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# Hydrogeological Report – Revision 1

## Napanee Water Pollution Control Plant Expansion & Upgrades
## 300 Water Street West
## Napanee, Ontario

**Client Name:** EVB Engineering on behalf of the Town of Greater Napanee
**Date:** February 3, 2025
**File:** 40745

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# 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.

It is noted that a previous draft version of this report was issued on August 18, 2021 to a different design team. Based on that information and the original design, a new maintenance garage is currently under construction on the southwest side of the property. Subsequently, a new design team comprised of EVB Engineering (EVB) and CIMA+ have been retained by the Town to complete the design of the remaining proposed upgrades, which have been modified since Thurber's original draft report was submitted. In addition, new geophysical testing was carried out for the project in November 2023, and supplemental geotechnical and hydrogeological investigations were carried out February 2024. This current version of Thurber's geotechnical report has been prepared specifically for the current design team (EVB and CIMA+) in regard to the proposed upgrades.

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.

The potential facility upgrades that are subject to hydrogeological assessment include the following:

- A single storey Multi-Use Building including headworks, electrical and mechanical rooms, lab, and offices. The footprint of the building will be approximately 22 m wide and 32 m long. The building will have two floor slab levels, with the office are having a finished floor Elevation of 81.76 m and the headworks area having a finished floor elevation of 80.90 m. A vortex tank within the headworks will have a founding elevation of 76.03 m.

- New Influent Buffer Tanks and Sludge Buffer Tanks adjoining the headworks building to the east and south, respectively. The footprint of the Influent Buffer Tanks will be approximately 9 m wide and 17 m long, and the Sludge Buffer Tanks will be approximately 6 m wide and 18 m long. The Influent Buffer Tank and Sludge Buffer Tank will be founded below grade on raft slabs with founding Elevations of 71.70 m and 73.90 m, respectively.

- Three AGS Reactor Tanks with an approximate width of 33 m and total length of 54.2 m. The tanks will be founded below grade on a raft slab with a founding Elevation of 75.45 m.

- A Post-Equalization Tank adjoining the AGS Tanks. The tank will be approximately 9 m wide and 29 m long. The tank will be founded on a raft slab with a founding Elevation of 77.84 m. A pad of lean concrete will be provided beneath the raft slab to an Elevation of 75.45 m (equal to the founding elevation of the AGS Tanks).

- A new two-storey Operation Building including solids thickener, AGS controls, tanks access, biogas boiler, pump gallery, piping, electrical and mechanical. The building will be approximately 14 m wide and 39 m long. The building will have a basement level and will be founded on a raft slab with a founding Elevation of 76.4 m.

- A single storey Tertiary / Ultraviolet Disinfection Building with flocculation tanks. The footprint of the building will be approximately 16 m wide and 27 m long. The building will have a basement level with raft slab founding Elevation of 75.068 m.

- A sanitary pumping station to the east of the tertiary building. The wet well for the pumping station will be approximately 2.4 m wide and 2.4 m long, with a base Elevation of approximately 73.0 m.

- An Outfall Pipe, service piping and duct banks.

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:

- *Geotechnical Design Report – Revision 1, Napanee Water Pollution Control Plant Expansion & Upgrades, 300 Water Street West, Napanee, Ontario* by Thurber Engineering Ltd. dated June 5, 2024.

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 nine monitoring wells within select boreholes of the concurrent geotechnical investigation and develop them prior to further testing.

- Collect multiple rounds of groundwater level readings in the monitoring wells installed during the concurrent geotechnical investigation.
- 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 Study Area for the hydrogeological investigation was defined as 500 m from the Site.

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 municipal wastewater treatment is conducted on Site.

A plan illustrating the Site and the proposed upgrades are shown on Drawings 40745-1 in Appendix A. The Site and Study Area is shown on Figure 1 and the topography of the Study Area is shown on Figure 2.

## 2.2 Site Physiographic, Geologic and Hydrogeologic Settings

Based on the information in *The Physiography of Southern Ontario* 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. The physiographic regions of the Study Area are shown on Figure 3.

The surficial geology of the Study Area consists primarily of glaciomarine deposits of massive to laminated silt and clays with minor sand and gravel (OGS, 2010). The surficial geology of the Study Area is shown on Figure 4.

The predominant bedrock of the Study Area consists of limestone with minor shale partings of the Bobcaygeon Formation (OGS, 2011). 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. South of the fault, the Study Area is situated on limestone and dolostone of the Gull River Formation. The Site is completely situated on the Bobcaygeon Formation. The bedrock geology of the Study Area is shown on Figure 5.

## 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, referred to as the Lower Napanee River Complex. Wetlands near the north bank overlap with 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 natural features located within the Study Area and Site are illustrated on Figure 7.

The Study Area is located within the Lower Napanee Subwatershed of the Napanee Region Watershed and is located within land regulated by Quinte Conservation. The Study Area is located in the Quinte Source Protection Area (SPA). The Study Area 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. The Study Area is not located within the designated areas of the Oak Ridges Moraine Conservation Act or Niagara Escarpment Planning and Development Act. The Study Area is not within a wellhead protection area. The Study Area is located within a Highly Vulnerable Aquifer but is not located within a Significant Groundwater Recharge Area.

### 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 in February 2024. These well records include all recorded wells regardless of their current status.

In total, 36 recorded wells were located within the 500 m radius Study Area. The approximate locations of the wells are shown on Figure 6. A summary of well record details is provided in Table B1 of Appendix B.

There were 25 well records recorded as water supply wells. For the remaining records, six records were for monitoring and test holes, test holes, or observation wells, one well record is recorded as abandoned, and four records have an unknown status.

### 2.5 Existing Water Taking Permits

A search of MECP's Permit to Take Water mapping application in December 2024 indicated no active permits were located within the Study Area. A search of MECP's Environmental Activity and Sector Registry (EASR) mapping application in December 2024 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 were made available 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, and BH19-17 from the GHD investigation were considered most relevant to the current works and have been included in the associated geotechnical report, 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 in two stages, with the first stage occurring between February 22 and March 2, 2021 and the second stage occurring between February 20 and 21, 2024. In total, the two stages included the installation of 24 sampled geotechnical boreholes (BH01 through BH14, BH19 through BH26, MW24-101, and BH24-301), four unsampled auger probes (BH15, BH16, BH17, BH18), and six cone penetration tests (CPTu) tests (CPT24-201, through CPT24-206).

A summary of the borehole, auger probe, and CPT details are provided in Table 3.1. Borehole details are also provided on the Record of Borehole sheets included in Appendix C. The approximate locations of the boreholes, auger probes, and CPTs are shown on the Testhole Location Plan, Drawing No. 40745-1 provided in Appendix A.

***Table 3-1: Borehole Details***

| Testhole ID | Northing (m) | Easting (m) | Ground Surface Elev. (m) | Termination Depth (m) | Termination Elev. (m) | MW Installed? |
|---|---|---|---|---|---|---|
| BH-01 | 4 900 363.3 | 343 393.4 | 80.9 | 10.2 | 70.7 | N |
| BH-02 | 4 900 376.0 | 343 427.4 | 79.0 | 8.8 | 70.2 | Y |
| BH-03 | 4 900 314.4 | 343 421.8 | 76.4 | 10.3 | 66.2 | Y |
| BH-04 | 4 900 313.1 | 343 466.0 | 77.2 | 10.2 | 67.0 | Y |
| BH-05 | 4 900 278.5 | 343 451.1 | 76.3 | 11.6 | 64.7 | N |
| BH-06 | 4 900 323.2 | 343 358.1 | 78.5 | 5.8 | 72.7 | Y |
| BH-07 | 4 900 335.5 | 343 376.2 | 78.5 | 5.9 | 72.6 | N |
| BH-08 | 4 900 312.0 | 343 386.0 | 77.2 | 6.5 | 70.6 | N |
| BH-09 | 4 900 314.9 | 343 400.5 | 76.8 | 2.9 | 73.9 | N |
| BH-10 | 4 900 286.0 | 343 480.9 | 76.5 | 3.7 | 72.9 | N |
| BH-11 | 4 900 293.0 | 343 503.0 | 76.4 | 3.7 | 72.7 | Y |
| BH-12 | 4 900 302.0 | 343 528.0 | 76.4 | 3.7 | 72.7 | N |

| Testhole ID | Northing (m) | Easting (m) | Ground Surface Elev. (m) | Termination Depth (m) | Termination Elev. (m) | MW Installed? |
|---|---|---|---|---|---|---|
| BH-13 | 4 900 388.5 | 343 400.4 | 81.7 | 3.7 | 78.1 | N |
| BH-14 | 4 900 385.9 | 343 445.9 | 80.4 | 3.7 | 76.7 | N |
| BH-15* | 4 900 334.4 | 343 401.2 | 77.7 | 6.3 | 71.4 | N |
| BH-16* | 4 900 348.3 | 343 451.0 | 78.2 | 7.8 | 70.4 | N |
| BH-17* | 4 900 301.2 | 343 445.0 | 76.5 | 9.8 | 66.7 | N |
| BH-18* | 4 900 305.4 | 343 483.5 | 76.9 | 11.3 | 65.6 | N |
| BH-19 | 4 900 314.3 | 343 501.3 | 77.5 | 5.2 | 72.4 | N |
| BH-20 | 4 900 375.0 | 343 378.0 | 80.0 | 2.9 | 77.1 | N |
| BH-21 | 4 900 395.1 | 343 423.1 | 80.5 | 2.9 | 77.6 | N |
| BH-22 | 4 900 334.8 | 343 465.,3 | 77.7 | 3.7 | 74.1 | N |
| BH-23 | 4 900 302.4 | 343 359.7 | 77.5 | 2.9 | 74.7 | N |
| BH-24 | 4 900 283.0 | 343 428.0 | 75.9 | 2.9 | 73.1 | N |
| BH-25 | 4 900 364.7 | 343 500.3 | 77.7 | 8.2 | 69.5 | N |
| BH-26 | 4 900 345.9 | 343 514.1 | 77.4 | 8.2 | 69.2 | N |
| MW24-101 | 4 900 343.9 | 343 412.5 | 79.0 | 9.8 | 69.2 | Y |
| BH24-301 | 4 900 313.0 | 343 462.9 | 77.2 | 8.5 | 68.7 | N |
| CPT24-201 | 4 900 310.8 | 343 463.9 | 77.1 | 8.7 | 68.4 | N |
| CPT24-202 | 4 900 284.2 | 343 464.4 | 76.8 | 10.8 | 66.0 | N |
| CPT24-203 | 4 900 311.8 | 343 432.2 | 76.5 | 7.2 | 69.3 | N |
| CPT24-204 | 4 900 328.9 | 343 439.0 | 77.9 | 7.9 | 70.0 | N |
| CPT24-205 | 4 900 352.9 | 343 439.6 | 78.3 | 7.3 | 71.0 | N |
| CPT24-206 | 4 900 344.1 | 343 460.1 | 78.0 | 8.5 | 69.5 | N |

**Notes:** MW – Monitoring well

* - Auger probes to determine approximate bedrock depth.

The testhole locations were established in the field by Thurber using a portable GPS receiver and verified relative to existing Site features. All testhole locations were cleared of utilities prior to commencement of drilling. The testholes 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. Boreholes MW24-101 and BH24-301 were advanced using mud rotary techniques powered by a Gtech GT8 drill rig operated by ConeTec Investigations Ltd. Within the boreholes, 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). During the 2021 investigation, in-situ vane shear testing was

conducted in the cohesive deposits at selected locations/depths with an MTO N-sized vane. During the 2024 investigation, three Nilcon vane tests were carried out at selected depths in BH24-301. Thin-Walled (Shelby) tube samples were pushed and retrieved at various elevations in the boreholes to obtain relatively undisturbed cohesive soil samples for further laboratory testing. Bedrock core samples were recovered in BH-01, BH-02, BH-03 and MW24-101 using NQ or HQ 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 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 |

| 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) | | | | |
| 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 |
| MW24-101 | 79.0 | 9.4 | 69.6 | 1.5 | 8.7 | 70.4 | Bedrock |

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.

### 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 nine 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 are included 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 0.125 - 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.

***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 | Feb. 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 |
| | | | | Feb. 22, 2024 | 0.7 | 78.3 |
| 02 Deep | 7.6 | 71.4 | Limestone Bedrock | Feb. 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 |
| | | | | Feb. 21, 2024 | 1.0 | 78.0 |

| Borehole / Monitoring Well No | Mid Screen Depth (m) | Mid Screen Elev. (m) | Screened Material | Date | WL Depth (m) | WL Elev. (m) |
|---|---|---|---|---|---|---|
| 03 Shallow | 5.7 | 70.7 | Silty clay and silt some sand | Feb. 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 | Feb. 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 | Feb. 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 |
| | | | | Feb. 21, 2024 | 0.9 | 76.3 |
| 04 Deep | 8.7 | 68.5 | Silty clay | Feb. 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 |
| | | | | Feb. 22, 2024 | 1.6 | 75.6 |
| 06 | 4.3 | 74.2 | Silty clay / silty sand | Feb. 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 / silty clay | Feb. 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 |

| Borehole / Monitoring Well No | Mid Screen Depth (m) | Mid Screen Elev. (m) | Screened Material | Date | WL Depth (m) | WL Elev. (m) |
|---|---|---|---|---|---|---|
| MW24-101 | 8.7 | 70.4 | Limestone Bedrock | Feb. 20, 2024 | 1.8 | 77.2 |
| | | | | Feb. 22, 2024 | 1.8 | 77.2 |

* Negative water level indicates water level measured above the ground surface.

Based on the groundwater elevations measured at the monitoring wells, the local shallow overburden groundwater flow is interpreted to travel in a general southerly / southeasterly direction towards Napanee River. On review of the nested overburden / bedrock well pairs (02 and 03), the overburden and shallow bedrock aquifers have very similar water levels, suggesting the overburden and shallow bedrock are hydraulicly connected. A minor downward hydraulic gradient is noted in all nested well pairs (02, 03, and 04).

## 4.2 Hydraulic Conductivity

A total of nine slug tests were completed and analyzed using the Hvorslev method. The test results indicated that the hydraulic conductivity of the screened formations ranged from $1.9 \times 10^{-8}$ m/s to $1.7 \times 10^{-5}$ 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***

| Borehole/Monitoring Well No | Screen Depth (m) | | Hydraulic Conductivity (m/s) | Dominant Screened Formation |
|---|---|---|---|---|
| | Top | Bottom | | |
| 02 Shallow | 2.7 | 5.7 | $5.5 \times 10^{-6}$ | Silty clay, frequent sand seams |
| 02 Deep | 6.4 | 8.8 | $2.5 \times 10^{-7}$ | Limestone bedrock |
| 03 Shallow | 4.2 | 7.2 | $2.0 \times 10^{-6}$ | Silty clay and silt some sand |
| 03 Deep | 7.9 | 10.3 | $2.5 \times 10^{-6}$ | Limestone bedrock |
| 04 Shallow | 3.1 | 6.1 | $1.9 \times 10^{-8}$ | Silty clay |
| 04 Deep | 7.1 | 10.1 | $2.3 \times 10^{-6}$ | Silty clay, frequent silt/sand lenses |
| 06 | 2.8 | 5.8 | $1.4 \times 10^{-6}$ | Silty clay and silty sand |
| 11 | 1.5 | 3.0 | $4.4 \times 10^{-6}$ | Sand, some silt and silty clay |
| MW24-101 | 7.9 | 9.4 | $1.7 \times 10^{-5}$* <br> $1.1 \times 10^{-6}$* | Limestone bedrock |

*Two analyses were conducted for test at MW24-101 due to two distinct curves, which may be due to variable hydraulic conductivity of the bedrock matrix.

Six slug tests were conducted in the silty clay and sand overburden, and the largest tested value of $5.5 \times 10^{-6}$ m/s was selected for dewatering estimates. Three slug tests were conducted in the

limestone bedrock and the largest tested value of 1.7 x $10^{-5}$ 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 directly to or within 30 m of a surface water body. 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 the detailed design drawings, it is understood that structures that may require dewatering include the Multi-Use Building, Influent Buffer Tanks and Sludge Buffer Tanks, Three AGS Reactor Tanks, a Post-Equalization Tank adjoining the AGS Tanks, an Operation Building, the Tertiary/Ultraviolet Disinfection Building, the Sanitary Pumping Station, an Outfall Pipe, and service piping and duct banks. It is our understanding that the Site-wide access roads will not require excavations below grade. It is assumed that the AGS Tanks, Post-Equalization Tank, and new Operation Building will be constructed within a single combined excavation; therefore, a single dewatering estimate for these structures was assumed.

It is understood that the Influent Buffer Tanks and Sludge Buffer Tanks will be constructed within watertight shoring systems socketed into the underlying bedrock and the remainder of the excavations are assumed to be constructed with non-watertight shoring. It is recommended that the watertight shoring walls be extended a minimum of approximately 1 m into limestone bedrock to cut off the overburden. The bedrock is still anticipated to provide flow.

The estimated dimensions of the aforementioned construction features and dewatering assumptions are summarized below:

- A single storey Multi-Use Building including headworks, electrical and mechanical rooms, lab, and offices. The footprint of the building will be approximately 32 m long and 22 m wide, with an assumed excavation of 35 m x 25 m. The building will have two floor slab levels, with the office area having a finished floor Elevation of 81.76 m and the headworks area having a finished floor elevation of 80.90 m. The headworks building will typically be founded at elevation of 79.1 m. A vortex tank within the headworks will have a founding elevation of 76.03 m. The dewatering calculations assume an unconfined scenario using the highest hydraulic conductivity value for silty clay and sand overburden ($5.5 \times 10^{-6}$ m/s) from Section 4.2 and an assumed high water level elevation of 78.5 m, based on the maximum water level measured in Monitoring Well BH-02 Shallow.
- Influent Buffer Tanks directly east of the Multi-Use Building and Sludge Buffer Tanks directly to the south of the Multi-Use Building. The footprint of the Influent Buffer Tanks will be approximately 9 m wide and 17 m long, and the Sludge Buffer Tanks will be approximately 6 m wide and 18 m long. It is assumed the two structures will be constructed in separate excavations with footprints of approximately 20 m x 13 m and 20 m x 8 m for the Influent Buffer Tanks and Sludge Buffer Tanks, respectively. The deepest excavation elevation levels are assumed to be approximately 71.7 m and 73.9 m for the Influent Buffer Tanks and Sludge Buffer Tanks, respectively. The excavation for the Influent Buffer Tanks is anticipated to extend through the silty clay and advance to the top of bedrock. The excavation for the Sludge Buffer Tank is anticipated to advance through the silty clay only. As there will be approximately only 2.2 m of silty clay below the excavation of the Sludge Buffer Tanks, there is a possibility that depressurization of the underlying bedrock will be required prior to excavation in order to reduce the risk of basal heave. It is understood that it is proposed that both excavations will be constructed within separate watertight shoring systems socketed into the underlying limestone bedrock; therefore, the dewatering calculations assume a confined scenario with an assumed 3 m extraction interval below the excavation, using the highest hydraulic conductivity value of for limestone bedrock ($1.7 \times 10^{-5}$ m/s) from Section 4.2 and an assumed high water level

elevation of 78.5 m, based on the maximum water level measured in Monitoring Well BH-02 Shallow. In addition, an allowance for removal of water entrained by the watertight shoring system in the overburden was provided, assuming a drainable porosity of 20%, a base flow rate assuming six days to complete bulk excavation, and a peak flow rate assuming two days to complete bulk excavation (i.e. a safety factor of three on the base flow rate).

- Three AGS Reactor Tanks, a Post-Equalization Tank adjoining the AGS Tanks, and an Operation Building will be constructed within one excavation. The footprint of the excavation is assumed to be approximately 65 m x 55 m and the base of the bulk excavation is assumed to be at Elev. 74.9 m. The dewatering calculations assume an unconfined scenario using the highest hydraulic conductivity value for silty clay and sand overburden ($5.5 \times 10^{-6}$ m/s) from Section 4.2 and an assumed high water level elevation of 77.2 m, based on the maximum water level measured in monitoring well MW24-101.
- A single storey Tertiary / Ultraviolet Disinfection Building with flocculation tanks. The footprint of the building will be approximately 27 m long and 16 m long with an assumed excavation of 30 m x 20 m. The base of the excavation is assumed to be at Elev. 74.4 m. The dewatering calculations assume an unconfined scenario using the highest hydraulic conductivity value for silty clay and sand overburden ($5.5 \times 10^{-6}$ m/s) from Section 4.2 and an assumed high water level elevation of 76.3 m, based on the maximum water level measured in Monitoring Well BH-04 Shallow.
- A Sanitary Pumping Station to the east of the Tertiary Building. The wet well for the pumping station will be approximately 2.4 m wide and 2.4 m long, with a base elevation of approximately 73.0 m. The assumed excavation footprint will be 4 m x 4 m and the base of the excavation is assumed to be at Elev. 72.7 m. The dewatering calculations assume an unconfined scenario using the highest hydraulic conductivity value for silty clay and sand overburden ($5.5 \times 10^{-6}$ m/s) from Section 4.2 and an assumed high water level elevation of 76.3 m, based on the maximum water level measured in Monitoring Well BH-04 Shallow.
- The trench for the Outfall Pipe is assumed to be 2 m deep with a footprint of 55 m x 2 m. The dewatering calculations assume an unconfined scenario using the highest hydraulic conductivity value for silty clay and sand overburden ($5.5 \times 10^{-6}$ m/s) from Section 4.2 and an assumed high water level of 0.9 m below grade, based on the maximum water level measured in Monitoring Well BH-04 Shallow. It is understood that other shallow trenches will be required within the project area for service piping and duct banks; however, it is assumed that the Outfall Pipe trench will represent the worst-case conditions for the required service trenches.

