	730340	1	20	5.0	5.0	✓
VOCs (Eastern Canada List) by Headspace GC-MS	E611D	728063	1	20	5.0	5.0	✓
Method Blanks (MB)							
Alkalinity Species by Titration	E290	729185	1	14	7.1	5.0	✓
Ammonia by Fluorescence	E298	726698	1	20	5.0	5.0	✓
BNA (ON 625-511 list) by GC-MS	E655A	724805	1	2	50.0	5.0	✓
CCME PHC - F1 by Headspace GC-FID (Low Level)	E581.F1-L	728064	1	13	7.6	5.0	✓
Chloride in Water by IC	E235.Cl	729182	1	18	5.5	5.0	✓
Colour (True) by Spectrometer (2 CU)	E329-L	724671	1	12	8.3	5.0	✓
Conductivity in Water	E100	729186	1	12	8.3	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	724874	1	19	5.2	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	723488	1	20	5.0	5.0	✓
E. coli (MF-mFC-BCIG)	E012A.EC	721578	1	10	10.0	5.0	✓
Fluoride in Water by IC	E235.F	729179	1	4	25.0	5.0	✓
Heterotrophic Plate Count by MF (MF-mHPC)	E012.HPC	721573	1	5	20.0	5.0	✓
Miscellaneous Pesticides by GC-MS	E660E-H	724791	1	4	25.0	5.0	✓
Nitrate in Water by IC	E235.NO3	729180	1	14	7.1	5.0	✓
Nitrite in Water by IC	E235.NO2	729181	1	4	25.0	5.0	✓
Phenolics (Ontario Chlorophenols List) by GC-MS	E651D	724808	1	2	50.0	5.0	✓
Silica Gel Treated CCME PHCs - F2-F4sg by GC-FID	E601.SG	725961	1	11	9.0	5.0	✓
Sulfate in Water by IC	E235.SO4	729183	1	7	14.2	5.0	✓
Tannin & Lignin in Water	E563	722654	1	11	9.0	5.0	✓
TDS by Gravimetry	E162	726629	1	20	5.0	5.0	✓
Total Coliforms (MF-mEndo)	E012.TC	721574	1	9	11.1	5.0	✓
Total Coliforms Background (MF-mEndo)	E012.BG.TC	721575	1	3	33.3	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	726029	1	20	5.0	5.0	✓
Total Sulfide by Colourimetry (Automated Flow)	E395-H	727164	1	20	5.0	5.0	✓
Turbidity by Nephelometry	E121	730340	1	20	5.0	5.0	✓
VOCs (Eastern Canada List) by Headspace GC-MS	E611D	728063	1	20	5.0	5.0	✓
Matrix Spikes (MS)							

Matrix: **Water**

Evaluation: × = *QC frequency outside specification*; ✓ = *QC frequency within specification.*

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Matrix Spikes (MS) - Continued							
Ammonia by Fluorescence	E298	726698	1	20	5.0	5.0	✓
CCME PHC - F1 by Headspace GC-FID (Low Level)	E581.F1-L	728064	1	13	7.6	5.0	✓
Chloride in Water by IC	E235.Cl	729182	1	18	5.5	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	724874	1	19	5.2	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	723488	1	20	5.0	5.0	✓
Fluoride in Water by IC	E235.F	729179	1	4	25.0	5.0	✓
Nitrate in Water by IC	E235.NO3	729180	1	14	7.1	5.0	✓
Nitrite in Water by IC	E235.NO2	729181	1	4	25.0	5.0	✓
Sulfate in Water by IC	E235.SO4	729183	1	7	14.2	5.0	✓
Tannin & Lignin in Water	E563	722654	1	11	9.0	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	726029	1	20	5.0	5.0	✓
Total Sulfide by Colourimetry (Automated Flow)	E395-H	727164	1	20	5.0	5.0	✓
VOCs (Eastern Canada List) by Headspace GC-MS	E611D	728063	1	20	5.0	5.0	✓

Methodology References and Summaries

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Reference methods may incorporate modifications to improve performance (indicated by "mod").

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Total Coliforms Background (MF-mEndo)	E012.BG.TC Waterloo - Environmental	Water	APHA 9222B (mod)	Noncoliform bacteria observed on Total Coliform plates are enumerated.
Heterotrophic Plate Count by MF (MF-mHPC)	E012.HPC Waterloo - Environmental	Water	SM 9215D	Following filtration (0.45 µm), and incubation at 35.0 ±0.5°C for 48 hours, the observed colonies are enumerated.
Total Coliforms (MF-mEndo)	E012.TC Waterloo - Environmental	Water	APHA 9222B (mod)	Following filtration (0.45 µm), and incubation at 35.0 ±0.5°C for 24 hours, colonies exhibiting characteristic morphology of the target organism are enumerated and confirmed.
E. coli (MF-mFC-BCIG)	E012A.EC Waterloo - Environmental	Water	ON E3433 (mod)	Following filtration (0.45 µm), and incubation at 44.5±0.2°C for 24 hours, colonies exhibiting characteristic morphology of the target organism are enumerated.
Conductivity in Water	E100 Waterloo - Environmental	Water	APHA 2510 (mod)	Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a water sample. Conductivity measurements are temperature-compensated to 25°C.
pH by Meter	E108 Waterloo - Environmental	Water	APHA 4500-H (mod)	pH is determined by potentiometric measurement with a pH electrode, and is conducted at ambient laboratory temperature (normally 20 ± 5°C). For high accuracy test results, pH should be measured in the field within the recommended 15 minute hold time.
Turbidity by Nephelometry	E121 Waterloo - Environmental	Water	APHA 2130 B (mod)	Turbidity is measured by the nephelometric method, by measuring the intensity of light scatter under defined conditions.
TDS by Gravimetry	E162 Waterloo - Environmental	Water	APHA 2540 C (mod)	Total Dissolved Solids (TDS) are determined by filtering a sample through a glass fibre filter, with evaporation of the filtrate at 180 ± 2°C for 16 hours or to constant weight, with gravimetric measurement of the residue.
Chloride in Water by IC	E235.Cl Waterloo - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Fluoride in Water by IC	E235.F Waterloo - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Nitrite in Water by IC	E235.NO2 Waterloo - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Nitrate in Water by IC	E235.NO3 Waterloo - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Sulfate in Water by IC	E235.SO4 Waterloo - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Alkalinity Species by Titration	E290 Waterloo - Environmental	Water	APHA 2320 B (mod)	Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.
Ammonia by Fluorescence	E298 Waterloo - Environmental	Water	Method Fialab 100, 2018	Ammonia in water is determined by automated continuous flow analysis with membrane diffusion and fluorescence detection, after reaction with OPA (ortho-phthalaldehyde). This method is approved under US EPA 40 CFR Part 136 (May 2021)
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318 Waterloo - Environmental	Water	Method Fialab 100, 2018	TKN in water is determined by automated continuous flow analysis with membrane diffusion and fluorescence detection, after reaction with OPA (ortho-phthalaldehyde). This method is approved under US EPA 40 CFR Part 136 (May 2021).
Colour (True) by Spectrometer (2 CU)	E329-L Waterloo - Environmental	Water	APHA 2120 C (mod)	Colour (True Colour) is determined by filtering a sample through a 0.45 micron membrane filter followed by analysis of the filtrate using the platinum-cobalt colourimetric method. Colour measurements can be highly pH dependent, and apply to the pH of the sample as received (at time of testing), without pH adjustment.
Dissolved Organic Carbon by Combustion (Low Level)	E358-L Waterloo - Environmental	Water	APHA 5310 B (mod)	Dissolved Organic Carbon (Non-Purgeable), also known as NPOC (dissolved), is a direct measurement of DOC after a filtered (0.45 micron) sample has been acidified and purged to remove inorganic carbon (IC). Analysis is by high temperature combustion with infrared detection of CO_2. NPOC does not include volatile organic species that are purged off with IC. For samples where the majority of DC (dissolved carbon) is comprised of IC (which is common), this method is more accurate and more reliable than the DOC by subtraction method (i.e. DC minus DIC).
Total Sulfide by Colourimetry (Automated Flow)	E395-H Vancouver - Environmental	Water	APHA 4500 -S E-Auto-Colorimetry	Sulfide is determined using the gas dialysis automated methlyene blue colourimetric method. Results expressed "as H_2S" if reported represent the maximum possible H_2S concentration based on the total sulfide concentration in the sample. The H_2S calculation converts Total Sulphide as (S^{2-}) and reports it as Total Sulphide as (H_2S)
Dissolved Metals in Water by CRC ICPMS	E421 Waterloo - Environmental	Water	APHA 3030B/EPA 6020B (mod)	Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by Collision/Reaction Cell ICPMS. Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Tannin & Lignin in Water	E563 Waterloo - Environmental	Water	APHA 5550 B-Colorimetry	This analysis is carried out using procedures adapted from APHA Method 5550 B. "Tannin & Lignin ". Both lignin and tannin contain aromatic hydroxyl groups that react with Folin phenol reagent (tungstophosphoric and molybdophosphoric acids) to form a blue color suitable for the estimation of tannin and lignin concentrations. However, the reaction is not specific for lignin or tannin, nor for compounds containing aromatic hydroxyl groups, in as much as many other reducing materials, both organic and inorganic, respond similarly.
CCME PHC - F1 by Headspace GC-FID (Low Level)	E581.F1-L Waterloo - Environmental	Water	CCME PHC in Soil - Tier 1	CCME Fraction 1 (F1) is analyzed by static headspace GC-FID. Samples are prepared in headspace vials and are heated and agitated on the headspace autosampler, causing VOCs to partition between the aqueous phase and the headspace in accordance with Henry's law.
Silica Gel Treated CCME PHCs - F2-F4sg by GC-FID	E601.SG Waterloo - Environmental	Water	CCME PHC in Soil - Tier 1	Sample extracts are subjected to in-situ silica gel treatment prior to analysis by GC-FID for CCME hydrocarbon fractions (F2-F4).
VOCs (Eastern Canada List) by Headspace GC-MS	E611D Waterloo - Environmental	Water	EPA 8260D (mod)	Volatile Organic Compounds (VOCs) are analyzed by static headspace GC-MS. Samples are prepared in headspace vials and are heated and agitated on the headspace autosampler, causing VOCs to partition between the aqueous phase and the headspace in accordance with Henry's law.
Phenolics (Ontario Chlorophenols List) by GC-MS	E651D Waterloo - Environmental	Water	EPA 8270E (mod)	Phenolics are analyzed by GC-MS.
BNA (ON 625-511 list) by GC-MS	E655A Waterloo - Environmental	Water	EPA 8270E (mod)	BNA are analyzed by GC-MS.
Miscellaneous Pesticides by GC-MS	E660E-H Waterloo - Environmental	Water	EPA 8270E (mod)	Pesticides are analyzed by GC-MS.
Dissolved Hardness (Calculated)	EC100 Waterloo - Environmental	Water	APHA 2340B	"Hardness (as CaCO3), dissolved" is calculated from the sum of dissolved Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. "Total Hardness" refers to the sum of Calcium and Magnesium Hardness. Hardness is normally or preferentially calculated from dissolved Calcium and Magnesium concentrations, because it is a property of water due to dissolved divalent cations.
Ion Balance using Dissolved Metals	EC101 Waterloo - Environmental	Water	APHA 1030E	Cation Sum, Anion Sum, and Ion Balance are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Dissolved species are used where available. Minor ions are included where data is present. Ion Balance cannot be calculated accurately for waters with very low electrical conductivity (EC).

