Part of Lots 11-13, Concessions A and 1, Block D
Elgin Street East, Cobourg, ON

Phase 1 Development – Hydrogeological Impact Assessment

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Executive Summary

PGL Environmental Consultants (PGL) conducted a Hydrogeological Impact Assessment at Part of Lots 11-13, Concessions A and 1, Block D, Elgin Street East in Cobourg, Ontario (the Site). The investigation was completed for 1351745 Ontario Limited to assess groundwater conditions at the Site in advance of the first phase of construction.

The proposed development includes a subdivision that will be developed in seven construction phases. The first phase of construction (the Phase 1 area) will begin on the west side of the Site, north of Elgin Street East and west of Brook Road North. The Phase 1 area development will include construction of single detached residential lots, a village square, a stormwater management pond, and supporting roadway and sewer infrastructure. Prior to construction, earthworks will be completed at the Site for ground surface regrading.

Groundwater conditions were assessed by reviewing existing information and reports on geology and hydrogeology. PGL also conducted hydraulic conductivity tests at the Site. This data was then used to approximate flow volumes during construction dewatering for the proposed development. PGL then evaluated potential impacts to groundwater due to passive dewatering during ground surface regrading and construction dewatering.

The key results of the hydrogeological impact assessment for the Site are:

- PGL recommends passive groundwater drainage via directed channels during surface regrading to divert groundwater flow, with an anticipated flow of 266,680L/day;
- There are no anticipated impacts to aquifers, nearby water wells, or baseflow to surface water features due to the planned surface regrading activities in the Phase 1 area;
- Dewatering will be required during the excavation for construction, with maximum estimated flow estimated at 354,680L/day;
- While no impacts to the adjacent natural heritage features (e.g., wetlands and water courses) are anticipated, PGL recommends:
  - New water levels be measured in the Phase 1 area to confirm dewatering flow estimates; and
  - Staff gauges and wetland monitoring be conducted to confirm no impacts to the wetland from groundwater draw-down;
- Construction dewatering at the Site will likely require registration in the Environmental Activity and Sector Registry;
- A Permit to Take Water is not likely required for the construction dewatering during surface regrading or construction excavations;
- Groundwater at the Site meets the Town of Cobourg Sanitary Sewer Use By-Law limits but exceeds the Town of Cobourg Storm Sewer Use By-Laws for a small number of parameters. Groundwater also exceeds the PWQOs for multiple parameters. Treatment may be required if sewer discharge or surface water discharge (e.g., to a nearby wetland) is anticipated and confirmatory sampling is recommended;
- PGL recommends thermal controls for any surface water discharge to protect downstream cool water aquatic life;
- PGL recommends sediment and erosion controls be in place for any surface water discharge; and
- If the construction dewatering plan changes or any of the assumptions stated in this report are otherwise violated, re-evaluation of the potential hydrogeological impact will be required.

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Based on the observed groundwater table in close proximity to the ground surface and some potentially artesian conditions elsewhere on the Site, precautions should be considered for possible slow flowing springs occurring on the Phase 1 area during the above-mentioned construction activities.

According to a pre-consultation with the Ganaraska Region Conservation Authority, the proposed active construction dewatering for the development of the Phase 1 area will require a dewatering plan, as per the *TRCA Technical Guidelines for the Development of Environmental Management Plans for Dewatering* (2013).

Assessment of ground settling due to dewatering was outside the scope of this work program and area of expertise of the authors. We recommend this potential impact be evaluated by a geotechnical engineer.

This Executive Summary is subject to the same standard limitations as contained in the report and must be read in conjunction with the entire report.

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asl	-	above sea level
bgs	-	below ground surface
BH##	-	borehole with a monitoring well installed
m/s	-	metres per second
MW##	-	borehole with a monitoring well installed
PGL	-	PGL Environmental Consultants
PWQO	-	Provincial Water Quality Objectives

1.0 INTRODUCTION

V.A. Wood Associates Limited (V.A. Wood) retained PGL Environmental Consultants (PGL) on behalf of 1351745 Ontario Limited to conduct a hydrogeological investigation and impact assessment at Part of Lots 11-13, Concessions A and 1, Block D, Elgin Street East in Cobourg, Ontario (the Site). The investigation was conducted to assess groundwater conditions at the Site in advance of the first phase of construction.

The proposed development includes a subdivision that will be developed in seven construction phases. The proposed subdivision will include single detached residential lots, medium-density housing, a mixed-use and seniors housing, an elementary school, commercial areas, a water reservoir, six stormwater management ponds and various road networks.

The first phase of construction (Phase 1) will begin on the west side of the Site, north of Elgin Street East and west of Brook Road North. The Phase 1 area of development will include construction of single detached residential lots, a village square, a stormwater management pond, and supporting roadway and sewer infrastructure. Prior to construction, earthworks will be completed at the Site for ground surface regrading. The purpose of the earthworks is level off the development area to a more gradual slope, by lowering the ground elevation in most of the Phase 1 area (e.g., cutting) and increasing the ground elevation in a smaller area (e.g., filling).

V.A. Wood completed a geotechnical investigation at the Site from January 7 to 18, 2019, and additional drilling work on June 4, 2019. The purpose of the geotechnical investigation was to evaluate subsurface conditions and determine the engineering properties of soils for the design and construction of the Phase 1 development. The geotechnical investigations included drilling a total of 22 boreholes in the Phase 1 area, with 4 of these boreholes completed as monitoring wells (BH6, BH14, BH95, and BH96).

2.0 SCOPE OF WORK

To meet the objectives noted above, PGL:

1. Reviewed and evaluated existing Site information including:
    a. Geotechnical borehole logs for 22 boreholes completed by V.A. Wood in January and June 2019 in the Phase 1 area of the Site, with monitoring well installation details for the two wells (BH95 and BH96) installed in January 2019 (Appendix 1);
    b. Engineering and Planning drawings prepared by D.G. Biddle & Associates Limited, including grading elevations, cut and fill earthworks estimations, and the design for storm water pond D (Appendix 2);
    c. An Environmental Impact Study (EIS) prepared by Niblett Environmental Associates Inc. (NEA), dated October 2017 (Appendix 3); and
    d. Ministry of Natural Resources and Forestry Heritage Maps, the Town of Cobourg Official Plan, and Ganaraska Region Conservation Authority Maps;
2. Supervised the installation of two of the monitoring wells (BH6 and BH14) in June 2019;
3. Developed the four Phase 1 wells, measured static groundwater levels, and completed single well response tests at each of the four existing monitoring wells within the Phase 1 area;

4. Calculated the hydraulic conductivity at each monitoring well using the results of the single well response tests;
5. Determined whether groundwater would be encountered during the Phase 1 construction and estimated flow rate for dewatering management; and
6. Conducted a hydrogeological impact assessment to identify possible impacts of the Phase 1 construction on groundwater quantity and quality.

3.0 SITE DESCRIPTION

The entire Site is roughly 107.3ha (267acres). It is bounded on the south by Elgin Street East (County Road 20), Greer Road to the east and Danforth Road to the north.

The Phase 1 development area is roughly 10.9ha (27acres). It is bounded on the south by Elgin Street East (County Road 20), to the north and east by agricultural land, and to the west by a residential area. Environmental Protection areas have been designated on the northwest section and the southeast section of the Site and extend offsite.

The proposed Phase 1 construction area is currently agricultural land on the north section, and overgrown grassed and treed areas on the south section. A former building previously backed onto Elgin Road East in the south area of the Phase 1 area but has been demolished in preparation for redevelopment.

3.1 Topography and Physical Setting

The Phase 1 area slopes down to the south and southwest toward Lake Ontario. A Tributary of Brook Creek extends partially along the east Phase 1 property line and the south property line (along Elgin Street East). This Tributary to Brook Creek has been described as having intermittent, seasonal flow in sections in the EIS report (NEA, 2017). The EIS report also identified marshes and swamp areas with wetland habitat on the southeast part of the Phase 1 area and further south of Elgin Street East. Midtown Creek is north of the Phase 1 area. Both the Tributary to Brook Creek and Midtown Creek flow southwest and drain into Lake Ontario, roughly 2.5km south of the Site.

No Areas of Natural and Scientific Research sites, Oak Ridges Moraine, or Niagara Escarpment have been identified within 250m of the Phase 1 area. There is a Provincially Significant Wetland located onsite and within 250m of the Phase 1 area. According to the Town of Cobourg official plan, there are environmentally sensitive areas located within 250m of the Site. The extent of these onsite and offsite Environmental Protection Areas have been provided in the EIS report (NEA, 2017). The Environmental Protection Areas, water courses and wetland areas on the Phase 1 property in the surrounding areas are shown on Figure 3.

Based on topography and the proximity of the Tributary to Brook Creek and Midtown Creek and Lake Ontario, the inferred local groundwater flows are expected to be to the southwest towards the Tributary to Brook Creek, and the regional groundwater flows are expected to be to the south towards Lake Ontario.

3.2 Geology

Geological maps show the surficial soils near the Site and Phase 1 area are expected to be Pleistocene-age till deposits: sandy silt to silt deposits that are rich in clasts (OGS, 2000). Overburden at the Site is underlain by Shadow Lake formation bedrock consisting of limestone, dolostone, shale, arkose, and sandstone deposits (OGS, 2010). Bedrock is expected to be at a depth below 31.6m based on review of Ministry of Environment, Conservation and Parks well records in the area.

The ground surface in the Phase 1 area ranges in elevation from roughly 101.1m to 123.7m above sea level (asl). According to the geotechnical borehole logs provided by V.A. Wood, the boreholes in the Phase 1 area were extended to a maximum depth of 18.6m below ground surface (bgs), corresponding to an elevation of 90.5m asl. The locations of the boreholes are shown on Figure 2. Site geology generally comprised the following:

Table A: Site Geology

Stratigraphy	Approximate Depths (m bgs)
Topsoil and Sandy Silt	0.0 – 0.5
Silty Sand Till	0.5 – 18.6

4.0 HYDROGEOLOGICAL WORK PROGRAM

In order to estimate groundwater extraction rates during construction, several hydrogeological parameters must be measured or calculated. The following sections describe how the Site groundwater elevations, inferred groundwater flow direction and hydraulic conductivity were estimated.

4.1 Groundwater Elevations and Flow Direction

Depth to groundwater in the Phase 1 area was measured by PGL in four of the monitoring wells during monitoring events in May and June 2019. Groundwater elevation data indicates that there is groundwater mounding beneath the ground surface which follows the topography of the Phase 1 area. Measured depths to groundwater in May and June 2019 are provided in Table 1, attached. A snapshot of the groundwater elevations in all four monitoring wells in the Phase 1 area are presented Table B, below.

Table B: Groundwater Levels and Elevations

Location	Ground Elevation (m asl)	June 11, 2019		
		Depth to Groundwater (m btr)	Depth to Groundwater (m bgs)	Groundwater Elevation (m asl)
MW6	109.75	1.22	0.30	109.5
MW14	121.72	2.84	1.99	119.7
MW95	102.96	1.88	1.21	101.8
MW96	109.53	0.50	-0.18	108.3

Notes: btr = below top of riser bgs = below ground surface asl = above sea level

The depth to groundwater was recorded using a Solinst water level tape to establish static groundwater levels. The measured depth to groundwater was translated to elevation above sea level based on the ground surface elevations at each monitoring well reported in the borehole logs by V.A. Wood (Appendix 1).

Groundwater depths measured by PGL on June 11, 2019, ranged from 1.99m to -0.18m bgs, where the water level at BH96 was within the riser pipe above ground surface. These groundwater depths correspond to groundwater elevations of between 101.8m and 119.7m asl.

Figure 2 shows the groundwater elevations at each monitoring well measured on June 11, 2019. Based on the groundwater elevations and topography shown on Figure 2, groundwater flow at the Phase 1 area is from the topographic high, that extends from the northeast to the southwest on the Phase 1 area and flows downslope on either side of the topographic high, towards the northwest and southeast.

4.2 Aquifer Performance Tests

Single well response tests (rising head tests) were conducted at all four wells in the Phase 1 area to estimate the hydraulic conductivity (K) of the subsurface materials expected to be encountered during the construction activities onsite. Stabilized groundwater levels were measured in each well, prior to well response testing. The results of these tests were analyzed using the Bouwer-Rice Solution for an unconfined aquifer. Single well response data is presented in Appendix 4. The Bouwer-Rice mathematical solution was used to approximate the hydraulic conductivity of the soil material. The solution assumes a homogenous, uniform aquifer with infinite lateral extent and that a volume of water is introduced or removed instantaneously.

The following table summarizes the calculated hydraulic conductivities from the hydrogeological investigation. The presented K value is an average of the calculated values from the rising head tests conducted at each well. Hydraulic conductivity solution reports are provided in Appendix 4.

Table C: Calculated Hydraulic Conductivities

Well	Test	K (m/s)	Average K (m/s)	Screen Depth (m bgs)	Screen Elevation (m asl)	Screened Material
BH6	1	9.1E-07	8.0E-07	1.5 – 6.0	108.3 – 103.8	Silty Sand Till
	2	6.9E-07				
BH14	1	8.0E-07	7.6E-07	5.5 – 10.0	117.1 – 112.5	Silty Sand Till
	2	7.2E-07				
BH95	1	9.4E-010	9.4E-10	8.6 – 11.7	94.4 – 91.3	Silty Sand Till
	2	-				
BH96	1	5.9E-07	6.5E-07	8.9 – 12.0	100.6 – 97.5	Silty Sand Till
	2	7.1E-07				

The hydraulic conductivities calculated for the silty sand till were within the same order of magnitude across the Phase 1 area, except BH95 that was three orders of magnitude smaller. The higher hydraulic conductivities on the order of 10^{-7}m/s, are consistent with those for silty sand till (Domenico and Schwartz, 1990). The silty sand till unit can likely be represented as a porous media and the Bouwer-Rice solution is therefore appropriate. The entire observed stratigraphy, including

the areas to be cut and the proposed development excavation areas are within the silty sand till unit, and the groundwater is found in the silty sand till layer. Conservatively, the applicable hydraulic conductivity for dewatering assumptions for this development is **9.1 x 10^{-7}m/s**.

5.0 GROUNDWATER FLOW CALCULATIONS

In order to evaluate the potential impacts on nearby groundwater receptors from construction dewatering of the Phase 1 area, approximate groundwater flow rates need to be calculated. In addition, when applicable, the radius of influence needs to be estimated. The radius of influence is the maximum distance from the area of groundwater extraction where groundwater pressure decreases can be measured and represents the area where potential hydrogeological impacts may occur.

A number of analytical models have been developed to generate these estimates. These models typically have similar assumptions to the hydraulic conductivity solutions discussed in Section 4.2, including steady state flow and a homogeneous aquifer of infinite extent.

5.1 Groundwater Flow Volume: Construction Dewatering

The construction dewatering has been considered in two stages. Firstly, the ground surface in the Phase 1 area will be re-graded, with the majority of the area being cut down to a lower elevation. Based on the current water level data and observed groundwater mounding, passive dewatering through the use of a channel to direct groundwater flow to surface discharge during this work would likely be sufficient (see discussion in Section 6.0 below).

Secondly, construction dewatering activities will likely be required during excavation work to support developing the Phase 1 area with the proposed sewer, roadway and building infrastructure. We anticipate that groundwater levels will equilibrate and be significantly different after the cut activities have been completed. Assumptions have been made to asses approximate groundwater flow volumes for this second construction dewatering phase. However, we recommend measuring groundwater levels from additional monitoring wells to confirm these assumptions and recalculate the dewatering volumes if needed.

5.1.1 Ground Surface Re-grading

To calculate approximate flow volumes of groundwater expected to be intercepted during the re-grading construction activities, the irregular shaped construction area was assumed to be rectangular. The groundwater flow from the topographic high was modelled as flow from a line source at the topographic high, to a trench on either side of the topographic high, with groundwater flowing perpendicularly into the trench. The equation representing this analytical model, from Powers et al. (2007)[1], is:

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

[1] J. Patrick Powers, Arthur B. Corwin, Paul C. Schm, "Construction Dewatering and Groundwater Control, New Methods and Applications, 3rd Edition", John Wiley and Sons Inc, 2007.

Where:

Parameter	Input	Description
Q (L/day)	-	Volumetric flow of groundwater to surface water via gravity drainage (i.e., parameter being calculated)
K (m/s)	$9.1x10^{-7}$	Hydraulic conductivity (conservatively assumed to be the highest measured value in Table C). The regrading soil excavation work will extend into the silty sand till (Table A).
H (m)	23.0	Static height of the water table (potentiometric surface) with respect to a datum[2] at the line source. The elevation of the datum is conservatively estimated at 100.7m asl, corresponding to the lowest ground surface elevation (both existing and proposed) within the Phase 1 area. To be conservative and with limited water level data, we have assumed that the water table across the Phase 1 area extends up to the ground surface. The maximum measured ground surface at the Site is at 123.7m asl. As such the shallowest water table is assumed to be at this same elevation. **H** is the difference between the water level elevation and the assumed datum (23.0m).
h (m)	10.2	Drawdown of the water table, relative to the datum. During active dewatering, this is the water level required to ensure dry working conditions during construction. However, for passive groundwater drainage intercepted during slope excavation, we estimated **h** to represent the water table at the final grade elevation for the maximum observed cut depth from the grading plans. This maximum cut depth was observed to be 12.8m, and as such the final grade elevation would be 113.5m asl, which corresponds to an **h** estimate of 10.2m.
x (m)	500	Length of trench, and corresponds to the approximate length of the regrading area in Phase 1 to be cut down, running from northeast to southwest (Figure 2)
L (m)	150	**L** is related to the maximum distance where hypothetical drawdown from pumping can be measured, which corresponds to the lateral distance between **H** and **h**. During the regrading phase, no active dewatering is anticipated. As such, for groundwater flow calculation purposes, we estimate that the distance **L** is the horizontal extent of the Phase 1 area to be regraded, perpendicular to the trench direction. This equation assumes flow into the trench from both sides, and therefore based on PGL's professional judgement, **L** is set at half the width of the Phase 1 regrading area, at 150m.

Using these input values, the total volumetric flow of groundwater to the surface via passive, gravity drains to channels during surface regarding in the Phase 1 area, is estimated at 133,340L/day under steady state conditions. To account for the initial draining of pores, precipitation and runoff, and uncertainty in the input parameter estimates, a safety factor of two was deemed reasonable for passive flow, based on experience at similar sites. The maximum anticipated flow rate is **266,680L/day**.

[2] The datum is assigned 100.7m asl. This datum was selected as it is the lowest observed ground surface elevation in the Phase 1 area, and no bottom depth of the aquifer could be estimated from available information in the borehole logs.

5.1.2 Construction Dewatering for Development

To calculate approximate flow volumes of groundwater into the subdivision excavations during construction, the approximate rectangular excavation across the Phase 1 area was modelled as a trench with groundwater flowing perpendicular to the trench face and radially into the trench at each end of the trench. The equation representing this analytical model, from Powers et al. (2007)[3], is:

$$Q = \frac{2xK(H^2 - h^2)}{2L} + \frac{\pi K(H^2 - h^2)}{\ln(\frac{R_o}{r})}$$

Where:

Parameter	Input	Description
Q (L/day)	-	Volumetric flow into the excavation (i.e., parameter being calculated)
K (m/s)	$9.1x10^{-7}$	Same as above.
H (m)	18.2	Static height of the water table (potentiometric surface) with respect to a datum[4]. The elevation of the datum is conservatively estimated at 100.7m asl, corresponding to the lowest ground surface elevation (both existing and proposed) within the Phase 1 area. To be conservative and with limited water level data, we have assumed that the water table across the Phase 1 area extends up to the ground surface. The highest ground surface elevation after regrading activities in the Phase 1 area is 118.9m asl. As such the shallowest water table is assumed to be at this same elevation. **H** is the difference between the water level elevation and the assumed datum (18.2m).
h (m)	13.0	Drawdown of the water table, relative to the datum. During active dewatering, this is the set drawdown height required to ensure dry working conditions during construction of the residences and trenches. Based on the general information provided from the proposed development, the residential units are only expected to have up to 1 basement level, assumed to a depth of roughly 3m bgs, with an additional 1.2m bgs for footings. Typically, it is assumed dewatering is required to 1m below the base of the deepest excavation to ensure dry working conditions. The drawdown required would then be 5m bgs or roughly 113.7m asl relative to the highest ground elevation. These elevations were chosen as conservative measures for the greatest drawdown, despite the Pond D invert at 100.5m asl and other sewer inverts proposed to similar depths. This corresponds to an **h** estimate of 0.8m above the datum.
x (m)	300	Length of trench, and corresponds to the approximate length of the Phase 1 area to be developed, running from northeast to southwest, minus the areas of radial flow at the two ends.
L (m)	150	Unchanged from above.
r	160	**r** is the equivalent radius of the excavation when modelled as an equivalent well. In this case, just the ends of the rectangular excavation are modelled as the equivalent well, with each end representing half of the well. The width of the Phase 1 excavation area is less than or equal to 250m wide (Figure 2). and the equivalent radius is calculated by **(2 x width)/π** and equals 160m.

[3] J. Patrick Powers, Arthur B. Corwin, Paul C. Schm, "Construction Dewatering and Groundwater Control, New Methods and Applications, 3rd Edition", John Wiley and Sons Inc, 2007.

[4] The datum is maintained as 100.7m asl. This datum was selected as it is the lowest observed ground surface elevation in the Phase 1 area, and no bottom depth of the aquifer could be estimated from available information in the borehole logs.

Parameter	Input	Description
R_o	300	R_o, the radius of influence, is related to the maximum distance where drawdown from pumping can be measured, which corresponds to the lateral distance between **H** and **h**. R_o was calculated using the empirical relationship developed by Sichart (Powers et al, 2007): $R_o = 3000^* (H-h)^* K^{0.5}$. Considerable professional judgement is required to employ this relationship. For these flow calculations, the Sichart relationship yields a value of approximately 50m from the edge of the excavation. Conceptually, R_o should be greater than **r**. Based on PGL's professional judgement and experience in similar hydrogeological environments and using a rule of them that $R_o \approx 2L$, a value of 300m was chosen as a conservative and reasonable radius of influence for the magnitude of drawdowns and hydraulic conductivities anticipated at the Site.

Using these input values, the total volumetric flow to the excavations for construction is estimated at 88,670L/day under steady state conditions. To account for the initial draining of pores, precipitation and runoff and uncertainty in the input parameter estimates, a safety factor of four was deemed reasonable, based on experience at similar sites. The maximum anticipated flow rate is **354,680L/day**.

This is also highly conservative as it would indicate that the entire Phase 1 area be dewatered at any given time. It is also conservative in the assumption that the water table will extend to the ground surface across the Phase 1 area after it has equilibrated post-regrading. However, PGL recommends that new water levels be obtained prior to this construction to confirm these estimates, as heterogeneities in the soils and preferential pathways may be present after the re-grading work that could increase the required dewatering rates for construction substantially.

5.2 Groundwater Flow Volume: Long-Term Dewatering

Based on the shallow groundwater conditions observed, with the water table within 2m bgs. It is anticipated that long-term dewatering or building waterproofing may be required. Flow rates for long-term dewatering were not calculated at this time. Based on the observed low hydraulic conductivity in the area and the limited expected infrastructure depths to less than 5m bgs, PGL does not anticipate that long-term dewatering flows would exceed 50,000L/day; however, new water levels would have to be obtained prior to this construction to provide estimated long-term dewatering flow rates.

6.0 HYDROGEOLOGICAL IMPACT ASSESSMENT

The impact assessment portion of PGL's scope characterized the potential impacts of the construction dewatering during surface regrading and construction for the subdivision development. This assessment discusses quantity and then quality of groundwater.

6.1 Groundwater Quantity

Potential hydrogeological impacts evaluated for the proposed construction are:

- Impacts to water levels in aquifers;
- Impacts to water levels in nearby water wells; and
- Impacts to baseflow in nearby surface water features.

The Scarborough Formation aquifer (or equivalent) potentially underlie the Site. Site geology indicates that this aquifer (sand and gravel) was not encountered during this investigation. The water table is expected to be in shallow overburden glacial sediments and the Site is potentially separated from deeper aquifers by the Bowmanville Till aquitard, glacially deposited fine sediments (Ganaraska Region Conservation Authority, 2008)[5]. Therefore, impacts on local aquifers are not anticipated as a result of construction dewatering. The Site, including the Phase 1 area, is located in the East Lake Ontario Subwatershed, roughly 2km east of the Cobourg Creek Subwatershed.

The groundwater table was observed to be in close proximity to the ground surface and some potentially artesian conditions were observed in other construction phase areas of the Site. During re-grading and construction excavation activities, contractors should consider precautions for possible slow flowing springs occurring on the Phase 1 area.

A water well search was conducted within 500m of the Site. Four water well records were identified within 500m of the Site. Of these water well records, one is documented as domestic, one as livestock, and two are not classified. The nearest well, for domestic supply, is just at the edge of the 300m radius of influence. This domestic well screen is installed to roughly 24.7m to 25.9m bgs, or an approximate elevation of 88m to 89m asl. Water entering a screen at this low elevation is unlikely to be impacted by dewatering down to even the lowest ground surface elevation (the datum) at the Site of 100.7m asl. Based on the distance and screen install depth, measurable changes to water levels in the nearby water wells from the Site dewatering are not anticipated.

The closest surface water courses are a Tributary of Brook Creek that extends partially along the east Phase 1 property line and the south property line (along Elgin Street East). This Tributary to Brook Creek has been described as having intermittent, seasonal flow in sections in the EIS report (NEA, 2017). The EIS report also identified marshes and swamp areas with wetland habitat on the southeast part of the Phase 1 area and further south of Elgin Street East. Midtown Creek is roughly 130m northwest of the Phase 1 area to be developed. Both the Tributary to Brook Creek and Midtown Creek flow southwest and drain into Lake Ontario, roughly 2.5km south of the Site.

The wetland area elevation ranges from roughly 103.5m asl in the northeast to roughly 100.7m asl in the southwest parts of the Phase 1 area, near Elgin Street. The elevation of the wetland is below the proposed final grade elevations (as low as roughly 105m asl in the northeast section to 101m asl in the southwest section) and the wetlands are cross-gradient to downgradient of the re-grading area. During surface re-grading, we anticipate passive groundwater drainage via channels instead of active dewatering. As such, the water table will not be drawn down below the final ground surface elevation and surrounding water courses and wetlands are not expected to be impacted the surface re-grading works.

