THURBER ENGINEERING LTD.

INTERIM DRAFT
HYDROGEOLOGIC REPORT
NAPANEE WATER POLLUTION CONTROL PLANT UPGRADES
NAPANEE, ONTARIO

Report

to

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Date: August 18, 2021
File: 30726

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APPENDICES

1. INTRODUCTION

This report presents the results of a hydrogeological investigation completed by Thurber Engineering Ltd. (Thurber) in conjunction with geotechnical investigation for the design and construction of upgrades at the Napanee Water Pollution Control Plant (WPCP). The project is located southwest of the intersection of Water Street W. and Hessford Street, extending to the Napanee River. Thurber carried out the investigation as a sub-consultant to R.V. Anderson Associates Limited (RVA).

The Hydrogeologic Report was provided to establish baseline hydrogeological conditions, assess groundwater conditions, evaluate construction dewatering requirements, assess the potential impacts of construction on the local groundwater quality and quantity, determine water taking permit requirements, and develop a groundwater monitoring program for the proposed upgrades to the WPCP.

Hydrogeological services may be required for the design of the following facilities included in the WPCP upgrade:

- Two-storey Headworks Building
- Four Water retaining tanks (up to 8 m below grade)
- Single Storey Tertiary / Ultraviolet Disinfection Building
- Maintenance Building
- Site-wide access roads
- Outfall pipe

A geotechnical investigation was completed concurrently for this project. The results of geotechnical investigation and recommendations should be read in conjunction with this report and is presented under a separate cover entitled:

- *Draft Geotechnical Design Report, Napanee Water Pollution Control Plant Upgrades, Napanee, Ontario* by Thurber Engineering Ltd. dated July 16, 2021.

The hydrogeological components of the investigation included the following tasks:

- Conduct background review within 500 m of the site (the Study Area) including the setting, Ministry of the Environment, Conservation and Parks (MECP) well records, geological maps, relevant existing reports, and proposed design drawings as available.
- Install eight monitoring wells within select boreholes of the concurrent geotechnical investigation and develop them prior to further testing.

- Collect monthly groundwater level readings in the monitoring wells installed during the concurrent geotechnical investigation for six months. Currently five rounds of water level readings have been collected. One additional water level reading will be collected in the fall season and will be included in a revised version of this report.
- Conduct in-situ hydraulic testing in all monitoring wells.
- Collect two groundwater samples from selected monitoring wells and testing in accordance with the Provincial Water Quality Objectives (PWQOs) and Greater Napanee Sewer-Use By-Law with respect to storm and sanitary sewers.
- Hydrogeological analysis and reporting, including estimated water taking rates, radius of influence, potential impacts to water users, structures, the natural environment including surface water features, potential existing soil or groundwater contamination, potential mitigation measures as well as a monitoring plan and contingency plan, and assessment of water taking permitting needs.

It is a condition of this report that Thurber's performance of its professional services is subject to the attached Statement of Limitations and Conditions.

2. BACKGROUND REVIEW

2.1 Site Description

The project site is located at 300 Water Street West, Napanee, Ontario (the Site). The Site is bounded by Water Street West to the north and the Napanee River to the south. The west and east sides of the Site are bounded by the Riverine Retirement Home property line and Hessford St, respectively.

The ground surface of the Site slopes towards the river to the south and ranges from approximately Elevation 85 m in the north to 75 m in the south of the Site. The Study Area lies within the Napanee River Valley and the valley wall rises north of the Site to approximately 100 m elevation.

In general, the land use surrounding the Site is residential or vacant. A retirement home lies to the west of the Site, while homes, a restaurant, and an apartment building are north and east of the Site. The Site itself is industrial and wastewater treatment is conducted on Site.

The plan and profile drawings of the Site and the proposed upgrades are shown on Drawings 30726-1 and 30726-2 of Appendix A. The Study Area is shown on Drawing 30726-3 of Appendix A.

2.2 Site Physiographic, Geologic and Hydrogeologic Settings

Based on the information in *The Physiography of Southern Ontario*[1] by Chapman and Putnam (1984), the Site is located within the Napanee Plain physiographic region. The Napanee Plain is characterized by flat-to-undulating limestone with little overburden, except for within stream valleys and along the Napanee River and Salmon River Valleys, which may contain a variety of alluvial deposits. The region is characterized as a clay plain, with fine textured glaciolacustrine deposits of silt and clay with minor sands and gravel. The Site is situated on limestone plains and clay plains physiograph landforms.

Based on *Quaternary Geology Map M288*[2] the surficial deposits in the vicinity are generally glaciolacustrine deposits of massive to laminated silt and clays with minor sand and gravel.

According to *Paleozoic Geology Map P2976*[3], the underlying bedrock in the area consists of the Bobcaygeon Formation. This formation contains limestone with minor shale partings. This formation ranges from micritic limestone to a coarse grainstone with abundant reworked clasts and calcareous fossils. Locally, the Bobcaygeon Formation is bounded by a fault along the Napanee River, which runs along the south of the Site.

2.3 Environmental Setting

Natural features in the vicinity of the Study Area include the following:

a) The Napanee River is located directly south of the Site and flows in a general southwesterly direction.
b) Wetlands classified as Provincially Significant are located along the north and south banks of the Napanee River. Wetlands near the north bank are located directly adjacent to the southern boundary of the Site.
c) Multiple wooded areas are located within the Study Area. The closest wooded area to the Site is located approximately 100 m west of the Site.

The Site and Study Area are located within the Lower Napanee Subwatershed of the Napanee Region Watershed and are located within land regulated by Quinte Conservation. The Site is not located within the designated areas of the Oak Ridges Moraine Conservation Act or Niagara

[1] Chapman, L.J. and Putnam, D.F. 1984. The Physiography of Southern Ontario, Ontario Geological Survey Special Volume 2, Third Edition. Accompanied by Map P.2715, Scale 1:600,000.
[2] Leyland, J.G., Russell, T.S., 1983: Geological series, Quaternary geology, Bath-Yorkshire Island area, southern Ontario; Ontario Geological Survey, Map 2588, Quaternary Geology Series, scale 1:50,000.
[3] Carson, D.M., 1982: Paleozoic Geology of the Bath-Yorkshire Island Area, Southern Ontario, Ontario Geological Survey, Map P2497, Geological Series-Preliminary Map, Scale 1:50,000.

Escarpment Planning and Development Act. The Site does not lie within a designated Source Water Protection Area or wellhead protection area. The Site lies within an Intake Protection Zone 3. An Intake Protection Zone refers to an area of land and water around a municipal intake pipe that collects surface water for drinking water purposes. Intake Protection Zone 3 refers to an area where contaminants could reach the potable water intake pipe during and immediately after a large precipitation event.

2.4 MECP Well Records Review and Status

The available records of wells within a 500 m radius of the Site were obtained from the MECP's online well record database. These well records include all recorded wells regardless of their current status.

In total, 39 recorded wells were located within the 500 m radius Study Area. The approximate locations of the wells are shown on Drawing 30726-3 of Appendix A. A summary of well record details is provided in Table B1 of Appendix B.

There were 28 well records recorded as water supply for domestic, public, livestock, and commercial uses. For the remaining records, five records were for monitoring and test holes, one records list the use as 'not used', and five records have an unknown status.

2.5 Existing Water Taking Permits

A search of MECP's Permit to Take Water mapping application in April 2021 indicated no active permits were located within the Study Area. A search of MECP's Environmental Activity and Sector Registry (EASR) mapping application in April 2021 found no water taking registrations for the purpose of construction dewatering within the Study Area.

2.6 Previous Investigation

Three previous investigations have been completed on the WPCP Site which were provided by R.V. Anderson Associates for review and documented in the following reports:

- Geotechnical Investigation (DRAFT), Upgrades to Wastewater Treatment Plant, 300 Water Street West, Napanee, Ontario, by GHD dated June 21, 2018
- Geotechnical Investigation, Proposed Tank Installation, Napanee Plant, 300 Water Street by Inspec-Sol Inc, dated November 15, 1999
- Geotechnical Investigation, Stage 2 Contract Soil Investigation, by Site Investigation Services dated October 5, 1977

A total of 31 sampled boreholes were drilled as part of the referenced geotechnical investigations above. All boreholes from these investigations were reviewed and Boreholes BH1-17, BH13-17, BH14-17, MW15-17, BH16-17, MW17-17 BH18-17, BH19-17 and BH20-17 from the GHD investigation were considered most relevant to the current works and have been included in Appendix C along with the borehole location drawing. The previous investigations were used to provide supplemental bedrock and groundwater information for design and are noted in the summarized bedrock physical properties.

3. INVESTIGATION PROCEDURES

3.1 Geotechnical Drilling and Testing

The concurrent geotechnical field investigation was carried out between February 22, 2021, to March 2, 2021 and comprised installation of a total of 22 sampled geotechnical boreholes and 4 unsampled auger probes. A summary of borehole and auger probe details are provided in Table 3.1. Borehole details are provided in the Record of Borehole sheets included in Appendix C. The approximate locations of the current boreholes and auger probes are shown on the Borehole Location Plan, Drawing No. 30726-1 provided in Appendix A.

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Table 3.1 – Borehole Details

BH/Auger Probe No.	Northing (m)	Easting (m)	GS Elev. (m)	Term. Depth (m)	Term. Elev. (m)	MW Installed?
01	4900363.3	343393.4	80.9	10.2	70.7	N
02	4900376.0	343427.4	79.0	8.8	70.2	Y
03	4900314.4	343421.8	76.4	10.3	66.2	Y
04	4900313.1	343466.0	77.2	10.2	67.0	Y
05	4900278.5	343451.1	76.3	11.6	64.7	N
06	4900323.2	343358.1	78.5	5.8	72.7	Y
07	4900335.5	343376.2	78.5	5.9	72.6	N
08	4900312.0	343386.0	77.2	6.5	70.6	N
09	4900314.9	343400.5	76.8	2.9	73.9	N
10	4900286.0	343480.9	76.5	3.7	72.9	N
11	4900293.0	343503.0	76.4	3.7	72.7	Y
12	4900302.0	343528.0	76.4	3.7	72.7	N
13	4900388.5	343400.4	81.7	3.7	78.1	N
14	4900385.9	343445.9	80.4	3.7	76.7	N
15*	4900334.4	343401.2	77.7	6.3	71.4	N
16*	4900348.3	343451.0	78.2	7.8	70.4	N
17*	4900301.2	343445.0	76.5	9.8	66.7	N
18*	4900305.4	343483.5	76.9	11.3	65.6	N
19	4900314.3	343501.3	77.5	5.2	72.4	N
20	4900375.0	343378.0	80.0	2.9	77.1	N
21	4900395.1	343423.1	80.5	2.9	77.6	N
22	4900334.8	343465.,3	77.7	3.7	74.1	N
23	4900302.4	343359.7	77.5	2.9	74.7	N
24	4900283.0	343428.0	75.9	2.9	73.1	N
25	4900364.7	343500.3	77.7	8.2	69.5	N
26	4900345.9	343514.1	77.4	8.2	69.2	N

Notes:
GS – Ground Surface
Term. – Termination
MW – Monitoring well
* - Auger probes to determine approximate bedrock depth.

The borehole and auger probe locations were established in the field by Thurber using a portable GPS receiver and verified relative to existing Site features. All borehole locations were cleared of utilities prior to commencement of drilling. The boreholes were repositioned as necessary in consideration of surface features, underground utilities, and overhead obstructions. Borehole

location coordinates are presented in the Universal Transverse Mercator (UTM) system (NAD83, CSRS 2010.0).

The boreholes and auger probes were advanced using hollow stem and solid stem augers, powered by track mounted CME 55 drill rigs operated by GET Drilling. At borehole locations soil samples were obtained at selected intervals using a 50 mm outside diameter split-spoon sampler driven in conjunction with the Standard Penetration Test (SPT). Bedrock core samples were recovered using NQ size diamond drill core barrels.

The field investigation was carried out under the full-time supervision of Thurber technical staff. Soil samples were identified, placed in labelled containers, logged in the field, and transported back to Thurber's laboratory in Oakville for further visual examination and laboratory testing, including moisture content, grain size distribution testing, and Atterberg limits. Where soil samples were selected for analytical testing, one portion of each soil sample was placed into a laboratory-supplied labelled glass jar or vial and stored on ice in an insulated cooler to maintain a cool environment for possible analytical testing. A second portion of the sample was placed inside a labelled plastic bag for screening of headspace soil vapours, visual assessment, classification of the soils and additional geotechnical laboratory testing. The recovered rock core samples were described and photographed in the field, packaged in core boxes, and transported back to Thurber's Oakville laboratory for further examination and testing.

3.2 Monitoring Well Installation

Monitoring wells were installed in selected boreholes to permit monitoring of the groundwater levels at the Site, to allow for water quality samples to be collected and submitted for analytical testing and to allow for single well response testing. The monitoring wells were installed by an MECP licensed well technician in accordance with O.Reg. 903, as amended. The monitoring wells consisted of 50 mm diameter PVC pipe with a slotted screen sealed at a selected depth within the borehole. The annular space of the borehole around the screen was backfilled with clean filter sand covered by a bentonite seal. The installation details are summarized in Table 3.2 below.

Table 3.2 – Monitoring Well Details

Borehole/ Monitoring Well No.	GS Elev. (m)	Monitoring Well Tip		Slotted Screen Length (m)	Mid-Screen Depth (m)	Mid-Screen Elev. (m)	Screened Material
		Depth (m)	Elev. (m)				
02 Shallow	79.0	5.7	73.3	3.0	4.2	74.8	Silty Clay
02 Deep		8.8	70.2	2.4	7.6	71.4	Bedrock
03 Shallow	76.4	7.2	69.2	3.0	5.7	70.7	Silty Clay / Silt
03 Deep		10.3	66.2	2.4	9.1	67.4	Bedrock
04 Shallow	77.2	6.1	71.1	3.0	4.6	72.6	Silty Clay
04 Deep		10.2	67.0	3.0	8.7	68.5	Silty Clay
06	78.5	5.8	72.7	3.0	4.3	74.2	Silty Clay / Silty Sand
11	76.4	3.1	73.3	1.5	2.3	74.1	Sand / Silty Clay

Notes: GS – Ground surface

The remaining boreholes were backfilled with bentonite to the ground surface in general accordance with O.Reg. 903, as amended.

3.3 Water Level Monitoring

The groundwater conditions at the borehole locations were assessed during drilling by visual examination of the soil, the sampler and the drill rods as the samples were retrieved and when appropriate by measurement of the water level in the open borehole.

Water levels in the monitoring wells were measured using a water level meter upon completion of the monitoring well installations and on subsequent dates, as provided in Table 4.1 in Section 4.1. Water level monitoring is ongoing and one additional water level measurement will be collected in the fall season.

3.4 Ground Water Sampling and Chemical Analysis

Groundwater quality samples were collected from two selected wells for the purpose of considering disposal options and potential treatment needs at a preliminary level. The results

obtained herein were representative of the water sampled from the selected wells at the time of sampling and provide a general understanding of groundwater quality under those conditions; however, the water quality may vary significantly from the results obtained based on location, time, meteorological conditions, and in particular based on construction and dewatering methods. The extent of suspended solids in the groundwater or in water that is collected during construction dewatering (for example from a sump in an open excavation) will significantly affect the concentrations of many parameters that may be regulated based on discharge location, particularly metals. The value of testing groundwater quality during the investigation is primarily to identify the types of contaminants that may need to be managed, the extent to which they are dissolved and therefore unlikely to be filtered by physical means alone, and the presence of anthropogenic contaminants that are listed in the given discharge criteria that may require specific treatment.

The monitoring wells were developed prior to sampling to remove excess sediment that may have entered the well during installation, to increase the representativeness of the natural groundwater in the well and to improve the transmissivity of the sand pack and well screen. Prior to any sampling or in-situ testing, the wells were purged dry, or until at least three well volumes had been removed and general chemistry parameters (pH, temperature and conductivity) were monitored with a hand-held meter to ensure consistency in addition to visual observations of turbidity.

Groundwater quality samples were collected from two monitoring wells installed in the boreholes listed in Table 3.2 (04 Deep and 06). The groundwater samples were collected using a dedicated bailer and, where required, a dedicated inline disposable 0.45 µm metals filter. The samples were collected into prepared laboratory sample bottles, stored in an insulated cooler with ice to keep the samples cool for transportation to Thurber's laboratory and subsequent submission to ALS Laboratory Group (ALS) for analysis. ALS is a Canadian Association for Laboratory Accreditation (CALA) accredited laboratory.

The selected groundwater samples were submitted for analysis for metals and inorganics, major anions and cations, general chemistry parameters, and parameters required for the Greater Napanee Sewer-Use By-law (No. 2012-39). The samples were analyzed and compared to the PWQOs and interim PWQOs, and Greater Napanee Sewer-Use By-law (No. 2012-39).

In addition, field-filtered metals samples were collected from each sampled monitoring well and submitted in comparison to PWQO metal limits. The filtered samples are a preliminary measurement of dissolved (based on a 0.45-micron filter), and assumedly not physically filterable, metal parameters.

3.5 Single Well Response Tests

Single well response tests (“slug” tests) were carried out in the eight 50-mm diameter wells installed in the geotechnical boreholes. The wells were screened in various materials including, silty clay, sand, silt some sand, and limestone bedrock. A summary of the tests completed, and the depths and screened materials is presented in Table 4.2. Results of the single well response tests can be found in Appendix D.

The tests were completed using the following method:

- In advance of conducting the slug tests, the monitoring wells were developed and purged, as noted above.
- Once the water level returned to a stabilized level, the static water level was measured and recorded, and a datalogger was inserted into the well below the water level. The datalogger was set to record water levels every 0.5 - 1 seconds, depending on the anticipated rate of recovery of each well.
- A slug of groundwater was removed from the well with a dedicated bailer for each well to induce a change in hydraulic head (rising head test).
- Manual and electronic measurements were recorded until the water level in the well recovered sufficiently.
- Manual measurements were compared to electronic measurements for quality control of the data.

4. TESTING RESULTS AND ANALYSIS

4.1 Water Level Monitoring

A summary of the groundwater levels recorded in the monitoring wells is provided in Table 4.1. Groundwater levels that are not under the influence of water taking or dewatering will fluctuate naturally over time, as a function of a number of factors including intensity, duration, and frequency of precipitation events as well as temperatures, which affect precipitation type and timing of snowmelt and accumulation.

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Table 4.1 – Groundwater Levels and Observations

Borehole/Monitoring Well No	Mid Screen Depth (m)	Mid Screen Elev. (m)	Screened Material	Date	WL Depth (m)	WL Elev. (m)
02 Shallow	4.2	74.8	Silty Clay	February 26, 2021	0.7	78.3
				March 12, 2021	0.6	78.4
				April 14, 2021	0.6	78.4
				May 11, 2021	0.5	78.5
				July 30, 2021	0.6	78.4
02 Deep	7.6	71.4	Limestone Bedrock	February 26, 2021	0.8	78.2
				March 12 2021	0.7	78.3
				April 14, 2021	0.8	78.2
				May 11, 2021	0.6	78.4
				July 30, 2021	0.8	78.3
03 Shallow	5.7	70.7	Silty clay and silt some sand	February 26, 2021	0.2	76.3
				March 12, 2021	-0.2	76.7
				April 14, 2021	-0.1	76.5
				May 11, 2021	-0.2	76.7
				July 30, 2021	0.0	76.4
03 Deep	9.1	67.4	Limestone Bedrock	February 26, 2021	-0.2	76.6
				March 3, 2021	0.7	75.8
				April 14, 2021	0.6	75.9
				May 11, 2021	0.5	76.0
				July 30, 2021	0.5	75.9
04 Shallow	4.6	76.6	Silty clay	February 26, 2021	2.9	74.3
				March 12, 2021	1.0	76.1
				April 14, 2021	1.2	75.9
				May 11, 2021	1.0	76.2
				July 30, 2021	1.3	75.9
04 Deep	8.7	68.5	Silty clay	February 26, 2021	1.8	75.4
				March 2, 2021	1.8	75.4
				April 14, 2021	1.8	75.4
				May 11, 2021	1.6	75.6
				July 30, 2021	1.6	75.5
06	4.3	74.2	Silty clay and silty sand	February 26, 2021	-0.8	79.3
				March 12, 2021	-1.0	79.5
				April 14, 2021	-0.8	79.3
				May 11, 2021	-0.9	79.4
				July 30, 2021	-0.8	79.3
11	2.3	74.1	Sand and silty clay	February 26, 2021	2.2	74.2
				March 2, 2021	2.1	74.3
				April 14, 2021	2.1	74.3
				May 11, 2021	2.1	74.3
				July 30, 2021	2.1	74.3

4.2 Hydraulic Conductivity

A total of eight slug tests were completed and analyzed using the Hvorslev method. The test results indicated that the hydraulic conductivity of the screened formations ranged from 1.9 x 10^{-8} m/s to 5.5 x 10^{-6} m/s. Plots of the slug test results are included in Appendix D. The hydraulic conductivity values calculated from the in-situ slug tests are summarized in Table 4.2.

Table 4.2 – Summary of In-Situ Hydraulic Conductivity Test Results

Monitoring Well	Screen Depth (m)		Hydraulic Conductivity (m/s)	Dominant Screened Formation
	Top	Bottom		
02 Shallow	2.7	5.7	5.5 E-06	Silty clay, frequent sand seams
02 Deep	6.4	8.8	2.5 E-07	Limestone bedrock
03 Shallow	4.2	7.2	2.0 E-06	Silty clay and silt some sand
03 Deep	7.9	10.3	2.5 E-06	Limestone bedrock
04 Shallow	3.1	6.1	1.9 E-08	Silty clay
04 Deep	7.1	10.1	2.3 E-06	Silty clay, frequent silt/sand lenses
06	2.8	5.8	1.4 E-06	Silty clay and silty sand
11	1.5	3.0	4.4 E-06	Sand, some silt and silty clay

Six slug tests were conducted in the silty clay and sand overburden, and the largest tested value of 5.5 x 10^{-6} m/s was selected for dewatering estimates. Two slug tests were conducted in the limestone bedrock and the largest tested value of 2.5 x 10^{-6} m/s was selected for dewatering estimates.

4.3 Groundwater Quality Results

As described in Section 3.4, groundwater quality samples were collected from two monitoring wells installed in the boreholes listed in Table 3.2 (06 and 04 Deep) using bailers. In addition, two field filtered metals samples were submitted from the above-mentioned wells for analysis of metals for PWQO metals limits as a preliminary measurement of dissolved, and assumedly not physically filterable, parameters.

Exceedances of the above standards within the groundwater analytical results are discussed below. A summary of the exceedances and the Certificates of Analysis are provided in Appendix E.

It should be noted that a limited number of groundwater samples were collected and the samples are only representative of groundwater found at the well screen depths.

PWQO and Interim PWQO

Testing of groundwater samples for comparison to the PWQOs and Interim PWQOs comprised analysis of general chemistry and selected metals and inorganic parameters. Not all parameters in the PWQOs were analyzed.

Multiple parameters exceeded the PWQO in the unfiltered samples from 06, including the following: iron, nickel, silver, and zinc. No parameters exceeded the PWQO in the unfiltered samples from 04 Deep. Multiple parameters exceeded the interim PWQO limits in the unfiltered samples from both 06 and 04 Deep, including aluminum, cobalt, copper, lead, phosphorus, thallium, vanadium, and zinc. Phosphorus exceeded the interim PWQO of 0.01 mg/L, which is set as a high level of protection against aesthetic deterioration, the interim PWQO of 0.02 mg/L to avoid nuisance concentrations of algae in lakes, and the interim PWQO of 0.03 mg/L to avoid excessive plant growth in rivers and streams.

On review of the filtered analytical results, including dissolved parameters, filtering lowered most parameters concentrations below the PWQOs, with a few exceptions. In the filtered samples from 04 Deep, cobalt exceeded the interim PWQO. Concentrations of phosphorous (dissolved) were measured at non-detectable concentrations from the unfiltered samples from both 06 and 04 Deep, but the detection limits are above the interim PWQOs of 0.01 mg/L, 0.02 mg/L, and 0.03 mg/L discussed above.

Groundwater of the quality that was observed herein could not be discharged to the natural environment without pre-treatment. Further, the above results suggest that while filtration may have removed some metals, it did not lower all parameters to within the interim PWQOs.

Greater Napanee Sewers By-Law

The results of the unfiltered groundwater samples analyzed in comparison to the Greater Napanee Sewers By-law met the sanitary/combined limits for all tested parameters but did not meet the storm limits for manganese, phosphorus, total suspended solids, and zinc.

Groundwater of the quality that was observed herein could not be discharged to the storm sewer without pre-treatment.

5. DEWATERING ASSESSMENT

5.1 Construction Dewatering

Groundwater taking for construction dewatering is governed by the Ontario Water Resources Act (OWRA), Environmental Protection Act (EPA) and the Water Taking and Transfer Regulation 387/04, a regulation under the OWRA. If the water taking rate will be greater than 50,000 L/day and less than 400,000 L/day, then registration on the Environmental Activity and Sector Registry (EASR) will be required. If the water taking rate will be greater than 400,000 L/day, then a Category 3 Permit to Take Water (PTTW) will be required.

Assessment of the need for a Category 3 PTTW or registration on the EASR is provided, based on dewatering estimates presented herein. For the purposes of estimating water taking, the estimated withdrawal rates are conservatively assessed in order to reduce the likelihood that actual pumping rates might exceed the permit allowance thereby stopping work and delaying the Project.

Based on design information available to date, it is understood that structures that may require dewatering include the Maintenance Building, the Two-storey Headworks Building, the Water retaining tanks, Tertiary/Ultraviolet Disinfection Building, and the Outfall pipe. It is our understanding that the Site-wide access roads will not require excavations below grade; therefore, no dewatering is expected for these two upgrades. It is assumed that the Water retaining tanks, Headworks Building, and Tertiary/Ultraviolet Disinfection Building will be constructed within a single excavation; therefore, the dewatering flow rate is calculated for a combined excavation for these features. The estimated dimensions of the aforementioned construction features are summarized below:

- Maintenance Building will be constructed slab-on-grade, with foundations expected to extend approximately 1.5 m below ground surface. The excavation will be for trench and column footings and the trench for the footings is assumed to be 110 m x 2 m.

- The foundations for the Water retaining tanks, Headworks Building, and Tertiary/Ultraviolet Disinfection Building, will be constructed within one open cut excavation. The footprint of the excavation is assumed to be approximately 115 m x 50 m and the base of the bulk excavation is assumed to be at Elev. 71.7 m.

- The trench for the Outfall pipe is assumed to be 2 m deep with a footprint of 55 m x 2 m.

The expected soil and groundwater conditions at the excavations are assumed based on the on the subsurface conditions encountered in the boreholes, as summarized in the profile drawings in Appendix A. The excavations are expected to extend through the surficial pavement structure or topsoil, fill, and into the overburden comprised of primarily silty clay with occasional silt and sand layers and extending into limestone bedrock. A summary of the excavation details, anticipated soil and groundwater conditions, and anticipated basal stability is provided in Table 5.1.

Table 5.1 – Summary of Excavations and Dewatering Conditions

Excavation	Approx. Depth (m)	Approx. Base Elev. (m)	Borehole No.	Anticipated Ground Conditions at Base of Excavation	Ground-water Depth (m)	Assumed Highest Ground-water Elev. (m)	Risk of Basal Stability Issues	Target Dewater Elev. (m)
Maintenance Building	1.5	77.0	06, 07, 08	Silty clay	-1.0	79.5	Low	76.0
Combined Excavation for Tanks, Headworks & Tertiary Bldgs.	8.6	71.7	01, 02, 03, 04, 05, 10, 13, 16, 17, 18, 21, 22	Limestone in the north, silty clay in the south	-1.0	79.5	High due to Potential for Blow-up where excavation terminates in silty clay in southern portion of excavation	70.7
Outfall pipe	2	74.4	10, 11, 12	Silty sand and silty clay	-1.0	79.5	High due to Potential for Blow-up in areas where the excavation terminates in clay, piping in areas where the excavation terminates in sand	73.4

For the purposes of this report and the table above the definitions of piping is as follows:

Piping: Piping is a basal instability issue that develops when the base of the excavation is excavated in non-plastic soils and the groundwater level is above the base of the excavation. Groundwater will tend to flow into the base of the shaft creating quick conditions.

Blow-up/Heave: Blow-up/heave is a basal instability issue that develops when the base of the excavation is excavated in plastic soils and there is an underlying non-plastic layer with sufficient pressure. This may cause the soil at the base of the shaft to blow-up or heave into the shaft.

The following approach was used to estimate the budgeted peak water taking rate:

- A base groundwater extraction flow rate was estimated, and a factor of safety of three was applied to this flow rate to provide an allowance for removal of water from aquifer storage, variation in hydraulic conductivity, actual excavation dimensions and geometry, and ground water levels due to seasonality or other factors;
- An allowance for removal of rainfall into the excavation was included, assuming 24 hours are used to remove 50 mm of rainfall; and
- Lowering of groundwater to about 1 m below the base of the excavation to facilitate a dry, stable work area was assumed.
- For the combined Excavation for Water retaining tanks, Headworks Building and Tertiary/Ultraviolet Disinfection Building, two dewatering estimates were prepared. One estimate assumes non-watertight shoring is used and the other estimate assumes watertight shoring is used. Due to the highly compressible soils on Site and the proximity of settlement-sensitive structures in relation to the excavation, non-watertight shoring is not recommended. The non-watertight scenario is presented in Appendix F for reference purposes only.

Dewatering rates were estimated using the Dupuit analytical solution. The radius of influence was calculated using the Sichardt equation. The calculation details including all the parameters used are presented in Appendix F.

A review of the ROI and the geologic profile indicated that surface water bodies exist within the zone of influence of excavations for the Combined Excavation for Water retaining tanks, Headworks Building, and Tertiary/Ultraviolet Disinfection Building and for the Outfall pipe. The presence of the surface water bodies may act as a potential line source and recharge boundaries to the dewatering aquifer around each excavation. The degree of connection between the surface water and the groundwater is expected to be high. The rate of recharge for those excavations will be higher due to the proximity to surface water bodies. Estimated peak flows for these locations were calculated by substituting the value of the radius of influence with the distance from the excavation to the water body.

The estimated peak flow rate for the or the Combined Excavation for Water retaining tanks, Headworks Building, and Tertiary/Ultraviolet Disinfection Building assuming non-watertight shoring was over 1,600,000 L/day. However, as noted previously, this value is provided for reference purposes only. Non-watertight shoring is not recommended due to the large flow rates, required drawdown, highly compressible overlying soils, and nearby settlement sensitive structures including three existing digesters.

It is recommended that watertight shoring walls socketed into bedrock be used for the Combined Excavation for Water retaining tanks, Headworks Building and Tertiary/Ultraviolet Disinfection Building to reduce groundwater extraction flow rates, drawdown levels outside the shoring, and therefore to reduce the likelihood of settlement of the compressible Site soils. The excavation for the water tanks is anticipated to extend into limestone. It is recommended that the watertight shoring walls be extended a minimum of approximately 1 m into limestone bedrock to cut off the overburden.

It is expected that higher anticipated flow rates will occur at the north end of the Support of Excavation (SOE) enclosure due to shorter SOE depth. Mitigation options to decrease flow rates at the north end include grouting of bedrock fractures and application of approximately 50 to 100 mm of shotcrete to the bedrock walls and a mud slab over the rock to reduce groundwater flow.

It is recommended that water taking occur from the interior of the SOE enclosure only by passive relief wells or pumping of groundwater from the base of the excavation, as active dewatering of the overburden could cause ground surface settlement. In addition, a mud slab may be installed to cover the entire excavation floor in order to ensure a stable base and to reduce upward groundwater flow.

Conservative estimation of water taking for the purpose of a PTTW application was conducted assuming watertight shoring in the soil and accounting for flow through a 3-m vertical interval below the excavation. In practice the dewatering would consist of sumps and passive relief wells within the SOE enclosure. The estimated base groundwater flow, peak groundwater flow and radii of influence for the excavations for the Maintenance Building, Outfall pipe, and Combined Excavation for Water retaining tanks, Headworks Building, and Tertiary/Ultraviolet Disinfection Building using watertight shoring are summarized in Table 5.2, below. The calculations and equations for the peak flow rate and radius of influence are provided in Appendix F.

Table 5.2 –Construction Dewatering Estimate

Excavation Location	Base Groundwater Flow (L/day)	Groundwater Flow with Safety Factor of 3 (L/day)	Stormwater Allowance (L/day)	Estimated Peak Flow Rate (L/day)	Approx. Radius of Influence (m)
Maintenance Building	31,000	93,000	11,000	104,000	25

Table 5.2 –Construction Dewatering Estimate

Excavation Location	Base Groundwater Flow (L/day)	Groundwater Flow with Safety Factor of 3 (L/day)	Stormwater Allowance (L/day)	Estimated Peak Flow Rate (L/day)	Approx. Radius of Influence (m)
Combined Excavation for Tanks, Headworks & Tertiary Bldgs. **using watertight shoring**	109,000	327,000	288,000	615,000	42
Outfall pipe	55,000	165,000	6,000	171,000	43
Total	**195,000**	**585,000**	**305,000**	**890,000**	**As above**

The total base groundwater flow from all the excavations is approximately 195,000 L/day. With a safety factor of three on groundwater flow and a rainfall removal allowance of 50 mm in 24 hours, the estimated peak flow rate flow is approximately 890,000 L/day. Since the combined discharge rates for the subject construction dewatering using watertight shoring are expected to be greater than 400,000 L/day and the radii of influence overlap, a Category 3 PTTW will be required prior to commencing excavations. The maximum radius of influence of the dewatering for a single excavation was estimated to be 43 m.

Considering the large reduction in flow rates estimated for the watertight shoring dewatering model as compared to the non-watertight scenario for the combined excavation for the Water retaining tanks, Headworks Building, and Tertiary/Ultraviolet Disinfection Building, and the highly compressible Site soils, it is recommended watertight shoring be used for this excavation in order to cut-off groundwater flows from the sand/silt layer encountered on top of bedrock. Active dewatering of this layer is not recommended as groundwater drawdown within the clay deposit could cause ground surface settlement. Secant pile walls socketed a minimum of 1 m into the limestone bedrock is considered a feasible option for the support system.

In the north part of combined excavation for the Water retaining tanks, Headworks Building, and Tertiary/Ultraviolet Disinfection Building where the excavation extends into the bedrock, concentrated seepage may be experienced from fractures and cavities within the limestone bedrock. Grouting of fractures may be required to reduce the flow. The contractor should be prepared to pump groundwater from the bedrock out of the excavation; however, the primary method of groundwater control for this situation must be grouting of fractures in order to limit drawdown in the compressible overburden soils.

In the southern portion of the combined excavation for the Water retaining tanks, Headworks Building, and Tertiary/Ultraviolet Disinfection Building where the base of the excavation will consist of silty clay, the sand/silt layer and the bedrock will need to be depressurized to prevent subgrade disturbance due basal heave. This could be accomplished using passive relief wells located inside the excavation. The use of passive relief wells is recommended as active dewatering is expected to cause settlement. The design of the dewatering system is the responsibility of the contractor. The contractor should retain a specialized dewatering subcontractor to design the passive relief wells which will need to remain operational and effective until the tanks and buildings are in place and then should be decommissioned and removed. The design of the system should follow OPSS.MUNI 517. The dewatering plan should be reviewed by qualified geotechnical/hydrogeological personnel retained by the owner to confirm that the contractor's dewatering plan meets the design intent, prior to the commencement of excavations.

5.2 Permanent Drainage

It is our understanding that all the structures will be constructed watertight below grade, designed to resist uplift, with no permanent drainage of groundwater.

6. IMPACT ASSESSMENT

Within the construction dewatering zone of influence, impacts such as ground settlement, reduction in groundwater flow to groundwater users and watercourses, and other impacts may potentially occur. The potential impacts are discussed herein, and monitoring and potential mitigation measures are discussed in the following section.

6.1 Geotechnical Impacts (Not Completed)

Not completed at the time of this draft submission.

6.2 Impacts to Surface Water and Natural Environment

As described in the previous section, the Napanee River is within the zone of influence of the proposed dewatering activities. Reduction of groundwater discharges to surface water flow, to some extent, may occur due to groundwater extraction. Based on the Quinte Conservation surface water monitoring gauge for the Napanee River located in the Hamlet of Camden East, approximately 14.5 km upstream from the Site, Napanee River has an average flow rate 2.11 m^3/s, or approximately 182,304,000 L/day. The maximum combined dewatering rate for the proposed work excluding stormwater is 585,000 L/day, or approximately 0.3% the average daily flow of Napanee River. Therefore, the magnitude of the impact is expected to be negligible due

to the large volume of water in the Napanee River relative to estimated dewatering volumes. It is also noted that following treatment, the water will be returned to the river.

Groundwater of the quality that was observed herein could not be discharged to the natural environment without pre-treatment due to exceedances of the PWQO and interim PWQO and could not be discharged to the Greater Napanee storm sewer without pre-treatment due to exceedances above the Greater Napanee Strom Sewer Use Limit. A water treatment specialist or qualified process engineer must be consulted regarding potential treatment options.

6.3 Impacts to Water Well Users

Construction dewatering with watertight soil shoring is expected to result in a maximum radius of influence of approximately 43 m. Dewatering activities may impact the quantity and/or quality of water obtained by water well users within the radius of influence.

Permanent drainage is not anticipated and thus permanent impact to existing water well users is not anticipated.

As noted in Section 2.4, there were 28 well records within the Study Area listed as water supply for domestic, public, livestock, and commercial uses. Temporary dewatering activities may impact water well users within the respective radii of influence, including impacting the quality or quantity of drinking water. The magnitude of any drawdown and the relative impact is anticipated to decrease as the distance between the well and the edge of the excavation increases.

A pre-construction, construction stage, and post-construction monitoring program should be conducted for properties on the north side of the Napanee River within 130 m (approximately 3 times the radius of influence) of the Site. Wells on the south side of the Napanee River are not expected to be affected by dewatering. The results of the monitoring program will assist in verifying potential impacts on well users and provide the data required to document the effects, where permission is given by residents to monitor their wells. Remedial measures that the Town of Greater Napanee may consider for affected well users include the provision of potable water or assistance with improving or restoring well productivity.

6.4 Other Potential Impacts

With prolonged dewatering activities there can be potential for inorganic or organic chemical compounds present within the radius of influence to migrate and to enter open excavations where sufficient flow rate and time permit. Considering the temporary duration of dewatering activities, as well as the limited commercial and industrial development in the area with the exception of the WPCP, there is a low likelihood that contaminants would be mobilized during dewatering activities; however, a contaminant overview would be required to confirm this. If any

contaminated groundwater is collected from the dewatering operations it should be treated to meet any discharge criteria or disposed of at a facility licensed to handle such materials. It is noted that dewatering will occur over a limited duration for construction purposes only, and no permanent drainage conditions are anticipated.

7. CONCLUSIONS AND RECOMMENDATIONS

7.1 Category 3 Permit To Take Water

As described previously, the estimated peak water taking rate with watertight shoring keyed into the limestone for all excavations was 890,000 litres per day.

Application for a Category 3 Permit To Take Water (PTTW) from the MECP will be required prior to the excavation at each shaft location. The permit application fee from MECP is currently $3,000 and the application will be subject to an administrative review as well as a technical review. MECP may request additional information or testing. The review process typically takes three to five months following submission.

The PTTW will include terms and conditions that must be met, which will include performance, monitoring and reporting requirements among others.

7.2 Discharge of Groundwater

Groundwater of the quality that was observed herein could not be discharged to the natural environment without pre-treatment due to exceedances of the PWQO and interim PWQO as discussed in Section 4.3. If considering discharge to the natural environment, additional treatment is anticipated to be required. It is anticipated that sediment control alone will be insufficient to address all exceedances identified. A water treatment specialist or qualified process engineer must be consulted regarding potential treatment options. Discharge of groundwater to the natural environment may require approval by Quinte Conservation, MECP and potentially the Ministry of Natural Resources and Forestry (MNRF), and the Department of Fisheries and Oceans (DFO). As noted previously in Section 2.3, a provincially significant wetland is present adjacent to the Site along the edges of the Napanee River and additional restrictions in regard to discharge near the wetland may apply. The effects of discharge water temperature and the impacts to the natural environment are beyond the scope of this investigation.

Groundwater of the quality that was observed herein could not be discharged to the Greater Napanee storm sewer without pre-treatment, but could be discharged to the Napanee sanitary sewer based on the samples that were submitted and analyzed. Treatment to meet storm limits may require advanced treatment in addition to sediment control/filtration due to dissolved metals.

A water treatment specialist or qualified process engineer must be consulted regarding potential treatment options. Prior to discharge, a discharge agreement must be obtained from the Town of Greater Napanee and it must be verified that the sewer system has capacity for the proposed discharge volume. Sediment in pumped groundwater should be minimized prior to discharge. Additional testing of actual pumped groundwater would need to be conducted prior to discharge to confirm that the pumped groundwater is in accordance with the By-Law criteria.

As noted previously, water quality observed during construction will vary from the results obtained herein based on a number of factors. An experienced dewatering contractor and water treatment contractor are recommended to be retained to design and operate dewatering and/or treatment operations as required.

7.3 Proposed Monitoring Plan

A proposed monitoring plan is provided in the sections below with the understanding that the Contractor's means and methods are not known and that the monitoring plan may need to be adjusted and further specified once additional details are available.

7.3.1 Groundwater Taking

The quantity of water taken every day must be measured and recorded. A condition of the PTTW will be to report the water quantity actually taken, for each individual day that water has been taken. The quantity of water taken must not exceed the maximum permitted value.

7.3.2 Groundwater Quality

The table below provides a proposed water quality monitoring plan, along with timing and frequency of measurements and observations. However, implementation would need to be adjusted to the contractor's means and methods that takes into account method of dewatering, number of locations being simultaneously dewatered, discharge type (natural environment or sewer), number of discharge locations, and additional constraints that may be applied by the PTTW and any discharge agreements, permits, and external agencies.

More frequent monitoring is required whenever there is a substantial change in condition. Examples would include a new water taking extraction area, a modification to the treatment process, a change in the nature of the water being collected (e.g., a new contaminant or large change in concentration of an existing contaminant) or a new discharge location. It is anticipated that there would be one water taking location for the purpose of the PTTW, which encompasses all assessed excavations.

The following general monitoring is recommended in Table 7.1, in addition to requirements from permits, agreements or external agencies, for each initial condition or substantial change in condition.

Table 7.1 – Monitoring Plan

Monitoring Activity	Minimum Monitoring Frequency
Visual check for excessive sediment in discharge and measurement of Turbidity using handheld device. Record findings. Check for erosion.	Twice daily during active construction; once daily while system running but no active construction.
Sample discharge for TSS	Daily for first week, then weekly.
Discharge compliance sampling in accordance with criteria for permitted/approved discharge location.	Upon initiation, then weekly for 4 weeks, then monthly.
Visual check of raw water being removed from subsurface for excessive sediment or contamination such as chemical product or sheen.	Twice daily during active construction; once daily while system running but no active construction.
Sample raw groundwater being extracted for Permit discharge parameters to identify changes in incoming groundwater quality.	Upon initiation and monthly thereafter, and as required by Permit.