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
F1-BTEX	EC580 Waterloo - Environmental	Water	CCME PHC in Soil - Tier 1	F1-BTEX is calculated as follows: F1-BTEX = F1 (C6-C10) minus benzene, toluene, ethylbenzene and xylenes (BTEX).
SUM F1 to F4 where F2-F4 is SG treated	EC581SG Waterloo - Environmental	Water	CCME PHC in Soil - Tier 1	Hydrocarbons, total (C6-C50) is the sum of CCME Fraction F1(C6-C10), F2(C10-C16), F3(C16-C34), and F4(C34-C50), where F2-F4 have been treated with silica gel. F4G-sg is not used within this calculation due to overlap with other fractions.
F2-F4 (sg) minus PAH	EC600SG Waterloo - Environmental	Water	CCME PHC in Soil - Tier 1	F2-F4 (sg) minus PAH is calculated as follows: F2-F4 minus PAH = Sum of CCME Fraction 2 (C10-C16), CCME Fraction 3 (C16-C34), and CCME Fraction 4 (C34-C50), minus select Polycyclic Aromatic Hydrocarbons (PAH).

Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Preparation for Ammonia	EP298 Waterloo - Environmental	Water		Sample preparation for Preserved Nutrients Water Quality Analysis.
Digestion for TKN in water	EP318 Waterloo - Environmental	Water	APHA 4500-Norg D (mod)	Samples are digested at high temperature using Sulfuric Acid with Copper catalyst, which converts organic nitrogen sources to Ammonia, which is then quantified by the analytical method as TKN. This method is unsuitable for samples containing high levels of nitrate. If nitrate exceeds TKN concentration by ten times or more, results may be biased low.
Preparation for Dissolved Organic Carbon for Combustion	EP358 Waterloo - Environmental	Water	APHA 5310 B (mod)	Preparation for Dissolved Organic Carbon
Dissolved Metals Water Filtration	EP421 Waterloo - Environmental	Water	APHA 3030B	Water samples are filtered (0.45 um), and preserved with HNO3.
VOCs Preparation for Headspace Analysis	EP581 Waterloo - Environmental	Water	EPA 5021A (mod)	Samples are prepared in headspace vials and are heated and agitated on the headspace autosampler. An aliquot of the headspace is then injected into the GC/MS-FID system.
PHCs and PAHs Hexane Extraction	EP601 Waterloo - Environmental	Water	EPA 3511 (mod)	Petroleum Hydrocarbons (PHCs) and Polycyclic Aromatic Hydrocarbons (PAHs) are extracted using a hexane liquid-liquid extraction.
Phenolics Extraction	EP651 Waterloo - Environmental	Water	EPA 3511 (mod)	Phenolics are extracted from acidic aqueous sample using DCM liquid-liquid extraction.

Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
BNA Extraction	EP655 Waterloo - Environmental	Water	EPA 3510C (mod)	SVOCs are extracted from aqueous sample using DCM liquid-liquid extraction.
Pesticides & Toxaphene Extraction by DCM	EP660D Waterloo - Environmental	Water	EPA 1699 (mod)	Samples are extracted from aqueous sample using DCM liquid-liquid extraction.

QUALITY CONTROL REPORT

Work Order	: **WT2220058**	Page	: 1 of 19
Client	: GHD Limited	Laboratory	: Waterloo - Environmental
Contact	: Pascal Renella	Account Manager	: Rick Hawthorne
Address	: 455 Phillip Street Waterloo ON Canada N2L 3X2	Address	: 60 Northland Road, Unit 1 Waterloo, Ontario Canada N2V 2B8
Telephone	:	Telephone	: +1 519 886 6910
Project	: 12586015-03.004	Date Samples Received	: 28-Oct-2022 07:40
PO	: 735-003748-1	Date Analysis Commenced	: 29-Oct-2022
C-O-C number	: ----	Issue Date	: 09-Nov-2022 10:59
Sampler	: ---- 519 725 3313		
Site	: ----		
Quote number	: 12586015-SSOW-735-003748-1		
No. of samples received	: 3		
No. of samples analysed	: 3		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percent Difference (RPD) and Data Quality Objectives
- Matrix Spike (MS) Report; Recovery and Data Quality Objectives
- Method Blank (MB) Report; Recovery and Data Quality Objectives
- Laboratory Control Sample (LCS) Report; Recovery and Data Quality Objectives

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Amanda Ganouri-Lumsden	Department Manager - Microbiology and Prep	Waterloo Microbiology, Waterloo, Ontario
Danielle Gravel	Team Leader - Semi-Volatile Instrumentation	Waterloo Organics, Waterloo, Ontario
Greg Pokocky	Supervisor - Inorganic	Waterloo Inorganics, Waterloo, Ontario
Jeremy Gingras	Team Leader - Semi-Volatile Instrumentation	Waterloo Organics, Waterloo, Ontario
Jon Fisher	Department Manager - Inorganics	Waterloo Inorganics, Waterloo, Ontario
Jon Fisher	Department Manager - Inorganics	Waterloo Metals, Waterloo, Ontario
Kelsey Hesch	Analyst	Waterloo Organics, Waterloo, Ontario
Lindsay Gung	Supervisor - Water Chemistry	Vancouver Inorganics, Burnaby, British Columbia
Ruby Sujeepan		Waterloo Microbiology, Waterloo, Ontario

General Comments

The ALS Quality Control (QC) report is optionally provided to ALS clients upon request. ALS test methods include comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against predetermined Data Quality Objectives (DQOs) to provide confidence in the accuracy of associated test results. This report contains detailed results for all QC results applicable to this sample submission. Please refer to the ALS Quality Control Interpretation report (QCI) for applicable method references and methodology summaries.

Key :

Anonymous = Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number = Chemical Abstracts Service number is a unique identifier assigned to discrete substances.
DQO = Data Quality Objective.
LOR = Limit of Reporting (detection limit).
RPD = Relative Percent Difference
# = Indicates a QC result that did not meet the ALS DQO.

Workorder Comments

Holding times are displayed as "---" if no guidance exists from CCME, Canadian provinces, or broadly recognized international references.

Laboratory Duplicate (DUP) Report

A Laboratory Duplicate (DUP) is a randomly selected intralaboratory replicate sample. Laboratory Duplicates provide information regarding method precision and sample heterogeneity. ALS DQOs for Laboratory Duplicates are expressed as test-specific limits for Relative Percent Difference (RPD), or as an absolute difference limit of 2 times the LOR for low concentration duplicates within ~ 4-10 times the LOR (cut-off is test-specific).

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
Physical Tests (QC Lot: 724671)											
WT2219921-001	Anonymous	colour, true	----	E329-L	2.0	CU	2.4	3.5	1.1	Diff <2x LOR	----
Physical Tests (QC Lot: 726629)											
WT2219765-001	Anonymous	solids, total dissolved [TDS]	----	E162	20	mg/L	327	313	4.53%	20%	----
Physical Tests (QC Lot: 729184)											
WT2220058-001	GW-12586015-GW-004	pH	----	E108	0.10	pH units	8.43	8.43	0.00%	4%	----
Physical Tests (QC Lot: 729185)											
WT2220058-001	GW-12586015-GW-004	alkalinity, total (as CaCO3)	----	E290	2.0	mg/L	269	276	2.61%	20%	----
Physical Tests (QC Lot: 729186)											
WT2220058-001	GW-12586015-GW-004	conductivity	----	E100	2.0	µS/cm	790	806	2.00%	10%	----
Physical Tests (QC Lot: 730340)											
WT2220018-010	Anonymous	turbidity	----	E121	0.10	NTU	26.2	25.4	3.10%	15%	----
Anions and Nutrients (QC Lot: 726029)											
WT2219431-001	Anonymous	Kjeldahl nitrogen, total [TKN]	----	E318	0.250	mg/L	7.85	8.30	5.56%	20%	----
Anions and Nutrients (QC Lot: 726698)											
WT2219521-001	Anonymous	ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L	<0.0050	<0.0050	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 729179)											
WT2220058-001	GW-12586015-GW-004	fluoride	16984-48-8	E235.F	0.020	mg/L	0.192	0.196	0.004	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 729180)											
WT2220058-001	GW-12586015-GW-004	nitrate (as N)	14797-55-8	E235.NO3	0.020	mg/L	<0.020	<0.020	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 729181)											
WT2220058-001	GW-12586015-GW-004	nitrite (as N)	14797-65-0	E235.NO2	0.010	mg/L	<0.010	<0.010	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 729182)											
WT2220058-001	GW-12586015-GW-004	chloride	16887-00-6	E235.Cl	0.50	mg/L	67.0	65.2	2.80%	20%	----
Anions and Nutrients (QC Lot: 729183)											
WT2220058-001	GW-12586015-GW-004	sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L	62.5	61.5	1.52%	20%	----
Organic / Inorganic Carbon (QC Lot: 723488)											
WT2219719-001	Anonymous	carbon, dissolved organic [DOC]	----	E358-L	0.50	mg/L	6.34	6.73	5.97%	20%	----
Total Sulfides (QC Lot: 727164)											
WT2219979-001	Anonymous	sulfide, total (as S)	18496-25-8	E395-H	0.010	mg/L	<0.010	<0.010	0	Diff <2x LOR	----
Microbiological Tests (QC Lot: 721573)											