The expected soil and groundwater conditions at the excavations are assumed based on the on the subsurface conditions encountered in the boreholes presented in Appendix C. 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 to limestone bedrock. A summary of the excavation details, and anticipated soil and groundwater conditions is provided in Table 5-1.

***Table 5-1: Summary of Excavations and Dewatering Conditions***

| Excavation | Approx. Excavation Footprint (m) | Approx. Base Elev. (m) | Borehole No. | Anticipated Ground Conditions at Base of Excavation | Assumed Highest Ground-water Elev. (m) | Assumed Hydraulic Conductivity (m/s) | Target Dewater Elev. (m) |
|---|---|---|---|---|---|---|---|
| Multi-Use Building | 35 x 25 | 76.0 | 01, 02, MW24-101 | Silty clay | 78.5 | $5.5 \times 10^{-6}$ | 75.0 |
| Influent Buffer Tanks **Watertight Shoring** | 20 x 13 | 71.7 | 01, 02, MW24-101 | Limestone Bedrock | 78.5 | $1.7 \times 10^{-5}$ | 71.2 |
| Sludge Buffer Tanks **Watertight Shoring and Depressurization of Bedrock** | 20 x 8 | 73.9[1] | 01, 02, MW24-101 | Silty clay and Limestone Bedrock | 78.5 | $1.7 \times 10^{-5}$ | 72.9 |
| Combined Excavation for Three AGS Reactor Tanks, Post-Equalization Tank, and Operation Building | 65 x 55 | 74.9 | 03, 04, 22, MW24-101 | Silty Clay, Peat | 77.2 | $5.5 \times 10^{-6}$ | 73.9 |
| Single storey Tertiary / Ultraviolet Disinfection Building | 30 x 20 | 74.4 | 05, 10 | Sand to silty sand, silty clay | 76.3 | $5.5 \times 10^{-6}$ | 73.4 |
| Sanitary Pumping Station | 4 x 4 | 72.7 | 10 | Sand and silty clay | 76.3 | $5.5 \times 10^{-6}$ | 71.7 |
| Utility Trench (e.g., Outfall Pipe) | 55 x 2 | 2 m below grade | 04, 10, 11, 12, 19 | Sand and silty clay | 0.9 m below grade | $5.5 \times 10^{-6}$ | 3 m below grade |

Note 1 It is assumed that wells would be installed in the bedrock below the depth of the required excavation for the Sludge Buffer Tanks.

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 groundwater 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;
- An allowance for removal of water entrained by the watertight shoring system (for the Influent Buffer Tanks and Sludge Buffer Tanks) in the overburden was provided, assuming a drainable porosity of 20%, a base flow rate assuming six days to complete bulk excavation, and a peak flow rate assuming two days to complete bulk excavation (i.e. a safety factor of three on the base flow rate); and,
- Lowering of groundwater to about 1 m below the base of excavations terminating in overburden and about 0.5 m below the base of excavations terminating in bedrock, to facilitate a dry, stable work area was assumed.

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. The estimated base groundwater flow, peak groundwater flow and radii of influence are summarized in Table 5-2.

**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) | Removal of Water Entrained in the Soil (L/day) | Estimated Peak Flow Rate (L/day) | Approx. Radius of Influence (m) |
|---|---|---|---|---|---|---|
| Multi-Use Building | 58,000 | 174,000 | 44,000 | - | 218,000 | 25 |
| Influent Buffer Tanks **Watertight Shoring** | 91,000 | 273,000 | 13,000 | 177,000 | 463,000 | 90 |
| Sludge Buffer Tanks **Watertight Shoring and Depressurization of Bedrock** | 69,000 | 207,000 | 8,000 | 73,000 | 288,000 | 69 |
| Combined Excavation for Three AGS Reactor Tanks, Post-Equalization Tank, and Operation Building | 50,000 | 150,000 | 179,000 | - | 329,000 | 23 |
| Single Storey Tertiary / Ultraviolet Disinfection Building | 26,000 | 78,000 | 30,000 | - | 108,000 | 20 |
| Sanitary Pumping Station | 17,000 | 51,000 | 1,000 | - | 52,000 | 32 |
| Utility Trench (e.g., Outfall Pipe) | 19,000 | 57,000 | 6,000 | - | 63,000 | 15 |
| **Total** | **330,000** | **990,000** | **281,000** | **250,000** | **1,521,000** | **As above** |

The total base groundwater flow from all the excavations is approximately 333,000 L/day. With a safety factor of three on groundwater flow, a rainfall removal allowance of 50 mm in 24 hours, and

an allowance for removal of water entrained in soil for excavations with watertight shoring, the estimated peak flow rate flow is approximately 1,521,000 L/day. Since the combined water taking rates for the subject construction dewatering within an overlapping radius of influence are expected to be greater than 400,000 L/day, a Category 3 PTTW will be required prior to commencing excavations. The maximum dewatering radius of influence for a single excavation was estimated to be 90 m.

## 5.2 Permanent Drainage

Based on the design drawings, the Three AGS Reactor Tanks, the Operation Building, and the Single Storey Tertiary / Ultraviolet Disinfection Building have perimeter footing sub-drains indicated for the purpose of long-term groundwater drainage. The drawings indicate perimeter footing sub-drains with a lowest base elevation at approximately Elev. 75.99 m for the AGS tanks, 75.89 m for the Operation Building, and 75.28 m for the Single Storey Tertiary / Ultraviolet Disinfection Building.

The other structures, including the Post-Equalization Tank, Multi-Use Building, Influent Buffer Tanks, Sludge Buffer Tanks, Sanitary Pumping Station, Outfall Pipe, and service piping and duct banks have no sub-drains indicated on the drawings and it is understood that these structures will be designed to be waterproofed and to resist hydrostatic pressure; therefore, no permanent drainage is anticipated for these structures.

The maximum water levels recorded in the vicinity of the Three AGS Reactor Tanks and Operation Building was 77.2 m and the maximum water level recorded in the vicinity of the Tertiary / Ultraviolet Disinfection Building was 76.3 m; therefore, the foundation drains installed at elevations 75.99 m, 75.89 m, and 75.28 m would continuously collect groundwater and permanently lower the water table. Estimates of daily permanent drainage flow rates from the foundation drains for these three structures are presented on Table 5-3.

***Table 5-3: Permanent Drainage Estimates***

| Structure | Approx. Structure Footprint (m) | Approx. Sub Drain Base Elev. (m) | Assumed Highest Ground-water Elev. (m) | Assumed Hydraulic Conductivity (m/s) | Base Foundation Drainage Flow (L/day) | Peak Foundation Drainage Flow with Safety Factor of 3 (L/day) | Approx. Radius of Influence (m) |
|---|---|---|---|---|---|---|---|
| Three AGS Reactor Tanks | 55 x 33 | 75.99 | 77.2 | $1.2 \times 10^{-6}$ | 7,000 | 21,000 | <10 |
| Operation Building | 39 x 14 | 75.89 | 77.2 | $1.2 \times 10^{-6}$ | 4,000 | 12,000 | <10 |
| Single Storey Tertiary / Ultraviolet Disinfection Building | 27 x 16 | 75.28 | 76.3 | $1.2 \times 10^{-6}$ | 4,000 | 12,000 | <10 |
| **Total** | | | | | **15,000** | **45,000** | **As above** |

Permanent drainage flow rates were estimated using the Dupuit analytical solution. The radius of influence was calculated using the Sichardt equation. The geometric mean hydraulic conductivity value for silty clay and sand overburden ($1.2 \times 10^{-6}$ m/s) was used, calculated based on the results of all overburden slug test results presented in Section 4.2, because it is expected to be a more representative value over a widespread area and over an extended duration. A base groundwater extraction flow rate was estimated, and a factor of safety of 3 was applied to this flow rate to provide an allowance for significant precipitation events, variation in hydraulic conductivity, actual structure dimensions and geometry, and ground water levels due to seasonality or other factors. The calculation details including all the parameters used are presented on Table F5 in Appendix F.

Considering the combined estimated peak long-term permanent drainage water taking rate is 45,000 L/day and is thus less than 50,000 L/day, it is anticipated that a long-term Category 3 Permit To Take Water (PTTW) from the MECP will not be required for the long-term foundation drainage needs of the structures on Site.

# 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

Dewatering of the excavations are estimated to have radii of influence varying between 15 m and 90 m, with a maximum drawdown of the water table near the edges of the excavations, reducing with distance to the maximum estimated radius of influence. A maximum drawdown of 7.3 m within the limestone was estimated for the excavation for the Influent Buffer Tanks.

It is understood that the excavations for the Influent Buffer Tanks and Sludge Buffer Tanks adjacent to the headworks will take place within the confines of an engineered support system. It is recommended that the support system be watertight in order to cut-off groundwater flows from the sand/silt layer encountered on top of bedrock. Secant pile walls socketed a minimum of 1 m into the limestone bedrock is considered a feasible option for the support system.

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 from inside the watertight shoring system.

It is noted that dewatering activities have the potential to cause settlement of adjacent structures due to an increase in the effective stress of the foundation soils caused by groundwater level lowering. For this project the risk of settlement beneath the existing structures is considered low provided that watertight shoring systems are used for deep excavations that extend into the sand/silt and bedrock. Notwithstanding this assessment, a settlement monitoring program should be carried out during construction as a precautionary measure to confirm that the existing structures do not settle excessively. Thurber can assist with the preparation of a settlement monitoring specification, if requested.

Basal stability is not expected to be an issue for excavations terminated in the limestone bedrock. There is some risk of basal instability in the Sludge Buffer Tank excavation that terminates in silty clay or sand overburden. To mitigate the risk of basal instability in the Sludge Buffer Tank excavation, the overburden could be sub-excavated to bedrock, or the bedrock could be depressurized prior to bulk excavation.

## 6.2 Impacts to Surface Water and Natural Environment

As described in Section 2.3, the Napanee River and Lower Napanee River Complex Provincially Significant Wetland (PSW) are located immediately south of the Site are 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 14.3 km upstream from the Site, the low water trigger condition for Napanee River is 1.67 $m^3/s$, or approximately 144,288,000 L/day. The maximum combined dewatering rate for the proposed work excluding stormwater and removal of water entrained in the soil is 990,000 L/day, or approximately 0.7% the low water trigger condition for 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 and it is reasonable to assume that the dewatering water would originate from other portions of the aquifer and not only from the river flow. The Lower Napanee River Complex PSW is interpreted to be supplied primarily by water from the Napanee River; therefore, no impacts to the water quantity of the PSW are anticipated.

Groundwater of the quality that was observed herein could not be discharged to surface water or within 30 m of surface water or the Lower Napanee River Complex PSW, 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. Assessment of impacts to the wetland ecosystem and impacts to stream geomorphology due to groundwater discharge are beyond the scope of this Study.

### 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 90 m. Dewatering activities may impact the quantity and/or quality of water obtained by water well users within the radius of influence.

As noted in Section 2.4, there were 25 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 270 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.

Permanent drainage is anticipated for the Three AGS Reactor Tanks, Operation Building, and the Single Storey Tertiary / Ultraviolet Disinfection Building with a maximum radius of influence of less than 10 m, which is anticipated to not extend past the Site boundary; therefore, no impact to the quantity and/or quality of private wells is anticipated from permanent drainage.

### 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.

## 7. CONCLUSIONS AND RECOMMENDATIONS

### 7.1 Category 3 Permit To Take Water

As described previously, the estimated peak water taking rate is 1,521,000 litres per day. Since the combined discharge rates for the subject construction dewatering within an overlapping radius of influence are expected to be greater than 400,000 L/day, a Category 3 Permit To Take Water (PTTW) from the MECP will be required prior to commencing full-scale operations. 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 peak water taking rate for the project as a whole will depend on the number of excavations and which specific excavations will be conducted concurrently. For each excavation, the water taking rate is expected to be highest at the beginning of dewatering when the water table is being actively lowered and during large rainfall events. The design and operation of the dewatering activities is the sole responsibility of the Contractor, to ensure the PTTW limit is not exceeded.

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 surface water, within 30 m of surface water, or within 30 m of the Lower Napanee River Complex PSW due to exceedances of the PWQO and interim PWQO as discussed in Section 4.3. If considering discharge to or within 30 m of surface water or the PSW, 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. Assessment of impacts due to groundwater discharge to or within 30 m of surface water or the PSW, including increase in streamflow rates, impacts to water temperature, impacts to the wetland ecosystem, and impacts to stream geomorphology are beyond the scope of this Study.

Discharge more than 30 m away from a surface water body may not require treatment beyond limiting total suspended solids (TSS) to be no higher than 25 mg/L and possibly lower depending on discharge permit criteria and external agencies, and dispersing discharge water to promote infiltration so that no channelized flow of discharge water directly flows into surface water.

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 to a sewer, 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 Additional Recommendations

The following measures are recommended to mitigate the potential for the dewatering activities to cause negative impacts as assessed previously:

- Implement monitoring and contingency plans.
- Treatment of groundwater to meet the discharge limits is required. Advanced treatment methods beyond typical sediment control (filtration / sedimentation) will likely be required for discharge to surface water or within 30 m of surface water or the PSW or to the Town of Greater Napanee storm sewer. Treatment of solids is anticipated for discharge to land surface greater than 30 m from surface water provided the discharge water infiltrates and overland flow does not reach surface water.
- The operation and monitoring of discharge facilities should be carried out by an experienced dewatering contractor and water treatment contractor familiar with fisheries and water quality requirements.
- All occupational health and safety regulations must be adhered to, including those with respect to work in the potential presence of toxic or explosive gases or a lack of oxygen.

## 7.4 Proposed Monitoring Plan and Contingency Plan

There are three monitoring and contingency plans that are applicable to the project, which are presented in Table G1, Table G2, and Table G3 in Appendix G.

- Table G1: Monitoring and Contingency Plan for Groundwater Taking
- Table G2: Monitoring and Contingency Plan for Discharge to the town of Greater Napanee Sanitary/Combined Sewer
- Table G3: Monitoring and Contingency Plan for Discharge to Ground Surface Greater than 30 m from Surface Water

The conditions under which each Monitoring and Contingency Plan is applicable are identified in Table 7-1. Details of each plan are further presented herein Appendix G.

***Table 7-1: Monitoring and Contingency Plan Applicability***

| Monitoring and Contingency Plan | Applicable Conditions |
|---|---|
| Table G1<br>(Groundwater Taking) | Applicable to each water taking location where water is being taken. |
| Table G2<br>(Discharge to town of Greater Napanee Sanitary/Combined Sewer) | Applicable to each sewer discharge location and each new water taking location that is being discharged to said location. |
| Table G3<br>(Monitoring and Contingency Plan for Discharge to Ground Surface Greater than 30 m from Surface Water) | Applicable to each ground surface discharge location and each new water taking location that is being discharged to said location. |

It is noted that the Contractor's means and methods are not known at this time and that the monitoring and contingency plan may need to be adjusted and further specified once additional details are known. In addition to the monitoring and contingency measures proposed herein, compliance with all other permits and agreements apply. In particular, any additional measures identified in the PTTW to be issued by MECP.

## 7.5 Permanent Drainage and Discharge

Considering the estimated peak long-term permanent drainage water taking rate is 45,000 L/day and less than 50,000 L/day, it is anticipated a long-term Category 3 Permit To Take Water (PTTW) from the MECP will not be required for the long-term foundation drainage needs of the structures on Site.

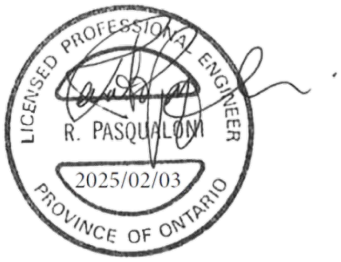
The design of foundation drains, mechanical systems, and discharge methods, and approvals for long-term drainage are not addressed herein.

## 8. CLOSURE

We trust this information meets your present needs. If you have any questions, please contact the undersigned at your convenience.


Paul Coulson, P.Geo.
Hydrogeologist


David Hill, M.A.Sc., P.Eng., P.Geo
Senior Hydrogeologist / Review Engineer




Date: February 3, 2025
File: ***40745***

Renato Pasqualoni, P.Eng.
Review Principal

## 9. REFERENCES

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THURBER

# 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.

## 4. USE OF THE REPORT

The information and opinions expressed in the Report, or any document forming part of the Report, are for the sole benefit of the Client. NO OTHER PARTY MAY USE OR RELY UPON THE REPORT OR ANY PORTION THEREOF WITHOUT THURBER'S WRITTEN CONSENT AND SUCH USE SHALL BE ON SUCH TERMS AND CONDITIONS AS THURBER MAY EXPRESSLY APPROVE. Ownership in and copyright for the contents of the Report belong to Thurber. Any use which a third party makes of the Report, is the sole responsibility of such third party. Thurber accepts no responsibility whatsoever for damages suffered by any third party resulting from use of the Report without Thurber's express written permission.

## 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.

THURBER ENGINEERING LTD.

# FIGURES



**LEGEND**

- APPROXIMATE PROJECT AREA
- APPROXIMATE STUDY AREA (250 m BUFFER)
- ROADWAY
- WATERCOURSE
- WATERBODY

0 100 200 400

1:7,500 METRES

**NOTES**

1. CONTAINS INFORMATION LICENSED UNDER THE OPEN GOVERNMENT LICENCE - ON
2. IMAGERY: © 2010 MICROSOFT CORPORATION AND ITS DATA SUPPLIERS
3. SERVICE LAYER CREDITS: SOURCES: ESRI, HERE, GARMIN, USGS, INTERMAP, INCREMENT P, NRCAN, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), ESRI KOREA, ESRI (THAILAND), NGCC, (C) OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY
4. COORDINATE SYSTEM: NAD 1983 UTM ZONE 18N

CLIENT

EVB ENGINEERING ON BEHALF OF
THE TOWN OF GREATER NAPANEE

PROJECT

NAPANEE WATER POLLUTION CONTROL PLANT
EXPANSION & UPGRADES
300 WATER STREET WEST, NAPANEE, ONTARIO

# SITE LOCATION PLAN

| | |
|---|---|
| PROJECT No. | 40745 |
| DESIGNED | PC |
| DRAWN | JEM |
| APPROVED | DH |
| DATE | 2024-02-15 |
| FIGURE No. | 1 |

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**LEGEND**

- APPROXIMATE PROJECT AREA
- APPROXIMATE STUDY AREA (250 m BUFFER)
- TOPOGRAPHIC CONTOUR, 2 m
- ROADWAY
- WATERCOURSE
- WATERBODY

0 100 200 400

1:7,500 METRES

**NOTES**

1. CONTAINS INFORMATION LICENSED UNDER THE OPEN GOVERNMENT LICENCE - ON
2. 2014 DIGITAL RASTER ACQUISITION PROJECT EASTERN ONTARIO (DRAPE)
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CLIENT

EVB ENGINEERING ON BEHALF OF
THE TOWN OF GREATER NAPANEE

PROJECT

NAPANEE WATER POLLUTION CONTROL PLANT
EXPANSION & UPGRADES
300 WATER STREET WEST, NAPANEE, ONTARIO

# TOPOGRAPHY

| | |
|---|---|
| PROJECT No. | 40745 |
| DESIGNED | PC |
| DRAWN | JEM |
| APPROVED | DH |
| DATE | 2024-02-15 |
| FIGURE No. | 2 |

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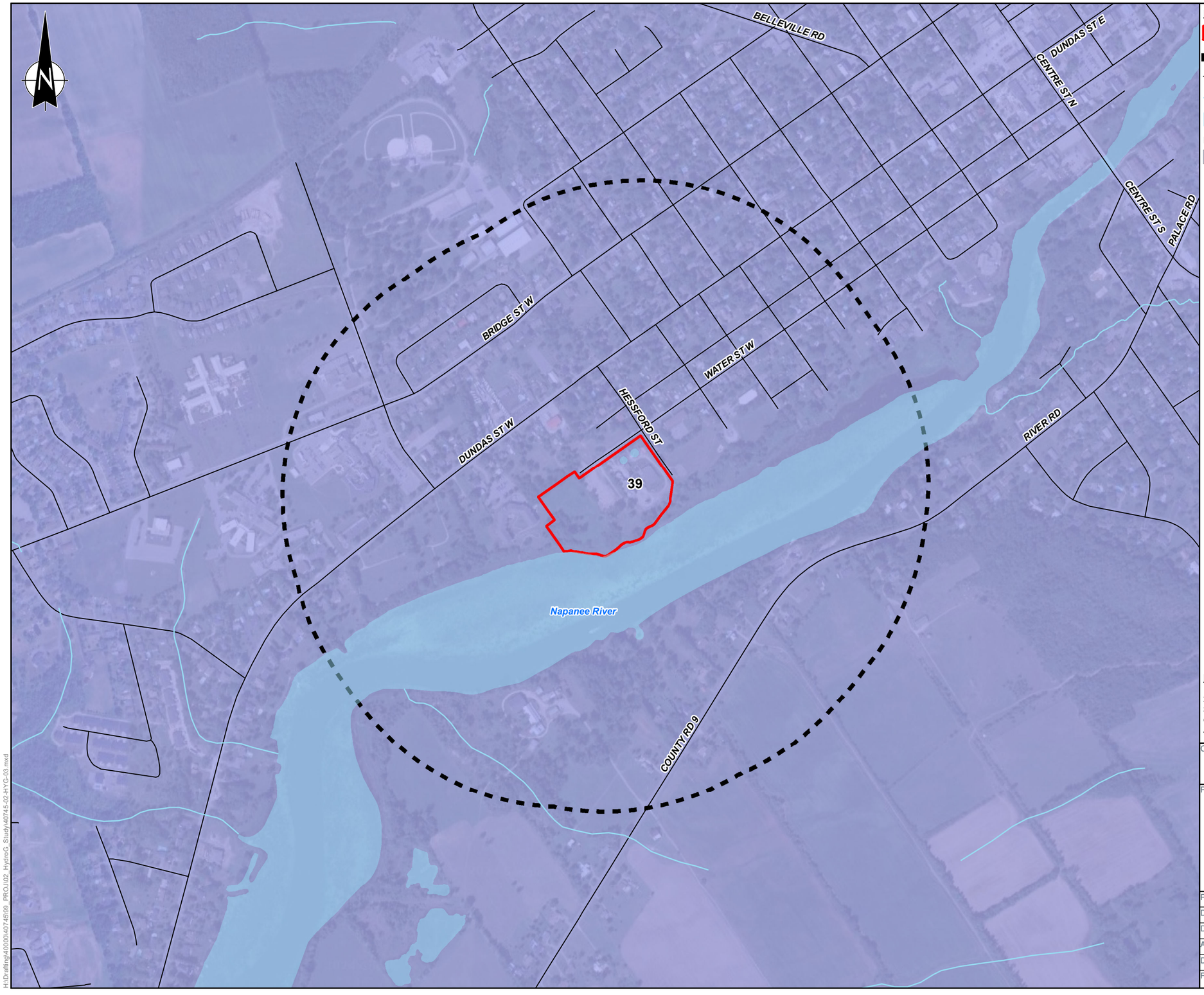