The purpose of measuring TSS and Turbidity (NTU) daily for the first week is to prepare a correlation between TSS and NTU. The correlation should be updated periodically as new data become available. The NTU value that corresponds to any TSS limit required by the discharge location is herein referred to as NTU_{MAX}. If discharging to land that is at least 30 m away from any surface water bodies, it is recommended that the TSS limit be no higher than 25 mg/L, and possibly lower depending on Permit discharge criteria and external agencies.

7.3.3 Groundwater Level Monitoring

It is recommended that water levels in monitoring wells within the radius of influence of each extraction area be monitored weekly during construction and until full groundwater level recovery. A minimum of three monitoring wells for the Combined Excavation are recommended to be used, and at least one monitoring well be used for the Maintenance Building and Outfall pipe excavations each. If there is an insufficient number of pre-existing monitoring wells located in a

ROI area, it is recommended that additional monitoring wells are to be installed. Some wells may be used for multiple extraction areas if within the anticipated radius of influence.

It is recommended that the water levels in monitoring wells for the entire Site be monitored on a quarterly bases prior to, during, and shortly following construction, until full anticipated recovery.

7.3.4 Surface Water Monitoring

If discharging to land where runoff may reach surface water, it is recommended to sample surface water for the same parameters as the discharge criteria in addition to general chemistry parameters. Sampling timing would be the same as for the discharge sampling; that being upon initiation, then weekly for 4 weeks, and then monthly. This is in addition to discharge permit requirements, or any other requirements of approving agencies. Flow monitoring of surface water is not recommended as the impact of water taking on surface water flow volumes was estimated to be negligible.

7.3.5 Pre-construction Survey and Settlement Monitoring

It is recommended that a pre-construction survey be developed by a geotechnical engineer to determine pre-construction elevations of sensitive infrastructure and to recommend a monitoring plan during construction.

7.4 Proposed Contingency Plan

The recommended contingency plan is outlined in Table 7.2.

Table 7.2 – Contingency Plan

Observation / Parameter	Trigger(s)	Review Conditions	Possible Mitigations
Quality of raw water being taken	• Excessive solids observed visually. • NTU value that is significantly greater than prior results for raw water.	Concern for potential ground loss.	• Modify water intake setup, procedures and equipment to reduce solids intake. • Stop dewatering operations until addressed, unless stopping would create safety risk. • Modify dewatering means and methods.

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Table 7.2 – Contingency Plan

Observation / Parameter	Trigger(s)	Review Conditions	Possible Mitigations
Quality of raw water being taken	• New significant contaminant identified or large increase in known contaminant	• Assess potential sources of new impact. • Assess risk of continuing to receive new contaminant and determine options for proceeding.	• Modify intake procedures if possible. • Reduce water taking rate if possible. • Stop dewatering operations until addressed, unless stopping would create safety risk. • Consider watertight excavation method or other alternatives for mitigating impact.
Quality of treated effluent being discharged	• Excessive solids observed visually. • NTU value that exceeds $NTU_{MAX.}$ • TSS value exceeds discharge criterion.	• Check raw water quality for changes and treatment system function.	• Modify treatment system to reduce solids in effluent. • Stop dewatering operations until addressed by further treatment modifications, unless stopping would create safety risk.
	Exceedance of discharge criteria	• Advise regulating body of any Permit exceedance, as required in the permit. • Contractor review data and operations, and provide rationale or changes to rectify.	• Once any changes made, re-sample effluent, raw water on rush analysis. • If re-sampling exceeds, advise regulating body and stop dewatering operations until addressed by further treatment modifications, unless stopping would create safety risk.
Discharge location impacts contrary to Permit requirements	Erosion observed at discharge location	Make changes to erosion controls and re-evaluate.	Stop dewatering operations until addressed, unless stopping would create safety risk.
Settlement	Settlement exceeds target levels set by engineer or infrastructure owner.	Promptly investigate structures for indications of damage.	Reduce water taking rate if safe to do so.

Table 7.2 – Contingency Plan

Observation / Parameter	Trigger(s)	Review Conditions	Possible Mitigations
			Consider watertight construction method or means of alternate support of affected structure.

8. CLOSURE

We trust that this report provides the information you require at this time. If you have any questions regarding this report, please contact the undersigned at your earliest convenience.

Yours truly,
Thurber Engineering Ltd.

Draft

Paul Coulson, P.Geo.
Hydrogeologist

Draft

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Draft

Renato Pasqualoni, P.Eng.
Review Principal

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STATEMENT OF LIMITATIONS AND CONDITIONS

1. STANDARD OF CARE

This Report has been prepared in accordance with generally accepted engineering or environmental consulting practices in the applicable jurisdiction. No other warranty, expressed or implied, is intended or made.

2. COMPLETE REPORT

All documents, records, data and files, whether electronic or otherwise, generated as part of this assignment are a part of the Report, which is of a summary nature and is not intended to stand alone without reference to the instructions given to Thurber by the Client, communications between Thurber and the Client, and any other reports, proposals or documents prepared by Thurber for the Client relative to the specific site described herein, all of which together constitute the Report.

IN ORDER TO PROPERLY UNDERSTAND THE SUGGESTIONS, RECOMMENDATIONS AND OPINIONS EXPRESSED HEREIN, REFERENCE MUST BE MADE TO THE WHOLE OF THE REPORT. THURBER IS NOT RESPONSIBLE FOR USE BY ANY PARTY OF PORTIONS OF THE REPORT WITHOUT REFERENCE TO THE WHOLE REPORT.

3. BASIS OF REPORT

The Report has been prepared for the specific site, development, design objectives and purposes that were described to Thurber by the Client. The applicability and reliability of any of the findings, recommendations, suggestions, or opinions expressed in the Report, subject to the limitations provided herein, are only valid to the extent that the Report expressly addresses proposed development, design objectives and purposes, and then only to the extent that there has been no material alteration to or variation from any of the said descriptions provided to Thurber, unless Thurber is specifically requested by the Client to review and revise the Report in light of such alteration or variation.

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5. INTERPRETATION OF THE REPORT

a) Nature and Exactness of Soil and Contaminant Description: Classification and identification of soils, rocks, geological units, contaminant materials and quantities have been based on investigations performed in accordance with the standards set out in Paragraph 1. Classification and identification of these factors are judgmental in nature. Comprehensive sampling and testing programs implemented with the appropriate equipment by experienced personnel may fail to locate some conditions. All investigations utilizing the standards of Paragraph 1 will involve an inherent risk that some conditions will not be detected and all documents or records summarizing such investigations will be based on assumptions of what exists between the actual points sampled. Actual conditions may vary significantly between the points investigated and the Client and all other persons making use of such documents or records with our express written consent should be aware of this risk and the Report is delivered subject to the express condition that such risk is accepted by the Client and such other persons. Some conditions are subject to change over time and those making use of the Report should be aware of this possibility and understand that the Report only presents the conditions at the sampled points at the time of sampling. If special concerns exist, or the Client has special considerations or requirements, the Client should disclose them so that additional or special investigations may be undertaken which would not otherwise be within the scope of investigations made for the purposes of the Report.

b) Reliance on Provided Information: The evaluation and conclusions contained in the Report have been prepared on the basis of conditions in evidence at the time of site inspections and on the basis of information provided to Thurber. Thurber has relied in good faith upon representations, information and instructions provided by the Client and others concerning the site. Accordingly, Thurber does not accept responsibility for any deficiency, misstatement or inaccuracy contained in the Report as a result of misstatements, omissions, misrepresentations, or fraudulent acts of the Client or other persons providing information relied on by Thurber. Thurber is entitled to rely on such representations, information and instructions and is not required to carry out investigations to determine the truth or accuracy of such representations, information and instructions.

c) Design Services: The Report may form part of design and construction documents for information purposes even though it may have been issued prior to final design being completed. Thurber should be retained to review final design, project plans and related documents prior to construction to confirm that they are consistent with the intent of the Report. Any differences that may exist between the Report's recommendations and the final design detailed in the contract documents should be reported to Thurber immediately so that Thurber can address potential conflicts.

d) Construction Services: During construction Thurber should be retained to provide field reviews. Field reviews consist of performing sufficient and timely observations of encountered conditions in order to confirm and document that the site conditions do not materially differ from those interpreted conditions considered in the preparation of the report. Adequate field reviews are necessary for Thurber to provide letters of assurance, in accordance with the requirements of many regulatory authorities.

6. RELEASE OF POLLUTANTS OR HAZARDOUS SUBSTANCES

Geotechnical engineering and environmental consulting projects often have the potential to encounter pollutants or hazardous substances and the potential to cause the escape, release or dispersal of those substances. Thurber shall have no liability to the Client under any circumstances, for the escape, release or dispersal of pollutants or hazardous substances, unless such pollutants or hazardous substances have been specifically and accurately identified to Thurber by the Client prior to the commencement of Thurber's professional services.

7. INDEPENDENT JUDGEMENTS OF CLIENT

The information, interpretations and conclusions in the Report are based on Thurber's interpretation of conditions revealed through limited investigation conducted within a defined scope of services. Thurber does not accept responsibility for independent conclusions, interpretations, interpolations and/or decisions of the Client, or others who may come into possession of the Report, or any part thereof, which may be based on information contained in the Report. This restriction of liability includes but is not limited to decisions made to develop, purchase or sell land.

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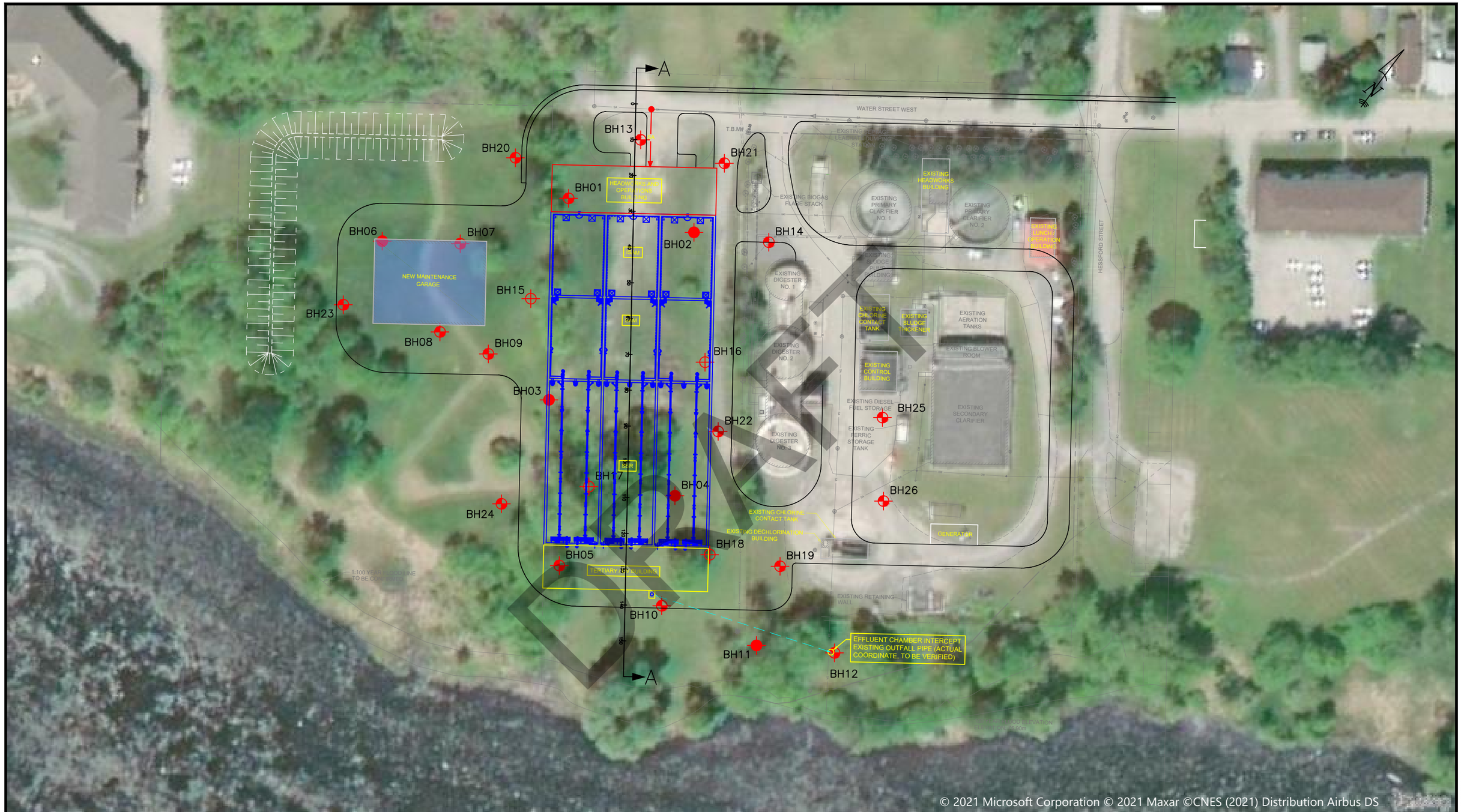
Appendix A

Drawings



LEGEND

- BOREHOLE LOCATION
- BOREHOLE WITH MONITORING WELL LOCATION
- AUGER PROBE LOCATION

DRAFT

20 0 20 40m

SCALE 1:1000

NAPANEE WATER POLLUTION CONTROL PLANT

BOREHOLE LOCATION PLAN

JOB# 30726

THURBER ENGINEERING LTD.

ENGINEER :	DRAWN :	APPROVED :
RB	MFA	MTB
DATE :	SCALE :	DRAWING No.
MAY 2021	1:1000	30726-1

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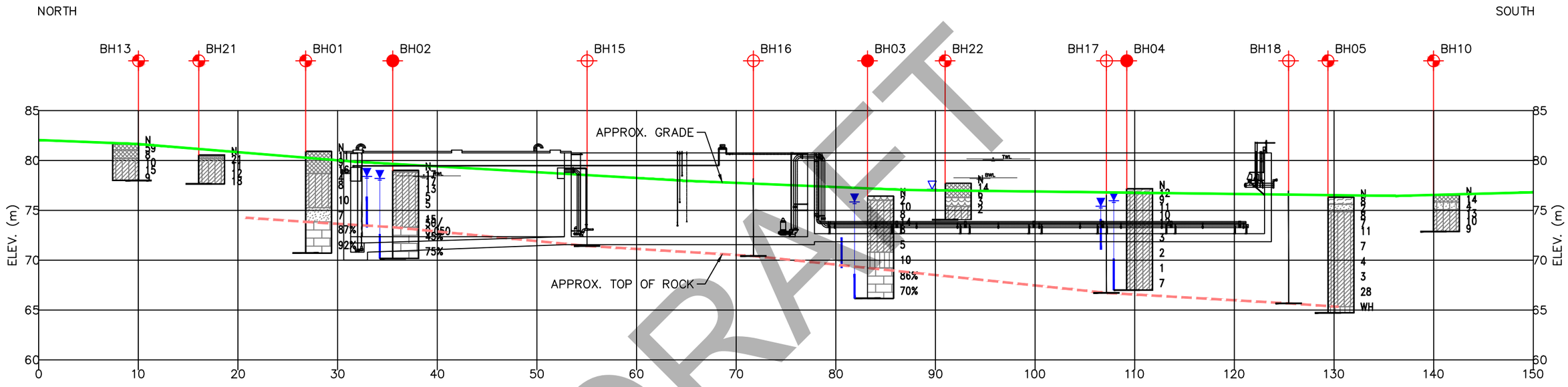

LEGEND

- BOREHOLE LOCATION
- BOREHOLE WITH MONITORING WELL LOCATION
- AUGER PROBE LOCATION

- ASPHALT
- FILL
- TOPSOIL
- PEAT
- SAND
- SILTY SAND
- SILT
- SILTY CLAY
- LIMESTONE

DRAFT

8 0 8 16m

SCALE 1:400

NAPANEE WATER POLLUTION CONTROL PLANT

STRATIGRAPHIC PROFILE A-A

JOB# 30726

THURBER ENGINEERING LTD.

ENGINEER :	DRAWN :	APPROVED :
RB	MFA	MTB
DATE :	SCALE :	DRAWING No.
MAY 2021	1:400	30726-2

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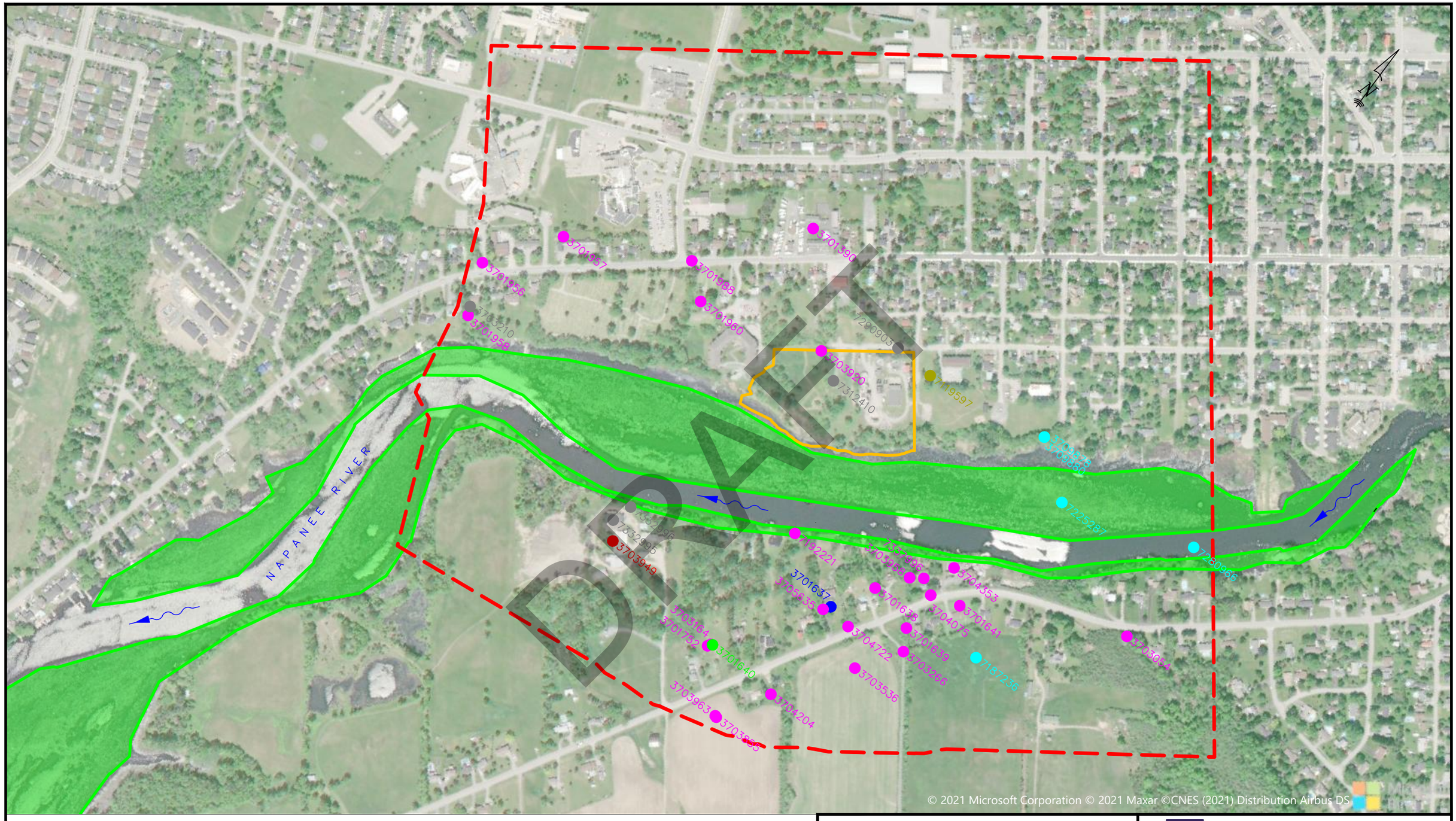

DRAFT

LEGEND

- 500m BUFFER ZONE
- SITE BOUNDARY
- PROVINCIALLY SIGNIFICANT WETLAND
- DOMESTIC
- MONITORING/TEST HOLE
- COMMERCIAL
- PUBLIC
- LIVESTOCK
- NOT USED
- OTHER

0 metres 240

NAPANEE WATER POLLUTION CONTROL PLANT

WELL RECORD PLAN

JOB# 30726

THURBER ENGINEERING LTD.

ENGINEER :	DRAWN :	APPROVED :
PC	MFA	-
DATE :	SCALE :	DRAWING No.
APRIL 2021	1:6000	30726-3

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Appendix B

MECP Well Records

Well ID	Date Completed	Depth of Well (m)	Depth of Bedrock (m)	Static Water Level (m)	Final Status	UTM Zone	Easting	Northing
3701390	1949-02-01	16.76	5.18	12.19	Domestic	18	343242	4900530
3701637	1950-03-02	12.19	0.61	4.57	Public	18	343637	4900031
3701638	1951-04-07	45.72	0.91	44.81	Domestic	18	343679	4900100
3701639	1951-04-12	9.75	1.22	6.10	Domestic	18	343761	4900076
3701640	1956-11-14	21.34	0.00	15.24	Livestock	18	343513	4899863
3701641	1967-09-07	36.88	1.83	32.00	Domestic	18	343812	4900159
3701752	1962-08-22	19.81	2.44	10.97	Domestic	18	343507	4899857
3701956	1956-03-10	21.34	11.89	15.85	Domestic	18	342824.1	4900159
3701957	1959-04-17	19.51	10.36	18.29	Domestic	18	342909.1	4900274
3701958	1964-06-12	21.34	8.53	18.29	Domestic	18	342856.1	4900073
3701960	1964-09-11	18.29	13.11	13.72	Domestic	18	343160	4900320
3701988	1960-02-03	18.29	13.41	15.85	Domestic	18	343108	4900367
3703054	1970-08-29	66.45	1.83	30.48	Domestic	18	344070	4900281
3703164	1971-07-16	19.81	0.91	18.29	Domestic	18	343510	4899862
3703210	1971-05-19	25.91	2.44	21.95	-	18	342850.1	4900087
3703266	1971-07-26	24.38	1.83	35.66	Domestic	18	343780	4900041
3703536	1972-11-01	38.10	2.13	37.19	Domestic	18	343730	4899971
3703855	1973-06-05	40.23	1.83	35.05	Domestic	18	343589	4899768
3703920	1973-08-29	38.10	13.11	36.88	Domestic	18	343373	4900371
3703949	1973-10-24	29.57	26.82	28.65	Commerical	18	343275	4899907
3703958	1973-11-24	38.10	0.61	33.53	Domestic	18	343716	4900148
3703963	1973-08-08	25.91	1.22	22.86	Domestic	18	343586	4899769
3704075	1974-06-14	36.58	1.83	18.29	Domestic	18	343762	4900145
3704204	1974-03-04	25.91	1.52	24.08	Domestic	18	343641	4899853
3704353	1975-08-02	39.62	2.13	19.81	Domestic	18	343767	4900205
3704722	1976-06-28	32.00	1.52	15.24	Domestic	18	343680	4900021
3705635	1980-08-18	30.48	1.83	6.71	Domestic	18	343629	4900020
3709878	2004-03-18	3.35	N/A	-	Monitoring and Test Hole	18	343762	4900472
3709880	2004-03-16	4.57	N/A	-	Monitoring and Test Hole	18	343762	4900472
7119597	2008-11-21	6.40	N/A	-	Not Used	18	343546	4900444
7187236	2012-09-11	6.10	N/A	-	Monitoring and Test Hole	18	343885	4900104
7192221	2012-08-17	11.89	N/A	11.89	Domestic	18	343516	4900096
7225287	2014-05-12	2.84	N/A	-	Monitoring and Test Hole	18	343850	4900400
7280966	2017-01-18	7.62	2.74	-	Monitoring and Test Hole	18	344074	4900468
7290903	2017-05-19	-	-	-	-	18	343475	4900450
7312410	2017-11-28	-	-	-	-	18	343419	4900342
7332995	2018-12-14	2.44	N/A	1.25	-	18	343255	4899936
7332996	2018-12-14	2.44	N/A	1.29	-	18	343266	4899971
7337996	2019-07-19	49.38	-	41.15	Domestic	18	343736	4900161

THURBER

Appendix C

Record of Borehole Sheets

SYMBOLS, ABBREVIATIONS AND TERMS USED ON RECORDS OF BOREHOLES

1. TEXTURAL CLASSIFICATION OF SOILS

CLASSIFICATION	PARTICLE SIZE	VISUAL IDENTIFICATION
Boulders	Greater than 200mm	same
Cobbles	75 to 200mm	same
Gravel	4.75 to 75mm	5 to 75mm
Sand	0.075 to 4.75mm	Not visible particles to 5mm
Silt	0.002 to 0.075mm	Non-plastic particles, not visible to the naked eye
Clay	Less than 0.002mm	Plastic particles, not visible to the naked eye

2. COARSE GRAIN SOIL DESCRIPTION (50% greater than 0.075mm)

TERMINOLOGY	PROPORTION
Trace or Occasional	Less than 10%
Some	10 to 20%
Adjective (e.g. silty or sandy)	20 to 35%
And (e.g. sand and gravel)	35 to 50%

3. TERMS DESCRIBING CONSISTENCY (COHESIVE SOILS ONLY)

DESCRIPTIVE TERM	UNDRAINED SHEAR STRENGTH (kPa)	APPROXIMATE SPT[(1)] 'N' VALUE
Very Soft	12 or less	Less than 2
Soft	12 to 25	2 to 4
Firm	25 to 50	4 to 8
Stiff	50 to 100	8 to 15
Very Stiff	100 to 200	15 to 30
Hard	Greater than 200	Greater than 30

NOTE: Hierarchy of Soil Strength Prediction
1) Laboratory Triaxial Testing
2) Field Insitu Vane Testing
3) Laboratory Vane Testing
4) SPT value
5) Pocket Penetrometer

4. TERMS DESCRIBING DENSITY (COHESIONLESS SOILS ONLY)

DESCRIPTIVE TERM	SPT "N" VALUE
Very Loose	Less than 4
Loose	4 to 10
Compact	10 to 30
Dense	30 to 50
Very Dense	Greater than 50

5. LEGEND FOR RECORDS OF BOREHOLES

SYMBOLS AND ABBREVIATIONS FOR SAMPLE TYPE	SS Split Spoon Sample	WS Wash Sample	AS Auger (Grab) Sample
	TW Thin Wall Shelby Tube Sample		TP Thin Wall Piston Sample
	PH Sampler Advanced by Hydraulic Pressure		PM Sampler Advanced by Manual Pressure
	WH Sampler Advanced by Self Static Weight	RC Rock Core	SC Soil Core

$$\text{Sensitivity} = \frac{\text{Undisturbed Shear Strength}}{\text{Remoulded Shear Strength}}$$

▼ Water Level

C_{pen} Shear Strength Determination by Pocket Penetrometer

(1) SPT 'N' Value Standard Penetration Test 'N' Value – refers to the number of blows from a 63.5kg hammer free falling a height of 0.76m to advance a standard 50 mm outside diameter split spoon sampler for 0.3 m depth into undisturbed ground.

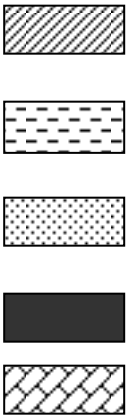
(2) DCPT Dynamic Cone Penetration Test – Continuous penetration of a 50 mm outside diameter, 60° conical steel point attached to "A" size rods driven by a 63.5 kg hammer free falling a height of 0.76 m. The resistance to cone penetration is the number of hammer blows required for each 0.3 m advance of the conical point into undisturbed ground.

EXPLANATION OF ROCK LOGGING TERMS

ROCK WEATHERING CLASSIFICATION

Fresh (FR)	No visible signs of weathering.
Fresh Jointed (FJ)	Weathering limited to the surface of major discontinuities.
Slightly Weathered (SW)	Penetrative weathering developed on open discontinuity surfaces, but only slight weathering of rock material.
Moderately Weathered (MW)	Weathering extends throughout the rock mass, but the rock material is not friable.
Highly Weathered (HW)	Weathering extends throughout the rock mass and the rock is partly friable.
Completely Weathered (CW)	Rock is wholly decomposed and in a friable condition, but the rock texture and structure are preserved.

SYMBOLS



CLAYSTONE

SILTSTONE

SANDSTONE

COAL

Bedrock (general)

DISCONTINUITY SPACING

Bedding	Bedding Plane Spacing
Very thickly bedded	Greater than 2m
Thickly bedded	0.6 to 2m
Medium bedded	0.2 to 0.6m
Thinly bedded	60mm to 0.2m
Very thinly bedded	20 to 60mm
Laminated	6 to 20mm
Thinly Laminated	Less than 6mm

TERMS

Total Core Recovery: (TCR)	Core recovered as a percentage of total core run length.
Solid Core Recovery: (SCR)	Percent Ratio of solid core of full cylindrical shape recovered. Expressed with respect to the total length of core run.
Rock Quality Designation: (RQD)	Total length of sound core recovered in pieces 0.1m in length or larger as a percentage of total core run length.
Uniaxial Compressive Strength (UCS)	Axial stress required to break the specimen
Fracture Index: (FI)	Frequency of natural fractures per 0.3m of core run.

STRENGTH CLASSIFICATION

Rock Strength	Approximate Uniaxial Compressive Strength (MPa)	(psi)	Field Estimation of Hardness*
Extremely Strong	Greater than 250	Greater than 36,000	Specimen can only be chipped with a geological hammer
Very Strong	100-250	15,000 to 36,000	Requires many blows of geological hammer to break
Strong	50-100	7,500 to 15,000	Requires more than one blow of geological hammer to break
Medium Strong	25.0 to 50.0	3,500 to 7,500	Breaks under single blow of geological hammer.
Weak	5.0 to 25.0	750 to 3,500	Can be peeled by a pocket knife with difficulty
Very Weak	1.0 to 5.0	150 to 750	Can be peeled by a pocket knife, crumbles under firm blows of geological pick.
Extremely Weak (Rock)	0.25 to 1.0	35 to 150	Indented by thumbnail

RECORD OF BOREHOLE BH-01

PROJECT : Napanee Water Pollution Control Plant Expansion
LOCATION : 300 Water St West Napanee, ON
STARTED : February 23, 2021
COMPLETED : February 23, 2021
N 4 900 363.3 E 343 393.4

Project No. 30726
SHEET 1 OF 2
DATUM Geodetic

DEPTH SCALE (metres)	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	COMMENTS	SHEAR STRENGTH: Cu, KPa (nat V - ✚, rem V - ●, Q - ✖, Cpen ▲) 40 80 120 160 / WATER CONTENT, PERCENT wp w wl 10 20 30 40	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		80.91				DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100			
	Hollow Stem Augers	**CLAY**, silty, trace to some gravel, trace to some sand, trace organics, stiff to very stiff, brown, moist: (FILL)		0.00	1	SS	11		○		
1		occasional brick fragments in SS2			2	SS	9		○		
		occasional cobbles			3	SS	16		○		
2		**CLAY**, silty, trace sand, occasional gravel, frequent sand seams firm to stiff, grey, moist		78.70 2.21	4	SS	4	Grain Size Analysis: Gr 1%/ Sa 37%/ Si 41%/ Cl 21%	○—○		
3					5	SS	8		○		
4		some sand			6	SS	10		○		
5				75.27							
		SAND, some silt to silty, trace Gravel, trace clay, loose, brown, wet		5.64	7	SS	7	Grain Size Analysis: Gr 3%/ Sa 84%/ Si 12%/ Cl 1%	○ ○		
6											
7				73.84						FI	
	NQ Coring	**LIMESTONE** slightly weathered to fresh, strong to very strong, thinly bedded, grey with black mudstone interbeds and occasional calcite filled vugs (Bobcageon Formation)		7.06	1	RUN		UCS = 113.5MPa TCR=100% SCR=88% RQD=87% UCS = 75MPa (Average) (PLT)		3 2 1	
8		subvertical fracture at 8.6 m (125 mm in length)								2 2	
9					2	RUN		TCR=100% SCR=92% RQD=92% UCS = 119MPa (Average) (PLT)		3 2 0 2	

GROUNDWATER ELEVATIONS

▽ WATER LEVEL UPON COMPLETION ▼ WATER LEVEL IN WELL/PIEZOMETER

LOGGED : RB
CHECKED : JDA/MTB

THURBER

RECORD OF BOREHOLE BH-01

PROJECT : Napanee Water Pollution Control Plant Expansion
LOCATION : 300 Water St West Napanee, ON
STARTED : February 23, 2021
COMPLETED : February 23, 2021
N 4 900 363.3 E 343 393.4

Project No. 30726
SHEET 2 OF 2
DATUM Geodetic

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	COMMENTS: DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100)	SHEAR STRENGTH: Cu, KPa (nat V - ✚, rem V - ●, Q - ✖, Cpen ▲) (40 80 120 160) / WATER CONTENT, PERCENT (wp, w, wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
				70.72						1	
		END OF BOREHOLE AT 10.2m. BOREHOLE BACKFILLED WITH HOLEPLUG.		10.19							
11											
12											
13											
14											
15											
16											
17											
18											
19											

GROUNDWATER ELEVATIONS

▽ WATER LEVEL UPON COMPLETION ▼ WATER LEVEL IN WELL/PIEZOMETER

LOGGED : RB
CHECKED : JDA/MTB

THURBER

RECORD OF BOREHOLE BH-02

PROJECT : Napanee Water Pollution Control Plant Expansion
LOCATION : 300 Water St West Napanee, ON
STARTED : February 22, 2021
COMPLETED : February 23, 2021
N 4 900 376.0 E 343 427.4

Project No. 30726
SHEET 1 OF 2
DATUM Geodetic

DEPTH SCALE (metres)	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	COMMENTS
		GROUND SURFACE		79.00				
		FILL (100mm)		0.10				
		TOPSOIL (75mm)		0.18				
		CLAY, silty, trace to some sand, very stiff to firm, brown, moist			1	SS	17	
1	Hollow Stem Augers				2	SS	17	Grain Size Analysis: Gr 0%/ Sa 18%/ Si 38%/ Cl 44%
2					3	SS	13	
					4	SS	5	
3		becoming grey			5	SS	5	
4								
5		Frequent sand seams (2-3 mm thick) in SS6			6	SS	15	Grain Size Analysis: Gr 0%/ Sa 1%/ Si 25%/ Cl 74%
		rock fragments in SS7						
				73.31	7	SS	50/ 0.050	
6		**LIMESTONE**, slightly weathered to fresh, strong to very strong, thinly bedded, flat to wavy foliation, fossiliferous, fine grained matrix with occasional <5mm clasts, with black shale interbeds (15-30mm) and occasional calcite infilling and calcite filled vugs (Bobcageon Formation)		5.69				UCS = 105.9MPa
7	NQ Coring				1	RUN		TCR=97% SCR=87% RQD=70% UCS = 113MPa (Average) (PLT)
		vertical fracture at 7.7m (125mm long)						
8					2	RUN		TCR=98% SCR=89% RQD=82% UCS = 89MPa (Average) (PLT)
				70.16				
9		END OF BOREHOLE AT 8.84m.		8.84				

Deep Monitoring Well installation consists of 50mm diameter Schedule 40 PVC pipe with a 2.44m slotted screen.
Shallow monitoring well was installed in a separate borehole drilled approximately 1m away from the sampled borehole. The shallow well installation consists of a 50mm diameter Schedule 40 PVC pipe with a 3.04

SHEAR STRENGTH: Cu, KPa (nat V - ✚, rem V - ●, Q - ✖, Cpen ▲)
40 80 120 160
WATER CONTENT, PERCENT
wp w wl
10 20 30 40

DYNAMIC CONE PENETRATION RESISTANCE PLOT
20 40 60 80 100

ADDITIONAL LAB. TESTING: FI

PIEZOMETER OR STANDPIPE INSTALLATION: Shallow, Deep, Bentonite, Filter Sand, Slotted Screen, Filter Sand, Slotted Screen

GROUNDWATER ELEVATIONS
▽ WATER LEVEL UPON COMPLETION
▼ WATER LEVEL IN WELL/PIEZOMETER
April 14, 2021

LOGGED : RB
CHECKED : JDA/MTB

THURBER

THURBER2S TEL-30726.GPJ 7/15/21

RECORD OF BOREHOLE BH-02

PROJECT : Napanee Water Pollution Control Plant Expansion
LOCATION : 300 Water St West Napanee, ON
STARTED : February 22, 2021
COMPLETED : February 23, 2021
N 4 900 376.0 E 343 427.4

Project No. 30726
SHEET 2 OF 2
DATUM Geodetic

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	COMMENTS: DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100)	SHEAR STRENGTH: Cu, KPa (nat V - ✚, rem V - ●, Q - ✖, Cpen ▲) (40 80 120 160) / WATER CONTENT, PERCENT (wp, w, wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		m slotted screen. DEEP WELL WATER LEVEL READINGS: DATE DEPTH(m) ELEV.(m) Feb 26/2021 0.8 78.20 Mar 03/2021 0.7 78.30 Apr 14/2021 0.6 78.40 SHALLOW WELL WATER LEVEL READINGS: DATE DEPTH(m) ELEV.(m) Feb 26/2021 0.7 78.30 Mar 12/2021 0.6 78.40 Apr 14/2021 0.6 78.40									
11											
12											
13											
14											
15											
16											
17											
18											
19											

GROUNDWATER ELEVATIONS

▽ WATER LEVEL UPON COMPLETION

▼ WATER LEVEL IN WELL/PIEZOMETER
April 14, 2021

LOGGED : RB
CHECKED : JDA/MTB

THURBER

RECORD OF BOREHOLE BH-03

PROJECT : Napanee Water Pollution Control Plant Expansion
LOCATION : 300 Water St West Napanee, ON
STARTED : February 23, 2021
COMPLETED : February 24, 2021
N 4 900 314.4 E 343 421.8

Project No. 30726
SHEET 1 OF 2
DATUM Geodetic

DEPTH SCALE (metres)	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	COMMENTS	SHEAR STRENGTH: Cu, KPa (nat V - ✤, rem V - ●, Q - ✖, Cpen ▲) 40 80 120 160 / WATER CONTENT, PERCENT wp w wl 10 20 30 40	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		76.44				DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100			
	Hollow Stem Augers	**PEAT**		0.00							
				76.01	1	SS	2		72		Deep
		CLAY, silty, trace sand, stiff to firm, brown, moist		0.43							
1		trace to some organic material in SS2			2	SS	10				
					3	SS	8				Bentonite
2											
					4	SS	14				
3											
		frequent silt lenses (1mm thick) in SS5 and SS6, becoming grey			5	SS	8	Grain Size Analysis: Gr 0%/ Sa 1%/ Si 30%/ Cl 69%	61		
4											Filter Sand
					6	SS	5	Note: Vane test completed in separate borehole adjacent to sampled borehole			
5											
				70.80							
		SILT, some sand, some clay, trace gravel, frequent sand interbeds, compact, brown, wet		5.64							Slotted Screen
6					7	SS	10	Grain Size Analysis: Gr 1%/ Sa 17%/ Si 68%/ Cl 14%			
7											
				69.23							
	I	**LIMESTONE** fresh, strong to very strong, thinly bedded, flat to wavy foliation, fossiliferous, fine grained matrix with occasional <5mm clasts, interbedded with black mudstone and occasional calcite infilling (Bobcageon Formation)		7.21				UCS = 130.6MPa		FI 1	
	NQ Coring				1	RUN		TCR=93% SCR=97% RQD=92% UCS = 157MPa (Average) (PLT)		2 3 1 1	
8											
9		highly fractured zone at 9.2m			2	RUN		TCR=97% SCR=77% RQD=75% UCS = 104MPa (Average) (PLT)		2 3 3 1	Slotted Screen

GROUNDWATER ELEVATIONS

▽ WATER LEVEL UPON COMPLETION ▼ WATER LEVEL IN WELL/PIEZOMETER

April 14, 2021

LOGGED : RB
CHECKED : JDA/MTB

THURBER

RECORD OF BOREHOLE BH-03

PROJECT : Napanee Water Pollution Control Plant Expansion
LOCATION : 300 Water St West Napanee, ON
STARTED : February 23, 2021
COMPLETED : February 24, 2021
N 4 900 314.4 E 343 421.8

Project No. 30726
SHEET 2 OF 2
DATUM Geodetic

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	COMMENTS: DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100)	SHEAR STRENGTH: Cu, KPa (nat V - ✤, rem V - ●, Q - ✖, Cpen ▲; 40 80 120 160) / WATER CONTENT, PERCENT (wp, w, wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
				66.18						3	
		END OF BOREHOLE AT 10.26m.		10.26							

Deep Monitoring Wells installation consists of 50mm diameter Schedule 40 PVC pipe with a 2.44m slotted screen.

Shallow monitoring well installed in a separate borehole drilled approximately 1 m away from the sampled borehole.
Shallow monitoring well installation consists of a 50mm diameter Schedule 40 PVC pipe with a 3.05m slotted screen.

DEEP WELL
WATER LEVEL READINGS:

DATE	DEPTH(m)	ELEV.(m)
Feb 26/21	-0.20	76.64
Mar 03/21	0.70	75.74
Apr 14/21	0.60	75.84

SHALLOW WELL
WATER LEVEL READINGS:

Feb 26/21	0.20	76.24
Mar 12/21	-0.20	76.64
Apr 14/21	-0.10	76.54

(Negative water level indicates water level measured above the ground surface)

GROUNDWATER ELEVATIONS
▽ WATER LEVEL UPON COMPLETION
▼ WATER LEVEL IN WELL/PIEZOMETER
April 14, 2021

LOGGED : RB
CHECKED : JDA/MTB

THURBER

RECORD OF BOREHOLE BH-04

PROJECT : Napanee Water Pollution Control Plant Expansion
LOCATION : 300 Water St West Napanee, ON
STARTED : February 24, 2021
COMPLETED : February 24, 2021
N 4 900 313.1 E 343 466.0

Project No. 30726
SHEET 1 OF 2
DATUM Geodetic

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	COMMENTS: DYNAMIC CONE PENETRATION RESISTANCE PLOT	SHEAR STRENGTH: Cu, KPa (nat V - ✚, rem V - ●, Q - ✖, Cpen ▲) / WATER CONTENT, PERCENT (wp, w, wl)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		77.16							
		ORGANICS		0.00	1	SS	12				
				76.65							
		CLAY, silty, trace sand, stiff to very soft, brown, moist		0.51							
1					2	SS	9				Shallow Bentonite
					3	SS	11				Deep
2		becoming grey			4	SS	10				
											Filter Sand
3					5	SS	12	Grain Size Analysis: Gr 0%/ Sa 2%/ Si 45%/ Cl 53%			
		frequent silt lenses (1mm thick) in SS5									
4											
											Slotted Screen
5	Hollow Stem Augers				6	SS	3		59		
6					7	SS	2				
7											Filter Sand
8		frequent silt/sand lenses in SS8 and SS9			8	SS	1				
											Slotted Screen
9					9	SS	7	Grain Size Analysis: Gr 0%/ Sa 5%/ Si 70%/ Cl 25%			

GROUNDWATER ELEVATIONS

▽ WATER LEVEL UPON COMPLETION

▼ WATER LEVEL IN WELL/PIEZOMETER

April 14, 2021

LOGGED : RB
CHECKED : JDA/MTB

THURBER

RECORD OF BOREHOLE BH-04

PROJECT : Napanee Water Pollution Control Plant Expansion
LOCATION : 300 Water St West Napanee, ON
STARTED : February 24, 2021
COMPLETED : February 24, 2021
N 4 900 313.1 E 343 466.0

Project No. 30726
SHEET 2 OF 2
DATUM Geodetic

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	COMMENTS: DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100)	SHEAR STRENGTH: Cu, KPa (nat V - ✚, rem V - ●, Q - ✖, Cpen ▲) (40 80 120 160) / WATER CONTENT, PERCENT (wp, w, wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
				67.00							
		END OF BOREHOLE AT 10.16m UPON AUGER REFUSAL ON PROBABLE BEDROCK.		10.16							

Deep Monitoring Well installation consists of 50mm diameter Schedule 40 PVC pipe with a 3.05m slotted screen.
Shallow monitoring well installed in separate borehole drilled approximately 1m away from the sampled borehole.
Shallow monitoring well installation consists of a 50mm diameter Schedule 40 PVC pipe with a 3.05 m slotted screen.