Based on the current assumptions on equilibrated water table elevations after re-grading, groundwater draw-down during construction dewatering for the subdivision will be to elevations greater than the elevation of the water courses and wetlands. While impacts to these natural features are not anticipated, PGL recommends the installation of staff gauges and wetland monitoring throughout the dewatering activities to confirm no impacts to the wetlands. PGL also recommends that new water levels be measured after surface re-grading to confirm our assumptions on subsequent construction dewatering flow rates.

[5] "Cobourg Creek Background Report: Abiotic, Biotic and Cultural Features: for preparation of the Cobourg Creek Watershed Plan", prepared by Ganaraska Region Conservation Authority, 2008.

6.1.1 Environmental Activity and Sector Registry and Permit to Take Water

In Ontario, groundwater takings for construction dewatering require registration in the Environmental Activity and Sector Registry if the extracted groundwater rates are greater than 50,000L/day and less than 400,000L/day. Based on the current construction plan, the dewatering volumes during construction in the Phase 1 area will require registration in the Environmental Activity and Sector Registry, for online construction dewatering registration during both the regrading and excavation for development stages.

A Permit to Take Water is required by Ontario for long term takings of greater than 50,000L/day and construction dewatering projects of greater than 400,000L/day. It is unlikely a Permit to Take Water will be required for this work program.

If the proposed development is revised and the excavation will extend deeper than originally proposed, a Permit to Take Water may be required for construction. In addition, if any design changes cause violation of the assumptions stated regarding the dewatering, a Permit to Take Water may be required.

PGL recommends additional water levels be measured after re-grading the ground surface in the Phase 1 area to confirm dewatering volumes for construction of the subdivision.

6.2 Groundwater Quality

One groundwater sample was collected from the Phase 1 area. The chemical data is provided in Appendix 5. The groundwater results were compared against the Town of Cobourg Sanitary and Storm Sewer By-Laws to evaluate if treatment may be required prior to discharge of groundwater to a sewer system and were compared against the Ontario Provincial Water Quality Objectives (PWQOs) for surface discharge.

Groundwater met the Town of Cobourg Sewer By-Law Limits for Sanitary sewer limits. Groundwater exceeded the Town of Cobourg Sewer By-Law Limits for storm sewer discharge for one parameter: manganese, and the laboratory detection limit exceeded the storm sewer discharge limit for two parameters: free chlorine and DDT.

Groundwater exceeded the PWQOs or Interim PWQOs for multiple parameters: aluminium, cobalt, iron, phosphorus, vanadium and phenols. There were also parameters that were non-detectable, but the laboratory attainable detection limits exceed the PWQO values. This is applicable for free chlorine, multiple polycyclic aromatic hydrocarbons, and semi-volatile organic compounds, multiple organochlorine pesticides, BOD, and nonylphenol. Based on the theoretical nature of some of the Interim PWQO values, especially for polycyclic aromatic hydrocarbons, the laboratory cannot attain low enough detection limits to meet the PWQO values.

If discharge to the sanitary or storm sewer system, or the natural environment (e.g., wetland, water course) is anticipated, we recommend confirmatory sampling for the applicable parameters. Treatment for these parameters may be required prior to discharge of groundwater to the surface water or to the sanitary or storm sewer system.

The groundwater in three of the wells in the Phase 1 area (BH6, BH14, and BH96) were observed to have temperatures of roughly 12.7 to 14.8ºC and a pH of 8.1 to 8.6. As mentioned in the 2017 EIS report, thermal controls should be considered in the event of surface water discharge to the natural environment to protect downstream cool water aquatic life.

For any surface water discharge to the wetlands or water courses, sediment and erosion controls should also be in place. These are expected to be similar to those proposed in a Construction Environmental Management Plan for the Site and for the stormwater management pond discharge.

7.0 SUMMARY

The results of the hydrogeological investigation indicate the following features for the Site:

- Groundwater elevation ranges between between 101.8m and 119.7m asl;
- Ground surface regrading activities will occur prior to excavation activities for the construction of the subdivision in the Phase 1 area of the Site;
- The ground surface cuts will extend from 0m to up to 12.8m below grade, with final ground surface elevations ranging from 100.7m asl to 118.9m asl, all within the silty sand till layer;
- The excavations for the construction of the subdivision infrastructure, including basements, utility trenches, the storm water management pond and roadways is roughly estimated to extend down 4.2m bgs, within the silty sand till layer; and
- The hydraulic conductivity within the stratigraphy where the water table was observed and where the excavations and regrading will extend is $9.1x10^{-7}$m/s based on conservatively using the highest measured hydraulic conductivity from the single well response tests completed at the monitoring well, BH96, installed in that stratigraphy.

The key results of the hydrogeological impact assessment for the Site are:

- PGL recommends passive groundwater drainage via directed channels during surface re-grading to divert groundwater flow, with an anticipated maximum flow rate of 266,680L/day;
- There are no anticipated impacts to aquifers, nearby water wells, or baseflow to surface water features due to the planned surface regrading activities in the Phase 1 area;
- Dewatering will be required during the excavation for construction, with maximum estimated flow estimated at 354,680L/day;
- While no impacts to the adjacent natural heritage features (e.g., wetlands and water courses) are anticipated, PGL recommends:
  - New water levels be measured in the Phase 1 area to confirm dewatering flow estimates; and
  - Staff gauges and wetland monitoring be conducted to confirm no impacts to the wetland from construction dewatering;
- Construction dewatering at the Site will likely require registration in the Environmental Activity and Sector Registry;
- A Permit to Take Water is not likely required for the construction dewatering during surface regrading or construction excavations;
- Groundwater at the Site met the Town of Cobourg Sanitary Sewer Use By-Law limits but exceeds the Town of Cobourg Storm Sewer Use By-Laws for a small number of parameters. Groundwater also exceeds the PWQOs for multiple parameters. Treatment may be required if sewer discharge or surface water discharge (e.g., to a nearby wetland) is anticipated and confirmatory sampling is recommended;

- PGL recommends thermal controls for any surface water discharge to protect downstream cool water aquatic life;
- PGL recommends sediment and erosion controls be in place for any surface water discharge; and
- If the construction dewatering plan changes or any of the assumptions stated in this report are otherwise violated, re-evaluation of the potential hydrogeological impact will be required.

Based on the observed groundwater table in close proximity to the ground surface and some potentially artesian conditions elsewhere on the Site, precautions should be considered for possible slow flowing springs occurring on the Phase 1 area during the above-mentioned construction activities.

According to a pre-consultation with the Ganaraska Region Conservation Authority, the proposed active construction dewatering for the development of the Phase 1 area will require a dewatering plan, as per the *TRCA Technical Guidelines for the Development of Environmental Management Plans for Dewatering* (2013).

Assessment of ground settling due to dewatering was outside the scope of this work program and area of expertise of the authors. We recommend this potential impact be evaluated by a geotechnical engineer.

8.0 STANDARD LIMITATIONS

This report is accurate at a high level for reasonably foreseeable conditions. The limitations of the work are not always obvious, and the best way to understand them is discussion with the authors in the context of your intended use. This work is a snapshot in time, so any use must consider that conclusions may change materially because of changes in site condition or regulatory context.

Only the addressee, our client, and their agents may rely on this report for the stated purpose. We warrant only that the work was done as described and is similar to the work that would be done by other qualified consultants in this area. Our contract includes limitations on liability related to professional errors and omissions.

Respectfully submitted,

PGL ENVIRONMENTAL CONSULTANTS
Per:

Debra Cohen, M.Eng.
Environmental Consultant

Christina Trotter, M.Sc., P.Geo.
Senior Hydrogeologist

DSC/CET/slr
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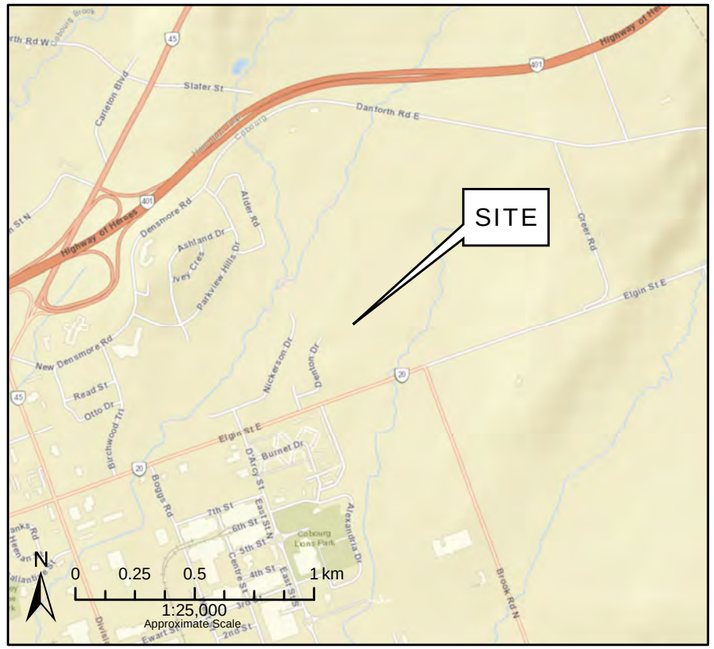
Figures

PGL
ENVIRONMENTAL CONSULTANTS



Phase 1 Area

Development Area

Borehole

Monitoring Well

N

0 50 100 200 m

1:5,000
Approximate Scale

Parcel: *Approximate* **Image:** *ESRI Base Imagery*

SITE LOCATION

Phase 1 - Proposed Subdivision, Elgin Street East
Cobourg, Ontario

RONDEAU (COBOURG) LTD.

PGL ENVIRONMENTAL CONSULTANTS

File No.:	Date:	Dwg No.:	Drawn by:	FIGURE
4027-21.01	JUN 2019	40272101-11	DPL	1

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Original in colour

Phase 1 Area

Development Area

Monitoring Well

109.45 Groundwater Elevation (m ASL)

N

0 25 50 100 m

1:3,000
Approximate Scale

Parcel: *Approximate* **Image:** *ESRI Base Imagery*

GROUNDWATER ELEVATIONS JUNE 11, 2019

Phase 1 - Proposed Subdivision, Elgin Street East
Cobourg, Ontario

RONDEAU (COBOURG) LTD.

PGL ENVIRONMENTAL CONSULTANTS

File No.:	Date:	Dwg No.:	Drawn by:	FIGURE
4027-21.01	JUN 2019	40272101-21	DPL	2

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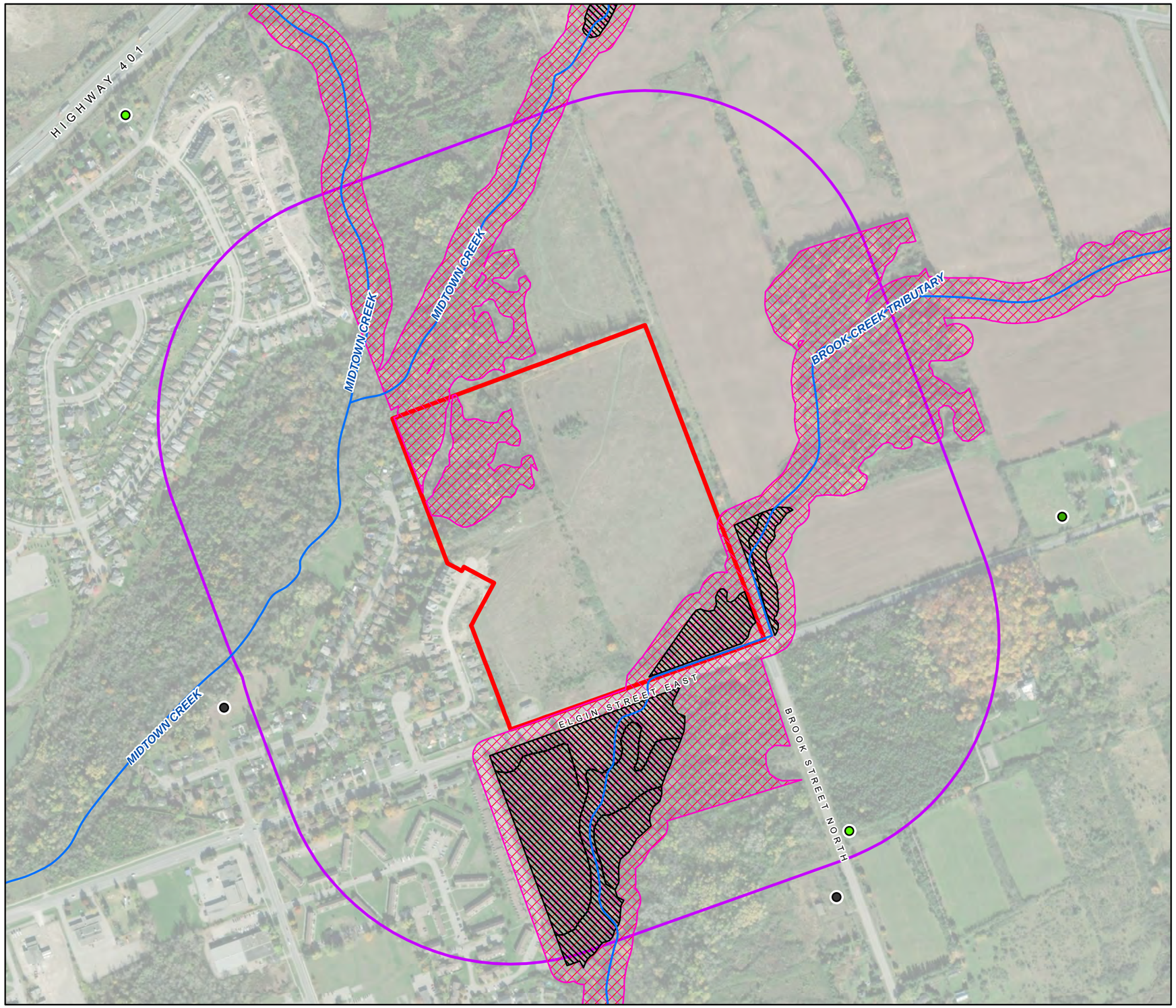
Original in colour



Phase 1 Area

Radius of Influence - 100m Buffer

Watercourse (Approximate)

Wetland (from NEA)

Environmental Protection Area (from NEA)

Ontario Well Record DB Classification

- Domestic
- Livestock
- Not Classified

N

0 75 150 300 m

1:6,000
Approximate Scale

Parcel: *Approximate* **Image:** *Ministry of Natural Resources*
Wetland/Environmental Protection Areas: *Niblett Environmental Associates (NEA)*

RADIUS OF INFLUENCE

Phase 1 - Proposed Subdivision, Elgin Street East
Cobourg, Ontario

RONDEAU (COBOURG) LTD.

PGL ENVIRONMENTAL CONSULTANTS

File No.:	Date:	Dwg No.:	Drawn by:	FIGURE
4027-26.01	JUN 2019	40272101-31	DPL	3

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Original in colour

Table

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ENVIRONMENTAL CONSULTANTS

Analytical Table Notes

BH_M	Monitoring Well
m bgs	Metres below ground surface
m btr	Metres below top of riser
-	Not measured
m asl	Metres above sea level. The benchmark is a nail and washer in east face H.B. pole north west corner Elgin and Darcy Street, Elevation 100.197m asl, as shown on the Lot Grading Plan, D.G. Biddle & Associates Limited, February 2019 (Appendix 2).

Table 1
Groundwater Elevations
Part of Lots 11-13, Concessions A and 1, Block D, Cobourg, Ontario
V.A. Wood Associates, PGL File 4027-21.01

Location	Ground Elevation (m asl)	Riser Elevation (m asl)	Stick-up height (m)	06-May-19			31-May-19			05-Jun-19			11-Jun-19		
				Depth to Groundwater (m btr)	Depth to Groundwater (m bgs)	Groundwater Elevation (m asl)	Depth to Groundwater (m btr)	Depth to Groundwater (m bgs)	Groundwater Elevation (m asl)	Depth to Groundwater (m btr)	Depth to Groundwater (m bgs)	Groundwater Elevation (m asl)	Depth to Groundwater (m btr)	Depth to Groundwater (m bgs)	Groundwater Elevation (m asl)
BH6	109.75	110.67	0.92	-	-	-	-	-	-	1.63	*0.71*	109.04	1.22	0.30	109.45
BH14	121.72	122.58	0.86	-	-	-	-	-	-	2.65	*1.79*	119.93	2.84	1.99	119.74
BH95	102.96	103.63	0.67	1.22	0.54	102.42	1.61	0.94	102.02	-	-	-	1.88	1.21	101.75
BH96	109.53	110.21	0.68	0.24	-0.45	109.98	0.41	-0.28	109.81	-	-	-	0.50	-0.18	109.71

Appendix 1

Borehole Logs

PGL
ENVIRONMENTAL CONSULTANTS

Reference No : 7503-18-10

Borehole No : 1

Enclosure No : 2

Client : Rondeau (Cobourg) Ltd.

Project : Proposed Subdivision

Method : Auger

Location : Elgin Street East, Cobourg, ON

Diameter : 110 mm

Datum Elevation : Geodetic

Date : January 17, 2019

Elevation m	Depth m	Description	Symbol	Water	Sample Number	Sample Type	N-value	Standard Penetration Test blows/300mm (20 40 60 80)	Moisture Content, % (10 30 50)	Remarks
102.7	0	Ground Surface								
		TOPSOIL AND CLAYEY SILT (Possible Cultivated Soil)			1	SS	9			frozen surface
102.1										
	1	wet			2	SS	15			
		wet			3	SS	9			
	2	brown								
		SILTY SAND TILL grey			4	SS	42			cave in at 2.4 m
		Compact and wet at the top, then dense to very dense, some fine to medium gravel, grading to sandy silt till, brown then grey, moist								
	3				5	SS	100+			
	4									
					6	SS	100+			
	5									
	6									
96.3					7	SS	100+			
		End of Borehole								
	7									
	8									
	9									

V.A. WOOD ASSOCIATES LIMITED

Disk :

Sheet : 1 of 1

Reference No : 7503-18-10

Borehole No : 2

Enclosure No : 3

Client : Rondeau (Cobourg) Ltd.

Project : Proposed Subdivision

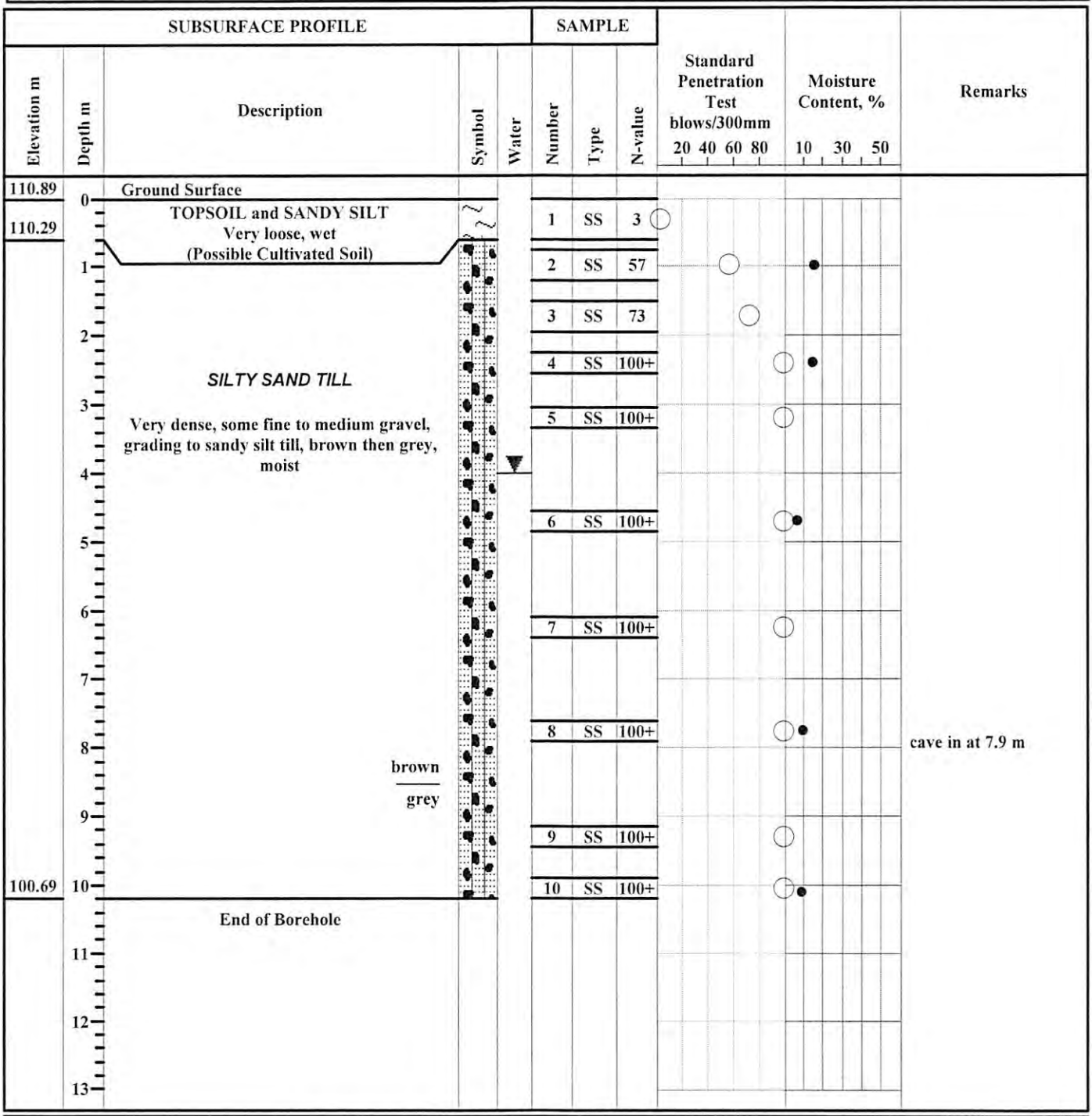
Method : Auger

Location : Elgin Street East, Cobourg, ON

Diameter : 110 mm

Datum Elevation : Geodetic

Date : January 17, 2019



V.A. WOOD ASSOCIATES LIMITED

Disk :

Sheet : 1 of 1

Reference No : 7503-18-10

Borehole No : 3

Enclosure No : 4

Client : Rondeau (Cobourg) Ltd.

Project : Proposed Subdivision

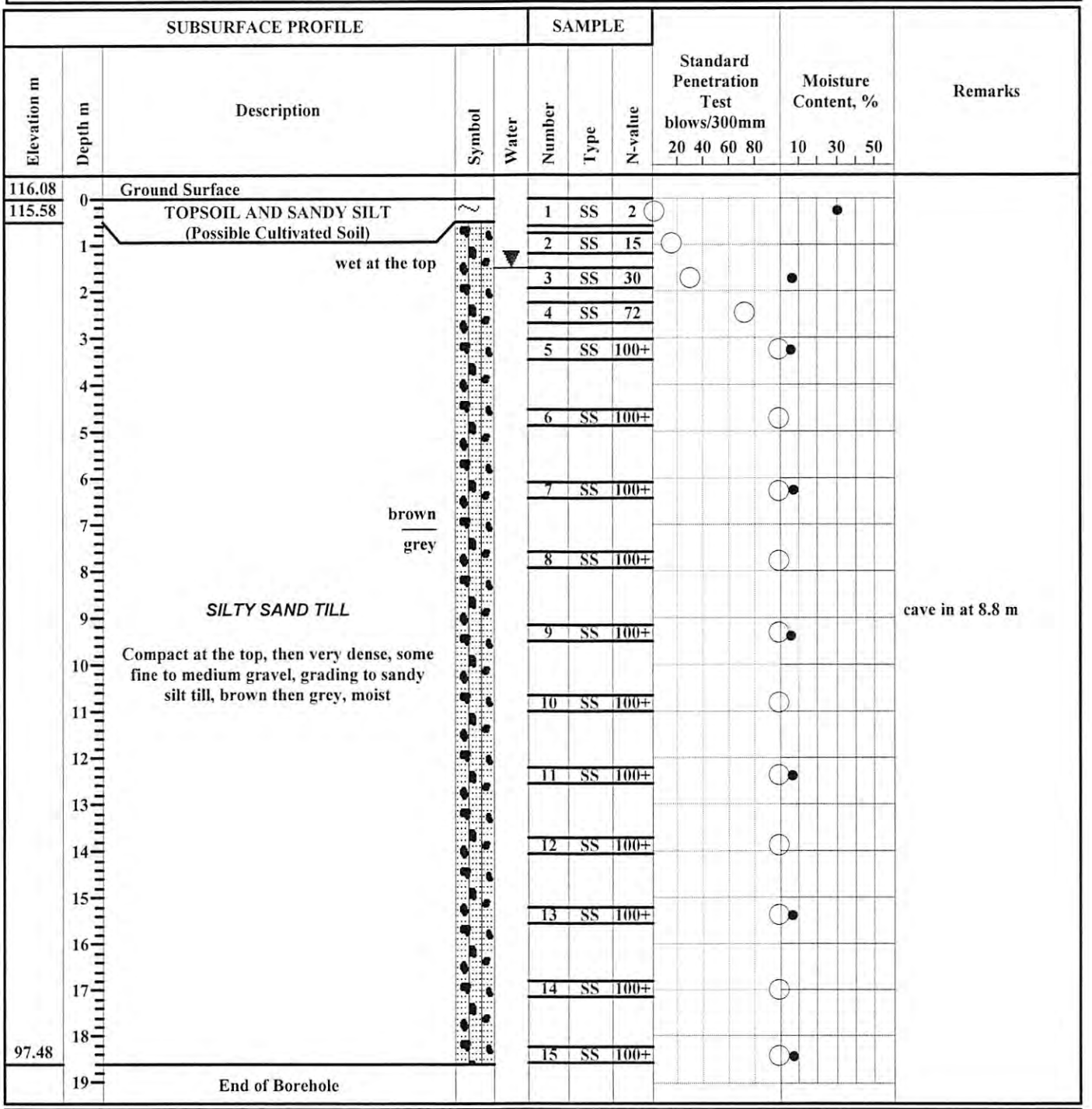
Method : Auger

Location : Elgin Street East, Cobourg, ON

Diameter : 110 mm

Datum Elevation : Geodetic

Date : January 16, 2019



V.A. WOOD ASSOCIATES LIMITED

Disk :

Sheet : 1 of 1

Reference No : 7503-18-10

Borehole No : 4

Enclosure No : 5

Client : Rondeau (Cobourg) Ltd.