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Microbiological Tests (QC Lot: 721573) - continued											
WT2220018-013	Anonymous	heterotrophic plate count [HPC]	----	E012.HPC	1	CFU/1mL	>200	>200	0.00%	65%	----
Microbiological Tests (QC Lot: 721574)											
WT2220058-001	GW-12586015-GW-004	coliforms, total	----	E012.TC	1	CFU/100mL	<1	<1	0	Diff <2x LOR	----
Microbiological Tests (QC Lot: 721575)											
WT2220058-001	GW-12586015-GW-004	coliforms, total background	----	E012.BG.TC	1	CFU/100mL	1	<1	0	Diff <2x LOR	----
Microbiological Tests (QC Lot: 721578)											
WT2220058-001	GW-12586015-GW-004	coliforms, Escherichia coli [E. coli]	----	E012A.EC	1	CFU/100mL	<1	<1	0	Diff <2x LOR	----
Dissolved Metals (QC Lot: 724874)											
WT2220058-001	GW-12586015-GW-004	aluminum, dissolved	7429-90-5	E421	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	----
		antimony, dissolved	7440-36-0	E421	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		arsenic, dissolved	7440-38-2	E421	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		barium, dissolved	7440-39-3	E421	0.00010	mg/L	0.149	0.149	0.0191%	20%	----
		beryllium, dissolved	7440-41-7	E421	0.000020	mg/L	<0.000020	<0.000020	0	Diff <2x LOR	----
		boron, dissolved	7440-42-8	E421	0.010	mg/L	0.077	0.077	0.00005	Diff <2x LOR	----
		cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L	<0.0000050	<0.0000050	0	Diff <2x LOR	----
		calcium, dissolved	7440-70-2	E421	0.050	mg/L	96.9	96.3	0.654%	20%	----
		chromium, dissolved	7440-47-3	E421	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		cobalt, dissolved	7440-48-4	E421	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		copper, dissolved	7440-50-8	E421	0.00020	mg/L	0.00035	0.00034	0.000005	Diff <2x LOR	----
		lead, dissolved	7439-92-1	E421	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		magnesium, dissolved	7439-95-4	E421	0.0050	mg/L	36.1	35.4	1.93%	20%	----
		manganese, dissolved	7439-96-5	E421	0.00010	mg/L	0.0420	0.0415	1.02%	20%	----
		molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L	0.00604	0.00602	0.410%	20%	----
		nickel, dissolved	7440-02-0	E421	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		potassium, dissolved	7440-09-7	E421	0.050	mg/L	5.14	5.04	1.88%	20%	----
		selenium, dissolved	7782-49-2	E421	0.000050	mg/L	0.000141	0.000174	0.000033	Diff <2x LOR	----
		silver, dissolved	7440-22-4	E421	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		sodium, dissolved	7440-23-5	E421	0.050	mg/L	28.8	28.1	2.42%	20%	----
		strontium, dissolved	7440-24-6	E421	0.00020	mg/L	2.05	2.04	0.441%	20%	----
		thallium, dissolved	7440-28-0	E421	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		uranium, dissolved	7440-61-1	E421	0.000010	mg/L	0.000246	0.000246	0.162%	20%	----
		vanadium, dissolved	7440-62-2	E421	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		zinc, dissolved	7440-66-6	E421	0.0010	mg/L	0.0066	0.0069	0.0002	Diff <2x LOR	----
Aggregate Organics (QC Lot: 722654)											

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Aggregate Organics (QC Lot: 722654) - continued											
VA22C5934-004	Anonymous	tannin + lignin (as tannic acid)	----	E563	0.10	mg/L	3.42	3.44	0.737%	20%	----
Volatile Organic Compounds (QC Lot: 728063)											
TY2203475-001	Anonymous	Acetone	67-64-1	E611D	20	µg/L	<20	<20	0	Diff <2x LOR	----
		benzene	71-43-2	E611D	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
		bromodichloromethane	75-27-4	E611D	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
		bromoform	75-25-2	E611D	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
		bromomethane	74-83-9	E611D	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
		carbon tetrachloride	56-23-5	E611D	0.20	µg/L	<0.20	<0.20	0	Diff <2x LOR	----
		chlorobenzene	108-90-7	E611D	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
		chloroform	67-66-3	E611D	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
		dibromochloromethane	124-48-1	E611D	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
		dibromoethane, 1,2-	106-93-4	E611D	0.20	µg/L	<0.20	<0.20	0	Diff <2x LOR	----
		dichlorobenzene, 1,2-	95-50-1	E611D	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
		dichlorobenzene, 1,3-	541-73-1	E611D	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
		dichlorobenzene, 1,4-	106-46-7	E611D	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
		dichlorodifluoromethane	75-71-8	E611D	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
		dichloroethane, 1,1-	75-34-3	E611D	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
		dichloroethane, 1,2-	107-06-2	E611D	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
		dichloroethylene, 1,1-	75-35-4	E611D	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
		dichloroethylene, cis-1,2-	156-59-2	E611D	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
		dichloroethylene, trans-1,2-	156-60-5	E611D	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
		dichloromethane	75-09-2	E611D	1.0	µg/L	<1.0	<1.0	0	Diff <2x LOR	----
		dichloropropane, 1,2-	78-87-5	E611D	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
		dichloropropylene, cis-1,3-	10061-01-5	E611D	0.30	µg/L	<0.30	<0.30	0	Diff <2x LOR	----
		dichloropropylene, trans-1,3-	10061-02-6	E611D	0.30	µg/L	<0.30	<0.30	0	Diff <2x LOR	----
		ethylbenzene	100-41-4	E611D	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
		hexane, n-	110-54-3	E611D	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
		methyl ethyl ketone [MEK]	78-93-3	E611D	20	µg/L	<20	<20	0	Diff <2x LOR	----
		methyl isobutyl ketone [MIBK]	108-10-1	E611D	20	µg/L	<20	<20	0	Diff <2x LOR	----
		methyl-tert-butyl ether [MTBE]	1634-04-4	E611D	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
		styrene	100-42-5	E611D	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
		tetrachloroethane, 1,1,1,2-	630-20-6	E611D	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
		tetrachloroethane, 1,1,2,2-	79-34-5	E611D	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
		tetrachloroethylene	127-18-4	E611D	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Volatile Organic Compounds (QC Lot: 728063) - continued											
TY2203475-001	Anonymous	toluene	108-88-3	E611D	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
		trichloroethane, 1,1,1-	71-55-6	E611D	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
		trichloroethane, 1,1,2-	79-00-5	E611D	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
		trichloroethylene	79-01-6	E611D	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
		trichlorofluoromethane	75-69-4	E611D	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
		vinyl chloride	75-01-4	E611D	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
		xylene, m+p-	179601-23-1	E611D	0.40	µg/L	<0.40	<0.40	0	Diff <2x LOR	----
		xylene, o-	95-47-6	E611D	0.30	µg/L	<0.30	<0.30	0	Diff <2x LOR	----
Hydrocarbons (QC Lot: 728064)											
TY2203475-001	Anonymous	F1 (C6-C10)	----	E581.F1-L	25	µg/L	<25	<25	0	Diff <2x LOR	----

Method Blank (MB) Report

A Method Blank is an analyte-free matrix that undergoes sample processing identical to that carried out for test samples. Method Blank results are used to monitor and control for potential contamination from the laboratory environment and reagents. For most tests, the DQO for Method Blanks is for the result to be < LOR.

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Physical Tests (QCLot: 724671)						
colour, true	----	E329-L	2	CU	<2.0	----
Physical Tests (QCLot: 726629)						
solids, total dissolved [TDS]	----	E162	10	mg/L	<10	----
Physical Tests (QCLot: 729185)						
alkalinity, total (as CaCO3)	----	E290	1	mg/L	# 2.6	----
Physical Tests (QCLot: 729186)						
conductivity	----	E100	1	µS/cm	<1.0	----
Physical Tests (QCLot: 730340)						
turbidity	----	E121	0.1	NTU	<0.10	----
Anions and Nutrients (QCLot: 726029)						
Kjeldahl nitrogen, total [TKN]	----	E318	0.05	mg/L	<0.050	----
Anions and Nutrients (QCLot: 726698)						
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	<0.0050	----
Anions and Nutrients (QCLot: 729179)						
fluoride	16984-48-8	E235.F	0.02	mg/L	<0.020	----
Anions and Nutrients (QCLot: 729180)						
nitrate (as N)	14797-55-8	E235.NO3	0.02	mg/L	<0.020	----
Anions and Nutrients (QCLot: 729181)						
nitrite (as N)	14797-65-0	E235.NO2	0.01	mg/L	<0.010	----
Anions and Nutrients (QCLot: 729182)						
chloride	16887-00-6	E235.Cl	0.5	mg/L	<0.50	----
Anions and Nutrients (QCLot: 729183)						
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	<0.30	----
Organic / Inorganic Carbon (QCLot: 723488)						
carbon, dissolved organic [DOC]	----	E358-L	0.5	mg/L	<0.50	----
Total Sulfides (QCLot: 727164)						
sulfide, total (as S)	18496-25-8	E395-H	0.01	mg/L	<0.010	----
Microbiological Tests (QCLot: 721573)						
heterotrophic plate count [HPC]	----	E012.HPC	1	CFU/1mL	<1	----
Microbiological Tests (QCLot: 721574)						
coliforms, total	----	E012.TC	1	CFU/100mL	<1	----
Microbiological Tests (QCLot: 721575)						