DEEP WELL
WATER LEVEL READINGS:

DATE	DEPTH(m)	ELEV.(m)
Feb 26/2021	1.8	76.36
Mar 02/2021	1.8	76.36
Apr 14/2021	1.8	76.36

SHALLOW WELL
WATER LEVEL READINGS:

DATE	DEPTH(m)	ELEV.(m)
Feb 26/2021	2.9	74.26
Mar 12/2021	1.0	76.16
Apr 14/2021	1.2	75.96

11 12 13 14 15 16 17 18 19

GROUNDWATER ELEVATIONS

▽ WATER LEVEL UPON COMPLETION

▼ WATER LEVEL IN WELL/PIEZOMETER
April 14, 2021

LOGGED : RB
CHECKED : JDA/MTB

THURBER

RECORD OF BOREHOLE BH-05

PROJECT : Napanee Water Pollution Control Plant Expansion
LOCATION : 300 Water St West Napanee, ON
STARTED : February 25, 2021
COMPLETED : February 25, 2021
N 4 900 278.5 E 343 451.1

Project No. 30726
SHEET 1 OF 2
DATUM Geodetic

DEPTH SCALE (metres)	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	COMMENTS / DYNAMIC CONE PENETRATION RESISTANCE PLOT	SHEAR STRENGTH: Cu, KPa (nat V - ✚, rem V - ●, Q - ✖, Cpen ▲) / WATER CONTENT, PERCENT (wp, w, wl)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		76.30							
	Hollow Stem Augers	**ORGANICS**, some sand, trace silt, trace clay, black, moist, loose		0.00	1	SS	8				
				75.62							
1		**SAND**, some silt, trace clay, very loose, brown, moist		0.69	2	SS	2				
				74.85							
		CLAY, silty, trace sand, stiff to soft, brown, moist		1.45	3	SS	8				
2					4	SS	7				
3		trace gravel			5	SS	11				
4											
5		becoming grey			6	SS	7	Grain Size Analysis: Gr 0%/ Sa 1%/ Si 20%/ Cl 79%	68		
6					7	SS	4				
7											
8					8	SS	3				
9		varved, becoming very stiff			9	SS	28				

GROUNDWATER ELEVATIONS

▽ WATER LEVEL UPON COMPLETION ▼ WATER LEVEL IN WELL/PIEZOMETER

LOGGED : RB
CHECKED : JDA/MTB

THURBER

RECORD OF BOREHOLE BH-05

PROJECT : Napanee Water Pollution Control Plant Expansion
LOCATION : 300 Water St West Napanee, ON
STARTED : February 25, 2021
COMPLETED : February 25, 2021
N 4 900 278.5 E 343 451.1

Project No. 30726
SHEET 2 OF 2
DATUM Geodetic

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	COMMENTS: DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100)	SHEAR STRENGTH: Cu, KPa (nat V - ✚ Q - ✖ / rem V - ● Cpen ▲) 40 80 120 160 / WATER CONTENT, PERCENT (wp w wl) 10 20 30 40	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
11		**SILT**, some sand to sandy, trace to some clay, very loose, wet		65.33 10.97	10	SS	WH	Grain Size Analysis: Gr 0%/ Sa 19%/ Si 71%/ Cl 10%	○ ○		
		END OF BOREHOLE AT 11.58m UPON AUGER REFUSAL ON PROBABLE BEDROCK. BOREHOLE OPEN UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE TO SURFACE.		64.72 11.58							
12											
13											
14											
15											
16											
17											
18											
19											

GROUNDWATER ELEVATIONS

▽ WATER LEVEL UPON COMPLETION ▼ WATER LEVEL IN WELL/PIEZOMETER

LOGGED : RB
CHECKED : JDA/MTB

THURBER

RECORD OF BOREHOLE BH-06

PROJECT : Napanee Water Pollution Control Plant Expansion
LOCATION : 300 Water St West Napanee, ON
STARTED : February 24, 2021
COMPLETED : February 24, 2021
N 4 900 323.2 E 343 358.1

Project No. 30726
SHEET 1 OF 1
DATUM Geodetic

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	COMMENTS: DYNAMIC CONE PENETRATION RESISTANCE PLOT	SHEAR STRENGTH: Cu, KPa (nat V - ✚, rem V - ●, Q - ✖, Cpen ▲) / WATER CONTENT, PERCENT (wp, w, wl)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		78.49							
	Hollow Stem Augers	**CLAY**, silty, some gravel, trace sand, some organics, occasional brick fragments firm, reddish brown, moist: (FILL)		0.00	1	SS	6				
				77.83							
		CLAY, silty, trace sand, soft to stiff, brown, moist		0.66	2	SS	3				Bentonite
1											
					3	SS	13	Grain Size Analysis: Gr 0%/ Sa 6%/ Si 56%/ Cl 38%			
2											Filter Sand
					4	SS	7				
3											
					5	SS	8				
4											
		SAND, silty, some clay to clayey, loose, brown, wet (bedded in 20 to 50 mm layers)		74.38 4.11							Slotted Screen
					6	SS	7	Grain Size Analysis: Gr 0%/ Sa 44%/ Si 30%/ Cl 26%			
5											
				72.70							
		END OF BOREHOLE AT 5.79m UPON AUGER REFUSAL ON PROBABLE BEDROCK.		5.79							
6											
		Monitoring Wells installation consists of 50mm diameter Schedule 40 PVC pipe with a 3.05m slotted screen.									
7		WATER LEVEL READINGS: DATE / DEPTH(m) / ELEV.(m): Feb 26/21 -0.23 78.73; Mar 12/21 -0.30 78.79; Apr 14/21 -0.24 78.74									
		(Negative water level indicates water level measured above the ground surface)									
8											
9											

GROUNDWATER ELEVATIONS

▽ WATER LEVEL UPON COMPLETION ▼ WATER LEVEL IN WELL/PIEZOMETER

LOGGED : RB
CHECKED : JDA/MTB

THURBER

RECORD OF BOREHOLE BH-07

PROJECT : Napanee Water Pollution Control Plant Expansion
LOCATION : 300 Water St West Napanee, ON
STARTED : February 26, 2021
COMPLETED : February 26, 2021
N 4 900 335.3 E 343 376.2

Project No. 30726
SHEET 1 OF 1
DATUM Geodetic

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	COMMENTS: DYNAMIC CONE PENETRATION RESISTANCE PLOT	SHEAR STRENGTH: Cu, KPa (nat V - ✚, rem V - ●, Q - ✖, Cpen ▲) 40 80 120 160 / WATER CONTENT, PERCENT wp w wl 10 20 30 40	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		78.53				20 40 60 80 100			
	Hollow Stem Augers	**CLAY** and **ORGANICS**, silty, some sand, moist, firm, black (topsoil)		0.00	1	SS	5		○		
				77.92							
		CLAY, silty, trace to some sand, brown, moist, firm to stiff, frequent sand lenses (1mm thick)		0.61							
1					2	SS	5	Grain Size Analysis: Gr 0%/ Sa 12%/ Si 54%/ Cl 34%	○ ▲		
2					3	SS	8		◐		
					4	SS	13		○ >>		
3											
					5	SS	9	Grain Size Analysis: Gr 0%/ Sa 3%/ Si 48%/ Cl 49%	○ >>		▽
4											
5		frequent sand layers (50mm to 75mm thick) in SS6			6	SS	11		▲ ○		
				72.64							
6		END OF BOREHOLE AT 5.89m UPON AUGER REFUSAL ON PROBABLE BEDROCK. BOREHOLE OPEN TO 4.88m AND WATER LEVEL AT 3.66m UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE.		5.89							
7											
8											
9											

GROUNDWATER ELEVATIONS

▽ WATER LEVEL UPON COMPLETION ▼ WATER LEVEL IN WELL/PIEZOMETER

LOGGED : RB
CHECKED : JDA/MTB

THURBER

RECORD OF BOREHOLE BH-08

PROJECT : Napanee Water Pollution Control Plant Expansion
LOCATION : 300 Water St West Napanee, ON
STARTED : February 26, 2021
COMPLETED : February 26, 2021
N 4 900 312.0 E 343 386.0

Project No. 30726
SHEET 1 OF 1
DATUM Geodetic

DEPTH SCALE (metres)	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	COMMENTS	SHEAR STRENGTH: Cu, KPa (nat V - ✚, rem V - ●, Q - ✖, Cpen ▲) 40 80 120 160 / WATER CONTENT, PERCENT wp w wl 10 20 30 40	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		77.17				DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100			
		TOPSOIL (150mm)		0.00							
		CLAY, silty, some sand, some organics, firm, brown, moist		0.15	1	SS	5				
				76.49							
		CLAY, silty, trace sand, stiff to firm, brown, moist		0.69							
1					2	SS	11				
					3	SS	15	Grain Size Analysis: Gr 0%/ Sa 6%/ Si 57%/ Cl 37%			
2											▽
					4	SS	12				
3	Hollow Stem Augers										
		becoming grey			5	SS	9				
4											
					6	SS	7				
5											
		SILT, sandy (bedded), trace clay, trace gravel, compact, brown, wet		71.53 5.64							
6					7	SS	9	Grain Size Analysis: Gr 1%/ Sa 27%/ Si 70%/ Cl 2%			
				70.62							
		END OF BOREHOLE AT 6.55m UPON AUGER REFUSAL ON PROBABLE BEDROCK. BOREHOLE OPEN TO 6.25m AND WATER LEVEL AT 2.44m UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE TO GROUND SURFACE.		6.55							
7											
8											
9											

GROUNDWATER ELEVATIONS

▽ WATER LEVEL UPON COMPLETION ▼ WATER LEVEL IN WELL/PIEZOMETER

LOGGED : RB
CHECKED : JDA/MTB

THURBER

RECORD OF BOREHOLE BH-09

PROJECT : Napanee Water Pollution Control Plant Expansion
LOCATION : 300 Water St West Napanee, ON
STARTED : February 26, 2021
COMPLETED : February 26, 2021
N 4 900 314.9 E 343 400.5

Project No. 30726
SHEET 1 OF 1
DATUM Geodetic

DEPTH SCALE (metres)	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/0.3m	COMMENTS: DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100)	SHEAR STRENGTH: Cu, KPa (nat V - ✚, rem V - ●, Q - ✖, Cpen ▲) 40 80 120 160; WATER CONTENT, PERCENT wp w wl 10 20 30 40	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		76.84							
	Solid Stem Augers	**TOPSOIL** (600mm)		0.00	1	SS	4		65		▽
				76.23							
		SAND, trace to some silt, trace gravel, loose, brown, wet		0.61							
				75.92							
1		**CLAY**, silty, trace sand, stiff, brown, moist		0.91	2	SS	9				
				75.47							
		SAND, some gravel, trace silt, compact, brown, moist		1.37							
				75.01	3	SS	13				
2		**CLAY**, silty, trace sand, stiff, brown, moist		1.83							
				74.55							
		SAND, trace gravel, trace silt, compact, brown, moist		2.29	4	SS	11				
				73.94							
3		END OF BOREHOLE AT 2.90m. BOREHOLE WATER LEVEL AT 0.91m UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE TO GROUND SURFACE.		2.90							
4											
5											
6											
7											
8											
9											

GROUNDWATER ELEVATIONS

▽ WATER LEVEL UPON COMPLETION ▼ WATER LEVEL IN WELL/PIEZOMETER

LOGGED : RB
CHECKED : JDA/MTB

THURBER

RECORD OF BOREHOLE BH-10

PROJECT : Napanee Water Pollution Control Plant Expansion
LOCATION : 300 Water St West Napanee, ON
STARTED : February 25, 2021
COMPLETED : February 25, 2021
N 4 900 286.0 E 343 480.9

Project No. 30726
SHEET 1 OF 1
DATUM Geodetic

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	COMMENTS: DYNAMIC CONE PENETRATION RESISTANCE PLOT	SHEAR STRENGTH: Cu, KPa / WATER CONTENT, PERCENT	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		76.53							
	Solid Stem Augers	**CLAY**, silty, some gravel, some sand, some organics, stiff, brown, moist: (FILL)		0.00	1	SS	14				
				75.84							
1		**SAND**, silty, trace clay, trace gravel, loose, brown, moist		0.69	2	SS	4				
				75.08							
2		**CLAY**, silty, trace to some sand, stiff, brown, moist; with sand layers up to 100mm thick		1.45	3	SS	13				
		becoming grey			4	SS	10				
3					5	SS	9	Grain Size Analysis: Gr 0%/ Sa 15%/ Si 24%/ Cl 61%			
				72.87							
4		END OF BOREHOLE AT 3.66m. BOREHOLE OPEN AND DRY UPON COMPLETION. BOREHOLE BACKFILLED WITH HOLEPLUG.		3.66							
5											
6											
7											
8											
9											

SHEAR STRENGTH: Cu, KPa — nat V - ✚ Q - ✖ — rem V - ● Cpen ▲ — 40 80 120 160
WATER CONTENT, PERCENT — wp w wl — 10 20 30 40
DYNAMIC CONE PENETRATION RESISTANCE PLOT — 20 40 60 80 100

GROUNDWATER ELEVATIONS

▽ WATER LEVEL UPON COMPLETION ▼ WATER LEVEL IN WELL/PIEZOMETER

LOGGED : RB
CHECKED : JDA/MTB

THURBER

RECORD OF BOREHOLE BH-11

PROJECT : Napanee Water Pollution Control Plant Expansion
LOCATION : 300 Water St West Napanee, ON
STARTED : February 25, 2021
COMPLETED : February 25, 2021
N 4 900 293.0 E 343 503.0

Project No. 30726
SHEET 1 OF 1
DATUM Geodetic

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	COMMENTS: DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100)	SHEAR STRENGTH: Cu, KPa (nat V - ✚, rem V - ●, Q - ✖, Cpen ▲) 40 80 120 160 / WATER CONTENT, PERCENT wp w wl 10 20 30 40	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		76.39							
	Hollow Stem Augers	**CLAY**, silty, some sand, trace gravel, some organics, very stiff to firm, brown, moist Note:SS1 was frozen: (FILL)		0.00	1	SS	31				Bentonite
1		**SAND**, some silt, trace clay, very loose to loose, brown, moist		75.33 1.07	2	SS	6				Filter Sand
2					3	SS	3	Grain Size Analysis: Gr 0%/ Sa 81%/ Si 13%/ Cl 6%			Slotted Screen
		CLAY, silty, trace sand, firm, brown, moist		73.80 2.59	4	SS	6				
3					5	SS	5				
		END OF BOREHOLE AT 3.66m. Monitoring Wells installation consists of 50mm diameter Schedule 40 PVC pipe with a 1.54m slotted screen. WATER LEVEL READINGS: DATE DEPTH(m) ELEV.(m) Feb 26/21 2.20 74.19 Mar 03/21 2.09 74.30 Apr 14/21 2.10 74.29		72.73 3.66							
4											
5											
6											
7											
8											
9											

GROUNDWATER ELEVATIONS

▽ WATER LEVEL UPON COMPLETION ▼ WATER LEVEL IN WELL/PIEZOMETER
April 14, 2021

LOGGED : RB
CHECKED : JDA/MTB

THURBER

RECORD OF BOREHOLE BH-12

PROJECT : Napanee Water Pollution Control Plant Expansion
LOCATION : 300 Water St West Napanee, ON
STARTED : February 25, 2021
COMPLETED : February 25, 2021
N 4 900 302.0 E 343 528.0

Project No. 30726
SHEET 1 OF 1
DATUM Geodetic

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	COMMENTS: DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100)	SHEAR STRENGTH: Cu, KPa (nat V - ✚ rem V - ● Q - ✖ Cpen ▲) 40 80 120 160 / WATER CONTENT, PERCENT (wp w wl) 10 20 30 40	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		76.40							
	Solid Stem Augers	**CLAY**, silty, trace sand, trace gravel, trace organics, very stiff, brown, moist: (FILL)		0.00	1	SS	16		○		
				75.64							
1		**SAND**, some silt, trace clay, trace gravel, compact to loose, brown, moist; with layers of find sand/silt (~25mm thick)		0.76	2	SS	16	Grain Size Analysis: Gr 4%/ Sa 75%/ Si 15%/ Cl 6%	○		
2					3	SS	8		○		
				74.06							
		CLAY, silty, trace sand, firm, moist, grey		2.34	4	SS	7		○		
3					5	SS	6		○		▽
				72.74							
		END OF BOREHOLE AT 3.66m. BOREHOLE OPEN AND WATER LEVEL AT 3.50m UPON COMPLETION. BOREHOLE BACKFILLED WITH HOLEPLUG.		3.66							
4											
5											
6											
7											
8											
9											

GROUNDWATER ELEVATIONS

▽ WATER LEVEL UPON COMPLETION ▼ WATER LEVEL IN WELL/PIEZOMETER

LOGGED : RB
CHECKED : JDA/MTB

THURBER

RECORD OF BOREHOLE BH-13

PROJECT : Napanee Water Pollution Control Plant Expansion
LOCATION : 300 Water St West Napanee, ON
STARTED : March 2, 2021
COMPLETED : March 2, 2021
N 4 900 388.5 E 343 400.4

Project No. 30726
SHEET 1 OF 1
DATUM Geodetic

DEPTH SCALE (metres)	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100)	SHEAR STRENGTH: Cu, KPa (nat V - ✚, rem V - ●, Q - ✖, Cpen ▲) 40 80 120 160 / WATER CONTENT, PERCENT wp w wl 10 20 30 40	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		81.75							
	Solid Stem Augers	**SAND**, silty, trace gravel, trace clay, very dense, brown, frozen: (FILL)		0.00	1	SS	59		○		
				81.14							
		CLAY, silty, trace sand, trace gravel, trace oxidation/rust, stiff, brown, moist: (FILL)		0.61							
1					2	SS	8		○		
				80.30							
		CLAY, silty, trace sand, trace oxidation, stiff, brown, moist		1.45							
2					3	SS	10		○ ▲		
					4	SS	15		○ ▲		
3											
					5	SS	9		○ ▲		
				78.09							
		END OF BOREHOLE AT 3.66m. BOREHOLE OPEN AND DRY UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE.		3.66							
4											
5											
6											
7											
8											
9											

GROUNDWATER ELEVATIONS

▽ WATER LEVEL UPON COMPLETION ▼ WATER LEVEL IN WELL/PIEZOMETER

LOGGED : RB
CHECKED : JDA/MTB

THURBER

RECORD OF BOREHOLE BH-14

PROJECT : Napanee Water Pollution Control Plant Expansion
LOCATION : 300 Water St West Napanee, ON
STARTED : March 1, 2021
COMPLETED : March 1, 2021
N 4 900 385.9 E 343 445.9

Project No. 30726
SHEET 1 OF 1
DATUM Geodetic

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	COMMENTS: DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100)	SHEAR STRENGTH: Cu, KPa (nat V - ✚, rem V - ●, Q - ✖, Cpen ▲) 40 80 120 160 / WATER CONTENT, PERCENT (wp, w, wl) 10 20 30 40	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		80.37							
	Solid Stem Augers	**ASPHALT** (62.5mm)		0.06							
		SAND, gravelly, trace silt, compact to loose, brown, moist (FILL)			1	SS	30		○		
1					2	SS	4		○		
				78.92							
		CLAY, silty, sandy, trace gravel, firm to hard, brown, moist		1.45							
2					3	SS	4	Grain Size Analysis: Gr 2%/ Sa 25%/ Si 48%/ Cl 25%	○		
					4	SS	32		○		
3					5	SS	22		○		
				76.71							
		END OF BOREHOLE AT 3.66m. BOREHOLE BACKFILLED WITH HOLEPLUG.		3.66							
4											
5											
6											
7											
8											
9											

GROUNDWATER ELEVATIONS

▽ WATER LEVEL UPON COMPLETION ▼ WATER LEVEL IN WELL/PIEZOMETER

LOGGED : RB
CHECKED : JDA/MTB

THURBER

RECORD OF BOREHOLE BH-19

PROJECT : Napanee Water Pollution Control Plant Expansion
LOCATION : 300 Water St West Napanee, ON
STARTED : March 2, 2021
COMPLETED : March 2, 2021
N 4 900 314.3 E 343 501.3

Project No. 30726
SHEET 1 OF 1
DATUM Geodetic

DEPTH SCALE (metres)	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	COMMENTS	SHEAR STRENGTH: Cu, KPa (nat V - ✚, rem V - ●, Q - ✖, Cpen ▲) / WATER CONTENT, PERCENT (wp, w, wl)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		77.54				DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100)	40 80 120 160 / wp w wl 10 20 30 40		
	Solid Stem Augers	**CLAY**, silty, trace to some sand, trace to some gravel, hard to very stiff, brown, moist: (FILL)		0.00	1	SS	36				
1					2	SS	15				
		SAND, silty, trace to some clay, trace gravel, compact, brown, moist (FILL)		76.09 1.45	3	SS	14	Grain Size Analysis: Gr 5%/ Sa 63%/ Si 22%/ Cl 10%			
2		**CLAY**, silty, trace sand, very stiff to stiff, brown, moist		75.20 2.34	4	SS	17				
3					5	SS	14	Grain Size Analysis: Gr 0%/ Sa 6%/ Si 54%/ Cl 40%			
4											
5					1	ST		Grain Size Analysis: Gr 0%/ Sa 0%/ Si 19%/ Cl 81%	72		
		END OF BOREHOLE AT 5.18m. BOREHOLE BACKFILLED WITH BENTONITE.		72.35 5.18							
6											
7											
8											
9											

GROUNDWATER ELEVATIONS

▽ WATER LEVEL UPON COMPLETION ▼ WATER LEVEL IN WELL/PIEZOMETER

LOGGED : RB
CHECKED : JDA/MTB

THURBER

RECORD OF BOREHOLE BH-20

PROJECT : Napanee Water Pollution Control Plant Expansion
LOCATION : 300 Water St West Napanee, ON
STARTED : February 26, 2021
COMPLETED : February 26, 2021
N 4 900 375.0 E 343 378.0

Project No. 30726
SHEET 1 OF 1
DATUM Geodetic

DEPTH SCALE (metres)	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	COMMENTS / DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100)	SHEAR STRENGTH: Cu, KPa (nat V - ✚, rem V - ●, Q - ✖, Cpen ▲) 40 80 120 160 / WATER CONTENT, PERCENT (wp, w, wl) 10 20 30 40	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		79.99							
	Solid Stem Augers	**CLAY**, silty, trace sand, trace gravel, firm, brown, wet: (FILL)		0.00	1	SS	6		○ ▲		
				79.30							
1		**CLAY**, silty, trace sand, very stiff, brown, moist		0.69	2	SS	19		○ ▲		
2					3	SS	17		○		
					4	SS	18	Grain Size Analysis: Gr 0%/ Sa 8%/ Si 44%/ Cl 48%	○		
				77.09							
3		END OF BOREHOLE AT 2.90m. BOREHOLE OPEN TO 2.9m AND DRY UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE.		2.90							
4											
5											
6											
7											
8											
9											

GROUNDWATER ELEVATIONS

▽ WATER LEVEL UPON COMPLETION ▼ WATER LEVEL IN WELL/PIEZOMETER

LOGGED : RB
CHECKED : JDA/MTB

THURBER

RECORD OF BOREHOLE BH-21

PROJECT : Napanee Water Pollution Control Plant Expansion
LOCATION : 300 Water St West Napanee, ON
STARTED : March 2, 2021
COMPLETED : March 2, 2021
N 4 900 395.1 E 343 423.1

Project No. 30726
SHEET 1 OF 1
DATUM Geodetic

DEPTH SCALE (metres)	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100)	SHEAR STRENGTH: Cu, KPa (nat V - ✚, rem V - ●, Q - ✖, Cpen ▲) 40 80 120 160 / WATER CONTENT, PERCENT (wp, w, wl) 10 20 30 40	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		80.51							
	Solid Stem Augers	**ASPHALT** (62.5mm)		0.06							
		GRAVEL, sandy: (FILL)		0.17	1	SS	21				
		SILT, sandy, some clay, trace gravel, compact, brown, moist: (FILL)		0.37							
1		**CLAY**, silty, trace sand, stiff to very stiff, brown, moist			2	SS	11				
					3	SS	12				
2					4	SS	18				
				77.62							
3		END OF BOREHOLE AT 2.90m. BOREHOLE BACKFILLED WITH BENTONITE TO 0.2m AND THEN ASPHALT PATCH TO SURFACE.		2.90							
4											
5											
6											
7											
8											
9											

GROUNDWATER ELEVATIONS

▽ WATER LEVEL UPON COMPLETION ▼ WATER LEVEL IN WELL/PIEZOMETER

LOGGED : RB
CHECKED : JDA/MTB

THURBER

RECORD OF BOREHOLE BH-22

PROJECT : Napanee Water Pollution Control Plant Expansion
LOCATION : 300 Water St West Napanee, ON
STARTED : March 2, 2021
COMPLETED : March 2, 2021
N 4 900 334.8 E 343 465.3

Project No. 30726
SHEET 1 OF 1
DATUM Geodetic

DEPTH SCALE (metres)	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/0.3m	COMMENTS
		GROUND SURFACE		77.72				
	Solid Stem Augers	**SILT**, sandy, some clay, trace gravel, compact, brown, moist: (FILL)		0.00	1	SS	14	
				77.03				
1		**CLAY**, silty, sandy, trace gravel, trace organics, firm, brown, moist: (FILL)		0.69	2	SS	6	Grain Size Analysis: Gr 3%/ Sa 22%/ Si 49%/ Cl 26%
				76.27				
		PEAT, soft, black, wet		1.45	3	SS	3	
2				75.38				
		CLAY, silty, some organics, very soft, grey, wet		2.34	4	SS	2	
3					1	ST		Grain Size Analysis: Gr 0%/ Sa 5%/ Si 47%/ Cl 48%
				74.06				
		END OF BOREHOLE AT 3.66m. BOREHOLE OPEN AND WATER LEVEL AT 0.66m UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE TO SURFACE.		3.66				
4								
5								
6								
7								
8								
9								

DYNAMIC CONE PENETRATION RESISTANCE PLOT
20 40 60 80 100

SHEAR STRENGTH: Cu, KPa
nat V - ✚ Q - ✖
rem V - ● Cpen ▲
40 80 120 160

WATER CONTENT, PERCENT
wp w wl
10 20 30 40

317 ○
91 ○

ADDITIONAL LAB. TESTING

PIEZOMETER OR STANDPIPE INSTALLATION

GROUNDWATER ELEVATIONS

▽ WATER LEVEL UPON COMPLETION ▼ WATER LEVEL IN WELL/PIEZOMETER

LOGGED : RB
CHECKED : JDA/MTB

THURBER

THURBER2S TEL-30726.GPJ 7/15/21

RECORD OF BOREHOLE BH-23

PROJECT : Napanee Water Pollution Control Plant Expansion
LOCATION : 300 Water St West Napanee, ON
STARTED : February 26, 2021
COMPLETED : February 26, 2021
N 4 900 302.4 E 343 359.7

Project No. 30726
SHEET 1 OF 1
DATUM Geodetic

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	COMMENTS: DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100)	SHEAR STRENGTH: Cu, KPa (nat V - ✚, rem V - ●, Q - ✖, Cpen ▲) (40 80 120 160) / WATER CONTENT, PERCENT (wp, w, wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		77.55							
1	Solid Stem Augers	**SILT**, clayey, some sand, trace to some gravel, firm, black/brown/red, moist: (FILL)		0.00	1	SS	19		○		
					2	SS	8		○		
				76.10							
2		**CLAY**, silty, trace sand, stiff to very stiff, brown, moist		1.45	3	SS	9		○		
					4	SS	19		○		
				74.65							
3		END OF BOREHOLE AT 2.90m. BOREHOLE OPEN AND DRY UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE.		2.90							
4											
5											
6											
7											
8											
9											

GROUNDWATER ELEVATIONS

▽ WATER LEVEL UPON COMPLETION ▼ WATER LEVEL IN WELL/PIEZOMETER

LOGGED : RB
CHECKED : JDA/MTB

THURBER

RECORD OF BOREHOLE BH-24

PROJECT : Napanee Water Pollution Control Plant Expansion
LOCATION : 300 Water St West Napanee, ON
STARTED : February 25, 2021
COMPLETED : February 25, 2021
N 4 900 283.0 E 343 428.0

Project No. 30726
SHEET 1 OF 1
DATUM Geodetic

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	COMMENTS: DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100)	SHEAR STRENGTH: Cu, KPa (nat V - ✚, rem V - ●, Q - ✖, Cpen ▲) 40 80 120 160 / WATER CONTENT, PERCENT wp w wl 10 20 30 40	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		75.94							
	Solid Stem Augers	**ORGANICS**, **CLAY**, silty, soft, brown, moist		0.00	1	SS	4		○		
				75.26							
1		**CLAY**, silty, trace sand, very stiff to stiff, brown, moist		0.69	2	SS	16		▲ ○		
2					3	SS	13	Grain Size Analysis: Gr 0%/ Sa 6%/ Si 68%/ Cl 26%	○	>>	
					4	SS	21		58 ○ >>		
				73.05							
3		END OF BOREHOLE AT 2.90m. BOREHOLE OPEN AND DRY UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE.		2.90							
4											
5											
6											
7											
8											
9											

GROUNDWATER ELEVATIONS

▽ WATER LEVEL UPON COMPLETION ▼ WATER LEVEL IN WELL/PIEZOMETER

LOGGED : RB
CHECKED : JDA/MTB

THURBER

RECORD OF BOREHOLE BH-25

PROJECT : Napanee Water Pollution Control Plant Expansion
LOCATION : 300 Water St West Napanee, ON
STARTED : March 1, 2021
COMPLETED : March 1, 2021
N 4 900 364.7 E 343 500.3

Project No. 30726
SHEET 1 OF 1
DATUM Geodetic

DEPTH SCALE (metres)	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	COMMENTS	SHEAR STRENGTH: Cu, KPa (nat V - ✚, rem V - ●, Q - ✖, Cpen ▲) / WATER CONTENT, PERCENT (wp, w, wl)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		77.70				DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100	40 80 120 160 / wp w wl 10 20 30 40		
		ASPHALT (150mm)		0.00							
		GRAVEL and **SAND**, trace silt, compact to loose, brown to grey, wet: (FILL)		0.15	1	SS	19				
1					2	SS	16				▽
2					3	SS	8	Grain Size Analysis: Gr 51%/ Sa 42%/ Si & Cl 7%			
				75.42							
		CLAY, silty, trace sand, stiff to firm, brown, moist		2.29	4	SS	12				
3	Solid Stem Augers				5	SS	6				
4		becoming grey									
5					6	SS	7				
6					7	SS	10	Grain Size Analysis: Gr 2%/ Sa 9%/ Si 12%/ Cl 77%	71		
7											
8					8	SS	7				
				69.47							
		END OF BOREHOLE AT 8.23m. BOREHOLE OPEN AND WATER LEVEL AT 1.1m UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE TO 0.3m THEN ASPHALT PATCH TO SURFACE.		8.23							
9											

GROUNDWATER ELEVATIONS

▽ WATER LEVEL UPON COMPLETION ▼ WATER LEVEL IN WELL/PIEZOMETER

LOGGED : RB
CHECKED : JDA/MTB

THURBER

RECORD OF BOREHOLE BH-26

PROJECT : Napanee Water Pollution Control Plant Expansion
LOCATION : 300 Water St West Napanee, ON
STARTED : March 1, 2021
COMPLETED : March 1, 2021
N 4 900 345.9 E 343 514.1

Project No. 30726
SHEET 1 OF 1
DATUM Geodetic

DEPTH SCALE (metres)	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	COMMENTS / DYNAMIC CONE PENETRATION RESISTANCE PLOT	SHEAR STRENGTH: Cu, KPa (nat V - ✚, rem V - ●, Q - ✖, Cpen ▲) / WATER CONTENT, PERCENT (wp, w, wl)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		77.38							
		ASPHALT (60mm)		0.06							
		SAND and **GRAVEL**, trace silt, very dense to compact, brown, moist: (FILL)			1	SS	56				
1					2	SS	10				
				75.94							
		SILT, clayey, some sand, trace gravel, very stiff, brown, moist (FILL)		1.45	3	SS	16	Grain Size Analysis: Gr 0%/ Sa 13%/ Si 59%/ Cl 28%			
2				75.17							
		CLAY, silty, trace gravel, trace sand, stiff to firm, brown, moist		2.21	4	SS	13				
3	Solid Stem Augers				5	SS	8				
4											
		becoming grey			6	SS	10	Grain Size Analysis: Gr 0%/ Sa 2%/ Si 50%/ Cl 48%			
5											
6					7	SS	7				
7											▽
8					8	SS	6				
				69.15							
		END OF BOREHOLE AT 8.2m. BOREHOLE OPEN AND WATER LEVEL AT 7.6m UPON COMPLETION. BOREHOLE BACKFILLED WITH HOLEPLUG TO 0.2m, THEN ASPHALT TO SURFACE.		8.23							
9											

GROUNDWATER ELEVATIONS

▽ WATER LEVEL UPON COMPLETION ▼ WATER LEVEL IN WELL/PIEZOMETER

LOGGED : RB
CHECKED : JDA/MTB

THURBER

THURBER

Selected Boreholes from Previous Investigation

Source: Microsoft product screen shot(s) reprinted with permission from Microsoft Corporation, September 2015
Coordinate System: NAD 1983 UTM Zone 18N

0 10 20 30
Meters

Coordinate System:
NAD 1983 UTM Zone 18N

GHD

TOWN OF GREATER NAPANEE
300 WATER STREET WEST, NAPANEE ONTARIO
GEOTECHNICAL INVESTIGATION FOR WWTP UPGRADES

NAPANEE WWTP
PROPOSED NEW STRUCTURES

11140477-A2
Jan 4, 2018

FIGURE 3

GIS File: Q:\GIS\PROJECTS\11140000s\11140477\Layouts\001\11140477-A2(001)GIS-OT006.mxd

REFERENCE No.: 11140477-A1 ENCLOSURE No.: 1

BOREHOLE No.: BH1-17
ELEVATION: 78.09 m

BOREHOLE LOG

Page: 1 of 1

CLIENT: Town of Greater Napanee C/o EVB Engineering Inc.
PROJECT: Geotechnical Investigation for Upgrades to Napanee Wastewater Treatment Plant
LOCATION: 300 Water Street West, Napanee, On
DESCRIBED BY: S.Wheeler CHECKED BY: S. Dunstan
DATE (START): 15 May 2017 DATE (FINISH): 15 May 2017

LEGEND

- SS Split Spoon
- GS Auger Sample
- ST Shelby Tube
- Water Level
- Water content (%)
- Atterberg limits (%)
- ● N Penetration Index based on Split Spoon sample
- • N Penetration Index based on Dynamic Cone sample
- △ Cu Shear Strength based on Field Vane
- □ Cu Shear Strength based on Lab Vane
- S Sensitivity Value of Soil
- ▲ Shear Strength based on Pocket Penetrometer

SCALE		STRATIGRAPHY		SAMPLE DATA					
Depth BGS	Elevation (m)	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	State	Type and Number	Recovery	OVC	Penetration Index / RQD	SCALE FOR TEST RESULTS 50kPa 100kPa 150kPa 200kPa 10 20 30 40 50 60 70 80 90
meters	78.09		GROUND SURFACE			%	ppm	N	
	78.0		**TOPSOIL-** Brown, damp. (Approximately 75 mm)		SS1	11/24		12	
	77.9		**FILL-** Gravel, some silt, compact, brown, damp.						
1.0			**FILL-** Sandy silt, loose, brown, damp. *Becoming moist.		SS2	11/24		2	
	76.4								
2.0	76.3		**BURIED TOPSOIL-** Brown, moist.		SS3	20/24		2	
			SILTY CLAY- Stiff, grey, moist. *Becoming wet.		FV1				S=3
3.0					SS4	24/24		4	
4.0			*Becoming very stiff.		SS5	24/24		4	
5.0					ST1				
			*Becoming stiff.		SS6	24/24		4	
6.0					SS7	24/24		3	
7.0			*FV > 90 kPa vane capacity.		FV2				
	70.3								
8.0			**SILTY CLAYEY SAND-** Loose, brown, wet.		SS8	24/24		9	
	69.3				SS9	12/18		R	
9.0			Auger refusal at approximately 8.8 m.						
10.0									
11.0									
12.0									
13.0									
14.0									
15.0									
16.0									

NOTES:
*No sheen odour or staining noted in borehole
*Borehole location and elevation surveyed by Hopkins-Chitty Surveying Ltd.
*Pocket penetrometer readings are for internal GHD use only and should not be relied upon by others.

REFERENCE No.: 11140477-A2 ENCLOSURE No.: 13

BOREHOLE No.: BH13-17
ELEVATION: 81.07 m

BOREHOLE LOG

Page: 1 of 1

CLIENT: Town of Greater Napanee C/o EVB Engineering Inc.
PROJECT: Geotechnical Investigation for Upgrades to Napanee Wastewater Treatment Plant
LOCATION: 300 Water Street West, Napanee, On
DESCRIBED BY: S. Wheeler CHECKED BY: S. Dunstan
DATE (START): 23 November 2017 DATE (FINISH): 23 November 2017

LEGEND

- SS Split Spoon
- GS Auger Sample
- ST Shelby Tube
- Water Level
- Water content (%)
- Atterberg limits (%)
- ● N Penetration Index based on Split Spoon sample
- • N Penetration Index based on Dynamic Cone sample
- △ Cu Shear Strength based on Field Vane
- □ Cu Shear Strength based on Lab Vane
- S Sensitivity Value of Soil
- ▲ Shear Strength based on Pocket Penetrometer

SCALE		STRATIGRAPHY		SAMPLE DATA					
Depth BGS	Elevation (m)	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	State	Type and Number	Recovery	OVC	Penetration Index / RQD	SCALE FOR TEST RESULTS 50kPa 100kPa 150kPa 200kPa 10 20 30 40 50 60 70 80 90
meters	81.07		GROUND SURFACE			%	ppm	N	
			FILL- Sandy Silt some Gravel, loose, grey, damp.		SS1	7/24		8	
1.0	80.1		**BURIED TOPSOIL-** (Approximately 50 mm thick)		SS2	14/24		9	
	80.1		**FILL-** Silt some Sand and Gravel, compact, grey, damp. *Becoming Sandy Silt trace Gravel, loose, brown, damp		SS3	15/24		6	
2.0	78.9		**CLAY AND SILT-** Very stiff, brownish grey, damp.		SS4	24/24		7	
3.0					SS5	24/24		9	
4.0			*Becoming grey		SS6	24/24		7	
5.0					SS7	24/24		6	
			*Becoming brown		SS8	24/24		6	
6.0	75.0		**SAND-** Compact, light brown, wet.		SS9	24/24		10	
	74.2		*Becoming Silty Sand						
7.0			**LIMESTONE-** Medium strong, thickly bedded, horizontal, slightly weathered, excellent quality based on RQD.		RC1	63/63		97	
8.0									
9.0					RC2	60/61		93	
10.0	71.1		End of borehole at approximately 10.0 m in limestone.						
11.0									
12.0									
13.0									
14.0									
15.0									
16.0									

NOTES:
*No sheen odour or staining noted in borehole
*Borehole location and elevation surveyed by GHD field staff
*Pocket penetrometer readings are for internal GHD use only and should not be relied upon by others.

REFERENCE No.: 11140477-A2 ENCLOSURE No.: 14

BOREHOLE No.: BH14-17
ELEVATION: 81.09 m

BOREHOLE LOG

Page: 1 of 1

CLIENT: Town of Greater Napanee C/o EVB Engineering Inc.
PROJECT: Geotechnical Investigation for Upgrades to Napanee Wastewater Treatment Plant
LOCATION: 300 Water Street West, Napanee, On
DESCRIBED BY: S. Wheeler CHECKED BY: S. Dunstan
DATE (START): 23 November 2017 DATE (FINISH): 23 November 2017

LEGEND

- SS Split Spoon
- GS Auger Sample
- ST Shelby Tube
- Water Level
- Water content (%)
- Atterberg limits (%)
- ● N Penetration Index based on Split Spoon sample
- • N Penetration Index based on Dynamic Cone sample
- △ Cu Shear Strength based on Field Vane
- □ Cu Shear Strength based on Lab Vane
- S Sensitivity Value of Soil
- ▲ Shear Strength based on Pocket Penetrometer

SCALE		STRATIGRAPHY		SAMPLE DATA					
Depth BGS	Elevation (m)	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	State	Type and Number	Recovery	OVC	Penetration Index / RQD	SCALE FOR TEST RESULTS 50kPa 100kPa 150kPa 200kPa 10 20 30 40 50 60 70 80 90
meters	81.09		GROUND SURFACE			%	ppm	N	
	80.5		**FILL-** Sandy Silt some Gravel, compact, light brown, damp.		SS1	20/24		16	
1.0	80.5		**BURIED TOPSOIL-** (Approximately 50 mm thick)		SS2	14/14		R	
			FILL- Silty Gravel some Sand, dense, dark grey, damp.						
2.0	79.0		*Becoming Sandy Silt trace Gravel, concrete piece limited recovery		SS3	6/11		R	
			CLAY AND SILT- Very stiff, brownish grey, damp.		SS4	24/24		12	
3.0					SS5	24/24		9	
4.0					SS6	22/24		17	
5.0					SS7	5/24		8	
	75.4				SS8	18/24		20	
6.0			**SAND-** Compact, brown, wet.						
			*Becoming some gravel, very dense, light brown, wet, limestone chips in tip of split spoon.		SS9	14/15		R	
	74.3								
7.0			Auger refusal at approximately 6.8 m.						
8.0									
9.0									
10.0									
11.0									
12.0									
13.0									
14.0									
15.0									
16.0									

NOTES:
*No sheen odour or staining noted in borehole
*Borehole location and elevation surveyed by GHD field staff
*Pocket penetrometer readings are for internal GHD use only and should not be relied upon by others.