**LEGEND**

- APPROXIMATE PROJECT AREA
- APPROXIMATE STUDY AREA (250 m BUFFER)
- ROADWAY
- WATERCOURSE
- WATERBODY

**PHYSIOGRAPHIC REGION**

- 39. NAPANEE PLAIN

0 100 200 400

1:7,500 METRES

**NOTES**

1. CONTAINS INFORMATION LICENSED UNDER THE OPEN GOVERNMENT LICENCE - ON
2. IMAGERY: © 2010 MICROSOFT CORPORATION AND ITS DATA SUPPLIERS
3. CHAPMAN, L.J. AND PUTNAM, D.F. 2007. PHYSIOGRAPHY OF SOUTHERN ONTARIO; ONTARIO GEOLOGICAL SURVEY, MISCELLANEOUS RELEASE--DATA 228.
4. COORDINATE SYSTEM: NAD 1983 UTM ZONE 18N

CLIENT

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THE TOWN OF GREATER NAPANEE

PROJECT

NAPANEE WATER POLLUTION CONTROL PLANT
EXPANSION & UPGRADES
300 WATER STREET WEST, NAPANEE, ONTARIO

# PHYSIOGRAPHY

| | |
|---|---|
| PROJECT No. | 40745 |
| DESIGNED | PC |
| DRAWN | JEM |
| APPROVED | DH |
| DATE | 2024-02-15 |
| FIGURE No. | 3 |

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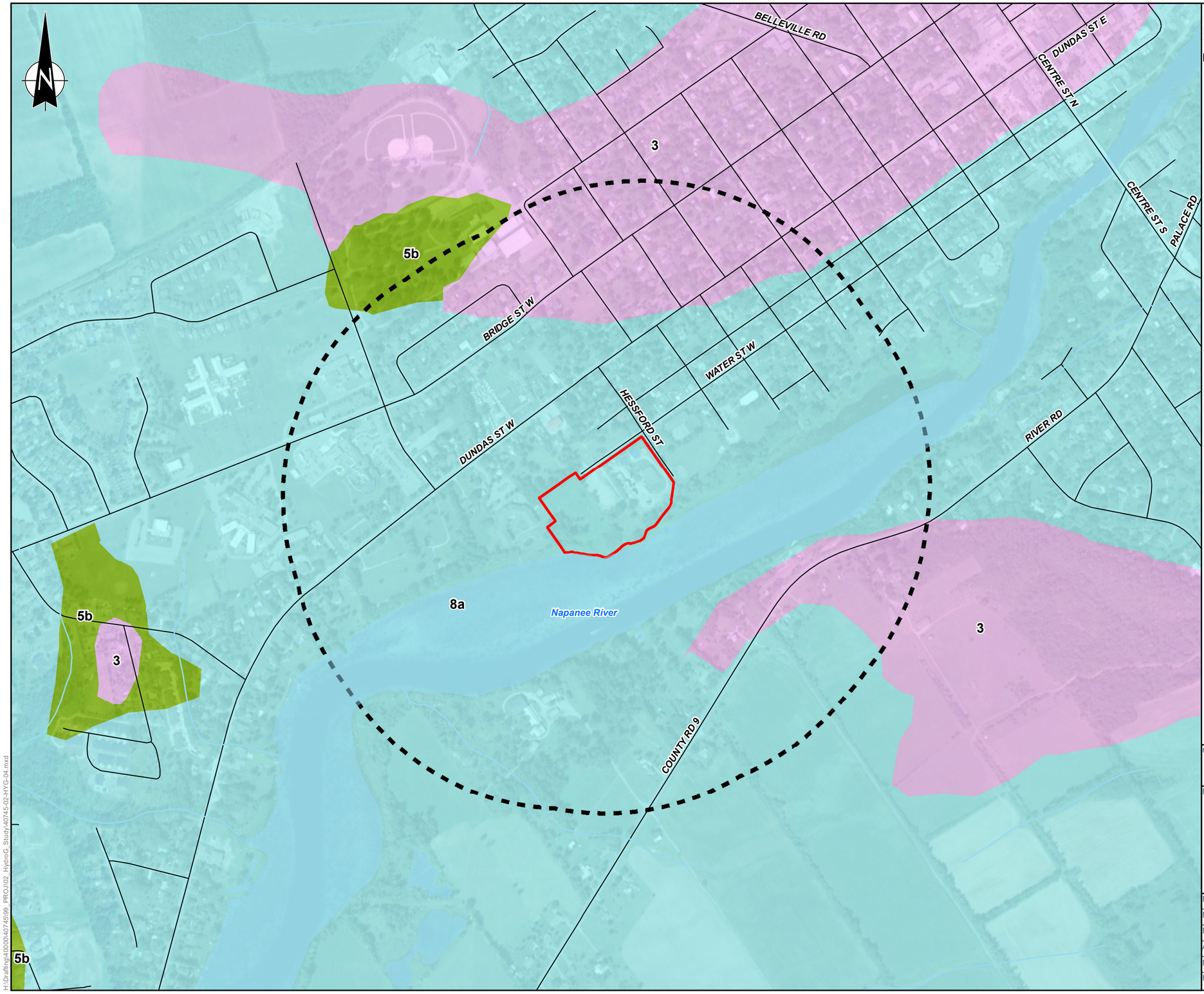


**LEGEND**

- APPROXIMATE PROJECT AREA
- APPROXIMATE STUDY AREA (250 m BUFFER)
- ROADWAY
- WATERCOURSE
- WATERBODY

**SURFICIAL GEOLOGY**

- 3. **PALEOZOIC BEDROCK**
- 5b. **TILL:** STONE-POOR, SANDY SILT TO SILTY SAND-TEXTURED TILL ON PALEOZOIC TERRAIN
- 8a. **FINE-TEXTURED GLACIOLACUSTRINE DEPOSITS:** SILT AND CLAY, MINOR SAND AND GRAVEL; MASSIVE TO WELL LAMINATED

0 100 200 400

1:7,500 METRES

**NOTES**

1. CONTAINS INFORMATION LICENSED UNDER THE OPEN GOVERNMENT LICENCE - ON
2. IMAGERY: © 2010 MICROSOFT CORPORATION AND ITS DATA SUPPLIERS
3. ONTARIO GEOLOGICAL SURVEY. 2010. SURFICIAL GEOLOGY OF SOUTHERN ONTARIO; ONTARIO GEOLOGICAL SURVEY, MISCELLANEOUS RELEASE--DATA 128-REV.
4. COORDINATE SYSTEM: NAD 1983 UTM ZONE 18N

CLIENT

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THE TOWN OF GREATER NAPANEE

PROJECT

NAPANEE WATER POLLUTION CONTROL PLANT
EXPANSION & UPGRADES
300 WATER STREET WEST, NAPANEE, ONTARIO

# SURFICIAL GEOLOGY

| | |
|---|---|
| PROJECT No. | 40745 |
| DESIGNED | PC |
| DRAWN | JEM |
| APPROVED | DH |
| DATE | 2024-02-15 |
| FIGURE No. | 4 |

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**LEGEND**

- APPROXIMATE PROJECT AREA
- APPROXIMATE STUDY AREA (250 m BUFFER)
- ROADWAY
- WATERCOURSE
- WATERBODY
- FAULTLINE
- APPROXIMATE CONTACT LINE

**BEDROCK FORMATION**

- 9. **BOBCAYGEON FORMATION:** LIMESTONE, WITH MINOR SHALES IN UPPER PART
- 8. **GULL RIVER FORMATION:** LIMESTONE, WITH DOLOSTONE BEDS TOWARDS BASE

0 100 200 400

1:7,500 METRES

**NOTES**

1. CONTAINS INFORMATION LICENSED UNDER THE OPEN GOVERNMENT LICENCE - ON
2. IMAGERY: © 2010 MICROSOFT CORPORATION AND ITS DATA SUPPLIERS
3. ARMSTRONG, D.K. AND DODGE, J.E.P. 2007. PALEOZOIC GEOLOGY OF SOUTHERN ONTARIO; ONTARIO GEOLOGICAL SURVEY, MISCELLANEOUS RELEASE--DATA 219.
4. COORDINATE SYSTEM: NAD 1983 UTM ZONE 18N

CLIENT

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PROJECT

NAPANEE WATER POLLUTION CONTROL PLANT
EXPANSION & UPGRADES
300 WATER STREET WEST, NAPANEE, ONTARIO

# BEDROCK GEOLOGY

| | |
|---|---|
| PROJECT No. | 40745 |
| DESIGNED | PC |
| DRAWN | JEM |
| APPROVED | DH |
| DATE | 2024-02-15 |
| FIGURE No. | 5 |

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**LEGEND**

- APPROXIMATE PROJECT AREA
- APPROXIMATE STUDY AREA (250 m BUFFER)
- ROADWAY
- WATERCOURSE
- WATERBODY

**MECP WELL RECORD**

- WATER SUPPLY
- MONITORING/TEST HOLE/OBSERVATION WELL
- ABANDONED/OTHER
- UNKNOWN

0 65 130 260

1:5,000 METRES

**NOTES**

1. CONTAINS INFORMATION LICENSED UNDER THE OPEN GOVERNMENT LICENCE - ON
2. IMAGERY: © 2010 MICROSOFT CORPORATION AND ITS DATA SUPPLIERS
3. MINISTRY OF THE ENVIRONMENT, CONSERVATION AND PARKS. 2024. WATER WELL RECORD DATABASE
4. COORDINATE SYSTEM: NAD 1983 UTM ZONE 18N

CLIENT

EVB ENGINEERING ON BEHALF OF
THE TOWN OF GREATER NAPANEE

PROJECT

NAPANEE WATER POLLUTION CONTROL PLANT
EXPANSION & UPGRADES
300 WATER STREET WEST, NAPANEE, ONTARIO

# MECP WELL RECORDS

| | |
|---|---|
| PROJECT No. | 40745 |
| DESIGNED | PC |
| DRAWN | JEM |
| APPROVED | DH |
| DATE | 2024-02-15 |
| FIGURE No. | 6 |

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**LEGEND**

- APPROXIMATE PROJECT AREA
- APPROXIMATE STUDY AREA (250 m BUFFER)
- ROADWAY
- WATERCOURSE
- WATERBODY
- WETLAND (UNEVALUATED)
- WETLAND (PROVINCIALLY SIGNIFICANT - PSW)
- WOODED AREA

0 100 200 400

1:7,500 METRES

**NOTES**

1. CONTAINS INFORMATION LICENSED UNDER THE OPEN GOVERNMENT LICENCE - ON
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3. ONTARIO MINISTRY OF NATURAL RESOURCES AND FORESTRY
4. COORDINATE SYSTEM: NAD 1983 UTM ZONE 18N

CLIENT

EVB ENGINEERING ON BEHALF OF
THE TOWN OF GREATER NAPANEE

PROJECT

NAPANEE WATER POLLUTION CONTROL PLANT
EXPANSION & UPGRADES
300 WATER STREET WEST, NAPANEE, ONTARIO

# NATURAL FEATURES

| | |
|---|---|
| PROJECT No. | 40745 |
| DESIGNED | PC |
| DRAWN | JEM |
| APPROVED | DH |
| DATE | 2024-02-15 |
| FIGURE No. | 7 |

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**LEGEND**

- MONITORING WELL LOCATION
- APPROXIMATE PROJECT AREA
- WATERBODY

0 20 40 80

1:1,500 METRES

**NOTES**

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3. COORDINATE SYSTEM: NAD 1983 UTM ZONE 18N

CLIENT

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THE TOWN OF GREATER NAPANEE

PROJECT

NAPANEE WATER POLLUTION CONTROL PLANT
EXPANSION & UPGRADES
300 WATER STREET WEST, NAPANEE, ONTARIO

# MONITORING WELL LOCATIONS

| | |
|---|---|
| PROJECT No. | 40745 |
| DESIGNED | PC |
| DRAWN | JEM |
| APPROVED | DH |
| DATE | 2024-02-26 |
| FIGURE No. | 8 |

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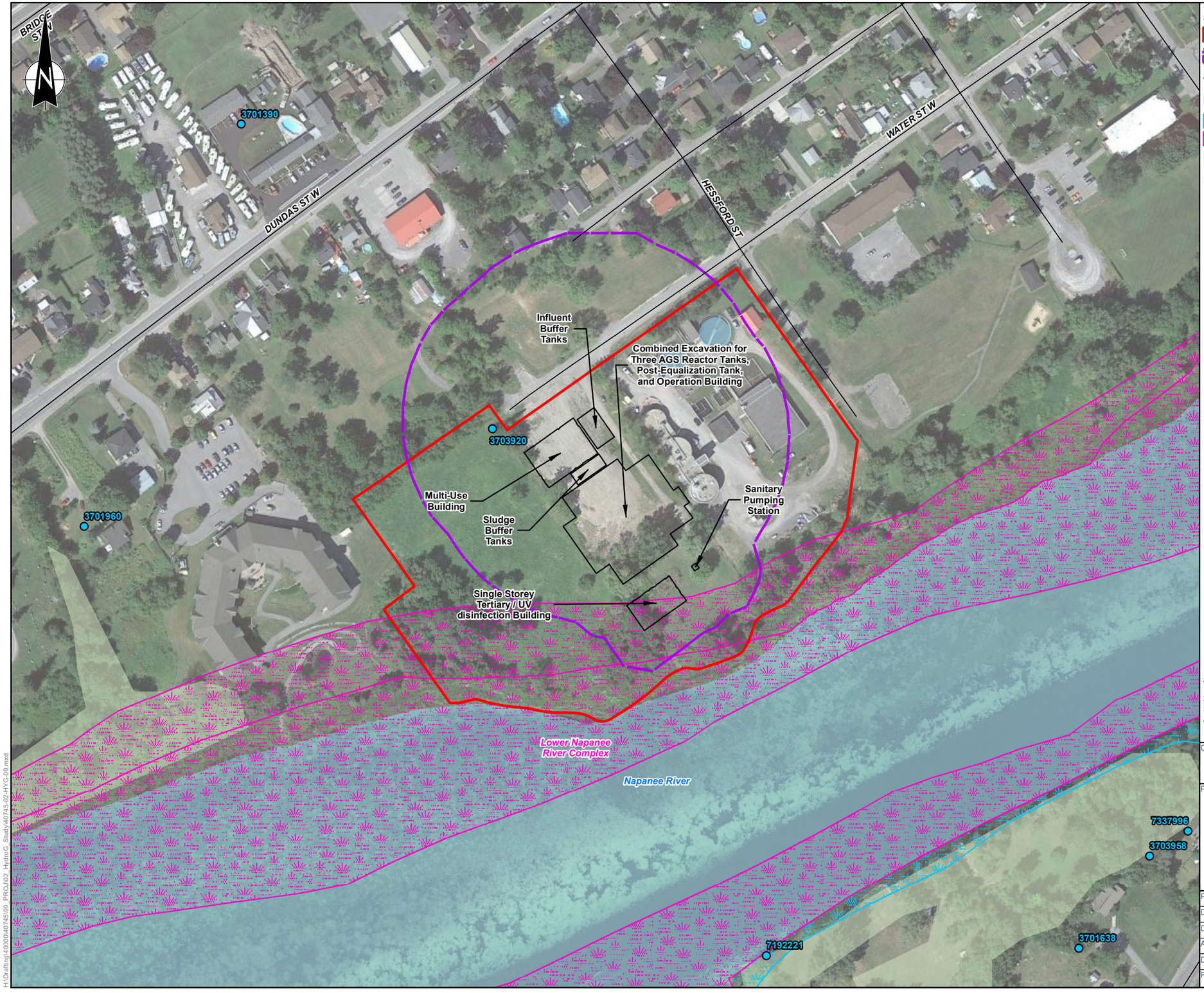


**LEGEND**

- APPROXIMATE PROJECT AREA
- ZONE OF INFLUENCE
- ROADWAY
- WATERBODY
- WETLAND (UNEVALUATED)
- WETLAND (PROVINCIALLY SIGNIFICANT - PSW)
- WOODED AREA

**MECP WELL RECORD**

- WATER SUPPLY

0 25 50 100

1:2,000 METRES

**NOTES**

1. CONTAINS INFORMATION LICENSED UNDER THE OPEN GOVERNMENT LICENCE - ON
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3. ONTARIO MINISTRY OF NATURAL RESOURCES AND FORESTRY
4. COORDINATE SYSTEM: NAD 1983 UTM ZONE 18N

CLIENT

EVB ENGINEERING ON BEHALF OF
THE TOWN OF GREATER NAPANEE

PROJECT

NAPANEE WATER POLLUTION CONTROL PLANT
EXPANSION & UPGRADES
300 WATER STREET WEST, NAPANEE, ONTARIO

# ZONE OF INFLUENCE

| | |
|---|---|
| PROJECT No. | 40745 |
| DESIGNED | PC |
| DRAWN | JEM |
| APPROVED | DH |
| DATE | 2024-12-20 |
| FIGURE No. | 9 |

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# APPENDIX A

# DRAWINGS


LEGEND

- BOREHOLE LOCATION (THURBER, 2021/2024)
- BOREHOLE WITH MONITORING WELL LOCATION (THURBER, 2021/2024)
- AUGER PROBE LOCATION (THURBER, 2021)
- CONE PENETRATION TESTING LOCATION (THURBER, 2024)
- BOREHOLE LOCATION (GHD, 2018)
- BOREHOLE WITH MONITORING WELL LOCATION (GHD, 2018)

20 0 20 40m

SCALE 1:1000

CLIENT

EVB ENGINEERING

PROJECT

NAPANEE WATER POLLUTION CONTROL PLANT

# TEST HOLE LOCATION PLAN

| | |
|---|---|
| PROJECT No. | 40745 |
| DESIGNED | RB |
| DRAWN | JEM |
| APPROVED | SD |
| DATE | 2024-04-30 |
| DRAWING No. | 40745-1 |

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# APPENDIX B

# MECP WELL RECORDS

| Well ID | Date Completed | Depth of Well (m) | Depth of Bedrock (m) | Static Level (m) | UTM Zone 18 | | Well Type |
|---|---|---|---|---|---|---|---|
| | | | | | Easting | Northing | |
| 3701390 | 1949-02-01 | 16.8 | 5.2 | 6.1 | 343242 | 4900530 | Water Supply |
| 3701637 | 1950-03-02 | 12.2 | 0.6 | 0.6 | 343637 | 4900031 | Water Supply |
| 3701638 | 1951-04-07 | 45.7 | 0.9 | 12.2 | 343679 | 4900100 | Water Supply |
| 3701639 | 1951-04-12 | 9.8 | 1.2 | 3 | 343761 | 4900076 | Water Supply |
| 3701640 | 1956-11-14 | 21.3 | - | 4.6 | 343513 | 4899863 | Water Supply |
| 3701641 | 1967-09-07 | 36.9 | 1.8 | 7.6 | 343812 | 4900159 | Water Supply |
| 3701752 | 1962-08-22 | 19.8 | 2.4 | 6.7 | 343507 | 4899857 | Water Supply |
| 3701957 | 1959-04-17 | 19.5 | 10.4 | 12.2 | 342909 | 4900274 | Water Supply |
| 3701960 | 1964-09-11 | 18.3 | 13.1 | 12.2 | 343160 | 4900320 | Water Supply |
| 3701988 | 1960-02-03 | 18.3 | 13.4 | 7.6 | 343108 | 4900367 | Water Supply |
| 3703164 | 1971-07-16 | 19.8 | 0.9 | 9.1 | 343510 | 4899862 | Water Supply |
| 3703266 | 1971-07-26 | 24.4 | 1.8 | 10.7 | 343780 | 4900041 | Water Supply |
| 3703536 | 1972-11-01 | 38.1 | 2.1 | 15.2 | 343730 | 4899971 | Water Supply |
| 3703855 | 1973-06-05 | 40.2 | 1.8 | 11.3 | 343589 | 4899768 | Water Supply |
| 3703920 | 1973-08-29 | 38.1 | 13.1 | 12.2 | 343373 | 4900371 | Water Supply |
| 3703949 | 1973-10-24 | 29.6 | 26.8 | 5.2 | 343275 | 4899907 | Water Supply |
| 3703958 | 1973-11-24 | 38.1 | 0.6 | 18.3 | 343716 | 4900148 | Water Supply |
| 3703963 | 1973-08-08 | 25.9 | 1.2 | 10.7 | 343586 | 4899769 | Water Supply |
| 3704075 | 1974-06-14 | 36.6 | 1.8 | 9.1 | 343762 | 4900145 | Water Supply |
| 3704204 | 1974-03-04 | 25.9 | 1.5 | 3.7 | 343641 | 4899853 | Water Supply |
| 3704353 | 1975-08-02 | 39.6 | 2.1 | 12.2 | 343767 | 4900205 | Water Supply |
| 3704722 | 1976-06-28 | 32 | 1.5 | 6.1 | 343680 | 4900021 | Water Supply |
| 3705635 | 1980-08-18 | 30.5 | 1.8 | 3.7 | 343629 | 4900020 | Water Supply |
| 3709878 | 2004-03-18 | 3.4 | - | - | 343762 | 4900472 | Test Hole |
| 3709880 | 2004-03-16 | 4.6 | - | - | 343762 | 4900472 | Test Hole |
| 7119597 | 2008-11-21 | 6.4 | - | - | 343546 | 4900444 | Abandoned-Other |
| 7187236 | 2012-09-11 | 6.1 | - | - | 343885 | 4900104 | Test Hole |
| 7192221 | 2012-08-17 | 11.9 | - | 1.8 | 343516 | 4900096 | Water Supply |
| 7225287 | 2014-05-12 | 2.8 | - | - | 343850 | 4900400 | Monitoring and Test Hole |
| 7290903 | 2017-05-19 | 0 | - | - | 343475 | 4900450 | Unknown |
| 7312410 | 2017-11-28 | 0 | - | - | 343419 | 4900342 | Unknown |
| 7332995 | 2018-12-14 | 2.4 | - | - | 343255 | 4899936 | Observation Wells |
| 7332996 | 2018-12-14 | 2.4 | - | - | 343266 | 4899971 | Observation Wells |
| 7337996 | 2019-07-19 | 49.4 | - | 14.1 | 343736 | 4900161 | Water Supply |
| 7389329 | 2021-02-24 | 0 | - | - | 343431 | 4900370 | Unknown |
| 7403607 | 2021-09-08 | 0 | - | - | 342820 | 4900371 | Unknown |

"-" denotes no data available

THURBER ENGINEERING LTD.