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Microbiological Tests (QCLot: 721575) - continued						
coliforms, total background	----	E012.BG.TC	1	CFU/100mL	<1	----
Microbiological Tests (QCLot: 721578)						
coliforms, Escherichia coli [E. coli]	----	E012A.EC	1	CFU/100mL	<1	----
Dissolved Metals (QCLot: 724874)						
aluminum, dissolved	7429-90-5	E421	0.001	mg/L	<0.0010	----
antimony, dissolved	7440-36-0	E421	0.0001	mg/L	<0.00010	----
arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	<0.00010	----
barium, dissolved	7440-39-3	E421	0.0001	mg/L	<0.00010	----
beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	<0.000020	----
boron, dissolved	7440-42-8	E421	0.01	mg/L	<0.010	----
cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	<0.0000050	----
calcium, dissolved	7440-70-2	E421	0.05	mg/L	<0.050	----
chromium, dissolved	7440-47-3	E421	0.0005	mg/L	<0.00050	----
cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	<0.00010	----
copper, dissolved	7440-50-8	E421	0.0002	mg/L	<0.00020	----
lead, dissolved	7439-92-1	E421	0.00005	mg/L	<0.000050	----
magnesium, dissolved	7439-95-4	E421	0.005	mg/L	<0.0050	----
manganese, dissolved	7439-96-5	E421	0.0001	mg/L	<0.00010	----
molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	<0.000050	----
nickel, dissolved	7440-02-0	E421	0.0005	mg/L	<0.00050	----
potassium, dissolved	7440-09-7	E421	0.05	mg/L	<0.050	----
selenium, dissolved	7782-49-2	E421	0.00005	mg/L	<0.000050	----
silver, dissolved	7440-22-4	E421	0.00001	mg/L	<0.000010	----
sodium, dissolved	7440-23-5	E421	0.05	mg/L	<0.050	----
strontium, dissolved	7440-24-6	E421	0.0002	mg/L	<0.00020	----
thallium, dissolved	7440-28-0	E421	0.00001	mg/L	<0.000010	----
uranium, dissolved	7440-61-1	E421	0.00001	mg/L	<0.000010	----
vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	<0.00050	----
zinc, dissolved	7440-66-6	E421	0.001	mg/L	<0.0010	----
Aggregate Organics (QCLot: 722654)						
tannin + lignin (as tannic acid)	----	E563	0.1	mg/L	<0.10	----
Volatile Organic Compounds (QCLot: 728063)						
Acetone	67-64-1	E611D	20	µg/L	<20	----
benzene	71-43-2	E611D	0.5	µg/L	<0.50	----
bromodichloromethane	75-27-4	E611D	0.5	µg/L	<0.50	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Volatile Organic Compounds (QCLot: 728063) - continued						
bromoform	75-25-2	E611D	0.5	µg/L	<0.50	----
bromomethane	74-83-9	E611D	0.5	µg/L	<0.50	----
carbon tetrachloride	56-23-5	E611D	0.2	µg/L	<0.20	----
chlorobenzene	108-90-7	E611D	0.5	µg/L	<0.50	----
chloroform	67-66-3	E611D	0.5	µg/L	<0.50	----
dibromochloromethane	124-48-1	E611D	0.5	µg/L	<0.50	----
dibromoethane, 1,2-	106-93-4	E611D	0.2	µg/L	<0.20	----
dichlorobenzene, 1,2-	95-50-1	E611D	0.5	µg/L	<0.50	----
dichlorobenzene, 1,3-	541-73-1	E611D	0.5	µg/L	<0.50	----
dichlorobenzene, 1,4-	106-46-7	E611D	0.5	µg/L	<0.50	----
dichlorodifluoromethane	75-71-8	E611D	0.5	µg/L	<0.50	----
dichloroethane, 1,1-	75-34-3	E611D	0.5	µg/L	<0.50	----
dichloroethane, 1,2-	107-06-2	E611D	0.5	µg/L	<0.50	----
dichloroethylene, 1,1-	75-35-4	E611D	0.5	µg/L	<0.50	----
dichloroethylene, cis-1,2-	156-59-2	E611D	0.5	µg/L	<0.50	----
dichloroethylene, trans-1,2-	156-60-5	E611D	0.5	µg/L	<0.50	----
dichloromethane	75-09-2	E611D	1	µg/L	<1.0	----
dichloropropane, 1,2-	78-87-5	E611D	0.5	µg/L	<0.50	----
dichloropropylene, cis-1,3-	10061-01-5	E611D	0.3	µg/L	<0.30	----
dichloropropylene, trans-1,3-	10061-02-6	E611D	0.3	µg/L	<0.30	----
ethylbenzene	100-41-4	E611D	0.5	µg/L	<0.50	----
hexane, n-	110-54-3	E611D	0.5	µg/L	<0.50	----
methyl ethyl ketone [MEK]	78-93-3	E611D	20	µg/L	<20	----
methyl isobutyl ketone [MIBK]	108-10-1	E611D	20	µg/L	<20	----
methyl-tert-butyl ether [MTBE]	1634-04-4	E611D	0.5	µg/L	<0.50	----
styrene	100-42-5	E611D	0.5	µg/L	<0.50	----
tetrachloroethane, 1,1,1,2-	630-20-6	E611D	0.5	µg/L	<0.50	----
tetrachloroethane, 1,1,2,2-	79-34-5	E611D	0.5	µg/L	<0.50	----
tetrachloroethylene	127-18-4	E611D	0.5	µg/L	<0.50	----
toluene	108-88-3	E611D	0.5	µg/L	<0.50	----
trichloroethane, 1,1,1-	71-55-6	E611D	0.5	µg/L	<0.50	----
trichloroethane, 1,1,2-	79-00-5	E611D	0.5	µg/L	<0.50	----
trichloroethylene	79-01-6	E611D	0.5	µg/L	<0.50	----
trichlorofluoromethane	75-69-4	E611D	0.5	µg/L	<0.50	----
vinyl chloride	75-01-4	E611D	0.5	µg/L	<0.50	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Volatile Organic Compounds (QCLot: 728063) - continued						
xylene, m+p-	179601-23-1	E611D	0.4	µg/L	<0.40	----
xylene, o-	95-47-6	E611D	0.3	µg/L	<0.30	----
Hydrocarbons (QCLot: 725961)						
F2 (C10-C16)	----	E601.SG	100	µg/L	<100	----
F3 (C16-C34)	----	E601.SG	250	µg/L	<250	----
F4 (C34-C50)	----	E601.SG	250	µg/L	<250	----
Hydrocarbons (QCLot: 728064)						
F1 (C6-C10)	----	E581.F1-L	25	µg/L	<25	----
Polycyclic Aromatic Hydrocarbons (QCLot: 724805)						
acenaphthene	83-32-9	E655A	0.2	µg/L	<0.20	----
acenaphthylene	208-96-8	E655A	0.2	µg/L	<0.20	----
anthracene	120-12-7	E655A	0.2	µg/L	<0.20	----
benz(a)anthracene	56-55-3	E655A	0.2	µg/L	<0.20	----
benzo(a)pyrene	50-32-8	E655A	0.02	µg/L	# <0.040	RRQC
benzo(b+j)fluoranthene	n/a	E655A	0.1	µg/L	<0.10	----
benzo(g,h,i)perylene	191-24-2	E655A	0.2	µg/L	<0.20	----
benzo(k)fluoranthene	207-08-9	E655A	0.1	µg/L	<0.10	----
chrysene	218-01-9	E655A	0.1	µg/L	<0.10	----
dibenz(a,h)anthracene	53-70-3	E655A	0.2	µg/L	<0.20	----
fluoranthene	206-44-0	E655A	0.2	µg/L	<0.20	----
fluorene	86-73-7	E655A	0.2	µg/L	<0.20	----
indeno(1,2,3-c,d)pyrene	193-39-5	E655A	0.2	µg/L	<0.20	----
methylnaphthalene, 1-	90-12-0	E655A	0.4	µg/L	<0.40	----
methylnaphthalene, 2-	91-57-6	E655A	0.4	µg/L	<0.40	----
naphthalene	91-20-3	E655A	0.2	µg/L	<0.20	----
phenanthrene	85-01-8	E655A	0.2	µg/L	<0.20	----
pyrene	129-00-0	E655A	0.2	µg/L	<0.20	----
Phthalate Esters (QCLot: 724805)						
bis(2-ethylhexyl) phthalate [DEHP]	117-81-7	E655A	2	µg/L	<2.0	----
diethyl phthalate	84-66-2	E655A	0.2	µg/L	<0.20	----
dimethyl phthalate	131-11-3	E655A	0.2	µg/L	<0.20	----
Semi-Volatile Organics (QCLot: 724805)						
biphenyl	92-52-4	E655A	0.4	µg/L	<0.40	----
bis(2-chloroethyl) ether	111-44-4	E655A	0.4	µg/L	<0.40	----
bis(2-chloroisopropyl) ether	39638-32-9	E655A	0.4	µg/L	<0.40	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Semi-Volatile Organics (QCLot: 724805) - continued						
chloroaniline, 4-	106-47-8	E655A	0.4	µg/L	<0.40	----
dichlorobenzidine, 3,3'-	91-94-1	E655A	0.4	µg/L	<0.40	----
dinitrotoluene, 2,4-	121-14-2	E655A	0.4	µg/L	<0.40	----
dinitrotoluene, 2,6-	606-20-2	E655A	0.4	µg/L	<0.40	----
trichlorobenzene, 1,2,4-	120-82-1	E655A	0.4	µg/L	<0.40	----
Chlorinated Phenolics (QCLot: 724805)						
chlorophenol, 2-	95-57-8	E655A	0.3	µg/L	<0.30	----
dichlorophenol, 2,4-	120-83-2	E655A	0.3	µg/L	<0.30	----
pentachlorophenol [PCP]	87-86-5	E655A	0.5	µg/L	<0.50	----
trichlorophenol, 2,4,5-	95-95-4	E655A	0.2	µg/L	<0.20	----
trichlorophenol, 2,4,6-	88-06-2	E655A	0.2	µg/L	<0.20	----
Chlorinated Phenolics (QCLot: 724808)						
tetrachlorophenol, 2,3,4,6-	58-90-2	E651D	0.5	µg/L	<0.50	----
Non-Chlorinated Phenolics (QCLot: 724805)						
dimethylphenol, 2,4-	105-67-9	E655A	0.5	µg/L	<0.50	----
dinitrophenol, 2,4-	51-28-5	E655A	1	µg/L	<1.0	----
phenol	108-95-2	E655A	0.5	µg/L	<0.50	----
Pesticides (QCLot: 724791)						
diazinon	333-41-5	E660E-H	0.1	µg/L	<0.10	----

Laboratory Control Sample (LCS) Report

A Laboratory Control Sample (LCS) is an analyte-free matrix that has been fortified (spiked) with test analytes at known concentration and processed in an identical manner to test samples. LCS results are expressed as percent recovery, and are used to monitor and control test method accuracy and precision, independent of test sample matrix.