REFERENCE No.: 11140477-A2 ENCLOSURE No.: 15

BOREHOLE No.: MW15-17-d

ELEVATION: 78.77 m

BOREHOLE LOG

Page: 1 of 1

CLIENT: Town of Greater Napanee C/o EVB Engineering Inc.

PROJECT: Geotechnical Investigation for Upgrades to Napanee Wastewater Treatment Plant

LOCATION: 300 Water Street West, Napanee, On

DESCRIBED BY: S. Wheeler CHECKED BY: S. Dunstan

DATE (START): 23 November 2017 DATE (FINISH): 23 November 2017

LEGEND

- SS Split Spoon
- GS Auger Sample
- ST Shelby Tube
- Water Level
- Water content (%)
- Atterberg limits (%)
- N Penetration Index based on Split Spoon sample
- N Penetration Index based on Dynamic Cone sample
- Cu Shear Strength based on Field Vane
- Cu Shear Strength based on Lab Vane
- S Sensitivity Value of Soil
- Shear Strength based on Pocket Penetrometer

SCALE		STRATIGRAPHY		MONITOR WELL	SAMPLE DATA					
Depth BGS	Elevation (m)	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK		State	Type and Number	Recovery	OVC	Penetration Index / RQD	SCALE FOR TEST RESULTS 50kPa 100kPa 150kPa 200kPa 10 20 30 40 50 60 70 80 90
meters	78.77		GROUND SURFACE	0.70 / 0.62			%	ppm	N	
	78.7		**TOPSOIL-** (Approximately 50 mm thick)	WL 0.37 / 0.46		SS1	18/24		7	
1.0	77.7		**FILL-** Sandy Silt some Gravel, loose, dark brown, damp.			SS2	22/24		5	
	77.7		**BURIED TOPSOIL-** Organic, dark brown to black.			SS3	24/24		15	
2.0			**CLAY AND SILT-** Very stiff, brown, damp.			SS4	24/24		12	
3.0				Bentonite		SS5	24/24		7	
4.0						SS6	24/24		17	
	74.2		**SILTY CLAY-** Very stiff, grey, damp.			SS7	24/24		7	
5.0										
6.0				5.79 Riser 6.25		SS8	24/24		11	
	72.1		**SAND-** Compact, brown, wet, some silt seams (approximately 125 mm thick).	Screen Sand		SS9	24/24		12	
7.0						SS10	24/24		10	
	71.0		Auger refusal at approximately 7.8 m.	7.77		SS11	5/5		R	
8.0										
9.0										
10.0										
11.0										
12.0										
13.0										
14.0										
15.0										
16.0										

NOTES:
*No sheen odour or staining noted in borehole
*Borehole location and elevation surveyed by GHD field staff
*Pocket penetrometer readings are for internal GHD use only and should not be relied upon by others.

REFERENCE No.: 11140477-A2 ENCLOSURE No.: 16

BOREHOLE No.: MW15-17-s

ELEVATION: 78.79 m

BOREHOLE LOG

Page: 1 of 1

CLIENT: Town of Greater Napanee C/o EVB Engineering Inc.

PROJECT: Geotechnical Investigation for Upgrades to Napanee Wastewater Treatment Plant

LOCATION: 300 Water Street West, Napanee, On

DESCRIBED BY: S. Wheeler CHECKED BY: S. Dunstan

DATE (START): 23 November 2017 DATE (FINISH): 23 November 2017

LEGEND

- SS Split Spoon
- GS Auger Sample
- ST Shelby Tube
- Water Level
- Water content (%)
- Atterberg limits (%)
- ● N Penetration Index based on Split Spoon sample
- • N Penetration Index based on Dynamic Cone sample
- △ Cu Shear Strength based on Field Vane
- □ Cu Shear Strength based on Lab Vane
- S Sensitivity Value of Soil
- ▲ Shear Strength based on Pocket Penetrometer

SCALE		STRATIGRAPHY		MONITOR WELL	SAMPLE DATA				
Depth BGS	Elevation (m)	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK		State	Type and Number	Recovery	OVC	Penetration Index / RQD
meters	78.79		GROUND SURFACE	0.73 0.66			%	ppm	N
	78.7		**TOPSOIL-** (Approximately 50 mm thick)	0.46 WL 0.61					
1.0	77.7		Inferred fill based on MW15-17-d Inferred clay and silt based on MW15-17-d	Bentonite Solid Pipe					
2.0				2.74 3.05					
3.0				Screen Silica Sand					
4.0									
	74.2		End of borehole at approximately 4.6 m.	4.57					
5.0									
6.0									
7.0									
8.0									
9.0									
10.0									
11.0									
12.0									
13.0									
14.0									
15.0									
16.0									

SCALE FOR TEST RESULTS

50kPa 100kPa 150kPa 200kPa

10 20 30 40 50 60 70 80 90

NOTES:

*No sheen odour or staining noted in borehole

*Borehole location and elevation surveyed by GHD field staff

*Pocket penetrometer readings are for internal GHD use only and should not be relied upon by others.

REFERENCE No.: 11140477-A2 ENCLOSURE No.: 17

BOREHOLE No.: BH16-17
ELEVATION: 78.43 m

BOREHOLE LOG

Page: 1 of 1

CLIENT: Town of Greater Napanee C/o EVB Engineering Inc.
PROJECT: Geotechnical Investigation for Upgrades to Napanee Wastewater Treatment Plant
LOCATION: 300 Water Street West, Napanee, On
DESCRIBED BY: S. Wheeler CHECKED BY: S. Dunstan
DATE (START): 23 November 2017 DATE (FINISH): 23 November 2017

LEGEND

- SS Split Spoon
- GS Auger Sample
- ST Shelby Tube
- Water Level
- Water content (%)
- Atterberg limits (%)
- N Penetration Index based on Split Spoon sample
- N Penetration Index based on Dynamic Cone sample
- Cu Shear Strength based on Field Vane
- Cu Shear Strength based on Lab Vane
- S Sensitivity Value of Soil
- Shear Strength based on Pocket Penetrometer

SCALE		STRATIGRAPHY		SAMPLE DATA					
Depth BGS	Elevation (m)	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	State	Type and Number	Recovery	OVC	Penetration Index / RQD	SCALE FOR TEST RESULTS 50kPa 100kPa 150kPa 200kPa 10 20 30 40 50 60 70 80 90
meters	78.43		GROUND SURFACE			%	ppm	N	
	78.4		**TOPSOIL-** (Approximately 50 mm thick)		SS1	18/24		7	
	77.6		**FILL-** Sandy Silt some Gravel, loose, dark brown, damp.		SS2	24/24		8	
1.0			**CLAY AND SILT-** Very stiff, brown, damp.		SS3	24/24		12	
2.0					SS4	24/24		16	
3.0					SS5	24/24		16	
4.0	74.5		**SILTY CLAY-** Very stiff, grey, damp, trace sand veins.		SS6	24/24		18	
5.0			*Becoming stiff		SS7	24/24		7	
					SS8	24/24		5	
6.0	72.3		**SAND-** Compact, brown, wet, some silt seams (approximately 125 to 150 mm thick).		SS9	24/24		8	
7.0					SS10	24/24		12	
8.0					SS11	24/24		R	
	70.1		Auger refusal at approximately 8.4 m.						
9.0									
10.0									
11.0									
12.0									
13.0									
14.0									
15.0									
16.0									

NOTES:
*No sheen odour or staining noted in borehole
*Borehole location and elevation surveyed by GHD field staff
*Pocket penetrometer readings are for internal GHD use only and should not be relied upon by others.

REFERENCE No.: 11140477-A2 ENCLOSURE No.: 18

BOREHOLE No.: MW17-17-d

ELEVATION: 77.24 m

BOREHOLE LOG

Page: 1 of 1

CLIENT: Town of Greater Napanee C/o EVB Engineering Inc.

PROJECT: Geotechnical Investigation for Upgrades to Napanee Wastewater Treatment Plant

LOCATION: 300 Water Street West, Napanee, On

DESCRIBED BY: S. Wheeler CHECKED BY: S. Dunstan

DATE (START): 24 November 2017 DATE (FINISH): 24 November 2017

LEGEND

- SS Split Spoon
- GS Auger Sample
- ST Shelby Tube
- Water Level
- Water content (%)
- Atterberg limits (%)
- N Penetration Index based on Split Spoon sample
- N Penetration Index based on Dynamic Cone sample
- Cu Shear Strength based on Field Vane
- Cu Shear Strength based on Lab Vane
- S Sensitivity Value of Soil
- Shear Strength based on Pocket Penetrometer

SCALE		STRATIGRAPHY		MONITOR WELL	SAMPLE DATA					
Depth BGS	Elevation (m)	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK		State	Type and Number	Recovery	OVC	Penetration Index / RQD	SCALE FOR TEST RESULTS 50kPa 100kPa 150kPa 200kPa 10 20 30 40 50 60 70 80 90
meters	77.24		GROUND SURFACE	0.70 / 0.63			%	ppm	N	
	77.0		**TOPSOIL-** (Approximately 200 mm thick)	0.46		SS1	12/24		4	
	76.4		**FILL-** Sandy Silt, loose, brown, damp.	WL 0.71 / 0.91		SS2	24/24		7	
1.0			**CLAY AND SILT-** Very stiff, brown, damp.			SS3	24/24		13	
2.0						SS4	24/24		9	
3.0	74.2		**SILTY CLAY-** Very stiff, grey, damp, trace sand veins.	Cuttings		SS5	24/24		10	
4.0						SS6	24/24		15	
5.0			*Becoming stiff			SS7	24/24		5	
6.0				6.40		SS8	24/24		6	
7.0						SS9	24/24		4	
8.0				Bentonite		SS10	24/24		3	
9.0	68.1		*Becoming firm	8.84 / 9.09		SS11	24/24		5	
10.0			**SAND-** Compact, light brown, wet.	Sand Screen		SS12	24/24		4	
11.0	66.6		**LIMESTONE-** Medium strong, thickly bedded, horizontal, slightly weathered, good quality based on RQD.	10.62 / 10.67		SS13	24/24		0	
12.0			*Becoming excellent quality based on RQD	Bentonite Seal in Rock		SS14	24/24		10	
13.0							61/65		83	
14.0	63.4		End of borehole at approximately 13.8 m in limestone.	13.82			59/59		100	
15.0										
16.0										

NOTES:
*No sheen odour or staining noted in borehole
*Borehole location and elevation surveyed by GHD field staff
*Pocket penetrometer readings are for internal GHD use only and should not be relied upon by others.

REFERENCE No.: 11140477-A2 ENCLOSURE No.: 19

BOREHOLE LOG

BOREHOLE No.: MW17-17-s
ELEVATION: 77.22 m

Page: 1 of 1

CLIENT: Town of Greater Napanee C/o EVB Engineering Inc.
PROJECT: Geotechnical Investigation for Upgrades to Napanee Wastewater Treatment Plant
LOCATION: 300 Water Street West, Napanee, On
DESCRIBED BY: S. Wheeler CHECKED BY: S. Dunstan
DATE (START): 24 November 2017 DATE (FINISH): 24 November 2017

LEGEND

- SS Split Spoon
- GS Auger Sample
- ST Shelby Tube
- Water Level
- Water content (%)
- Atterberg limits (%)
- ● N Penetration Index based on Split Spoon sample
- • N Penetration Index based on Dynamic Cone sample
- △ Cu Shear Strength based on Field Vane
- □ Cu Shear Strength based on Lab Vane
- S Sensitivity Value of Soil
- ▲ Shear Strength based on Pocket Penetrometer

SCALE		STRATIGRAPHY		MONITOR WELL	SAMPLE DATA				
Depth BGS	Elevation (m)	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK		State	Type and Number	Recovery	OVC	Penetration Index / RQD
meters	77.22		GROUND SURFACE				%	ppm	N
	77.0		**TOPSOIL-** (Approximately 200 mm thick)	0.83 / 0.76					
1.0	76.4		Inferred fill based on MW17-17-d	0.46 / WL 0.62 / 0.91 Solid Pipe					
2.0			Inferred clay and silt based on MW17-17-d	Cuttings					
3.0	74.2		Inferred silty clay based on MW17-17-d	3.05					
4.0				Bentonite					
5.0									
6.0				5.72 / 6.10					
7.0				Screen / Silica Sand					
	69.6		End of borehole at approximately 7.6 m.	7.62					
8.0									
9.0									
10.0									
11.0									
12.0									
13.0									
14.0									
15.0									
16.0									

SCALE FOR TEST RESULTS
50kPa 100kPa 150kPa 200kPa
10 20 30 40 50 60 70 80 90

NOTES:
*No sheen odour or staining noted in borehole
*Borehole location and elevation surveyed by GHD field staff
*Pocket penetrometer readings are for internal GHD use only and should not be relied upon by others.

REFERENCE No.: 11140477-A2 ENCLOSURE No.: 20

BOREHOLE No.: BH18-17
ELEVATION: 77.62 m

BOREHOLE LOG

Page: 1 of 1

CLIENT: Town of Greater Napanee C/o EVB Engineering Inc.
PROJECT: Geotechnical Investigation for Upgrades to Napanee Wastewater Treatment Plant
LOCATION: 300 Water Street West, Napanee, On
DESCRIBED BY: S. Wheeler CHECKED BY: S. Dunstan
DATE (START): 24 November 2017 DATE (FINISH): 24 November 2017

LEGEND

- SS Split Spoon
- GS Auger Sample
- ST Shelby Tube
- Water Level
- Water content (%)
- Atterberg limits (%)
- N Penetration Index based on Split Spoon sample
- N Penetration Index based on Dynamic Cone sample
- Cu Shear Strength based on Field Vane
- Cu Shear Strength based on Lab Vane
- S Sensitivity Value of Soil
- Shear Strength based on Pocket Penetrometer

SCALE		STRATIGRAPHY		SAMPLE DATA					
Depth BGS	Elevation (m)	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	State	Type and Number	Recovery	OVC	Penetration Index / RQD	SCALE FOR TEST RESULTS 50kPa 100kPa 150kPa 200kPa 10 20 30 40 50 60 70 80 90
meters	77.62		GROUND SURFACE			%	ppm	N	
			FILL- Gravel, dense, grey, damp. *Becoming Gravel some Sand and Silt, brown and grey.		SS1	20/24		24	
1.0	76.6		*Becoming Gravelly Silt, dark brown, damp		SS2	22/24		11	
			CLAY AND SILT- Very stiff, brown, damp.		SS3	24/24		24	
2.0					SS4	24/24		19	
3.0					SS5	24/24		11	
4.0					SS6	24/24		17	
	73.1		**SILTY CLAY-** Very stiff, grey, damp, trace sand veins.		SS7	24/24		6	
5.0					SS8	24/24		8	
6.0			*Becoming stiff		SS9	24/24		3	
7.0			*Becoming firm, moist		SS10	24/24		4	
8.0					SS11	24/24		3	
					SS12	24/24		4	
9.0	68.5		**SAND-** Loose, light brown, wet, some silt seams (approximately 200 mm thick).		SS13	24/24		7	
10.0					SS14	24/24		10	
11.0					SS15	24/24		R	
	66.3		Auger refusal at approximately 11.3 m.						
12.0									
13.0									
14.0									
15.0									
16.0									

NOTES:
*No sheen odour or staining noted in borehole
*Borehole location and elevation surveyed by GHD field staff
*Pocket penetrometer readings are for internal GHD use only and should not be relied upon by others.

REFERENCE No.: 11140477-A2 ENCLOSURE No.: 21

BOREHOLE No.: BH19-17
ELEVATION: 76.99 m

BOREHOLE LOG

Page: 1 of 1

CLIENT: Town of Greater Napanee C/o EVB Engineering Inc.
PROJECT: Geotechnical Investigation for Upgrades to Napanee Wastewater Treatment Plant
LOCATION: 300 Water Street West, Napanee, On
DESCRIBED BY: S. Wheeler CHECKED BY: S. Dunstan
DATE (START): 24 November 2017 DATE (FINISH): 24 November 2017

LEGEND

- SS Split Spoon
- GS Auger Sample
- ST Shelby Tube
- Water Level
- Water content (%)
- Atterberg limits (%)
- N Penetration Index based on Split Spoon sample
- N Penetration Index based on Dynamic Cone sample
- Cu Shear Strength based on Field Vane
- Cu Shear Strength based on Lab Vane
- S Sensitivity Value of Soil
- Shear Strength based on Pocket Penetrometer

SCALE		STRATIGRAPHY		SAMPLE DATA					
Depth BGS	Elevation (m)	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	State	Type and Number	Recovery	OVC	Penetration Index / RQD	SCALE FOR TEST RESULTS 50kPa 100kPa 150kPa 200kPa 10 20 30 40 50 60 70 80 90
meters	76.99		GROUND SURFACE			%	ppm	N	
	76.9		**TOPSOIL-** (Approximately 125 mm thick)		SS1	6/24		4	
			FILL- Sand, very loose, brown, damp.						
1.0					SS2	24/24		2	
	75.2		*Becoming wet		SS3	22/24		2	
2.0			**CLAY AND SILT-** Very stiff, brown, damp.						
					SS4	14/24		10	
3.0					SS5	24/24		12	
4.0					SS6	24/24		16	
	72.4		**SILTY CLAY-** Very stiff, grey, damp, trace sand veins.		SS7	24/24		7	
5.0									
					SS8	24/24		15	
6.0			*Becoming stiff and moist		SS9	24/24		4	
7.0					SS10	24/24		9	
					SS11	24/24		1	
8.0			*Becoming firm		SS12	24/24		3	
9.0					FV1				
			*FV > 90 kPa vane capacity.						
10.0	67.1		**SAND-** Dense, light brown, wet.		SS13	24/24		33	
					SS14	24/24		13	
11.0			*Silt seam (approximately 125 mm thick)						
	65.6		Auger refusal at approximately 11.4 m.						
12.0									
13.0									
14.0									
15.0									
16.0									

NOTES:
*No sheen odour or staining noted in borehole
*Borehole location and elevation surveyed by GHD field staff
*Pocket penetrometer readings are for internal GHD use only and should not be relied upon by others.

REFERENCE No.: 11140477-A2 ENCLOSURE No.: 22

BOREHOLE No.: BH20-17
ELEVATION: 77.87 m

BOREHOLE LOG

Page: 1 of 1

CLIENT: Town of Greater Napanee C/o EVB Engineering Inc.
PROJECT: Geotechnical Investigation for Upgrades to Napanee Wastewater Treatment Plant
LOCATION: 300 Water Street West, Napanee, On
DESCRIBED BY: S. Wheeler CHECKED BY: S. Dunstan
DATE (START): 27 November 2017 DATE (FINISH): 27 November 2017

LEGEND

- SS Split Spoon
- GS Auger Sample
- ST Shelby Tube
- Water Level
- Water content (%)
- Atterberg limits (%)
- ● N Penetration Index based on Split Spoon sample
- • N Penetration Index based on Dynamic Cone sample
- △ Cu Shear Strength based on Field Vane
- □ Cu Shear Strength based on Lab Vane
- S Sensitivity Value of Soil
- ▲ Shear Strength based on Pocket Penetrometer

SCALE		STRATIGRAPHY		SAMPLE DATA					
Depth BGS	Elevation (m)	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	State	Type and Number	Recovery	OVC	Penetration Index / RQD	SCALE FOR TEST RESULTS 50kPa 100kPa 150kPa 200kPa 10 20 30 40 50 60 70 80 90
meters	77.87		GROUND SURFACE			%	ppm	N	
			FILL- Gravelly Sand, loose, brown, damp.		SS1	18/24		8	
1.0	76.9		*Becoming Sandy Silt some Gravel, dark brown		SS2	16/24		4	
	76.9		**BURIED TOPSOIL-** (Approximately 50 mm thick)						
2.0			**FILL-** Sand some Silt, loose, dark brown, damp.		SS3	15/24		5	
	75.2				SS4	20/24		11	
3.0	74.7		**CLAY AND SILT-** Very stiff, brown, damp.						
			SILTY CLAY- Very stiff, grey, damp, trace sand veins.		SS5	24/24		6	
4.0					SS6	24/24		12	
5.0					SS7	24/24		8	
					SS8	24/24		10	
6.0					SS9	24/24		4	
7.0			*Becoming stiff		SS10	24/24		7	
8.0					SS11	24/24		3	
			*Becoming firm		SS12	24/24		3	
9.0					SS13	24/24		3	
10.0	67.7		**SAND SOME SILT AND GRAVEL-** Compact, light brown, wet.		SS14	24/24		13	
11.0			*Becoming Sand, loose		SS15	20/24		6	
			*Becoming compact		SS16	24/24		13	
12.0	65.8		Auger refusal at approximately 12.1 m.						
13.0									
14.0									
15.0									
16.0									

NOTES:
*No sheen odour or staining noted in borehole
*Borehole location and elevation surveyed by GHD field staff
*Pocket penetrometer readings are for internal GHD use only and should not be relied upon by others.

THURBER

Appendix D

Single Well Response Test Results

THURBER ENGINEERING LTD.

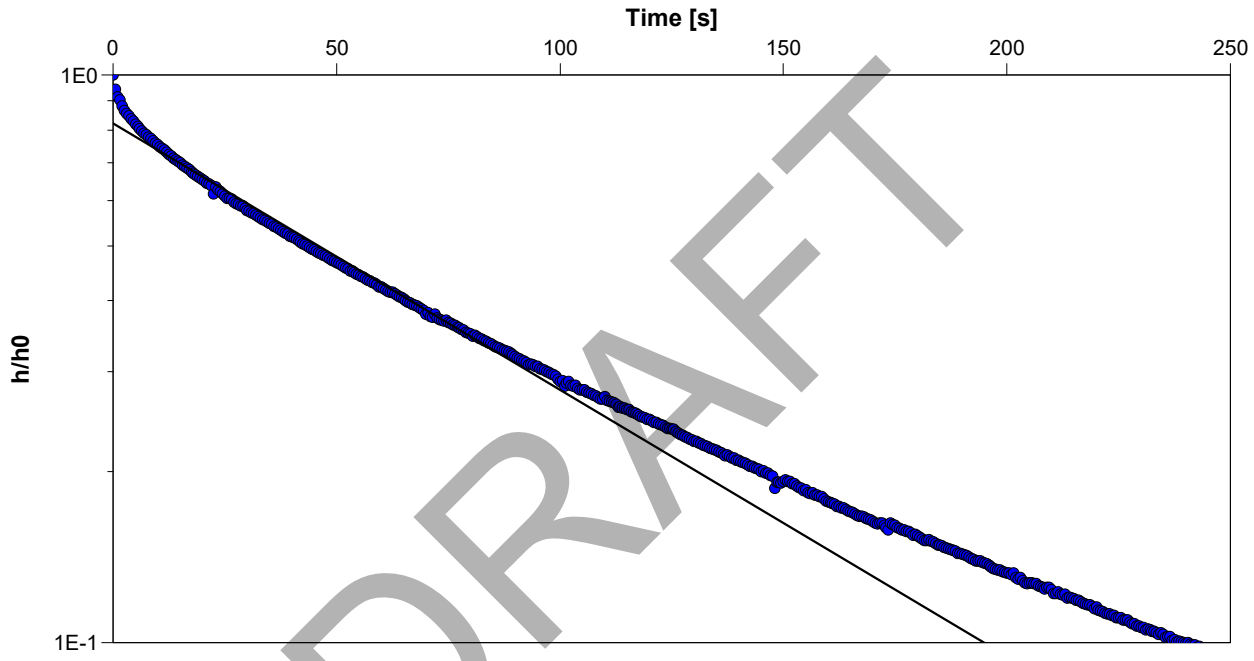
Slug Test Analysis Report

Project: Napanee Water Pollution Control Plant

Number: 30726

Client: RV Anderson

Location: 300 Water St West	Slug Test: 02 Shallow	Test Well: 02 Shallow
Test Conducted by: RB		Test Date: 2021-03-03
Analysis Performed by: RB	02 Shallow SWRT Analysis	Analysis Date: 2021-03-09
Aquifer Thickness:		
Reviewed By: DH		



Calculation using Hvorslev

Observation Well	Hydraulic Conductivity [m/s]	
02 Shallow	5.5×10^{-6}	

THURBER ENGINEERING LTD.

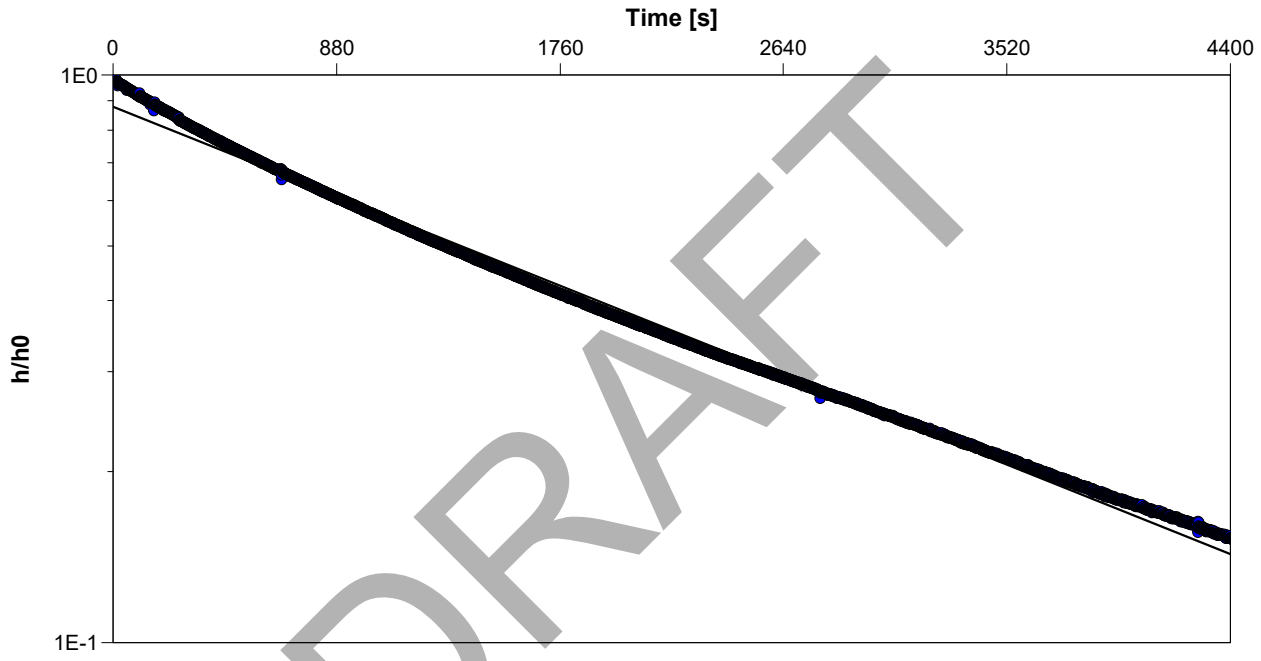
Slug Test Analysis Report

Project: Napanee Water Pollution Control Plant

Number: 30726

Client: RV Anderson

Location: 300 Water St West	Slug Test: 02 Deep	Test Well: 02 Deep
Test Conducted by: RB		Test Date: 2021-03-03
Analysis Performed by: PC	02 Deep SWRT Analysis	Analysis Date: 2021-04-13
Aquifer Thickness:		
Checked by: DH		



Calculation using Hvorslev

Observation Well	Hydraulic Conductivity [m/s]	
02 Deep	2.5×10^{-7}	

THURBER ENGINEERING LTD.

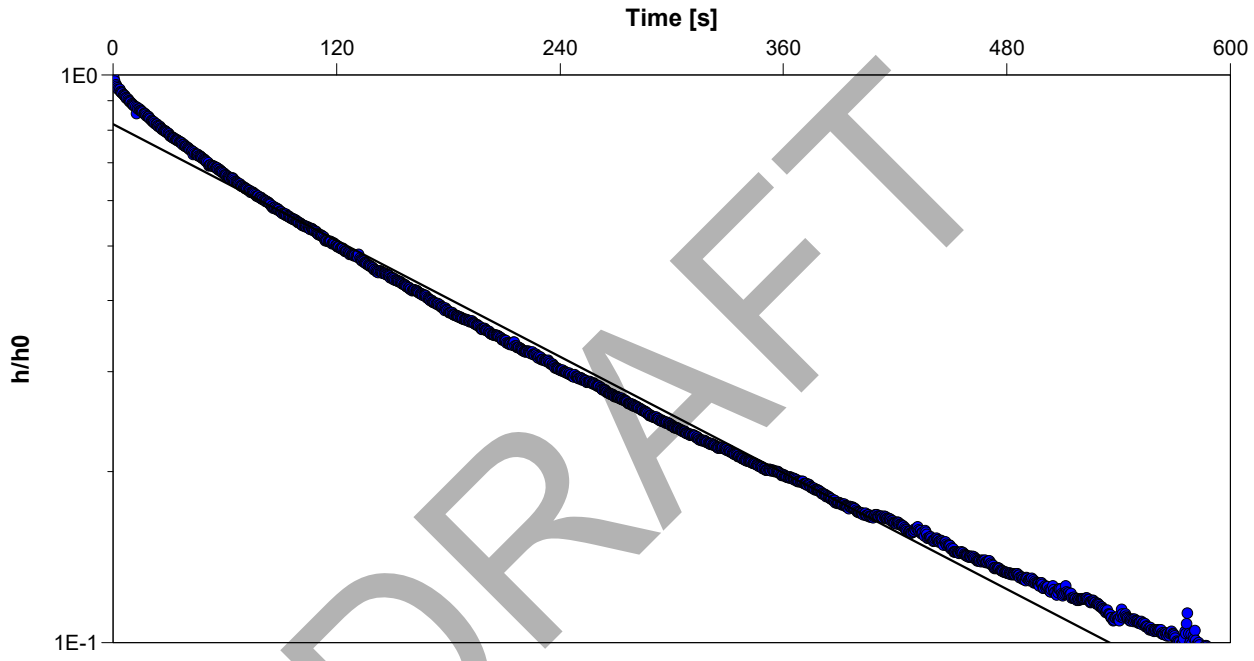
Slug Test Analysis Report

Project: Napanee Water Pollution Control Plant

Number: 30726

Client: RV Anderson

Location: 300 Water St West	Slug Test: 03 Shallow	Test Well: 03 Shallow
Test Conducted by: RB		Test Date: 2021-03-12
Analysis Performed by: PC	03 Shallow SWRT Analysis	Analysis Date: 2021-04-13
Aquifer Thickness:		
Checked by: DH		



Calculation using Hvorslev

Observation Well	Hydraulic Conductivity [m/s]	
03 Shallow	2.0×10^{-6}	

THURBER ENGINEERING LTD.

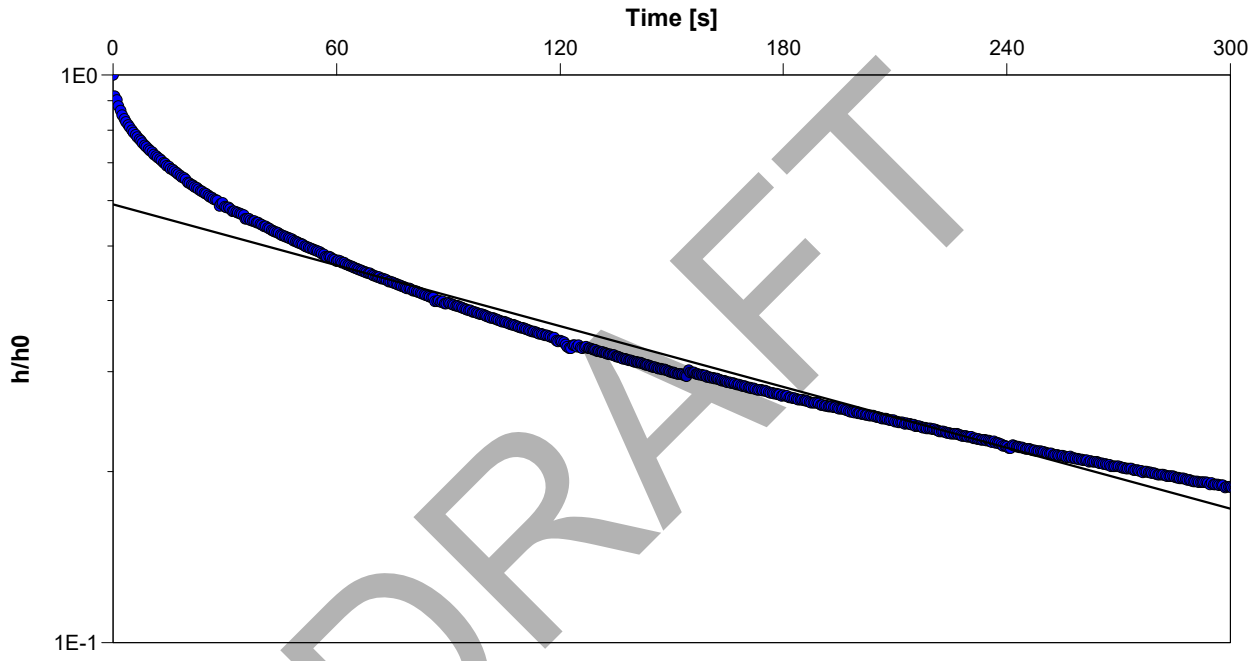
Slug Test Analysis Report

Project: Napanee Water Pollution Control Plant

Number: 30726

Client: RV Anderson

Location: 300 Water St West	Slug Test: 03 Deep	Test Well: 03 Deep
Test Conducted by: RB		Test Date: 2021-03-03
Analysis Performed by: RB	03 Deep SWRT Analysis	Analysis Date: 2021-03-09
Aquifer Thickness:		
Reviewed by: DH		



Calculation using Hvorslev

Observation Well	Hydraulic Conductivity [m/s]	
03 Deep	2.5×10^{-6}	

THURBER ENGINEERING LTD.

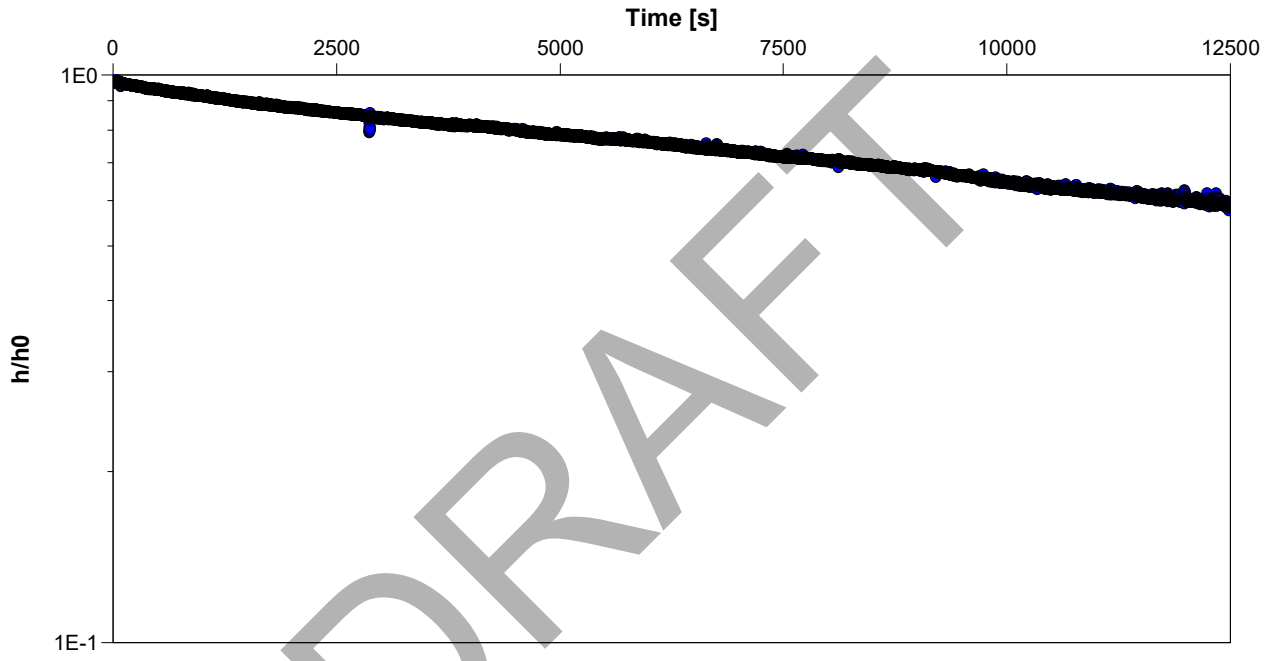
Slug Test Analysis Report

Project: Napanee Water Pollution Control Plant

Number: 30726

Client: RV Anderson

Location: 300 Water St West	Slug Test: 04 Shallow	Test Well: 04 Shallow
Test Conducted by: RB		Test Date: 2021-03-12
Analysis Performed by: PC	04 Shallow SWRT Analysis	Analysis Date: 2021-04-13
Aquifer Thickness:		
Checked by: DH		



Calculation using Hvorslev

Observation Well	Hydraulic Conductivity [m/s]	
04 Shallow	1.9×10^{-8}	

THURBER ENGINEERING LTD.

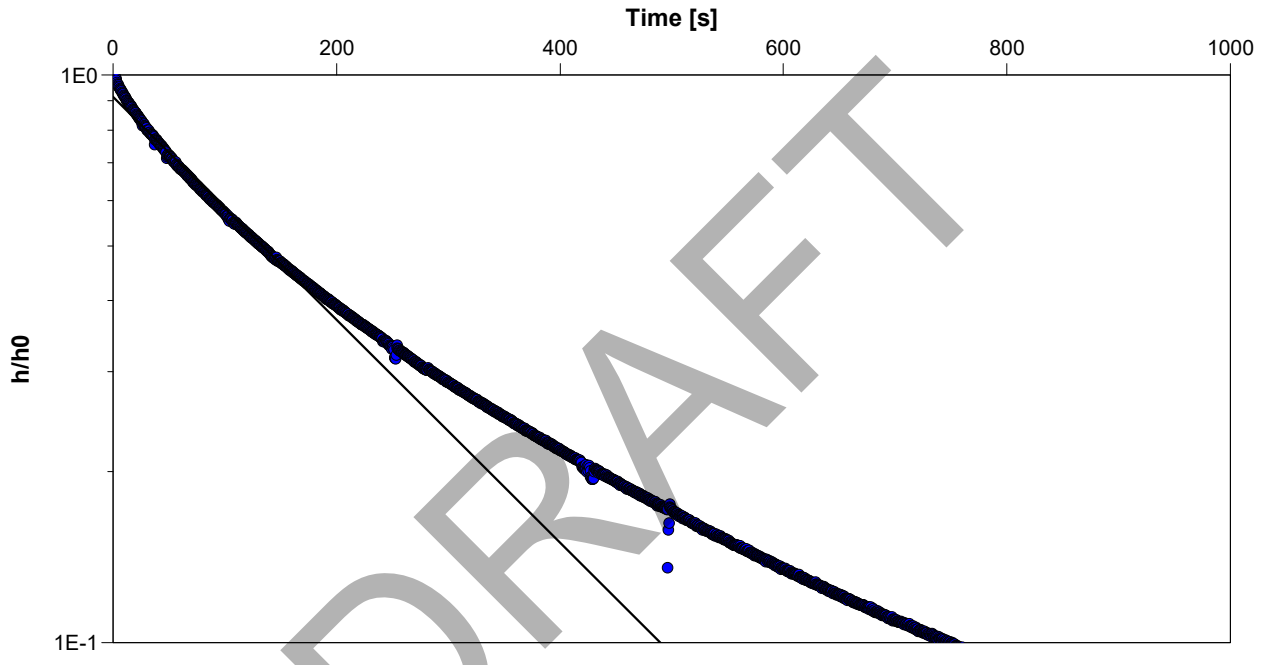
Slug Test Analysis Report

Project: Napanee Water Pollution Control Plant

Number: 30726

Client: RV Anderson

Location: 300 Water St West	Slug Test: 04 Deep	Test Well: 04 Deep
Test Conducted by: RB		Test Date: 2021-03-03
Analysis Performed by: RB	04 Deep SWRT Analysis	Analysis Date: 2021-03-09
Aquifer Thickness:		
Reviewed By: DH		



Calculation using Hvorslev

Observation Well	Hydraulic Conductivity [m/s]	
04 Deep	2.3×10^{-6}	

THURBER ENGINEERING LTD.

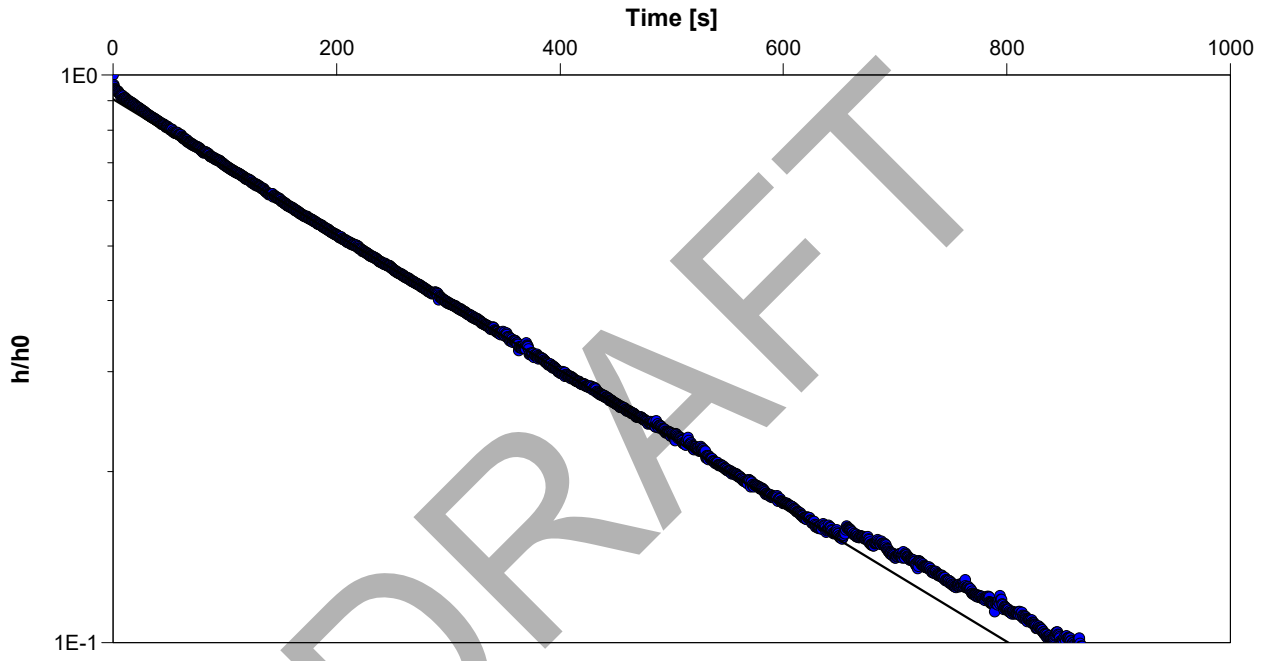
Slug Test Analysis Report

Project: Napanee Water Pollution Control Plant

Number: 30726

Client: RV Anderson

Location: 300 Water St West	Slug Test: 06	Test Well: 06
Test Conducted by: RB		Test Date: 2021-03-12
Analysis Performed by: PC	06 SWRT Analysis	Analysis Date: 2021-04-13
Aquifer Thickness:		
Checked by: DH		



Calculation using Hvorslev

Observation Well	Hydraulic Conductivity [m/s]	
06	1.4×10^{-6}	

THURBER ENGINEERING LTD.