Project : Proposed Subdivision

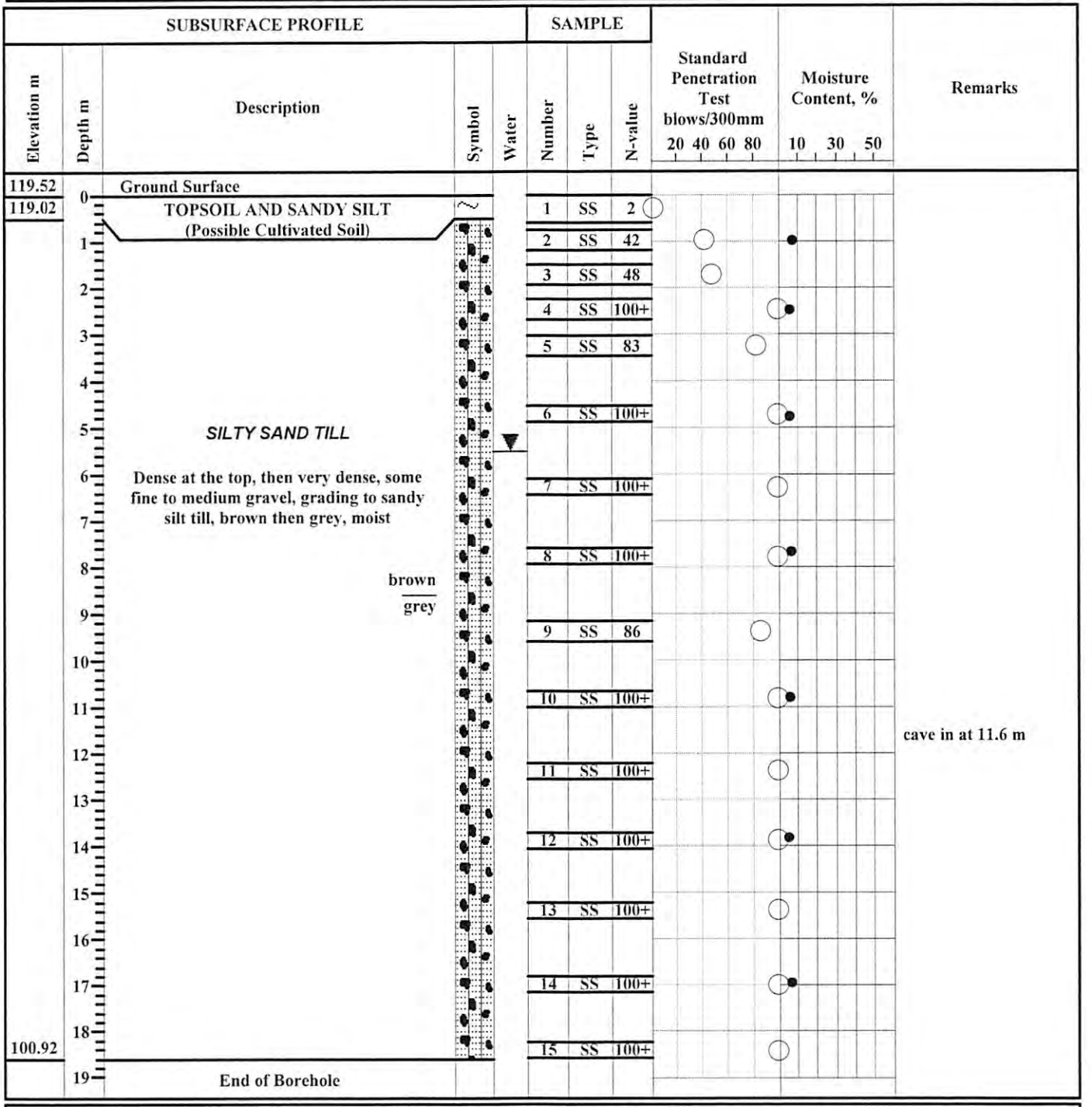
Method : Auger

Location : Elgin Street East, Cobourg, ON

Diameter : 110 mm

Datum Elevation : Geodetic

Date : January 15, 2019



V.A. WOOD ASSOCIATES LIMITED

Disk :

Sheet : 1 of 1

Reference No : 7503-18-10

Borehole No : 5

Enclosure No : 6

Client : Rondeau (Cobourg) Ltd.

Project : Proposed Subdivision

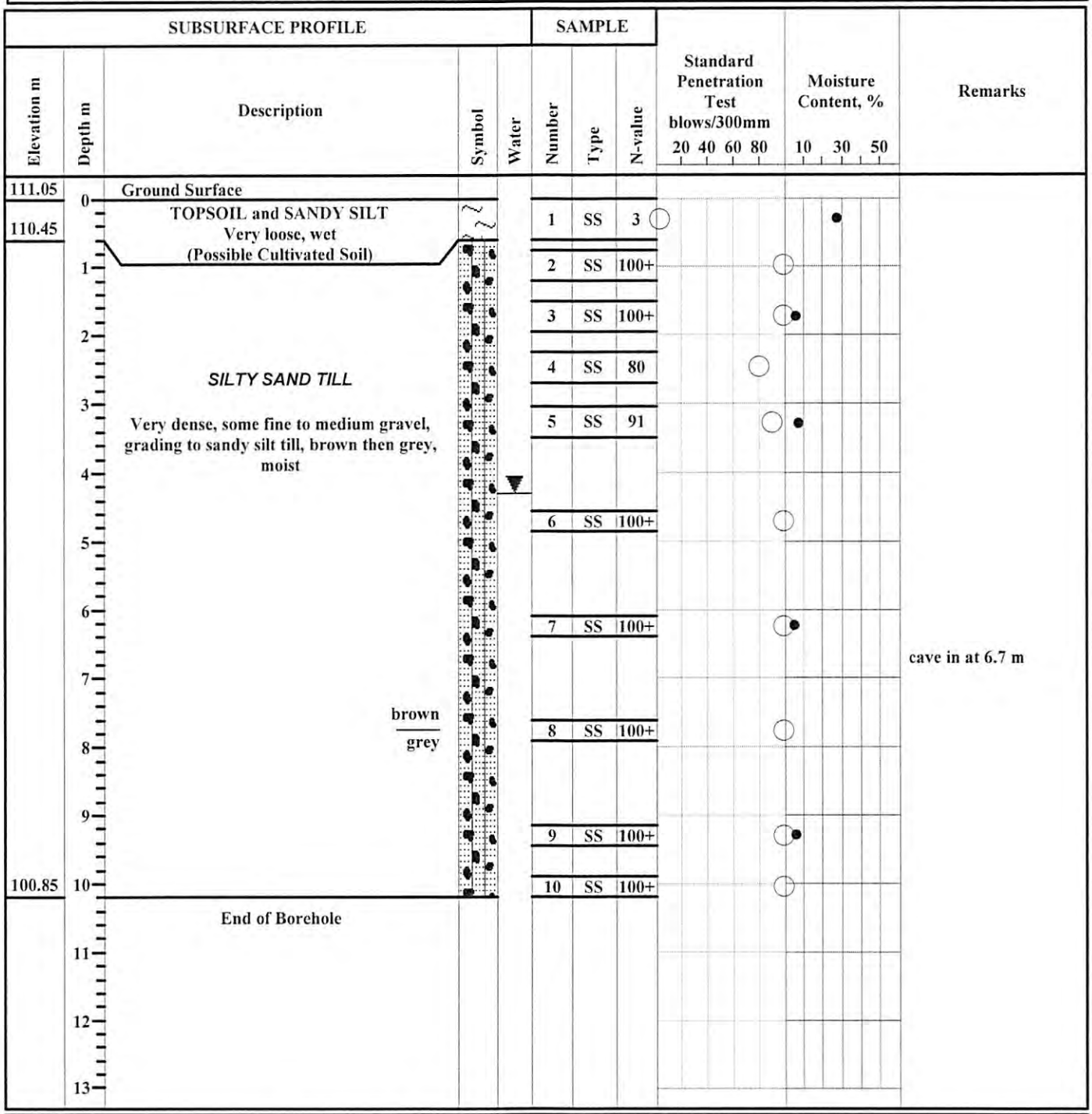
Method : Auger

Location : Elgin Street East, Cobourg, ON

Diameter : 110 mm

Datum Elevation : Geodetic

Date : January 16, 2019



V.A. WOOD ASSOCIATES LIMITED

Disk :

Sheet : 1 of 1

Reference No : 7503-18-10

Borehole No : 6

Enclosure No : 7

Client : Rondeau (Cobourg) Ltd.

Project : Proposed Subdivision

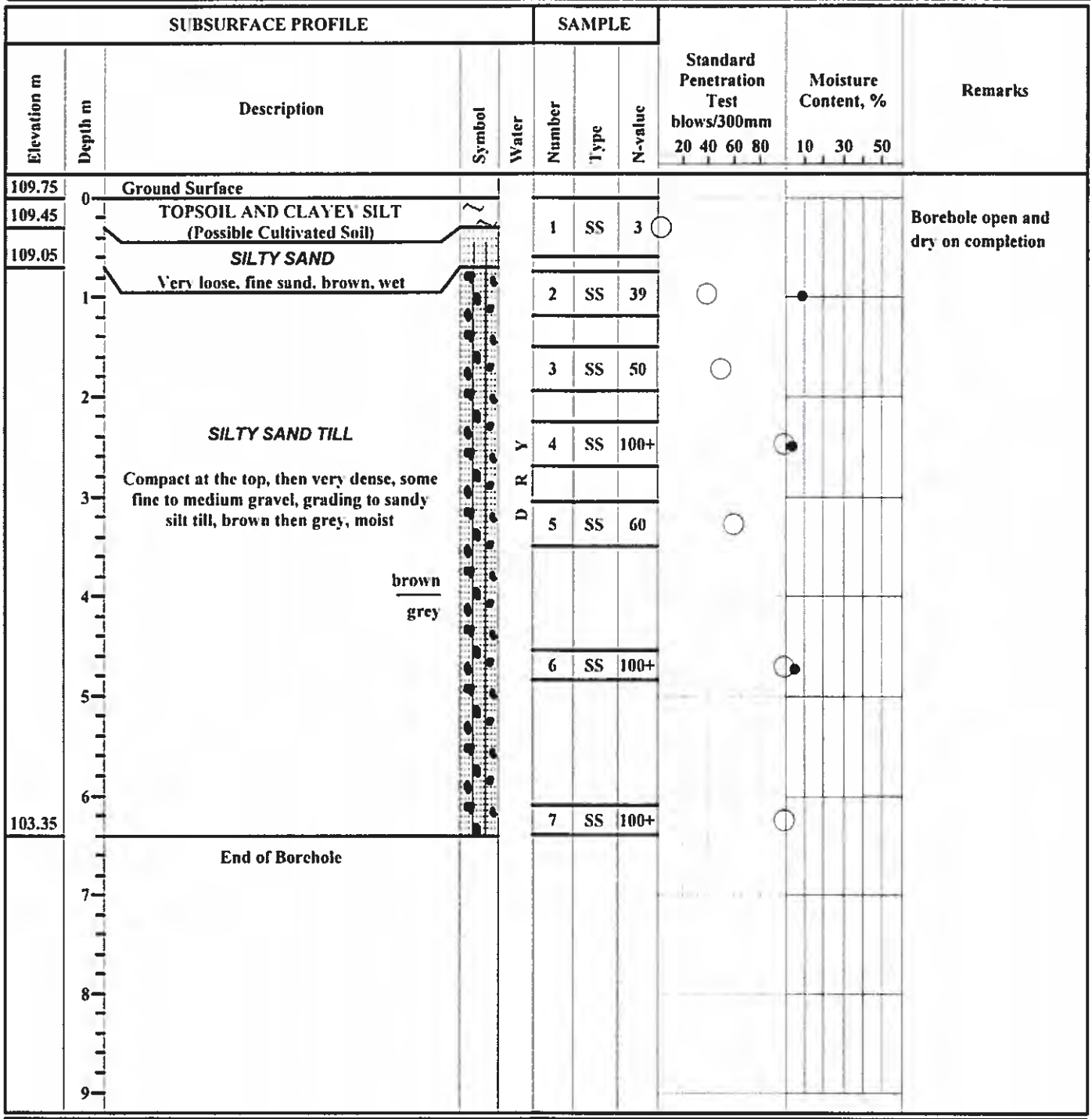
Method : Auger

Location : Elgin Street East, Cobourg, ON

Diameter : 110 mm

Datum Elevation : Geodetic

Date : January 15, 2019



V.A. WOOD ASSOCIATES LIMITED

Disk :

Sheet : 1 of 1

Reference No : 7503-18-10

Borehole No : 7

Enclosure No : 8

Client : Rondeau (Cobourg) Ltd.

Project : Proposed Subdivision

Method : Auger

Location : Elgin Street East, Cobourg, ON

Diameter : 110 mm

Datum Elevation : Geodetic

Date : January 9, 2019

SUBSURFACE PROFILE					SAMPLE					
Elevation m	Depth m	Description	Symbol	Water	Number	Type	N-value	Standard Penetration Test blows/300mm (20 40 60 80)	Moisture Content, % (10 30 50)	Remarks
107.3	0	Ground Surface								
107		TOPSOIL and SANDY SILT (Possible Cultivated Soil)			1	SS	2			
106.6		***SILTY SAND*** Very loose, brown, wet			2	SS	32			
	1				3	SS	49			
	2	***SILTY SAND TILL*** Dense at the top, then very dense, some fine to medium gravel, grading to sandy silt till, brown, moist			4	SS	56			
	3				5	SS	70			
	4									cave in at 4.3 m
102.45					6	SS	100+			
	5	End of Borehole								
	6									
	7									
	8									

V.A. WOOD ASSOCIATES LIMITED

Disk :

Sheet : 1 of 1

Reference No : 7503-18-10

Borehole No : 8

Enclosure No : 9

Client : Rondeau (Cobourg) Ltd.

Project : Proposed Subdivision

Method : Auger

Location : Elgin Street East, Cobourg, ON

Diameter : 110 mm

Datum Elevation : Geodetic

Date : January 9, 2019

Elevation m	Depth m	Description	Symbol	Water	Number	Type	N-value	Standard Penetration Test blows/300mm (20 40 60 80)	Moisture Content, % (10 30 50)	Remarks
120.12	0	Ground Surface								
119.52		TOPSOIL and SANDY SILT Loose, wet (Possible Cultivated Soil)			1	SS	5			
	1				2	SS	40			
	2				3	SS	35			
	3			▼	4	SS	53			
	4	*SILTY SAND TILL*			5	SS	97			
	5	Dense at the top, then very dense, some fine to medium gravel, grading to sandy silt till, brown then grey, moist			6	SS	100+			
	6				7	SS	100+			cave in at 6.7 m
	7									
	8	brown / grey			8	SS	100+			
	9				9	SS	100+			
	10				10	SS	100+			
	11				11	SS	100+			
	12									
106.12	13				12	SS	100+			
	14	End of Borehole								
	15									

V.A. WOOD ASSOCIATES LIMITED

Disk :

Sheet : 1 of 1

Reference No : 7503-18-10

Borehole No : 9

Enclosure No : 10

Client : Rondeau (Cobourg) Ltd.

Project : Proposed Subdivision

Method : Auger

Location : Elgin Street East, Cobourg, ON

Diameter : 110 mm

Datum Elevation : Geodetic

Date : January 9, 2019

SUBSURFACE PROFILE					SAMPLE					
Elevation m	Depth m	Description	Symbol	Water	Number	Type	N-value	Standard Penetration Test blows/300mm (20 40 60 80)	Moisture Content, % (10 30 50)	Remarks
117.98	0	Ground Surface								
117.38		TOPSOIL and SANDY SILT Very loose, wet (Possible Cultivated Soil)			1	SS	1			
	1				2	SS	25			
	2				3	SS	58			
					4	SS	100+			
	3				5	SS	100+			
	4	*SILTY SAND TILL*								
	5	Compact at the top, then very dense, some fine to medium gravel, grading to sandy silt till, brown then grey, moist			6	SS	100+			
	6				7	SS	100+			
	7	brown / grey								
	8				8	SS	100+			
	9				9	SS	100+			cave in at 8.8 m
	10				10	SS	100+			
	11				11	SS	100+			
	12									
103.98	13				12	SS	100+			
	14	End of Borehole								
	15									

V.A. WOOD ASSOCIATES LIMITED

Disk :

Sheet : 1 of 1

Reference No : 7503-18-10

Borehole No : 10

Enclosure No : 11

Client : Rondeau (Cobourg) Ltd.

Project : Proposed Subdivision

Method : Auger

Location : Elgin Street East, Cobourg, ON

Diameter : 110 mm

Datum Elevation : Geodetic

Date : January 8, 2019

SUBSURFACE PROFILE					SAMPLE					
Elevation m	Depth m	Description	Symbol	Water	Number	Type	N-value	Standard Penetration Test blows/300mm (20 40 60 80)	Moisture Content, % (10 30 50)	Remarks
122.09	0	Ground Surface								
		TOPSOIL and SANDY SILT Very loose, wet (Possible Cultivated Soil)			1	SS	1			
121.49										
	1				2	SS	33			
					3	SS	61			
	2	*SILTY SAND TILL*		▼						cave in at 2.1 m
		Dense at the top, then very dense, some fine to medium gravel, grading to sandy silt till, brown, moist			4	SS	76			
	3				5	SS	100+			
	4									
117.24					6	SS	100+			
	5	End of Borehole								
	6									
	7									
	8									

V.A. WOOD ASSOCIATES LIMITED

Disk :

Sheet : 1 of 1

Reference No : 7503-18-10

Borehole No : 11

Enclosure No : 12

Client : Rondeau (Cobourg) Ltd.

Project : Proposed Subdivision

Method : Auger

Location : Elgin Street East, Cobourg, ON

Diameter : 110 mm

Datum Elevation : Geodetic

Date : January 8, 2019

Elevation m	Depth m	Description	Symbol	Water	Sample Number	Sample Type	N-value	Standard Penetration Test blows/300mm (20 40 60 80)	Moisture Content, % (10 30 50)	Remarks
122.97	0	Ground Surface								
		TOPSOIL and SANDY SILT Very loose, wet (Possible Cultivated Soil)			1	SS	3			Borehole open on completion
122.37										
	1				2	SS	59			
					3	SS	66			
	2	*SILTY SAND TILL* Very dense, some fine to medium gravel, grading to sandy silt till, brown, moist			4	SS	100+			
	3				5	SS	100+			
	4			▼						
118.12					6	SS	100+			
	5	End of Borehole								
	6									
	7									
	8									

SUBSURFACE PROFILE | SAMPLE

V.A. WOOD ASSOCIATES LIMITED

Disk :

Sheet : 1 of 1

Reference No : 7503-18-10

Borehole No : 12

Enclosure No : 13

Client : Rondeau (Cobourg) Ltd.

Project : Proposed Subdivision

Method : Auger

Location : Elgin Street East, Cobourg, ON

Diameter : 110 mm

Datum Elevation : Geodetic

Date : January 7, 2019

Elevation m	Depth m	Description	Symbol	Water	Sample Number	Sample Type	N-value	Standard Penetration Test blows/300mm (20 40 60 80)	Moisture Content, % (10 30 50)	Remarks
123.68	0	Ground Surface								
123.28		TOPSOIL and SANDY SILT Loose, wet (Possible Cultivated Soil)			1	SS	5			
	1				2	SS	43			
					3	SS	31			
	2	*SILTY SAND TILL* Compact to dense, then very dense, some fine to medium gravel, grading to sandy silt till, brown, moist			4	SS	79			
	3				5	SS	52			
	4			▼						cave in at 3.8 m
118.83					6	SS	100+			
	5	End of Borehole								
	6									
	7									
	8									

V.A. WOOD ASSOCIATES LIMITED

Disk :

Sheet : 1 of 1

Reference No : 7503-18-10

Borehole No : 13

Enclosure No : 14

Client : Rondeau (Cobourg) Ltd.

Project : Proposed Subdivision

Method : Auger

Location : Elgin Street East, Cobourg, ON

Diameter : 110 mm

Datum Elevation : Geodetic

Date : January 18, 2019

Elevation m	Depth m	Description	Symbol	Water	Sample Number	Sample Type	N-value	Standard Penetration Test blows/300mm (20 40 60 80)	Moisture Content, % (10 30 50)	Remarks
120.15	0	Ground Surface								
		TOPSOIL AND CLAYEY SILT (Possible Cultivated Soil)			1	SS	9			frozen surface
119.65					2	SS	41			Borehole open and dry on completion
	1				3	SS	75			
	2	*SILTY SAND TILL*			4	SS	100+			
		Dense at the top, then very dense, some fine to medium gravel, grading to sandy silt till, brown then grey, moist		DRY	5	SS	100+			
	3									
	4				6	SS	100+			
	5									
	6	brown / grey			7	SS	100+			
113.75		End of Borehole								
	7									
	8									
	9									

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Disk :

Sheet : 1 of 1

Reference No : 7503-18-10

Borehole No : 14

Enclosure No : 15

Client : Rondeau (Cobourg) Ltd.

Project : Proposed Subdivision

Method : Auger

Location : Elgin Street East, Cobourg, ON

Diameter : 110 mm

Datum Elevation : Geodetic

Date : January 7, 2019

Elevation m	Depth m	Description	Symbol	Water	Sample Number	Sample Type	N-value	Standard Penetration Test blows/300mm (20 40 60 80)	Moisture Content, % (10 30 50)	Remarks
121.72	0	Ground Surface								
121.32	0	TOPSOIL and SANDY SILT Loose, wet (Possible Cultivated Soil)			1	SS	7			
	1				2	SS	41			
	2				3	SS	72			
	2				4	SS	100+			
	3				5	SS	100+			
	4	*SILTY SAND TILL* Compact to dense at the top, then very dense, some fine to medium gravel, grading to sandy silt till, brown then grey, moist								cave in at 4.3 m
	5				6	SS	100+			
	6				7	SS	100+			
	7	brown / grey								
	8				8	SS	100+			
	9				9	SS	100+			
111.52	10				10	SS	100+			
	10	End of Borehole								
	11									
	12									

V.A. WOOD ASSOCIATES LIMITED

Disk :

Sheet : 1 of 1

Reference No : 7503-18-10

Borehole No : 15

Enclosure No : 16

Client : Rondeau (Cobourg) Ltd.

Project : Proposed Subdivision

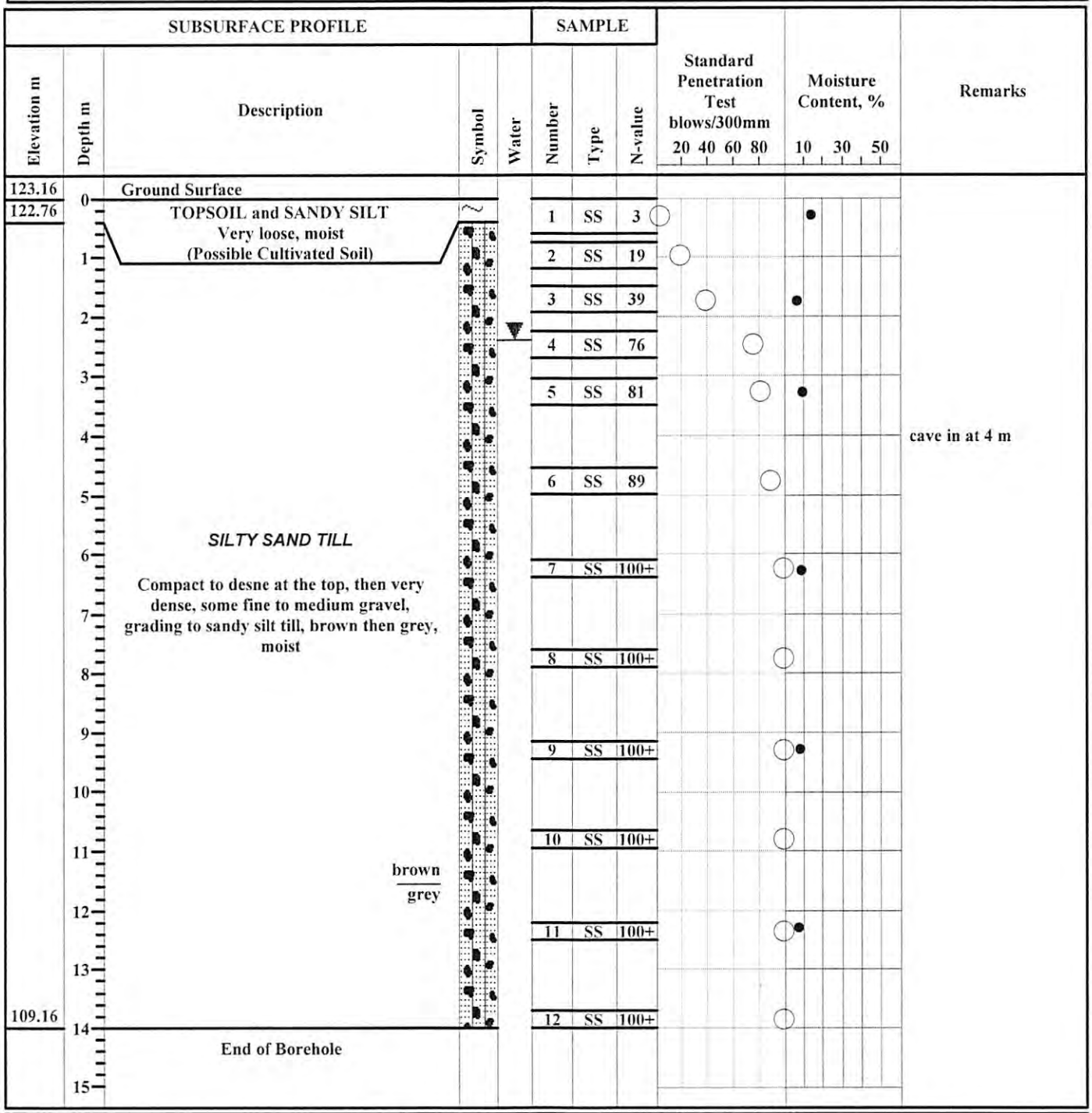
Method : Auger

Location : Elgin Street East, Cobourg, ON

Diameter : 110 mm

Datum Elevation : Geodetic

Date : January 8, 2019



V.A. WOOD ASSOCIATES LIMITED

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Sheet : 1 of 1

Reference No : 7503-18-10

Borehole No : 16

Enclosure No : 17

Client : Rondeau (Cobourg) Ltd.