# APPENDIX C

# RECORD OF BOREHOLE SHEETS

# RECORD OF BOREHOLE BH-01

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

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 | | 80.9 | | | | |
| | Hollow Stem Augers | **CLAY**, silty, trace to some gravel, trace to some sand, trace organics, stiff to very stiff, brown, moist: (FILL) | | 0.0 | 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, stiff, grey, moist | | 78.7<br>2.2 | 4 | SS | 4 | Grain Size Analysis:<br>Gr 1%/ Sa 37%/Si 41%/ Cl 21% |
| 3 | | | | | 5 | SS | 8 | |
| 4 | | Some sand | | | 6 | SS | 10 | |
| 5 | | | | 75.3<br>5.6 | | | | |
| | | **SAND**, some silt to silty, trace Gravel, trace clay, loose, brown, wet | | | 7 | SS | 7 | Grain Size Analysis:<br>Gr 3%/ Sa 84%/Si 12%/ Cl 1% |
| 7 | 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) | | 73.8<br>7.1 | 1 | RUN | | UCS = 113.5MPa<br>TCR=100% SCR=88% RQD=87%<br>UCS = 75MPa (Average) (PLT) |
| 8 | | Subvertical fracture at 8.6 m (125 mm in length) | | | | | | |
| 9 | | | | | 2 | RUN | | TCR=100% SCR=92% RQD=92%<br>UCS = 119MPa (Average) (PLT) |

SHEAR STRENGTH: Cu, KPa
nat V - ✚ Q - ✖
rem V - ● Cpen ▲
20 40 60 80

WATER CONTENT, PERCENT
wp w wl
10 20 30 40

DYNAMIC CONE PENETRATION RESISTANCE PLOT
20 40 60 80 100

| ADDITIONAL LAB. TESTING | PIEZOMETER OR STANDPIPE INSTALLATION |
|---|---|
| | |
| | |
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| | |
| | |
| | |
| | |
| | |
| | |
| FI | |
| 3 | |
| 2 | |
| 1 | |
| 2 | |
| 2 | |
| 3 | |
| 2 | |
| 0 | |
| 2 | |

## GROUNDWATER ELEVATIONS

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

LOGGED : RB
CHECKED : JDA/MTB

THURBER

THURBER2S TEL-30726.GPJ 4-30-24

# RECORD OF BOREHOLE BH-01

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

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 ▲) (20 40 60 80) / WATER CONTENT, PERCENT (wp, w, wl) (10 20 30 40) | ADDITIONAL LAB. TESTING | PIEZOMETER OR STANDPIPE INSTALLATION |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 70.7 | | | | | | 1 | |
| | | END OF BOREHOLE AT 10.2m. BOREHOLE BACKFILLED WITH HOLEPLUG. | | 10.2 | | | | | | | |
| 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

THURBER2S TEL-30726.GPJ 4-30-24

# RECORD OF BOREHOLE BH-02

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

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 | | 79.0 | | | | |
| | Hollow Stem Augers | **FILL** (100mm) | | 0.1 | | | | |
| | | **TOPSOIL** (75mm) | | 0.2 | | | | |
| | | **CLAY**, silty, trace to some sand, very stiff to stiff, brown, moist | | | 1 | SS | 17 | |
| 1 | | | | | 2 | SS | 17 | Grain Size Analysis: Gr 0%/ Sa 18%/ Si 38%/ Cl 44% |
| | | | | | 3 | SS | 13 | |
| 2 | | | | | 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 | | 73.3 | 7 | SS | 50/ 0.050 | |
| | | **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) | | 5.7 | | | | UCS = 105.9MPa |
| 6 | NQ Coring | | | | 1 | RUN | | TCR=97% SCR=87% RQD=70% UCS = 113MPa (Average) (PLT) |
| 7 | | vertical fracture at 7.7m (125mm long) | | | 2 | RUN | | TCR=98% SCR=89% RQD=82% UCS = 89MPa (Average) (PLT) |
| 8 | | | | 70.2 | | | | |
| 9 | | END OF BOREHOLE AT 8.84m. | | 8.8 | | | | |

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

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

ADDITIONAL LAB. TESTING: FI; 1; 3; 3; 3; 3; 1; 4; 2; 2; 1

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 4-30-24

# RECORD OF BOREHOLE BH-02

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

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 ▲) (20 40 60 80) / WATER CONTENT, PERCENT (wp, w, wl) (10 20 30 40) | ADDITIONAL LAB. TESTING | PIEZOMETER OR STANDPIPE INSTALLATION |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 11 | | shallow well installation consists of a 50mm diameter Schedule 40 PVC pipe with a 3.04 m slotted screen. | | | | | | | | | |
| 12 | | **DEEP WELL**<br>WATER LEVEL READINGS:<br>DATE DEPTH(m) ELEV.(m)<br>Feb 26-21 0.80 78.20<br>Mar 03-21 0.70 78.30<br>Apr 14-21 0.60 78.40 | | | | | | | | | |
| 13 | | **SHALLOW WELL**<br>WATER LEVEL READINGS:<br>DATE DEPTH(m) ELEV.(m)<br>Feb 26-21 0.70 78.30<br>Mar 12-21 0.60 78.40<br>Apr 14-21 0.60 78.40 | | | | | | | | | |
| 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

THURBER2S TEL-30726.GPJ 4-30-24

# RECORD OF BOREHOLE BH-03

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

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 (20 40 60 80 100) | SHEAR STRENGTH: Cu, KPa (nat V - ✚, rem V - ●, Q - ✖, Cpen ▲) (20 40 60 80) / WATER CONTENT, PERCENT (wp w wl) (10 20 30 40) | ADDITIONAL LAB. TESTING | PIEZOMETER OR STANDPIPE INSTALLATION |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | GROUND SURFACE | | 76.4 | | | | | | | |
| | | **PEAT** | | 0.0 | | | | | | | |
| | | | | 76.0 | 1 | SS | 2 | | 72 | | Deep |
| | | **CLAY**, silty, trace sand, very stiff to firm, brown, moist | | 0.4 | | | | | | | |
| 1 | | Trace to some organic material in SS2 | | | 2 | SS | 10 | | | | |
| | | | | | 3 | SS | 8 | | | | Bentonite |
| 2 | | | | | | | | | | | |
| | | | | | 4 | SS | 14 | | | | |
| 3 | | | | | | | | | | | |
| | | | | | 5 | SS | 8 | Grain Size Analysis: Gr 0%/ Sa 1%/ Si 30%/ Cl 69% | 61 | | |
| | | Frequent silt lenses (1mm thick) in SS5 and SS6, becoming grey | | | | | | | | | |
| 4 | | | | | | | | | | | Filter Sand |
| | | | | | 6 | SS | 5 | Note: Vane test completed in separate borehole adjacent to sampled borehole. | | | |
| 5 | | | | | | | | | | | |
| | | | | 70.8 | | | | | | | |
| | | **SILT**, some sand, some clay, trace gravel, frequent sand interbeds, compact, brown, wet | | 5.6 | | | | | | | Slotted Screen |
| 6 | | | | | 7 | SS | 10 | Grain Size Analysis: Gr 1%/ Sa 17%/Si 68%/ Cl 14% | | | |
| 7 | | | | 69.2 | | | | | | | |
| | | **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) | | 7.2 | | | | 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

THURBER2S TEL-30726.GPJ 4-30-24

# RECORD OF BOREHOLE BH-03

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

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 ▲) (20 40 60 80) / WATER CONTENT, PERCENT (wp, w, wl) (10 20 30 40) | ADDITIONAL LAB. TESTING | PIEZOMETER OR STANDPIPE INSTALLATION |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 66.2 | | | | | | 3 | |
| | | END OF BOREHOLE AT 10.26m. | | 10.3 | | | | | | | |
| 11 | | Deep Monitoring Wells installation consists of 50mm diameter Schedule 40 PVC pipe with a 2.44m slotted screen.<br><br>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. | | | | | | | | | |
| 12 | | **DEEP WELL**<br>WATER LEVEL READINGS:<br>DATE DEPTH(m) ELEV.(m)<br>Feb 26-21 -0.20 76.64<br>Mar 03-21 0.70 75.74<br>Apr 14-21 0.60 75.84 | | | | | | | | | |
| 13 | | **SHALLOW WELL**<br>WATER LEVEL READINGS:<br>DATE DEPTH(m) ELEV.(m)<br>Feb 26-21 0.20 76.24<br>Mar 12-21 -0.20 76.64<br>Apr 14-21 -0.10 76.54 | | | | | | | | | |
| 14 | | (Negative water level indicates water level measured above the ground surface) | | | | | | | | | |
| 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

THURBER2S TEL-30726.GPJ 4-30-24

# RECORD OF BOREHOLE BH-04

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

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 | | 77.2 | | | | | | | |
| | | **ORGANICS** | | 0.0 | 1 | SS | 12 | | | | |
| | | | | 76.7 | | | | | | | |
| | | **CLAY**, silty, trace sand, very stiff to soft, brown, moist | | 0.5 | | | | | | | |
| 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 | | | | | | | | | | | |
| | | | | | 6 | SS | 3 | | | 59 | Slotted Screen |
| 5 | | | | | | | | | | | |
| 6 | | | | | 7 | SS | 2 | | | | |
| | | | | | | | | | | | Filter Sand |
| 7 | | | | | | | | | | | |
| | | | | | 8 | SS | 1 | | | | |
| 8 | | Frequent silt/sand lenses in SS8 and SS9 | | | | | | | | | |
| | | | | | | | | | | | Slotted Screen |
| 9 | | | | | 9 | SS | 7 | Grain Size Analysis: Gr 0%/ Sa 5%/ Si 70%/ Cl 25% | | | |

Hollow Stem Augers

## GROUNDWATER ELEVATIONS

▽ WATER LEVEL UPON COMPLETION

▼ WATER LEVEL IN WELL/PIEZOMETER
April 14, 2021

LOGGED : RB
CHECKED : JDA/MTB

THURBER

THURBER2S TEL-30726.GPJ 4-30-24

# RECORD OF BOREHOLE BH-04

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

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 ▲) (20 40 60 80) / WATER CONTENT, PERCENT (wp, w, wl) (10 20 30 40) | ADDITIONAL LAB. TESTING | PIEZOMETER OR STANDPIPE INSTALLATION |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 67.0 | | | | | | | |
| | | END OF BOREHOLE AT 10.16m UPON AUGER REFUSAL ON PROBABLE BEDROCK. | | 10.2 | | | | | | | |
| | | Deep Monitoring Well installation consists of 50mm diameter Schedule 40 PVC pipe with a 3.05m slotted screen. | | | | | | | | | |
| 11 | | 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. | | | | | | | | | |
| 12 | | **DEEP WELL** WATER LEVEL READINGS: DATE / DEPTH(m) / ELEV.(m): Feb 26-21 / 1.80 / 75.36; Mar 02-21 / 1.80 / 75.36; Apr 14-21 / 1.80 / 75.36 | | | | | | | | | |
| 13 | | **SHALLOW WELL** WATER LEVEL READINGS: DATE / DEPTH(m) / ELEV.(m): Feb 26-21 / 2.90 / 74.26; Mar 12-21 / 1.00 / 76.16; Apr 14-21 / 1.20 / 75.96 | | | | | | | | | |
| 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

THURBER2S TEL-30726.GPJ 4-30-24

# RECORD OF BOREHOLE BH-05

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

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 | | 76.3 | | | | |
| | Hollow Stem Augers | **ORGANICS**, some sand, trace silt, trace clay, black, moist, loose | | 0.0 | 1 | SS | 8 | |
| | | | | 75.6 | | | | |
| 1 | | **SAND**, some silt, trace clay, very loose, brown, moist | | 0.7 | 2 | SS | 2 | |
| | | | | 74.9 | | | | |
| | | **CLAY**, silty, trace sand, stiff to firm, brown, moist | | 1.4 | 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% |
| 6 | | | | | 7 | SS | 4 | |
| 7 | | | | | | | | |
| 8 | | | | | 8 | SS | 3 | |
| 9 | | Varved, becoming very stiff | | | 9 | SS | 28 | |

DYNAMIC CONE PENETRATION RESISTANCE PLOT
20 40 60 80 100

SHEAR STRENGTH: Cu, KPa
nat V - ✚ Q - ✖
rem V - ● Cpen ▲
20 40 60 80

WATER CONTENT, PERCENT
wp w wl
10 20 30 40

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 4-30-24

# RECORD OF BOREHOLE BH-05

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

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 - ✚, rem V - ●, Q - ✖, Cpen ▲) (20 40 60 80) / 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 | | 65.3<br>11.0 | 10 | SS | WH | Grain Size Analysis:<br>Gr 0%/ Sa 19%/ Si 71%/ Cl 10% | ○ (w) ≈ 20 | | |
| | | END OF BOREHOLE AT 11.58m UPON AUGER REFUSAL ON PROBABLE BEDROCK.<br>BOREHOLE OPEN UPON COMPLETION.<br>BOREHOLE BACKFILLED WITH BENTONITE TO SURFACE. | | 64.7<br>11.6 | | | | | | | |
| 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

THURBER2S TEL-30726.GPJ 4-30-24

# RECORD OF BOREHOLE BH-06

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

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 |
|---|---|---|---|---|---|---|---|---|
| | | GROUND SURFACE | | 78.5 | | | | |
| | Hollow Stem Augers | **CLAY**, silty, some gravel, trace sand, some organics, occasional brick fragments firm, reddish brown, moist: (FILL) | | 0.0 | 1 | SS | 6 | |
| | | | | 77.8 | | | | |
| | | **CLAY**, silty, trace sand, firm to very stiff, brown, moist | | 0.7 | 2 | SS | 3 | |
| 1 | | | | | | | | |
| | | | | | 3 | SS | 13 | Grain Size Analysis: Gr 0%/ Sa 6%/ Si 56%/ Cl 38% |
| 2 | | | | | | | | |
| | | | | | 4 | SS | 7 | |
| 3 | | | | | | | | |
| | | | | | 5 | SS | 8 | |
| 4 | | | | 74.4 | | | | |
| | | **SAND**, silty, some clay to clayey, loose, brown, wet (bedded in 20 to 50 mm layers) | | 4.1 | | | | |
| | | | | | 6 | SS | 7 | Grain Size Analysis: Gr 0%/ Sa 44%/ Si 30%/ Cl 26% |
| 5 | | | | | | | | |
| | | | | 72.7 | | | | |
| | | END OF BOREHOLE AT 5.79m UPON AUGER REFUSAL ON PROBABLE BEDROCK. | | 5.8 | | | | |
| 6 | | | | | | | | |
| 7 | | | | | | | | |
| 8 | | | | | | | | |
| 9 | | | | | | | | |

Monitoring Wells installation consists of 50mm diameter Schedule 40 PVC pipe with a 3.05m slotted screen.

WATER LEVEL READINGS:

| DATE | DEPTH(m) | ELEV.(m) |
|---|---|---|
| Feb 26-21 | -0.23 | 78.72 |
| Mar 12-21 | -0.30 | 78.79 |
| Apr 14-21 | -0.24 | 78.73 |

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

SHEAR STRENGTH: Cu, KPa (nat V - ✚, rem V - ●, Q - ✖, Cpen ▲)
20 40 60 80

DYNAMIC CONE PENETRATION RESISTANCE PLOT
20 40 60 80 100

WATER CONTENT, PERCENT
wp w wl
10 20 30 40

ADDITIONAL LAB. TESTING

PIEZOMETER OR STANDPIPE INSTALLATION

Bentonite
Filter Sand
Slotted Screen

GROUNDWATER ELEVATIONS

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

LOGGED : RB
CHECKED : JDA/MTB

THURBER

THURBER2S TEL-30726.GPJ 4-30-24

# RECORD OF BOREHOLE BH-07

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

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 ▲) (20 40 60 80) / WATER CONTENT, PERCENT (wp, w, wl) (10 20 30 40) | ADDITIONAL LAB. TESTING | PIEZOMETER OR STANDPIPE INSTALLATION |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | GROUND SURFACE | | 78.5 | | | | | | | |
| | Hollow Stem Augers | **CLAY** and **ORGANICS**, silty, some sand, moist, firm, black (topsoil) | | 0.0 | 1 | SS | 5 | | ○ | | |
| | | | | 77.9 | | | | | | | |
| 1 | | **CLAY**, silty, trace to some sand, brown, moist, very stiff to stiff, frequent sand lenses (1mm thick) | | 0.6 | 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 | | ○ | >> | |
| | | | | 72.6 | | | | | | | |
| 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. | | 5.9 | | | | | | | |
| 7 | | | | | | | | | | | |
| 8 | | | | | | | | | | | |
| 9 | | | | | | | | | | | |

GROUNDWATER ELEVATIONS

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

LOGGED : RB
CHECKED : JDA/MTB

THURBER

THURBER2S TEL-30726.GPJ 4-30-24

# RECORD OF BOREHOLE BH-08

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

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 | | 77.2 | | | | DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) | SHEAR STRENGTH: Cu, KPa (20 40 60 80) / WATER CONTENT, PERCENT (wp, w, wl; 10 20 30 40) | | |
| | | **TOPSOIL:** (150mm) | | 0.0 | | | | | | | |
| | | **CLAY**, silty, some sand, some organics, firm, brown, moist | | 0.2 | 1 | SS | 5 | | | | |
| | | | | 76.5 | | | | | | | |
| | | **CLAY**, silty, trace sand, very stiff to stiff, brown, moist | | 0.7 | | | | | | | |
| 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 | | | | 5 | SS | 9 | | | | |
| | | Becoming grey | | | | | | | | | |
| 4 | | | | | | | | | | | |
| | | | | | 6 | SS | 7 | | | | |
| 5 | | | | | | | | | | | |
| | | | | 71.5 | | | | | | | |
| | | **SILT**, sandy (bedded), trace clay, trace gravel, compact, brown, wet | | 5.6 | | | | | | | |
| 6 | | | | | 7 | SS | 9 | Grain Size Analysis: Gr 1%/ Sa 27%/Si 70%/ Cl 2% | | | |
| | | | | 70.6 | | | | | | | |
| | | 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. | | 6.6 | | | | | | | |
| 7 | | | | | | | | | | | |
| 8 | | | | | | | | | | | |
| 9 | | | | | | | | | | | |

GROUNDWATER ELEVATIONS

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

LOGGED : RB
CHECKED : JDA/MTB

THURBER

THURBER2S TEL-30726.GPJ 4-30-24

# RECORD OF BOREHOLE BH-09

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

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 ▲; 20 40 60 80) / WATER CONTENT, PERCENT (wp, w, wl; 10 20 30 40) | ADDITIONAL LAB. TESTING | PIEZOMETER OR STANDPIPE INSTALLATION |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | GROUND SURFACE | | 76.8 | | | | | | | |
| | Solid Stem Augers | **TOPSOIL:** (600mm) | | 0.0 | 1 | SS | 4 | | 65 | | |
| | | | | 76.2 | | | | | | | |
| | | **SAND**, trace to some silt, trace gravel, loose, brown, wet | | 0.6 | | | | | | | |
| | | | | 75.9 | 2 | SS | 9 | | | | ▽ |
| 1 | | **CLAY**, silty, trace sand, stiff, brown, moist | | 0.9 | | | | | | | |
| | | | | 75.5 | | | | | | | |
| | | **SAND**, some gravel, trace silt, compact, brown, moist | | 1.4 | | | | | | | |
| | | | | 75.0 | 3 | SS | 13 | | | | |
| 2 | | **CLAY**, silty, trace sand, very stiff, brown, moist | | 1.8 | | | | | | | |
| | | | | 74.6 | | | | | | | |
| | | **SAND**, trace gravel, trace silt, compact, brown, moist | | 2.3 | 4 | SS | 11 | | | | |
| | | | | 73.9 | | | | | | | |
| 3 | | END OF BOREHOLE AT 2.90m.<br>BOREHOLE WATER LEVEL AT 0.91m UPON COMPLETION.<br>BOREHOLE BACKFILLED WITH BENTONITE TO GROUND SURFACE. | | 2.9 | | | | | | | |
| 4 | | | | | | | | | | | |
| 5 | | | | | | | | | | | |
| 6 | | | | | | | | | | | |
| 7 | | | | | | | | | | | |
| 8 | | | | | | | | | | | |
| 9 | | | | | | | | | | | |