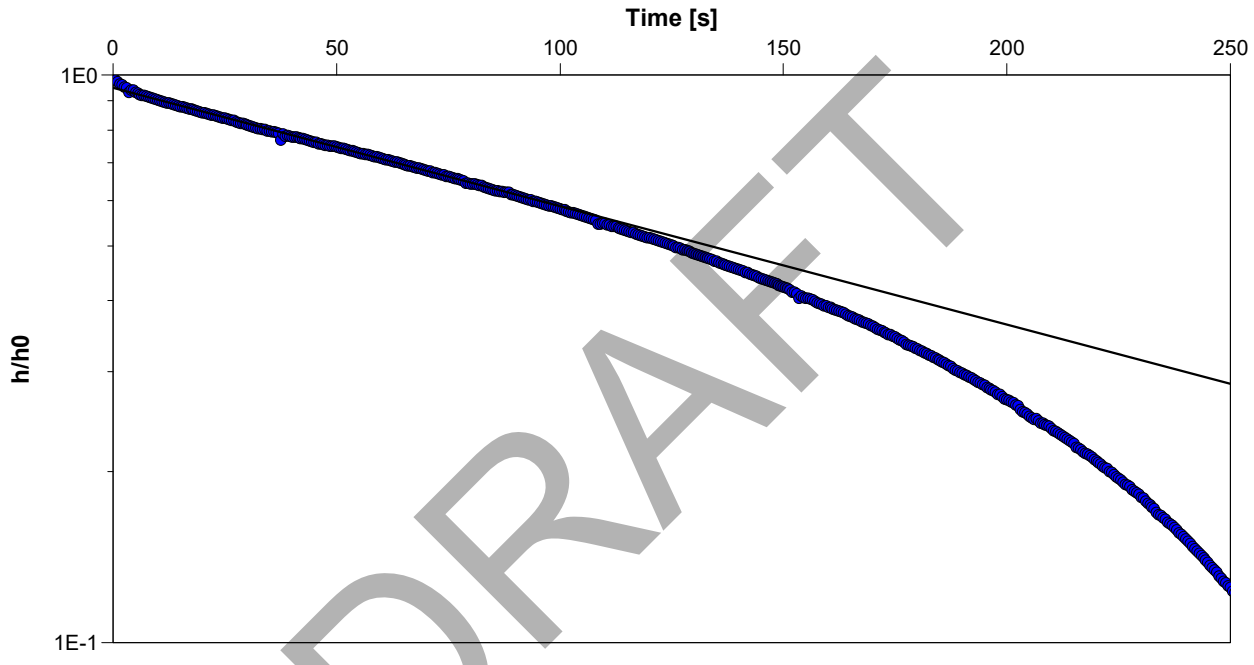
Slug Test Analysis Report

Project: Napanee Water Pollution Control Plant

Number: 30726

Client: RV Anderson

Location: 300 Water St West	Slug Test: 11	Test Well: 11
Test Conducted by: RB		Test Date: 2021-03-03
Analysis Performed by: RB	11 SWRT Analysis	Analysis Date: 2021-03-09
Aquifer Thickness:		
Reviewed By: DH		



Calculation using Hvorslev

Observation Well	Hydraulic Conductivity [m/s]	
11	4.4×10^{-6}	

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Appendix E

Groundwater Analytical Results and Certificates of Analysis

Well ID	Screened Material	CoA	Napanee Sanitary Sewer[1]				Napanee Storm Sewer[2]				PWQO[3]				Interim PWQO[4]			
			Exceeding Parameter	Units	Value	Limit	Exceeding Parameter	Units	Value	Limit	Exceeding Parameter	Units	Value	Limit	Exceeding Parameter	Units	Value	Limit
04 Deep	Silty clay	L2566855	No Exceedances				Manganese - Total	mg/L	0.0631	0.05	No Exceedances				Aluminum - Total	mg/L	0.0837	0.075
							Total Suspended Solids	mg/L	23.3	15					Cobalt - Total	mg/L	0.00103	0.0009
															Phosphorus - Total	mg/L	0.0111	0.01-0.03
															Phosphorus (P)- Total	mg/L	*<0.050*	0.01-0.03
															Cobalt - Dissolved	mg/L	0.00093	0.0009
															Phosphorus (P) - Dissolved	mg/L	*<0.050*	0.01 - 0.03
06	Silty clay and silty sand	L2566855	No Exceedances				Manganese - Total	mg/L	0.554	0.05	Iron (total)	mg/L	26.4	0.3	Aluminum - Total	mg/L	21.0	0.075
							Phosphorus (P) - Total	mg/L	0.85	0.3	Nickel	mg/L	0.0287	0.025	Cobalt - Total	mg/L	0.0129	0.0009
							Total Suspended Solids	mg/L	140	15	Silver	mg/L	*<0.00050*	0.0001	Copper, Total	mg/L	0.0353	0.005
							Zinc - Total	mg/L	0.097	0.04	Zinc	mg/L	0.097	0.03	Lead, Total	mg/L	0.0247	0.005
															Phosphorus, Total	mg/L	0.148	0.01-0.03
															Phosphorus (P), Total	mg/L	0.85	0.01-0.03
															Thallium	mg/L	0.00031	0.0003
															Vanadium	mg/L	0.0438	0.006
															Zinc (total)	mg/L	0.097	0.02
															Phosphorus (P) - Dissolved	mg/L	*<0.050*	0.01-0.03

General Notes:

[1] Greater Napanee Sewer Use By-Law Table 1 - Limits for Discharges to Sanitary Sewers - By-law 2012-39
[2] Greater Napanee Sewer Use By-Law Table 2 - Limits for Discharges to Storm Sewers - By-law 2012-39
[3] Table 2 - Provincial Water Quality Objectives
[4] Table 2 - Interim Provincial Water Quality Objectives
Certificate of Analysis supersedes results presented here in case of any discrepancy.
Only parameters presented in Certificate of Analyses were analyzed. Criteria not assessed where noted.

Some parameter limits in the PWQO depend on the result of other parameters (e.g. Aluminum limits are dependent on pH values). An effort to adjust for these dependencies was made herein.

Specific: *Italics indicate that the detection limit is higher than the regulagory limit*

Thurber Engineering Ltd. (Oakville)
ATTN: Rachel Bourassa
2010 Winston Park Drive
Unit 103
Oakville ON L6H 5R7

Date Received: 15-MAR-21
Report Date: 15-APR-21 12:05 (MT)
Version: FINAL REV. 5

Client Phone: 905-829-8666

Certificate of Analysis

Lab Work Order #: L2566855

Project P.O. #: NOT SUBMITTED
Job Reference: 30726
C of C Numbers:
Legal Site Desc:

Comments: ADDITIONAL 23-MAR-21 08:39

Amanda Overholster
Account Manager

Summary of Guideline Exceedances

Guideline ALS ID	Client ID	Grouping	Analyte	Result	Guideline Limit	Unit
Ontario Provincial Water Quality Objectives (JULY, 1994) - Surface Water PWQO						
L2566855-1	BH06	Anions and Nutrients	Phosphorus, Total	0.148	0.01	mg/L
		Total Metals	Aluminum (Al)-Total	21.0	0.015	mg/L
			Cadmium (Cd)-Total	0.000148	0.0001	mg/L
			Cobalt (Co)-Total	0.0129	0.0009	mg/L
			Copper (Cu)-Total	0.0353	0.001	mg/L
			Iron (Fe)-Total	26.4	0.3	mg/L
			Lead (Pb)-Total	0.0247	0.001	mg/L
			Nickel (Ni)-Total	0.0287	0.025	mg/L
			Phosphorus (P)-Total	0.85	0.01	mg/L
			Silver (Ag)-Total	<0.00050	0.0001	mg/L
			Thallium (Tl)-Total	0.00031	0.0003	mg/L
			Vanadium (V)-Total	0.0438	0.006	mg/L
			Zinc (Zn)-Total	0.097	0.02	mg/L
		Dissolved Metals	Phosphorus (P)-Dissolved	<0.050	0.01	mg/L
L2566855-2	BH04D	Anions and Nutrients	Phosphorus, Total	0.0111	0.01	mg/L
		Total Metals	Aluminum (Al)-Total	0.0837	0.015	mg/L
			Cobalt (Co)-Total	0.00103	0.0009	mg/L
			Phosphorus (P)-Total	<0.050	0.01	mg/L
		Dissolved Metals	Cobalt (Co)-Dissolved	0.00093	0.0009	mg/L
			Phosphorus (P)-Dissolved	<0.050	0.01	mg/L

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Physical Tests - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID L2566855-1 / Sample Date 12-MAR-21 / Sample ID BH06	Lab ID L2566855-2 / Sample Date 12-MAR-21 / Sample ID BH04D
Colour, Apparent	CU	-	-	47.7 PEHR	<2.0 PEHR
Conductivity	umhos/cm	-	-	867	850
Hardness (as CaCO3)	mg/L	-	-	418	383
pH	pH units	6.5-8.5	-	7.60	7.91
Total Suspended Solids	mg/L	-	-	140 DLHC	23.3
Total Dissolved Solids	mg/L	-	-	506 DLDS	468 DLDS
Turbidity	NTU	-	-	201 PEHR	11.3 PEHR

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Anions and Nutrients - WATER

				Lab ID	L2566855-1	L2566855-2
				Sample Date	12-MAR-21	12-MAR-21
				Sample ID	BH06	BH04D
Analyte	Unit	Guide Limits #1	#2			
Alkalinity, Bicarbonate (as CaCO3)	mg/L	-	-		358	297
Alkalinity, Carbonate (as CaCO3)	mg/L	-	-		<2.0	<2.0
Alkalinity, Hydroxide (as CaCO3)	mg/L	-	-		<2.0	<2.0
Alkalinity, Total (as CaCO3)	mg/L	-	-		358	297
Ammonia, Total (as N)	mg/L	-	-		0.022	0.050
Bromide (Br)	mg/L	-	-		<0.10	<0.10
Chloride (Cl)	mg/L	-	-		59.2	71.8
Computed Conductivity	uS/cm	-	-		798	801
Conductivity % Difference	%	-	-		-8	-6
Fluoride (F)	mg/L	-	-		0.093	0.143
Hardness (as CaCO3)	mg/L	-	-		418	383
Ion Balance	%	-	-		121	120
Langelier Index		-	-		1	1
Nitrate and Nitrite as N	mg/L	-	-		0.98	0.444
Nitrate (as N)	mg/L	-	-		0.980	0.425
Nitrite (as N)	mg/L	-	-		<0.010	0.019
Saturation pH	pH	-	-		6.86	7.15
Orthophosphate-Dissolved (as P)	mg/L	-	-		0.0101	<0.0030
Phosphorus, Total	mg/L	0.01	-		0.148	0.0111
TDS (Calculated)	mg/L	-	-		493	480
Sulfate (SO4)	mg/L	-	-		28.8	56.0
Anion Sum	me/L	-	-		8.24	8.15
Cation Sum	me/L	-	-		9.98	9.81
Cation - Anion Balance	%	-	-		10	9

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Organic / Inorganic Carbon - WATER

			Lab ID	L2566855-1	L2566855-2
			Sample Date	12-MAR-21	12-MAR-21
			Sample ID	BH06	BH04D
Analyte	**Unit**	**Guide Limits #1**	**#2**		
Total Organic Carbon	mg/L	-	-	3.24	2.17

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Inorganic Parameters - WATER

			Lab ID	L2566855-1	L2566855-2
			Sample Date	12-MAR-21	12-MAR-21
			Sample ID	BH06	BH04D
		Guide Limits			
Analyte	Unit	#1	#2		
Silica	mg/L	-	-	20.7	25.2

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

Total Metals - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID: L2566855-1 Sample Date: 12-MAR-21 Sample ID: BH06	Lab ID: L2566855-2 Sample Date: 12-MAR-21 Sample ID: BH04D
Aluminum (Al)-Total	mg/L	0.015	-	21.0 DLHC	0.0837
Antimony (Sb)-Total	mg/L	0.02	-	<0.0010 DLHC	0.00022
Arsenic (As)-Total	mg/L	0.005	-	0.0039 DLHC	0.00117
Barium (Ba)-Total	mg/L	-	-	0.596 DLHC	0.214
Beryllium (Be)-Total	mg/L	0.011	-	<0.0010 DLHC	<0.00010
Bismuth (Bi)-Total	mg/L	-	-	<0.00050 DLHC	<0.000050
Boron (B)-Total	mg/L	0.2	-	<0.10 DLHC	0.040
Cadmium (Cd)-Total	mg/L	0.0001	-	0.000148 DLHC	<0.0000050
Calcium (Ca)-Total	mg/L	-	-	183 DLHC	70.1
Cesium (Cs)-Total	mg/L	-	-	0.00154 DLHC	0.000013
Chromium (Cr)-Total	mg/L	-	-	0.0316 DLHC	<0.00050
Cobalt (Co)-Total	mg/L	0.0009	-	0.0129 DLHC	0.00103
Copper (Cu)-Total	mg/L	0.001	-	0.0353 DLHC	<0.00050
Iron (Fe)-Total	mg/L	0.3	-	26.4 DLHC	0.086
Lead (Pb)-Total	mg/L	0.001	-	0.0247 DLHC	0.000082
Lithium (Li)-Total	mg/L	-	-	0.022 DLHC	0.0075
Magnesium (Mg)-Total	mg/L	-	-	49.0 DLHC	45.0
Manganese (Mn)-Total	mg/L	-	-	0.554 DLHC	0.0631
Mercury (Hg)-Total	mg/L	0.0002	-	0.0000065	<0.0000050 SRU
Molybdenum (Mo)-Total	mg/L	0.04	-	0.00056 DLHC	0.00316
Nickel (Ni)-Total	mg/L	0.025	-	0.0287 DLHC	0.00173
Phosphorus (P)-Total	mg/L	0.01	-	0.85 DLHC	<0.050
Potassium (K)-Total	mg/L	-	-	8.15 DLHC	2.47
Rubidium (Rb)-Total	mg/L	-	-	0.0373 DLHC	0.00172
Selenium (Se)-Total	mg/L	0.1	-	<0.00050 DLHC	0.000258
Silicon (Si)-Total	mg/L	-	-	46.6 DLHC	11.0
Silver (Ag)-Total	mg/L	0.0001	-	<0.00050 DLHC	<0.000050
Sodium (Na)-Total	mg/L	-	-	36.3 DLHC	45.5
Strontium (Sr)-Total	mg/L	-	-	0.496 DLHC	0.969
Sulfur (S)-Total	mg/L	-	-	10.4 DLHC	22.1

Guide Limit #1: Surface Water PWQO

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Total Metals - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID: L2566855-1 Sample Date: 12-MAR-21 Sample ID: BH06	Lab ID: L2566855-2 Sample Date: 12-MAR-21 Sample ID: BH04D
Tellurium (Te)-Total	mg/L	-	-	<0.0020 DLHC	<0.00020
Thallium (Tl)-Total	mg/L	0.0003	-	0.00031 DLHC	0.000016
Thorium (Th)-Total	mg/L	-	-	0.0053 DLHC	<0.00010
Tin (Sn)-Total	mg/L	-	-	0.0011 DLHC	0.00198
Titanium (Ti)-Total	mg/L	-	-	1.26 DLHC	0.00445
Tungsten (W)-Total	mg/L	0.03	-	<0.0010 DLHC	<0.00010
Uranium (U)-Total	mg/L	0.005	-	0.00123 DLHC	0.00221
Vanadium (V)-Total	mg/L	0.006	-	0.0438 DLHC	0.00136
Zinc (Zn)-Total	mg/L	0.02	-	0.097 DLHC	<0.0030
Zirconium (Zr)-Total	mg/L	0.004	-	<0.0020 DLHC	<0.00020

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Dissolved Metals - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID L2566855-1 / Sample Date 12-MAR-21 / Sample ID BH06	Lab ID L2566855-2 / Sample Date 12-MAR-21 / Sample ID BH04D
Dissolved Mercury Filtration Location		-	-	LAB	FIELD
Dissolved Metals Filtration Location		-	-	LAB	LAB
Aluminum (Al)-Dissolved	mg/L	0.015	-	<0.0050	<0.0050
Antimony (Sb)-Dissolved	mg/L	0.02	-	0.00020	0.00020
Arsenic (As)-Dissolved	mg/L	0.005	-	0.00032	0.00142
Barium (Ba)-Dissolved	mg/L	-	-	0.210	0.221
Beryllium (Be)-Dissolved	mg/L	0.011	-	<0.00010	<0.00010
Bismuth (Bi)-Dissolved	mg/L	-	-	<0.000050	<0.000050
Boron (B)-Dissolved	mg/L	0.2	-	0.026	0.045
Cadmium (Cd)-Dissolved	mg/L	0.0001	-	0.0000572	<0.0000050
Calcium (Ca)-Dissolved	mg/L	-	-	117	72.3
Cesium (Cs)-Dissolved	mg/L	-	-	<0.000010	<0.000010
Chromium (Cr)-Dissolved	mg/L	-	-	<0.00050	<0.00050
Cobalt (Co)-Dissolved	mg/L	0.0009	-	0.00016	0.00093
Copper (Cu)-Dissolved	mg/L	0.001	-	0.00065	0.00040
Iron (Fe)-Dissolved	mg/L	0.3	-	<0.010	<0.010
Lead (Pb)-Dissolved	mg/L	0.001	-	0.000124	<0.000050
Lithium (Li)-Dissolved	mg/L	-	-	0.0046	0.0095
Magnesium (Mg)-Dissolved	mg/L	-	-	30.5	49.2
Manganese (Mn)-Dissolved	mg/L	-	-	0.0253	0.0588
Mercury (Hg)-Dissolved	mg/L	0.0002	-	<0.0000050	<0.0000050
Molybdenum (Mo)-Dissolved	mg/L	0.04	-	0.00177 DTC	0.00331
Nickel (Ni)-Dissolved	mg/L	0.025	-	0.00133	0.00161
Phosphorus (P)-Dissolved	mg/L	0.01	-	<0.050	<0.050
Potassium (K)-Dissolved	mg/L	-	-	2.22	2.64
Rubidium (Rb)-Dissolved	mg/L	-	-	0.00074	0.00164
Selenium (Se)-Dissolved	mg/L	0.1	-	0.000551	0.000327
Silicon (Si)-Dissolved	mg/L	-	-	9.66	11.8
Silver (Ag)-Dissolved	mg/L	0.0001	-	<0.000050	<0.000050
Sodium (Na)-Dissolved	mg/L	-	-	35.9	47.9

Guide Limit #1: Surface Water PWQO

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

Dissolved Metals - WATER

				Lab ID	L2566855-1	L2566855-2
				Sample Date	12-MAR-21	12-MAR-21
				Sample ID	BH06	BH04D
Analyte	Unit	Guide Limits #1	#2			
Strontium (Sr)-Dissolved	mg/L	-	-		0.347	0.990
Sulfur (S)-Dissolved	mg/L	-	-		10.8	21.3
Tellurium (Te)-Dissolved	mg/L	-	-		<0.00020	<0.00020
Thallium (Tl)-Dissolved	mg/L	0.0003	-		<0.000010	0.000015
Thorium (Th)-Dissolved	mg/L	-	-		<0.00010	<0.00010
Tin (Sn)-Dissolved	mg/L	-	-		0.00203	0.00195
Titanium (Ti)-Dissolved	mg/L	-	-		<0.00030	<0.00030
Tungsten (W)-Dissolved	mg/L	0.03	-		<0.00010	<0.00010
Uranium (U)-Dissolved	mg/L	0.005	-		0.000789	0.00215
Vanadium (V)-Dissolved	mg/L	0.006	-		0.00156	0.00124
Zinc (Zn)-Dissolved	mg/L	0.02	-		0.0018	0.0014
Zirconium (Zr)-Dissolved	mg/L	0.004	-		<0.00020	<0.00020

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

Reference Information

Additional Comments for Sample Listed:

Samplenum	Matrix	Report Remarks	Sample Comments
L2566855-1	Water	Note: RRR: Detection limits adjusted due to low recovery in LCS.	

Qualifiers for Individual Parameters Listed:

Qualifier	Description
DTC	Dissolved concentration exceeds total. Results were confirmed by re-analysis.
DLDS	Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.
PEHR	Parameter Exceeded Recommended Holding Time On Receipt: Proceed With Analysis As Requested.
SRU	Sample Received Unpreserved. Results may be biased low for indicated parameter(s)
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Method Reference**
625-SAN-WT	Water	Ontario Sanitary Sewer SVOC Target List	SW-846 8270

Samples are extracted with solvent and then analyzed by GC/MS.

ALD+DIEL-CALC-WT	Water	Aldrin + Dieldrin Calculation	CALCULATION

This calculation represents the sum of the aldrin and dieldrin analyzed for in a given sample.

ALK-SPEC-PCT-WT	Water	Automated Speciated Alkalinity	APHA 2320B

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". 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.

BOD-C-WT	Water	BOD Carbonaceous	APHA 5210 B (CBOD)

This analysis is carried out using procedures adapted from APHA Method 5210B - "Biochemical Oxygen Demand (BOD)". All forms of biochemical oxygen demand (BOD) are determined by diluting and incubating a sample for a specified time period, and measuring the oxygen depletion using a dissolved oxygen meter. Dissolved BOD (SOLUBLE) is determined by filtering the sample through a glass fibre filter prior to dilution. Carbonaceous BOD (CBOD) is determined by adding a nitrification inhibitor to the diluted sample prior to incubation.

BR-IC-N-WT	Water	Bromide in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CHLORDANE-T-CALC-WT	Water	Chlordane Total sums	CALCULATION

Aqueous sample is extracted by liquid/liquid extraction with a solvent mix. After extraction, a number of clean up techniques may be applied, depending on the sample matrix and analyzed by GC/MS.

CL-IC-N-WT	Water	Chloride by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

CN-TOT-WT	Water	Cyanide, Total	ISO 14403-2

Total cyanide is determined by the combination of UV digestion and distillation. Cyanide is converted to cyanogen chloride by reacting with chloramine-T, the cyanogen chloride then reacts with a combination of barbituric acid and isonicotinic acid to form a highly colored complex.

Reference Information

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Method Reference**

When using this method, high levels of thiocyanate in samples can cause false positives at ~1-2% of the thiocyanate concentration. For samples with detectable cyanide analyzed by this method, ALS recommends analysis for thiocyanate to check for this potential interference

COD-T-WT	Water	Chemical Oxygen Demand	APHA 5220 D

This analysis is carried out using procedures adapted from APHA Method 5220 "Chemical Oxygen Demand (COD)". Chemical oxygen demand is determined using the closed reflux colourimetric method.

COLOUR-APPARENT-WT	Water	Colour	APHA 2120

Apparent Colour is measured spectrophotometrically by comparison to platinum-cobalt standards using the single wavelength method after sample decanting. Colour measurements can be highly pH dependent, and apply to the pH of the sample as received (at time of testing), without pH adjustment. Concurrent measurement of sample pH is recommended.

CR-CR6-IC-WT	Water	Chromium +6	EPA 7199

This analysis is carried out using procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846, Method 7199, published by the United States Environmental Protection Agency (EPA). The procedure involves analysis for chromium (VI) by ion chromatography using diphenylcarbazide in a sulphuric acid solution. Chromium (III) is calculated as the difference between the total chromium and the chromium (VI) results.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

DDD-DDE-DDT-CALC-WT	Water	DDD, DDE, DDT sums	CALCULATION

Calculation of Total DDD, Total DDE and Total DDT

EC-SCREEN-WT	Water	Conductivity Screen (Internal Use Only)	APHA 2510

Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.

EC-WT	Water	Conductivity	APHA 2510 B

Water samples can be measured directly by immersing the conductivity cell into the sample.

EC-WW-MF-WT	Water	E. Coli	SM 9222D

A 100 mL volume of sample is filtered through a membrane, the membrane is placed on mFC-BCIG agar and incubated at 44.5 –0 .2 °C for 24 – 2 h. Method ID: WT-TM-1200

ETL-N2N3-WT	Water	Calculate from NO2 + NO3	APHA 4110 B
ETL-SILICA-CALC-WT	Water	Calculate from SI-TOT-WT	EPA 200.8
F-IC-N-WT	Water	Fluoride in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

HARDNESS-CALC-WT	Water	Hardness	APHA 2340 B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-D-CVAA-WT	Water	Dissolved Mercury in Water by CVAAS	EPA 1631E (mod)

Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS.

Reference Information

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Method Reference**
Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).			
HG-T-CVAA-WT	Water	Total Mercury in Water by CVAAS	EPA 1631E (mod)
Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS.			
IONBALANCE-OP03-WT	Water	Detailed Ion Balance Calculation	APHA 1030E, 2330B, 2510A
MET-D-CCMS-WT	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B/6020A (mod)
Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.			
Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.			
Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).			
MET-T-CCMS-WT	Water	Total Metals in Water by CRC ICPMS	EPA 200.2/6020A (mod)
Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.			
Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.			
Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).			
METHYLNAPS-CALC-WT	Water	PAH-Calculated Parameters	SW846 8270
NH3-F-WT	Water	Ammonia in Water by Fluorescence	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC
This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.			
NO2-IC-WT	Water	Nitrite in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
NO3-IC-WT	Water	Nitrate in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
NP,NPE-LCMS-WT	Water	Nonylphenols and Ethoxylates by LC/MS-MS	J. Chrom A849 (1999) p.467-482
Water samples are filtered and analyzed on LCMS/MS by direct injection.			
OCP-ROUTINE-WT	Water	Pesticides, Organochlorine in Water	SW846 8270
Samples are extracted using a solvent mixture and the resulting extracts are analyzed on GC/MSD			
OGG-SPEC-CALC-WT	Water	Speciated Oil and Grease A/V Calc	CALCULATION
Sample is extracted with hexane, sample speciation into mineral and animal/vegetable fractions is achieved via silica gel separation and is then determined gravimetrically.			

Reference Information

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Method Reference**
OGG-SPEC-WT	Water	Speciated Oil and Grease-Gravimetric	APHA 5520 B

The procedure involves an extraction of the entire water sample with hexane. Sample speciation into mineral and animal/vegetable fractions is achieved via silica gel separation and is then determined gravimetrically.

P-T-COL-WT	Water	Total P in Water by Colour	APHA 4500-P PHOSPHORUS

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is deteremined colourimetrically after persulphate digestion of the sample.

PAH-511-WT	Water	PAH-O. Reg 153/04 (July 2011)	SW846 3510/8270

Aqueous samples, fortified with surrogates, are extracted using liquid/liquid extraction technique. The sample extracts are concentrated and then analyzed using GC/MS. Results for benzo(b) fluoranthene may include contributions from benzo(j)fluoranthene, if also present in the sample.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011), unless a subset of the Analytical Test Group (ATG) has been requested (the Protocol states that all analytes in an ATG must be reported).

PAH-SUM-CALC-WT	Water	TOTAL PAH's	CALCULATION

Total PAH represents the sum of all PAH analytes reported for a given sample. Note that regulatory agencies and criteria differ in their definitions of Total PAH in terms of the individual PAH analytes to be included.

PCB-WT	Water	Polychlorinated Biphenyls	EPA 8082

PCBs are extracted from an aqueous sample at neutral pH with aliquots of dichloromethane using a modified separatory funnel technique. The extracts are analyzed by GC/MSD.

PH-WT	Water	pH	APHA 4500 H-Electrode

Water samples are analyzed directly by a calibrated pH meter.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011). Holdtime for samples under this regulation is 28 days

PHENOLS-4AAP-WT	Water	Phenol (4AAP)	EPA 9066

An automated method is used to distill the sample. The distillate is then buffered to pH 9.4 which reacts with 4AAP and potassium ferricyanide to form a red complex which is measured colorimetrically.

PO4-DO-COL-WT	Water	Diss. Orthophosphate in Water by Colour	APHA 4500-P PHOSPHORUS

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.

SO4-IC-N-WT	Water	Sulfate in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

SOLIDS-TDS-WT	Water	Total Dissolved Solids	APHA 2540C

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Dissolved Solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.

SOLIDS-TSS-WT	Water	Suspended solids	APHA 2540 D-Gravimetric

Reference Information

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Method Reference**
		A well-mixed sample is filtered through a weighed standard glass fibre filter and the residue retained is dried in an oven at 104–1°C for a minimum of four hours or until a constant weight is achieved.	
TKN-F-WT	Water	TKN in Water by Fluorescence	J. ENVIRON. MONIT., 2005,7,37-42,RSC
		Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection	
TOC-WT	Water	Total Organic Carbon	APHA 5310B
		Sample is injected into a heated reaction chamber which is packed with an oxidative catalyst. The water is vaporized and the organic cabon is oxidized to carbon dioxide. The carbon dioxide is transported in a carrier gas and is measured by a non-dispersive infrared detector.	
TURBIDITY-WT	Water	Turbidity	APHA 2130 B
		Sample result is based on a comparison of the intensity of the light scattered by the sample under defined conditions with the intensity of light scattered by a standard reference suspension under the same conditions. Sample readings are obtained from a Nephelometer.	
VOC-ROU-HS-WT	Water	Volatile Organic Compounds	SW846 8260
		Aqueous samples are analyzed by headspace-GC/MS.	
XYLENES-SUM-CALC-WT	Water	Sum of Xylene Isomer Concentrations	CALCULATION
		Total xylenes represents the sum of o-xylene and m&p-xylene.	

**ALS test methods may incorporate modifications from specified reference methods to improve performance.

Chain of Custody Numbers:

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
WT	ALS ENVIRONMENTAL - WATERLOO, ONTARIO, CANADA

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.
mg/kg - milligrams per kilogram based on dry weight of sample
mg/kg wwt - milligrams per kilogram based on wet weight of sample
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight
mg/L - unit of concentration based on volume, parts per million.
< - Less than.
D.L. - The reporting limit.
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Application of guidelines is provided "as is" without warranty of any kind, either expressed or implied, including, but not limited to, fitness for a particular purpose, or non-infringement. ALS assumes no responsibility for errors or omissions in the information. Guideline limits are not adjusted for the hardness, pH or temperature of the sample (the most conservative values are used). Measurement uncertainty is not applied to test results prior to comparison with specified criteria values.

Quality Control Report

Workorder: L2566855 Report Date: 15-APR-21

Client: Thurber Engineering Ltd. (Oakville)
2010 Winston Park Drive Unit 103
Oakville ON L6H 5R7
Contact: Rachel Bourassa

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
ALK-SPEC-PCT-WT	**Water**							
Batch R5401759								
WG3502803-4 DUP		**WG3502803-3**						
Alkalinity, Total (as CaCO3)		214	215		mg/L	0.5	20	16-MAR-21
Alkalinity, Bicarbonate (as CaCO3)		214	215		mg/L	0.5	20	16-MAR-21
Alkalinity, Carbonate (as CaCO3)		<2.0	<2.0	RPD-NA	mg/L	N/A	20	16-MAR-21
Alkalinity, Hydroxide (as CaCO3)		<2.0	<2.0	RPD-NA	mg/L	N/A	20	16-MAR-21
WG3502803-2 LCS								
Alkalinity, Total (as CaCO3)			98.7		%		85-115	16-MAR-21
WG3502803-1 MB								
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	16-MAR-21
Alkalinity, Bicarbonate (as CaCO3)			<2.0		mg/L		2	16-MAR-21
Alkalinity, Carbonate (as CaCO3)			<2.0		mg/L		2	16-MAR-21
Alkalinity, Hydroxide (as CaCO3)			<2.0		mg/L		2	16-MAR-21
BR-IC-N-WT	**Water**							
Batch R5403000								
WG3503957-4 DUP		**WG3503957-3**						
Bromide (Br)		<0.10	<0.10	RPD-NA	mg/L	N/A	20	17-MAR-21
WG3503957-2 LCS								
Bromide (Br)			100.6		%		85-115	17-MAR-21
WG3503957-1 MB								
Bromide (Br)			<0.10		mg/L		0.1	17-MAR-21
WG3503957-5 MS		**WG3503957-3**						
Bromide (Br)			101.2		%		75-125	17-MAR-21
CL-IC-N-WT	**Water**							
Batch R5403000								
WG3503957-4 DUP		**WG3503957-3**						
Chloride (Cl)		1.50	1.51		mg/L	0.3	20	17-MAR-21
WG3503957-2 LCS								
Chloride (Cl)			99.8		%		90-110	17-MAR-21
WG3503957-1 MB								
Chloride (Cl)			<0.50		mg/L		0.5	17-MAR-21
WG3503957-5 MS		**WG3503957-3**						
Chloride (Cl)			98.0		%		75-125	17-MAR-21
COLOUR-APPARENT-WT	**Water**							
Batch R5401483								
WG3502608-3 DUP		**L2566743-1**						
Colour, Apparent		28.3	28.7		CU	1.6	20	15-MAR-21
WG3502608-2 LCS								

Quality Control Report

Workorder: L2566855 Report Date: 15-APR-21

Client: Thurber Engineering Ltd. (Oakville)
2010 Winston Park Drive Unit 103
Oakville ON L6H 5R7
Contact: Rachel Bourassa

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
COLOUR-APPARENT-WT	**Water**							
Batch R5401483								
WG3502608-2 LCS								
Colour, Apparent			101.8		%		85-115	15-MAR-21
WG3502608-1 MB								
Colour, Apparent			<2.0		CU		2	15-MAR-21
EC-WT	**Water**							
Batch R5401759								
WG3502803-4 DUP		**WG3502803-3**						
Conductivity		613	608		umhos/cm	0.8	10	16-MAR-21
WG3502803-2 LCS								
Conductivity			99.7		%		90-110	16-MAR-21
WG3502803-1 MB								
Conductivity			<3.0		umhos/cm		3	16-MAR-21
F-IC-N-WT	**Water**							
Batch R5403000								
WG3503957-4 DUP		**WG3503957-3**						
Fluoride (F)		0.075	0.075		mg/L	0.1	20	17-MAR-21
WG3503957-2 LCS								
Fluoride (F)			102.3		%		90-110	17-MAR-21
WG3503957-1 MB								
Fluoride (F)			<0.020		mg/L		0.02	17-MAR-21
WG3503957-5 MS		**WG3503957-3**						
Fluoride (F)			100.5		%		75-125	17-MAR-21
HG-D-CVAA-WT	**Water**							
Batch R5404178								
WG3505160-4 DUP		**WG3505160-3**						
Mercury (Hg)-Dissolved		<0.0000050	<0.000005C	RPD-NA	mg/L	N/A	20	16-MAR-21
WG3505160-2 LCS								
Mercury (Hg)-Dissolved			103.0		%		80-120	16-MAR-21
WG3505160-1 MB								
Mercury (Hg)-Dissolved			<0.000005C		mg/L		0.000005	16-MAR-21
WG3505160-6 MS		**WG3505160-5**						
Mercury (Hg)-Dissolved			99.3		%		70-130	16-MAR-21
Batch R5407708								
WG3505214-4 DUP		**WG3505214-3**						
Mercury (Hg)-Dissolved		<0.0000050	<0.000005C	RPD-NA	mg/L	N/A	20	22-MAR-21
WG3505214-2 LCS								
Mercury (Hg)-Dissolved			94.2		%		80-120	22-MAR-21

Quality Control Report

Client: Thurber Engineering Ltd. (Oakville)
2010 Winston Park Drive Unit 103
Oakville ON L6H 5R7
Contact: Rachel Bourassa

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
HG-D-CVAA-WT	**Water**							
Batch R5407708								
WG3505214-1 MB								
Mercury (Hg)-Dissolved			<0.000005C		mg/L		0.000005	22-MAR-21
WG3505214-6 MS		**WG3505214-5**						
Mercury (Hg)-Dissolved			89.5		%		70-130	22-MAR-21
HG-T-CVAA-WT	**Water**							
Batch R5401807								
WG3502836-4 DUP		**WG3502836-3**						
Mercury (Hg)-Total		<0.0000050	<0.000005C	RPD-NA	mg/L	N/A	20	16-MAR-21
WG3502836-2 LCS								
Mercury (Hg)-Total			103.0		%		80-120	16-MAR-21
WG3502836-1 MB								
Mercury (Hg)-Total			<0.000005C		mg/L		0.000005	16-MAR-21
WG3502836-6 MS		**WG3502836-5**						
Mercury (Hg)-Total			99.3		%		70-130	16-MAR-21
Batch R5407711								
WG3505207-3 DUP		**L2568290-1**						
Mercury (Hg)-Total		<0.0000050	<0.000005C	RPD-NA	mg/L	N/A	20	22-MAR-21
WG3505207-2 LCS								
Mercury (Hg)-Total			100.0		%		80-120	22-MAR-21
WG3505207-1 MB								
Mercury (Hg)-Total			<0.000005C		mg/L		0.000005	22-MAR-21
WG3505207-4 MS		**L2568425-1**						
Mercury (Hg)-Total			100.3		%		70-130	22-MAR-21
MET-D-CCMS-WT	**Water**							
Batch R5403719								
WG3504802-4 DUP		**WG3504802-3**						
Aluminum (Al)-Dissolved		<0.050	<0.050	RPD-NA	mg/L	N/A	20	18-MAR-21
Antimony (Sb)-Dissolved		0.0027	0.0031		mg/L	14	20	18-MAR-21
Arsenic (As)-Dissolved		0.0166	0.0183		mg/L	9.4	20	18-MAR-21
Barium (Ba)-Dissolved		0.108	0.119		mg/L	9.7	20	18-MAR-21
Beryllium (Be)-Dissolved		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	18-MAR-21
Bismuth (Bi)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	18-MAR-21
Boron (B)-Dissolved		0.35	0.40		mg/L	15	20	18-MAR-21
Cadmium (Cd)-Dissolved		0.000069	0.000079		mg/L	14	20	18-MAR-21
Calcium (Ca)-Dissolved		132	152		mg/L	14	20	18-MAR-21
Cesium (Cs)-Dissolved		0.00015	0.00019	J	mg/L	0.00004	0.0002	18-MAR-21

Quality Control Report

Client: Thurber Engineering Ltd. (Oakville)
2010 Winston Park Drive Unit 103
Oakville ON L6H 5R7
Contact: Rachel Bourassa

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-WT	**Water**							
Batch R5403719								
WG3504802-4 DUP		**WG3504802-3**						
Chromium (Cr)-Dissolved		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	18-MAR-21
Cobalt (Co)-Dissolved		0.0077	0.0084		mg/L	8.7	20	18-MAR-21
Copper (Cu)-Dissolved		0.0129	0.0142		mg/L	9.4	20	18-MAR-21
Iron (Fe)-Dissolved		<0.10	<0.10	RPD-NA	mg/L	N/A	20	18-MAR-21
Lead (Pb)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	18-MAR-21
Lithium (Li)-Dissolved		0.336	0.379		mg/L	12	20	18-MAR-21
Magnesium (Mg)-Dissolved		45.0	49.4		mg/L	9.2	20	18-MAR-21
Manganese (Mn)-Dissolved		0.0122	0.0135		mg/L	10	20	18-MAR-21
Molybdenum (Mo)-Dissolved		0.0129	0.0146		mg/L	13	20	18-MAR-21
Nickel (Ni)-Dissolved		0.0184	0.0205		mg/L	11	20	18-MAR-21
Phosphorus (P)-Dissolved		<0.50	<0.50	RPD-NA	mg/L	N/A	20	18-MAR-21
Potassium (K)-Dissolved		36.0	39.9		mg/L	10	20	18-MAR-21
Rubidium (Rb)-Dissolved		0.0245	0.0273		mg/L	11	20	18-MAR-21
Selenium (Se)-Dissolved		0.0144	0.0163		mg/L	13	20	18-MAR-21
Silicon (Si)-Dissolved		0.80	0.89		mg/L	11	20	18-MAR-21
Silver (Ag)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	18-MAR-21
Sodium (Na)-Dissolved		296	328		mg/L	10	20	18-MAR-21
Strontium (Sr)-Dissolved		1.85	2.12		mg/L	14	20	18-MAR-21
Sulfur (S)-Dissolved		160	179		mg/L	11	20	18-MAR-21
Tellurium (Te)-Dissolved		<0.0020	<0.0020	RPD-NA	mg/L	N/A	20	18-MAR-21
Thallium (Tl)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	18-MAR-21
Thorium (Th)-Dissolved		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	18-MAR-21
Tin (Sn)-Dissolved		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	18-MAR-21
Titanium (Ti)-Dissolved		<0.0030	<0.0030	RPD-NA	mg/L	N/A	20	18-MAR-21
Tungsten (W)-Dissolved		0.0169	0.0192		mg/L	13	20	18-MAR-21
Uranium (U)-Dissolved		0.00122	0.00134		mg/L	9.4	20	18-MAR-21
Vanadium (V)-Dissolved		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	18-MAR-21
Zinc (Zn)-Dissolved		<0.010	<0.010	RPD-NA	mg/L	N/A	20	18-MAR-21
Zirconium (Zr)-Dissolved		<0.0020	<0.0020	RPD-NA	mg/L	N/A	20	18-MAR-21
WG3504802-2 LCS								
Aluminum (Al)-Dissolved			112.4		%		80-120	18-MAR-21
Antimony (Sb)-Dissolved			101.0		%		80-120	18-MAR-21
Arsenic (As)-Dissolved			107.0		%		80-120	18-MAR-21

Quality Control Report

Client: Thurber Engineering Ltd. (Oakville)
2010 Winston Park Drive Unit 103
Oakville ON L6H 5R7
Contact: Rachel Bourassa