Project : Proposed Subdivision

Method : Auger

Location : Elgin Street East, Cobourg, ON

Diameter : 110 mm

Datum Elevation : Geodetic

Date : January 7, 2019

Elevation m	Depth m	Description	Symbol	Water	Sample Number	Sample Type	N-value	Standard Penetration Test blows/300mm (20 40 60 80)	Moisture Content, % (10 30 50)	Remarks
112.95	0	Ground Surface								
		TOPSOIL and SANDY SILT Loose, moist (Possible Cultivated Soil)			1	SS	4	○		Borehole open and dry on completion
112.45										
	1	***SILTY SAND TILL*** Loose at the top, then very dense, some fine to medium gravel, grading to sandy silt till, brown, moist		DRY	2	SS	61	○	●	
					3	SS	96	○		
	2				4	SS	100+	○	●	
	3				5	SS	100+	○		
109.55		End of Borehole								
	4									
	5									
	6									
	7									
	8									

SUBSURFACE PROFILE

SAMPLE

V.A. WOOD ASSOCIATES LIMITED

Disk :

Sheet : 1 of 1

Reference No : 7503-18-10

Borehole No : 17

Enclosure No : 18

Client : Rondeau (Cobourg) Ltd.

Project : Proposed Subdivision

Method : Auger

Location : Elgin Street East, Cobourg, ON

Diameter : 110 mm

Datum Elevation : Geodetic

Date : January 7, 2019

Elevation m	Depth m	Description	Symbol	Water	Sample Number	Sample Type	N-value	Standard Penetration Test blows/300mm (20 40 60 80)	Moisture Content, % (10 30 50)	Remarks
116.78	0	Ground Surface								
116.38	0	TOPSOIL and SANDY SILT Loose, wet (Possible Cultivated Soil)			1	SS	4			
	1				2	SS	36			
	2				3	SS	51			
	2				4	SS	69			
	3				5	SS	100+			cave in at 3 m
	4	*SILTY SAND TILL* Compact to desne at the top, then very dense, some fine to medium gravel, grading to sandy silt till, brown then grey, moist			6	SS	100+			
	6				7	SS	100+			
	7				8	SS	100+			
	8	brown / grey		▼						
107.38	9				9	SS	100+			
	10	End of Borehole								
	11									

V.A. WOOD ASSOCIATES LIMITED

Disk :

Sheet : 1 of 1

Reference No : 7503-18-10

Borehole No : 18

Enclosure No : 19

Client : Rondeau (Cobourg) Ltd.

Project : Proposed Subdivision

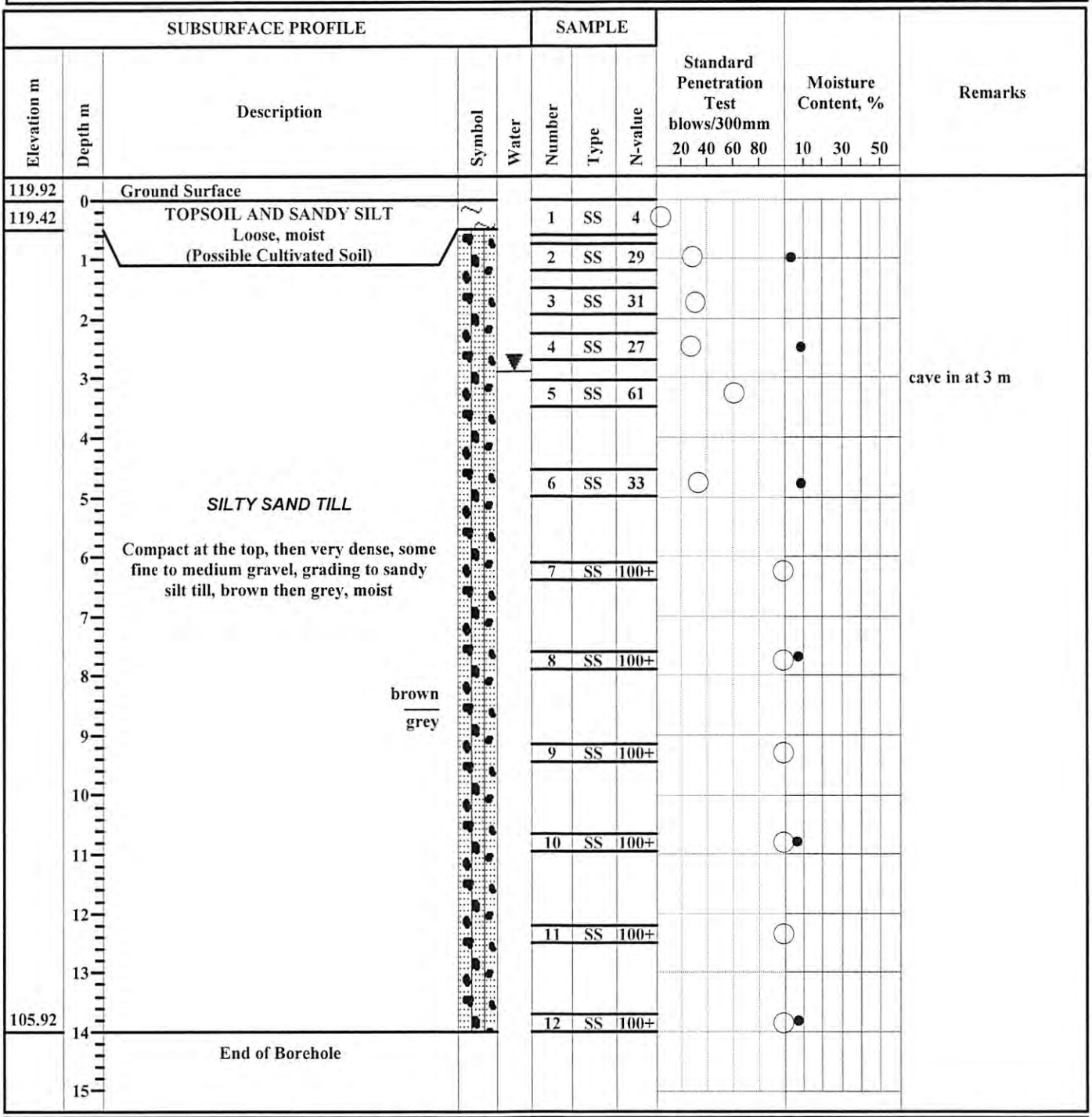
Method : Auger

Location : Elgin Street East, Cobourg, ON

Diameter : 110 mm

Datum Elevation : Geodetic

Date : January 14, 2019



V.A. WOOD ASSOCIATES LIMITED

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Sheet : 1 of 1

Reference No : 7503-18-10

Borehole No : 19

Enclosure No : 20

Client : Rondeau (Cobourg) Ltd.

Project : Proposed Subdivision

Method : Auger

Location : Elgin Street East, Cobourg, ON

Diameter : 110 mm

Datum Elevation : Geodetic

Date : January 14, 2019

Elevation m	Depth m	Description	Symbol	Water	Number	Type	N-value	Standard Penetration Test blows/300mm (20 40 60 80)	Moisture Content, % (10 30 50)	Remarks
113.25	0	Ground Surface								
		TOPSOIL AND SANDY SILT (Possible Cultivated Soil)			1	SS	50+			
	1	suspected boulder at 0.3 m			2	SS	30			
	2				3	SS	26			
					4	SS	73			
	3	*SILTY SAND TILL*			5	SS	100+			
	4	Compact at the top, then very dense, some fine to medium gravel, grading to sandy silt till, brown then grey, moist								
	5	brown / grey			6	SS	100+			
	6			▼	7	SS	100+			
	7									
	8				8	SS	100+			
	9				9	SS	100+			
	10									cave in at 9.8 m
102.25	11				10	SS	100+			
		End of Borehole								
	12									
	13									

V.A. WOOD ASSOCIATES LIMITED

Disk :

Sheet : 1 of 1

Reference No : 7503-18-10

Borehole No : 20

Enclosure No : 21

Client : Rondeau (Cobourg) Ltd.

Project : Proposed Subdivision

Method : Auger

Location : Elgin Street East, Cobourg, ON

Diameter : 110 mm

Datum Elevation : Geodetic

Date : January 4, 2019

Elevation m	Depth m	Description	Symbol	Water	Number	Type	N-value	Standard Penetration Test blows/300mm (20 40 60 80)	Moisture Content, % (10 30 50)	Remarks
114.12	0	Ground Surface								
		TOPSOIL and SANDY SILT Very loose, moist (Possible Cultivated Soil)			1	SS	1			
113.52	1				2	SS	31			
					3	SS	49			
	2				4	SS	41			
	3	*SILTY SAND TILL*		▼	5	SS	60			
	4	Dense becoming very dense, some fine to medium gravel, grading to sandy silt till, brown then grey, moist			6	SS	100+			
	5	brown / grey								
	6				7	SS	100+			cave in at 6.7 m
	7									
	8				8	SS	100+			
	9									
104.72					9	SS	100+			
		End of Borehole								
	10									
	11									

V.A. WOOD ASSOCIATES LIMITED

Disk :

Sheet : 1 of 1

Reference No : 7503-18-10

Borehole No : 95

Enclosure No : 96

Client : Rondeau (Cobourg) Ltd.

Project : Proposed Subdivision

Method : Auger

Location : Elgin Street East, Cobourg, ON

Diameter : 110 mm

Datum Elevation : Geodetic

Date : January 17, 2019

Elevation m	Depth m	Description	Symbol	Water	Number	Type	N-value	Standard Penetration Test blows/300mm (20 40 60 80)	Moisture Content, % (10 30 50)	Remarks
102.96	0	Ground Surface								
102.46		TOPSOIL AND SANDY SILT (Possible Cultivated Soil)			1	SS	3			
	1	SANDY SILT			2	SS	3			
101.56		Very loose, brown, wet								
		wet			3	SS	8			
	2	brown / grey			4	SS	85			
	3				5	SS	100+			
	4									cave in at 4 m
					6	SS	100+			
	5									
	6	SILTY SAND TILL			7	AS	100+			Borehole extended on Jan 25, 2019
	7	Loose and wet at the top, then very dense, some fine to medium gravel, grading to sandy silt till, brown then grey, moist			8	SS	100+			
	8									
	9				9	SS	100+			
	10									
					10	SS	100+			
	11									
90.46	12				11	SS	100+			
		End of Borehole								
	13									
	14									

V.A. WOOD ASSOCIATES LIMITED

Disk :

Sheet : 1 of 1

Reference No : 7503-18-10

Borehole No : 96

Enclosure No : 97

Client : Rondeau (Cobourg) Ltd.

Project : Proposed Subdivision

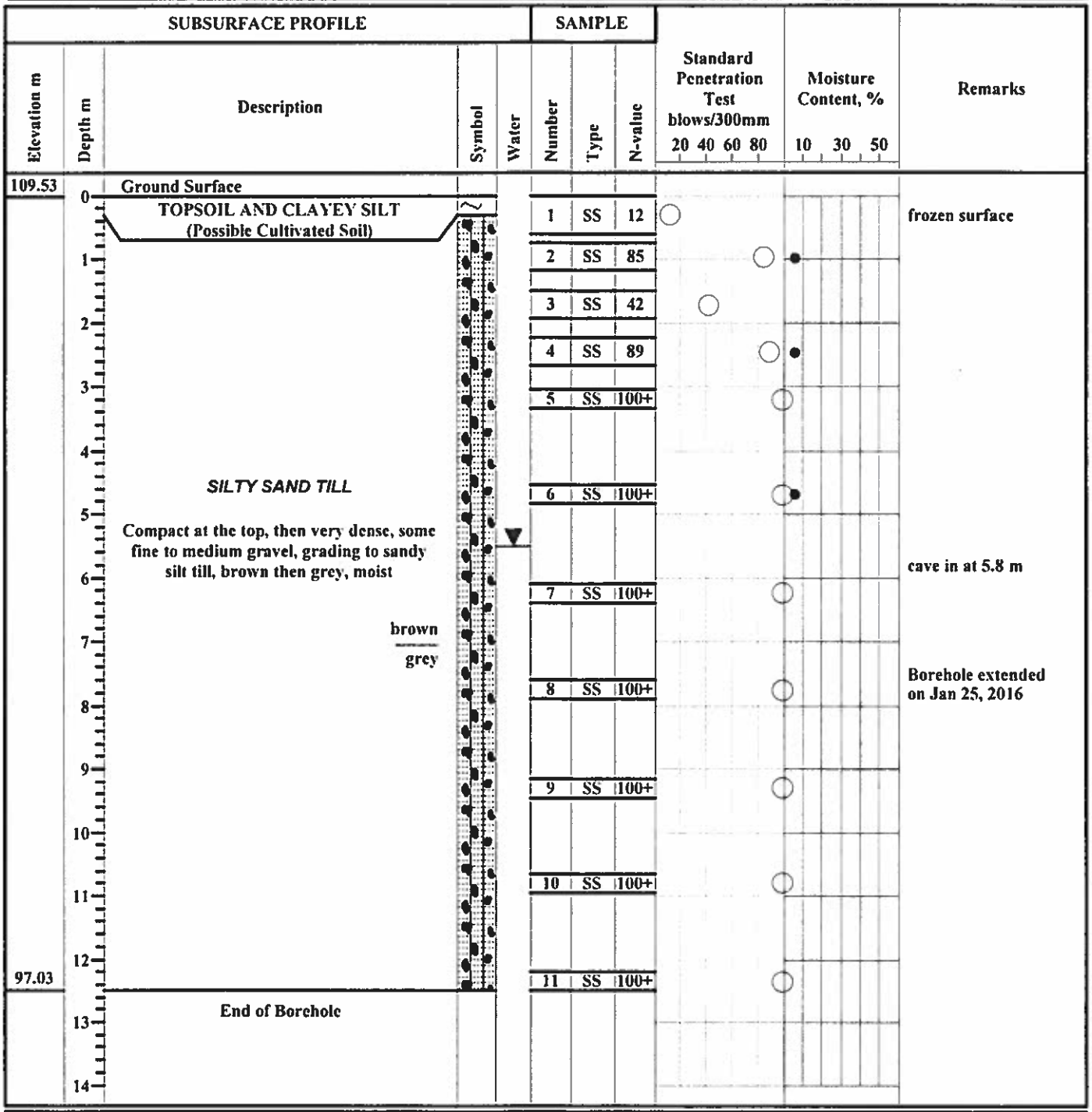
Method : Auger

Location : Elgin Street East, Cobourg, ON

Diameter : 110 mm

Datum Elevation : Geodetic

Date : January 18, 2019



V.A. WOOD ASSOCIATES LIMITED

Disk :

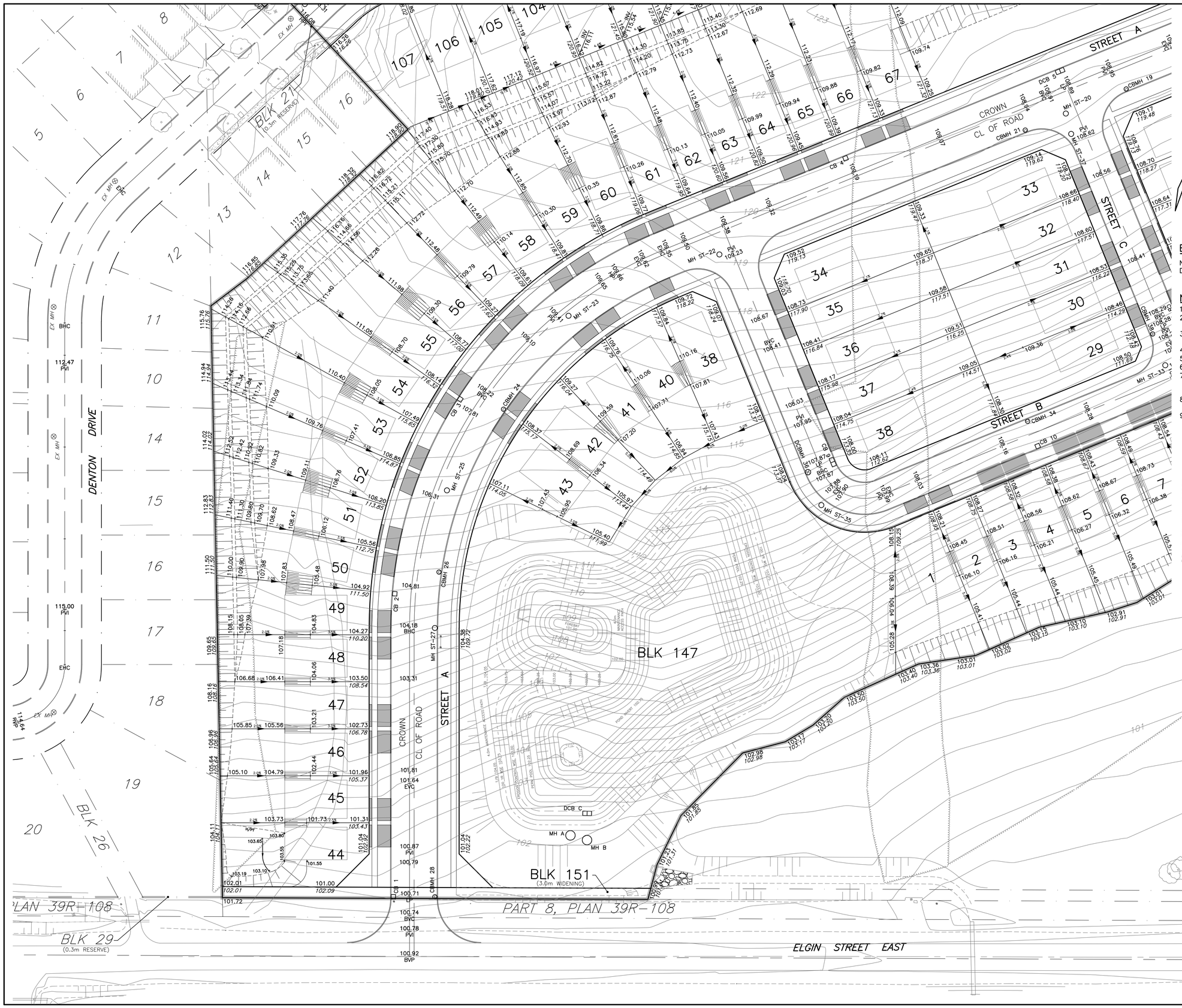
Sheet : 1 of 1

Appendix 2

Engineering Plans and Drawings for Proposed Development (D.G. Biddle)

PGL
ENVIRONMENTAL CONSULTANTS

REFER TO DWG 114057 LG-3



REFER TO DWG 114057 LG-2

BENCHMARK — ELEVATION 100.197m

NAIL AND WASHER IN EAST FACE H.B. POLE NORTH WEST CORNER ELGIN AND DARCY STREET.

NOTES

1) LOT GRADES SHALL BE 2% MIN TO 5% MAX.
2) SWALE GRADES SHALL BE 2% (MIN) TO 5% (MAX) UNLESS OTHERWISE NOTED.
3) ALL SWALES SHALL HAVE 3:1 SIDE SLOPES (MAX) AND BE SODDED ON 150mm OF TOPSOIL.
4) ALL SLOPES SHALL BE 3:1 (MAX) AND BE SODDED ON 150mm OF TOPSOIL.
5) REAR YARDS TO BE RESTORED WITH 300mm TOPSOIL AND SOD.
6) LIMIT OF ENGINEERED FILL SUBJECT TO ENGINEERED FILL REPORT.
7) DISTURBED AREAS AND FUTURE DEVELOPMENT SHALL BE GRADED SUCH THAT THERE IS NO PONDING WATER AND DRAINAGE IS DIRECTED AWAY FROM PROPOSED LOTS.
8) DISTURBED DITCHES AND BOULEVARDS ON MIDDLE ROAD TO BE RESTORED WITH 150mm TOPSOIL AND SOD.
9) ALL VACANT BLOCKS SHALL BE SEEDED ON 150mm TOPSOIL AND MAINTAINED TO THE SATISFACTION OF THE DIRECTOR OF ENGINEERING SERVICES.

LEGEND

- ORIGINAL GROUND CONTOUR — 103 / 101.5
- ORIGINAL SURVEY ELEVATION — 101.35
- ORIGINAL GROUND ELEVATION — 103.15
- PROPOSED ELEVATION
- PROPOSED SWALE
- DIRECTION OF DRAINAGE
- DIRECTION OF OVERLAND FLOW
- ENGINEERED FILL LOT
- DRIVEWAY LOCATION
- LIMIT OF SURFACE PONDING
- LIMIT OF PHASE

NO.	DATE	REVISION	BY

REVISIONS

APPROVED	APPROVED
DIRECTOR, ENGINEERING SERVICES MUNICIPALITY OF	DIRECTOR, ENGINEERING SERVICES REGION OF .....
DATE	DATE

THE CORPORATION OF THE TOWN OF COBOURG
PUBLIC WORKS DIVISION – ENGINEERING DEPARTMENT

VILLAGES OF CENTRAL PARK
RONDEAU (Cobourg) Ltd.

LOT GRADING PLAN

D.G. Biddle & Associates Limited
consulting engineers and planners
96 KING STREET EAST • OSHAWA,ON L1H 1B6
PHONE (905)576-8500 • FAX (905)576-9730
info@dgbiddle.com

SCALE:	HORZ 1:500 VERT 1:50	PROJECT NO. 114057
DRAWN BY:	H.R.	DRAWING NO. LG-1
DESIGN BY:	H.R.	
CHECKED BY:	M.B.C	
DATE:	FEB 2019	

Y:\JOB FILES\114000\114057 RONDEAU COBOURG\114057 DRAWINGS CIVIL\114057 ENGINEERING DRAWINGS\114057-3D-LOT GRADING PLAN.DWG

BENCHMARK — ELEVATION 100.197m

NAIL AND WASHER IN EAST FACE H.B. POLE NORTH WEST CORNER ELGIN AND DARCY STREET.

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LEGEND

ORIGINAL GROUND CONTOUR	103
ORIGINAL SURVEY ELEVATION	103.15
ORIGINAL GROUND ELEVATION	101.35
PROPOSED ELEVATION	103.15
PROPOSED SWALE	
DIRECTION OF DRAINAGE	
DIRECTION OF OVERLAND FLOW	
ENGINEERED FILL LOT	*
DRIVEWAY LOCATION	
LIMIT OF SURFACE PONDING	
LIMIT OF PHASE	

NO.	DATE	REVISION	BY

REVISIONS

APPROVED	APPROVED
DIRECTOR, ENGINEERING SERVICES MUNICIPALITY OF	DIRECTOR, ENGINEERING SERVICES REGION OF .....
DATE	DATE

THE CORPORATION OF THE TOWN OF COBOURG
PUBLIC WORKS DIVISION – ENGINEERING DEPARTMENT

VILLAGES OF CENTRAL PARK
RONDEAU (Cobourg) Ltd.

LOT GRADING PLAN

D.G. Biddle & Associates Limited
consulting engineers and planners
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PHONE (905)576-8500 • FAX (905)576-9730
info@dgbiddle.com

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CHECKED BY:	M.B.C	
DATE:	FEB 2019	

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BLK 150

BLK 149

BLK 148

BLK 139

BLK 21
10.3m RESERVE

STREET A

STREET D

STREET E

CL OF ROAD

CROWN

PART 5

PART 6

PART 1

41

42

43

44

BENCHMARK

ELEVATION 100.197m

NAIL AND WASHER IN EAST FACE H.B. POLE NORTH WEST CORNER ELGIN AND DARCY STREET.

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DIRECTION OF DRAINAGE	
DIRECTION OF OVERLAND FLOW	
ENGINEERED FILL LOT	*
DRIVEWAY LOCATION	
LIMIT OF SURFACE PONDING	
LIMIT OF PHASE	

NO.	DATE	REVISION	BY

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DIRECTOR, ENGINEERING SERVICES MUNICIPALITY OF	DIRECTOR, ENGINEERING SERVICES REGION OF .....
DATE	DATE

THE CORPORATION OF THE TOWN OF COBOURG
PUBLIC WORKS DIVISION – ENGINEERING DEPARTMENT

VILLAGES OF CENTRAL PARK
RONDEAU (Cobourg) Ltd.

LOT GRADING PLAN

D.G. Biddle & Associates Limited
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96 KING STREET EAST • OSHAWA,ON L1H 1B6
PHONE (905)576-8500 • FAX (905)576-9730
info@dgbiddle.com

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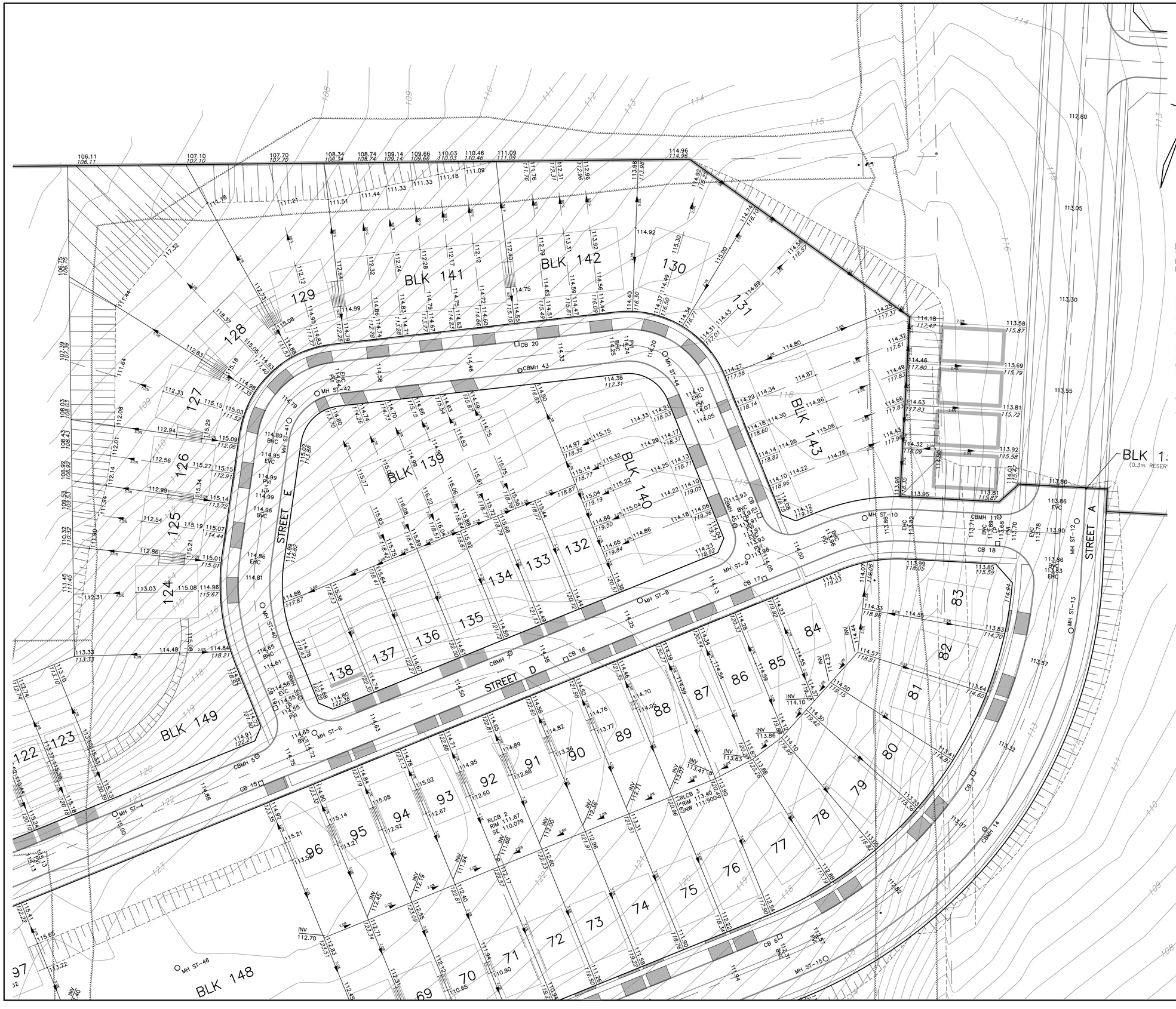

BENCHMARK — ELEVATION 100.197m

NAIL AND WASHER IN EAST FACE H.B. POLE NORTH WEST CORNER ELGIN AND DARCY STREET.