GROUNDWATER ELEVATIONS

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

LOGGED : RB
CHECKED : JDA/MTB

THURBER

THURBER2S TEL-30726.GPJ 4-30-24

# RECORD OF BOREHOLE BH-10

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

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 |
|---|---|---|---|---|---|---|---|---|
| | | GROUND SURFACE | | 76.5 | | | | |
| | Solid Stem Augers | **CLAY**, silty, some gravel, some sand, some organics, stiff, brown, moist: (FILL) | | 0.0 | 1 | SS | 14 | |
| | | | | 75.8 | | | | |
| 1 | | **SAND**, silty, trace clay, trace gravel, loose, brown, moist | | 0.7 | 2 | SS | 4 | |
| | | | | 75.1 | | | | |
| | | **CLAY**, silty, trace to some sand, very stiff, brown, moist; with sand layers up to 100mm thick | | 1.4 | 3 | SS | 13 | |
| 2 | | Becoming grey | | | 4 | SS | 10 | |
| 3 | | | | | 5 | SS | 9 | Grain Size Analysis: Gr 0%/ Sa 15%/Si 24%/ Cl 61% |
| | | | | 72.9 | | | | |
| | | END OF BOREHOLE AT 3.66m. BOREHOLE OPEN AND DRY UPON COMPLETION. BOREHOLE BACKFILLED WITH HOLEPLUG. | | 3.7 | | | | |
| 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 ▲
20 40 60 80

WATER CONTENT, PERCENT
wp w wl
10 20 30 40

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 4-30-24

# RECORD OF BOREHOLE BH-11

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

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 |
|---|---|---|---|---|---|---|---|---|
| | | GROUND SURFACE | | 76.4 | | | | |
| | Hollow Stem Augers | **CLAY**, silty, some sand, trace gravel, some organics, very stiff to firm, brown, moist<br>Note:SS1 was frozen: (FILL) | | 0.0 | 1 | SS | 31 | |
| 1 | | **SAND**, some silt, trace clay, very loose to loose, brown, moist | | 75.3<br>1.1 | 2 | SS | 6 | |
| | | | | | 3 | SS | 3 | Grain Size Analysis:<br>Gr 0%/ Sa 81%/ Si 13%/ Cl 6% |
| 2 | | | | 73.8 | 4 | SS | 6 | |
| | | **CLAY**, silty, trace sand, stiff, brown, moist | | 2.6 | | | | |
| 3 | | | | | 5 | SS | 5 | |
| | | | | 72.7 | | | | |
| | | END OF BOREHOLE AT 3.66m.<br><br>Monitoring Wells installation consists of 50mm diameter Schedule 40 PVC pipe with a 1.54m slotted screen.<br><br>WATER LEVEL READINGS:<br>DATE DEPTH(m) ELEV.(m)<br>Feb 26-21 2.20 74.19<br>Mar 03-21 2.09 74.30<br>Apr 14-21 2.10 74.29 | | 3.7 | | | | |
| 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 ▲
20 40 60 80

WATER CONTENT, PERCENT
wp w wl
10 20 30 40

ADDITIONAL LAB. TESTING

PIEZOMETER OR STANDPIPE INSTALLATION
Bentonite
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 4-30-24

# RECORD OF BOREHOLE BH-12

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

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 ▲) (20 40 60 80) / WATER CONTENT, PERCENT (wp, w, wl) (10 20 30 40) | ADDITIONAL LAB. TESTING | PIEZOMETER OR STANDPIPE INSTALLATION |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | GROUND SURFACE | | 76.4 | | | | | | | |
| | Solid Stem Augers | **CLAY**, silty, trace sand, trace gravel, trace organics, very stiff, brown, moist: (FILL) | | 0.0 | 1 | SS | 16 | | ○ | | |
| | | | | 75.6 | | | | | | | |
| 1 | | **SAND**, some silt, trace clay, trace gravel, compact to loose, brown, moist; with layers of find sand/silt (~25mm thick) | | 0.8 | 2 | SS | 16 | Grain Size Analysis: Gr 4%/ Sa 75%/ Si 15%/ Cl 6% | ○ | | |
| | | | | | 3 | SS | 8 | | ○ | | |
| 2 | | | | 74.1 | | | | | | | |
| | | **CLAY**, silty, trace sand, stiff, moist, grey | | 2.3 | 4 | SS | 7 | | ○ | | |
| 3 | | | | | 5 | SS | 6 | | ○ | | ▽ |
| | | | | 72.7 | | | | | | | |
| | | END OF BOREHOLE AT 3.66m. BOREHOLE OPEN AND WATER LEVEL AT 3.50m UPON COMPLETION. BOREHOLE BACKFILLED WITH HOLEPLUG. | | 3.7 | | | | | | | |
| 4 | | | | | | | | | | | |
| 5 | | | | | | | | | | | |
| 6 | | | | | | | | | | | |
| 7 | | | | | | | | | | | |
| 8 | | | | | | | | | | | |
| 9 | | | | | | | | | | | |

GROUNDWATER ELEVATIONS

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

LOGGED : RB
CHECKED : JDA/MTB

THURBER

THURBER2S TEL-30726.GPJ 4-30-24

# RECORD OF BOREHOLE BH-13

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

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 ▲) (20 40 60 80) / WATER CONTENT, PERCENT (wp, w, wl) (10 20 30 40) | ADDITIONAL LAB. TESTING | PIEZOMETER OR STANDPIPE INSTALLATION |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | GROUND SURFACE | | 81.8 | | | | | | | |
| | Solid Stem Augers | **SAND**, silty, trace gravel, trace clay, very dense, brown, frozen: (FILL) | | 0.0 | 1 | SS | 59 | | ○ | | |
| | | | | 81.1 | | | | | | | |
| | | **CLAY**, silty, trace sand, trace gravel, trace oxidation/rust, stiff, brown, moist: (FILL) | | 0.6 | | | | | | >> | |
| 1 | | | | | 2 | SS | 8 | | ○ | | |
| | | | | 80.3 | | | | | | | |
| | | **CLAY**, silty, trace sand, trace oxidation, very stiff, brown, moist | | 1.4 | | | | | | | |
| | | | | | 3 | SS | 10 | | ○ | >> | |
| 2 | | | | | | | | | | | |
| | | | | | 4 | SS | 15 | | ○ | >> | |
| 3 | | | | | | | | | | | |
| | | | | | 5 | SS | 9 | | ○ | >> | |
| | | | | 78.1 | | | | | | | |
| | | END OF BOREHOLE AT 3.66m. BOREHOLE OPEN AND DRY UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE. | | 3.7 | | | | | | | |
| 4 | | | | | | | | | | | |
| 5 | | | | | | | | | | | |
| 6 | | | | | | | | | | | |
| 7 | | | | | | | | | | | |
| 8 | | | | | | | | | | | |
| 9 | | | | | | | | | | | |

GROUNDWATER ELEVATIONS

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

LOGGED : RB
CHECKED : JDA/MTB

THURBER

THURBER2S TEL-30726.GPJ 4-30-24

# RECORD OF BOREHOLE BH-14

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

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 ▲) (20 40 60 80) / WATER CONTENT, PERCENT (wp, w, wl) (10 20 30 40) | ADDITIONAL LAB. TESTING | PIEZOMETER OR STANDPIPE INSTALLATION |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | GROUND SURFACE | | 80.4 | | | | | | | |
| | Solid Stem Augers | **ASPHALT:** (60mm) | | 0.1 | | | | | | | |
| | | **SAND**, gravelly, trace silt, compact to loose, brown, moist (FILL) | | | 1 | SS | 30 | | ○ | | |
| 1 | | | | | 2 | SS | 4 | | ○ | | |
| | | | | 78.9 | | | | | | | |
| | | **CLAY**, silty, sandy, trace gravel, stiff to hard, brown, moist | | 1.4 | 3 | SS | 4 | Grain Size Analysis: Gr 2%/ Sa 25%/ Si 48%/ Cl 25% | ○ | | |
| 2 | | | | | 4 | SS | 32 | | ○ | | |
| 3 | | | | | 5 | SS | 22 | | ○ | | |
| | | | | 76.7 | | | | | | | |
| | | END OF BOREHOLE AT 3.66m. BOREHOLE BACKFILLED WITH HOLEPLUG. | | 3.7 | | | | | | | |
| 4 | | | | | | | | | | | |
| 5 | | | | | | | | | | | |
| 6 | | | | | | | | | | | |
| 7 | | | | | | | | | | | |
| 8 | | | | | | | | | | | |
| 9 | | | | | | | | | | | |

GROUNDWATER ELEVATIONS

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

LOGGED : RB
CHECKED : JDA/MTB

THURBER

THURBER2S TEL-30726.GPJ 4-30-24

# RECORD OF BOREHOLE BH-19

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

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 | | 77.5 | | | | DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) | SHEAR STRENGTH: Cu, KPa (20 40 60 80) / WATER CONTENT, PERCENT (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) | | 0.0 | 1 | SS | 36 | | | | |
| 1 | | | | | 2 | SS | 15 | | | | |
| | | **SAND**, silty, trace to some clay, trace gravel, compact, brown, moist (FILL) | | 76.1<br>1.4 | 3 | SS | 14 | Grain Size Analysis:<br>Gr 5%/ Sa 63%/ Si 22%/ Cl 10% | | | |
| 2 | | | | 75.2 | | | | | | | |
| | | **CLAY**, silty, trace sand, very stiff, brown, moist | | 2.3 | 4 | SS | 17 | | >> | | |
| 3 | | | | | 5 | SS | 14 | Grain Size Analysis:<br>Gr 0%/ Sa 6%/ Si 54%/ Cl 40% | | | |
| 4 | | | | | | | | | | | |
| | | | | | 1 | ST | | Grain Size Analysis:<br>Gr 0%/ Sa 0%/ Si 19%/ Cl 81% | 72 | | |
| 5 | | | | 72.4 | | | | | | | |
| | | END OF BOREHOLE AT 5.18m. BOREHOLE BACKFILLED WITH BENTONITE. | | 5.2 | | | | | | | |
| 6 | | | | | | | | | | | |
| 7 | | | | | | | | | | | |
| 8 | | | | | | | | | | | |
| 9 | | | | | | | | | | | |

GROUNDWATER ELEVATIONS

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

LOGGED : RB
CHECKED : JDA/MTB

THURBER

THURBER2S TEL-30726.GPJ 4-30-24

# RECORD OF BOREHOLE BH-20

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

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 |
|---|---|---|---|---|---|---|---|---|
| | | GROUND SURFACE | | 80.0 | | | | |
| | Solid Stem Augers | **CLAY**, silty, trace sand, trace gravel, firm, brown, wet: (FILL) | | 0.0 | 1 | SS | 6 | |
| | | | | 79.3 | | | | |
| 1 | | **CLAY**, silty, trace sand, very stiff, brown, moist | | 0.7 | 2 | SS | 19 | |
| | | | | | 3 | SS | 17 | |
| 2 | | | | | 4 | SS | 18 | Grain Size Analysis: Gr 0%/ Sa 8%/ Si 44%/ Cl 48% |
| | | | | 77.1 | | | | |
| 3 | | END OF BOREHOLE AT 2.90m. BOREHOLE OPEN TO 2.9m AND DRY UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE. | | 2.9 | | | | |
| 4 | | | | | | | | |
| 5 | | | | | | | | |
| 6 | | | | | | | | |
| 7 | | | | | | | | |
| 8 | | | | | | | | |
| 9 | | | | | | | | |

DYNAMIC CONE PENETRATION RESISTANCE PLOT: 20 40 60 80 100

SHEAR STRENGTH: Cu, KPa (nat V - ✚, rem V - ●, Q - ✖, Cpen ▲): 20 40 60 80

WATER CONTENT, PERCENT: wp w wl; 10 20 30 40

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 4-30-24

# RECORD OF BOREHOLE BH-21

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

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 ▲) (20 40 60 80) / WATER CONTENT, PERCENT (wp, w, wl) (10 20 30 40) | ADDITIONAL LAB. TESTING | PIEZOMETER OR STANDPIPE INSTALLATION |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | GROUND SURFACE | | 80.5 | | | | | | | |
| | Solid Stem Augers | **ASPHALT:** (60mm) | | 0.1 | | | | | | | |
| | | **GRAVEL**, sandy: (FILL) | | 0.2 | | | | | | | |
| | | **SILT**, sandy, some clay, trace gravel, compact, brown, moist: (FILL) | | 0.4 | 1 | SS | 21 | | | | |
| | | **CLAY**, silty, trace sand, very stiff, brown, moist | | | | | | | | | |
| 1 | | | | | 2 | SS | 11 | | | | |
| | | | | | 3 | SS | 12 | | | >> | |
| 2 | | | | | 4 | SS | 18 | | | >> | |
| | | | | 77.6 | | | | | | | |
| 3 | | END OF BOREHOLE AT 2.90m. BOREHOLE BACKFILLED WITH BENTONITE TO 0.2m AND THEN ASPHALT PATCH TO SURFACE. | | 2.9 | | | | | | | |
| 4 | | | | | | | | | | | |
| 5 | | | | | | | | | | | |
| 6 | | | | | | | | | | | |
| 7 | | | | | | | | | | | |
| 8 | | | | | | | | | | | |
| 9 | | | | | | | | | | | |

GROUNDWATER ELEVATIONS

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

LOGGED : RB
CHECKED : JDA/MTB

THURBER

THURBER2S TEL-30726.GPJ 4-30-24

# RECORD OF BOREHOLE BH-22

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

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 | 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 | | 77.7 | | | | DYNAMIC CONE PENETRATION RESISTANCE PLOT: 20 40 60 80 100 | 20 40 60 80 / 10 20 30 40 | | |
| 0 | Solid Stem Augers | **SILT**, sandy, some clay, trace gravel, compact, brown, moist: (FILL) | | 0.0 | 1 | SS | 14 | | | | ▽ |
| | | | | 77.0 | | | | | | | |
| 1 | | **CLAY**, silty, sandy, trace gravel, trace organics, firm, brown, moist: (FILL) | | 0.7 | 2 | SS | 6 | Grain Size Analysis: Gr 3%/ Sa 22%/ Si 49%/ Cl 26% | ○ | | |
| | | | | 76.3 | | | | | | | |
| 2 | | **PEAT**, soft, black, wet | | 1.4 | 3 | SS | 3 | | | 317○ | |
| | | | | 75.4 | | | | | | | |
| | | **CLAY**, silty, some organics, firm, grey, wet | | 2.3 | 4 | SS | 2 | | | 91○ | |
| 3 | | | | | 1 | ST | | Grain Size Analysis: Gr 0%/ Sa 5%/ Si 47%/ Cl 48% | wp ⊢ ○ ⊣ wl | | |
| | | | | 74.1 | | | | | | | |
| | | END OF BOREHOLE AT 3.66m. BOREHOLE OPEN AND WATER LEVEL AT 0.66m UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE TO SURFACE. | | 3.7 | | | | | | | |
| 4 | | | | | | | | | | | |
| 5 | | | | | | | | | | | |
| 6 | | | | | | | | | | | |
| 7 | | | | | | | | | | | |
| 8 | | | | | | | | | | | |
| 9 | | | | | | | | | | | |

GROUNDWATER ELEVATIONS

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

LOGGED : RB
CHECKED : JDA/MTB

THURBER

THURBER2S TEL-30726.GPJ 4-30-24

# RECORD OF BOREHOLE BH-23

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

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 ▲) (20 40 60 80) / WATER CONTENT, PERCENT (wp w wl) (10 20 30 40) | ADDITIONAL LAB. TESTING | PIEZOMETER OR STANDPIPE INSTALLATION |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | GROUND SURFACE | | 77.5 | | | | | | | |
| | Solid Stem Augers | **SILT**, clayey, some sand, trace to some gravel, firm, black/brown/red, moist: (FILL) | | 0.0 | 1 | SS | 19 | | | | |
| 1 | | | | | 2 | SS | 8 | | | | |
| | | **CLAY**, silty, trace sand, stiff to very stiff, brown, moist | | 76.1<br>1.4 | 3 | SS | 9 | | | | |
| 2 | | | | | 4 | SS | 19 | | | | |
| | | END OF BOREHOLE AT 2.90m.<br>BOREHOLE OPEN AND DRY UPON COMPLETION.<br>BOREHOLE BACKFILLED WITH BENTONITE. | | 74.7<br>2.9 | | | | | | | |
| 3 | | | | | | | | | | | |
| 4 | | | | | | | | | | | |
| 5 | | | | | | | | | | | |
| 6 | | | | | | | | | | | |
| 7 | | | | | | | | | | | |
| 8 | | | | | | | | | | | |
| 9 | | | | | | | | | | | |

GROUNDWATER ELEVATIONS

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

LOGGED : RB
CHECKED : JDA/MTB

THURBER

THURBER2S TEL-30726.GPJ 4-30-24

# RECORD OF BOREHOLE BH-24

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

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 |
|---|---|---|---|---|---|---|---|---|
| | | GROUND SURFACE | | 75.9 | | | | |
| | Solid Stem Augers | **ORGANICS**, **CLAY**, silty, soft, brown, moist | | 0.0 | 1 | SS | 4 | |
| | | | | 75.3 | | | | |
| 1 | | **CLAY**, silty, trace sand, very stiff, brown, moist | | 0.7 | 2 | SS | 16 | |
| 2 | | | | | 3 | SS | 13 | Grain Size Analysis: Gr 0%/ Sa 6%/ Si 68%/ Cl 26% |
| | | | | | 4 | SS | 21 | |
| | | | | 73.0 | | | | |
| 3 | | END OF BOREHOLE AT 2.90m. BOREHOLE OPEN AND DRY UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE. | | 2.9 | | | | |
| 4 | | | | | | | | |
| 5 | | | | | | | | |
| 6 | | | | | | | | |
| 7 | | | | | | | | |
| 8 | | | | | | | | |
| 9 | | | | | | | | |

DYNAMIC CONE PENETRATION RESISTANCE PLOT: 20 40 60 80 100

SHEAR STRENGTH: Cu, KPa (nat V - ✚, rem V - ●, Q - ✖, Cpen ▲): 20 40 60 80

WATER CONTENT, PERCENT: wp w wl; 10 20 30 40

ADDITIONAL LAB. TESTING

PIEZOMETER OR STANDPIPE INSTALLATION

58 >>

GROUNDWATER ELEVATIONS

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

LOGGED : RB
CHECKED : JDA/MTB

THURBER

THURBER2S TEL-30726.GPJ 4-30-24

# RECORD OF BOREHOLE BH-25

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

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 | | 77.7 | | | | DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) | SHEAR STRENGTH: Cu, KPa (nat V - ✚, rem V - ●, Q - ✖, Cpen ▲) 20 40 60 80 / WATER CONTENT, PERCENT wp w wl 10 20 30 40 | | |
| | | **ASPHALT:** (150mm) | | 0.0 | | | | | | | |
| | | **GRAVEL** and **SAND**, trace silt, compact to loose, brown to grey, wet: (FILL) | | 0.2 | 1 | SS | 19 | | | | |
| 1 | | | | | 2 | SS | 16 | | | | ▽ |
| | | | | | 3 | SS | 8 | Grain Size Analysis: Gr 51%/Sa 42%/ Si & Cl 7% | | | |
| 2 | | | | 75.4 | | | | | | | |
| | | **CLAY**, silty, trace sand, firm to stiff, brown, moist | | 2.3 | 4 | SS | 12 | | | | |
| 3 | Solid Stem Augers | | | | 5 | SS | 6 | | | | |
| 4 | | | | | | | | | | | |
| | | Becoming grey | | | 6 | SS | 7 | | | | |
| 5 | | | | | | | | | | | |
| 6 | | | | | 7 | SS | 10 | Grain Size Analysis: Gr 2%/ Sa 9%/ Si 12%/ Cl 77% | 71 | | |
| 7 | | | | | | | | | | | |
| | | | | | 8 | SS | 7 | | | | |
| 8 | | 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. | | 69.5 8.2 | | | | | | | |
| 9 | | | | | | | | | | | |

GROUNDWATER ELEVATIONS

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

LOGGED : RB
CHECKED : JDA/MTB

THURBER

THURBER2S TEL-30726.GPJ 4-30-24

# RECORD OF BOREHOLE BH-26

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

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 |
|---|---|---|---|---|---|---|---|---|
| | | GROUND SURFACE | | 77.4 | | | | |
| | | **ASPHALT:** (60mm) | | 0.1 | | | | |
| | | **SAND** and **GRAVEL**, trace silt, very dense to compact, brown, moist: (FILL) | | | 1 | SS | 56 | |
| 1 | | | | | 2 | SS | 10 | |
| | | | | 75.9 | | | | |
| | | **SILT**, clayey, some sand, trace gravel, very stiff, brown, moist (FILL) | | 1.4 | 3 | SS | 16 | Grain Size Analysis: Gr 0%/ Sa 13%/ Si 59%/ Cl 28% |
| 2 | | | | 75.2 | | | | |
| | | **CLAY**, silty, trace gravel, trace sand, very stiff to firm, brown, moist | | 2.2 | 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 | SS | 6 | |
| 8 | | | | 69.2 | | | | |
| | | 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. | | 8.2 | | | | |
| 9 | | | | | | | | |