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Physical Tests (QCLot: 724671)									
colour, true	----	E329-L	2	CU	25 CU	97.6	85.0	115	----
Physical Tests (QCLot: 726629)									
solids, total dissolved [TDS]	----	E162	10	mg/L	1000 mg/L	103	85.0	115	----
Physical Tests (QCLot: 729184)									
pH	----	E108	----	pH units	7 pH units	100	98.0	102	----
Physical Tests (QCLot: 729185)									
alkalinity, total (as CaCO3)	----	E290	1	mg/L	150 mg/L	113	85.0	115	----
Physical Tests (QCLot: 729186)									
conductivity	----	E100	1	µS/cm	1409 µS/cm	99.8	90.0	110	----
Physical Tests (QCLot: 730340)									
turbidity	----	E121	0.1	NTU	200 NTU	90.9	85.0	115	----
Anions and Nutrients (QCLot: 726029)									
Kjeldahl nitrogen, total [TKN]	----	E318	0.05	mg/L	4 mg/L	96.1	75.0	125	----
Anions and Nutrients (QCLot: 726698)									
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	0.2 mg/L	97.9	85.0	115	----
Anions and Nutrients (QCLot: 729179)									
fluoride	16984-48-8	E235.F	0.02	mg/L	1 mg/L	102	90.0	110	----
Anions and Nutrients (QCLot: 729180)									
nitrate (as N)	14797-55-8	E235.NO3	0.02	mg/L	2.5 mg/L	100.0	90.0	110	----
Anions and Nutrients (QCLot: 729181)									
nitrite (as N)	14797-65-0	E235.NO2	0.01	mg/L	0.5 mg/L	99.4	90.0	110	----
Anions and Nutrients (QCLot: 729182)									
chloride	16887-00-6	E235.Cl	0.5	mg/L	100 mg/L	101	90.0	110	----
Anions and Nutrients (QCLot: 729183)									
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	100 mg/L	102	90.0	110	----
Organic / Inorganic Carbon (QCLot: 723488)									
carbon, dissolved organic [DOC]	----	E358-L	0.5	mg/L	8.57 mg/L	105	80.0	120	----
Total Sulfides (QCLot: 727164)									
sulfide, total (as H2S)	7783-06-4	E395-H	----	mg/L	0.085 mg/L	106	80.0	120	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
					Concentration	LCS	Low	High	Qualifier
Total Sulfides (QCLot: 727164) - continued									
sulfide, total (as S)	18496-25-8	E395-H	0.01	mg/L	0.08 mg/L	106	80.0	120	----
Dissolved Metals (QCLot: 724874)									
aluminum, dissolved	7429-90-5	E421	0.001	mg/L	0.1 mg/L	103	80.0	120	----
antimony, dissolved	7440-36-0	E421	0.0001	mg/L	0.05 mg/L	104	80.0	120	----
arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	0.05 mg/L	104	80.0	120	----
barium, dissolved	7440-39-3	E421	0.0001	mg/L	0.0125 mg/L	106	80.0	120	----
beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	0.005 mg/L	102	80.0	120	----
boron, dissolved	7440-42-8	E421	0.01	mg/L	0.05 mg/L	98.5	80.0	120	----
cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	0.005 mg/L	105	80.0	120	----
calcium, dissolved	7440-70-2	E421	0.05	mg/L	2.5 mg/L	104	80.0	120	----
chromium, dissolved	7440-47-3	E421	0.0005	mg/L	0.0125 mg/L	103	80.0	120	----
cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	0.0125 mg/L	103	80.0	120	----
copper, dissolved	7440-50-8	E421	0.0002	mg/L	0.0125 mg/L	101	80.0	120	----
lead, dissolved	7439-92-1	E421	0.00005	mg/L	0.025 mg/L	104	80.0	120	----
magnesium, dissolved	7439-95-4	E421	0.005	mg/L	2.5 mg/L	106	80.0	120	----
manganese, dissolved	7439-96-5	E421	0.0001	mg/L	0.0125 mg/L	105	80.0	120	----
molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	0.0125 mg/L	104	80.0	120	----
nickel, dissolved	7440-02-0	E421	0.0005	mg/L	0.025 mg/L	105	80.0	120	----
potassium, dissolved	7440-09-7	E421	0.05	mg/L	2.5 mg/L	107	80.0	120	----
selenium, dissolved	7782-49-2	E421	0.00005	mg/L	0.05 mg/L	105	80.0	120	----
silver, dissolved	7440-22-4	E421	0.00001	mg/L	0.005 mg/L	108	80.0	120	----
sodium, dissolved	7440-23-5	E421	0.05	mg/L	2.5 mg/L	108	80.0	120	----
strontium, dissolved	7440-24-6	E421	0.0002	mg/L	0.0125 mg/L	106	80.0	120	----
thallium, dissolved	7440-28-0	E421	0.00001	mg/L	0.05 mg/L	103	80.0	120	----
uranium, dissolved	7440-61-1	E421	0.00001	mg/L	0.00025 mg/L	104	80.0	120	----
vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	0.025 mg/L	105	80.0	120	----
zinc, dissolved	7440-66-6	E421	0.001	mg/L	0.025 mg/L	110	80.0	120	----
Aggregate Organics (QCLot: 722654)									
tannin + lignin (as tannic acid)	----	E563	0.1	mg/L	5 mg/L	103	85.0	115	----
Volatile Organic Compounds (QCLot: 728063)									
Acetone	67-64-1	E611D	20	µg/L	100 µg/L	127	70.0	130	----
benzene	71-43-2	E611D	0.5	µg/L	100 µg/L	98.2	70.0	130	----
bromodichloromethane	75-27-4	E611D	0.5	µg/L	100 µg/L	98.7	70.0	130	----

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Volatile Organic Compounds (QCLot: 728063) - continued									
bromoform	75-25-2	E611D	0.5	µg/L	100 µg/L	104	70.0	130	----
bromomethane	74-83-9	E611D	0.5	µg/L	100 µg/L	99.5	60.0	140	----
carbon tetrachloride	56-23-5	E611D	0.2	µg/L	100 µg/L	88.6	70.0	130	----
chlorobenzene	108-90-7	E611D	0.5	µg/L	100 µg/L	91.6	70.0	130	----
chloroform	67-66-3	E611D	0.5	µg/L	100 µg/L	98.9	70.0	130	----
dibromochloromethane	124-48-1	E611D	0.5	µg/L	100 µg/L	104	70.0	130	----
dibromoethane, 1,2-	106-93-4	E611D	0.2	µg/L	100 µg/L	96.7	70.0	130	----
dichlorobenzene, 1,2-	95-50-1	E611D	0.5	µg/L	100 µg/L	94.3	70.0	130	----
dichlorobenzene, 1,3-	541-73-1	E611D	0.5	µg/L	100 µg/L	90.0	70.0	130	----
dichlorobenzene, 1,4-	106-46-7	E611D	0.5	µg/L	100 µg/L	91.7	70.0	130	----
dichlorodifluoromethane	75-71-8	E611D	0.5	µg/L	100 µg/L	79.6	60.0	140	----
dichloroethane, 1,1-	75-34-3	E611D	0.5	µg/L	100 µg/L	106	70.0	130	----
dichloroethane, 1,2-	107-06-2	E611D	0.5	µg/L	100 µg/L	112	70.0	130	----
dichloroethylene, 1,1-	75-35-4	E611D	0.5	µg/L	100 µg/L	95.7	70.0	130	----
dichloroethylene, cis-1,2-	156-59-2	E611D	0.5	µg/L	100 µg/L	101	70.0	130	----
dichloroethylene, trans-1,2-	156-60-5	E611D	0.5	µg/L	100 µg/L	101	70.0	130	----
dichloromethane	75-09-2	E611D	1	µg/L	100 µg/L	111	70.0	130	----
dichloropropane, 1,2-	78-87-5	E611D	0.5	µg/L	100 µg/L	98.1	70.0	130	----
dichloropropylene, cis-1,3-	10061-01-5	E611D	0.3	µg/L	100 µg/L	94.8	70.0	130	----
dichloropropylene, trans-1,3-	10061-02-6	E611D	0.3	µg/L	100 µg/L	105	70.0	130	----
ethylbenzene	100-41-4	E611D	0.5	µg/L	100 µg/L	92.7	70.0	130	----
hexane, n-	110-54-3	E611D	0.5	µg/L	100 µg/L	91.4	70.0	130	----
methyl ethyl ketone [MEK]	78-93-3	E611D	20	µg/L	100 µg/L	103	70.0	130	----
methyl isobutyl ketone [MIBK]	108-10-1	E611D	20	µg/L	100 µg/L	116	70.0	130	----
methyl-tert-butyl ether [MTBE]	1634-04-4	E611D	0.5	µg/L	100 µg/L	91.4	70.0	130	----
styrene	100-42-5	E611D	0.5	µg/L	100 µg/L	93.7	70.0	130	----
tetrachloroethane, 1,1,1,2-	630-20-6	E611D	0.5	µg/L	100 µg/L	97.0	70.0	130	----
tetrachloroethane, 1,1,2,2-	79-34-5	E611D	0.5	µg/L	100 µg/L	110	70.0	130	----
tetrachloroethylene	127-18-4	E611D	0.5	µg/L	100 µg/L	93.2	70.0	130	----
toluene	108-88-3	E611D	0.5	µg/L	100 µg/L	97.1	70.0	130	----
trichloroethane, 1,1,1-	71-55-6	E611D	0.5	µg/L	100 µg/L	96.3	70.0	130	----
trichloroethane, 1,1,2-	79-00-5	E611D	0.5	µg/L	100 µg/L	112	70.0	130	----
trichloroethylene	79-01-6	E611D	0.5	µg/L	100 µg/L	91.2	70.0	130	----
trichlorofluoromethane	75-69-4	E611D	0.5	µg/L	100 µg/L	94.8	60.0	140	----
vinyl chloride	75-01-4	E611D	0.5	µg/L	100 µg/L	80.1	60.0	140	----
xylene, m+p-	179601-23-1	E611D	0.4	µg/L	200 µg/L	94.8	70.0	130	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Laboratory Control Sample (LCS) Report: Spike Concentration	Recovery (%): LCS	Recovery Limits (%): Low	Recovery Limits (%): High	Qualifier
Volatile Organic Compounds (QCLot: 728063) - continued									
xylene, o-	95-47-6	E611D	0.3	µg/L	100 µg/L	97.8	70.0	130	----
Hydrocarbons (QCLot: 725961)									
F2 (C10-C16)	----	E601.SG	100	µg/L	5190.11 µg/L	98.0	70.0	130	----
F3 (C16-C34)	----	E601.SG	250	µg/L	6225.68 µg/L	99.1	70.0	130	----
F4 (C34-C50)	----	E601.SG	250	µg/L	6014.63 µg/L	87.8	70.0	130	----
Hydrocarbons (QCLot: 728064)									
F1 (C6-C10)	----	E581.F1-L	25	µg/L	2000 µg/L	108	80.0	120	----
Polycyclic Aromatic Hydrocarbons (QCLot: 724805)									
acenaphthene	83-32-9	E655A	0.2	µg/L	1.6 µg/L	94.8	50.0	140	----
acenaphthylene	208-96-8	E655A	0.2	µg/L	1.6 µg/L	97.1	50.0	140	----
anthracene	120-12-7	E655A	0.2	µg/L	1.6 µg/L	105	50.0	140	----
benz(a)anthracene	56-55-3	E655A	0.2	µg/L	1.6 µg/L	119	50.0	140	----
benzo(a)pyrene	50-32-8	E655A	0.02	µg/L	1.6 µg/L	109	50.0	140	----
benzo(b+j)fluoranthene	n/a	E655A	0.1	µg/L	1.6 µg/L	74.0	50.0	140	----
benzo(g,h,i)perylene	191-24-2	E655A	0.2	µg/L	1.6 µg/L	67.9	50.0	140	----
benzo(k)fluoranthene	207-08-9	E655A	0.1	µg/L	1.6 µg/L	105	50.0	140	----
chrysene	218-01-9	E655A	0.1	µg/L	1.6 µg/L	95.1	50.0	140	----
dibenz(a,h)anthracene	53-70-3	E655A	0.2	µg/L	1.6 µg/L	73.3	50.0	140	----
fluoranthene	206-44-0	E655A	0.2	µg/L	1.6 µg/L	90.1	50.0	140	----
fluorene	86-73-7	E655A	0.2	µg/L	1.6 µg/L	89.8	50.0	140	----
indeno(1,2,3-c,d)pyrene	193-39-5	E655A	0.2	µg/L	1.6 µg/L	66.4	50.0	140	----
methylnaphthalene, 1-	90-12-0	E655A	0.4	µg/L	1.6 µg/L	97.7	50.0	140	----
methylnaphthalene, 2-	91-57-6	E655A	0.4	µg/L	1.6 µg/L	86.6	50.0	140	----
naphthalene	91-20-3	E655A	0.2	µg/L	1.6 µg/L	87.4	50.0	140	----
phenanthrene	85-01-8	E655A	0.2	µg/L	1.6 µg/L	93.6	50.0	140	----
pyrene	129-00-0	E655A	0.2	µg/L	1.6 µg/L	86.4	50.0	140	----
Phthalate Esters (QCLot: 724805)									
bis(2-ethylhexyl) phthalate [DEHP]	117-81-7	E655A	2	µg/L	6.4 µg/L	116	50.0	140	----
diethyl phthalate	84-66-2	E655A	0.2	µg/L	6.4 µg/L	100	50.0	140	----
dimethyl phthalate	131-11-3	E655A	0.2	µg/L	6.4 µg/L	107	50.0	140	----
Semi-Volatile Organics (QCLot: 724805)									
biphenyl	92-52-4	E655A	0.4	µg/L	1.6 µg/L	97.1	50.0	140	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
					Concentration	LCS	Low	High	Qualifier
Semi-Volatile Organics (QCLot: 724805) - continued									
bis(2-chloroethyl) ether	111-44-4	E655A	0.4	µg/L	1.6 µg/L	85.5	50.0	140	----
bis(2-chloroisopropyl) ether	39638-32-9	E655A	0.4	µg/L	1.6 µg/L	89.4	50.0	140	----
chloroaniline, 4-	106-47-8	E655A	0.4	µg/L	1.6 µg/L	61.4	30.0	130	----
dichlorobenzidine, 3,3'-	91-94-1	E655A	0.4	µg/L	1.6 µg/L	# 25.6	30.0	130	RRQC
dinitrotoluene, 2,4-	121-14-2	E655A	0.4	µg/L	1.6 µg/L	121	50.0	140	----
dinitrotoluene, 2,6-	606-20-2	E655A	0.4	µg/L	1.6 µg/L	118	50.0	140	----
trichlorobenzene, 1,2,4-	120-82-1	E655A	0.4	µg/L	1.6 µg/L	72.0	50.0	140	----
Chlorinated Phenolics (QCLot: 724805)									
chlorophenol, 2-	95-57-8	E655A	0.3	µg/L	4.8 µg/L	87.6	50.0	140	----
dichlorophenol, 2,4-	120-83-2	E655A	0.3	µg/L	4.8 µg/L	106	50.0	140	----
pentachlorophenol [PCP]	87-86-5	E655A	0.5	µg/L	4.8 µg/L	# 148	50.0	140	LCS-H
trichlorophenol, 2,4,5-	95-95-4	E655A	0.2	µg/L	4.8 µg/L	115	50.0	140	----
trichlorophenol, 2,4,6-	88-06-2	E655A	0.2	µg/L	4.8 µg/L	114	50.0	140	----
Chlorinated Phenolics (QCLot: 724808)									
tetrachlorophenol, 2,3,4,6-	58-90-2	E651D	0.5	µg/L	4.8 µg/L	115	50.0	140	----
Non-Chlorinated Phenolics (QCLot: 724805)									
dimethylphenol, 2,4-	105-67-9	E655A	0.5	µg/L	4.8 µg/L	98.8	30.0	130	----
dinitrophenol, 2,4-	51-28-5	E655A	1	µg/L	4.8 µg/L	# 174	50.0	140	LCS-H
phenol	108-95-2	E655A	0.5	µg/L	4.8 µg/L	114	50.0	140	----
Pesticides (QCLot: 724791)									
diazinon	333-41-5	E660E-H	0.1	µg/L	0.2 µg/L	94.8	60.0	130	----