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ORIGINAL GROUND CONTOUR	103 / 103.15
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DIRECTION OF DRAINAGE	
DIRECTION OF OVERLAND FLOW	
ENGINEERED FILL LOT	*
DRIVEWAY LOCATION	
LIMIT OF SURFACE PONDING	
LIMIT OF PHASE	

NO.	DATE	REVISION	BY

REVISIONS

APPROVED	APPROVED
DIRECTOR, ENGINEERING SERVICES MUNICIPALITY OF	DIRECTOR, ENGINEERING SERVICES REGION OF .....
DATE	DATE

THE CORPORATION OF THE TOWN OF COBOURG
PUBLIC WORKS DIVISION – ENGINEERING DEPARTMENT

VILLAGES OF CENTRAL PARK
RONDEAU (Cobourg) Ltd.

LOT GRADING PLAN

D.G. Biddle & Associates Limited
consulting engineers and planners
96 KING STREET EAST • OSHAWA,ON L1H 1B6
PHONE (905)576-8500 • FAX (905)576-9730
info@dgbiddle.com

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DATE:	FEB 2019	

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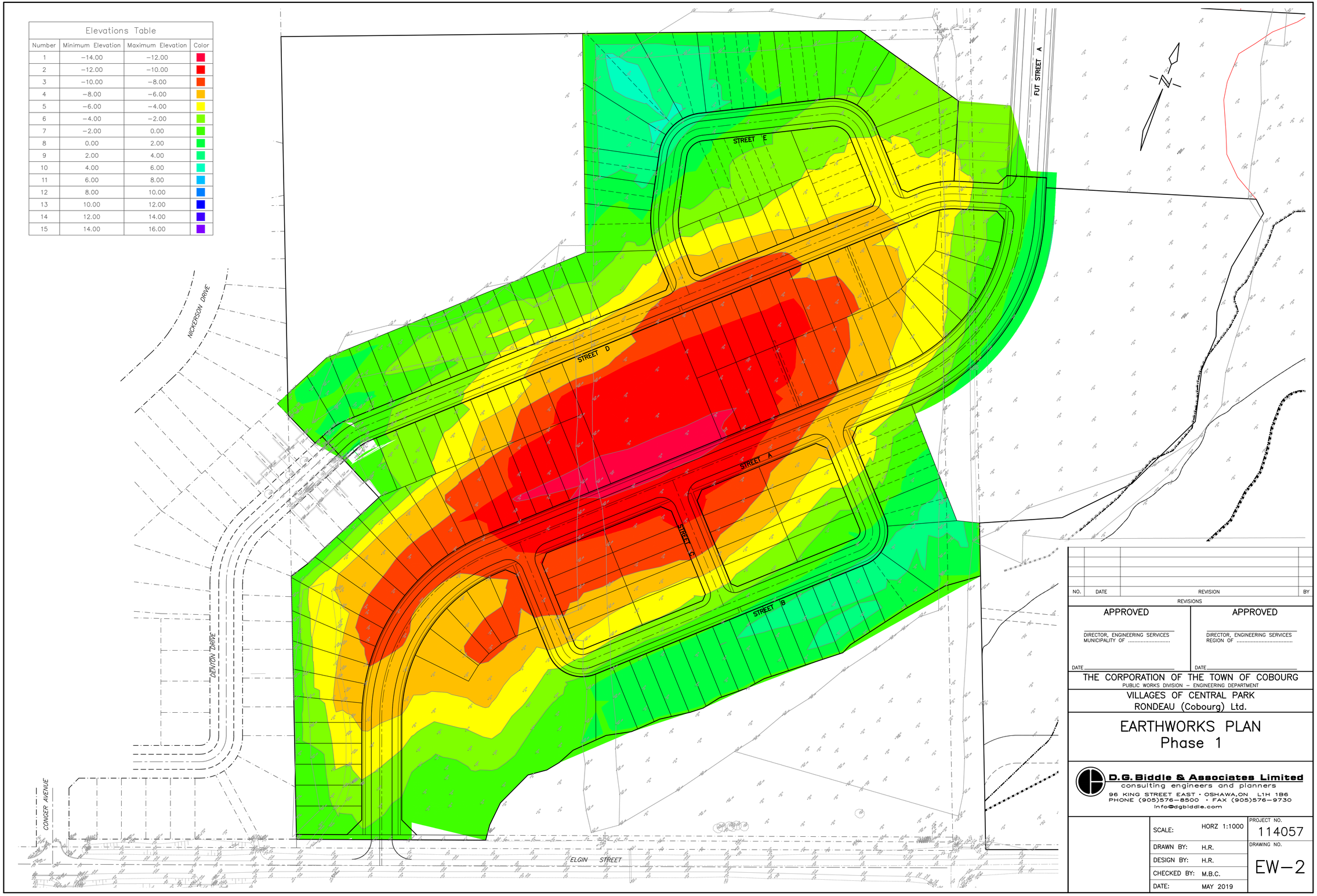
Elevations Table			
Number	Minimum Elevation	Maximum Elevation	Color
1	−14.00	−12.00	
2	−12.00	−10.00	
3	−10.00	−8.00	
4	−8.00	−6.00	
5	−6.00	−4.00	
6	−4.00	−2.00	
7	−2.00	0.00	
8	0.00	2.00	
9	2.00	4.00	
10	4.00	6.00	
11	6.00	8.00	
12	8.00	10.00	
13	10.00	12.00	
14	12.00	14.00	
15	14.00	16.00	



NO.	DATE	REVISION	BY

REVISIONS

APPROVED	APPROVED
DIRECTOR, ENGINEERING SERVICES MUNICIPALITY OF	DIRECTOR, ENGINEERING SERVICES REGION OF .....
DATE	DATE

THE CORPORATION OF THE TOWN OF COBOURG
PUBLIC WORKS DIVISION – ENGINEERING DEPARTMENT

VILLAGES OF CENTRAL PARK
RONDEAU (Cobourg) Ltd.

EARTHWORKS PLAN
Phase 1

D.G. Biddle & Associates Limited
consulting engineers and planners
96 KING STREET EAST • OSHAWA,ON L1H 1B6
PHONE (905)576-8500 • FAX (905)576-9730
info@dgbiddle.com

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DESIGN BY:	H.R.	
CHECKED BY:	M.B.C.	
DATE:	MAY 2019	

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May 15, 2019

Appendix 3

Environmental Impact Study (Niblett Environmental Associates Inc.)

PGL
ENVIRONMENTAL CONSULTANTS

1351745 ONTARIO LTD. DEVELOPMENT
DRAFT PLAN OF SUBDIVISION 14T-06001-R
COBOURG EAST COMMUNITY SECONDARY PLAN AREA
ELGIN STREET EAST/COUNTY ROAD 20
PART LOTS 11, 12 AND 13, CONCESSIONS A AND 1
BLOCK D, PLAN 277
TOWN OF COBOURG

ENVIRONMENTAL IMPACT STUDY

Prepared for: **1351745 Ontario Ltd.**

Submitted by: **Niblett Environmental Associates Inc.**
File: **PN 14-056**

Date: **October 2017**

Niblett Environmental Associates Inc.
Biological Consultants

05 October 2017 PN 14-056

Mr. Richard Rondeau
1351745 Ontario Ltd.
513 Westney Rd. S., Unit 4
Ajax, ON L1S 6W8

SUBJECT: 1351745 ONTARIO LTD. DEVELOPMENT
DRAFT PLAN OF SUBDIVISION 14T-06001-R
COBOURG EAST COMMUNITY SECONDARY PLAN AREA
ELGIN STREET EAST/COUNTY ROAD 20
PART LOTS 11, 12 AND 13, CONCESSIONS A AND 1
BLOCK D, PLAN 277
TOWN OF COBOURG

ENVIRONMENTAL IMPACT STUDY

Dear Mr. Rondeau:

We are pleased to submit our Environmental Impact Study report in support of your draft plan of subdivision application.

After a thorough review of our field data and existing literature we have assessed the impacts of the proposed subdivision on the natural features in the area. We have made several recommendations to mitigate any potential impacts.

This revised EIS is the same as the May 18, 2016 version with some minor changes in the proposed development and impact sections (5.0 and 6.0).

If you have any questions or comments, we would be please to provide additional assistance as needed.

Sincerely,

Chris Ellingwood
President and Sr. Terrestrial/Wetland Biologist

55 Mary Street West, Suite 112, Lindsay, Ontario K9V 5Z6 Tel: (705) 878-9399 Fax: (705) 878-9390
Email: mail@niblett.ca Website: www.niblett.ca

ACKNOWLEDGEMENTS

The following NEA staff contributed to this project:

Project Co-ordinators: Chris Ellingwood, Sr. Terrestrial and Wetland Biologist
Amanda Smith (H. BSc), Fisheries and Aquatic Biologist

Authors: Chris Ellingwood, Sr. Terrestrial and Wetland Biologist
Amanda Smith (H. BSc), Fisheries and Aquatic Biologist
Stacey Zwiers, Fisheries Technologist
Ernie Silhanek (EP), Terrestrial and Wetland Biologist
Katherine Ryan (H. BSc), Terrestrial and Wetland Biologist

Field Crew: Chris Ellingwood, Sr. Terrestrial and Wetland Biologist
Amanda Smith, Fisheries and Aquatic Biologist
Stacey Zwiers, Fisheries Technologist
Ernie Silhanek, Terrestrial and Wetland Biologist
Katherine Ryan, Terrestrial and Wetland Biologist

Graphics: Will Pridham, GIS Specialist and Cartographer

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DRAFT PLAN OF SUBDIVISION 14T-06001-R
COBOURG EAST COMMUNITY SECONDARY PLAN AREA
ELGIN STREET EAST/COUNTY ROAD 20
PART LOTS 11, 12 and 13, CONCESSIONS A and 1
Block D, Plan 277
TOWN OF COBOURG

ENVIRONMENTAL IMPACT STUDY

1.0 Introduction

1.1 Background

Niblett Environmental Associates Inc. (NEA) was retained by 1351745 Ontario Ltd. to complete an Environmental Impact Study (EIS) for a proposed Draft Plan of subdivision on the subject properties. Previous reports have been completed by NEA for the same properties in 2007 and 2009 (NEA, 2007) (NEA, 2009) under a different proponent. The majority of the property is located within the Cobourg East Community Secondary Plan area in the Town of Cobourg in the County of Northumberland.

1.2 Property Description

The subject properties encompass a total of approximately 107.3 ha (267 acres). The property is bounded on the south by Elgin Street East (County Road 20), Greer Road on the east and Danforth Road to the north. The property consists of Part Lots 11, 12 and 13, Concession 1 and Part lot 13, concession A.

The Bell property (17 ha/42 acres) is located south of Elgin Street East and west of Brook Road. Highway 401 lies just north (within 500 m) of the northern limit of study site.

The study area extended approximately 100m on all sides of the property and further along the two creeks to better define the role of adjacent communities (Figure 1).

1.3 Study Rationale

The Town of Cobourg has released a Secondary Plan and accompanying schedules detailing the land use plan for the area (Meridian Planning Consultants Inc., 2005). Portions of the lands are designated as Environmental Protection Areas and Special Study Area Overlay. A natural heritage system with valleys and interconnected woodlands is one of the main focuses of the secondary plan. No development is permitted in areas designated as environmental protection; however, the boundaries can be refined through an Environmental Impact Study (EIS). Three sections of the properties have been designated as Environmental Protection (high constraint):

- Central woodland
- Midtown Creek valley
- North-western portion of the Bell property

The northern outer edge of the central woodland and hedgerows to the west and the central portion of the Bell property have been designated as Special Study Area (moderate constraint). An EIS is required when development is proposed within the Special Study Area Overlay.

The Town of Cobourg Official Plan (2010) (s. 4.2.6) requires the following information in an Environmental Impact Study report:

- *an inventory and analysis of all natural heritage features and ecological functions on the site including vegetation, wildlife habitat, fish habitat, wetlands, steep slopes, habitat of endangered and threatened species, significant areas of natural and scientific interest, groundwater discharge areas and contribution to maintenance of fluvial processes.*
- *regard shall be had for the relationship between the lands for which the environmental audit is being undertaken and the lands within the neighbouring Environmental Constraint Area.*
- *where the environmental audit identifies significant natural environmental features and/or ecological systems, such areas shall be preserved and enhanced and consideration given to including them in the Environmental constraint Area designation*
- *submission of a detailed site plan, landscaping and grading plans will be required as the basis of the approval of any development...*

s. 15.4.5 Environmental Area

s. 15.4.5.4 Reductions to Environmental Area Designation

Reductions to the spatial extent and/or the ecological function of a significant natural heritage feature within the Environmental Area shall not be permitted. The boundaries of lands within the Environmental Area designation can be refined through the development process without an Official Plan Amendment subject to the approval by the Town, in consultation with the appropriate Conservation Authority, of an Environmental Impact Study.

15.4.5.5 Special Study Area Overlay

a) Location

Certain areas have been identified as being within the Special Study Area Overlay on Schedule 'XI'. These areas are considered to be sensitive to development. In addition, these lands may also act as a buffer between more sensitive environmental areas and development areas.

b) Development Permissions

Development may be permitted in these areas provided an Environmental Impact Study has been completed and is considered to be satisfactory to the Town. If this occurs, the subject lands may be developed in accordance with the underlying land use designation.

c) Requirements for Environmental Impact Study
All Environmental Impact Studies (EIS) shall be prepared by experts qualified in the fields of ecology, hydrogeology and/or environmental planning and shall be prepared in accordance with a work plan that has been approved by the Town in consultation with the Ganaraska Region Conservation Authority.

The work plan shall identify the boundaries of the area to be studied and may include lands beyond the area for which the EIS is being carried out.
The objective of the EIS is to identify and assess the potential impacts of a specific development proposal on the key environmental functions, attributes and linkages of the potentially affected area and to ensure that the proposed development complies with the policies and intent of the Secondary Plan with respect to protection of the natural environment.

Components of an EIS shall generally include:

i) A detailed study area description, including an assessment of the terrain conditions, hydrogeology, surface water, biological setting and hazard lands;

ii) A characterization of existing natural heritage features and functions on-site and adjacent to the subject lands, including the roles of vegetation, surface water and groundwater;

iii) A detailed description of the proposed development or land use activities, including servicing and grading plans and the locations of building envelopes where appropriate;

iv) A prediction of the potential direct, indirect, and cumulative effects of the proposed development on the natural and physical environment;

v) An identification and evaluation of options to avoid or mitigate impacts, including recommendations for the establishment of buffers/setbacks, erosion and sediment control, surface and sub-surface drainage, and habitat maintenance, restoration and enhancement;

vi) A strategy for implementing the recommended mitigation measures; and,

vii) A summary of predicted net effects following mitigation.

2.0 Methodology

2.1 General Approach

Our approach to preparation of the EIS consisted of three distinct phases.

In the first phase all available information on the study site and site vicinity was collected and reviewed. This included reviewing previously completed NEA reports in the study area (NEA, 2007) (NEA, 2009), recent aerial photography, OMNRF GIS layers (2008-2011), OMNRF 'Make-a-map Natural Heritage Features' mapping, wetland mapping, Town of Cobourg Official Plan schedules (2004, 2010) and the Cobourg East Community Secondary Plan (Meridian Planning Consultants Inc., 2005).

Our second phase consisted of a series of site visits by our terrestrial and wetland biologists and fisheries biologists. As this project has been off and on over a number of years, the surveys have been conducted from 2005 to 2011. Surveys are conducted to confirm the data collected in the literature review and to collect additional information on species present including vegetation, herpetozoa, birds, fish and mammals. The most recent site visits were conducted on September 17th, 2014; and May 7th, 2015. These visits entailed searching for the presence of significant species including Species at Risk (SAR) and delineating the boundaries of any wetland communities.

The final phase consisted of preparation of the EIS report based upon data from both the literature and field surveys. Previous information collected from field visits in 2005, 2006 and 2011 formed the basis of the report along with supplemental information gained from the 2014 and 2015 visits. The report includes an assessment of the effects of the proposed development on natural heritage features and functions, establishment of buffers/setbacks and mitigation measures.

This report includes figures that show the location of all of the natural features, the development Concept Plan (The Planning Partnership, May 25, 2016, Drawing No. A) and recommended setbacks and buffers.

2.2 Detailed Methodology

2.2.1 Vegetation

Background information was collected from the Ontario Ministry of Natural Resources and Forestry (OMNRF) 'Make-a-map Natural Heritage Features mapping and forest resource inventory mapping. Prior to field visits the vegetation communities, linkages and corridors were delineated on air photos. The vegetation community descriptions in the Background Natural Heritage Assessment by Gartner Lee (May 2004) were reviewed and mapping of environmental constraint areas consulted. Their boundaries and the area of high, moderate and low constraint were confirmed in the field in 2005.

In the second stage, field inventories were conducted on September 19th, 2005; May 19th, June 30th, 2006; and August 16th, September 19th and November 25th 2011. Detailed inventories were made of the plant species present in each community within the study area. Community boundaries and descriptions delineated on air photos were ground-truthed. The location of wetland communities was determined for the property and adjacent properties to the north and south. Specimens were collected of species requiring verification. Adjacent properties were visited to ascertain the extent of community boundaries beyond the plan area and to inventory the species present.

Additional surveys were conducted on September 17th, 2014 to conduct Butternut Health Assessments on the trees that were located on the property and to further delineate additional wetland communities found on the property.

General notes on disturbance, topography, soil types, soil moisture and state of each community were also compiled.

Naming of the vegetation community types was based on the Ecological Land Classification for Southern Ontario (Lee et. al., 1998).

The presence of rare, significant or unusual species was noted. Species significance or rarity on a national, provincial, regional and local level was based on published literature and standard status lists. These included COSEWIC (2017), COSSARO (2017), Argus et al (1982-90), OMNR (2013), NHIC (2015), ESA (2007), SARA (2017) and Riley (1989).

2.2.2 Birds

Breeding bird surveys were conducted during the breeding season on May 19th, June 30th, 2006; and July 18th 2011. Surveys were timed to coincide with the dawn chorus and within acceptable weather parameters. The surveys were modeled after the Ontario Breeding Bird Atlas (2nd) point count methodologies (2001) and used standardized data collection forms. The surveys were a combination of point counts and wandering transects and covered all portions of the property.

A breeding bird species list was generated from the Atlas of the Breeding Birds of Ontario (Cadman et. al., 1987 and Bird Studies Canada, 2005) for the 10 x 10 km atlas square that contains the study area (17QJ27). The data was reviewed to determine if any sensitive or significant breeding species have been recorded in the area of the development. Records of any special concern, threatened or endangered species were also collected from the MNRF Natural Heritage database.

Bird species significance on a national, provincial, regional and local level was based on published literature and current status lists. These included COSEWIC (2017), COSSARO (2017), Ontario Endangered Species Act (2007), OMNR (wetland manual, version 3.2, 2013) and SARA (2017).

2.2.3 Wildlife: Mammals, Reptiles and Amphibians

Amphibian surveys were conducted on April 1th, 2006 following the methodology of the Marsh Monitoring Program (BSC, 2001). As standing water is limited on this site, the amphibian surveys focussed on two vernal pools in the central woodland and the wetland communities. Species significance on a national, provincial, regional and local level was based on COSEWIC (2017), COSSARO (2017), SARA (2017) and Oldham (1996).

Species significance on a national, provincial, regional and local level was based on COSEWIC (2017), COSSARO (2017) SARA (2017), Dobbyn (1994), and Sunderland (1994).

In addition, observations of mammals, amphibians and reptiles were made whenever biologists were on site. Observations included direct sightings and indirect evidence such as calls, tracks, scat, burrows, dens and browse.

2.2.4 Fish and Aquatic Habitat

2.2.4.1. Aquatic Habitat

Biophysical habitat characteristics of the unnamed tributaries of Brook Creek and Midtown Creek located in the study area were assessed on May 14th, June 12th and 20th 2006 (NEA, 2007).

Aquatic habitat was quantified and characterized by determining the existing habitat types and potential function based on substrate composition, riparian habitat, percent in-stream cover, flow influence and condition, sediment transport, groundwater indicators, barrier presence and form, landscape influences, human modifications and unique features. Assessments were conducted using standardized provincial aquatic protocol methods from OSAP, MTO and following the "*Manual of Instruction: Aquatic Habitat Inventory Surveys*" (Dodge, Tilt, MacRitchie, Goodchild, & Waldrif, 1987) protocol (NEA, 2007). The fish and aquatic habitat impact assessments were based on acquired fisheries data (OMNRF, GRCA and DFO) and NEA's biophysical habitat data collected on site.

2.2.4.2. Fish Community

Fish community surveys were conducted in the unnamed tributary of Brook Creek and Midtown Creek on May 14th, June 12th and 20th 2006 (NEA, 2007) and May 7th 2015.

Fish community sampling was conducted using a Smith-Root Model 24 backpack electrofisher employing the single pass technique outlined in the Ontario Stream Assessment Protocol (Stanfield, 2010). Electrofishing was conducted on June 12th 2006 and May 7th 2015 in both tributaries. The single pass survey technique allowed biologists to characterize the fish community and provide a qualitative assessment of species abundance at the site. This method requires a high shocking intensity (7-15 sec/m^2) and typically captures 60% of the population when all habitats are sampled (Stanfield, 2010).

Additional sampling gear was used in 2006 where electrofishing was not feasible due to water levels. Five minnow traps were set for approximately 24 hours on May 14th and June 20th 2006 within both tributaries (NEA, 2007) (Figure 2).

The Ontario Endangered Species Act (ESA) was enacted in 2007. To ensure the project meets the strict policies of this act, NEA completed a background literature review from OMNRF-NHIC and GRCA.

2.2.4.3. Surface Water Quality

Surface water quality was collected in the unnamed tributary of Brook Creek and Midtown Creek in 2015 by NEA biologists. Measured parameters included, dissolved oxygen (mg/L), conductivity (mS), total dissolved solids (mg/L), and water temperature (°C) using a handled YSI Pro2030 System. The pH was recorded with a handheld waterproof pH meter and turbidity was recorded with a handheld LaMotte2020. The Canadian Water Quality Guidelines for the Protection of Aquatic Life (Canadian Council of Ministers of the Environment, 2002) and the Provincial Water Quality Objectives (PWQO) were used to interpret water quality data (Energy, 1994).

2.2.5 Wetlands

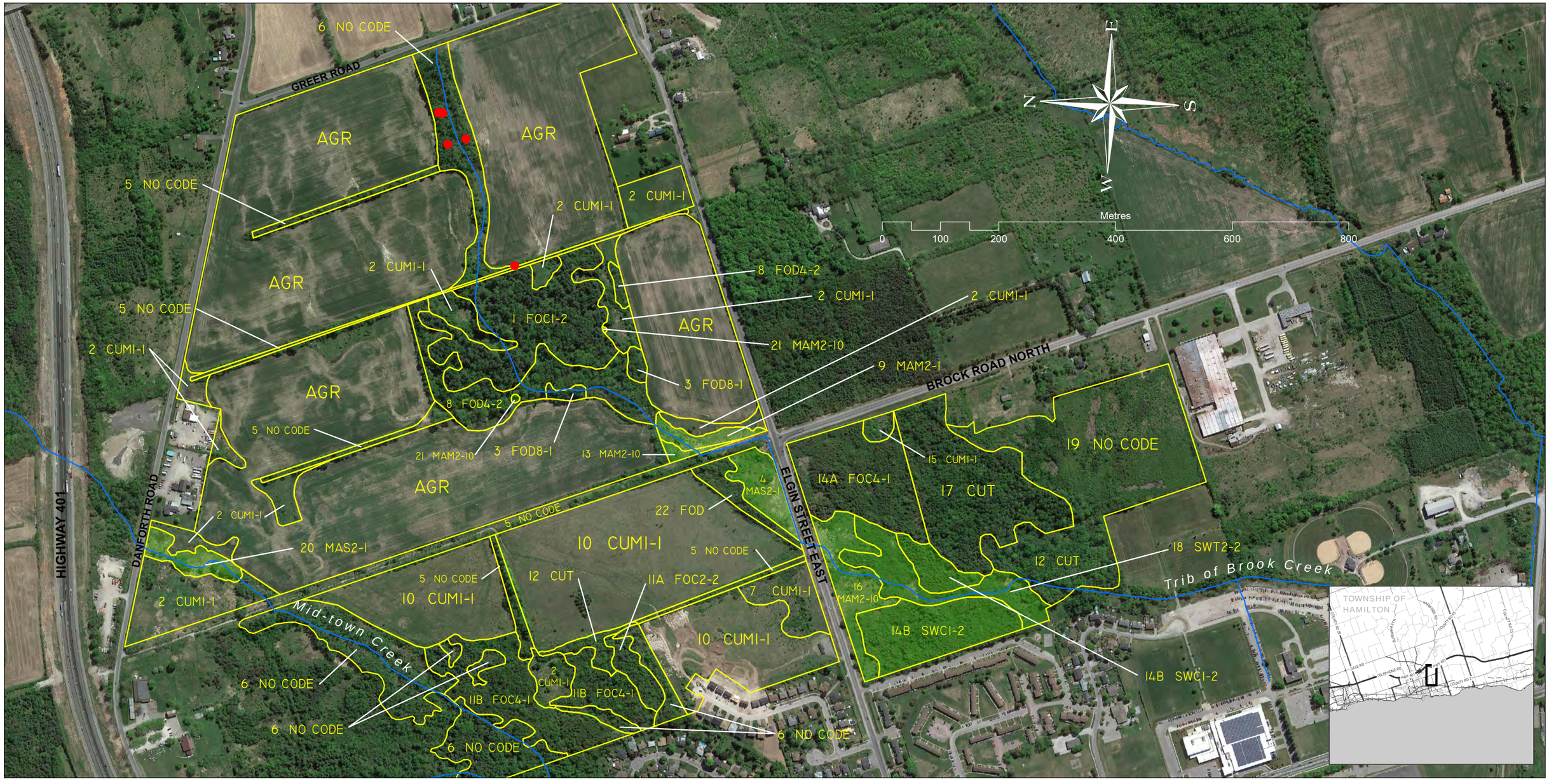
The property was screened for the presence of wetland communities using NHIC, LIO database, MNRF GIS database and other mapping and schedules. The wetlands boundaries and communities were confirmed in the field using the Ontario Wetland Evaluation System manual, Southern Ontario, Third Edition (MNRF, 1997 and later with the 2013 version 3.2). The method includes detailed plant inventories, soil cores and assessment of hydrological characteristics. Wetland boundaries were delineated and GPS readings taken. Wetlands were also confirmed using the definitions in the GRCA regulations and policy manuals.