SHEAR STRENGTH: Cu, KPa (nat V - ✚, rem V - ●, Q - ✖, Cpen ▲) 20 40 60 80
WATER CONTENT, PERCENT wp w wl 10 20 30 40
DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100
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 4-30-24

# RECORD OF BOREHOLE BH24-301

PROJECT : Napnee WPCP Detailed Design
LOCATION : 300 Water Street N 4 900 313.0 E 343 462.9
STARTED : February 21, 2024
COMPLETED : February 21, 2024
DRILLER: ConeTec
DRILL RIG: Gtech GT8

Project No. 40745
SHEET 1 OF 1
DATUM CGVD28

| 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 ▲) (20 40 60 80) / WATER CONTENT, PERCENT (wp, w, wl) (20 40 60 80) | ADDITIONAL LAB. TESTING | PIEZOMETER OR STANDPIPE INSTALLATION |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | GROUND SURFACE | | 77.2 | | | | | | | |
| | HW Casing / Mud Rotary | **Note:** Refer to Project No. 30726 Borehole No. BH-04 dated February 24, 2021 for upper stratigraphy | | 0.0 | | | | | | | |
| 1 | | | | | | | | | | | |
| 2 | | | | | | | | | | | |
| 3 | | | | | | | | | | | |
| 4 | | | | | | | | | | | |
| | | | | 72.6 | | | | | | | |
| 5 | | **CLAY** very stiff grey wet | | 4.6 | 1 | ST | - | | | | |
| | | Nilcon Vane Test by Conetec at 5.5 m peak torque achieved without shearing | | | | | | | | | |
| 6 | | | | | 2 | ST | - | | | | |
| 7 | | Nilcon Vane Test by Conetec at 7.0 m | | | | | | | ✚ | | |
| 8 | | | | | 3 | ST | - | | | | |
| | | | | 68.7 | | | | | | | |
| | | Nilcon Vane Test by Conetec at 8.5 m peak torque achieved without shearing End of Borehole | | 8.5 | | | | | | | |
| 9 | | | | | | | | | | | |



GROUNDWATER ELEVATIONS

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

LOGGED : IK
CHECKED : SD

THURBER

# RECORD OF BOREHOLE MW24-101

PROJECT : Napnee WPCP Detailed Design
LOCATION : 300 Water Street N 4 900 343.9 E 343 412.5
STARTED : February 20, 2024
COMPLETED : February 20, 2024
DRILLER: ConeTec
DRILL RIG: Gtech GT8

Project No. 40745
SHEET 1 OF 2
DATUM CGVD28

| 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 ▲) 20 40 60 80 / WATER CONTENT, PERCENT wp w wl 20 40 60 80 | ADDITIONAL LAB. TESTING | PIEZOMETER OR STANDPIPE INSTALLATION |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | GROUND SURFACE | | 79.0 | | | | | | | |
| | HW Casing / Mud Rotary | SILTY CLAY with gravel<br>some to trace organics<br>brown<br>moist<br>**FILL** | | 0.0 | 1 | SS | 10 | | | | |
| 1 | | | | | 2 | SS | 4 | | | | |
| | | **SILTY CLAY**<br>very stiff<br>brown to grey<br>moist to wet<br>moist | | 77.5<br>1.5 | 3 | SS | 17 | | | | ▽<br>▼ |
| 2 | | | | | 4 | SS | 8 | | | | |
| 3 | | | | | 5 | SS | 13 | | | | |
| 4 | | | | | 6 | SS | 13 | | | | Bentonite |
| | | | | | 7 | SS | 6 | | | | |
| 5 | | - some silt/sand seams below 5.3 m | | | 8 | SS | 6 | | | | |
| 6 | | | | | | | | | | | |
| 7 | | | | 71.7 | | | | | | | |
| | HQ Coring / Diamond Drilling | **LIMESTONE BEDROCK**<br>slightly weathered to fresh<br>strong to very strong<br>thinly bedded<br>flat to wavy folation<br>fossiliferous<br>fined grained matrix with occasional <5mm clasts<br>with black shale interbeds (15-30mm) and occasional calcite infilling and calcite filled vugs (Bobcageon Formation) | | 7.3 | 1 | RUN | | TCR=95% SCR=89% RQD=89% | FI<br>>10<br>2<br>2<br>1 | |
| 8 | | | | | | | | | | 2 | Filter Sand<br>Slotted Screen |
| 9 | | | | | 2 | RUN | | | TCR=100% SCR=100% RQD=89% | 2<br>0 | |
| | | | | 69.2 | | | | | | 1 | Sand |
| | | End of Borehole | | 9.8 | | | | | | | |



## GROUNDWATER ELEVATIONS

▽ WATER LEVEL UPON COMPLETION
February 20, 2024

▼ WATER LEVEL IN WELL/PIEZOMETER
February 21, 2024

LOGGED : IK
CHECKED : SD

THURBER

# RECORD OF BOREHOLE MW24-101

PROJECT : Napnee WPCP Detailed Design
LOCATION : 300 Water Street N 4 900 343.9 E 343 412.5
STARTED : February 20, 2024
COMPLETED : February 20, 2024
DRILLER: ConeTec
DRILL RIG: Gtech GT8

Project No. 40745
SHEET 2 OF 2
DATUM CGVD28

| 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 ▲) (20 40 60 80) / WATER CONTENT, PERCENT (wp, w, wl) (20 40 60 80) | ADDITIONAL LAB. TESTING | PIEZOMETER OR STANDPIPE INSTALLATION |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 11 | | **Monitoring well 24-101 installed:** Schedule 40 PVC standpipe of 50 mm diameter with 1.5 m screen length. Monument casing installed at ground surface. | | | | | | | | | |
| 12 | | **Well Readings:** Date: 2024/02/20 Depth (m): 1.5 Elev. (m): 77.5; 2024/02/21 1.8 77.2; 2024/02/22 1.8 77.2 | | | | | | | | | |
| 13 | | | | | | | | | | | |
| 14 | | | | | | | | | | | |
| 15 | | | | | | | | | | | |
| 16 | | | | | | | | | | | |
| 17 | | | | | | | | | | | |
| 18 | | | | | | | | | | | |
| 19 | | | | | | | | | | | |



GROUNDWATER ELEVATIONS

WATER LEVEL UPON COMPLETION
February 20, 2024

WATER LEVEL IN WELL/PIEZOMETER
February 21, 2024

LOGGED : IK
CHECKED : SD

THURBER

THURBER ENGINEERING LTD.

# APPENDIX D

# SINGLE WELL RESPONSE TEST RESULTS

THURBER ENGINEERING LTD.

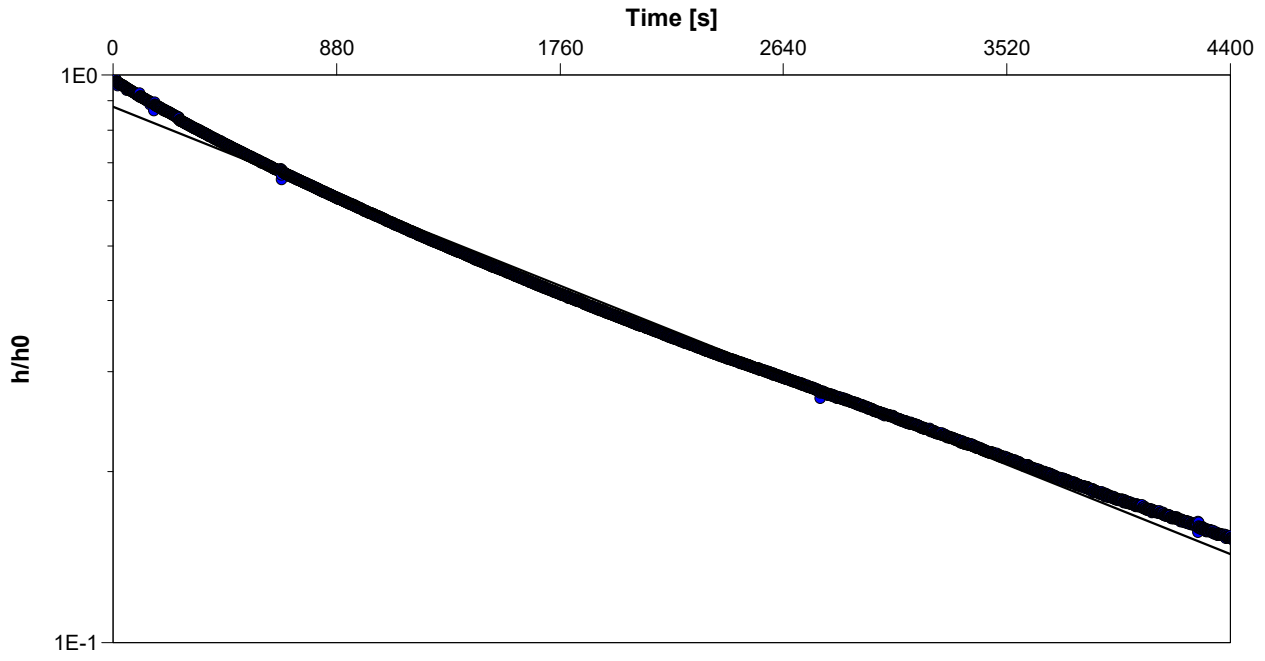
**Slug Test Analysis Report**

Project: Napanee Water Pollution Control Plant

Number: 30726

Client: RV Anderson

| | | |
|---|---|---|
| Location: 300 Water St West | Slug Test: 02 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 | $2.5 \times 10^{-7}$ | |

THURBER ENGINEERING LTD.

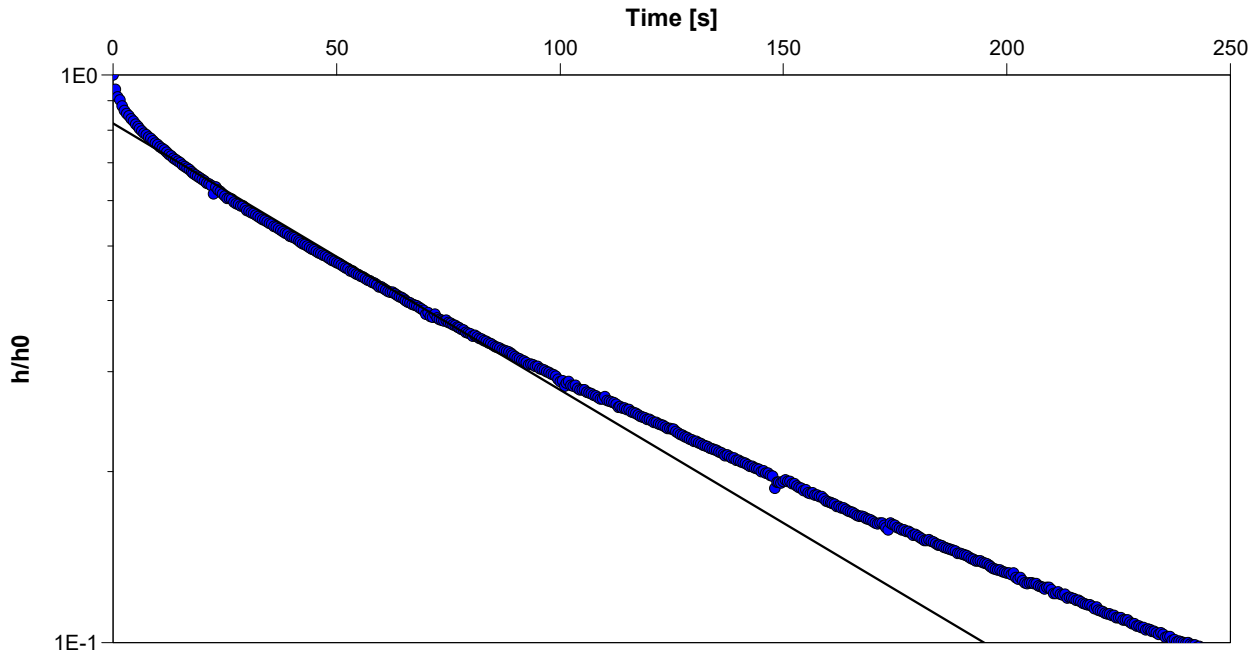
**Slug Test Analysis Report**

Project: Napanee Water Pollution Control Plant

Number: 30726

Client: RV Anderson

| | | |
|---|---|---|
| Location: 300 Water St West | Slug Test: 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 | $5.5 \times 10^{-6}$ | |

THURBER ENGINEERING LTD.

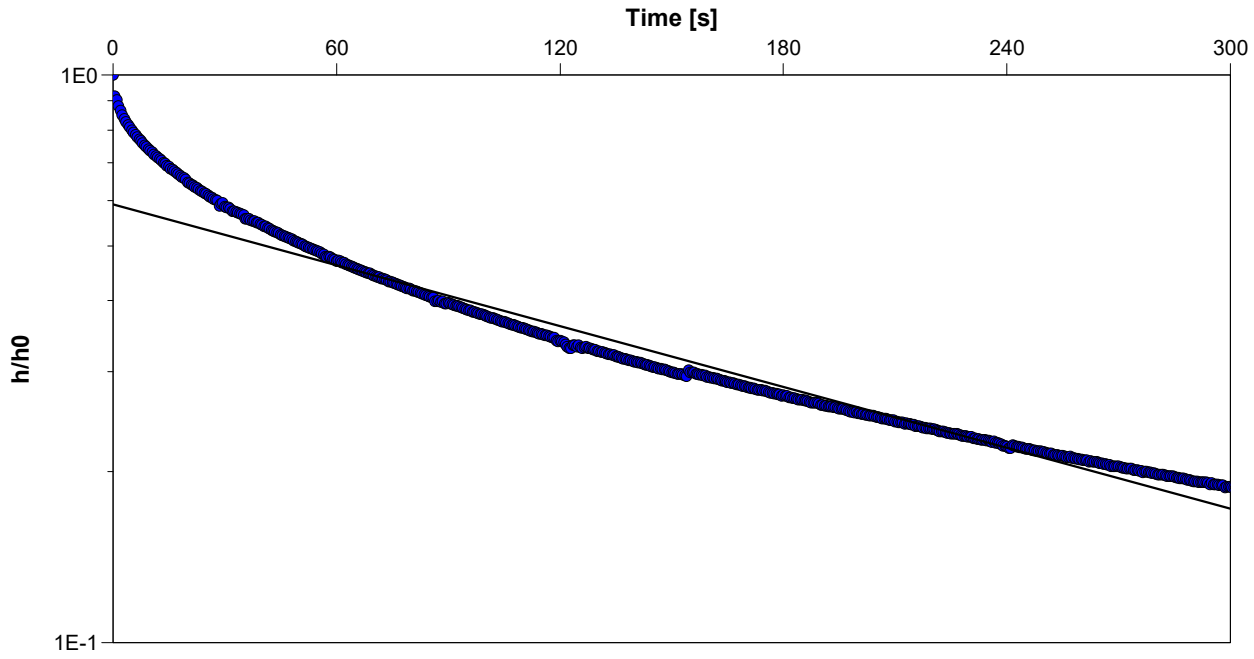
**Slug Test Analysis Report**

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 | $2.5 \times 10^{-6}$ | |

THURBER ENGINEERING LTD.

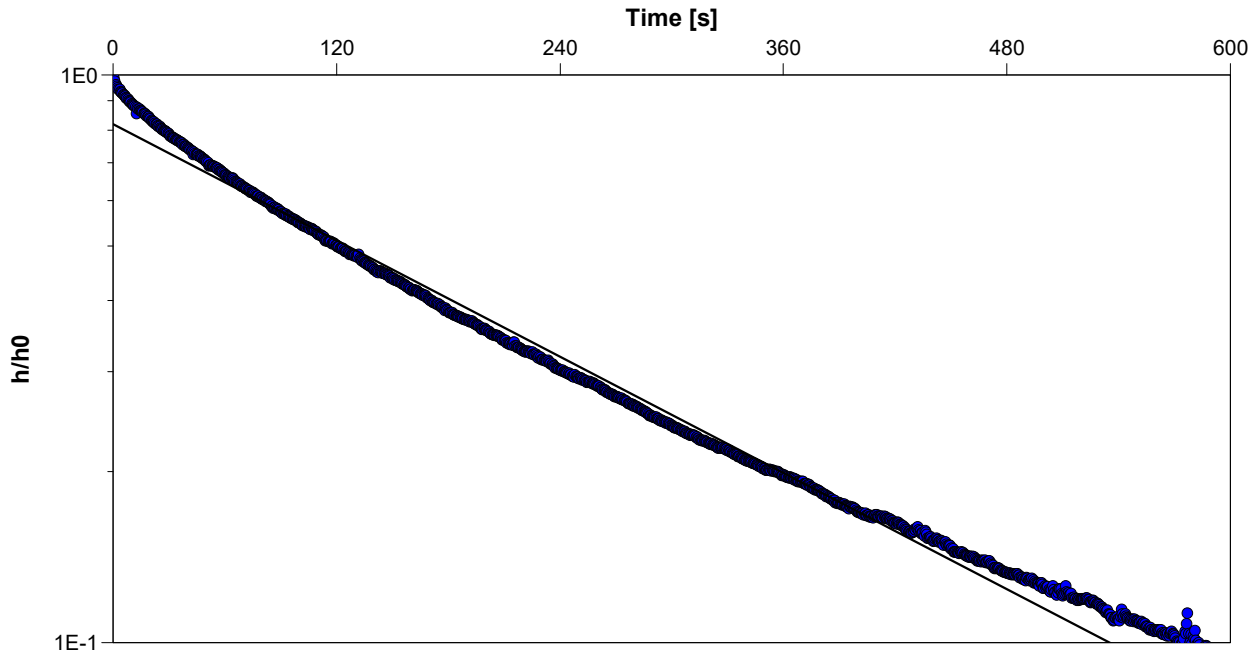
**Slug Test Analysis Report**

Project: Napanee Water Pollution Control Plant

Number: 30726

Client: RV Anderson

| | | |
|---|---|---|
| Location: 300 Water St West | Slug Test: 03 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 | $2.0 \times 10^{-6}$ | |

THURBER ENGINEERING LTD.

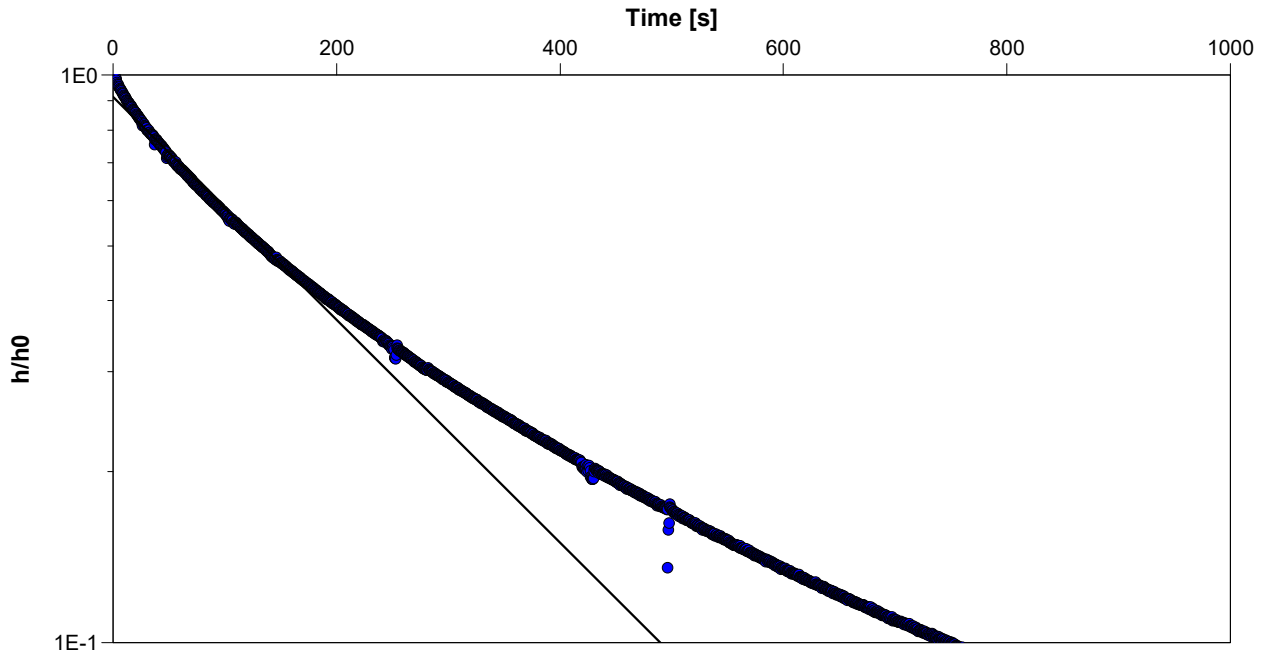
**Slug Test Analysis Report**

Project: Napanee Water Pollution Control Plant

Number: 30726

Client: RV Anderson

| | | |
|---|---|---|
| Location: 300 Water St West | Slug Test: 04 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 | $2.3 \times 10^{-6}$ | |

THURBER ENGINEERING LTD.