Qualifiers

Qualifier	Description
LCS-H	*Lab Control Sample recovery was above ALS DQO. Non-detected sample results are considered reliable. Other results, if reported, have been qualified.*
RRQC	*Refer to report comments for information regarding this QC result.*

Matrix Spike (MS) Report

A Matrix Spike (MS) is a randomly selected intra-laboratory replicate sample that has been fortified (spiked) with test analytes at known concentration, and processed in an identical manner to test samples. Matrix Spikes provide information regarding analyte recovery and potential matrix effects. MS DQO exceedances due to sample matrix may sometimes be unavoidable; in such cases, test results for the associated sample (or similar samples) may be subject to bias. ND – Recovery not determined, background level >= 1x spike level.

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Anions and Nutrients (QCLot: 726029)										
WT2219431-001	Anonymous	Kjeldahl nitrogen, total [TKN]	----	E318	ND mg/L	2.5 mg/L	ND	70.0	130	----
Anions and Nutrients (QCLot: 726698)										
WT2219521-001	Anonymous	ammonia, total (as N)	7664-41-7	E298	0.103 mg/L	0.1 mg/L	103	75.0	125	----
Anions and Nutrients (QCLot: 729179)										
WT2220058-001	GW-12586015-GW-004	fluoride	16984-48-8	E235.F	0.983 mg/L	1 mg/L	98.3	75.0	125	----
Anions and Nutrients (QCLot: 729180)										
WT2220058-001	GW-12586015-GW-004	nitrate (as N)	14797-55-8	E235.NO3	2.32 mg/L	2.5 mg/L	92.7	75.0	125	----
Anions and Nutrients (QCLot: 729181)										
WT2220058-001	GW-12586015-GW-004	nitrite (as N)	14797-65-0	E235.NO2	0.485 mg/L	0.5 mg/L	97.0	75.0	125	----
Anions and Nutrients (QCLot: 729182)										
WT2220058-001	GW-12586015-GW-004	chloride	16887-00-6	E235.Cl	94.4 mg/L	100 mg/L	94.4	75.0	125	----
Anions and Nutrients (QCLot: 729183)										
WT2220058-001	GW-12586015-GW-004	sulfate (as SO4)	14808-79-8	E235.SO4	96.5 mg/L	100 mg/L	96.5	75.0	125	----
Organic / Inorganic Carbon (QCLot: 723488)										
WT2219719-001	Anonymous	carbon, dissolved organic [DOC]	----	E358-L	ND mg/L	5 mg/L	ND	70.0	130	----
Total Sulfides (QCLot: 727164)										
WT2219982-003	Anonymous	sulfide, total (as S)	18496-25-8	E395-H	0.904 mg/L	1 mg/L	90.4	75.0	125	----
Dissolved Metals (QCLot: 724874)										
WT2220058-002	GW-12586015-GW-003	aluminum, dissolved	7429-90-5	E421	0.108 mg/L	0.1 mg/L	108	70.0	130	----
		antimony, dissolved	7440-36-0	E421	0.0552 mg/L	0.05 mg/L	110	70.0	130	----
		arsenic, dissolved	7440-38-2	E421	0.0608 mg/L	0.05 mg/L	122	70.0	130	----
		barium, dissolved	7440-39-3	E421	ND mg/L	0.0125 mg/L	ND	70.0	130	----
		beryllium, dissolved	7440-41-7	E421	0.00562 mg/L	0.005 mg/L	112	70.0	130	----
		boron, dissolved	7440-42-8	E421	ND mg/L	0.05 mg/L	ND	70.0	130	----
		cadmium, dissolved	7440-43-9	E421	0.00535 mg/L	0.005 mg/L	107	70.0	130	----
		calcium, dissolved	7440-70-2	E421	ND mg/L	2.5 mg/L	ND	70.0	130	----
		chromium, dissolved	7440-47-3	E421	0.0133 mg/L	0.0125 mg/L	106	70.0	130	----
		cobalt, dissolved	7440-48-4	E421	0.0127 mg/L	0.0125 mg/L	102	70.0	130	----
		copper, dissolved	7440-50-8	E421	0.0122 mg/L	0.0125 mg/L	97.4	70.0	130	----

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Dissolved Metals (QCLot: 724874) - continued										
WT2220058-002	GW-12586015-GW-003	lead, dissolved	7439-92-1	E421	0.0253 mg/L	0.025 mg/L	101	70.0	130	----
		magnesium, dissolved	7439-95-4	E421	ND mg/L	2.5 mg/L	ND	70.0	130	----
		manganese, dissolved	7439-96-5	E421	ND mg/L	0.0125 mg/L	ND	70.0	130	----
		molybdenum, dissolved	7439-98-7	E421	0.0137 mg/L	0.0125 mg/L	110	70.0	130	----
		nickel, dissolved	7440-02-0	E421	0.0250 mg/L	0.025 mg/L	99.9	70.0	130	----
		potassium, dissolved	7440-09-7	E421	ND mg/L	2.5 mg/L	ND	70.0	130	----
		selenium, dissolved	7782-49-2	E421	0.0614 mg/L	0.05 mg/L	123	70.0	130	----
		silver, dissolved	7440-22-4	E421	0.00281 mg/L	0.005 mg/L	56.1	70.0	130	MS-Ag
		sodium, dissolved	7440-23-5	E421	ND mg/L	2.5 mg/L	ND	70.0	130	----
		strontium, dissolved	7440-24-6	E421	ND mg/L	0.0125 mg/L	ND	70.0	130	----
		thallium, dissolved	7440-28-0	E421	0.0505 mg/L	0.05 mg/L	101	70.0	130	----
		uranium, dissolved	7440-61-1	E421	0.000253 mg/L	0.00025 mg/L	101	70.0	130	----
		vanadium, dissolved	7440-62-2	E421	0.0276 mg/L	0.025 mg/L	110	70.0	130	----
		zinc, dissolved	7440-66-6	E421	0.0260 mg/L	0.025 mg/L	104	70.0	130	----
Aggregate Organics (QCLot: 722654)										
VA22C5934-004	Anonymous	tannin + lignin (as tannic acid)	----	E563	ND mg/L	1.96 mg/L	ND	70.0	130	----
Volatile Organic Compounds (QCLot: 728063)										
TY2203475-001	Anonymous	Acetone	67-64-1	E611D	131 µg/L	100 µg/L	131	60.0	140	----
		benzene	71-43-2	E611D	97.1 µg/L	100 µg/L	97.1	60.0	140	----
		bromodichloromethane	75-27-4	E611D	99.3 µg/L	100 µg/L	99.3	60.0	140	----
		bromoform	75-25-2	E611D	107 µg/L	100 µg/L	107	60.0	140	----
		bromomethane	74-83-9	E611D	97.8 µg/L	100 µg/L	97.8	60.0	140	----
		carbon tetrachloride	56-23-5	E611D	87.4 µg/L	100 µg/L	87.4	60.0	140	----
		chlorobenzene	108-90-7	E611D	91.2 µg/L	100 µg/L	91.2	60.0	140	----
		chloroform	67-66-3	E611D	98.8 µg/L	100 µg/L	98.8	60.0	140	----
		dibromochloromethane	124-48-1	E611D	105 µg/L	100 µg/L	105	60.0	140	----
		dibromoethane, 1,2-	106-93-4	E611D	96.2 µg/L	100 µg/L	96.2	60.0	140	----
		dichlorobenzene, 1,2-	95-50-1	E611D	94.3 µg/L	100 µg/L	94.3	60.0	140	----
		dichlorobenzene, 1,3-	541-73-1	E611D	88.3 µg/L	100 µg/L	88.3	60.0	140	----
		dichlorobenzene, 1,4-	106-46-7	E611D	89.9 µg/L	100 µg/L	89.9	60.0	140	----
		dichlorodifluoromethane	75-71-8	E611D	74.5 µg/L	100 µg/L	74.5	60.0	140	----
		dichloroethane, 1,1-	75-34-3	E611D	106 µg/L	100 µg/L	106	60.0	140	----
		dichloroethane, 1,2-	107-06-2	E611D	111 µg/L	100 µg/L	111	60.0	140	----
		dichloroethylene, 1,1-	75-35-4	E611D	93.6 µg/L	100 µg/L	93.6	60.0	140	----
		dichloroethylene, cis-1,2-	156-59-2	E611D	99.7 µg/L	100 µg/L	99.7	60.0	140	----