2.2.6 Significant Wildlife Habitat

A review of the criteria for Significant Wildlife Habitat was completed. Targeted surveys were completed for those criteria that may be candidate. The SWH Technical Guide (2013) was used for the screening and surveys completed as per established protocols.

2.2.7 Species At Risk

The Ontario Endangered Species Act (ESA) was enacted in 2007. To ensure the project meets the strict policies of this Act, NEA completed a background literature review from DFO and OMNRF-NHIC. All Endangered and Threatened species receive individual protection under Section 9 of the ESA and receive general habitat protection under Section 10 of the ESA, 2007. Special Concern species are covered under the Significant Wildlife Habitat criteria of the Provincial Policy Statement. A screening level review was completed of existing data sources. Targeted surveys were completed for Species At Risk that may find habitat within the study area. Searches for butternut trees were undertaken and trees assessed by our MNRF certified Butternut Health Assessor (BHA).



LEGEND

- Retainable Butternut
- Watercourse
- Property Boundary
- Vegetation Community
- Parcel Fabric
- Wetland Community

Composite imagery acquired in May 2015. DigitalGlobe WorldView-2. 30 cm Resolution.

ELC TYPES (1ST APPROXIMATION)

CODE	TYPE DESCRIPTION
CUMI-1	Dry-moist old field meadow
CUT	Cultural thicket
FOC1-2	Dry-fresh white pine-red pine coniferous forest
FOC2-2	Dry-fresh white cedar coniferous forest
FOC4-1	Fresh-moist white cedar coniferous forest
FOD	Deciduous forest
FOD4-2	Dry-fresh white ash deciduous forest
FOD8-1	Fresh-moist poplar deciduous forest
MAM2-1	Bluejoint mineral meadow marsh
MAM2-10	Forb mineral meadow marsh
MAS2-1	Cattail mineral shallow marsh
SWC1-1	White cedar mineral coniferous swamp
SWT2-2	Willow mineral thicket swamp

FIGURE 1: VEGETATION COMMUNITIES

Pt Lots 11 & 12, Con 1, Heritage Village of Rondeau
Town of Cobourg, Secondary Plan Area
Peterborough District

UTM Zone 17
WKID: 26917 Authority: EPSG
Transverse Mercator
GCS North American 1983, ESRI ArcGIS 10.1

REVISIONS

NO	BY	DATE	DESCRIPTION
1	W.P.	10/05/2016	Initial map creation.
2	W.P.	17/06/2016	Changed labels 18A, 18B, and 19.

CONTACT: Will Pridham, GIS Specialist & Cartographer
PHONE/FAX: T: 1 (705)-878-9399 F: 1 (705)-878-9390
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PROJECT NO: PN14056
REVISION NO.: RV-01
PROJECT: East Cobourg
CLIENT: N/A

SCALE: 1:6,500 CENTIMETERS

NIBLETT ENVIRONMENTAL ASSOCIATES INC.

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LEGEND

- Minnow Trap Station
- Water Quality Station
- Watercourse
- Electrofishing Station
- Parcel Fabric
- Property Boundary
- HZ Habitat Zone Label

Composite imagery acquired in May 2015. DigitalGlobe WorldView-2. 30 cm Resolution.

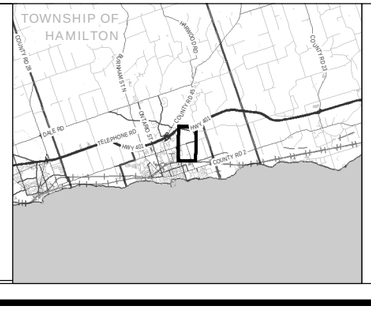

FIGURE 2: AQUATIC SURVEY LOCATIONS

Pt Lots 11 & 12, Con 1, Heritage Village of Rondeau
Town of Cobourg, Secondary Plan Area
Peterborough District

REVISIONS

NO	BY	DATE	DESCRIPTION
1	W.P.	10/05/2016	Initial map creation.

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3.0 Resource Inventory

3.1 Site Characteristics

The subject properties are located within a drumlinized sand plain. Three large drumlins are located on the property and create steep slopes and high elevations on parts of the property. The drumlins are located on the Bell property south of Elgin Street and crossing Brook Road, north of Elgin Street and crossing the west part of the property and on the east side of the property at Greer Road. As is typical of drumlinized areas, the intervening low areas have creeks and wetlands. The site contains a large central woodland north of Elgin Street, cedar forest and swamp south of Elgin, tributary of Midtown Creek and forest to the west and an intermittent tributary of Brook Creek through the centre and onto the Bell property. Overall the site is dominated by active agricultural fields (Figure 1).

3.2 Vegetation

Twenty-two vegetation communities were delineated on and adjacent to the property (Figure 1). A total of 186 species of plants were identified within the study area (Appendix I-A). A variety of field, thicket, wetland and forest communities were found and are described in further detail. The main features of the property include a large woodland (central woodland) with some patches of trees and fencerow connected to it and associated the tributary of Brook Creek. A large portion (>70%) of the property north of Elgin Street was active agricultural field planted in corn. The property south of Elgin Street was former pasture land that had been abandoned. It contains a dense cedar forest/swamp, thicket swamp and old field meadow habitat.

Community 1 Dry-Fresh White Pine-Red Pine Coniferous Forest (ELC code FOC1-2)

This community is located in the central woodlot along the south and western edges, bordered by agricultural fields. The majority of the pines were mature, with many measuring 50-90 cm diameter at breast height (dbh). Eastern white pine (*Pinus strobus)* is the dominant canopy species. There were some pockets containing deciduous species including balsam poplar (*Populus balsamifera*), American beech (*Fagus grandifolia*), sugar maple (*Acer saccharum*), black cherry (*Prunus serotina*), ironwood (*Ostrya virginiana*), American elm (*Ulmus americana*) and Manitoba maple (*Acer negundo*) and shrubs such as alternate-leaf dogwood (*Cornus alternifolia*). Ground cover was represented by a good variety of species such as bitter nightshade (*Solanum dulcamara*), yellow avens (*Geum allepicum*), trout lily (*Erythronium americanum*), sensitive fern (*Onoclea sensibilis*), American stinging nettle (*Urtica dioica*), mayapple (*Podophyllum peltatum*) and Jack-in-the-pulpit (*Arisaema triphyllum*).

An intermittent tributary of Brook Creek bisected Community 1 in an east to west orientation.

Photo 1. Pine Plantation (Photo taken Sept 17, 2014)

Community 2 Old Field Meadow (ELC Code: CUM 1-1)

Community 2 represents a number of separate communities within the study area ranging from a regenerating field with pioneer species, to a regenerating shrubland or forest.

One of the pockets extended from the north side of Elgin Street along the east side of the riverine wetland pockets, which has had some grading and clearing in the past, and into the fields beyond. The regenerating field community was comprised of primarily pioneer and/or invasive species. Fencerows and thickets were present on both the west and east sides of the allowance. The west side had primarily Manitoba maple, sugar maple, white ash (*Fraxinus americana*) and European buckthorn (*Rhamnus cathartica*). Closer to Elgin street, the European buckthorn thicket gradually replaced the fencerow and became increasingly and more densely covered by Virginia creeper (*Parthenocissus inserta*).

The east side of the road allowance was at a slightly lower elevation and had clumps of shrubs present. Species included hawthorn (*Crataegus sp.*) species, crack willow (*Salix fragilis)*, Bebb's willow (*Salix bebbiana)* and pussy willow (*Salix discolor*), red-osier dogwood (*Cornus*

stolonifera), high bush cranberry (*Viburnum trilobum*) and choke cherry (*Prunus virginiana*).

The field itself was dominated by common strawberry (*Fragaria virginiana*), Canada goldenrod (*Solidago canadensis*), red clover (*Trifolium pratense*), common ragweed (*Ambrosia artemisiifolia*), white sweet-clover (*Melilotus alba*), chicory (*Chicorium intybus*), New England aster (*Aster novae-angliae*), cow vetch (*Vicia cracca*) and Canada thistle (*Cirsium arvense*). Species present near the bottom of the hill which are more commonly associated with wetlands included spotted jewelweed (*Impatiens capensis*), boneset (*Eupatorium perfoliatum*), spotted Joe-pye weed (*Eupatorium maculatum*), spotted water hemlock (*Cicuta maculata*) and common reed (*Phragmites australis*).

An abandoned field on the east and south side of the central woodland contained upland meadow species and scattered shrubs. Species included awnless brome grass *(Bromus inermis)*, Canada goldenrod, tartarian honeysuckle (*Lonicera tatarica*), red-osier dogwood, red clover, cow vetch and common milkweed (*Asclepias syriaca*).

An open field and slope community in the northwest part of the subject property, east and west of Midtown Creek and adjacent to the industrial lands not on the subject property, had low species diversity and contained many typical regenerating field species such as Queen Anne's lace (*Daucus carota*), Canada goldenrod, choke cherry, American mountain ash (*Sorbus americana*), Virginia creeper, marginal wood fern (*Dryopteris marginalis*), Deptford pink (*Dianthus armeria*) and foxglove beardtongue (*Penstemon digitalis*). Numerous stems of European buckthorn were scattered throughout.

Another pocket lay to the west of the Brook Road allowance along an east-west fencerow. Similar pioneer species to those found above were found this pocket also had a notable component of deciduous and shrub regeneration of species including white ash, hawthorn, staghorn sumac (*Rhus typhina*), eastern white cedar (*Thuja occidentalis*) and eastern white pine.

Photo 2. Old field meadow (Photo taken Sept 17, 2014)

Community 3 Fresh-moist Poplar Deciduous Forest (ELC Code: FOD 8-1)

The poplar forest was found on the western edge of the central woodlot along the tributary The community was dominated by trembling aspen (*Populus tremuloides*) with balsam poplar, white ash, green ash (*Fraxinus pennsylvanica var. subintergerimma*), eastern white cedar (*Thuja occidentalis*), eastern white pine, black cherry (*Prunus serotina*), red oak (*Quercus rubra*), Manitoba maple, white birch (*Betula papyrifera*) and silver maple (*Acer saccharinum*). There was a considerable amount of deadfall present in the understory. Thirteen butternuts (*Juglans cinerea*) were found in this community.

The shrub layer consisted of snowberry (*Symphoricarpos albus*), purple-flowering raspberry (*Rubus odoratus*), wild red raspberry (*Rubus idaeus*), alternate-leaf dogwood, Alleghany blackberry (*Rubus alleghaniensis*), high bush cranberry, tartarian honeysuckle (*Lonicera tatarica*) and common crabapple (*Malus pumila*). Ground cover included yellow avens (*Geum aleppicum)*, flat top white aster (*Aster umbellatus*), nodding beggarsticks (*Bidens cernua*), clearweed (*Pilea pumila*), wild cucumber (*Echinocystis lobata*), American water-horehound (*Lycopus americana*), field horsetail (*Equisetum arvense*) and hog-peanut (*Amphicarpa bracteata*).

Photo 3. Poplar forest (Photo taken Sept 17, 2014)

Community 4 Cattail Mineral Shallow Marsh (ELC Code: MAS 2-1)

This small wetland pocket just north of Elgin Street and west of the Brook Road allowance was evidently disturbed due to its proximity to the road and agricultural fields. The wetland was dominated with narrow-leaved cattail (*Typha angustifolia*). Additional species in the cattail marsh included boneset, American water-horehound, wild mint (*Mentha arvensis*), spotted jewelweed, reed canary grass (*Phalaris arundinacea*), sensitive fern, red-osier dogwood and flat top white aster.

A high spot in the southeast corner had some eastern white cedar, eastern white pine and weeping willow (*Salix babylonica*).

Photo 4. Cattail marsh (Photo taken Sept 17, 2014)

Community 5 Manitoba Maple / European Buckthorn Fencerow (no applicable ELC Code)

This disturbed community was a regenerating fencerow dominated by Manitoba maple and European buckthorn. Other species found here included black cherry, Philadelphia fleabane (*Erigeron philadelphicus*), yellow avens, wild grape (*Vitis riparia*), smooth gooseberry (*Ribes hirtellum*), ox-eye daisy (*Chrysanthemum leucanthemum*) and purple-stemmed aster (*Aster puniceum*).

Photo 5. Manitoba Maple/Buckthorn fencerow (Google map)

Community 6 Cultural Regenerating Thicket (no applicable ELC Code)

Community 6 is a regenerating community along the field edge on the slope west of the Brook road allowance and also on along the south border of the central woodland and north easterly extent of the Brook Creek tributary. This community had co-dominants of trembling aspen, Manitoba maple and balsam poplar with densely regenerating European buckthorn in the understorey. Due to the high density of the buckthorn, species variety was very low but included downy yellow violet (*Viola pubescens*), choke cherry, Virginia creeper, American elm, wild cucumber and tall buttercup (*Ranunculus acris*).

Photo 6. Thicket (Photo taken Sept 17, 2014)

Community 7 Dry-moist Old Field Meadow (ELC Code: CUM 1-1)

This open field and slope community in the northwest end of the subject property had low species diversity and contained many typical regenerating field species such as Queen Anne's lace (*Daucus carota*), Canada goldenrod, choke cherry, American mountain ash (*Sorbus americana*), Virginia creeper, marginal wood fern (*Dryopteris marginalis*), Deptford pink (*Dianthus armeria*) and foxglove beardtongue (*Penstemon digitalis*). Numerous European buckthorn were scattered throughout.

Photo 7. Cultural Field Meadow (Google map)

Community 8 Dry-fresh White Ash Deciduous Forest (FOD4-2)

Found along the slope of the intermittent tributary was a disturbed community that had regenerated in a young white ash *(Fraxinus americana)* stand (1-10 cm dbh). The community was surrounded by a dense eastern white cedar community. Additional species included black cherry, trembling aspen, American mountain ash and Scot's pine (*Pinus sylvestris*).

Photo 8. White ash deciduous forest (Photo taken Sept 17, 2014)

Community 9 Bluejoint Mineral Meadow Marsh (ELC Code: MAM 2-1)

This community was part of the creek floodplain and extended east of the Brook Road allowance. The meadow marsh was dominated by Canada bluejoint (*Calamagrostis canadensis*) and had lesser components of sensitive fern, common elderberry (*Sambucus canadensis*), mayapple, purple-stemmed aster, bitter nightshade, tall buttercup and ostrich fern (*Matteuccia struthiopteris*).

Photo 9. Bluejoint meadow marsh (Photo taken Sept 17, 2014)

Community 10 Dry-moist Old Field Meadow (ELC Code: CUM 1-1)

This community as well as Communities 11a, 11b and 12 lay to the west of the Brook Road allowance. Community 10 was comprised of similar pioneer species to those found in Community 2. It, however, also had a notable component of deciduous and shrub regeneration of species including white ash, hawthorn, staghorn sumac, eastern white cedar and eastern white pine.

Photo 10. Cultural Field Meadow (Photo taken Sept 17, 2014)

Community 11a Dry-fresh White Cedar Coniferous Forest (ELC Code: FOC 2-2)

This thicket community was comprised entirely of regenerating eastern white cedar. The cedar was very dense inhibiting any undergrowth with the deep shade and leaf litter.

Community 11b Fresh-moist White Cedar Coniferous Forest (ELC Code: FOC 4-1)

The cedar forest towards the toe of the slope was comprised of eastern white cedar with scattered green/red ash *(Acer pennsylvanica)* and trembling aspen *(Populus tremuloides)*. The groundcover was dominated by a variety of meadow and field species.

Community 12 Cultural Thicket White Ash Regeneration (ELC Code: no applicable ELC Code)

This regenerating thicket of young white ash was also quite dense. It had a much lower component of eastern white cedar, and there were a few larger white ash specimens that had provided the seed source for the young white ash regeneration.

Photo 11. Ash regenerating thicket (Google map)

Community 13 Forb Mineral Meadow Marsh (ELC Code: MAM 2-10)

The narrow riparian belt on either side of the creek was dominated by ferns and wetland plants. Three wetland areas were identified, each approximately 10 m wide and 40 m long. Species included wild red raspberry, purple loosestrife (*Lythrum salicaria*), ostrich and sensitive ferns, dwarf enchanter's nightshade (*Circaea alpina*), field horsetail and common cattail (*Typha latifolia*).

Photo 12. Meadow Marsh (Photo taken Sept 17, 2014)

BELL PROPERTY: COMMUNITIES SOUTH OF ELGIN STREET WEST
(Southwest corner of Elgin Street West and Brook Road)

Community 14a Fresh-moist White Cedar Coniferous Forest (ELC Code: FOC 4-1)

The cedar forest on the southwest corner of Brook Road and Elgin Street was very dense and therefore had very little understory, particularly in some areas. The second most dominant species was European buckthorn of which there were several mature, multi-stemmed specimens. Small openings in the western portion and edges on the north and east side contained a mixture of regenerating species and open meadow species. Edge species included field horsetail, saplings of balsam poplar, poison ivy (*Rhus rydbergii*), high bush cranberry, hawthorn, wild grape, bitter nightshade and sensitive fern. This community was part of a cattle pasture and had numerous trails, cedar forts and disturbed areas in the centre.

Photo 13. Cedar Coniferous Forest (Google map)

Community 14b White Cedar Mineral Coniferous Swamp (SWC1-2)

The western portion of the cedar forest became moister as the slope flattened. The pits and mounds, buttressed trees and organic soils are all indicators of a wetland. The change from open cedar forest with no groundcover to scattered pockets of evergreen wood-fern *(Dryopteris intermedia)*, sensitive fern *(Onoclea sensibilis)* and bitter nightshade signaled a change to a wetland community. Soils were moist to saturated with a sandy silt composition and evidence of gleying. Drainage from the wetland Community 18 was evident in an intermittent channel through the community where pussy willow, red-osier dogwood *(Cornus stolonifera)* and sensitive fern were dominant. Soils were also more organic in this feature.

Buckthorn was widely scattered in this community with small patches towards the west side of the creek.

Community 15 Dry-moist Old Field Meadow (ELC Code: CUM 1-1)

This field community located on the lee end of a drumlin. This area had been used as pasture up until 2005. This old field habitat contained awnless brome grass with weedy and spiny species scattered throughout as cattle avoid these plants. Species included mature hawthorn, wild red raspberry, Canada thistle and viper's bugloss (*Echium vulgare*). The community edge was distinct with hawthorn and buckthorn become very dense along the edge.

Photo 14. Cultural Field Meadow (Google map)

Community 16 Forb Mineral Meadow Marsh (ELC Code: MAM2-10)

At the culvert outlet where the creek passed under Elgin Street and between the tree line and the road, there was a meadow marsh dominated by reed canary grass. Marsh marigold (*Caltha palustris*) was found along the creek channel and in pockets scattered throughout this community. Other species such as swamp milkweed (*Asclepias incarnata*), spotted jewelweed, marsh bedstraw, common water-plantain (*Alisma plantago-aquatica*), purple loosestrife and bitter nightshade were also present. The community was broadest near Elgin Street and contained small pockets of standing water and an uneven topography (pits and mounds).

Photo 15. View of meadow marsh and marsh marigold mounds (Photo taken May 7th, 2015)

Community 17 Cultural Thicket (no applicable ELC Code)

A split rail fence delineated a change from a pure eastern white cedar community to a mature buckthorn thicket with pockets and rows of mature eastern white cedar. The pattern is typical of fields that were open meadows with scattered stands and individual cedar. As the field succeeds, buckthorn fills in all the gaps creating a very dense buckthorn thicket with remnant cedar trees and stands. Eastern white cedar was now regenerating under the buckthorn due to the shade and moist microclimate. Scattered mature to over mature hawthorn were widely scattered in this community.

Community 18 Willow Mineral Thicket Swamp (ELC Code: SWT2-2)

This swamp community contained crack willow, slender willow, eastern white cedar and eastern hemlock (*Tsuga canadensis*). The community was very hummocky with some organic patches containing species similar to Community 16. Pockets of dense willow were present at the south end of the community.

Photo 16. Willow Mineral Thicket Swamp (Google Earth Street View)

Community 19 Cultural Thicket and Successional Meadow (no applicable ELC Code)

The southern half of the property was a mix of agricultural fields and successional meadow. As in other parts of the property, European buckthorn was regenerating throughout the abandoned fields. Scattered stands and individual cedar were still present.

Community 20 Cattail Mineral Shallow Marsh (ELC Code: MAS 2-1)

This community was identified on the eastern side of the property and was a linear feature along the tributary. Dominated by a dense stand of narrow-leaved cattail (*Typha angustifolia*). The wetland edges contained Canada goldenrod (*Solidago canadensis*) and Canada bluejoint grass (*Calamagrostis canadensis*).

Photo 17. Cattail marsh (Photo taken Sept 17, 2014).

Community 21 Forb Mineral Meadow Marsh (ELC Code: MAM2-10)

Two small vernal pools were found in the central woodlot. Along the northwest corner and south central portion of the woodland, these pools provided seasonal amphibian breeding habitat. The pockets were mainly comprised of wetland grasses including Canada bluejoint.

Community 22 Deciduous Woodland (FOD)

This community was identified just north of the cattail marsh adjacent Elgin Street. This linear community was dominated by deciduous tree species including crack willow (*Salix fragilis*), white ash (*Fraxinus americana*) and balsam poplar (*Populus balsamifera*).

Photo 18. Deciduous Woodland (Google map)

3.3 Birds

A variety of habitats were present for the 53 bird species recorded in 2006 and 2011 on the subject property including open fields, wetlands and forests with good vertical structure. Species observed in the woodlands included a great horned owl (*Bubo virginianus*) which is thought to be roosting and nesting in the large pine trees.

Seven area sensitive bird species were among those recorded and include the Cooper's hawk (*Accipiter cooperii*), winter wren (*Troglodytes hiemalis*), veery (*Catharus fuscescens*), black and white warbler (*Mniotilta varia*), ovenbird (*Seiurus aurocapilla*), American redstart (*Setophaga ruticilla*) and savannah sparrow (*Passerculus sandwichensis*).

Field and hedgerow species included savannah sparrow *(Passerculus sandwichensis)*, red-tailed hawk (*Buteo jamaicensis*) and bobolink (*Dolichonyx oryzivorus*).

The great horned owl and Cooper's hawk (*Accipiter cooperii*), were observed in the woodland to the west and in the central woodland on several occasions during 2006 surveys and may be nesting in this area. No stick nests were observed in the woodland except those of American crow. No further observations were made of these birds after 2006.

The marshes harboured yellow warbler *(Dendroica petechia)*, red-winged blackbird *(Agelaius phoeniceus)* and common yellowthroat (*Geothlypis trichas*). Two sedge wrens singing during the October 2005 survey were considered late migrants. This species was not recorded during the breeding bird surveys or other times on site.

Bird species found in the central woodland include great-crested flycatcher (*Myiarchus crinitus*), red-eyed vireo (*Vireo olivaceus*), wood thrush (*Hylocichla mustelina*), eastern wood-pewee (*Contopus virens*), American redstart and ovenbird.

A cumulative list of birds observed during the surveys is found in Appendix II.

3.4 Mammals

A total of four mammal species were observed during 2014 field visits and include white-tailed deer (*Odocoileus virginianus*), black bear (*Ursus americanus*), eastern chipmunk (*Tamias striatus*) and a hairy-tailed mole (*Parascalops breweri*).

An additional six species were observed in previous years (NEA, 2007) and included black squirrel (*Sciurus carolinensis*), raccoon (*Procyon lotor*), red fox (*Vulpes vulpes*), striped skunk (*Mephitis mephitis*), meadow vole (*Microtus pennsylvanicus*), and a northern short-tailed shrew (*Blarina brevicauda*).

3.5 Reptiles and Amphibians

Amphibian species recorded during 2014 field visits included the wood frog (*Rana sylvatica*) and mink frog (*Rana septentrionalis*).

Information collected in previous field investigations (NEA, 2007) identified northern spring peeper (*Pseudacris crucifer),* American toad (*Bufo americanus*) and eastern gray treefrog (*Hyla versicolor*) as being present. Northern leapord frogs (*Rana pipens*), Amercian bullfrogs (*Rana catesbeiana*) and green frogs (*Rana clamitans*) were observed during the 2011 surveys.

Three ephemeral ponds were noted during the spring amphibian surveys in April 2006 (NEA, 2007). These ponds were identified as Community 21 on Figure 1. Ephemeral ponds/pools are areas that are flooded in the spring after the snowmelt and provide short term (4-8 weeks) habitat for spring breeding frog species. This site contained a deeper pool and shallow flooded meadow approximately 20 x 10 metres. Spring peeper and wood frogs were heard at calling code 3 as per the Marsh Monitoring methodology. Tadpoles were noted in this pool in early May. The last pool examined was a small but deep pool approximately 5 x 15 metres located on the south side of the central woodland. On April 10th, 2006, wood frogs were calling (code 3) in this pool.