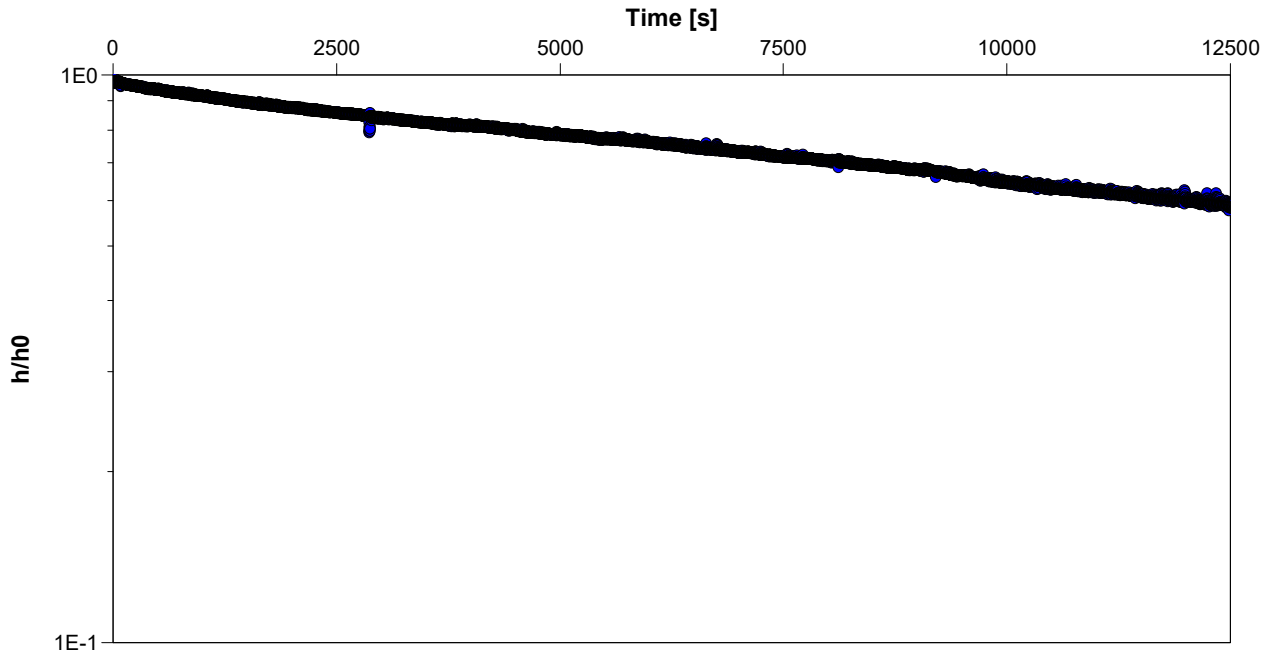
**Slug Test Analysis Report**

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 | $1.9 \times 10^{-8}$ | |

THURBER ENGINEERING LTD.

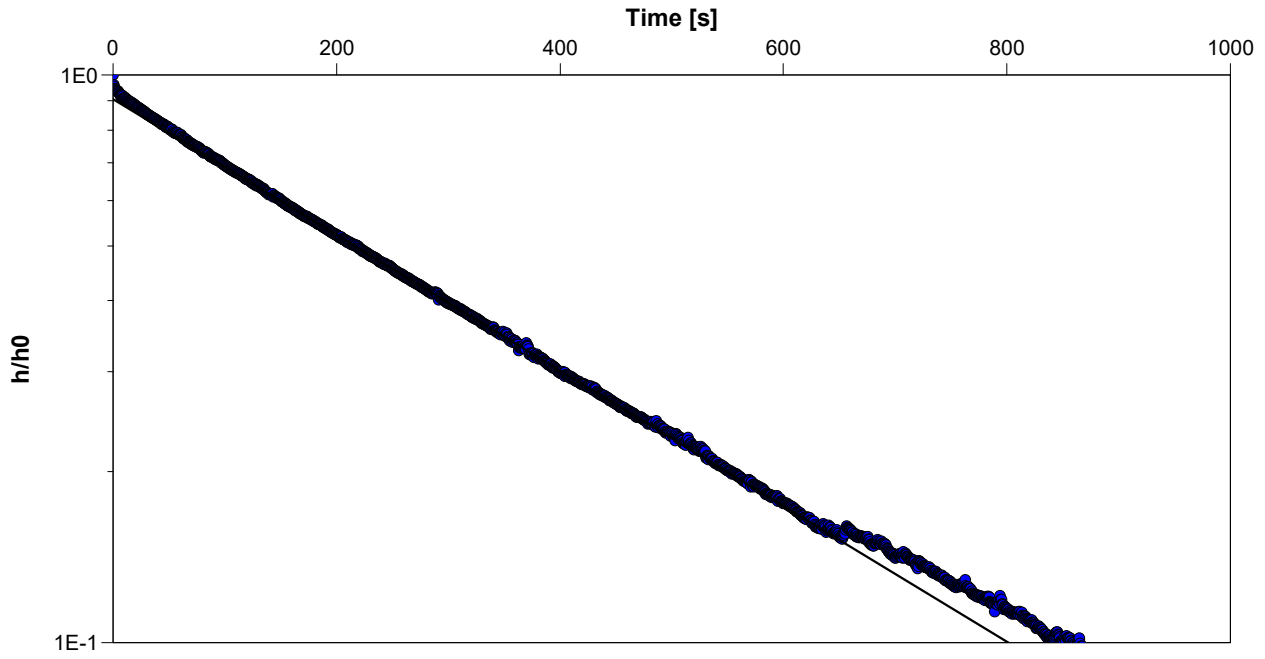
**Slug Test Analysis Report**

Project: Napanee Water Pollution Control Plant

Number: 30726

Client: RV Anderson

| | | |
|---|---|---|
| Location: 300 Water St West | Slug Test: 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 | $1.4 \times 10^{-6}$ | |

THURBER ENGINEERING LTD.

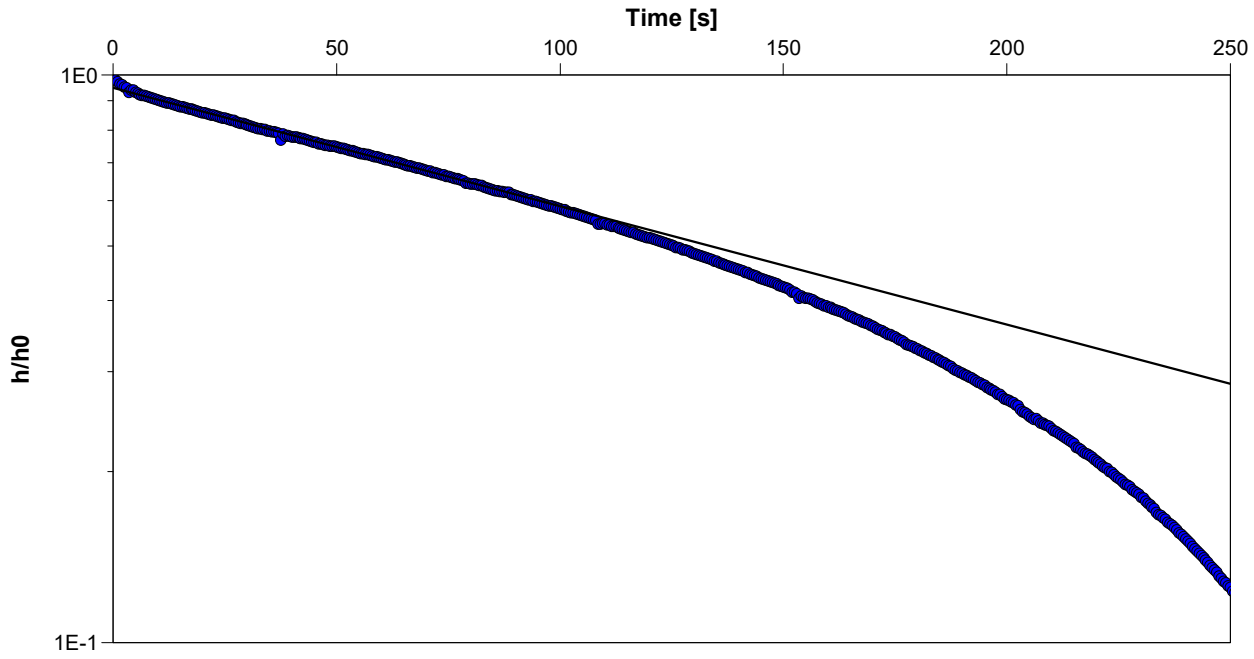
**Slug Test Analysis Report**

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 | $4.4 \times 10^{-6}$ | |

THURBER ENGINEERING LTD.

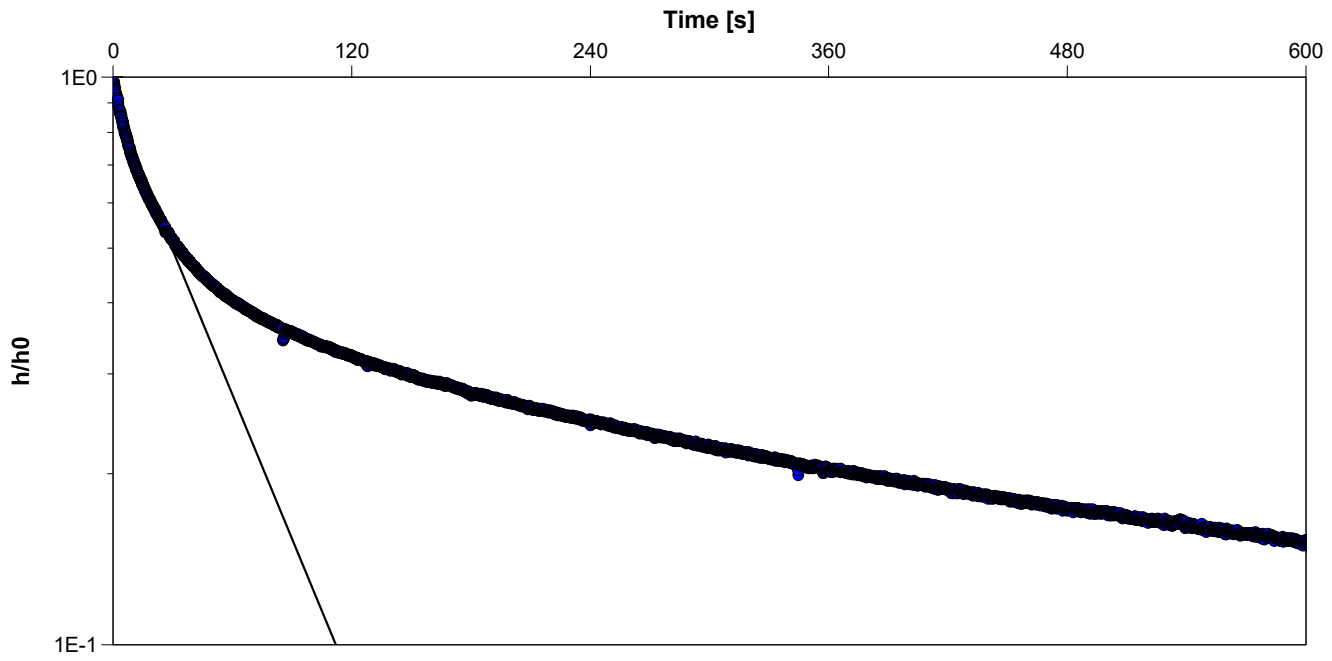
**Slug Test Analysis Report**

Project: Napanee Water Pollution Control Plant

Number: 40745

Client: EVB Engineering

| | | |
|---|---|---|
| Location: 300 Water Steet West | Slug Test: MW24-101 Test 2 | Test Well: MW24-101 |
| Test Conducted by: IK | | Test Date: 2024-02-22 |
| Analysis Performed by: PC | MW24-101 Test 2 Analysis 1 | Analysis Date: 2024-02-23 |
| Aquifer Thickness: | | |
| | Checked by: DH | |




Calculation using Hvorslev

| Observation Well | Hydraulic Conductivity [m/s] | |
|---|---|---|
| MW24-101 | $1.7 \times 10^{-5}$ | |

THURBER ENGINEERING LTD.

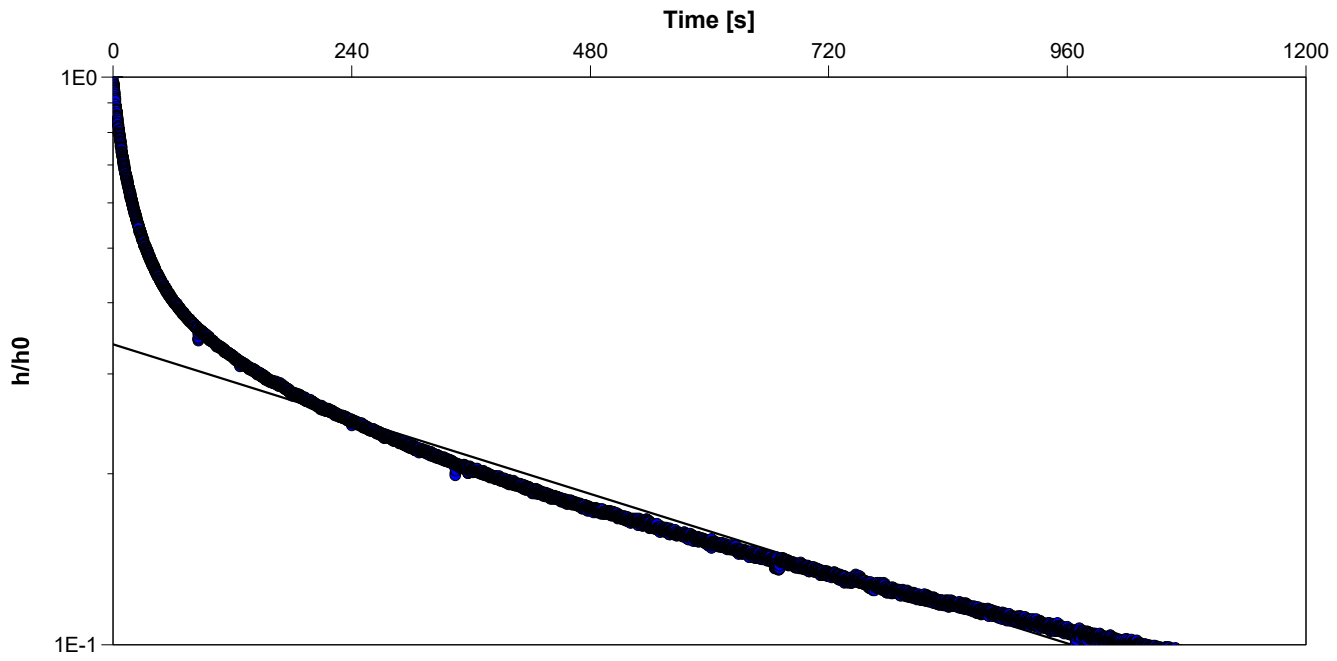
**Slug Test Analysis Report**

Project: Napanee Water Pollution Control Plant

Number: 40745

Client: EVB Engineering

| | | |
|---|---|---|
| Location: 300 Water Steet West | Slug Test: MW24-101 Test 2 | Test Well: MW24-101 |
| Test Conducted by: IK | | Test Date: 2024-02-22 |
| Analysis Performed by: PC | MW24-101 Test 2 Analysis 2 | Analysis Date: 2024-02-23 |
| Aquifer Thickness: | | |
| | Checked by: DH | |




Calculation using Hvorslev

| Observation Well | Hydraulic Conductivity [m/s] | |
|---|---|---|
| MW24-101 | $1.1 \times 10^{-6}$ | |

THURBER ENGINEERING LTD.

# 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 |
| BH 04D | 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 |
| BH 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 / Sample Date / Sample ID: L2566855-1, 12-MAR-21, BH06 | Lab ID / Sample Date / Sample ID: L2566855-2, 12-MAR-21, 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.

## 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 |
| **Analyte** | **Unit** | **Guide Limits #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<br>Sample Date: 12-MAR-21<br>Sample ID: BH06 | Lab ID: L2566855-2<br>Sample Date: 12-MAR-21<br>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.

# ANALYTICAL REPORT

## 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



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 | <0.000005( | 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 | | | <0.000005( | | 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 | <0.000005( | 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.

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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 | 1.4 | | |

**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 | 15:31 |

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

AUG 2020 FRONT

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

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

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

| | | Guide Limits | | | |
|---|---|---|---|---|---|
| **Lab ID** | | | | L2566855-1 | L2566855-2 |
| **Sample Date** | | | | 12-MAR-21 | 12-MAR-21 |
| **Sample ID** | | | | BH06 | BH04D |
| **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

| Analyte | Unit | Guide Limits #1 | Guide Limits #2 | Lab ID: L2566855-1<br>Sample Date: 12-MAR-21<br>Sample ID: BH06 | Lab ID: L2566855-2<br>Sample Date: 12-MAR-21<br>Sample ID: BH04D |
|---|---|---|---|---|---|
| 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.

## 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 | 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<br>Sample Date: 12-MAR-21<br>Sample ID: BH06 | Lab ID: L2566855-2<br>Sample Date: 12-MAR-21<br>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 |
| | | Guide Limits | | | |
| Analyte | Unit | #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.

## Aggregate Organics - 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 | | | |
| 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.

## 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 |
| | | Guide Limits | | | |
| Analyte | Unit | #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

| | | | | | |
|---|---|---|---|---|---|
| | | | **Lab ID** | L2566855-1 | L2566855-2 |
| | | | **Sample Date** | 12-MAR-21 | 12-MAR-21 |
| | | | **Sample ID** | BH06 | BH04D |
| **Analyte** | **Unit** | **Guide Limits #1** | **#2** | | |
| 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.

## Polychlorinated Biphenyls - 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** | | |
| 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.

## 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.

## Organic Parameters - 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 | | | |
| 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.

# 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



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



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



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 | 1.4 | | |

**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 | 15:31 |

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

AUG 2020 FRONT

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

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

THURBER ENGINEERING LTD.

# APPENDIX F

# DEWATERING ESTIMATES

**Table F1 - Dewatering Calculations for Unconfined Scenarios**

| Parameter | Units | Multi-use building | Combined Excavation for Three AGS reactor tanks, post-equalization tank, and operation building | Single storey tertiary / ultraviolet disinfection building | Sanitary Pumping Station |
|---|---|---|---|---|---|
| Relevant Boreholes | | MW24-101, BH01, BH02 | BH03, BH04, BH22,MW24-101 | BH05, BH10 | BH10 |
| Geologic Unit to Dewater | | Silty clay | Silty clay, peat | Sand to silty sand, silty clay | Silty sand, Silty clay |
| Input Hydraulic Conductivity in m/s (K) | m/s | 5.5E-06 | 5.5E-06 | 5.5E-06 | 5.5E-06 |
| Hydraulic Conductivity converted to m/day | m/day | 0.5 | 0.5 | 0.5 | 0.5 |
| Input static water level elevation | m | 78.5 | 77.2 | 76.3 | 76.3 |
| Input excation elevation | m | 76.0 | 74.9 | 74.4 | 72.7 |
| Input dewatering target elevation | m | 75.0 | 73.9 | 73.4 | 71.7 |
| Input bottom of aquifer elevation | m | 71.7 | 72.9 | 72.4 | 70.7 |
| Input height of groundwater pressure (H) | m | 6.8 | 4.3 | 3.9 | 5.6 |
| Input dewatering height (h) | m | 3.3 | 1.0 | 1.0 | 1.0 |
| Input length of excavation (x, a) | m | 35 | 65 | 30 | 4 |
| Input width of excavation (b) | m | 25 | 55 | 20 | 4 |
| Input/calculate radius of trench ($r_w$ or $r_s$) | m | 16.7 | 33.7 | 10.0 | 2.3 |
| Length to width ratio | unitless | 1.4 | 1.2 | 1.5 | 1.0 |
| Net water table lowering | m | 3.50 | 3.30 | 2.90 | 4.60 |
| Equation Type | | Radial | Radial | Trench | Radial |
| Apply reduction for partial aquifer penetration? | yes/no | no | no | no | no |
| **Radii of Influence** | | | | | |
| Sichardt Equation (Ro based on K, H, h) | m | 25 | 23 | 20 | 32 |
| **Ro = Sichardt + (rw or rs)** | **m** | **41** | **57** | **30** | **35** |
| **Calculated Flow Rate** | | | | | |
| **Base groundwater flow** | **L/day** | **58,000** | **50,000** | **26,000** | **17,000** |
| Partial Penetration Factor | unitless | 1.00 | 1.00 | 1.00 | 1.00 |
| Safety factor on groundwater flow | unitless | 3 | 3 | 3 | 3 |
| Groundwater flow with safety factor | L/day | 174,000 | 150,000 | 78,000 | 51,000 |
| Rainfall entering excavation | mm | 50 | 50 | 50 | 50 |
| Duration to remove rainfall | hours | 24 | 24 | 24 | 24 |
| Flow rate to remove rainfall | L/day | 44,000 | 179,000 | 30,000 | 1,000 |
| **Budgeted peak flow rate** | **L/day** | **218,000** | **329,000** | **108,000** | **52,000** |
| = | L/s | 2.5 | 3.8 | 1.3 | 0.6 |
| = | gal/min | 33 | 50 | 16 | 8 |

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

**Table F2 -Dewatering Calculations for Unconfined Scenarios**

| Parameter | Units | Utility Trench (e.g., Outfall Pipe) |
|---|---|---|
| Relevant Boreholes | | BH04, BH10, BH11, BH12, BH19 |
| Geologic Unit to Dewater | | Sand to silty sand, silty clay |
| Input Hydraulic Conductivity in m/s (K) | m/s | 5.5E-06 |
| Hydraulic Conductivity converted to m/day | m/day | 0.5 |
| Input static water level depth below grade | m | 0.9 |
| Input excavation depth below grade | m | 2.0 |
| Input dewatering target depth below grade | m | 3.0 |
| Input bottom of aquifer depth below grade | m | 4.0 |
| Input height of groundwater pressure (H) | m | 3.1 |
| Input dewatering height (h) | m | 1.0 |
| Input length of excavation (x, a) | m | 55 |
| Input width of excavation (b) | m | 2 |
| Input/calculate radius of trench ($r_w$ or $r_s$) | m | 1.0 |
| Length to width ratio | unitless | 27.5 |
| Net water table lowering | m | 2.10 |
| Equation Type | | Trench |
| Apply reduction for partial aquifer penetration? | yes/no | no |
| **Radii of Influence** | | |
| Sichardt Equation (Ro based on K, H, h) | m | 15 |
| **Ro = Sichardt + (rw or rs)** | **m** | **16** |
| **Calculated Flow Rate** | | |
| **Base groundwater flow** | **L/day** | **19,000** |
| Partial Penetration Factor | unitless | 1.00 |
| Safety factor on groundwater flow | unitless | 3 |
| Groundwater flow with safety factor | L/day | 57,000 |
| Rainfall entering excavation | mm | 50 |
| Duration to remove rainfall | hours | 24 |
| Flow rate to remove rainfall | L/day | 6,000 |
| **Budgeted peak flow rate** | **L/day** | **63,000** |
| = | L/s | 0.7 |
| = | gal/min | 10 |

Table F2 uses depths based on metres below grade.
Flow rate estimates rounded to nearest 1,000 L/day.