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Volatile Organic Compounds (QCLot: 728063) - continued										
TY2203475-001	Anonymous	dichloroethylene, trans-1,2-	156-60-5	E611D	99.8 µg/L	100 µg/L	99.8	60.0	140	----
		dichloromethane	75-09-2	E611D	110 µg/L	100 µg/L	110	60.0	140	----
		dichloropropane, 1,2-	78-87-5	E611D	98.1 µg/L	100 µg/L	98.1	60.0	140	----
		dichloropropylene, cis-1,3-	10061-01-5	E611D	95.5 µg/L	100 µg/L	95.5	60.0	140	----
		dichloropropylene, trans-1,3-	10061-02-6	E611D	107 µg/L	100 µg/L	107	60.0	140	----
		ethylbenzene	100-41-4	E611D	92.1 µg/L	100 µg/L	92.1	60.0	140	----
		hexane, n-	110-54-3	E611D	87.6 µg/L	100 µg/L	87.6	60.0	140	----
		methyl ethyl ketone [MEK]	78-93-3	E611D	104 µg/L	100 µg/L	104	60.0	140	----
		methyl isobutyl ketone [MIBK]	108-10-1	E611D	121 µg/L	100 µg/L	121	60.0	140	----
		methyl-tert-butyl ether [MTBE]	1634-04-4	E611D	91.6 µg/L	100 µg/L	91.6	60.0	140	----
		styrene	100-42-5	E611D	92.8 µg/L	100 µg/L	92.8	60.0	140	----
		tetrachloroethane, 1,1,1,2-	630-20-6	E611D	97.9 µg/L	100 µg/L	97.9	60.0	140	----
		tetrachloroethane, 1,1,2,2-	79-34-5	E611D	115 µg/L	100 µg/L	115	60.0	140	----
		tetrachloroethylene	127-18-4	E611D	92.0 µg/L	100 µg/L	92.0	60.0	140	----
		toluene	108-88-3	E611D	96.0 µg/L	100 µg/L	96.0	60.0	140	----
		trichloroethane, 1,1,1-	71-55-6	E611D	95.1 µg/L	100 µg/L	95.1	60.0	140	----
		trichloroethane, 1,1,2-	79-00-5	E611D	112 µg/L	100 µg/L	112	60.0	140	----
		trichloroethylene	79-01-6	E611D	90.3 µg/L	100 µg/L	90.3	60.0	140	----
		trichlorofluoromethane	75-69-4	E611D	91.7 µg/L	100 µg/L	91.7	60.0	140	----
		vinyl chloride	75-01-4	E611D	77.0 µg/L	100 µg/L	77.0	60.0	140	----
		xylene, m+p-	179601-23-1	E611D	188 µg/L	200 µg/L	93.8	60.0	140	----
		xylene, o-	95-47-6	E611D	98.1 µg/L	100 µg/L	98.1	60.0	140	----
Hydrocarbons (QCLot: 728064)										
TY2203475-001	Anonymous	F1 (C6-C10)	----	E581.F1-L	1920 µg/L	2000 µg/L	96.2	60.0	140	----

Qualifiers

Qualifier	Description
MS-Ag	*MS-Ag: Matrix Spike recovery for silver was marginally below DQO (40 to <60%) due to its instability in the sample matrix. Silver was not detected. Reported result (< LOR) is reliable*

10/27/2022
center well

Chain of Custody (COC) / Analytical Request Form

COC Number: 20 -

Page 1 of 1

ALS www.alsglobal.com

Canada Toll Free: 1 800 668 9878

Environmental Division Waterloo
Work Order Reference
WT2220058

Telephone : +1 519 886 6910

Report To	Contact and company name below will appear on the final report
Company:	GHD Ltd. (GHDL100)
Contact:	Pascal Renella
Phone:	519-884-0510
	Company address below will appear on the final report
Street:	455 Phillip St.
City/Province:	Waterloo, ON
Postal Code:	N2L 3X2
Invoice To	Same as Report To ☑ YES ☐ NO
	Copy of Invoice with Report ☐ YES ☑ NO
Company:	GHD Ltd. (GHDL100)
Contact:	

Reports / Recipients

Select Report Format: ☑ PDF ☑ EXCEL ☑ EDD (DIGITAL)
Merge QC/QCI Reports with COA ☐ YES ☐ NO ☐ N/A
☐ Compare Results to Criteria on Report - provide details below if box checked
Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax: pascal.renella@ghd.com
Email 2: See SSOW/PO
Email 3:

Invoice Recipients

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax: Invoicing-Canada@ghd.com
Email 2:

Turnaround Time (TAT) Requested

☒ Routine [R] if received by 3pm M-F - no surcharges apply
☐ 4 day [P4] if received by 3pm M-F - 20% rush surcharge minimum
☐ 3 day [P3] if received by 3pm M-F - 25% rush surcharge minim
☐ 2 day [P2] if received by 3pm M-F - 50% rush surcharge minim
☐ 1 day [E] if received by 3pm M-F - 100% rush surcharge minimu
☐ Same day [E2] if received by 10am M-S - 200% rush surcharge. fees may apply to rush resuests on weekends, statutory holidays a routine tests

Date and Time Required for all E&P TATs:

For tests that can not be performed according to th

Analysis Req

Project Information		Oil and Gas Required Fields (client use)	
ALS Account # / Quote #:	WT2022GHDL1000126	AFE/Cost Center:	PO#:
Job #:	12586015	Major/Minor Code:	Routing Code:
PO / AFE:		Requisitioner:	
LSD:		Location:	

ALS Lab Work Order # (lab use only): | **ALS Contact:** Rick H | **Sampler:**

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	NUMBER OF CONTAINERS	Groundwater Parameters Routine	includes: Anions, Alk, Colour, EC	TC,EC,TCB,HPC	Semi vols (incl Phenols CPs,PAHs)	Dissolved Metals (field filter)	Sulphide/H2S, NH3	TKN,pH, Turbidity	VOCs/PHC F1-F4	TDS, Tannins/Lignins	OP Pesticides (Diazinon)	Ion Balance (calc)	Hardness (Calc)	DOC (Field Filter)	VOC/F1 (TRIP)	SAMPLES ON HOLD	EXTENDED STORAGE REQUI	SUSPECTED HAZARD (see no
	GW-12586015- GW-004			WATER		R	R	R	R	R	R	R	R	R	R	R	R	R				
	GW-12586015- GW-003			WATER		R				R												
	~~GW-12586015-~~ TRIP BLANK			WATER		~~R~~													R			
	~~GW-12586015-~~			~~WATER~~		~~R~~																
	~~GW-12586015-~~			~~WATER~~		R																

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System? ☐ YES ☑ NO
Are samples for human consumption/ use? ☐ YES ☑ NO

Notes / Specify Limits for result evaluation by selecting from drop-down below (Excel COC only)

SAMPLE RECEIPT DETAILS (lab use only)

Cooling Method: ☐ NONE ☐ ICE ☑ ICE PACKS ☐ FROZEN ☐ COOLING INITIATED
Submission Comments identified on Sample Receipt Notification: ☐ YES ☐ NO
Cooler Custody Seals Intact: ☐ YES ☐ N/A Sample Custody Seals Intact: ☐ YES ☐ N/A

INITIAL COOLER TEMPERATURES °C				FINAL COOLER TEMPERATURES °C		
4.3				~~6.3~~	~~6.3~~	10.3

SHIPMENT RELEASE (client use)

Released by:	Date:	Time:
Chris Bolin	Oct. 27/22	9:00 pm

INITIAL SHIPMENT RECEPTION (lab use only)

Received by:	Date:	Time:
[signature]	10/28/22	7:40

FINAL SHIPMENT RECEPTION (lab use only)

Received by:	Date:	Time:
MA	2022-10-29	10:00

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

AUG 2020 FRO

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

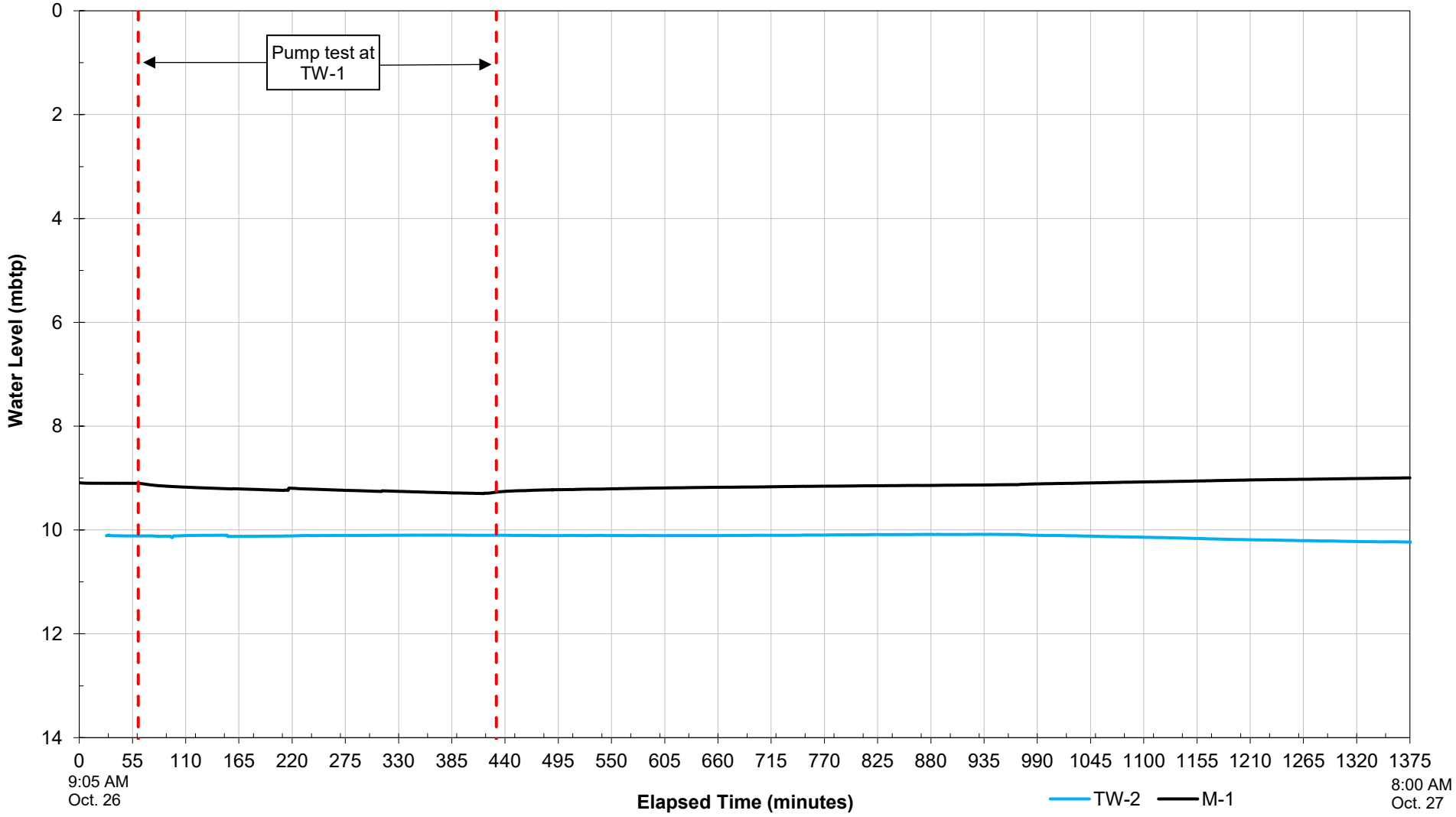
1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form**.