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-WT	**Water**							
Batch R5403719								
WG3504802-2 LCS								
Barium (Ba)-Dissolved			106.7		%		80-120	18-MAR-21
Beryllium (Be)-Dissolved			109.0		%		80-120	18-MAR-21
Bismuth (Bi)-Dissolved			104.0		%		80-120	18-MAR-21
Boron (B)-Dissolved			104.2		%		80-120	18-MAR-21
Cadmium (Cd)-Dissolved			105.2		%		80-120	18-MAR-21
Calcium (Ca)-Dissolved			105.7		%		80-120	18-MAR-21
Cesium (Cs)-Dissolved			106.0		%		80-120	18-MAR-21
Chromium (Cr)-Dissolved			104.9		%		80-120	18-MAR-21
Cobalt (Co)-Dissolved			105.9		%		80-120	18-MAR-21
Copper (Cu)-Dissolved			104.5		%		80-120	18-MAR-21
Iron (Fe)-Dissolved			106.2		%		80-120	18-MAR-21
Lead (Pb)-Dissolved			104.6		%		80-120	18-MAR-21
Lithium (Li)-Dissolved			115.2		%		80-120	18-MAR-21
Magnesium (Mg)-Dissolved			112.0		%		80-120	18-MAR-21
Manganese (Mn)-Dissolved			105.1		%		80-120	18-MAR-21
Molybdenum (Mo)-Dissolved			105.2		%		80-120	18-MAR-21
Nickel (Ni)-Dissolved			104.6		%		80-120	18-MAR-21
Phosphorus (P)-Dissolved			111.8		%		80-120	18-MAR-21
Potassium (K)-Dissolved			108.9		%		80-120	18-MAR-21
Rubidium (Rb)-Dissolved			110.0		%		80-120	18-MAR-21
Selenium (Se)-Dissolved			101.4		%		80-120	18-MAR-21
Silicon (Si)-Dissolved			107.1		%		60-140	18-MAR-21
Silver (Ag)-Dissolved			107.7		%		80-120	18-MAR-21
Sodium (Na)-Dissolved			110.0		%		80-120	18-MAR-21
Strontium (Sr)-Dissolved			106.0		%		80-120	18-MAR-21
Sulfur (S)-Dissolved			108.2		%		80-120	18-MAR-21
Tellurium (Te)-Dissolved			96.3		%		80-120	18-MAR-21
Thallium (Tl)-Dissolved			104.6		%		80-120	18-MAR-21
Thorium (Th)-Dissolved			105.2		%		80-120	18-MAR-21
Tin (Sn)-Dissolved			104.5		%		80-120	18-MAR-21
Titanium (Ti)-Dissolved			104.4		%		80-120	18-MAR-21
Tungsten (W)-Dissolved			101.8		%		80-120	18-MAR-21
Uranium (U)-Dissolved			108.8		%		80-120	18-MAR-21

Quality Control Report

Client: Thurber Engineering Ltd. (Oakville)
2010 Winston Park Drive Unit 103
Oakville ON L6H 5R7
Contact: Rachel Bourassa

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-WT	**Water**							
Batch R5403719								
WG3504802-2 LCS								
Vanadium (V)-Dissolved			108.2		%		80-120	18-MAR-21
Zinc (Zn)-Dissolved			106.2		%		80-120	18-MAR-21
Zirconium (Zr)-Dissolved			105.7		%		80-120	18-MAR-21
WG3504802-1 MB								
Aluminum (Al)-Dissolved			<0.0050		mg/L		0.005	18-MAR-21
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	18-MAR-21
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	18-MAR-21
Barium (Ba)-Dissolved			<0.00010		mg/L		0.0001	19-MAR-21
Beryllium (Be)-Dissolved			<0.00010		mg/L		0.0001	18-MAR-21
Bismuth (Bi)-Dissolved			<0.000050		mg/L		0.00005	18-MAR-21
Boron (B)-Dissolved			<0.010		mg/L		0.01	18-MAR-21
Cadmium (Cd)-Dissolved			<0.000005(		mg/L		0.000005	18-MAR-21
Calcium (Ca)-Dissolved			0.216	B	mg/L		0.05	18-MAR-21
Cesium (Cs)-Dissolved			<0.000010		mg/L		0.00001	18-MAR-21
Chromium (Cr)-Dissolved			<0.00050		mg/L		0.0005	18-MAR-21
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	18-MAR-21
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	18-MAR-21
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	18-MAR-21
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	18-MAR-21
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	18-MAR-21
Magnesium (Mg)-Dissolved			0.0537	B	mg/L		0.005	18-MAR-21
Manganese (Mn)-Dissolved			<0.00050		mg/L		0.0005	18-MAR-21
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	18-MAR-21
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	18-MAR-21
Phosphorus (P)-Dissolved			<0.050		mg/L		0.05	18-MAR-21
Potassium (K)-Dissolved			<0.050		mg/L		0.05	18-MAR-21
Rubidium (Rb)-Dissolved			<0.00020		mg/L		0.0002	18-MAR-21
Selenium (Se)-Dissolved			<0.000050		mg/L		0.00005	18-MAR-21
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	18-MAR-21
Silver (Ag)-Dissolved			<0.000050		mg/L		0.00005	18-MAR-21
Sodium (Na)-Dissolved			0.065	B	mg/L		0.05	18-MAR-21
Strontium (Sr)-Dissolved			<0.0010		mg/L		0.001	18-MAR-21
Sulfur (S)-Dissolved			<0.50		mg/L		0.5	18-MAR-21
Tellurium (Te)-Dissolved			<0.00020		mg/L		0.0002	18-MAR-21

Quality Control Report

Client: Thurber Engineering Ltd. (Oakville)
2010 Winston Park Drive Unit 103
Oakville ON L6H 5R7
Contact: Rachel Bourassa

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-WT	**Water**							
Batch R5403719								
WG3504802-1 MB								
Thallium (Tl)-Dissolved			<0.000010		mg/L		0.00001	18-MAR-21
Thorium (Th)-Dissolved			<0.00010		mg/L		0.0001	18-MAR-21
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	18-MAR-21
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	18-MAR-21
Tungsten (W)-Dissolved			<0.00010		mg/L		0.0001	18-MAR-21
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	18-MAR-21
Vanadium (V)-Dissolved			<0.00050		mg/L		0.0005	18-MAR-21
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	18-MAR-21
Zirconium (Zr)-Dissolved			<0.00020		mg/L		0.0002	18-MAR-21
WG3504802-5 MS		**WG3504802-6**						
Aluminum (Al)-Dissolved			102.3		%		70-130	18-MAR-21
Antimony (Sb)-Dissolved			94.5		%		70-130	18-MAR-21
Arsenic (As)-Dissolved			75.1		%		70-130	18-MAR-21
Barium (Ba)-Dissolved			N/A	MS-B	%		-	18-MAR-21
Beryllium (Be)-Dissolved			108.4		%		70-130	18-MAR-21
Bismuth (Bi)-Dissolved			99.1		%		70-130	18-MAR-21
Boron (B)-Dissolved			N/A	MS-B	%		-	18-MAR-21
Cadmium (Cd)-Dissolved			103.2		%		70-130	18-MAR-21
Calcium (Ca)-Dissolved			N/A	MS-B	%		-	18-MAR-21
Cesium (Cs)-Dissolved			95.5		%		70-130	18-MAR-21
Chromium (Cr)-Dissolved			105.3		%		70-130	18-MAR-21
Cobalt (Co)-Dissolved			73.7		%		70-130	18-MAR-21
Copper (Cu)-Dissolved			82.9		%		70-130	18-MAR-21
Iron (Fe)-Dissolved			90.3		%		70-130	18-MAR-21
Lead (Pb)-Dissolved			100.3		%		70-130	18-MAR-21
Lithium (Li)-Dissolved			N/A	MS-B	%		-	18-MAR-21
Magnesium (Mg)-Dissolved			N/A	MS-B	%		-	18-MAR-21
Manganese (Mn)-Dissolved			N/A	MS-B	%		-	18-MAR-21
Phosphorus (P)-Dissolved			116.0		%		70-130	18-MAR-21
Potassium (K)-Dissolved			N/A	MS-B	%		-	18-MAR-21
Rubidium (Rb)-Dissolved			N/A	MS-B	%		-	18-MAR-21
Selenium (Se)-Dissolved			94.0		%		70-130	18-MAR-21
Silicon (Si)-Dissolved			N/A	MS-B	%		-	18-MAR-21
Silver (Ag)-Dissolved			103.3		%		70-130	18-MAR-21

Quality Control Report

Client: Thurber Engineering Ltd. (Oakville)
2010 Winston Park Drive Unit 103
Oakville ON L6H 5R7
Contact: Rachel Bourassa

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-WT	**Water**							
Batch R5403719								
WG3504802-5 MS		**WG3504802-6**						
Sodium (Na)-Dissolved			N/A	MS-B	%		-	18-MAR-21
Strontium (Sr)-Dissolved			N/A	MS-B	%		-	18-MAR-21
Sulfur (S)-Dissolved			N/A	MS-B	%		-	18-MAR-21
Tellurium (Te)-Dissolved			95.9		%		70-130	18-MAR-21
Thallium (Tl)-Dissolved			100.2		%		70-130	18-MAR-21
Thorium (Th)-Dissolved			105.0		%		70-130	18-MAR-21
Tin (Sn)-Dissolved			103.4		%		70-130	18-MAR-21
Titanium (Ti)-Dissolved			104.3		%		70-130	18-MAR-21
Tungsten (W)-Dissolved			N/A	MS-B	%		-	18-MAR-21
Uranium (U)-Dissolved			N/A	MS-B	%		-	18-MAR-21
Vanadium (V)-Dissolved			107.3		%		70-130	18-MAR-21
Zinc (Zn)-Dissolved			84.0		%		70-130	18-MAR-21
Zirconium (Zr)-Dissolved			103.4		%		70-130	18-MAR-21
MET-T-CCMS-WT	**Water**							
Batch R5401825								
WG3502672-4 DUP		**WG3502672-3**						
Aluminum (Al)-Total		<0.050	<0.050	RPD-NA	mg/L	N/A	20	16-MAR-21
Antimony (Sb)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	16-MAR-21
Arsenic (As)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	16-MAR-21
Barium (Ba)-Total		2.07	2.07		mg/L	0.1	20	16-MAR-21
Beryllium (Be)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	16-MAR-21
Bismuth (Bi)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	16-MAR-21
Boron (B)-Total		<0.10	<0.10	RPD-NA	mg/L	N/A	20	16-MAR-21
Cadmium (Cd)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	16-MAR-21
Calcium (Ca)-Total		400	404		mg/L	1.0	20	16-MAR-21
Chromium (Cr)-Total		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	16-MAR-21
Cesium (Cs)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	16-MAR-21
Cobalt (Co)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	16-MAR-21
Copper (Cu)-Total		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	16-MAR-21
Iron (Fe)-Total		1.40	1.39		mg/L	0.5	20	16-MAR-21
Lead (Pb)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	16-MAR-21
Lithium (Li)-Total		0.014	0.014		mg/L	1.6	20	16-MAR-21
Magnesium (Mg)-Total		177	178		mg/L	0.9	20	16-MAR-21

Quality Control Report

Client: Thurber Engineering Ltd. (Oakville)
2010 Winston Park Drive Unit 103
Oakville ON L6H 5R7
Contact: Rachel Bourassa

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R5401825								
WG3502672-4 DUP		**WG3502672-3**						
Manganese (Mn)-Total		0.157	0.157		mg/L	0.1	20	16-MAR-21
Molybdenum (Mo)-Total		0.00158	0.00157		mg/L	0.5	20	16-MAR-21
Nickel (Ni)-Total		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	16-MAR-21
Phosphorus (P)-Total		<0.50	<0.50	RPD-NA	mg/L	N/A	20	16-MAR-21
Potassium (K)-Total		8.35	8.35		mg/L	0.1	20	16-MAR-21
Rubidium (Rb)-Total		0.0044	0.0038		mg/L	14	20	16-MAR-21
Selenium (Se)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	16-MAR-21
Silicon (Si)-Total		11.9	12.0		mg/L	0.9	20	16-MAR-21
Silver (Ag)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	16-MAR-21
Sodium (Na)-Total		847	856		mg/L	1.1	20	16-MAR-21
Strontium (Sr)-Total		3.93	4.04		mg/L	2.6	20	16-MAR-21
Sulfur (S)-Total		8.5	8.4		mg/L	1.4	20	16-MAR-21
Thallium (Tl)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	16-MAR-21
Tellurium (Te)-Total		<0.0020	<0.0020	RPD-NA	mg/L	N/A	20	16-MAR-21
Thorium (Th)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	16-MAR-21
Tin (Sn)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	16-MAR-21
Titanium (Ti)-Total		<0.0030	<0.0030	RPD-NA	mg/L	N/A	20	16-MAR-21
Tungsten (W)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	16-MAR-21
Uranium (U)-Total		0.00030	0.00030		mg/L	1.2	20	16-MAR-21
Vanadium (V)-Total		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	16-MAR-21
Zinc (Zn)-Total		<0.030	<0.030	RPD-NA	mg/L	N/A	20	16-MAR-21
Zirconium (Zr)-Total		<0.0020	<0.0020	RPD-NA	mg/L	N/A	20	16-MAR-21
WG3502672-2 LCS								
Aluminum (Al)-Total			105.0		%		80-120	16-MAR-21
Antimony (Sb)-Total			105.1		%		80-120	16-MAR-21
Arsenic (As)-Total			102.0		%		80-120	16-MAR-21
Barium (Ba)-Total			106.0		%		80-120	16-MAR-21
Beryllium (Be)-Total			99.9		%		80-120	16-MAR-21
Bismuth (Bi)-Total			104.4		%		80-120	16-MAR-21
Boron (B)-Total			100.6		%		80-120	16-MAR-21
Cadmium (Cd)-Total			103.2		%		80-120	16-MAR-21
Calcium (Ca)-Total			102.1		%		80-120	16-MAR-21
Chromium (Cr)-Total			104.2		%		80-120	16-MAR-21

Quality Control Report

Client: Thurber Engineering Ltd. (Oakville)
2010 Winston Park Drive Unit 103
Oakville ON L6H 5R7
Contact: Rachel Bourassa

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R5401825								
WG3502672-2 LCS								
Cesium (Cs)-Total			104.9		%		80-120	16-MAR-21
Cobalt (Co)-Total			103.4		%		80-120	16-MAR-21
Copper (Cu)-Total			100.5		%		80-120	16-MAR-21
Iron (Fe)-Total			104.4		%		80-120	16-MAR-21
Lead (Pb)-Total			104.9		%		80-120	16-MAR-21
Lithium (Li)-Total			101.4		%		80-120	16-MAR-21
Magnesium (Mg)-Total			108.2		%		80-120	16-MAR-21
Manganese (Mn)-Total			103.7		%		80-120	16-MAR-21
Molybdenum (Mo)-Total			101.1		%		80-120	16-MAR-21
Nickel (Ni)-Total			100.9		%		80-120	16-MAR-21
Phosphorus (P)-Total			108.4		%		70-130	16-MAR-21
Potassium (K)-Total			105.4		%		80-120	16-MAR-21
Rubidium (Rb)-Total			103.3		%		80-120	16-MAR-21
Selenium (Se)-Total			101.1		%		80-120	16-MAR-21
Silicon (Si)-Total			105.1		%		60-140	16-MAR-21
Silver (Ag)-Total			102.8		%		80-120	16-MAR-21
Sodium (Na)-Total			106.1		%		80-120	16-MAR-21
Strontium (Sr)-Total			102.8		%		80-120	16-MAR-21
Sulfur (S)-Total			101.5		%		80-120	16-MAR-21
Thallium (Tl)-Total			104.6		%		80-120	16-MAR-21
Tellurium (Te)-Total			95.7		%		80-120	16-MAR-21
Thorium (Th)-Total			107.0		%		80-120	16-MAR-21
Tin (Sn)-Total			102.7		%		80-120	16-MAR-21
Titanium (Ti)-Total			98.2		%		80-120	16-MAR-21
Tungsten (W)-Total			102.5		%		80-120	16-MAR-21
Uranium (U)-Total			109.6		%		80-120	16-MAR-21
Vanadium (V)-Total			105.5		%		80-120	16-MAR-21
Zinc (Zn)-Total			101.8		%		80-120	16-MAR-21
Zirconium (Zr)-Total			100.2		%		80-120	16-MAR-21
WG3502672-1 MB								
Aluminum (Al)-Total			<0.0050		mg/L		0.005	16-MAR-21
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	16-MAR-21
Arsenic (As)-Total			<0.00010		mg/L		0.0001	16-MAR-21
Barium (Ba)-Total			<0.00010		mg/L		0.0001	16-MAR-21

Quality Control Report

Client: Thurber Engineering Ltd. (Oakville)
2010 Winston Park Drive Unit 103
Oakville ON L6H 5R7
Contact: Rachel Bourassa

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R5401825								
WG3502672-1 MB								
Beryllium (Be)-Total			<0.00010		mg/L		0.0001	16-MAR-21
Bismuth (Bi)-Total			<0.000050		mg/L		0.00005	16-MAR-21
Boron (B)-Total			<0.010		mg/L		0.01	16-MAR-21
Cadmium (Cd)-Total			<0.000005C		mg/L		0.000005	16-MAR-21
Calcium (Ca)-Total			<0.050		mg/L		0.05	16-MAR-21
Chromium (Cr)-Total			<0.00050		mg/L		0.0005	16-MAR-21
Cesium (Cs)-Total			<0.000010		mg/L		0.00001	16-MAR-21
Cobalt (Co)-Total			<0.00010		mg/L		0.0001	16-MAR-21
Copper (Cu)-Total			<0.00050		mg/L		0.0005	16-MAR-21
Iron (Fe)-Total			<0.010		mg/L		0.01	16-MAR-21
Lead (Pb)-Total			<0.000050		mg/L		0.00005	16-MAR-21
Lithium (Li)-Total			<0.0010		mg/L		0.001	16-MAR-21
Magnesium (Mg)-Total			<0.0050		mg/L		0.005	16-MAR-21
Manganese (Mn)-Total			<0.00050		mg/L		0.0005	16-MAR-21
Molybdenum (Mo)-Total			<0.000050		mg/L		0.00005	16-MAR-21
Nickel (Ni)-Total			<0.00050		mg/L		0.0005	16-MAR-21
Phosphorus (P)-Total			<0.050		mg/L		0.05	16-MAR-21
Potassium (K)-Total			<0.050		mg/L		0.05	16-MAR-21
Rubidium (Rb)-Total			<0.00020		mg/L		0.0002	16-MAR-21
Selenium (Se)-Total			<0.000050		mg/L		0.00005	16-MAR-21
Silicon (Si)-Total			<0.10		mg/L		0.1	16-MAR-21
Silver (Ag)-Total			<0.000050		mg/L		0.00005	16-MAR-21
Sodium (Na)-Total			<0.050		mg/L		0.05	16-MAR-21
Strontium (Sr)-Total			<0.0010		mg/L		0.001	16-MAR-21
Sulfur (S)-Total			<0.50		mg/L		0.5	16-MAR-21
Thallium (Tl)-Total			<0.000010		mg/L		0.00001	16-MAR-21
Tellurium (Te)-Total			<0.00020		mg/L		0.0002	16-MAR-21
Thorium (Th)-Total			<0.00010		mg/L		0.0001	16-MAR-21
Tin (Sn)-Total			<0.00010		mg/L		0.0001	16-MAR-21
Titanium (Ti)-Total			<0.00030		mg/L		0.0003	16-MAR-21
Tungsten (W)-Total			<0.00010		mg/L		0.0001	16-MAR-21
Uranium (U)-Total			<0.000010		mg/L		0.00001	16-MAR-21
Vanadium (V)-Total			<0.00050		mg/L		0.0005	16-MAR-21

Quality Control Report

Client: Thurber Engineering Ltd. (Oakville)
2010 Winston Park Drive Unit 103
Oakville ON L6H 5R7
Contact: Rachel Bourassa

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R5401825								
WG3502672-1 MB								
Zinc (Zn)-Total			<0.0030		mg/L		0.003	16-MAR-21
Zirconium (Zr)-Total			<0.00020		mg/L		0.0002	16-MAR-21
WG3502672-5 MS		**WG3502672-3**						
Aluminum (Al)-Total			101.0		%		70-130	16-MAR-21
Antimony (Sb)-Total			106.4		%		70-130	16-MAR-21
Arsenic (As)-Total			101.5		%		70-130	16-MAR-21
Barium (Ba)-Total			N/A	MS-B	%		-	16-MAR-21
Beryllium (Be)-Total			104.0		%		70-130	16-MAR-21
Bismuth (Bi)-Total			97.7		%		70-130	16-MAR-21
Boron (B)-Total			92.7		%		70-130	16-MAR-21
Cadmium (Cd)-Total			98.9		%		70-130	16-MAR-21
Calcium (Ca)-Total			N/A	MS-B	%		-	16-MAR-21
Chromium (Cr)-Total			101.6		%		70-130	16-MAR-21
Cesium (Cs)-Total			104.7		%		70-130	16-MAR-21
Cobalt (Co)-Total			100.6		%		70-130	16-MAR-21
Copper (Cu)-Total			97.0		%		70-130	16-MAR-21
Iron (Fe)-Total			N/A	MS-B	%		-	16-MAR-21
Lead (Pb)-Total			98.8		%		70-130	16-MAR-21
Lithium (Li)-Total			N/A	MS-B	%		-	16-MAR-21
Magnesium (Mg)-Total			N/A	MS-B	%		-	16-MAR-21
Manganese (Mn)-Total			N/A	MS-B	%		-	16-MAR-21
Molybdenum (Mo)-Total			105.1		%		70-130	16-MAR-21
Phosphorus (P)-Total			111.3		%		70-130	16-MAR-21
Potassium (K)-Total			N/A	MS-B	%		-	16-MAR-21
Rubidium (Rb)-Total			100.3		%		70-130	16-MAR-21
Selenium (Se)-Total			99.8		%		70-130	16-MAR-21
Silicon (Si)-Total			N/A	MS-B	%		-	16-MAR-21
Silver (Ag)-Total			99.4		%		70-130	16-MAR-21
Sodium (Na)-Total			N/A	MS-B	%		-	16-MAR-21
Strontium (Sr)-Total			N/A	MS-B	%		-	16-MAR-21
Sulfur (S)-Total			N/A	MS-B	%		-	16-MAR-21
Thallium (Tl)-Total			98.1		%		70-130	16-MAR-21
Tellurium (Te)-Total			87.2		%		70-130	16-MAR-21
Thorium (Th)-Total			102.4		%		70-130	16-MAR-21

Quality Control Report

Client: Thurber Engineering Ltd. (Oakville)
2010 Winston Park Drive Unit 103
Oakville ON L6H 5R7
Contact: Rachel Bourassa

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R5401825								
WG3502672-5 MS		**WG3502672-3**						
Tin (Sn)-Total			102.0		%		70-130	16-MAR-21
Titanium (Ti)-Total			103.1		%		70-130	16-MAR-21
Tungsten (W)-Total			99.9		%		70-130	16-MAR-21
Uranium (U)-Total			N/A	MS-B	%		-	16-MAR-21
Vanadium (V)-Total			110.8		%		70-130	16-MAR-21
Zinc (Zn)-Total			101.2		%		70-130	16-MAR-21
Zirconium (Zr)-Total			101.0		%		70-130	16-MAR-21
NH3-F-WT	**Water**							
Batch R5406856								
WG3504783-3 DUP		**WG3504783-5**						
Ammonia, Total (as N)		<0.010	<0.010	RPD-NA	mg/L	N/A	20	19-MAR-21
WG3504783-2 LCS								
Ammonia, Total (as N)			100.5		%		85-115	19-MAR-21
WG3504783-1 MB								
Ammonia, Total (as N)			<0.010		mg/L		0.01	19-MAR-21
WG3504783-4 MS		**WG3504783-5**						
Ammonia, Total (as N)			98.6		%		75-125	19-MAR-21
NO2-IC-WT	**Water**							
Batch R5403000								
WG3503957-4 DUP		**WG3503957-3**						
Nitrite (as N)		<0.010	<0.010	RPD-NA	mg/L	N/A	20	17-MAR-21
WG3503957-2 LCS								
Nitrite (as N)			99.5		%		90-110	17-MAR-21
WG3503957-1 MB								
Nitrite (as N)			<0.010		mg/L		0.01	17-MAR-21
WG3503957-5 MS		**WG3503957-3**						
Nitrite (as N)			98.1		%		75-125	17-MAR-21
NO3-IC-WT	**Water**							
Batch R5403000								
WG3503957-4 DUP		**WG3503957-3**						
Nitrate (as N)		0.865	0.866		mg/L	0.2	20	17-MAR-21
WG3503957-2 LCS								
Nitrate (as N)			99.4		%		90-110	17-MAR-21
WG3503957-1 MB								
Nitrate (as N)			<0.020		mg/L		0.02	17-MAR-21
WG3503957-5 MS		**WG3503957-3**						

Quality Control Report

Client: Thurber Engineering Ltd. (Oakville)
2010 Winston Park Drive Unit 103
Oakville ON L6H 5R7
Contact: Rachel Bourassa

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NO3-IC-WT	**Water**							
Batch R5403000								
WG3503957-5 MS		**WG3503957-3**						
Nitrate (as N)			97.3		%		75-125	17-MAR-21
P-T-COL-WT	**Water**							
Batch R5407361								
WG3505159-3 DUP		**L2567022-1**						
Phosphorus, Total		0.0316	0.0319		mg/L	1.2	20	22-MAR-21
WG3505159-2 LCS								
Phosphorus, Total			98.0		%		80-120	22-MAR-21
WG3505159-1 MB								
Phosphorus, Total			<0.0030		mg/L		0.003	22-MAR-21
WG3505159-4 MS		**L2567022-1**						
Phosphorus, Total			92.3		%		70-130	22-MAR-21
PH-WT	**Water**							
Batch R5401759								
WG3502803-4 DUP		**WG3502803-3**						
pH		8.22	8.26	J	pH units	0.04	0.2	16-MAR-21
WG3502803-2 LCS								
pH			7.00		pH units		6.9-7.1	16-MAR-21
PO4-DO-COL-WT	**Water**							
Batch R5402904								
WG3504192-3 DUP		**L2566427-1**						
Orthophosphate-Dissolved (as P)		0.0287	0.0295		mg/L	2.8	20	18-MAR-21
WG3504192-2 LCS								
Orthophosphate-Dissolved (as P)			92.8		%		80-120	18-MAR-21
WG3504192-1 MB								
Orthophosphate-Dissolved (as P)			<0.0030		mg/L		0.003	18-MAR-21
WG3504192-4 MS		**L2566427-1**						
Orthophosphate-Dissolved (as P)			N/A	MS-B	%		-	18-MAR-21
SO4-IC-N-WT	**Water**							
Batch R5403000								
WG3503957-4 DUP		**WG3503957-3**						
Sulfate (SO4)		1.47	1.48		mg/L	0.1	20	17-MAR-21
WG3503957-2 LCS								
Sulfate (SO4)			100.6		%		90-110	17-MAR-21
WG3503957-1 MB								
Sulfate (SO4)			<0.30		mg/L		0.3	17-MAR-21

Quality Control Report

Client: Thurber Engineering Ltd. (Oakville)
2010 Winston Park Drive Unit 103
Oakville ON L6H 5R7
Contact: Rachel Bourassa

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
SO4-IC-N-WT	**Water**							
Batch R5403000								
WG3503957-5 MS		**WG3503957-3**						
Sulfate (SO4)			99.0		%		75-125	17-MAR-21
SOLIDS-TDS-WT	**Water**							
Batch R5407798								
WG3505168-3 DUP		**L2566855-1**						
Total Dissolved Solids		506	528		mg/L	4.3	20	19-MAR-21
WG3505168-2 LCS								
Total Dissolved Solids			92.3		%		85-115	19-MAR-21
WG3505168-1 MB								
Total Dissolved Solids			<10		mg/L		10	19-MAR-21
SOLIDS-TSS-WT	**Water**							
Batch R5408260								
WG3505171-3 DUP		**L2566855-1**						
Total Suspended Solids		140	163		mg/L	15	20	20-MAR-21
WG3505171-2 LCS								
Total Suspended Solids			103.5		%		85-115	20-MAR-21
WG3505171-1 MB								
Total Suspended Solids			<3.0		mg/L		3	20-MAR-21
TOC-WT	**Water**							
Batch R5406780								
WG3505015-3 DUP		**WG3505015-5**						
Total Organic Carbon		11.9	12.4		mg/L	3.9	20	19-MAR-21
WG3505015-2 LCS								
Total Organic Carbon			99.4		%		80-120	19-MAR-21
WG3505015-1 MB								
Total Organic Carbon			<0.50		mg/L		0.5	19-MAR-21
WG3505015-4 MS		**WG3505015-5**						
Total Organic Carbon			N/A	MS-B	%		-	19-MAR-21
TURBIDITY-WT	**Water**							
Batch R5401905								
WG3502964-3 DUP		**L2566851-17**						
Turbidity		33.5	33.0		NTU	1.5	15	16-MAR-21
WG3502964-2 LCS								
Turbidity			99.97		%		85-115	16-MAR-21
WG3502964-1 MB								
Turbidity			<0.10		NTU		0.1	16-MAR-21

Quality Control Report

Workorder: L2566855 Report Date: 15-APR-21

Client: Thurber Engineering Ltd. (Oakville)
2010 Winston Park Drive Unit 103
Oakville ON L6H 5R7
Contact: Rachel Bourassa

Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
B	Method Blank exceeds ALS DQO. Associated sample results which are < Limit of Reporting or > 5 times blank level are considered reliable.
J	Duplicate results and limits are expressed in terms of absolute difference.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Quality Control Report

Workorder: L2566855 Report Date: 15-APR-21

Client: Thurber Engineering Ltd. (Oakville)
2010 Winston Park Drive Unit 103
Oakville ON L6H 5R7
Contact: Rachel Bourassa

Hold Time Exceedances:

ALS Product Description	Sample ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Physical Tests							
Colour							
	1	12-MAR-21 14:00	15-MAR-21 20:00	48	78	hours	EHTR
	2	12-MAR-21 13:00	15-MAR-21 20:00	48	79	hours	EHTR
Turbidity							
	1	12-MAR-21 14:00	16-MAR-21 15:15	48	97	hours	EHTR
	2	12-MAR-21 13:00	16-MAR-21 15:15	48	98	hours	EHTR

Legend & Qualifier Definitions:

EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.
EHTR: Exceeded ALS recommended hold time prior to sample receipt.
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).

Notes*:
Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes.
Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L2566855 were received on 15-MAR-21 15:30.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes 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 pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

ALS www.alsglobal.com

Chain L2566855-COFC

COC Number: 20 -

Page 1 of 1

Report To	Contact and company name below will appear on the final report
Company:	Thurber Engineering Ltd.
Contact:	Rachel Bourassa
Phone:	905-829-8666
	Company address below will appear on the final report
Street:	2010 Winston Park Drive, Suite 103
City/Province:	Oakville, Ontario
Postal Code:	L6H 5R7
Invoice To	Same as Report To ☐ YES ☐ NO
	Copy of Invoice with Report ☐ YES ☐ NO
Company:	Thurber Engineering Ltd.
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 rbourassa@thurber.ca

Email 2

Email 3

Invoice Recipients

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax accountingON@thurber.ca

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 minimum

☐ 2 day [P2] if received by 3pm M-F - 50% rush surcharge minimum

☐ 1 day [E] if received by 3pm M-F - 100% rush surcharge minimum

☐ Same day [E2] if received by 10am M-S - 200% rush surcharge. Additional fees may apply to rush resuests on weekends, statutory holidays and non-routine tests

AFFIX ALS BARCODE LABEL HERE (ALS use only)

Date and Time Required for all E&P TATs:

For tests that can not be performed according to the TAT requested, you will be contacted.

Project Information

ALS Account # / Quote #:	25053 / Q84200
Job #:	30726
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): L2566855

ALS Contact: Amanda Overholster **Sampler:**

Analysis Request

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

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	ALK/BR/CL/F/N2/N3/PO4/SO4	COLOUR/EC/PH/TDS/TSS/TURB	HG/ION BAL/METALS	TP/NH3/TOC	CALC: SILICA/N2N3/HARDNESS		ON-SAN+STORM-NAP-WT		TSS	DISSOLVED METALS					SAMPLES ON HOLD	EXTENDED STORAGE REQUIRED	SUSPECTED HAZARD (see notes)
	BH06	12-Mar-21	14:00	GW	21	R	R	R	R	R		R		R	R							
	BH04D	12-Mar-21	13:00	GW	21	R	R	R	R	R		R		R	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)

PWQO, Napanee Storm + Sanitary

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			
				2.1	14		

SHIPMENT RELEASE (client use)

Released by:	Date:	Time:
Rachel Bourassa	3/15/2021	12:00

INITIAL SHIPMENT RECEPTION (lab use only)

Received by:	Date:	Time:

FINAL SHIPMENT RECEPTION (lab use only)

Received by:	Date:	Time:
	3/15/21	1531

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

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**.

Thurber Engineering Ltd. (Oakville)
ATTN: Rachel Bourassa
2010 Winston Park Drive
Unit 103
Oakville ON L6H 5R7

Date Received: 15-MAR-21
Report Date: 15-APR-21 13:53 (MT)
Version: FINAL REV. 7

Client Phone: 905-829-8666

Certificate of Analysis

Lab Work Order #: L2566855

Project P.O. #: NOT SUBMITTED
Job Reference: 30726
C of C Numbers:
Legal Site Desc:

Comments: ADDITIONAL 23-MAR-21 08:39

Amanda Overholster
Account Manager

Summary of Guideline Exceedances

ALS ID	Client ID	Grouping	Analyte	Result	Guideline Limit	Unit
Guideline						
Ontario Napanee Sanitary and Storm Sewer By-Law 2012-39 - Ontario Napanee Sanitary Sewer Discharge Limits						
(No parameter exceedances)						
Ontario Napanee Sanitary and Storm Sewer By-Law 2012-39 - Ontario Napanee Storm Sewer Discharge Limitis						
L2566855-1	BH06	Total Metals	Manganese (Mn)-Total	0.554	0.05	mg/L
			Phosphorus (P)-Total	0.85	0.3	mg/L
			Zinc (Zn)-Total	0.097	0.04	mg/L
L2566855-2	BH04D	Total Metals	Manganese (Mn)-Total	0.0631	0.05	mg/L

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Physical Tests - WATER

			Lab ID	L2566855-1	L2566855-2
			Sample Date	12-MAR-21	12-MAR-21
			Sample ID	BH06	BH04D
Analyte	**Unit**	**Guide Limits #1**	**#2**		
pH	pH units	-	6.0-9.5	7.60	7.91
Total Suspended Solids	mg/L	350	-	140 DLHC	23.3

Guide Limit #1: Ontario Napanee Sanitary Sewer Discharge Limits
Guide Limit #2: Ontario Napanee Storm Sewer Discharge Limitis

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Anions and Nutrients - WATER

			Lab ID	L2566855-1	L2566855-2
			Sample Date	12-MAR-21	12-MAR-21
			Sample ID	BH06	BH04D
		Guide Limits			
Analyte	Unit	#1	#2		
Fluoride (F)	mg/L	10	-	0.093	0.143
Total Kjeldahl Nitrogen	mg/L	100	-	0.340	0.150
Phosphorus, Total	mg/L	-	-	0.148	0.0111

Guide Limit #1: Ontario Napanee Sanitary Sewer Discharge Limits
Guide Limit #2: Ontario Napanee Storm Sewer Discharge Limitis

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

Cyanides - WATER

		Guide Limits			
Lab ID				L2566855-1	L2566855-2
Sample Date				12-MAR-21	12-MAR-21
Sample ID				BH06	BH04D
Analyte	**Unit**	**#1**	**#2**		
Cyanide, Total	mg/L	2.0	0.02	<0.0020	<0.0020

Guide Limit #1: Ontario Napanee Sanitary Sewer Discharge Limits
Guide Limit #2: Ontario Napanee Storm Sewer Discharge Limitis

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

ANALYTICAL REPORT

Bacteriological Tests - WATER

		Guide Limits			
Lab ID				L2566855-1	L2566855-2
Sample Date				12-MAR-21	12-MAR-21
Sample ID				BH06	BH04D
Analyte	**Unit**	**#1**	**#2**		
E. Coli	CFU/100mL	-	-	0 PEHR	0 PEHR

Guide Limit #1: Ontario Napanee Sanitary Sewer Discharge Limits
Guide Limit #2: Ontario Napanee Storm Sewer Discharge Limitis

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Total Metals - WATER

				Lab ID	L2566855-1	L2566855-2
				Sample Date	12-MAR-21	12-MAR-21
				Sample ID	BH06	BH04D
		Guide Limits				
Analyte	Unit	#1	#2			
Aluminum (Al)-Total	mg/L	50	-	21.0 DLHC	0.0837	
Antimony (Sb)-Total	mg/L	5	-	<0.0010 DLHC	0.00022	
Arsenic (As)-Total	mg/L	1.0	0.02	0.0039 DLHC	0.00117	
Barium (Ba)-Total	mg/L	-	-	0.596 DLHC	0.214	
Beryllium (Be)-Total	mg/L	-	-	<0.0010 DLHC	<0.00010	
Bismuth (Bi)-Total	mg/L	-	-	<0.00050 DLHC	<0.000050	
Boron (B)-Total	mg/L	-	-	<0.10 DLHC	0.040	
Cadmium (Cd)-Total	mg/L	0.7	0.008	0.000148 DLHC	<0.0000050	
Calcium (Ca)-Total	mg/L	-	-	183 DLHC	70.1	
Cesium (Cs)-Total	mg/L	-	-	0.00154 DLHC	0.000013	
Chromium (Cr)-Total	mg/L	4	0.04	0.0316 DLHC	<0.00050	
Cobalt (Co)-Total	mg/L	5	-	0.0129 DLHC	0.00103	
Copper (Cu)-Total	mg/L	2	0.04	0.0353 DLHC	<0.00050	
Iron (Fe)-Total	mg/L	-	-	26.4 DLHC	0.086	
Lead (Pb)-Total	mg/L	1.0	0.12	0.0247 DLHC	0.000082	
Lithium (Li)-Total	mg/L	-	-	0.022 DLHC	0.0075	
Magnesium (Mg)-Total	mg/L	-	-	49.0 DLHC	45.0	
Manganese (Mn)-Total	mg/L	5	0.05	0.554 DLHC	0.0631	
Mercury (Hg)-Total	mg/L	0.01	0.0004	0.0000065	<0.0000050 SRU	
Molybdenum (Mo)-Total	mg/L	5	-	0.00056 DLHC	0.00316	
Nickel (Ni)-Total	mg/L	2	0.08	0.0287 DLHC	0.00173	
Phosphorus (P)-Total	mg/L	10	0.3	0.85 DLHC	<0.050	
Potassium (K)-Total	mg/L	-	-	8.15 DLHC	2.47	
Rubidium (Rb)-Total	mg/L	-	-	0.0373 DLHC	0.00172	
Selenium (Se)-Total	mg/L	1.0	0.02	<0.00050 DLHC	0.000258	
Silicon (Si)-Total	mg/L	-	-	46.6 DLHC	11.0	
Silver (Ag)-Total	mg/L	5.0	0.12	<0.00050 DLHC	<0.000050	
Sodium (Na)-Total	mg/L	-	-	36.3 DLHC	45.5	
Strontium (Sr)-Total	mg/L	-	-	0.496 DLHC	0.969	
Sulfur (S)-Total	mg/L	-	-	10.4 DLHC	22.1	

Guide Limit #1: Ontario Napanee Sanitary Sewer Discharge Limits
Guide Limit #2: Ontario Napanee Storm Sewer Discharge Limitis

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Total Metals - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID: L2566855-1 Sample Date: 12-MAR-21 Sample ID: BH06	Lab ID: L2566855-2 Sample Date: 12-MAR-21 Sample ID: BH04D
Tellurium (Te)-Total	mg/L	-	-	<0.0020 DLHC	<0.00020
Thallium (Tl)-Total	mg/L	-	-	0.00031 DLHC	0.000016
Thorium (Th)-Total	mg/L	-	-	0.0053 DLHC	<0.00010
Tin (Sn)-Total	mg/L	5.0	-	0.0011 DLHC	0.00198
Titanium (Ti)-Total	mg/L	5.0	-	1.26 DLHC	0.00445
Tungsten (W)-Total	mg/L	-	-	<0.0010 DLHC	<0.00010
Uranium (U)-Total	mg/L	-	-	0.00123 DLHC	0.00221
Vanadium (V)-Total	mg/L	-	-	0.0438 DLHC	0.00136
Zinc (Zn)-Total	mg/L	2	0.04	0.097 DLHC	<0.0030
Zirconium (Zr)-Total	mg/L	-	-	<0.0020 DLHC	<0.00020

Guide Limit #1: Ontario Napanee Sanitary Sewer Discharge Limits
Guide Limit #2: Ontario Napanee Storm Sewer Discharge Limitis

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Speciated Metals - WATER

			Lab ID	L2566855-1	L2566855-2
			Sample Date	12-MAR-21	12-MAR-21
			Sample ID	BH06	BH04D
Analyte	**Unit**	**Guide Limits #1**	**#2**		
Chromium, Hexavalent	mg/L	2.0	0.08	<0.00050	<0.00050

Guide Limit #1: Ontario Napanee Sanitary Sewer Discharge Limits
Guide Limit #2: Ontario Napanee Storm Sewer Discharge Limitis

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Aggregate Organics - WATER

			Lab ID	L2566855-1	L2566855-2
			Sample Date	12-MAR-21	12-MAR-21
			Sample ID	BH06	BH04D
Analyte	**Unit**	**Guide Limits #1**	**#2**		
BOD Carbonaceous	mg/L	-	-	<3.0 BODL	<3.0 BODL
COD	mg/L	800	40	15	<10
Oil and Grease, Total	mg/L	-	-	<5.0	<5.0
Animal/Veg Oil & Grease	mg/L	150	-	<5.0	<5.0
Mineral Oil and Grease	mg/L	15	-	<2.5	<2.5
Phenols (4AAP)	mg/L	1.0	0.008	<0.0010	<0.0010

Guide Limit #1: Ontario Napanee Sanitary Sewer Discharge Limits
Guide Limit #2: Ontario Napanee Storm Sewer Discharge Limitis

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

Volatile Organic Compounds - WATER

				Lab ID	L2566855-1	L2566855-2
				Sample Date	12-MAR-21	12-MAR-21
				Sample ID	BH06	BH04D
		Guide Limits				
Analyte	Unit	#1	#2			
Acetone	ug/L	-	-	<20 OWP	<20	
Benzene	ug/L	10	2	<0.50 OWP	<0.50	
Bromodichloromethane	ug/L	-	-	<1.0 OWP	<1.0	
Bromoform	ug/L	-	-	<1.0 OWP	<1.0	
Bromomethane	ug/L	-	-	<0.50 OWP	<0.50	
Carbon Disulfide	ug/L	-	-	<1.0 OWP	<1.0	
Carbon tetrachloride	ug/L	-	-	<0.20 OWP	<0.20	
Chlorobenzene	ug/L	-	-	<0.50 OWP	<0.50	
Dibromochloromethane	ug/L	-	-	<1.0 OWP	<1.0	
Chloroethane	ug/L	-	-	<1.0 OWP	<1.0	
Chloroform	ug/L	40	2	<1.0 OWP	<1.0	
Chloromethane	ug/L	-	-	<1.0 OWP	<1.0	
1,2-Dibromoethane	ug/L	-	-	<0.20 OWP	<0.20	
1,2-Dichlorobenzene	ug/L	50	5.6	<0.50 OWP	<0.50	
1,3-Dichlorobenzene	ug/L	-	-	<0.50 OWP	<0.50	
1,4-Dichlorobenzene	ug/L	80	6.8	<0.50 OWP	<0.50	
Dichlorodifluoromethane	ug/L	-	-	<1.0 OWP	<1.0	
1,1-Dichloroethane	ug/L	-	-	<0.50 OWP	<0.50	
1,2-Dichloroethane	ug/L	-	-	<0.50 OWP	<0.50	
1,1-Dichloroethylene	ug/L	-	-	<0.50 OWP	<0.50	
cis-1,2-Dichloroethylene	ug/L	4000	5.6	<0.50 OWP	<0.50	
trans-1,2-Dichloroethylene	ug/L	-	-	<0.50 OWP	<0.50	
Dichloromethane	ug/L	2000	5.2	<2.0 OWP	<2.0	
1,2-Dichloropropane	ug/L	-	-	<0.50 OWP	<0.50	
cis-1,3-Dichloropropene	ug/L	-	-	<0.30 OWP	<0.30	
trans-1,3-Dichloropropene	ug/L	140	5.6	<0.30 OWP	<0.30	
Ethylbenzene	ug/L	160	2	<0.50 OWP	<0.50	
n-Hexane	ug/L	-	-	<0.50 OWP	<0.50	
2-Hexanone	ug/L	-	-	<20 OWP	<20	
Methyl Ethyl Ketone	ug/L	-	-	<20 OWP	<20	