**F3 - Dewatering Calculations for Confined Scenarios**

| Parameter | Units | Influent Buffer Tanks | Sludge Buffer Tanks |
|---|---|---|---|
| Relevant boreholes | | MW24-101, BH01, BH02 | MW24-101, BH01, BH02 |
| Geologic Unit to Dewater | | Limestone Bedrock | Limestone Bedrock |
| Input Hydraulic Conductivity (K) | m/s | 1.7E-05 | 1.7E-05 |
| Hydraulic Conductivity converted to m/day | m/day | 1.5E+00 | 1.5E+00 |
| High Groundwater Level Elevation | m | 78.5 | 78.5 |
| Proposed Elevation Excavation Level | m | 71.7 | 73.9 |
| Input dewatering target elevation | m | 71.2 | 72.9 |
| Height of groundwater pressure (H) | m | 10.8 | 10.8 |
| Dewatering height (h) | m | 3.5 | 5.2 |
| Net depressurization | m | 7.3 | 5.6 |
| Input length of excavation (x, a) | m | 20 | 20 |
| Input width of excavation (b) | m | 13 | 8 |
| Elevation of top of extraction interval | m | 70.7 | 70.7 |
| Elevation of bottom of extraction interval | m | 67.7 | 67.7 |
| Elevation of bottom of aquifer | m | 67.7 | 67.7 |
| Vertical extraction interval thickness | m | 3 | 3 |
| Aquifer thickness | m | 3 | 3 |
| Length to width ratio a/b | unitless | 1.5 | 2.5 |
| Apply reduction for partial aquifer penetration? | yes/no | no | no |
| Equivalent radius Rs, where applicable | m | 6.5 | 4.0 |
| **Radius of Influence (Ro based on Sichardt)** | **m** | **90** | **69** |
| Ratio Ro/Rs | | 13.9 | 17.3 |
| Flow equation based on a/b and Ro/Rs | | Trench + Equiv. Well | Trench + Equiv. Well |
| **Calculated Flow Rate** | | | |
| Groundwater flow prior to factor reductions | L/day | 91,000 | 69,000 |
| Partial Penetration Factor | unitless | 1.00 | 1.00 |
| **Base groundwater flow** | **L/day** | **91,000** | **69,000** |
| Allowance for Bulk Excavation Drainage Base Flow | L/day | 59,000 | 24,000 |
| Safety factor on groundwater flow | unitless | 3 | 3 |
| Groundwater flow with safety factor | L/day | 273,000 | 207,000 |
| Rainfall entering excavation, if applicable | mm | 50 | 50 |
| Duration to remove rainfall | hours | 24 | 24 |
| Flow rate to remove rainfall | L/day | 13,000 | 8,000 |
| Allowance for Bulk Excavation Drainage Peak Flow | L/day | 177,000 | 73,000 |
| **Budgeted peak flow rate** | **L/day** | **463,000** | **288,000** |
| = | L/s | 5.4 | 3.3 |
| = | gal/min | 71 | 44 |

Flow rate estimates rounded to nearest 1,000 L/day.
Where Ro/Rs < 1.5, calculate flow as perimeter trenches.

**Table F4 - Dewatering rates (L/day) based on the bulk excavation approach method**

| Project Element | Dimensions | | Drainable Porosity % | Total Saturated Subsurface Volume ($m^3$) | Base Groundwater Flow (L/day)[1] | Peak Groundwater Flow (L/day)[2] |
|---|---|---|---|---|---|---|
| | Length (m) | Width (m) | | | | |
| Influent Buffer Tanks | 20 | 13 | 20 | 1,768 | 59,000 | 177,000 |
| Sludge Buffer Tanks | 20 | 8 | 20 | 728 | 24,000 | 73,000 |

Notes:

[1] Based on the assumption that it will take 6 days to excavate the satuarated soil material

[2] Based on the assumption that it will take 2 days to excavate the satuarated soil material

**Table F5 - Permanent Drainage Calculations for Unconfined Scenarios**

| Parameter | Units | Three AGS reactor tanks | Operation Building | Single storey tertiary / ultraviolet disinfection building |
|---|---|---|---|---|
| Relevant Boreholes | | BH03, BH04, BH22,MW24-101 | BH22 | BH05, BH10 |
| Geologic Unit to Dewater | | Silty clay, peat | Silty clay, peat | Sand to silty sand, silty clay |
| Input Hydraulic Conductivity in m/s (K) | m/s | 1.2E-06 | 1.2E-06 | 1.2E-06 |
| Hydraulic Conductivity converted to m/day | m/day | 0.1 | 0.1 | 0.1 |
| Input static water level elevation | m | 77.2 | 77.2 | 76.3 |
| Input dewatering target elevation | m | 76.0 | 75.9 | 75.3 |
| Input bottom of aquifer elevation | m | 75.0 | 74.9 | 74.3 |
| Input height of groundwater pressure (H) | m | 2.2 | 2.3 | 2.0 |
| Input dewatering height (h) | m | 1.0 | 1.0 | 1.0 |
| Input length of structure (x, a) | m | 55 | 39 | 27 |
| Input width of structure (b) | m | 33 | 14 | 16 |
| Input/calculate radius of structure ($r_w$ or $r_s$) | m | 16.5 | 7.0 | 8.0 |
| Length to width ratio | unitless | 1.7 | 2.8 | 1.7 |
| Net water table lowering | m | 1.21 | 1.31 | 1.02 |
| Equation Type | | Trench | Trench | Trench |
| Apply reduction for partial aquifer penetration? | yes/no | no | no | no |
| **Radii of Influence** | | | | |
| Sichardt Equation (Ro based on K, H, h) | m | 4 | 4 | 3 |
| **Ro = Sichardt + (rw or rs)** | **m** | **20** | **11** | **11** |
| **Calculated Flow Rate** | | | | |
| **Base groundwater flow** | **L/day** | **7,000** | **4,000** | **4,000** |
| Partial Penetration Factor | unitless | 1.00 | 1.00 | 1.00 |
| Safety factor on groundwater flow | unitless | 3 | 3 | 3 |
| Groundwater flow with safety factor | L/day | 21,000 | 12,000 | 12,000 |
| **Budgeted peak flow rate** | **L/day** | **21,000** | **12,000** | **12,000** |
| = | L/s | 0.2 | 0.1 | 0.1 |
| = | gal/min | 3 | 2 | 2 |

# Theory and Formulae

**Trench flow in unconfined aquifer**

Use this equation when a/b > 1.5.

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

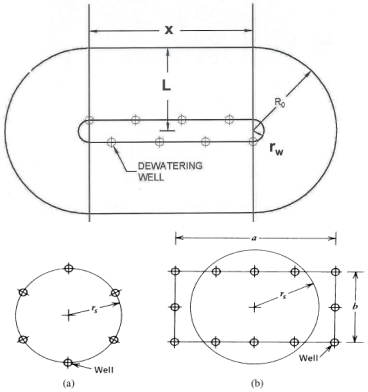
Circular System

$$r_s = \sqrt{\frac{a \times b}{\pi}}$$

**Trench flow in confined aquifer**

Use this equation when a/b > 1.5.

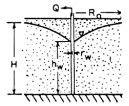
$$Q = \frac{2\pi KB(H - h)}{\ln(R_0/r_s)} + 2\left[\frac{xKB(H - h)}{L}\right]$$




**Radial flow in unconfined aquifer**

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

rs = well radius for single well

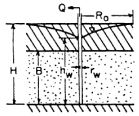



Radial flow, water table aquifier

**Radial flow in confined aquifer**

$$Q = \frac{2\pi KB(H - h)}{\ln(R_0/r_s)}$$

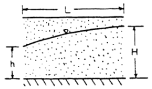
rs = well radius for single well




Radial flow, confined aquifer

**Unconfined flow from a line source to a drainage trench, 2 sides**

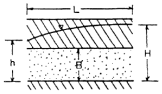
$$Q = \frac{xK(H^2 - h^2)}{L}$$




Water table flow from a line source to a drainage trench

**Confined flow from a line source to a drainage trench, 2 sides**

$$Q = \frac{2xKB(H - h)}{L}$$




Confined flow from a line source to a drainage trench

if Ro<1.5Rs, then assume confined flow to trench from 4 sides

**Radius of Influece**

Sichardt Equation:

$$R_0 = 3000\,(H - h)\sqrt{K}$$

**Partial Penetration Factor (F) Kozeny 1933**

$$F = \frac{L}{b}\{1 + 7\cos(\frac{\pi L}{2b})\sqrt{\frac{r}{2L}}\}$$

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.

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where:

Q = Pumping rate ($m^3/s$)

K = Hydraulic conductivity (m/s)

H = Depth from the initial static water level to bottom of the saturated aquifer (m)

h = Depth from the dewatering target water level to bottom of the saturated aquifer (m)

$R_0$ = Radius of influence (m)

$r_s$ = Equivalent radius of excavation or distance to the wellpoints from the centre of the trench (half trench width) (m)

x = Trench length (m)

L = Distance from a line source to the trench, equivalent to $R_0$ (m)

B = Aquifer thickness (m)

a = Excavation length (m)

b = Excavation width (m)

**Reference:** Powers, J. P., Corwin, A. B., Schmall, Paul C. and Kaeck, W. E. 2007. Construction Dewatering and Groundwater Control: New Methods and Applications, Third Edition, New York, New York: John Wiley & Sons.

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# APPENDIX G

# MONITORING AND CONTINGENCY PLAN

**Table G1. Monitoring and Contingency Plan for Groundwater Taking**

**Please note that the monitoring and contingency plan below is in addition to any requirements specified in the Project Specifications.**

| Category | Item | Performance Requirement | Monitoring Requirements | Initial Action(s) Upon Exceedance | Potential Mitigations if Exceedance not Eliminated |
|---|---|---|---|---|---|
| Groundwater Quantity | Quantity Taken | Total quantity taken at each water taking location per day must be less than permitted value at the given water taking location per the PTTW. | -Water quantity taken at each water taking location as specified in the PTTW must be measured accurately and recorded daily. | - Advise MECP and Contract Authority of exceedance of PTTW limit.<br>- Reduce flow rate being taken such that it is less than the permitted value, provided it is not unsafe to do so. | Contact the Geotechnical Engineer or Hydrogeologist to identify further options, potentially including grouting, reduction of work zone dimensions, or watertight construction methods. |
| Groundwater Quantity | Reporting | The quantity taken each day must be reported on the Ontario government's website titled Water Taking Reporting System by March 31st for the prior year's takings. | As above | Not reporting quantities is a violation of the terms and conditions of the PTTW. Report immediately, if overdue. | Not applicable. |
| Settlement Monitoring | Settlement Monitoring | Settlement exceeds level recommended by Geotechnical Engineer. | - Pre-construction survey, post-construction survey of all existing adjacent structures within Project Zone per Geotechnical Engineer.<br>- Settlement monitoring in accordance with Geotechnical Instrumentation and Monitoring Plan per Geotechnical Engineer.<br>-Periodic visual inspection during construction. | - Promptly investigate structures for indications of damage and advise EVB and the Town of Greater Napanee.<br>- Additional recommendations per Geotechnical Engineer.<br>- Investigate whether settlement may be partly due to dewatering. | -Reduce water taking rate if potentially due to water taking and if safe to do so.<br>-Reduce groundwater flow through any support of excavation or any excavation surfaces and/or investigate means of alternate support of affected structure. |

**Table G2. Monitoring and Contingency Plan for Discharge to Greater Napanee Sanitary/Combined Sewer**

**Please note that the monitoring and contingency plan below is <u>in addition</u> to the terms of and conditions of the Town of Greater Napanee Sewer Discharge Agreement and Project Specifications.**

| Category | Item | Performance Requirement | Monitoring Requirements | Initial Action(s) Upon Exceedance | Potential Mitigations if Exceedance not Eliminated |
|---|---|---|---|---|---|
| Groundwater Quality | Raw Groundwater Quality (Pre-Treatment) | - No sheen or pure products.<br>- Ensure treatment system suitable for water quality observed.<br>- Results reviewed by Qualified Person. | - Prior to first discharge, sample raw groundwater for TSS and Greater Napanee Bylaw limits. Include field measurement of temperature, pH, dissolved oxygen and turbidity.<br>- Monthly thereafter. | - If sheen or pure products observed in raw water, assess potential sources of new impact.<br>- Collect a second sample to confirm.<br>- Assess risks of continuing to receive any new contaminants, and determine options for proceeding.<br>- Ensure that there are no discharge exceedances, and develop alternate methods of managing water as needed. | - Modify intake procedures if possible.<br>- Reduce water taking rate if possible.<br>- Stop dewatering operations until addressed, or unless stopping would create safety risks.<br>- Consider further watertight shoring or ground modification if source of groundwater contamination cannot be excluded. |
| Groundwater Quality | Raw Groundwater Quality (Pre-Treatment) | No excessive sediment. Excessive sediment may be a sign of ground loss. | Monitor twice daily during dewatering with active construction; once daily during dewatering without active construction. Record on daily inspection report. | - Review extraction methodology and equipment for possible changes.<br>- Review areas for signs of ground loss.<br>- Modify water intake setup, procedures and equipment to reduce solids intake. | - Modify intake procedures if possible.<br>- Reduce water taking rate if possible.<br>- Stop dewatering operations until addressed, or unless stopping would create safety risks.<br>- Consider further watertight shoring or ground modification if source of groundwater contamination cannot be excluded. |
| Groundwater Quality | Raw Groundwater Quality (Pre-Treatment) | No sheen or pure products. | Monitor twice daily during dewatering with active construction; once daily during dewatering without active construction. Record on daily inspection report. | - Assess potential sources of new impact.<br>- Assess risks of continuing to receive new contaminants, and determine options for proceeding. | - Modify intake procedures if possible.<br>- Reduce water taking rate if possible.<br>- Stop dewatering operations until addressed, or unless stopping would create safety risks.<br>- Consider further watertight shoring or ground modification if source of groundwater contamination cannot be excluded. |
| Groundwater Quality | Treated Discharge Water Quality Prior to Discharge at Each Location | - Sanitary/combined sewer limits of the Town of Greater Napanee Sewers By-law met.<br>- No sheen or pure products.<br>- Results reviewed by Qualified Person. | Sample analyzed by CAEL accredited laboratory of treated water meeting requirements prior to first discharge. | - Modify treatment methods and/or intake methods.<br>- Retest until performance requirements met. | Further modifications as needed to meet criteria before discharging. |
| Groundwater Quality | Treated Discharge Water Quality | - Sanitary/combined sewer limits of the Town of Greater Napanee Sewers By-law met.<br>- No sheen or pure products.<br>- Results reviewed by Qualified Person. | Testing frequency per the Town of Greater Napanee Sewer Discharge Agreement. | - Notify Town of Greater Napanee and Contracting Authority of exceedance.<br>- Cease discharge and immediately resample on a rush basis.<br>- Review function of water treatment system and repair any deficiencies.<br>- Review changes to water intake and modify if necessary. | - Enhance water treatment system or modify intake until rectified.<br>- Submit additional water quality samples for Greater Napanee Sewers By-law limits to lab to determine if treatment sufficient to permit discharge to sewer. |
| Groundwater Quality | Treated Discharge Water Quality | - No signs of elevated sediment levels compared to standard operations.<br>- No visual or olfactory signs of any other type of contaminant in discharge. | Monitor for listed performance requirements twice daily during dewatering with active construction; once daily during dewatering without active construction. | - Review function of water treatment system and repair any deficiencies.<br>- Review changes to water intake and modify if necessary.<br>- Analyze water quality sample for Greater Napanee Sewers By-law. | - Enhance water treatment system or modify intake until rectified.<br>- Submit additional water quality samples to lab to assess quality of treatment prior to further discharge. |
| Erosion | Erosion at Discharge Point | No significant erosion occurring, and all water entering the intended sewer. | Monitor twice daily during dewatering with active construction; once daily during dewatering without active construction. Record on daily inspection report. | Review discharge setup and repair any deficiencies. | Cease discharge of water to sewer until performance requirement being met. |

**Table G3. Monitoring and Contingency Plan for Discharge to Ground Surface Greater than 30 m from Surface Water**

**Please note that the monitoring and contingency plan below is <u>in addition</u> to the terms of and conditions of the Permit to Take Water, Project Specifications, and any external approvals such as Quinte Conservation.**

| Category | Item | Performance Requirement | Monitoring Requirements | Initial Action(s) Upon Exceedance | Potential Mitigations if Exceedance not Eliminated |
|---|---|---|---|---|---|
| Groundwater Quality | Raw Groundwater Quality (Pre-Treatment) | - No sheen or pure product.<br>- Ensure treatment system suitable for water quality observed.<br>- Results reviewed by Qualified Person. | -Prior to first discharge, sample raw groundwater for TSS, PWQO metals, and PWQO dissolved metals. Include field measurement of temperature, pH, dissolved oxygen and turbidity.<br>- Weekly sampling for the first four weeks during active dewatering, monthly thereafter. | - If sheen or pure product observed in raw water, notify Qualified Person.<br>- Collect a second sample to confirm following development.<br>- Dispose of any collected water off-site at licensed facility or to Greater Napanee sanitary/combined sewer if sewer discharge agreement is obtained. | Consider watertight shoring or ground modification if source of groundwater contamination cannot be excluded. |
| Groundwater Quality | Raw Groundwater Quality (Pre-Treatment) | No excessive sediment, which may be sign of ground loss. | Monitor twice daily during dewatering with active construction; once daily during dewatering without active construction. | - Review extraction methodology and equipment for possible changes.<br>- Review area for signs of ground loss.<br>- Modify water intake setup, procedures and equipment to reduce solids intake. | - Stop dewatering operations until addressed, unless stopping would create safety risk.<br>- Further modifications or means and methods to extract water. |
| Groundwater Quality | Raw Groundwater Quality (Pre-Treatment) | No sheen or pure product. | Monitor twice daily during dewatering with active construction; once daily during dewatering without active construction. | - Assess potential sources of new impact.<br>- Assess risk of continuing to receive new contaminant and determine options for proceeding. | - Modify intake procedures if possible.<br>- Reduce water taking rate if possible.<br>- Stop dewatering operations until addressed, unless stopping would create safety risk.<br>- Consider watertight excavation method or other alternatives for mitigating impact. |
| Groundwater Quality | Treated Discharge Water Quality Prior to Discharge at Each Location | - Total suspended solids less than 25 mg/L as determined by laboratory analysis.<br>- No sheen or pure product. | Sample analyzed for TSS, and PWQO Metals and Inorganics for due diligence. Analysis by CALA accredited laboratory of treated water prior to first discharge. | - Modify treatment methods and/or intake methods.<br>- Retest until performance requirements met. | Further modifications as needed to meet criteria before discharging. |
| Groundwater Quality | Treated Discharge Water Quality | -Establish correlation between TSS and NTU by measuring field Turbidity for at least one week.<br>-NTU value corresponding to TSS limit of 25 mg/L should not be exceeded.<br>- No visual or olfactory signs of any other type of contaminant in discharge. | Monitor for listed performance requirements twice daily during dewatering with active construction; once daily during dewatering without active construction. | - Review function of water treatment system and repair any deficiencies.<br>- Review changes to water intake and modify if necessary. | - Cease discharge of water to natural environment until performance requirement being met.<br>- Enhance water treatment system or modify intake until rectified.<br>- Submit additional water quality samples to lab to assess quality of treatment prior to further discharge to environment. |
| Erosion | Erosion at Discharge Point or Downstream | No significant erosion occurring | Monitor twice daily during dewatering with active construction; once daily during dewatering without active construction. | - Review function of erosion and sediment controls and repair any deficiencies. | - Cease discharge of water to natural environment until performance requirement being met.<br>- Enhance erosion and sediment controls until rectified.<br>- Monitor hourly for first four hours upon re-commencement. |
| Discharge Flow | Overland Flow Reaching Surface Water | Discharge water shall not directly reach surface water via channelized overland flow. | Monitor twice daily during dewatering with active construction to ensure water discharge is not directly reaching surface water via channelized overland flow; once daily during dewatering without active construction. | - Review function of erosion and sediment controls and repair any deficiencies.<br>- Supplement water control measures to prevent overland flow to surface water. | - Cease discharge of water to natural environment until performance requirement being met.<br>- Enhance erosion and sediment controls until rectified.<br>- Monitor hourly for first four hours upon re-commencement. |