3.6 Fish and Aquatic Habitat

3.6.1 Aquatic Habitat

3.6.1.1. Cobourg Creek Watershed

Midtown Creek and Brook Creek are part of the Cobourg Creek watershed. The Cobourg Creek watershed is located within the Ganaraska Region Conservation Authority (GRCA) and drains into Lake Ontario; it is the second largest basin within the GRCA jurisdiction. Cobourg Creek watershed originates from the Oak Ridge Moraine, it drains a land base area of 123.2 km and is approximately 17.7 km long and 6.7 km wide at its widest point at the northern boundary of the watershed. (GRCA, 2008)

3.6.1.2. Aquatic Habitat Assessments

The study area was classified into three aquatic habitat zones in 2006, based on substrate composition, riparian habitat, percent in-stream cover and unique features. Habitat zones are illustrated in Figure 2.

Habitat Zone Descriptions

Brook Creek – Habitat Zone 1 & 3

Habitat Zone 1 was located in the Brook Creek tributary located immediately north and south of Elgin Street East in the bell property. Habitat Zone 3 was also located in the Brook Creek tributary approximately 300 m northeast of Habitat Zone 1 in the woodlot (Figure 2). During the 2006 habitat assessments the tributary was mainly comprised of intermittent flows primarily in the north and western portions of the tributary. The south western portion of the tributary had a well-defined channel with evidence of erosion on both sides of the bank, the wetted water widths ranged from 0.3 m to 0.6 m with water depths of 0.03 m to 0.08 m. Due to a change in the flows to the south and abandonment of the natural flow pattern southwest across the Brook Road allowance, access to the upstream areas has been impeded (NEA, 2007). During the 2015 field visit there was no flowing water within the tributary, only pockets of standing water.

Photo 19. Habitat Zone 1, Brook Creek S of Elgin Street East, looking downstream, facing south (Photo taken May 7th 2015).

Photo 20. Habitat Zone 3, Brook Creek, photo showing no flow in tributary (Photo taken May 7th 2015).

Midtown Creek – Habitat Zone 2

Habitat Zone 2 was located in Midtown Creek, north and south of Danforth Road, approximately 800 m northwest of Habitat Zone 3 (Figure 2). During the 2006 assessments, the habitat upstream of the culvert located on Danforth Road was well defined with minimal flows due to overgrown terrestrial grasses; the substrate was dominated by silt and sand. Wetted widths ranged from 0.15 m to 0.3 m with depths of 0.10 m to 0.20 m. Downstream of the culvert the channel widened to approximately 1.2 m and eventually dissipated into a wetland habitat. The substrate directly downstream of the culvert was dominated by gravel and cobble (NEA, 2007). Similar habitat features were observed in 2015, with the exception of increased flow and local areas of higher velocity.

Photo 21. Habitat Zone 2, Midtown Creek, looking upstream facing north (Photo taken May 7th 2015).

3.6.2 Fish Community

Brook Creek

Fish presence and community was sampled for in Habitat Zone 1 (2006 and 2015) and Habitat Zone 3 (2006, channel was dry in 2015). In the zone, two electrofishing samples (2006 & 2015) and two minnow trapping samples were completed.

Electrofishing surveys were conducted directly south of the Elgin Street East culvert and two minnow traps set upstream and two were set downstream of the Elgin Street East culvert. The fifth minnow trap was set in Habitat Zone 3, located in the middle of tributary in the woodlot between Greer Road and Elgin Street East (NEA, 2007) (Figure 2).

The Brook Creek fish presence sampling found fish during both spring and summer sampling events in 2006. NEA staff attempted to electrofishing in 2015 but the channel was dry and therefore sampling could not be completed. Results from 2006 samples have been summarized in Table 1.

The Brook Creek fish community (d/s of Elgin) sampled in 2006 had a total abundance of 5 individuals from one fish species, northern redbelly dace (NEA, 2007). The fish community sampled in 2016 had a lower total abundance of one individual from a different fish species, brook stickleback (NEA, 2007). The fish species represent different families, the northern redbelly dace belonging to the family *Cyprinidae* and the brook stickleback belonging to the family *Gasterosteidae.* The fish species observed in Brook Creek downstream of Eglin Street East Creek are both cool water fish species, common to the Cobourg Creek watershed (Table 1). Results from 2006 and 2015 sampling surveys have been summarized in Table 1. Detailed results for the 2015 sampling can be found in Appendix III.

Midtown Creek

Fish presence and community was sampled for in Habitat Zone 2 in 2006 and 2015. In the zone, two electrofishing samples (2006 & 2015) and two minnow trapping samples were completed.

Electrofishing surveys were conducted upstream and downstream of the Danforth Road culvert. Minnow trap were set upstream (2 traps) and downstream (2 traps) of the Danforth Road culvert (NEA, 2007) (Figure 2).

The Midtown fish community sampled in 2006 had a total abundance of 17 individuals from two fish species, representing two families, *Cyprinidae* and *Gasterosteidae* (NEA, 2007). The fish community sampled in 2015 had a higher total abundance of 172 individuals, represented by five fish species and two families, *Cyprinidae* and *Gasterosteidae* (NEA, 2007). Similar to the 2006 fish community results, these species represented families the same two families *Cyprinidae* and *Gasterosteidae.* The fish species observed in Midtown Creek are both warm and cool water fish species, common to the Cobourg Creek watershed (Table 1). Results from 2006 and 2015 sampling surveys have been summarized in Table 1. Detailed results for the 2015 sampling can be found in Appendix III.

Table 1. NEA Fish Community Results (2006 & 2015).

Family Name	Common Name	Scientific Name	Thermal Regime (Scott & Crossman, 1998)	Habitat Zone 1 (Brook Creek)				Habitat Zone 2 (Midtown Creek)				Habitat Zone 3 (Brook Creek)	
				Sample 1	Sample 2	Sample 3	Sample 4	Sample 1	Sample 2	Sample 3	Sample 4	Sample 1	Sample 2
				14-May-06	12-Jun-06	20-Jun-06	7-May-15	14-May-06	12-Jun-06	20-Jun-06	7-May-15	14-May-06	12-Jun-06
Cyprinidae	bluntnose minnow	*Pimephales notatus*	warmwater	0	0	0	0	0	0	0	4	0	0
	creek chub	*Semotilus atromaculatus*	coolwater	0	0	0	0	0	0	0	18	0	0
	fathead minnow	*Pimephales promelas*	warmwater	0	0	0	0	0	0	0	2	0	0
	northern redbelly dace	*Chrosomus eos*	coolwater	5	0	0	0	0	12	0	0	0	0
	YOY minnow sp.	*Cyprinidae sp.*	/	0	0	0	0	0	0	0	144	0	0
Gasterosteidae	brook stickleback	*Culaea inconstans*	coolwater	0	0	0	1	0	5	0	4	0	0
Catch Summary													
		Abundance		5	0	0	1	0	17	0	172	0	0
		Species Diversity		1	0	0	1	0	2	0	5	0	0
Environmental Conditions													
		Air Temperature (°C)		/	/	/	22.6	/	/	/	22.6	/	/
		Stream Temperature (°C)		/	/	/	9.5	/	/	/	9.5	/	/
Sample Attributes													
		Gear Type*		MT	EF	MT	EF	MT	EF	MT	EF	MT	MT
Electrofishing Attributes													
		Frequency (hertz)		n/a	/	n/a	60	n/a	/	n/a	70	n/a	n/a
		Voltage			/		100		/		280		
		Site Length (m)			/		4.95		/		17.36		
		Average Width (m)			/		5.6		/		1.54		
		Shocker Seconds			/		273		/		676		
		Effort sec/m²			/		9.8		/		25		

Legend: (/) data not available
(n/a) not applicable
(*) gear type; EF=Electrofisher, MT=Minnow Trap

3.6.3 Surface Water Quality

Surface water quality parameters were collected on May 7th 2015 within the electrofishing sampling areas of both sites approximately 0.2m below the surface of the water (Figure 2). Raw data have been summarized in Table 2. Detailed results can be found in Appendix IV.

Table 2. Surface Water Quality Results (7-May-15).

Surface Water Quality Parameters	Site 1	Site 2
Air Temperature (°C)	22.6	25
Water Temperature (°C)	9.5	17.5
Dissolved Oxygen (mg/L)	7.54	9.44
Total Dissolved Solids (mg/L)	452.9	604
Conductivity (um/cm)	491	786
pH	6.9	7.1
Turbidity (NTU)	0.42	1.68

Dissolved Oxygen (mg/L)

Dissolved oxygen is the measurement of the amount of oxygen dissolved within the water (EPA, 2012). The lowest acceptable range for cold water biota is 8-10 mg/L and 5-8 mg/L for warm water biota. Site 1 was slightly below the lowest acceptable range with a reading of 7.54 mg/L and Site 2 was within the lowest acceptable range for cool water biota with a reading of 9.44 mg/L (Table 2) (Canadian Council of Ministers of the Environment, 2002).

The dissolved oxygen sensor in the YSI Pro 2010 has a range of 0 to 50 mg/L, with an accuracy of ±0.2mg/L in the 0 to 20 mg/L range and ±0.6 mg/L in the 20 to 50 mg/L range (YSI Incorporated, 2010).

Total Dissolved Solids (TDS) (mg/L)

TDS is defined as the amount of inorganic salt and organic matter that are dissolved in water. TDS concentrations are the sum of cations and anions in the water (Health Canada, 2009). Sources of TDS include fertilizers, road runoff, industrial discharges and soil erosion (EPA, 2012). TDS at Site 1 was 452.9 mg/L and 604 mg/L at Site 2 (Table 2).

The Canadian Council of Ministers of the Environment does not have specific guidelines for TDS in relevance to the protection of aquatic life (Canadian Council of Ministers of the Environment, 2002). The TDS sensor range is 0 to 100g/L (YSI Incorporated, 2010).

Conductivity (us/cm)

Conductivity is the measure of capability of water to pass an electrical current (EPA, 2012). Conductivity at Site 1 was 491 us/cm and 786 us/cm (Table 2). The Canadian Council of Ministers of the Environment does not have specific guidelines for Conductivity in relevance to the protection of aquatic life (Canadian Council of Ministers of the Environment, 2002). The conductivity sensor range is 0 to 200 mS/cm with an accuracy of ±0.5% or 0.001 mS/cm, whichever is greater (YSI Incorporated, 2010)

pH

pH is the measures how acidic or basic a substance is (EPA, 2012). Local conditions in 2015 were alkaline with readings of 6.9 (Site 1) and 7.1 (Site 2) (Table 2). Both readings were in the acceptable pH range of 6.8-8.5 (Energy, 1994).

The pH handheld waterproof pH meter range is -2.00 to 16.00 and the accuracy at 20°C is ±0.05 pH (Hanna Instruments, 1995-2004).

Turbidity (NTU)

Turbidity is the measure of water transparency or clarity. The lack of clarity is caused by biotic and abiotic suspended or dissolved substances in the water. The more concentrated these substances are the higher the turbidity reading. The turbidity taken at Site 1 was 0.42 NTU and 1.68 NTU at Site 2 (Table 2). Both readings were defined as normal (Energy, 1994).

The accuracy of the turbidity meter is ±0.05 when measurements are from 0-2.5 NTU, ±2% when measurements are 2.5-100NTU and ±3% when measurements are 100NTU or greater (Hoskin Scientific, 2013).

3.7 General Hydrology

The woodland areas contained several wetland pockets, many located along an ephemeral streambed which was dry during the time of the site visits. The drainage is divided between the Brook Creek watershed which includes the eastern portion of the site and the intermittent tributary and the Midtown Creek watershed which includes the western portion and the permanent warm water creek (NEA, 2007).

3.8 Hydrogeology

The water table takes the general shape of the landscape and shallow groundwater movement follows the terrain. The water table depth on the site is considered to be relatively shallow over most of the site; however, it is deeper in upland areas and shallower in lowland areas. On July 7th, 2006 the water table was observed to be at surface at several watercourses and at 0.6 and 0.45 metres below grade (Goff, 2006).

4.0 Resource Significance

4.1 Key Features and Ecological Functions

4.1.1 Overview

The key natural features and functions of the study area are:

- Woodlands
- Significant Wildlife Habitat (SWH)
- Species At Risk
- Watercourse through central woodland and north of Elgin St. East
- Species At Risk (bobolink, bank swallow, barn swallow, wood thrush and eastern meadowlark)
- Significant vegetation species (butternut)
- General wildlife habitat
- Fish habitat in Midtown Creek
- Fish habitat downstream of Elgin Street on tributary of Brook Creek
- Unevaluated wetlands

The impact assessment of these features is discussed in greater detail in Section 6.0.

Additional ecological features and functions of the upland area and the adjacent wetland would be transitional habitat from wetland to upland and local wildlife linkage.

A review of the NHIC database did not identify any significant natural heritage features (PSWs, or ANSIs) within the subject property or within 120 metres.

4.1.2 Woodlands

The Natural Heritage Reference Manual outlines the criteria for significant woodlands. Features of the woodland based on field inventories were compared against Natural Heritage Reference Manual criteria (MNRF, 2010). Aerial imagery and the in-house "NEA mapper" was used to determine sizes and dimensions of woodlot features using the "measure tool".

Woodland cover within the Municipality was determined using data from a spreadsheet containing the area of different forest types based on the Southern Ontario Land Resource Information System (SOLRIS) which provides a landscape level inventory of woodland features. To calculate the percent cover, the area of the municipality was determined (to the edge of Lake Ontario and including all inland waterbodies) and the area of "woodland" features based on SOLRIS.

Vegetation categories that were included within the "woodland" designation included forest, coniferous forest, mixed forest, deciduous forest and hedge rows. The percent woodlot cover was then derived using the total woodland cover using the above categories within the area of the municipality. NEA did not include swamp within the percent woodland cover. Woodlands are considered significant if they meet the minimum standard for any one of the criteria within listed categories including size; woodland interior; proximity to other significant woodland or habitats; linkages; water protection; and woodland diversity representation (composition and uncommon characteristics). The woodland percentage cover within Northumberland County was determined to be approximately 20% and all criteria listed above will be rated based on this percentage.

The central woodland located on the subject property would be considered significant based on the categories met within the Natural Heritage Reference Manual (MNRF, 2010). The woodland meets the significance criteria for Water Protection and Woodland Diversity Representation.

Additionally, the secondary Plan report (Gartner Lee) identified the central woodland as containing high or in some portions moderate development constraints. The forest is mature and provides interior habitat, amphibian breeding habitat and the creek bed provides wetland habitat.

Literature Review: Secondary Plan Report (Gartner Lee)

Portions of both the subject property north of Elgin Street and the additional study area south of Elgin Street have been identified as having a high level of development constraint (Figure 2) in the report prepared for the Town of Cobourg by Gartner Lee (2004). Refer to Appendix VII of the current report for Constraints. High constraint designations identify the presence of features and functions such as wetlands and wet areas with important amphibian breeding habitat, high quality, mature forest, interior forest habitat, valley bottoms and flood plains, etc. Areas determined to have a moderate development constraint were those with smaller or lower functioning wetlands, immature forest, steep slopes, recharge areas, and areas between development and high constraint areas, therefore serving as a buffer.

Part of the northwest corner of the property contains hazard lands identified by the Ganaraska Region Conservation Authority as part of the Mid-Town Creek floodplain. Portions of the woodland (mainly the cedar forest) are identified as moderate constraint areas.

The Brook Creek (west branch) and the woodland (primarily white pine forest; Community 1) on the subject property are also recognized as having primarily high, or in some portions moderate development constraints. The forest is mature and provides interior habitat, amphibian breeding habitat and the creek bed provides wetland habitat.

A portion of the western limit of the property south of Elgin Street is also subject to these hazard land limitations as a result of the area of the Brook Creek (west branch) flood plain area. A large portion of the remainder of the property is either identified as either high or moderate constraint, likely due to the presence of wetland and woodland.

4.1.3 Significant Wildlife Habitat

A high level review of the Significant Wildlife Habitat (SWH) outlined in the Eco Region Criteron Schedule identified the potential for (Candidate) migratory butterfly stopover, waterfowl nesting area, turtle nesting, marsh breeding habitat and amphibian movement corridors. None of these were confirmed based on our field work. The potential for these SWH were based on the presence of ELC Codes within the study area.

In addition, several other criteria were confirmed based on our field surveys. This includes amphibian breeding habitat (woodland pools); woodland area sensitive bird breeding habitat; raptor nesting (great horned owl); and special concern and rare wildlife species (wood thrush, eastern wood-pewee).

4.2 Significant Species

Vegetation

A review of the list of plant species recorded on site found that five plant species were significant on a national, provincial or regional level, the federally and provincially endangered butternut tree *(Juglans cinerea)* and four regionally rare species (COSEWIC, 2017, COSSARO, 2017; Riley, 1989) (Appendix I-B).

The butternut has declined across Ontario due to the presence of a butternut canker or fungus that kills the tree. Fourteen trees were assessed by a certified Butternut Health Assessor and eight of these have been analyzed as retainable trees. Retainable trees are protected under the Ontario Endangered Species Act (2007). Butternuts require a buffer of 25 m from the base of the tree. A report will be sent to the local MNRF Species at Risk Biologist to provide details on the tree locations and BHA results. An ESA permit and planting plan are required if protection cannot be afforded and removal is necessary. The locations of the retainable trees are found on Figure 3.

Four regionally rare plant species were found on the property: purple flowering raspberry *(Rubus odoratus)*, American mountain ash *(Sorbus americana)*, European wood-sorrel *(Oxalis stricta)* and slender-leaved agalinis *(Agalinis tenuifolia)* (Riley, 1989)(Appendix I-B). All of these species were found at various locations on the property. The agalinis was present in the lower sections of the Brook Road allowance north of Elgin Street. Discussions with GRCA will determine if those specimens are to be salvaged prior to construction and relocated.

Birds

A review of the Ontario Breeding Bird Atlas (BSC 2005) Square Information Summary Sheet for the 10 x 10 km atlas square (17QJ27) that includes the subject property found fifteen (15) species listed either federally or provincially significant (Table 3).

Of the species recorded also found listed in the Atlas square, barn swallow (*Hirundo rustica*), bobolink (*Dolichonyx oryzivorus*), eastern wood-pewee (*Contopus virens*), bank swallow (*Riparia riparia*), wood thrush (*Hylocichla mustelina*), eastern meadowlark (*Sturnella magna*) were recorded on site during field visits in 2011 and 2006 (Appendix II).

The presence of bobolink in the fallow field west of the proposed Brock Road allowance (Community 2d) is directly within the proposed building envelope. It is recommended that the habitat be reassessed prior to draft plan approval to determine whether it still exists and

whether birds are still nesting here. If habitat still exists and birds are observed consultation with the MNRF Species at Risk Biologist will be required to determine the appropriate measures for species protection.

Seven area sensitive birds were recorded on site in 2006 and 2011. Area sensitive species are those that require a minimum hectarage of contiguous suitable habitat to successfully breed (MNR, 2000). These species include Cooper's hawk (*Accipiter cooperii*), winter wren (*Troglodytes hiemalis*), veery (*Catharus fuscescens*), black and white warbler (*Mniotilta varia*), ovenbird (*Seiurus aurocapilla*), American redstart (*Setophaga ruticilla*) and savannah sparrow (*Passerculus sandwichensis*) (Appendix II).

Great-horned owls are suspected to be nesting within the woodland. Although not a Species At Risk, raptor nests are protected under the Fish and Wildlife Conservation Act and as Significant Wildlife Habitat under the Provincial Policy Statement.

No regionally significant bird species were recorded on site (OMNR, 1993)(Appendix II).

Table 3. Provincially rare species at risk recorded for the Atlas of the Breeding Birds of Ontario

Species	COSEWIC (2017)	COSSARO (2017)	Habitat Preferences (OMNR 2000)	Habitat found on subject property	Recorded during field visits
Least Bittern	THR	THR	Prefers deep marshes, swamps, bogs; marshy borders of lakes, ponds, streams, ditches; dense emergent vegetation of cattail, bulrush, sedge; nests in cattails	No	No
King Rail	END	END	Prefers large, shallow, fresh water marshes, shrubby swamps, marshy borders of lakes and ponds with abundant vegetation; an 'edge' species;	No	No
Black tern*	NAR	SC	Prefers wetlands, coastal or inland marshes; large cattail marshes, marshy edges of rivers, lakes or ponds, wet open fens, wet meadows;	No	No
Common Nighthawk	THR	THR	Prefers open ground; clearings in dense forests; ploughed fields; gravel beaches or barren areas with rocky soils; open woodlands; flat gravel roofs	Yes-foraging only	No
Whip-poor-will	THR	THR	Found in a mix of open and forested areas with open woodlands or openings in more mature, deciduous, coniferous and mixed forests.	No	No
Chimney Swift	THR	THR	Commonly found in urban areas near buildings; nests in hollow trees, crevices of rock cliffs, chimneys; highly gregarious, feeds over open water	No	No

Red-headed Woodpecker	THR	SC	Open, deciduous forest with little understory; fields or pasture lands with scattered large trees; wooded swamps; orchards, small woodlots or forest edges; groves of dead or dying trees	No	No
Eastern wood-pewee	SC	SC	Breeding habitat is deciduous, mixed woods or pine plantations	Yes	Yes
Bank swallow	THR	THR	Breeds in a wide variety of natural and artificial sites with vertical banks, including riverbanks, lake and ocean bluffs, aggregate pits, road cuts, and stock piles of soil	No	Yes-flying over site
Barn swallow	THR	THR	Prefers farmlands or rural areas; cliffs, caves, rock niches; buildings or other man-made structures for nesting; open country near body of water	No - structures not present on site	Yes-flying over site
Wood thrush	THR	SC	Breeds in deciduous and mixed forests where there are large trees, moderate understory, shade and abundant leaf litter for foraging	Yes	Yes
Canada warbler	THR	SC	An interior forest species; dense, mixed coniferous, deciduous forests with closed canopy, wet bottomlands of cedar or alder; shrubby undergrowth in cool moist mature woodlands; riparian habitat	Yes	No
Grasshopper sparrow	SC	NAR	Nests on the ground in open grasslands and prairies with patches of bare ground; prefers moist meadows and abandoned fields at an early stage with grasses dominant	No	No

Bobolink	THR	THR	Prefers tall, grassy meadows and ditches, hayfields and some croplands	Yes	Yes
Eastern Meadowlark	THR	THR	Prefers open, grassy meadows, farmland, pastures, hayfields or grasslands with elevated singing perches; cultivated land and weedy areas with trees	Yes	Yes

Least bittern, king rail and black tern are wetland or lacustrine species that would not find suitable habitat in the area of the proposed development. All would be found in marshes along Lake Ontario which are included in the southern end of this atlas square.

Mammals and Herpetozoa

A review of the list of mammal, reptile and amphibian species recorded on site found that none were significant on a national or provincial (COSEWIC, 2017; COSSARO, 2017). The NHIC database did not identify any rare species in the study area.

A review of the NHIC database for squares 17QJ27_73/74/83/84 identified one significant species, Swamp Darner (*Epiaeschna heros*), a dragonfly. The darner is an S2S3 species but has not been recorded in the area since 1941 and the sensitive species is an S3 species whose record is from 1987.

Fish and Fish Habitat

The literature review found no provincially and/or nationally rare species were documented within the study area (COSEWIC, 2017; SARA, 2017; SARO, 2017; OMNR, 2012; OMNR, 2013). No critical habitat for Aquatic Species at Risk or OMNF sensitive spawning areas occurred within the study area (DFO, 2015; OMNR, 2012). No Aquatic Species at Risk were observed during field surveys.

5.0 Proposed Development

The proposed development includes a mix of street townhouses, low density detached and medium density blocks (Appendix V)(The Planning Partnership, May 25, 2016, Drawing No. C, revised Sept. 28, 2017) In addition, high density commercial/residential areas, a school, and seniors housing are planned. The main access will be via a new collector road winding through the site from Elgin Street to Danforth Road East and also back to Elgin Street further east. An extension of Denton Road will also be completed as part of Phase 1. No extension of Brook Road is planned along that road allowance. Changes to the vertical alignment and possible turning lanes are proposed along Elgin Street. Only one crossing of the Brook Road tributary is proposed, just west of Greer Road. A large green corridor is proposed beginning from Greer Road and continuing through the central woodland and crossing Elgin Street. This includes the woodlands, Brook Creek tributary and buffer and all of the wetland communities.

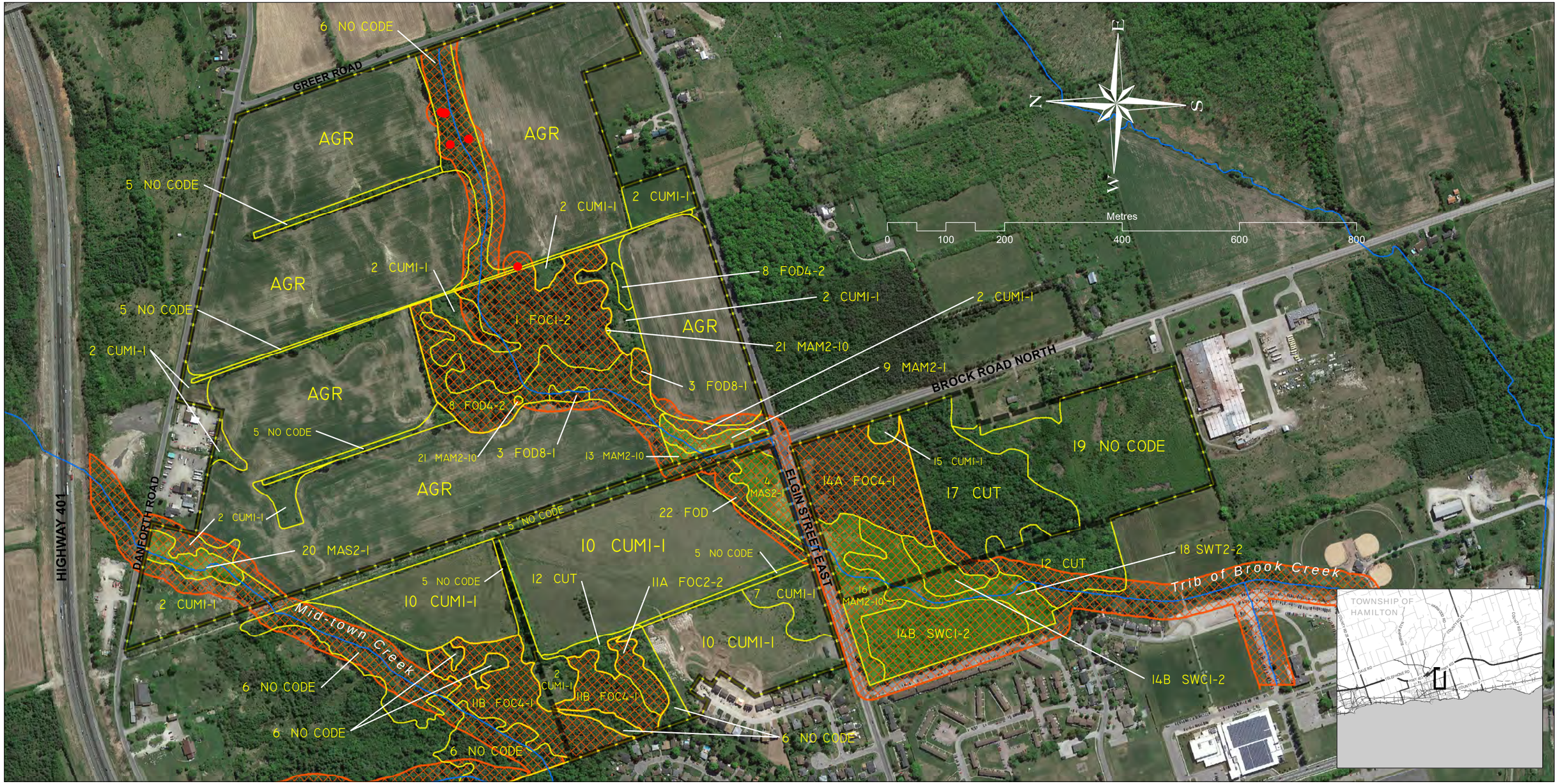
A total of approximately 26.298 ha of property is designated as Environmental Protection (EP) (Blocks 123-128) and will be left in its natural state preserving the woodlands, creeks and other natural features. A total of approximately 0.52 ha of land will be designated as open space on the property and 4.08 ha used for a Community Park, with Stormwater Management areas on 5.95 ha.