Guide Limit #1: Ontario Napanee Sanitary Sewer Discharge Limits
Guide Limit #2: Ontario Napanee Storm Sewer Discharge Limitis

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

Volatile Organic Compounds - WATER

				Lab ID	L2566855-1	L2566855-2
				Sample Date	12-MAR-21	12-MAR-21
				Sample ID	BH06	BH04D
Analyte	Unit	Guide Limits #1	#2			
Methyl Isobutyl Ketone	ug/L	-	-	<20 OWP	<20	
MTBE	ug/L	-	-	<0.50 OWP	<0.50	
Styrene	ug/L	-	-	<0.50 OWP	<0.50	
1,1,1,2-Tetrachloroethane	ug/L	-	-	<0.50 OWP	<0.50	
1,1,2,2-Tetrachloroethane	ug/L	1400	-	<0.50 OWP	<0.50	
Tetrachloroethylene	ug/L	1000	4.4	<0.50 OWP	<0.50	
Toluene	ug/L	16	2	<0.40 OWP	<0.40	
1,1,1-Trichloroethane	ug/L	-	-	<0.50 OWP	<0.50	
1,1,2-Trichloroethane	ug/L	-	-	<0.50 OWP	<0.50	
Trichloroethylene	ug/L	400	7.6	<0.50 OWP	<0.50	
Trichlorofluoromethane	ug/L	-	-	<1.0 OWP	<1.0	
Vinyl chloride	ug/L	-	-	<0.50 OWP	<0.50	
o-Xylene	ug/L	-	-	<0.30 OWP	<0.30	
m+p-Xylenes	ug/L	-	-	<0.40 OWP	<0.40	
Xylenes (Total)	ug/L	1400	4.4	<0.50	<0.50	
Surrogate: 4-Bromofluorobenzene	%	-	-	86.9	86.9	
Surrogate: 1,4-Difluorobenzene	%	-	-	99.5	99.4	

Guide Limit #1: Ontario Napanee Sanitary Sewer Discharge Limits
Guide Limit #2: Ontario Napanee Storm Sewer Discharge Limitis

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

Polycyclic Aromatic Hydrocarbons - WATER

			Lab ID	L2566855-1	L2566855-2
			Sample Date	12-MAR-21	12-MAR-21
			Sample ID	BH06	BH04D
Analyte	Unit	Guide Limits #1	#2		
Acenaphthene	ug/L	-	-	<0.020	<0.020
Acenaphthylene	ug/L	-	-	<0.020	<0.020
Anthracene	ug/L	-	-	<0.020	<0.020
Benzo(a)anthracene	ug/L	-	-	<0.020	<0.020
Benzo(a)pyrene	ug/L	-	-	<0.010	<0.010
Benzo(b&j)fluoranthene	ug/L	-	-	<0.020	<0.020
Benzo(g,h,i)perylene	ug/L	-	-	<0.020	<0.020
Benzo(k)fluoranthene	ug/L	-	-	<0.020	<0.020
Chrysene	ug/L	-	-	<0.020	<0.020
Dibenz(a,h)anthracene	ug/L	-	-	<0.020	<0.020
Fluoranthene	ug/L	-	-	<0.020	<0.020
Fluorene	ug/L	-	-	<0.020	<0.020
Indeno(1,2,3-cd)pyrene	ug/L	-	-	<0.020	<0.020
1+2-Methylnaphthalenes	ug/L	-	-	<0.028	<0.028
1-Methylnaphthalene	ug/L	-	-	<0.020	<0.020
2-Methylnaphthalene	ug/L	-	-	<0.020	<0.020
Naphthalene	ug/L	-	-	<0.050	<0.050
Phenanthrene	ug/L	-	-	<0.020	<0.020
Pyrene	ug/L	-	-	<0.020	<0.020
Surrogate: Chrysene d12	%	-	-	52.1	51.3
Surrogate: Naphthalene d8	%	-	-	69.0	63.0
Surrogate: Phenanthrene d10	%	-	-	64.1	60.9
Total PAHs	ug/L	5	2	<0.095	<0.095

Guide Limit #1: Ontario Napanee Sanitary Sewer Discharge Limits
Guide Limit #2: Ontario Napanee Storm Sewer Discharge Limitis

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

Semi-Volatile Organics - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID: L2566855-1 Sample Date: 12-MAR-21 Sample ID: BH06	Lab ID: L2566855-2 Sample Date: 12-MAR-21 Sample ID: BH04D
Aldrin + Dieldrin	ug/L	0.2	0.08	<0.011	<0.011
3,3'-Dichlorobenzidine	ug/L	2	0.8	<0.40	<0.40
Di-n-butylphthalate	ug/L	80	15	<1.0	<1.0
Bis(2-ethylhexyl)phthalate	ug/L	12	8.8	<2.0	<2.0
Pentachlorophenol	ug/L	5	2	<0.50	<0.50
Surrogate: 2-Fluorobiphenyl	%	-	-	81.7	88.5
Surrogate: p-Terphenyl d14	%	-	-	98.9	100.2
Surrogate: 2,4,6-Tribromophenol	%	-	-	109.0	109.2

Guide Limit #1: Ontario Napanee Sanitary Sewer Discharge Limits
Guide Limit #2: Ontario Napanee Storm Sewer Discharge Limitis

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

Polychlorinated Biphenyls - WATER

			Lab ID	L2566855-1	L2566855-2
			Sample Date	12-MAR-21	12-MAR-21
			Sample ID	BH06	BH04D
		Guide Limits			
Analyte	Unit	#1	#2		
Aroclor 1242	ug/L	-	-	<0.020	<0.020
Aroclor 1248	ug/L	-	-	<0.020	<0.020
Aroclor 1254	ug/L	-	-	<0.020	<0.020
Aroclor 1260	ug/L	-	-	<0.020	<0.020
Surrogate: Decachlorobiphenyl	%	-	-	82.9	117.3
Total PCBs	ug/L	-	-	<0.040	<0.040
Surrogate: Tetrachloro-m-xylene	%	-	-	119.9	94.1

Guide Limit #1: Ontario Napanee Sanitary Sewer Discharge Limits
Guide Limit #2: Ontario Napanee Storm Sewer Discharge Limitis

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Organochlorine Pesticides - WATER

				Lab ID	L2566855-1	L2566855-2
				Sample Date	12-MAR-21	12-MAR-21
				Sample ID	BH06	BH04D
		Guide Limits				
Analyte	Unit	#1	#2			
Aldrin	ug/L	-	-		<0.0080	<0.0080
alpha-BHC	ug/L	-	-		<0.0080	<0.0080
beta-BHC	ug/L	-	-		<0.0080	<0.0080
gamma-hexachlorocyclohexane	ug/L	-	-		<0.0080	<0.0080
delta-BHC	ug/L	-	-		<0.0080	<0.0080
a-chlordane	ug/L	-	-		<0.0080	<0.0080
Chlordane (Total)	ug/L	100	40		<0.011	<0.011
g-chlordane	ug/L	-	-		<0.0080	<0.0080
o,p-DDD	ug/L	-	-		<0.0040	<0.0040
pp-DDD	ug/L	-	-		<0.0040	<0.0040
Total DDD	ug/L	-	-		<0.0057	<0.0057
o,p-DDE	ug/L	-	-		<0.0040	<0.0040
pp-DDE	ug/L	-	-		<0.0040	<0.0040
Total DDE	ug/L	-	-		<0.0057	<0.0057
op-DDT	ug/L	-	-		<0.0040	<0.0040
pp-DDT	ug/L	-	-		<0.0040	<0.0040
Total DDT	ug/L	-	-		<0.0057	<0.0057
DDT+Metabolites	ug/L	0.1	0.04		<0.0098	<0.0098
Dieldrin	ug/L	-	-		<0.0080	<0.0080
Endosulfan I	ug/L	-	-		<0.0070	<0.0070
Endosulfan II	ug/L	-	-		<0.0070	<0.0070
Endosulfan Sulfate	ug/L	-	-		<0.0070	<0.0070
Endrin	ug/L	-	-		<0.025 RRR	<0.010
Endrin Aldehyde	ug/L	-	-		<0.010	<0.010
Heptachlor	ug/L	-	-		<0.0080	<0.0080
Heptachlor Epoxide	ug/L	-	-		<0.0080	<0.0080
Hexachlorobenzene	ug/L	0.1	0.04		<0.0080	<0.0080
Hexachlorobutadiene	ug/L	-	-		<0.0080	<0.0080
Hexachloroethane	ug/L	-	-		<0.0080	<0.0080
Methoxychlor	ug/L	-	-		<0.0080	<0.0080

Guide Limit #1: Ontario Napanee Sanitary Sewer Discharge Limits
Guide Limit #2: Ontario Napanee Storm Sewer Discharge Limitis

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Organochlorine Pesticides - WATER

			Lab ID	L2566855-1	L2566855-2
			Sample Date	12-MAR-21	12-MAR-21
			Sample ID	BH06	BH04D
		Guide Limits			
Analyte	Unit	#1	#2		
Mirex	ug/L	100	40	<0.0080	<0.0080
trans-Nonachlor	ug/L	-	-	<0.010	<0.010
Oxychlordane	ug/L	-	-	<0.0080	<0.0080
Pentachloronitrobenzene	ug/L	-	-	<0.010	<0.010
Surrogate: Decachlorobiphenyl	%	-	-	70.0	125.5
Surrogate: Tetrachloro-m-xylene	%	-	-	88.9	87.0

Guide Limit #1: Ontario Napanee Sanitary Sewer Discharge Limits
Guide Limit #2: Ontario Napanee Storm Sewer Discharge Limitis

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Organic Parameters - WATER

			Lab ID	L2566855-1	L2566855-2
			Sample Date	12-MAR-21	12-MAR-21
			Sample ID	BH06	BH04D
		Guide Limits			
Analyte	Unit	#1	#2		
Nonylphenol	ug/L	-	1	<1.0	<1.0
Nonylphenol Diethoxylates	ug/L	-	-	<0.10	<0.10
Total Nonylphenol Ethoxylates	ug/L	200	10	<2.0	<2.0
Nonylphenol Monoethoxylates	ug/L	-	-	<2.0	<2.0

Guide Limit #1: Ontario Napanee Sanitary Sewer Discharge Limits
Guide Limit #2: Ontario Napanee Storm Sewer Discharge Limitis

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

Reference Information

Additional Comments for Sample Listed:

Samplenum	Matrix	Report Remarks	Sample Comments
L2566855-1	Water	Note: RRR: Detection limits adjusted due to low recovery in LCS.	

Qualifiers for Individual Parameters Listed:

Qualifier	Description
PEHR	Parameter Exceeded Recommended Holding Time On Receipt: Proceed With Analysis As Requested.
BODL	Limit of Reporting for BOD was increased to account for the largest volume of sample tested.
OWP	Organic water sample contained visible sediment (must be included as part of analysis). Measured concentrations of organic substances in water can be biased high due to presence of

Reference Information

sediment.

SRU	Sample Received Unpreserved. Results may be biased low for indicated parameter(s)
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).
RRR	Refer to Report Remarks for issues regarding this analysis

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Method Reference**
625-SAN-WT	Water	Ontario Sanitary Sewer SVOC Target List	SW-846 8270

Samples are extracted with solvent and then analyzed by GC/MS.

ALD+DIEL-CALC-WT	Water	Aldrin + Dieldrin Calculation	CALCULATION

This calculation represents the sum of the aldrin and dieldrin analyzed for in a given sample.

ALK-SPEC-PCT-WT	Water	Automated Speciated Alkalinity	APHA 2320B

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". 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.

BOD-C-WT	Water	BOD Carbonaceous	APHA 5210 B (CBOD)

This analysis is carried out using procedures adapted from APHA Method 5210B - "Biochemical Oxygen Demand (BOD)". All forms of biochemical oxygen demand (BOD) are determined by diluting and incubating a sample for a specified time period, and measuring the oxygen depletion using a dissolved oxygen meter. Dissolved BOD (SOLUBLE) is determined by filtering the sample through a glass fibre filter prior to dilution. Carbonaceous BOD (CBOD) is determined by adding a nitrification inhibitor to the diluted sample prior to incubation.

BR-IC-N-WT	Water	Bromide in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CHLORDANE-T-CALC-WT	Water	Chlordane Total sums	CALCULATION

Aqueous sample is extracted by liquid/liquid extraction with a solvent mix. After extraction, a number of clean up techniques may be applied, depending on the sample matrix and analyzed by GC/MS.

CL-IC-N-WT	Water	Chloride by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

CN-TOT-WT	Water	Cyanide, Total	ISO 14403-2

Total cyanide is determined by the combination of UV digestion and distillation. Cyanide is converted to cyanogen chloride by reacting with chloramine-T, the cyanogen chloride then reacts with a combination of barbituric acid and isonicotinic acid to form a highly colored complex.

When using this method, high levels of thiocyanate in samples can cause false positives at ~1-2% of the thiocyanate concentration. For samples with detectable cyanide analyzed by this method, ALS recommends analysis for thiocyanate to check for this potential interference

COD-T-WT	Water	Chemical Oxygen Demand	APHA 5220 D

This analysis is carried out using procedures adapted from APHA Method 5220 "Chemical Oxygen Demand (COD)". Chemical oxygen demand is determined using the closed reflux colourimetric method.

Reference Information

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Method Reference**
COLOUR-APPARENT-WT	Water	Colour	APHA 2120

Apparent Colour is measured spectrophotometrically by comparison to platinum-cobalt standards using the single wavelength method after sample decanting. Colour measurements can be highly pH dependent, and apply to the pH of the sample as received (at time of testing), without pH adjustment. Concurrent measurement of sample pH is recommended.

CR-CR6-IC-WT	Water	Chromium +6	EPA 7199

This analysis is carried out using procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846, Method 7199, published by the United States Environmental Protection Agency (EPA). The procedure involves analysis for chromium (VI) by ion chromatography using diphenylcarbazide in a sulphuric acid solution. Chromium (III) is calculated as the difference between the total chromium and the chromium (VI) results.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

DDD-DDE-DDT-CALC-WT	Water	DDD, DDE, DDT sums	CALCULATION

Calculation of Total DDD, Total DDE and Total DDT

EC-SCREEN-WT	Water	Conductivity Screen (Internal Use Only)	APHA 2510

Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.

EC-WT	Water	Conductivity	APHA 2510 B

Water samples can be measured directly by immersing the conductivity cell into the sample.

EC-WW-MF-WT	Water	E. Coli	SM 9222D

A 100 mL volume of sample is filtered through a membrane, the membrane is placed on mFC-BCIG agar and incubated at 44.5 –0 .2 °C for 24 – 2 h. Method ID: WT-TM-1200

ETL-N2N3-WT	Water	Calculate from NO2 + NO3	APHA 4110 B
ETL-SILICA-CALC-WT	Water	Calculate from SI-TOT-WT	EPA 200.8
F-IC-N-WT	Water	Fluoride in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

HARDNESS-CALC-WT	Water	Hardness	APHA 2340 B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-D-CVAA-WT	Water	Dissolved Mercury in Water by CVAAS	EPA 1631E (mod)

Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

HG-T-CVAA-WT	Water	Total Mercury in Water by CVAAS	EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS.

IONBALANCE-OP03-WT	Water	Detailed Ion Balance Calculation	APHA 1030E, 2330B, 2510A

Reference Information

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Method Reference**
MET-D-CCMS-WT	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

MET-T-CCMS-WT	Water	Total Metals in Water by CRC ICPMS	EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

METHYLNAPS-CALC-WT	Water	PAH-Calculated Parameters	SW846 8270
NH3-F-WT	Water	Ammonia in Water by Fluorescence	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NO2-IC-WT	Water	Nitrite in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-IC-WT	Water	Nitrate in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NP,NPE-LCMS-WT	Water	Nonylphenols and Ethoxylates by LC/MS-MS	J. Chrom A849 (1999) p.467-482

Water samples are filtered and analyzed on LCMS/MS by direct injection.

OCP-ROUTINE-WT	Water	Pesticides, Organochlorine in Water	SW846 8270

Samples are extracted using a solvent mixture and the resulting extracts are analyzed on GC/MSD

OGG-SPEC-CALC-WT	Water	Speciated Oil and Grease A/V Calc	CALCULATION

Sample is extracted with hexane, sample speciation into mineral and animal/vegetable fractions is achieved via silica gel separation and is then determined gravimetrically.

OGG-SPEC-WT	Water	Speciated Oil and Grease-Gravimetric	APHA 5520 B

The procedure involves an extraction of the entire water sample with hexane. Sample speciation into mineral and animal/vegetable fractions is achieved via silica gel separation and is then determined gravimetrically.

P-T-COL-WT	Water	Total P in Water by Colour	APHA 4500-P PHOSPHORUS

Reference Information

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Method Reference**

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is deteremined colourimetrically after persulphate digestion of the sample.

PAH-511-WT Water PAH-O. Reg 153/04 (July 2011) SW846 3510/8270

Aqueous samples, fortified with surrogates, are extracted using liquid/liquid extraction technique. The sample extracts are concentrated and then analyzed using GC/MS. Results for benzo(b) fluoranthene may include contributions from benzo(j)fluoranthene, if also present in the sample.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011), unless a subset of the Analytical Test Group (ATG) has been requested (the Protocol states that all analytes in an ATG must be reported).

PAH-SUM-CALC-WT Water TOTAL PAH's CALCULATION

Total PAH represents the sum of all PAH analytes reported for a given sample. Note that regulatory agencies and criteria differ in their definitions of Total PAH in terms of the individual PAH analytes to be included.

PCB-WT Water Polychlorinated Biphenyls EPA 8082

PCBs are extracted from an aqueous sample at neutral pH with aliquots of dichloromethane using a modified separatory funnel technique. The extracts are analyzed by GC/MSD.

PH-WT Water pH APHA 4500 H-Electrode

Water samples are analyzed directly by a calibrated pH meter.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011). Holdtime for samples under this regulation is 28 days

PHENOLS-4AAP-WT Water Phenol (4AAP) EPA 9066

An automated method is used to distill the sample. The distillate is then buffered to pH 9.4 which reacts with 4AAP and potassium ferricyanide to form a red complex which is measured colorimetrically.

PO4-DO-COL-WT Water Diss. Orthophosphate in Water by Colour APHA 4500-P PHOSPHORUS

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.

SO4-IC-N-WT Water Sulfate in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

SOLIDS-TDS-WT Water Total Dissolved Solids APHA 2540C

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Dissolved Solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.

SOLIDS-TSS-WT Water Suspended solids APHA 2540 D-Gravimetric

A well-mixed sample is filtered through a weighed standard glass fibre filter and the residue retained is dried in an oven at 104–1°C for a minimum of four hours or until a constant weight is achieved.

TKN-F-WT Water TKN in Water by Fluorescence J. ENVIRON. MONIT., 2005,7,37-42,RSC

Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection

TOC-WT Water Total Organic Carbon APHA 5310B

Reference Information

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Method Reference**
		Sample is injected into a heated reaction chamber which is packed with an oxidative catalyst. The water is vaporized and the organic cabon is oxidized to carbon dioxide. The carbon dioxide is transported in a carrier gas and is measured by a non-dispersive infrared detector.	
TURBIDITY-WT	Water	Turbidity	APHA 2130 B
		Sample result is based on a comparison of the intensity of the light scattered by the sample under defined conditions with the intensity of light scattered by a standard reference suspension under the same conditions. Sample readings are obtained from a Nephelometer.	
VOC-ROU-HS-WT	Water	Volatile Organic Compounds	SW846 8260
		Aqueous samples are analyzed by headspace-GC/MS.	
XYLENES-SUM-CALC-WT	Water	Sum of Xylene Isomer Concentrations	CALCULATION
		Total xylenes represents the sum of o-xylene and m&p-xylene.	

**ALS test methods may incorporate modifications from specified reference methods to improve performance.

Chain of Custody Numbers:

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
WT	ALS ENVIRONMENTAL - WATERLOO, ONTARIO, CANADA

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.
mg/kg - milligrams per kilogram based on dry weight of sample
mg/kg wwt - milligrams per kilogram based on wet weight of sample
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight
mg/L - unit of concentration based on volume, parts per million.
< - Less than.
D.L. - The reporting limit.
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Application of guidelines is provided "as is" without warranty of any kind, either expressed or implied, including, but not limited to, fitness for a particular purpose, or non-infringement. ALS assumes no responsibility for errors or omissions in the information. Guideline limits are not adjusted for the hardness, pH or temperature of the sample (the most conservative values are used). Measurement uncertainty is not applied to test results prior to comparison with specified criteria values.

Quality Control Report

Workorder: L2566855 Report Date: 15-APR-21

Client: Thurber Engineering Ltd. (Oakville)
2010 Winston Park Drive Unit 103
Oakville ON L6H 5R7
Contact: Rachel Bourassa

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
625-SAN-WT	**Water**							
Batch R5404640								
WG3504568-2 LCS								
3,3'-Dichlorobenzidine			63.7		%		50-140	19-MAR-21
Bis(2-ethylhexyl)phthalate			96.7		%		50-140	19-MAR-21
Di-n-butylphthalate			100.7		%		50-140	19-MAR-21
Pentachlorophenol			118.3		%		50-140	19-MAR-21
WG3504568-1 MB								
3,3'-Dichlorobenzidine			<0.40		ug/L		0.4	19-MAR-21
Bis(2-ethylhexyl)phthalate			<2.0		ug/L		2	19-MAR-21
Di-n-butylphthalate			<1.0		ug/L		1	19-MAR-21
Pentachlorophenol			<0.50		ug/L		0.5	19-MAR-21
Surrogate: 2-Fluorobiphenyl			89.1		%		40-130	19-MAR-21
Surrogate: 2,4,6-Tribromophenol			88.2		%		40-130	19-MAR-21
Surrogate: p-Terphenyl d14			118.8		%		40-130	19-MAR-21
WG3504568-4 MS		**WG3504568-3**						
3,3'-Dichlorobenzidine			54.7		%		50-150	19-MAR-21
Bis(2-ethylhexyl)phthalate			94.3		%		50-150	19-MAR-21
Di-n-butylphthalate			95.3		%		50-150	19-MAR-21
Pentachlorophenol			118.2		%		50-150	19-MAR-21
BOD-C-WT	**Water**							
Batch R5406442								
WG3503151-6 DUP		**L2566855-2**						
BOD Carbonaceous		<3.0	<3.0	RPD-NA	mg/L	N/A	30	16-MAR-21
WG3503151-7 LCS								
BOD Carbonaceous			97.0		%		85-115	16-MAR-21
WG3503151-5 MB								
BOD Carbonaceous			<2.0		mg/L		2	16-MAR-21
CN-TOT-WT	**Water**							
Batch R5402189								
WG3503477-3 DUP		**L2566643-1**						
Cyanide, Total		0.0024	0.0045	J	mg/L	0.0022	0.004	16-MAR-21
WG3503477-2 LCS								
Cyanide, Total			93.7		%		80-120	16-MAR-21
WG3503477-1 MB								
Cyanide, Total			<0.0020		mg/L		0.002	16-MAR-21
WG3503477-4 MS		**L2566643-1**						
Cyanide, Total			91.0		%		70-130	16-MAR-21

Quality Control Report

Workorder: L2566855 Report Date: 15-APR-21

Client: Thurber Engineering Ltd. (Oakville)
2010 Winston Park Drive Unit 103
Oakville ON L6H 5R7
Contact: Rachel Bourassa

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
COD-T-WT	**Water**							
Batch R5402971								
WG3504241-3 DUP		**L2566191-1**						
COD		24	26		mg/L	8.4	20	18-MAR-21
WG3504241-2 LCS								
COD			100.2		%		85-115	18-MAR-21
WG3504241-1 MB								
COD			<10		mg/L		10	18-MAR-21
WG3504241-4 MS		**L2566191-1**						
COD			98.5		%		75-125	18-MAR-21
CR-CR6-IC-WT	**Water**							
Batch R5402782								
WG3503887-4 DUP		**WG3503887-3**						
Chromium, Hexavalent		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	17-MAR-21
WG3503887-2 LCS								
Chromium, Hexavalent			100.6		%		80-120	17-MAR-21
WG3503887-1 MB								
Chromium, Hexavalent			<0.00050		mg/L		0.0005	17-MAR-21
WG3503887-5 MS		**WG3503887-3**						
Chromium, Hexavalent			97.9		%		70-130	17-MAR-21
EC-WW-MF-WT	**Water**							
Batch R5402520								
WG3502930-3 DUP		**L2566855-1**						
E. Coli		0	<10	RPD-NA	CFU/100mL	N/A	65	16-MAR-21
WG3502930-1 MB								
E. Coli			0		CFU/100mL		1	16-MAR-21
F-IC-N-WT	**Water**							
Batch R5403000								
WG3503957-4 DUP		**WG3503957-3**						
Fluoride (F)		0.075	0.075		mg/L	0.1	20	17-MAR-21
WG3503957-2 LCS								
Fluoride (F)			102.3		%		90-110	17-MAR-21
WG3503957-1 MB								
Fluoride (F)			<0.020		mg/L		0.02	17-MAR-21
WG3503957-5 MS		**WG3503957-3**						
Fluoride (F)			100.5		%		75-125	17-MAR-21
HG-T-CVAA-WT	**Water**							

Quality Control Report

Client: Thurber Engineering Ltd. (Oakville)
2010 Winston Park Drive Unit 103
Oakville ON L6H 5R7
Contact: Rachel Bourassa

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
HG-T-CVAA-WT	**Water**							
Batch R5401807								
WG3502836-4 DUP		**WG3502836-3**						
Mercury (Hg)-Total		<0.0000050	<0.000005C	RPD-NA	mg/L	N/A	20	16-MAR-21
WG3502836-2 LCS								
Mercury (Hg)-Total			103.0		%		80-120	16-MAR-21
WG3502836-1 MB								
Mercury (Hg)-Total			<0.000005C		mg/L		0.000005	16-MAR-21
WG3502836-6 MS		**WG3502836-5**						
Mercury (Hg)-Total			99.3		%		70-130	16-MAR-21
Batch R5407711								
WG3505207-3 DUP		**L2568290-1**						
Mercury (Hg)-Total		<0.0000050	<0.000005C	RPD-NA	mg/L	N/A	20	22-MAR-21
WG3505207-2 LCS								
Mercury (Hg)-Total			100.0		%		80-120	22-MAR-21
WG3505207-1 MB								
Mercury (Hg)-Total			<0.000005C		mg/L		0.000005	22-MAR-21
WG3505207-4 MS		**L2568425-1**						
Mercury (Hg)-Total			100.3		%		70-130	22-MAR-21
MET-T-CCMS-WT	**Water**							
Batch R5401825								
WG3502672-4 DUP		**WG3502672-3**						
Aluminum (Al)-Total		<0.050	<0.050	RPD-NA	mg/L	N/A	20	16-MAR-21
Antimony (Sb)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	16-MAR-21
Arsenic (As)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	16-MAR-21
Barium (Ba)-Total		2.07	2.07		mg/L	0.1	20	16-MAR-21
Beryllium (Be)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	16-MAR-21
Bismuth (Bi)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	16-MAR-21
Boron (B)-Total		<0.10	<0.10	RPD-NA	mg/L	N/A	20	16-MAR-21
Cadmium (Cd)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	16-MAR-21
Calcium (Ca)-Total		400	404		mg/L	1.0	20	16-MAR-21
Chromium (Cr)-Total		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	16-MAR-21
Cesium (Cs)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	16-MAR-21
Cobalt (Co)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	16-MAR-21
Copper (Cu)-Total		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	16-MAR-21
Iron (Fe)-Total		1.40	1.39		mg/L	0.5	20	16-MAR-21
Lead (Pb)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	16-MAR-21
Lithium (Li)-Total		0.014	0.014		mg/L	1.6	20	16-MAR-21

Quality Control Report

Client: Thurber Engineering Ltd. (Oakville)
2010 Winston Park Drive Unit 103
Oakville ON L6H 5R7
Contact: Rachel Bourassa

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R5401825								
WG3502672-4 DUP		**WG3502672-3**						
Magnesium (Mg)-Total		177	178		mg/L	0.9	20	16-MAR-21
Manganese (Mn)-Total		0.157	0.157		mg/L	0.1	20	16-MAR-21
Molybdenum (Mo)-Total		0.00158	0.00157		mg/L	0.5	20	16-MAR-21
Nickel (Ni)-Total		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	16-MAR-21
Phosphorus (P)-Total		<0.50	<0.50	RPD-NA	mg/L	N/A	20	16-MAR-21
Potassium (K)-Total		8.35	8.35		mg/L	0.1	20	16-MAR-21
Rubidium (Rb)-Total		0.0044	0.0038		mg/L	14	20	16-MAR-21
Selenium (Se)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	16-MAR-21
Silicon (Si)-Total		11.9	12.0		mg/L	0.9	20	16-MAR-21
Silver (Ag)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	16-MAR-21
Sodium (Na)-Total		847	856		mg/L	1.1	20	16-MAR-21
Strontium (Sr)-Total		3.93	4.04		mg/L	2.6	20	16-MAR-21
Sulfur (S)-Total		8.5	8.4		mg/L	1.4	20	16-MAR-21
Thallium (Tl)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	16-MAR-21
Tellurium (Te)-Total		<0.0020	<0.0020	RPD-NA	mg/L	N/A	20	16-MAR-21
Thorium (Th)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	16-MAR-21
Tin (Sn)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	16-MAR-21
Titanium (Ti)-Total		<0.0030	<0.0030	RPD-NA	mg/L	N/A	20	16-MAR-21
Tungsten (W)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	16-MAR-21
Uranium (U)-Total		0.00030	0.00030		mg/L	1.2	20	16-MAR-21
Vanadium (V)-Total		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	16-MAR-21
Zinc (Zn)-Total		<0.030	<0.030	RPD-NA	mg/L	N/A	20	16-MAR-21
Zirconium (Zr)-Total		<0.0020	<0.0020	RPD-NA	mg/L	N/A	20	16-MAR-21
WG3502672-2 LCS								
Aluminum (Al)-Total			105.0		%		80-120	16-MAR-21
Antimony (Sb)-Total			105.1		%		80-120	16-MAR-21
Arsenic (As)-Total			102.0		%		80-120	16-MAR-21
Barium (Ba)-Total			106.0		%		80-120	16-MAR-21
Beryllium (Be)-Total			99.9		%		80-120	16-MAR-21
Bismuth (Bi)-Total			104.4		%		80-120	16-MAR-21
Boron (B)-Total			100.6		%		80-120	16-MAR-21
Cadmium (Cd)-Total			103.2		%		80-120	16-MAR-21
Calcium (Ca)-Total			102.1		%		80-120	16-MAR-21

Quality Control Report

Client: Thurber Engineering Ltd. (Oakville)
2010 Winston Park Drive Unit 103
Oakville ON L6H 5R7
Contact: Rachel Bourassa

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R5401825								
WG3502672-2 LCS								
Chromium (Cr)-Total			104.2		%		80-120	16-MAR-21
Cesium (Cs)-Total			104.9		%		80-120	16-MAR-21
Cobalt (Co)-Total			103.4		%		80-120	16-MAR-21
Copper (Cu)-Total			100.5		%		80-120	16-MAR-21
Iron (Fe)-Total			104.4		%		80-120	16-MAR-21
Lead (Pb)-Total			104.9		%		80-120	16-MAR-21
Lithium (Li)-Total			101.4		%		80-120	16-MAR-21
Magnesium (Mg)-Total			108.2		%		80-120	16-MAR-21
Manganese (Mn)-Total			103.7		%		80-120	16-MAR-21
Molybdenum (Mo)-Total			101.1		%		80-120	16-MAR-21
Nickel (Ni)-Total			100.9		%		80-120	16-MAR-21
Phosphorus (P)-Total			108.4		%		70-130	16-MAR-21
Potassium (K)-Total			105.4		%		80-120	16-MAR-21
Rubidium (Rb)-Total			103.3		%		80-120	16-MAR-21
Selenium (Se)-Total			101.1		%		80-120	16-MAR-21
Silicon (Si)-Total			105.1		%		60-140	16-MAR-21
Silver (Ag)-Total			102.8		%		80-120	16-MAR-21
Sodium (Na)-Total			106.1		%		80-120	16-MAR-21
Strontium (Sr)-Total			102.8		%		80-120	16-MAR-21
Sulfur (S)-Total			101.5		%		80-120	16-MAR-21
Thallium (Tl)-Total			104.6		%		80-120	16-MAR-21
Tellurium (Te)-Total			95.7		%		80-120	16-MAR-21
Thorium (Th)-Total			107.0		%		80-120	16-MAR-21
Tin (Sn)-Total			102.7		%		80-120	16-MAR-21
Titanium (Ti)-Total			98.2		%		80-120	16-MAR-21
Tungsten (W)-Total			102.5		%		80-120	16-MAR-21
Uranium (U)-Total			109.6		%		80-120	16-MAR-21
Vanadium (V)-Total			105.5		%		80-120	16-MAR-21
Zinc (Zn)-Total			101.8		%		80-120	16-MAR-21
Zirconium (Zr)-Total			100.2		%		80-120	16-MAR-21
WG3502672-1 MB								
Aluminum (Al)-Total			<0.0050		mg/L		0.005	16-MAR-21
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	16-MAR-21
Arsenic (As)-Total			<0.00010		mg/L		0.0001	16-MAR-21

Quality Control Report

Client: Thurber Engineering Ltd. (Oakville)
2010 Winston Park Drive Unit 103
Oakville ON L6H 5R7
Contact: Rachel Bourassa

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R5401825								
WG3502672-1 MB								
Barium (Ba)-Total			<0.00010		mg/L		0.0001	16-MAR-21
Beryllium (Be)-Total			<0.00010		mg/L		0.0001	16-MAR-21
Bismuth (Bi)-Total			<0.000050		mg/L		0.00005	16-MAR-21
Boron (B)-Total			<0.010		mg/L		0.01	16-MAR-21
Cadmium (Cd)-Total			<0.000005(		mg/L		0.000005	16-MAR-21
Calcium (Ca)-Total			<0.050		mg/L		0.05	16-MAR-21
Chromium (Cr)-Total			<0.00050		mg/L		0.0005	16-MAR-21
Cesium (Cs)-Total			<0.000010		mg/L		0.00001	16-MAR-21
Cobalt (Co)-Total			<0.00010		mg/L		0.0001	16-MAR-21
Copper (Cu)-Total			<0.00050		mg/L		0.0005	16-MAR-21
Iron (Fe)-Total			<0.010		mg/L		0.01	16-MAR-21
Lead (Pb)-Total			<0.000050		mg/L		0.00005	16-MAR-21
Lithium (Li)-Total			<0.0010		mg/L		0.001	16-MAR-21
Magnesium (Mg)-Total			<0.0050		mg/L		0.005	16-MAR-21
Manganese (Mn)-Total			<0.00050		mg/L		0.0005	16-MAR-21
Molybdenum (Mo)-Total			<0.000050		mg/L		0.00005	16-MAR-21
Nickel (Ni)-Total			<0.00050		mg/L		0.0005	16-MAR-21
Phosphorus (P)-Total			<0.050		mg/L		0.05	16-MAR-21
Potassium (K)-Total			<0.050		mg/L		0.05	16-MAR-21
Rubidium (Rb)-Total			<0.00020		mg/L		0.0002	16-MAR-21
Selenium (Se)-Total			<0.000050		mg/L		0.00005	16-MAR-21
Silicon (Si)-Total			<0.10		mg/L		0.1	16-MAR-21
Silver (Ag)-Total			<0.000050		mg/L		0.00005	16-MAR-21
Sodium (Na)-Total			<0.050		mg/L		0.05	16-MAR-21
Strontium (Sr)-Total			<0.0010		mg/L		0.001	16-MAR-21
Sulfur (S)-Total			<0.50		mg/L		0.5	16-MAR-21
Thallium (Tl)-Total			<0.000010		mg/L		0.00001	16-MAR-21
Tellurium (Te)-Total			<0.00020		mg/L		0.0002	16-MAR-21
Thorium (Th)-Total			<0.00010		mg/L		0.0001	16-MAR-21
Tin (Sn)-Total			<0.00010		mg/L		0.0001	16-MAR-21
Titanium (Ti)-Total			<0.00030		mg/L		0.0003	16-MAR-21
Tungsten (W)-Total			<0.00010		mg/L		0.0001	16-MAR-21
Uranium (U)-Total			<0.000010		mg/L		0.00001	16-MAR-21

Quality Control Report

Client: Thurber Engineering Ltd. (Oakville)
2010 Winston Park Drive Unit 103
Oakville ON L6H 5R7
Contact: Rachel Bourassa

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R5401825								
WG3502672-1 MB								
Vanadium (V)-Total			<0.00050		mg/L		0.0005	16-MAR-21
Zinc (Zn)-Total			<0.0030		mg/L		0.003	16-MAR-21
Zirconium (Zr)-Total			<0.00020		mg/L		0.0002	16-MAR-21
WG3502672-5 MS		**WG3502672-3**						
Aluminum (Al)-Total			101.0		%		70-130	16-MAR-21
Antimony (Sb)-Total			106.4		%		70-130	16-MAR-21
Arsenic (As)-Total			101.5		%		70-130	16-MAR-21
Barium (Ba)-Total			N/A	MS-B	%		-	16-MAR-21
Beryllium (Be)-Total			104.0		%		70-130	16-MAR-21
Bismuth (Bi)-Total			97.7		%		70-130	16-MAR-21
Boron (B)-Total			92.7		%		70-130	16-MAR-21
Cadmium (Cd)-Total			98.9		%		70-130	16-MAR-21
Calcium (Ca)-Total			N/A	MS-B	%		-	16-MAR-21
Chromium (Cr)-Total			101.6		%		70-130	16-MAR-21
Cesium (Cs)-Total			104.7		%		70-130	16-MAR-21
Cobalt (Co)-Total			100.6		%		70-130	16-MAR-21
Copper (Cu)-Total			97.0		%		70-130	16-MAR-21
Iron (Fe)-Total			N/A	MS-B	%		-	16-MAR-21
Lead (Pb)-Total			98.8		%		70-130	16-MAR-21
Lithium (Li)-Total			N/A	MS-B	%		-	16-MAR-21
Magnesium (Mg)-Total			N/A	MS-B	%		-	16-MAR-21
Manganese (Mn)-Total			N/A	MS-B	%		-	16-MAR-21
Molybdenum (Mo)-Total			105.1		%		70-130	16-MAR-21
Phosphorus (P)-Total			111.3		%		70-130	16-MAR-21
Potassium (K)-Total			N/A	MS-B	%		-	16-MAR-21
Rubidium (Rb)-Total			100.3		%		70-130	16-MAR-21
Selenium (Se)-Total			99.8		%		70-130	16-MAR-21
Silicon (Si)-Total			N/A	MS-B	%		-	16-MAR-21
Silver (Ag)-Total			99.4		%		70-130	16-MAR-21
Sodium (Na)-Total			N/A	MS-B	%		-	16-MAR-21
Strontium (Sr)-Total			N/A	MS-B	%		-	16-MAR-21
Sulfur (S)-Total			N/A	MS-B	%		-	16-MAR-21
Thallium (Tl)-Total			98.1		%		70-130	16-MAR-21
Tellurium (Te)-Total			87.2		%		70-130	16-MAR-21

Quality Control Report

Client: Thurber Engineering Ltd. (Oakville)
2010 Winston Park Drive Unit 103
Oakville ON L6H 5R7
Contact: Rachel Bourassa

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R5401825								
WG3502672-5 MS		**WG3502672-3**						
Thorium (Th)-Total			102.4		%		70-130	16-MAR-21
Tin (Sn)-Total			102.0		%		70-130	16-MAR-21
Titanium (Ti)-Total			103.1		%		70-130	16-MAR-21
Tungsten (W)-Total			99.9		%		70-130	16-MAR-21
Uranium (U)-Total			N/A	MS-B	%		-	16-MAR-21
Vanadium (V)-Total			110.8		%		70-130	16-MAR-21
Zinc (Zn)-Total			101.2		%		70-130	16-MAR-21
Zirconium (Zr)-Total			101.0		%		70-130	16-MAR-21
NP,NPE-LCMS-WT	**Water**							
Batch R5403088								
WG3502812-3 DUP		**L2566189-1**						
Nonylphenol		<1.0	<1.0	RPD-NA	ug/L	N/A	30	17-MAR-21
Nonylphenol Monoethoxylates		<2.0	<2.0	RPD-NA	ug/L	N/A	30	17-MAR-21
Nonylphenol Diethoxylates		<0.10	<0.10	RPD-NA	ug/L	N/A	30	17-MAR-21
WG3502812-2 LCS								
Nonylphenol			87.4		%		75-125	17-MAR-21
Nonylphenol Monoethoxylates			100.1		%		75-125	17-MAR-21
Nonylphenol Diethoxylates			107.0		%		75-125	17-MAR-21
WG3502812-1 MB								
Nonylphenol			<1.0		ug/L		1	17-MAR-21
Nonylphenol Monoethoxylates			<2.0		ug/L		2	17-MAR-21
Nonylphenol Diethoxylates			<0.10		ug/L		0.1	17-MAR-21
WG3502812-4 MS		**L2566189-1**						
Nonylphenol			97.9		%		50-150	17-MAR-21
Nonylphenol Monoethoxylates			109.9		%		50-150	17-MAR-21
Nonylphenol Diethoxylates			93.3		%		50-150	17-MAR-21
OCP-ROUTINE-WT	**Water**							
Batch R5402507								
WG3503474-2 LCS								
Aldrin			106.5		%		50-150	17-MAR-21
gamma-hexachlorocyclohexane			94.9		%		50-150	17-MAR-21
a-chlordane			98.3		%		50-150	17-MAR-21
g-chlordane			97.3		%		50-150	17-MAR-21
alpha-BHC			98.1		%		50-150	17-MAR-21

Quality Control Report

Client: Thurber Engineering Ltd. (Oakville)
2010 Winston Park Drive Unit 103
Oakville ON L6H 5R7
Contact: Rachel Bourassa