MA MS-478 GC-665 MM-368 OR-428

Appendix E

Observation Well Hydrographs

OBSERVATION WELL HYDROGRAPHS
October 26-27, 2022
Pumped Well TW-1



Observation Well Water Levels

Drilled Water Wells

Note: m = metres; mbtp = metres below top of pipe

DATE: DECEMBER 2022

LOCATION: 2545 9th Line, Metcalfe, Ontario

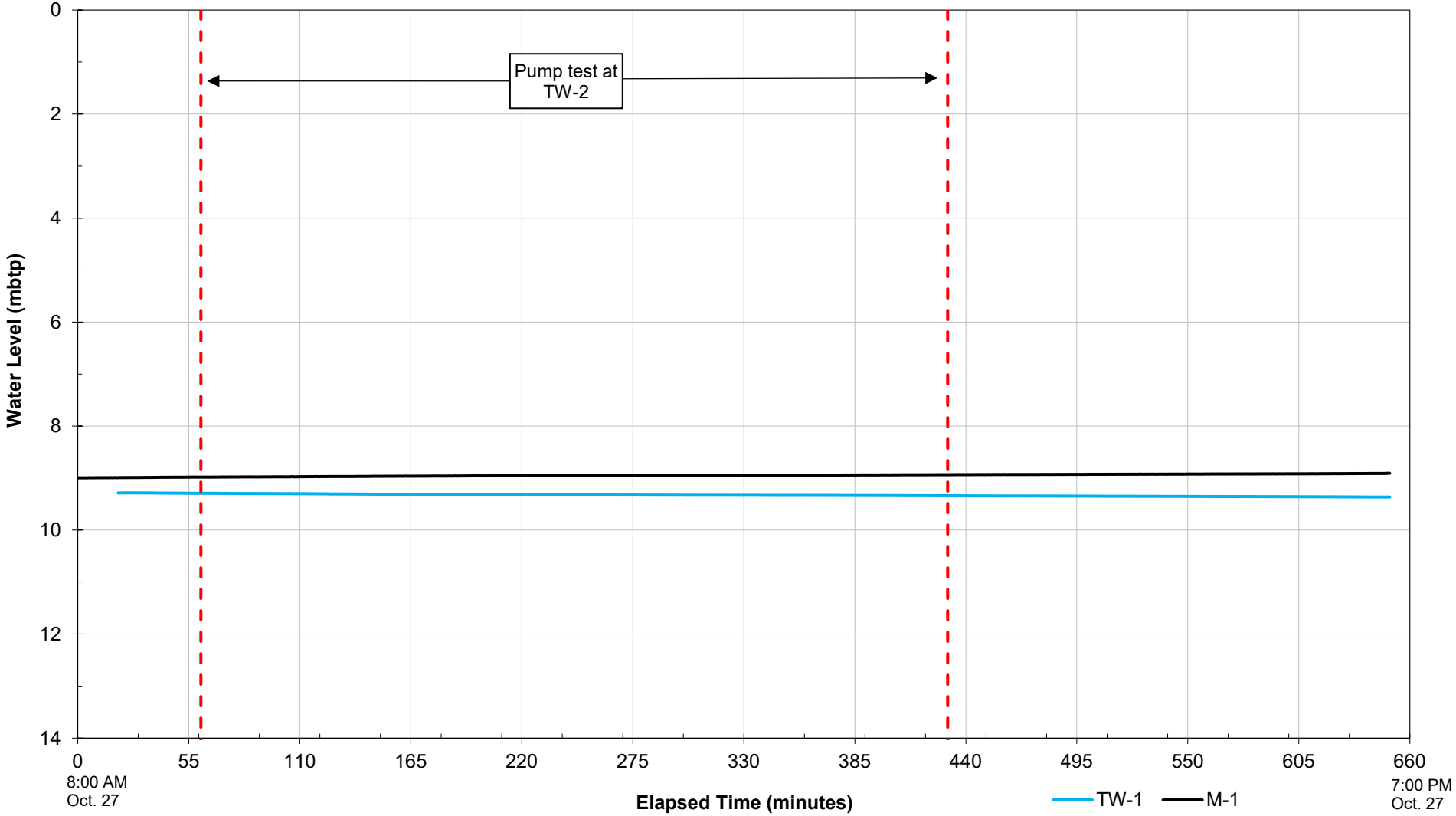
JOB NUMBER: 12586015

DRAWING NUMBER: E-1

GHD

347 PIDO ROAD, UNIT 29
PETERBOROUGH, ON K9J 6X7
www.ghd.com

OBSERVATION WELL HYDROGRAPHS
October 27, 2022
Pumped Well TW-2



Observation Well Water Levels

Drilled Water Wells

Note: m = metres; mbtp = metres below top of pipe

DATE: DECEMBER 2022

LOCATION: 2545 9th Line, Metcalfe, Ontario

JOB NUMBER: 12586015

DRAWING NUMBER: E-2

GHD

347 PIDO ROAD, UNIT 29
PETERBOROUGH, ON K9J 6X7
www.ghd.com

Appendix F

Impact Assessment

Appendix F.1
Recharge Calculations for Nitrate Assessment

Recharge Calculations

Total Area Considered	14.30	ha	
Available infiltration divided by 3*	57	mm/yr	*171mm/yr from water balance Appendix F.2
Average recharge volume	22331.5	L/day	

Note: Test pits were completed prevoiusly and encountered topsoil underlain by silty sand till over bedrock.

Nitrate Assessment Calculations

Background nitrate	0.05	mg/L	From analytical testing of piezometer and existing well
Nitrate	40	mg/L	Constant
Effluent	2550	L/day	Constant - design rate for the development
Lots	1	lots	
Onsite dilution$_{\text{Sandy Silt}}$	22331.5	L/day	Daily recharge volume
Onsite dilution$_{\text{Silty Sand}}$	0.0	L/day	Daily recharge volume
Onsite dilution$_{\text{Sand}}$	0.0	L/day	Daily recharge volume
Nitrate in precipitation recharge	0.0	mg/L	

Projected Nitrate Level = Background + (Sewage Nitrate+Dilution Nitrate)/(Onsite Dilution+Effluent)

Where: Sewage = Nitrate * Effluent

Dilution Nitrate = Onsite Dilution * Nitrate in precipitation recharge (assumed to be zero)

Projected Nitrate Level$_{\text{Sandy Silt}}$ = 4.15 mg/L

Background nitrate sample:	[Nitrate]
TW-1	<0.1
TW-2	<0.1

Appendix F.2

Water Budget Pre-Development

Catchment Designation	Existing Site			Total
	Rooftop	Granular Surface	Naturalized Areas / Grass	
Area (m^2)	15270	34852	92878	143000
Pervious Area (m^2)	0	0	92878	92878
% Pervious (m^2) of development	0%	0%	64.9%	64.9%
Impervious Area (m^2)	15270	34852	0	50122
% Impervious (m^2) of development	10.7%	24.4%	0%	35.1%
INFILTRATION FACTORS				
Topography Infiltration Factor	0	0.25	0.25	
Soil Infiltration Factor	0	0	0.2	
Land Cover Infiltration Factor	0	0	0.15	
MECP Infiltration Factor	0	0.25	0.6	
Actual Infiltration Factor	0.25	0	0.6	
Runoff Coefficient	0.75	1	0.4	
Runoff from Impervious Surfaces*	0.8	0.8	0	
INPUTS (PER UNIT AREA)				
Precipitation (mm/yr)	981	981	981	981
Run On (mm/yr)	0	0	0	0
Other Inputs (mm/yr)	0	0	0	0
Total Inputs (mm/yr)	981	981	981	981
OUTPUTS (PER UNIT AREA)				
Precipitation Surplus (mm/yr)	785	785	385	525
Net Surplus (mm/yr)	785	785	385	525
Evaportranspiration (mm/yr)	196	196	596	456
Infiltration (mm/yr)	196	0	231	171
Rooftop Infiltration (mm/yr)	0	0	0	0
Total Infiltration (mm/yr)	196	0	231	171
Runoff Pervious Areas	0	0	154	100
Runoff Impervious Areas	589	785	0	254
Total Runoff (mm/yr)	589	785	154	354
Total Outputs (mm/yr)	981	981	981	981
Difference (Inputs - Outputs)	0	0	0	0
INPUTS (VOLUMES)				
Precipitation (m^3/yr)	14980	34190	91113	140283
Run On (m^3/yr)	0	0	0	0
Other Inputs (m^3/yr)	0	0	0	0
Total Inputs (m^3/yr)	14980	34190	91113	140283
OUTPUTS (VOLUMES)				
Precipitation Surplus (m^3/yr)	11984	27352	35777	75112
Net Surplus (m^3/yr)	11984	27352	35777	75112
Evaportranspiration (m^3/yr)	2996	6838	55337	65171
Infiltration (m^3/yr)	2996	0	21466	24462
Rooftop Infiltration (m^3/yr)	0	0	0	0
Total Infiltration (m^3/yr)	2996	0	21466	24462
Runoff Pervious Areas (m^3/yr)	0	0	14311	14311
Runoff Impervious Areas (m^3/yr)	8988	27352	0	36340
Total Runoff (m^3/yr)	8988	27352	14311	50650
Total Outputs (m^3/yr)	14980	34190	91113	140283
Difference (Inputs - Outputs)	0	0	0	0

Notes:

Areas estimated from Google Earth