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
OCP-ROUTINE-WT	**Water**							
Batch R5402507								
WG3503474-2 LCS								
beta-BHC			73.0		%		50-150	17-MAR-21
delta-BHC			88.3		%		50-150	17-MAR-21
o,p-DDD			100.2		%		50-150	17-MAR-21
pp-DDD			115.6		%		50-150	17-MAR-21
o,p-DDE			90.3		%		50-150	17-MAR-21
pp-DDE			99.9		%		50-150	17-MAR-21
op-DDT			72.5		%		50-150	17-MAR-21
pp-DDT			60.9		%		50-150	17-MAR-21
Dieldrin			113.0		%		50-150	17-MAR-21
Endosulfan I			90.2		%		50-150	17-MAR-21
Endosulfan II			91.2		%		50-150	17-MAR-21
Endosulfan Sulfate			128.1		%		50-150	17-MAR-21
Endrin			55.0		%		50-150	17-MAR-21
Endrin Aldehyde			125.3		%		50-150	17-MAR-21
Heptachlor			78.0		%		50-150	17-MAR-21
Heptachlor Epoxide			96.3		%		50-150	17-MAR-21
Hexachlorobenzene			91.7		%		50-150	17-MAR-21
Hexachlorobutadiene			84.0		%		50-150	17-MAR-21
Hexachloroethane			90.6		%		50-150	17-MAR-21
Methoxychlor			70.3		%		50-150	17-MAR-21
Mirex			143.2		%		50-150	17-MAR-21
Oxychlordane			99.9		%		50-150	17-MAR-21
Pentachloronitrobenzene			93.0		%		50-150	17-MAR-21
trans-Nonachlor			99.1		%		50-150	17-MAR-21
WG3503474-1 MB								
Aldrin			<0.0080		ug/L		0.008	17-MAR-21
gamma-hexachlorocyclohexane			<0.0080		ug/L		0.008	17-MAR-21
a-chlordane			<0.0080		ug/L		0.008	17-MAR-21
g-chlordane			<0.0080		ug/L		0.008	17-MAR-21
alpha-BHC			<0.0080		ug/L		0.008	17-MAR-21
beta-BHC			<0.0080		ug/L		0.008	17-MAR-21
delta-BHC			<0.0080		ug/L		0.008	17-MAR-21
o,p-DDD			<0.0040		ug/L		0.004	17-MAR-21
pp-DDD			<0.0040		ug/L		0.004	17-MAR-21

Quality Control Report

Client: Thurber Engineering Ltd. (Oakville)
2010 Winston Park Drive Unit 103
Oakville ON L6H 5R7
Contact: Rachel Bourassa

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
OCP-ROUTINE-WT	**Water**							
Batch R5402507								
WG3503474-1 MB								
o,p-DDE			<0.0040		ug/L		0.004	17-MAR-21
pp-DDE			<0.0040		ug/L		0.004	17-MAR-21
op-DDT			<0.0040		ug/L		0.004	17-MAR-21
pp-DDT			<0.0040		ug/L		0.004	17-MAR-21
Dieldrin			<0.0080		ug/L		0.008	17-MAR-21
Endosulfan I			<0.0070		ug/L		0.007	17-MAR-21
Endosulfan II			<0.0070		ug/L		0.007	17-MAR-21
Endosulfan Sulfate			<0.0070		ug/L		0.007	17-MAR-21
Endrin			<0.010		ug/L		0.01	17-MAR-21
Endrin Aldehyde			<0.010		ug/L		0.01	17-MAR-21
Heptachlor			<0.0080		ug/L		0.008	17-MAR-21
Heptachlor Epoxide			<0.0080		ug/L		0.008	17-MAR-21
Hexachlorobenzene			<0.0080		ug/L		0.008	17-MAR-21
Hexachlorobutadiene			<0.0080		ug/L		0.008	17-MAR-21
Hexachloroethane			<0.0080		ug/L		0.008	17-MAR-21
Methoxychlor			<0.0080		ug/L		0.008	17-MAR-21
Mirex			<0.0080		ug/L		0.008	17-MAR-21
Oxychlordane			<0.0080		ug/L		0.008	17-MAR-21
Pentachloronitrobenzene			<0.010		ug/L		0.01	17-MAR-21
trans-Nonachlor			<0.010		ug/L		0.01	17-MAR-21
Surrogate: Decachlorobiphenyl			125.6		%		40-130	17-MAR-21
Surrogate: Tetrachloro-m-xylene			88.8		%		40-130	17-MAR-21
Batch R5404187								
WG3503068-2 LCS								
Aldrin			111.5		%		50-150	19-MAR-21
gamma-hexachlorocyclohexane			103.8		%		50-150	19-MAR-21
a-chlordane			114.4		%		50-150	19-MAR-21
g-chlordane			117.0		%		50-150	19-MAR-21
alpha-BHC			105.8		%		50-150	19-MAR-21
beta-BHC			89.5		%		50-150	19-MAR-21
delta-BHC			101.1		%		50-150	19-MAR-21
o,p-DDD			113.2		%		50-150	19-MAR-21
pp-DDD			122.4		%		50-150	19-MAR-21
o,p-DDE			106.5		%		50-150	19-MAR-21

Quality Control Report

Client: Thurber Engineering Ltd. (Oakville)
2010 Winston Park Drive Unit 103
Oakville ON L6H 5R7
Contact: Rachel Bourassa

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
OCP-ROUTINE-WT	**Water**							
Batch	**R5404187**							
WG3503068-2	**LCS**							
pp-DDE			117.9		%		50-150	19-MAR-21
op-DDT			118.6		%		50-150	19-MAR-21
pp-DDT			100.2		%		50-150	19-MAR-21
Dieldrin			129.5		%		50-150	19-MAR-21
Endosulfan I			102.2		%		50-150	19-MAR-21
Endosulfan II			102.1		%		50-150	19-MAR-21
Endosulfan Sulfate			135.8		%		50-150	19-MAR-21
Endrin			39.0	RRQC	%		50-150	19-MAR-21
Endrin Aldehyde			139.1		%		50-150	19-MAR-21
Heptachlor			93.2		%		50-150	19-MAR-21
Heptachlor Epoxide			117.7		%		50-150	19-MAR-21
Hexachlorobenzene			96.4		%		50-150	19-MAR-21
Hexachlorobutadiene			89.8		%		50-150	19-MAR-21
Hexachloroethane			94.9		%		50-150	19-MAR-21
Methoxychlor			92.7		%		50-150	19-MAR-21
Mirex			148.1		%		50-150	19-MAR-21
Oxychlordane			115.5		%		50-150	19-MAR-21
Pentachloronitrobenzene			99.1		%		50-150	19-MAR-21
trans-Nonachlor			103.4		%		50-150	19-MAR-21
COMMENTS: RRQC: Analyte recovery in LCS was below ALS DQO. Detection limit raised and associated sample data has been qualified.								
WG3503068-1	**MB**							
Aldrin			<0.0080		ug/L		0.008	19-MAR-21
gamma-hexachlorocyclohexane			<0.0080		ug/L		0.008	19-MAR-21
a-chlordane			<0.0080		ug/L		0.008	19-MAR-21
g-chlordane			<0.0080		ug/L		0.008	19-MAR-21
alpha-BHC			<0.0080		ug/L		0.008	19-MAR-21
beta-BHC			<0.0080		ug/L		0.008	19-MAR-21
delta-BHC			<0.0080		ug/L		0.008	19-MAR-21
o,p-DDD			<0.0040		ug/L		0.004	19-MAR-21
pp-DDD			<0.0040		ug/L		0.004	19-MAR-21
o,p-DDE			<0.0040		ug/L		0.004	19-MAR-21
pp-DDE			<0.0040		ug/L		0.004	19-MAR-21
op-DDT			<0.0040		ug/L		0.004	19-MAR-21
pp-DDT			<0.0040		ug/L		0.004	19-MAR-21

Quality Control Report

Workorder: L2566855 Report Date: 15-APR-21

Client: Thurber Engineering Ltd. (Oakville)
2010 Winston Park Drive Unit 103
Oakville ON L6H 5R7
Contact: Rachel Bourassa

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
OCP-ROUTINE-WT	**Water**							
Batch R5404187								
WG3503068-1 MB								
Dieldrin			<0.0080		ug/L		0.008	19-MAR-21
Endosulfan I			<0.0070		ug/L		0.007	19-MAR-21
Endosulfan II			<0.0070		ug/L		0.007	19-MAR-21
Endosulfan Sulfate			<0.0070		ug/L		0.007	19-MAR-21
Endrin			<0.010		ug/L		0.01	19-MAR-21
Endrin Aldehyde			<0.010		ug/L		0.01	19-MAR-21
Heptachlor			<0.0080		ug/L		0.008	19-MAR-21
Heptachlor Epoxide			<0.0080		ug/L		0.008	19-MAR-21
Hexachlorobenzene			<0.0080		ug/L		0.008	19-MAR-21
Hexachlorobutadiene			<0.0080		ug/L		0.008	19-MAR-21
Hexachloroethane			<0.0080		ug/L		0.008	19-MAR-21
Methoxychlor			<0.0080		ug/L		0.008	19-MAR-21
Mirex			<0.0080		ug/L		0.008	19-MAR-21
Oxychlordane			<0.0080		ug/L		0.008	19-MAR-21
Pentachloronitrobenzene			<0.010		ug/L		0.01	19-MAR-21
trans-Nonachlor			<0.010		ug/L		0.01	19-MAR-21
Surrogate: Decachlorobiphenyl			128.1		%		40-130	19-MAR-21
Surrogate: Tetrachloro-m-xylene			95.7		%		40-130	19-MAR-21
OGG-SPEC-WT	**Water**							
Batch R5403028								
WG3504176-2 LCS								
Oil and Grease, Total			95.4		%		70-130	18-MAR-21
Mineral Oil and Grease			93.2		%		70-130	18-MAR-21
WG3504176-1 MB								
Oil and Grease, Total			<5.0		mg/L		5	18-MAR-21
Mineral Oil and Grease			<2.5		mg/L		2.5	18-MAR-21
P-T-COL-WT	**Water**							
Batch R5407361								
WG3505159-3 DUP		**L2567022-1**						
Phosphorus, Total		0.0316	0.0319		mg/L	1.2	20	22-MAR-21
WG3505159-2 LCS								
Phosphorus, Total			98.0		%		80-120	22-MAR-21
WG3505159-1 MB								
Phosphorus, Total			<0.0030		mg/L		0.003	22-MAR-21
WG3505159-4 MS		**L2567022-1**						

Quality Control Report

Client: Thurber Engineering Ltd. (Oakville)
2010 Winston Park Drive Unit 103
Oakville ON L6H 5R7
Contact: Rachel Bourassa

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
P-T-COL-WT	**Water**							
Batch R5407361								
WG3505159-4 MS		**L2567022-1**						
Phosphorus, Total			92.3		%		70-130	22-MAR-21
PAH-511-WT	**Water**							
Batch R5401918								
WG3502652-2 LCS								
1-Methylnaphthalene			105.0		%		50-140	16-MAR-21
2-Methylnaphthalene			98.7		%		50-140	16-MAR-21
Acenaphthene			104.6		%		50-140	16-MAR-21
Acenaphthylene			99.3		%		50-140	16-MAR-21
Anthracene			102.1		%		50-140	16-MAR-21
Benzo(a)anthracene			80.4		%		50-140	16-MAR-21
Benzo(a)pyrene			91.5		%		50-140	16-MAR-21
Benzo(b&j)fluoranthene			87.9		%		50-140	16-MAR-21
Benzo(g,h,i)perylene			124.5		%		50-140	16-MAR-21
Benzo(k)fluoranthene			90.4		%		50-140	16-MAR-21
Chrysene			107.0		%		50-140	16-MAR-21
Dibenz(a,h)anthracene			104.1		%		50-140	16-MAR-21
Fluoranthene			102.9		%		50-140	16-MAR-21
Fluorene			104.4		%		50-140	16-MAR-21
Indeno(1,2,3-cd)pyrene			106.6		%		50-140	16-MAR-21
Naphthalene			101.9		%		50-140	16-MAR-21
Phenanthrene			104.3		%		50-140	16-MAR-21
Pyrene			104.1		%		50-140	16-MAR-21
WG3502652-1 MB								
1-Methylnaphthalene			<0.020		ug/L		0.02	16-MAR-21
2-Methylnaphthalene			<0.020		ug/L		0.02	16-MAR-21
Acenaphthene			<0.020		ug/L		0.02	16-MAR-21
Acenaphthylene			<0.020		ug/L		0.02	16-MAR-21
Anthracene			<0.020		ug/L		0.02	16-MAR-21
Benzo(a)anthracene			<0.020		ug/L		0.02	16-MAR-21
Benzo(a)pyrene			<0.010		ug/L		0.01	16-MAR-21
Benzo(b&j)fluoranthene			<0.020		ug/L		0.02	16-MAR-21
Benzo(g,h,i)perylene			<0.020		ug/L		0.02	16-MAR-21
Benzo(k)fluoranthene			<0.020		ug/L		0.02	16-MAR-21

Quality Control Report

Workorder: L2566855 Report Date: 15-APR-21

Client: Thurber Engineering Ltd. (Oakville)
2010 Winston Park Drive Unit 103
Oakville ON L6H 5R7
Contact: Rachel Bourassa

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PAH-511-WT	**Water**							
Batch	**R5401918**							
WG3502652-1	**MB**							
Chrysene			<0.020		ug/L		0.02	16-MAR-21
Dibenz(a,h)anthracene			<0.020		ug/L		0.02	16-MAR-21
Fluoranthene			<0.020		ug/L		0.02	16-MAR-21
Fluorene			<0.020		ug/L		0.02	16-MAR-21
Indeno(1,2,3-cd)pyrene			<0.020		ug/L		0.02	16-MAR-21
Naphthalene			<0.050		ug/L		0.05	16-MAR-21
Phenanthrene			<0.020		ug/L		0.02	16-MAR-21
Pyrene			<0.020		ug/L		0.02	16-MAR-21
Surrogate: Naphthalene d8			98.2		%		60-140	16-MAR-21
Surrogate: Phenanthrene d10			94.3		%		60-140	16-MAR-21
Surrogate: Chrysene d12			80.3		%		50-150	16-MAR-21
PCB-WT	**Water**							
Batch	**R5402911**							
WG3503068-2	**LCS**							
Aroclor 1242			83.4		%		65-130	18-MAR-21
Aroclor 1248			97.9		%		65-130	18-MAR-21
Aroclor 1254			73.8		%		65-130	18-MAR-21
Aroclor 1260			88.4		%		65-130	18-MAR-21
WG3503068-1	**MB**							
Aroclor 1242			<0.020		ug/L		0.02	18-MAR-21
Aroclor 1248			<0.020		ug/L		0.02	18-MAR-21
Aroclor 1254			<0.020		ug/L		0.02	18-MAR-21
Aroclor 1260			<0.020		ug/L		0.02	18-MAR-21
Surrogate: Decachlorobiphenyl			112.8		%		50-150	18-MAR-21
Surrogate: Tetrachloro-m-xylene			104.1		%		50-150	18-MAR-21
Batch	**R5403059**							
WG3503474-2	**LCS**							
Aroclor 1242			108.5		%		65-130	18-MAR-21
Aroclor 1248			85.7		%		65-130	18-MAR-21
Aroclor 1254			98.5		%		65-130	18-MAR-21
Aroclor 1260			117.4		%		65-130	18-MAR-21
WG3503474-1	**MB**							
Aroclor 1242			<0.020		ug/L		0.02	18-MAR-21
Aroclor 1248			<0.020		ug/L		0.02	18-MAR-21

Quality Control Report

Client: Thurber Engineering Ltd. (Oakville)
2010 Winston Park Drive Unit 103
Oakville ON L6H 5R7
Contact: Rachel Bourassa

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PCB-WT	**Water**							
Batch R5403059								
WG3503474-1 MB								
Aroclor 1254			<0.020		ug/L		0.02	18-MAR-21
Aroclor 1260			<0.020		ug/L		0.02	18-MAR-21
Surrogate: Decachlorobiphenyl			122.0		%		50-150	18-MAR-21
Surrogate: Tetrachloro-m-xylene			97.8		%		50-150	18-MAR-21
PH-WT	**Water**							
Batch R5401759								
WG3502803-4 DUP		**WG3502803-3**						
pH		8.22	8.26	J	pH units	0.04	0.2	16-MAR-21
WG3502803-2 LCS								
pH			7.00		pH units		6.9-7.1	16-MAR-21
PHENOLS-4AAP-WT	**Water**							
Batch R5405037								
WG3504785-3 DUP		**L2566739-1**						
Phenols (4AAP)		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	19-MAR-21
WG3504785-2 LCS								
Phenols (4AAP)			85.7		%		85-115	19-MAR-21
WG3504785-1 MB								
Phenols (4AAP)			<0.0010		mg/L		0.001	19-MAR-21
WG3504785-4 MS		**L2566739-1**						
Phenols (4AAP)			84.8		%		75-125	19-MAR-21
SOLIDS-TSS-WT	**Water**							
Batch R5408260								
WG3505171-3 DUP		**L2566855-1**						
Total Suspended Solids		140	163		mg/L	15	20	20-MAR-21
WG3505171-2 LCS								
Total Suspended Solids			103.5		%		85-115	20-MAR-21
WG3505171-1 MB								
Total Suspended Solids			<3.0		mg/L		3	20-MAR-21
TKN-F-WT	**Water**							
Batch R5404670								
WG3504748-3 DUP		**L2566781-2**						
Total Kjeldahl Nitrogen		3.97	4.13		mg/L	4.0	20	19-MAR-21
WG3504804-3 DUP		**L2567022-1**						
Total Kjeldahl Nitrogen		0.520	0.530		mg/L	1.9	20	19-MAR-21
WG3504748-2 LCS								
Total Kjeldahl Nitrogen			99.8		%		75-125	19-MAR-21

Quality Control Report

Client: Thurber Engineering Ltd. (Oakville)
2010 Winston Park Drive Unit 103
Oakville ON L6H 5R7
Contact: Rachel Bourassa

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
TKN-F-WT	**Water**							
Batch R5404670								
WG3504804-2 LCS								
Total Kjeldahl Nitrogen			100.5		%		75-125	19-MAR-21
WG3504748-1 MB								
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	19-MAR-21
WG3504804-1 MB								
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	19-MAR-21
WG3504748-4 MS		**L2566781-2**						
Total Kjeldahl Nitrogen			99.2		%		70-130	19-MAR-21
WG3504804-4 MS		**L2567022-1**						
Total Kjeldahl Nitrogen			105.0		%		70-130	19-MAR-21
VOC-ROU-HS-WT	**Water**							
Batch R5402257								
WG3503430-4 DUP		**WG3503430-3**						
1,1,1,2-Tetrachloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	17-MAR-21
1,1,2,2-Tetrachloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	17-MAR-21
1,1,1-Trichloroethane		0.61	0.63		ug/L	3.2	30	17-MAR-21
1,1,2-Trichloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	17-MAR-21
1,2-Dibromoethane		<0.20	<0.20	RPD-NA	ug/L	N/A	30	17-MAR-21
1,1-Dichloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	17-MAR-21
1,1-Dichloroethylene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	17-MAR-21
1,2-Dichlorobenzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	18-MAR-21
1,2-Dichloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	17-MAR-21
1,2-Dichloropropane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	17-MAR-21
1,3-Dichlorobenzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	18-MAR-21
1,4-Dichlorobenzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	18-MAR-21
2-Hexanone		<20	<20	RPD-NA	ug/L	N/A	30	17-MAR-21
Acetone		<20	<20	RPD-NA	ug/L	N/A	30	17-MAR-21
Benzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	17-MAR-21
Bromodichloromethane		<1.0	<1.0	RPD-NA	ug/L	N/A	30	17-MAR-21
Bromoform		<1.0	<1.0	RPD-NA	ug/L	N/A	30	17-MAR-21
Bromomethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	17-MAR-21
Carbon Disulfide		<1.0	<1.0	RPD-NA	ug/L	N/A	30	17-MAR-21
Carbon tetrachloride		<0.20	<0.20	RPD-NA	ug/L	N/A	30	17-MAR-21
Chlorobenzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	17-MAR-21
Chloroethane		<1.0	<1.0	RPD-NA	ug/L	N/A	30	17-MAR-21

Quality Control Report

Client: Thurber Engineering Ltd. (Oakville)
2010 Winston Park Drive Unit 103
Oakville ON L6H 5R7
Contact: Rachel Bourassa

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-ROU-HS-WT	**Water**							
Batch R5402257								
WG3503430-4 DUP		**WG3503430-3**						
Chloroform		<1.0	<1.0	RPD-NA	ug/L	N/A	30	17-MAR-21
Chloromethane		<1.0	<1.0	RPD-NA	ug/L	N/A	30	17-MAR-21
cis-1,2-Dichloroethylene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	17-MAR-21
cis-1,3-Dichloropropene		<0.30	<0.30	RPD-NA	ug/L	N/A	30	17-MAR-21
Dibromochloromethane		<1.0	<1.0	RPD-NA	ug/L	N/A	30	17-MAR-21
Dichlorodifluoromethane		<1.0	<1.0	RPD-NA	ug/L	N/A	30	17-MAR-21
Dichloromethane		<2.0	<2.0	RPD-NA	ug/L	N/A	30	17-MAR-21
Ethylbenzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	17-MAR-21
m+p-Xylenes		<0.40	<0.40	RPD-NA	ug/L	N/A	30	17-MAR-21
Methyl Ethyl Ketone		<20	<20	RPD-NA	ug/L	N/A	30	17-MAR-21
Methyl Isobutyl Ketone		<20	<20	RPD-NA	ug/L	N/A	30	17-MAR-21
n-Hexane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	17-MAR-21
MTBE		<0.50	<0.50	RPD-NA	ug/L	N/A	30	17-MAR-21
o-Xylene		<0.30	<0.30	RPD-NA	ug/L	N/A	30	17-MAR-21
Styrene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	17-MAR-21
Tetrachloroethylene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	17-MAR-21
Toluene		<0.40	<0.40	RPD-NA	ug/L	N/A	30	17-MAR-21
trans-1,2-Dichloroethylene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	17-MAR-21
trans-1,3-Dichloropropene		<0.30	<0.30	RPD-NA	ug/L	N/A	30	17-MAR-21
Trichloroethylene		1.27	1.33		ug/L	4.6	30	17-MAR-21
Trichlorofluoromethane		<1.0	<1.0	RPD-NA	ug/L	N/A	30	17-MAR-21
Vinyl chloride		<0.50	<0.50	RPD-NA	ug/L	N/A	30	17-MAR-21
WG3503430-1 LCS								
1,1,1,2-Tetrachloroethane			94.4		%		70-130	17-MAR-21
1,1,2,2-Tetrachloroethane			106.1		%		70-130	17-MAR-21
1,1,1-Trichloroethane			109.2		%		70-130	17-MAR-21
1,1,2-Trichloroethane			89.9		%		70-130	17-MAR-21
1,2-Dibromoethane			84.9		%		70-130	17-MAR-21
1,1-Dichloroethane			105.7		%		70-130	17-MAR-21
1,1-Dichloroethylene			112.7		%		70-130	17-MAR-21
1,2-Dichlorobenzene			102.4		%		70-130	17-MAR-21
1,2-Dichloroethane			103.4		%		70-130	17-MAR-21
1,2-Dichloropropane			100.2		%		70-130	17-MAR-21

Quality Control Report

Client: Thurber Engineering Ltd. (Oakville)
2010 Winston Park Drive Unit 103
Oakville ON L6H 5R7
Contact: Rachel Bourassa

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-ROU-HS-WT	**Water**							
Batch R5402257								
WG3503430-1 LCS								
1,3-Dichlorobenzene			105.7		%		70-130	17-MAR-21
1,4-Dichlorobenzene			108.8		%		70-130	17-MAR-21
2-Hexanone			73.9		%		60-140	17-MAR-21
Acetone			103.3		%		60-140	17-MAR-21
Benzene			100.3		%		70-130	17-MAR-21
Bromodichloromethane			111.9		%		70-130	17-MAR-21
Bromoform			91.5		%		70-130	17-MAR-21
Bromomethane			100.8		%		60-140	17-MAR-21
Carbon Disulfide			105.6		%		70-130	17-MAR-21
Carbon tetrachloride			115.9		%		70-130	17-MAR-21
Chlorobenzene			98.2		%		70-130	17-MAR-21
Chloroethane			117.6		%		70-130	17-MAR-21
Chloroform			110.5		%		70-130	17-MAR-21
Chloromethane			101.8		%		60-140	17-MAR-21
cis-1,2-Dichloroethylene			104.2		%		70-130	17-MAR-21
cis-1,3-Dichloropropene			100.8		%		70-130	17-MAR-21
Dibromochloromethane			84.9		%		70-130	17-MAR-21
Dichlorodifluoromethane			90.2		%		50-140	17-MAR-21
Dichloromethane			120.0		%		70-130	17-MAR-21
Ethylbenzene			95.3		%		70-130	17-MAR-21
m+p-Xylenes			99.7		%		70-130	17-MAR-21
Methyl Ethyl Ketone			88.0		%		60-140	17-MAR-21
Methyl Isobutyl Ketone			84.0		%		50-150	17-MAR-21
n-Hexane			104.7		%		70-130	17-MAR-21
MTBE			103.2		%		70-130	17-MAR-21
o-Xylene			101.5		%		70-130	17-MAR-21
Styrene			88.4		%		70-130	17-MAR-21
Tetrachloroethylene			98.4		%		70-130	17-MAR-21
Toluene			95.3		%		70-130	17-MAR-21
trans-1,2-Dichloroethylene			123.9		%		70-130	17-MAR-21
trans-1,3-Dichloropropene			93.9		%		70-130	17-MAR-21
Trichloroethylene			105.3		%		70-130	17-MAR-21
Trichlorofluoromethane			114.1		%		60-140	17-MAR-21

Quality Control Report

Client: Thurber Engineering Ltd. (Oakville)
2010 Winston Park Drive Unit 103
Oakville ON L6H 5R7
Contact: Rachel Bourassa

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-ROU-HS-WT	**Water**							
Batch R5402257								
WG3503430-1 LCS								
Vinyl chloride			107.8		%		60-140	17-MAR-21
WG3503430-2 MB								
1,1,1,2-Tetrachloroethane			<0.50		ug/L		0.5	17-MAR-21
1,1,2,2-Tetrachloroethane			<0.50		ug/L		0.5	17-MAR-21
1,1,1-Trichloroethane			<0.50		ug/L		0.5	17-MAR-21
1,1,2-Trichloroethane			<0.50		ug/L		0.5	17-MAR-21
1,2-Dibromoethane			<0.20		ug/L		0.2	17-MAR-21
1,1-Dichloroethane			<0.50		ug/L		0.5	17-MAR-21
1,1-Dichloroethylene			<0.50		ug/L		0.5	17-MAR-21
1,2-Dichlorobenzene			<0.50		ug/L		0.5	17-MAR-21
1,2-Dichloroethane			<0.50		ug/L		0.5	17-MAR-21
1,2-Dichloropropane			<0.50		ug/L		0.5	17-MAR-21
1,3-Dichlorobenzene			<0.50		ug/L		0.5	17-MAR-21
1,4-Dichlorobenzene			<0.50		ug/L		0.5	17-MAR-21
2-Hexanone			<20		ug/L		20	17-MAR-21
Acetone			<20		ug/L		20	17-MAR-21
Benzene			<0.50		ug/L		0.5	17-MAR-21
Bromodichloromethane			<1.0		ug/L		1	17-MAR-21
Bromoform			<1.0		ug/L		1	17-MAR-21
Bromomethane			<0.50		ug/L		0.5	17-MAR-21
Carbon Disulfide			<1.0		ug/L		1	17-MAR-21
Carbon tetrachloride			<0.20		ug/L		0.2	17-MAR-21
Chlorobenzene			<0.50		ug/L		0.5	17-MAR-21
Chloroethane			<1.0		ug/L		1	17-MAR-21
Chloroform			<1.0		ug/L		1	17-MAR-21
Chloromethane			<1.0		ug/L		1	17-MAR-21
cis-1,2-Dichloroethylene			<0.50		ug/L		0.5	17-MAR-21
cis-1,3-Dichloropropene			<0.30		ug/L		0.3	17-MAR-21
Dibromochloromethane			<1.0		ug/L		1	17-MAR-21
Dichlorodifluoromethane			<1.0		ug/L		1	17-MAR-21
Dichloromethane			<2.0		ug/L		2	17-MAR-21
Ethylbenzene			<0.50		ug/L		0.5	17-MAR-21
m+p-Xylenes			<0.40		ug/L		0.4	17-MAR-21
Methyl Ethyl Ketone			<20		ug/L		20	17-MAR-21

Quality Control Report

Client: Thurber Engineering Ltd. (Oakville)
2010 Winston Park Drive Unit 103
Oakville ON L6H 5R7
Contact: Rachel Bourassa

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-ROU-HS-WT	**Water**							
Batch R5402257								
WG3503430-2 MB								
Methyl Isobutyl Ketone			<20		ug/L		20	17-MAR-21
n-Hexane			<0.50		ug/L		0.5	17-MAR-21
MTBE			<0.50		ug/L		0.5	17-MAR-21
o-Xylene			<0.30		ug/L		0.3	17-MAR-21
Styrene			<0.50		ug/L		0.5	17-MAR-21
Tetrachloroethylene			<0.50		ug/L		0.5	17-MAR-21
Toluene			<0.40		ug/L		0.4	17-MAR-21
trans-1,2-Dichloroethylene			<0.50		ug/L		0.5	17-MAR-21
trans-1,3-Dichloropropene			<0.30		ug/L		0.3	17-MAR-21
Trichloroethylene			<0.50		ug/L		0.5	17-MAR-21
Trichlorofluoromethane			<1.0		ug/L		1	17-MAR-21
Vinyl chloride			<0.50		ug/L		0.5	17-MAR-21
Surrogate: 1,4-Difluorobenzene			100.0		%		70-130	17-MAR-21
Surrogate: 4-Bromofluorobenzene			88.3		%		70-130	17-MAR-21

Quality Control Report

Workorder: L2566855 Report Date: 15-APR-21

Client: Thurber Engineering Ltd. (Oakville)
2010 Winston Park Drive Unit 103
Oakville ON L6H 5R7
Contact: Rachel Bourassa

Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
J	Duplicate results and limits are expressed in terms of absolute difference.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.
RRQC	Refer to report remarks for information regarding this QC result.

Quality Control Report

Workorder: L2566855 Report Date: 15-APR-21

Client: Thurber Engineering Ltd. (Oakville)
2010 Winston Park Drive Unit 103
Oakville ON L6H 5R7
Contact: Rachel Bourassa

Hold Time Exceedances:

ALS Product Description	Sample ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Bacteriological Tests							
E. Coli							
	1	12-MAR-21 14:00	16-MAR-21 11:05	48	93	hours	EHTR
	2	12-MAR-21 13:00	16-MAR-21 11:05	48	94	hours	EHTR

Legend & Qualifier Definitions:

EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.
EHTR: Exceeded ALS recommended hold time prior to sample receipt.
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).

Notes*:
Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes.
Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L2566855 were received on 15-MAR-21 15:30.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes 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 pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

ALS www.alsglobal.com

Chain L2566855-COFC

COC Number: 20 -

Page 1 of 1

Report To	Contact and company name below will appear on the final report
Company:	Thurber Engineering Ltd.
Contact:	Rachel Bourassa
Phone:	905-829-8666
	Company address below will appear on the final report
Street:	2010 Winston Park Drive, Suite 103
City/Province:	Oakville, Ontario
Postal Code:	L6H 5R7
Invoice To	Same as Report To ☐ YES ☐ NO
	Copy of Invoice with Report ☐ YES ☐ NO
Company:	Thurber Engineering Ltd.
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 rbourassa@thurber.ca

Email 2

Email 3

Invoice Recipients

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax accountingON@thurber.ca

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 minimum

☐ 2 day [P2] if received by 3pm M-F - 50% rush surcharge minimum

☐ 1 day [E] if received by 3pm M-F - 100% rush surcharge minimum

☐ Same day [E2] if received by 10am M-S - 200% rush surcharge. Additional fees may apply to rush resuests on weekends, statutory holidays and non-routine tests

AFFIX ALS BARCODE LABEL HERE (ALS use only)

Date and Time Required for all E&P TATs:

For tests that can not be performed according to the TAT requested, you will be contacted.

Project Information

ALS Account # / Quote #:	25053 / Q84200
Job #:	30726
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): L2566855

ALS Contact: Amanda Overholster **Sampler:**

Analysis Request

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

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	ALK/BR/CL/F/N2/N3/PO4/SO4	COLOUR/EC/PH/TDS/TSS/TURB	HG/ION BAL/METALS	TP/NH3/TOC	CALC: SILICA/N2N3/HARDNESS		ON-SAN+STORM-NAP-WT		TSS	DISSOLVED METALS					SAMPLES ON HOLD	EXTENDED STORAGE REQUIRED	SUSPECTED HAZARD (see notes)
	BH06	12-Mar-21	14:00	GW	21	R	R	R	R	R		R		R	R							
	BH04D	12-Mar-21	13:00	GW	21	R	R	R	R	R		R		R	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)

PWQO, Napanee Storm + Sanitary

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			
				2.1	14		

SHIPMENT RELEASE (client use)

Released by:	Date:	Time:
Rachel Bourassa	3/15/2021	12:00

INITIAL SHIPMENT RECEPTION (lab use only)

Received by:	Date:	Time:

FINAL SHIPMENT RECEPTION (lab use only)

Received by:	Date:	Time:
	3/15/21	1531

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

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**.

THURBER

Appendix F

Dewatering Estimates

Geologic Model Assumptions and K Calculations

Parameter	Units	Combined excavation of Water tanks, headworks buidling, tertiary/UV building
Initial Groundwater Elevation	masl	79.5
Ground Surface Elevation	masl	78.6
WT below surface		**11.8**
Bottom of Excavation Assumed for Dewatering	masl	71.7
Target Groundwater Elevation	masl	70.7
Bottom of Extraction Interval	masl	67.7
Max Drawdowns		**8.8**
Geologic Unit 1		Overburden
K Unit 1	m/s	5.5E-06
Elevation of Bottom of Unit 1	masl	72.1
		6.5
Saturated Thickness Unit 1	m	6.5
Geologic Unit 2		Limestone
K Unit 2	m/s	2.5E-06
Elevation of Bottom of Unit 2	masl	67.5
		4.7
Saturated Thickness Unit 2	m	4.4
Weighted Average K for Q Estimate	m/s	4.3E-06
Largest K for ROI Estimate	m/s	5.5E-06

Table of Geologic Model Units

Geologic Units	K (m/s)
Silty Clay Overburden	5.50E-06
Limestone bedrock	2.50E-06

Dewatering Estimates for Non-Watertight Shoring Walls for combined excavation of water tanks, headworks buidling, tertiary/UV building for Background Only

Parameter	Units	Combined excavation of Water tanks, headworks buidling, tertiary/UV building
Weighted Average K for Q Estimate (see separate calculation table)	m/s	4.3E-06
Hydraulic Conductivity converted to m/day	m/day	3.7E-01
Input height of groundwater pressure (H)	m	11.8
Input dewatering height (h)	m	3.0
Input length of excavation (x, a)	m	115
Input width of excavation (b)	m	50
Input/calculate radius of trench (r_w or r_s)	m	25.0
Length to width ratio	unitless	2.3
Net water table lowering	m	8.8
Equation Type		Trench
Radii of Influence		
Sichardt Equation (Ro based on K, H, h) Based on Weighted Average K for Q Calc	m	55
Ro = Sichardt + (rw or rs)	m	80
Distance to Recharge Boundary	m	40
Calculated Flow Rate		
Base groundwater flow	**L/day**	**461,000**
Partial Penetration Factor	unitless	1.00
Safety factor on groundwater flow	unitless	3
Groundwater flow with safety factor	L/day	1,383,000
Rainfall entering excavation	mm	50
Duration to remove rainfall	hours	24
Flow rate to remove rainfall	L/day	288,000
Budgeted peak flow rate	**L/day**	**1,671,000**
=	L/s	19.3
=	gal/min	255

HYDROGEOLOGIC REPORT
NAPANEE WATER POLLUTION CONTROL PLANT UPGRADES
NAPANEE, ONTARIO

Dewatering Estimates for Watertight Shoring Walls for combined excavation of water tanks, headworks buidling, tertiary/UV building

Parameter	Units	Combined excavation of Water tanks, headworks buidling, tertiary/UV building
Geologic Unit to Dewater		Limestone
Input Hydraulic Conductivity in m/s (K)	m/s	2.5E-06
Hydraulic Conductivity converted to m/day	m/day	2.2E-01
Input height of groundwater pressure (H)	m	11.8
Input dewatering height (h)	m	3.0
Net depressurization	m	8.8
Input length of excavation (x, a)	m	115
Input width of excavation (b)	m	50
Elevation of top of extraction interval	m asl	70.7
Elevation of bottom of extraction interval	m asl	67.7
Extraction interval thickness	m	3.0
Aquifer thickness	m	3.0
Length to width ratio	unitless	2.3
Equation type		Trench
Input/calculate radius of trench (r_w or r_s)	m	25.0
Radii of Influence		
Sichardt Equation (Ro based on K, H, h)	m	**42**
Distance to Recharge Boundary	m	40
Rounded ROI for Impact Assessment	**m**	**40**
Calculated Flow Rate		
Base groundwater flow	**L/day**	**109,000**
Partial Penetration Factor	unitless	1.00
Safety factor on groundwater flow	unitless	3
Groundwater flow with safety factor	L/day	327,000
Rainfall entering excavation, if applicable	mm	50
Duration to remove rainfall	hours	24
Flow rate to remove rainfall	L/day	288,000
Budgeted peak flow rate	**L/day**	**615,000**
=	L/s	7.1
=	gal/min	93.9

Flow rate estimates rounded to nearest 1,000 L/day, with minimum of 1,000 L/day for base flo

Dewatering Calculations for Maintenace Building and Outfall Pipe Excavation (no watertight shoring).

Parameter	Units	Maintenace Building	Outfall Pipe
Closest Boreholes / Monitoring wells	**-**	**06, 07, 08**	**10, 11, 12**
Ground surface elevation at proposed structure		**78.5**	**76.4**
Geologic Unit to Dewater		Overburden	Overburden
10% diameter (D10)	mm		
Input Hydraulic Conductivity in m/s (K)	m/s	5.5E-06	5.5E-06
Hydraulic Conductivity converted to m/day	m/day	4.8E-01	4.8E-01
Input static water level elevation	m	79.5	79.5
Input excavation base elevation	m	77.0	74.4
Input bottom of aquifer elevation	m	76.0	73.4
Input height of groundwater pressure (H)	m	3.5	6.1
Input dewatering height (h)	m	0	0
Input length of excavation (x, a)	m	110	55
Input width of excavation (b)	m	2	2
Input/calculate radius of trench (r_w or r_s)	m	1	1
Length to width ratio	unitless	55.0	27.5
Net water table lowering	m	3.5	6.1
Equation Type		Trench	Trench
Radii of Influence			
Sichardt Equation (Ro based on K, H, h)	m	24.7	42.6
Ro = Sichardt + (rw or rs)	**m**	**26**	**44**
Distance to Recharge Boundary	m	78	25
Calculated Flow Rate			
Base groundwater flow	**L/day**	**31,000**	**55,000**
Safety factor on groundwater flow	unitless	3	3
Groundwater flow with safety factor	L/day	93,000	165,000
Rainfall entering excavation	mm	50	50
Duration to remove rainfall	hours	24	24
Flow rate to remove rainfall	L/day	11,000	6,000
Budgeted peak flow rate	**L/day**	**104,000**	**171,000**
=	L/s	1.2	2.0
=	gal/min	16	26

Flow rate estimates rounded to nearest 1,000 L/day.

Theory and Formulae

Trench flow in unconfined aquifer

Use this equation when a/b > 1.5.

Equation 4.0

$$Q = \frac{\pi K\left(H^2 - h^2\right)}{\ln R_0 / r_w} + 2\left[\frac{xK\left(H^2 - h^2\right)}{2L}\right]$$

Equation 4.1

$$r_w = \frac{a+b}{\pi}$$

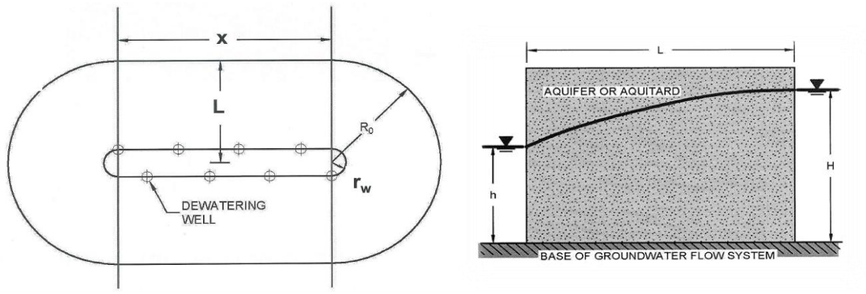

Figure 4.2 (Driscoll, 1986)

Note: L and Ro are the same distance

*Note: H, h measurements are relative to base of active groundwater

rw can be calculated (Eqn 4.1) or input = 1/2 the width of the trench.

For trench eqn estimate better if value is input as 1/2 the width of trench,

Rw must be smaller than Ro.

Rs for trench can be distance from centre line of trench to line of dewatering points.

Radial flow to well in unconfined aquifer (Dupuit Equation):

$$Q = \frac{\pi K\left(H^2 - h^2\right)}{\ln R_0 / r_w}$$

Steady-state flow in confined aquifer

Flow per well Q = 2.73 K b (H - h)/log(R/r)

Source: Driscoll, Fletcher G. (1986). *Groundwater and Wells* (2nd ed). St. Paul, Minnesota: Johnson Filtration Systems Inc.

Radius of Influece

Ro is determined by the Sichardt Equation:

Ro = 3000(H-hw)K^0.5 when K is in m/s

> Alternative equation by Bear (Bear, J., 1979. **Hydraulics of Groundwater**, McGraw-Hill, New York, 569p) $R_o=1.5(Tt/S)^{0.5}$ where **T** is transmissivity in **m^2/day**, t is pumping duration in **days. R_o** will be in **metres.**

Ro equals sichardt equatioı FROM STAN DENHOED

add rw to Ro calculated from Sichardt's euquation

rw as indicated in formulae

Hydraulic Conductivity and Grain Size

K = D10^2 , Hazen, where D10 = grain size diameter for 10% passing (smallest 10%) in mm and K in cm/s

OR Kozeny Carman equation

$$K = \left(\frac{\rho g}{\mu}\right)\left[\frac{n^3}{(1-n)^2}\right]\left(\frac{d_{10}^2}{180}\right)$$

Image from groundwatersoftware.com

Partial Penetration Factor (F) Kozeny 1933

F = L/b*(1+cos(PI*L/(2b))*sqrt(r/2L))

where:

L = Vertical length from which water is being extracted

r = single well radius

b = saturated aquifer thickness

L/r must be > 30 L/b must be < 0.5

Assumption made that same factor may be applied to equivalent well and trench equations.