Future upgrades to Elgin Street East and Brook Road will be required as part of the improvements to intersections and the road surface. The site will be serviced by municipal water and sewer.

Several stormwater management ponds will be located on the subject property including one on the west side of Brook Road North, two just north of Elgin Street, one just north of the central woodlot and one east of the central woodlot. They will outlet into the Brook Road tributary.

A watercourse road crossing will be located over the Brook Creek tributary east of the woodlot and west of Greer Road. A small section of Brook Creek tributary north of Elgin Street East will be realigned to accommodate road access.

Grading of the site will involve decreasing the elevation of the high drumlin tops and lowering the grades on roadways and existing side slopes.



LEGEND

- Retainable Butternut
- Constraints
- Watercourse
- Property Boundary
- Vegetation Community
- Parcel Fabric
- Wetland Community

Composite imagery acquired in May 2015. DigitalGlobe WorldView-2. 30 cm Resolution.

ELC TYPES (1ST APPROXIMATION)

CODE	TYPE DESCRIPTION
CUMI-1	Dry-moist old field meadow
CUT	Cultural thicket
FOCI-2	Dry-fresh white pine-red pine coniferous forest
FOC2-2	Dry-fresh white cedar coniferous forest
FOC4-1	Fresh-moist white cedar coniferous forest
FOD	Deciduous forest
FOD4-2	Dry-fresh white ash deciduous forest
FOD8-1	Fresh-moist poplar deciduous forest
MAM2-1	Bluejoint mineral meadow marsh
MAM2-10	Forb mineral meadow marsh
MAS2-1	Cattail mineral shallow marsh
SWCI-1	White cedar mineral coniferous swamp
SWT2-2	Willow mineral thicket swamp

FIGURE 3: VEGETATION COMMUNITIES & CONSTRAINTS

Pt Lots 11 & 12, Con 1, Heritage Village of Rondeau
Town of Cobourg, Secondary Plan Area
Peterborough District

UTM Zone 17
WKID: 26917 Authority: EPSG
Transverse Mercator
GCS North American 1983, ESRI ArcGIS 10.1

REVISIONS

NO	BY	DATE	DESCRIPTION
1	W.P.	09/02/2016	Initial map creation.
2	W.P.	09/02/2016	Revised constraints. Removed tributary of Mid-town Creek. Changes labeling.
3	W.P.	10/05/2016	Revised constraints. Added property line. Changed community numbering.

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PROJECT NO: PN14056
REVISION NO.: RV-01
PROJECT: East Cobourg
CLIENT: N/A

SCALE: 1:6,500 CENTIMETERS

NIBLETT ENVIRONMENTAL ASSOCIATES INC. WWW.NIBLETT.CA

6.0 Impact Assessment

6.1 Overview

The latest available proposed draft plan (Appendix V)(The Planning Partnership, May 25, 2016, Drawing No. C, revised Sept. 28, 2017) was used for the completion of the impact assessment.

The impact assessment was completed in three phases. The first phase was to identify the key natural heritage features, significant features, sensitive habitats and plot identified natural heritage designations. This information was derived from existing reports (Meridian Planning Consultants Inc., 2015; Gartner Lee, May 2004), the official plan and from our detailed field surveys and ELC mapping.

The second stage was to assess all of the features and their ecological functions to determine their significance on a local and regional level. This determines the key natural heritage features and functions to be retained in their entirety and those where development may be allowed with buffers and other mitigation measures. This plan was forwarded to the planners and designers to be incorporated into the early concept plans for the community. As the plan was developed additional input was provided where individual elements were proposed adjacent to these key features. The overall intent was to maintain the key existing natural features, including wildlife corridors and linkages, creeks and sensitive habitats. Buffers were determined from key natural features and applied to the site. This information (shapefiles) were supplied to the study team and mapped as part of the site plan constraints.

The final stage was to assess the potential impacts at the site preparation, construction and post-construction stages to ensure that the features and functions identified for preservation would not be negatively impacted. Specific mitigation measures were developed for each element of the development plan to minimize or avoid conflicts with wildlife and natural habitats. The EIS was written to comply with the Secondary Plan and to follow the requirements regarding environmental area designations in the Official Plan.

6.2 Large Central Woodlot Northeast of Brook Road and Elgin Street East

6.2.1 Central Woodlot Description

The main natural feature in the study area is the central woodland. This 10.68 hectare block contained many of the key features found on the site and listed in Section 4.1. The impact on each is explained in the following sections.

Overall the central woodland was identified early on as a significant feature. Preservation of the entire forested area is important for maintaining species diversity on the site post-development. Connections to the creek valleys to the west and east are important to allow species and genetic material to move across the landscape. The lot fabric has been located outside of the dripline of the edge trees, wetlands, creek corridors and sensitive amphibian pools with an appropriate setback to mitigate potential impacts during the site preparation, construction and post-construction phases. A number of site activities have to be mitigated to avoid negative impacts. These include grading, changes in hydrology, sediment and erosion, noise, lighting, changes to landform, urbanization of the fields, road crossings and human activity.

The woodlot contains interior habitat and a mature forest of white pine that provides habitat for area sensitive forest bird species, a diversity of plants, amphibian ponds and wetland pockets associated with the tributaries.

The forest edge is well defined along the southern and western edge with dense vegetation that protects the interior trees from windthrow and negative impacts. The western and southern edges will not be disturbed by the proposed development. The limit of development coincides with the dripline of the outermost trees, as well as a setback of open space to maintain the integrity of the trees and to prevent damage to the sensitive rooting zone from heavy equipment and grading. Installation of silt and snow fencing along the entire perimeter of the central woodland (at the development limit) prior to any site preparation activities is critical to preventing negative impacts and accidental intrusions by equipment operators into the preservation areas.

The central woodland was identified as significant for water protection and woodland diversity representation (Natural Heritage Reference Manual, 2010); these functions will not be impacted post construction. The central woodlot will be retained. The woodland acts as a buffer protecting the watercourse and prevents sedimentation. Additionally, the protection of the woodland will retain the woodland biodiversity. No negative impacts are expected on the woodland as a result of the proposed development.

A network of trails is included within the edge of the woodland as part of the development. The connection to the neighbourhoods and a linear network of trails from the woodland will provide nature appreciation opportunities for residents.

6.2.2 Western Portion

The northern edge contains a young community of aspen and buckthorn. Development is located outside the main treed area. The school block (Block 102) is located on the western side of the woodlot and outside of the contiguous mature forest. Mitigation measures to re-establish the buckthorn forest edge were described in the EIS and the previous addendum. A neighbourhood park exists on the western side of the woodlot just north of the proposed elementary school block. This allows more of the edge communities and disturbed meadows to be retained in the open space block. The benefit is a larger block of contiguous natural habitat.

Part of the redesign was to retain the existing creek channel in its current location and a 15 m buffer. The creek may need minor modifications or realignment associated with the crossing of Street R. This will form part of the fisheries work consultations with DFO and GRCA at that stage of the development.

The preservation of a corridor for wildlife south of Block 102 and the existing creek within the southwest portion of the woodland is still a priority in that area.

The diversity of habitats within the forest and along the edges of the forest community adds to the diversity of habitats and can be important for wildlife species that utilize different habitats at different times of the year. In particular wetlands, drainage channels and small openings in the forest add to the diversity of plant, bird and herpetezoan species. In addition, the creek has several tributaries within the western edge that provide water to fish habitat downstream and support wetland vegetation and amphibian breeding habitat. Retention of all of these habitats in a single contiguous area will maintain the existing features and their functions.

6.2.3 Southeast Corner-Seniors Housing

Mixed use/Seniors housing exists just south of the woodlot. This open area and regenerating thicket is outside the core woodland. The block is located approximately 30 metres south of an identified amphibian breeding pond. No impacts on the continued use of that pond are anticipated as it is also greater than 30 metres from Street B to the south. The area between the seniors housing and the pond is densely vegetated and will be allowed to succeed naturally as it is part of the open space designation. The seniors housing block will not result in a significant loss of forage habitat for the frogs post emergence. There is sufficient area and suitable habitat in the woodland for those species that forage in the leaf litter and shade of the forest during the non-breeding season. Overwintering habitat would also be present and a key function of the woodland.

6.2.4 Phase 1 Woodlot Adjacent to Mid-Town Creek (Block 125)

The north-western woodlot dominated by eastern white cedar existed within the Environmental Protection area (3.13 ha) as seen in the most recent Plan. The edges of the community started to grow into shrubs and some young trees. The forested area acts as a part of the tableland woodlands connected to Midtown Creek. The cedar forest (community 11A-FOC2-2) will be protected and is found within the Environmental Protection Block. The edge community is a regenerating community with meadow species and some small trees. Community 6 is to be mostly removed due to constraints of the double loaded lotting fabric and road alignment. A tree preservation plan and edge management plan are recommended for that edge as part of the detailed design. Restrictive fencing must also be installed prior to any site preparation and grading activities. The need for long term fencing at that location will be discussed with the Town and GRCA.

6.3 Significant Wildlife Habitat

6.3.1 SWH Identification

A high level review identified several candidate SWH. A high level review of the Significant Wildlife Habitat outlined in the Eco Region Criterion Schedule identified the potential for (Candidate) migratory butterfly stopover, waterfowl nesting area, turtle nesting, marsh breeding habitat and amphibian movement corridors. The potential for these SWH were based on the presence of ELC Codes.

NEA did not find these features to be present on site due to the lack of suitable habitat. The fields did not contain an abundance of milkweed or nectar plants and no records of monarchs were identified using the property. Additionally, no waterfowl nests, turtle nests or marsh bird nests were identified during field visits. Lastly, potential for amphibian movement corridors is limited as the breeding ponds exist within a woodland surrounded by agricultural fields.

Several SWH were confirmed during field surveys including woodland area sensitive bird breeding habitat, amphibian breeding habitat (woodland), raptor nesting (great horned owl) and special concern and rare wildlife species (wood thrush, eastern wood-pewee).

6.3.2 Woodland Area Sensitive Bird Breeding Habitat

Seven bird species were observed on the site which are considered area sensitive. Table 4 lists the existing habitat and the potential impact of the development on each species individually.

Table 4. Area Sensitive Bird Species Observed in Study Area (2011 & 2006).

Species	Existing habitat	Impact Post-development
Winter wren	Central woodland, prefer mature mixed and coniferous forest with dense tangles	-no impact on habitat or area -habitat will be retained in central woodland
Veery	Central woodland, prefer cool, damp deciduous or mixed forest with dense undergrowth and thicket swamps	-no impact on habitat or area -habitat will be retained in central woodland
American redstart	Central woodland, prefer open to semi-open deciduous or mixed forest and thickets	-no impact on habitat or area -habitat will be retained in central woodland
Ovenbird	Central woodland, mature undisturbed mixed and deciduous forest	-no impact on habitat or area -recent scientific information finds that individual pairs may use several woodlands in close proximity as part of territory -preservation of suitable habitat in central woodland and Midtown Creek will ensure this species remains.
Cooper's hawk	Central woodland, prefer pine plantations, cedar stands and coniferous or mixed forest	-no nests observed but suitable habitat is present. -preservation of central woodland and Midtown Creek valley and forest will maintain suitable hunting habitat (thickets, backyards, fencerows, woodlands) for this secretive species
Savannah sparrow	Fields east and west of Brook Road allowance, prefer old field meadow and agricultural field edges	-loss of habitat for this species as development phases proceed. Suitable habitat exists to the west and south.
Black-and-white warbler	Inhabits semi-open deciduous or mixed woodlands.	-no loss of habitat, as central woodland is to be preserved

6.3.3 Amphibian Breeding Habitat (Woodland) (3 Pools)

Three amphibian breeding ponds will be retained within the environmental areas and mitigation measures put in place to maintain existing conditions including hydrology.

Pond #1 is located in Communities 14 and 16 on the south side of Elgin Street. This area floods in the spring due to the creek overflow, snowmelt and location between two drumlins. The wetland provides habitat for spring breeding frogs such as spring peepers. American toad, leopard frog and grey tree frog were also recorded in these communities. The wetland communities and the adjacent cedar swamp are within the protected area. The inclusion of all of the willow thicket, cedar swamp and meadow marshes will ensure that amphibian breeding habitat and post-breeding foraging habitat is maintained post development. The reconnection of the creek to the north of Elgin Street will provide a corridor for movement north to south.

Pond #2 is located along the south edge of the central woodland and provides habitat for wood frogs. The central portion contains a spring (vernal) pool that provides habitat for wood frogs. This pool will be preserved in the plan with a 20 m buffer to the seniors housing block. These distances are sufficient to prevent negative impacts on the breeding pool. The location within the edge of the woodland also maintains a connection to the forest where the frogs spend much of the year outside of the short spring breeding season. Forested habitat with leaf litter is essential for this species that feeds on invertebrates in the woodland and overwinters underground or in the leaf litter.

Limiting construction in this area in the spring and use of silt and snow fencing closer to the housing will protect the pond while not limiting access for frogs migrating to the pond to breed.

Pond #3 is located in the northwest portion of the central woodland and is associated with runoff from the north. This pond is 20 m east of the neighbourhood park to the west and 30 m south of the stormwater management pond to the north. Maintenance of flows and spring flooding of this area is essential to preserving the breeding habitat. Runoff to this area should be maintained post development. Measures may include conveying runoff from open space and parks to the west or roof leader water. The location within the forest and foraging habitat will be maintained. Development of the surrounding area will not impact on access to the pond. Aquatic and terrestrial corridors will be maintained to the east along the intermittent creek and south to Midtown Creek along the restored creek channel.

6.3.4 Possible Great-Horned Owl Nest in Central Woodland

Great-horned owls were observed in the central woodland during July 18, 2011 surveys and evidence of this pair nesting and being on territory was present. However, no nest was found or young birds observed. Great-horned owls live in a wide variety of habitats from urban woodlots, plantations, mixed forest to wetlands and large wilderness areas. The key factors for the presence of owls are a suitable nesting site and sufficient hunting territory. The preservation of the woodland will provide both of these functions. As this species is wide ranging it would also use adjacent backyards, fields and forest edges for hunting. Although development will occur in the agricultural fields, this is not the preferred hunting territory. Urbanization does not deter owls from nesting as the new urban areas provide abundant habitat and populations of their favourite prey items, namely raccoons, squirrels, rabbits and skunks.

No impacts on the owls are anticipated by the development of the site as the entire woodlot will be retained.

6.3.5 Special Concern and Rare Wildlife Species

The wood thrush and eastern wood-pewee were identified within the central woodland. Both are listed as Special Concern species. As such the fall under the Significant Wildlife Habitat category of species of conservation concern. The wood thrush breeds in deciduous and mixed forests where there are large trees, moderate understory, shade and abundant leaf litter for foraging. The central woodlot would be considered suitable habitat for this species. The pewee uses the more open understory portions of the woodland to forage for flying insects. As the woodlot is being preserved, the habitat for both of these species will not be altered or impacted. The birds will continue to use the woodlot post construction and no net habitat loss will occur.

6.4 Tributary to Brook Creek

The unnamed tributary to Brook Creek enters the site from the east under Gear Road through a CSP culvert, flowing west into the centre woodlot, existing in the southwest corner moving across the property in a southwestern direction to the proposed Brook Road allowance at Elgin Street East crossing the road through a CSP culvert. The tributary is intermittent and no fish were observed over two seasons upstream of Elgin Street West. In addition, the tributary channel is not considered to be fish bearing due to blockages in the flow pattern and barriers created from the proposed Brook Road allowance berm, which has inadvertently realigned the tributary just north of Elgin Street East. However, the tributary indirectly supports direct fish habitat observed downstream of Elgin Street East, where fish were sampled in the spring of

2006 and 2015.

Within the study property, the entire Brook Creek tributary (30m from the watercourse high-water mark) will be designated as Environmental Protection (EP). Temporary in-water works are proposed within the EP area and include one watercourse road crossing, multiple servicing watercourse crossings, one watercourse realignment, and four stormwater blocks.

The proposed watercourse road crossing is located east of the woodlot and west of Gear Road (Appendix V). It is recommended that the crossing structure is designed to span the entire watercourse and avoid all works below the high-water mark. Additional field investigations may be required at the proposed crossing location to determine all potential impacts based on the detailed design.

Servicing such a storm sewer and water mains will likely need to cross the tributary. Directional drilling construction techniques are recommended over an open trench techniques to minimize impacts to the Brook Creek tributary, unless the in-water works can be conducted during natural dry conditions which have been observed in the summer months.

A small section of the roadside ditching and tributary along Elgin Street East and the proposed Brook Road allowance intersection will require realignment to accommodate a proposed access road. The Brook Road allowance is a main barrier to the existing tributary and is rerouting channel flow along the farm track (future Brook Road extension) and into a roadside ditch. The channel modification has impacted the downstream channel flow and volume of water reaching the downstream wetland habitat south of Elgin Street. In addition, the CSP is preventing water and runoff from maintaining a healthy wetland habitat. This has resulted in an increase of buckthorn in this community which has impacted the wetland form and function. Channel realignment should focus on enhancing the flow conveyance to the downstream wetland, fish passage through the culvert and the addition of fish habitat features. Any upgrades to the elevation or profile of Elgin Street should maintain a culvert that allows unimpeded fish passage upstream. Use of an oversized culvert would also benefit wildlife that would use the corridor of the restored creek to get under Elgin Street. If the road is to be upgraded and the culvert replaced a qualified biologist should be consulted on the fisheries and wildlife issues and sizing of the culvert.

Three stormwater ponds have been proposed north of Elgin Street East and one stormwater pond south of Elgin Street East. All four ponds will eventually discharge into the Brook Creek tributary. It is recommended that the stormwater outfalls are designed to flow into a wet meadow or wetland habitat prior to reaching the creek and a spreader or similar feature should be used to dissipate flows. Although the tributary is an intermittent warm water stream, the receiving main stem of Brook Creek is a cold water system and measures should be

made to minimize thermal impacts to Brook Creek from the four proposed stormwater ponds. It is recommended that the pond outlet design incorporate a bottom draw or underground infiltration gallery to cool or minimize heating of stormwater. The outfall for the pond should not discharge directly into wet meadows and thickets known to support breeding frogs that are sensitive to pollution and contaminants.

DFO Self-Assessment

The Fisheries Act requires projects avoid causing serious harm to fish unless authorized by the Minister of Fisheries and Oceans Canada (DFO). This applies to work being conducted in or near waterbodies that support fish species classified as commercial, recreational or Aboriginal.

A DFO Self-Assessment must be completed to determine if serious harm can be avoided through avoidance and mitigation measures. If a project cannot avoid serious harm a *Request for Review* document must be submitted to DFO staff, where they will determine the appropriate next steps based on project impacts.

Based on the proposed conceptual plan of the East Cobourg Development (Option 6) the project will likely not require DFO staff review given the following concepts are integrated into the detailed design.

Stormwater Management Facilities/Basins

- The construction of new land-based stormwater management facilities, settling ponds and storage basins may not require review by DFO staff if no work occurs below the high water mark of a nearby waterbody, including outflow structures.

- The construction of water outfalls will have no temporary or permanent increase in existing footprint below the high water mark and no new temporary or permanent fill will be placed below the high water mark.

Bank Stabilization

- All bank stabilization will use rock protection, plantings or bioengineering, no temporary or permanent increase in existing footprint below the high water mark will occur and no new temporary or permanent fill placed below the high water mark will occur.

Measures to Avoid Harm

- The project and construction works should integrate all measures to avoid harm recommended by the project biologist. It will include but be limited too, project planning, erosion and sediment control, timing windows, shoreline and bank re-vegetation and stabilization, fish protection and operation of machinery. Many of the measures to avoid harm have been provided in the Mitigation section of this report, however addition measures will likely be required as a part of detailed design.

6.5 Midtown Creek

The headwater tributaries of Midtown Creek are located northwest of the proposed development and one small reach bisects the north-west corner of the project, flowing south under Danforth Road in a south-westerly direction through dense grass meadows and narrow channel. The Midtown Creek headwaters provide fish, amphibian and wildlife habitat.

The headwater tributaries of Midtown Creek have been zoned Environmental Protection (EP) and no development will occur within the EP boundary shown in Appendix V. A DFO Self-Assessment will not be inclusive of Midtown Creek, given no development of any kind, including stormwater has been proposed for the watercourse and riparian habitat above the high-water mark.

6.6 Species At Risk

Several Species At Risk have been identified within the subject properties. This includes eastern meadowlark, bobolink, barn swallow, bank swallow and butternut. An Overall Benefit Permit and/or a Notice of Activity may be required prior to development. As the development is being phased, with Phase 1A being developed first, there may be a 10-15 year built out timeline. As such, obtaining a permit at the appropriate time prior to each phase, may be more feasible than applying for all species at this time. This would also require new surveys to be completed using the approved methods from MNRF at the time, to ensure habitat is still present, or in the case of butternut, that the trees are still classified as retainable

6.7 Endangered Butternut Trees

Seven retainable butternut trees were found in Community 3 adjacent to Greer Road (linear community detached from the central woodlot) and on the eastern edge of the central woodlot near the banks of the Brook Creek tributary. The trees within the linear community were in moderate health with little to no sign of visible canker. Those found within the central woodlot however were in poorer condition and displayed signs of canker. The seven retainable trees

will require protection with a buffer of 25 meters from the base of the tree (Figure 3). The trees themselves are inside the forest, which will be preserved but the buffer may extend beyond the forest edge. Discussions with the MNRF will be required to determine the best management and protection practices.

6.8 Wetlands

Wetland habitat on the property is associated with the intermittent creeks, floodplain and swales between drumlins. While there are no evaluated wetlands as per the Ontario Wetland Evaluation System, wetland communities are present within the study area. Some of these wetlands will be preserved in the environmental protection areas.

The pocket wetlands that harbour amphibian breeding have been discussed in Section 6.3.3.

The wetland area south of Elgin Street on the Bell property has been preserved in an environmental area designation due to a number of features and functions of this community. These include:

- amphibian breeding habitat throughout,
- diversity of wetland types (cedar swamp, willow thicket swamp, wet meadow, forb meadow marsh and riparian vegetation)
- diversity of plant and wildlife species
- habitat for amphibians, birds, mammals, insects, fish
- floodplain
- fish habitat in creek
- flood control and attenuation of spring meltwater
- wildlife corridor and linkages
- contiguous with wetland/woodland to the west (off site) and creek valley

The combination of a number of wetland types and tree/shrub species adds to the importance of these communities. The high constraint designation in the Secondary Plan was validated during our detailed assessments of this area.

A 30 m buffer from all wetlands has been recommended to preserve their features and functions (Figure 3).

6.9 Woodlot and Wetland on Bell Property

The woodlot on the northern portion of the Bell property was designated as Environmental Area and a high constraint area. An additional area to the south that includes a

buckthorn/cedar community were also included as a special policy area and moderate constraint. These areas were examined in detail as part of the overall impact assessment. Due to the pasturing that had occurred within these former fields and in the existing thickets and forest, there was a very poor structure and diversity. While the trees/shrub do have functions in terms of cover, forage, nesting, CO_2 uptake and habitat, the dominance of buckthorn and very sparse structure (canopy, subcanopy, regeneration) and groundcover limit the significance of these communities (Communities 14a & 17).

The key features were the tributary of Brook Creek, the wet meadow, forb marsh, willow thicket and the cedar swamp (Communities 16, 18 and 14b). The entire property had been used for cattle pasturing with cattle on the property up until 2007. Cattle were observed in the cedar forest and open edges along Elgin Street and Brook Road at that time. As a result, there has been extensive trampling, trails, browse and disturbance in all of the habitats. The property had not been managed for invasive species and is dominated by dense European buckthorn stands, both pure successional stands and the understory of former open poplar-cedar forest where it was very dense. This is particularly true of Community 19. There has also been extensive clearing of the southern part of the property along the southern edge of Community 19 and the former forest further south. Those areas had regenerated in early successional field/meadow and raspberry thicket vegetation (Community 2).

There are also several areas of topographic constraints and floodplain lines that pose additional limitations on the developable area.

The more significant natural features combined with the topographic and floodline constraints have created a large open space block on the western third of the property. This is adjacent to forest, floodplain and wetland retained on the development to the west creating a large core area of woodland. Combined this woodland encompasses most of the high constraint area. Large contiguous woodlands and natural areas are preferred ecologically over small fragmented parcels, particularly in development areas. The connection of this natural area to the central woodland and across Greer Road to the Brook Creek Valley was also an important consideration from a connectivity and wildlife corridor function.

The preservation of most of the environmental area is proposed, with the exception of a stormwater management facility in the eastern portion of the Bell property. The function and importance of this area was determined to be minimal in terms of wildlife, ecological functions and diversity. The proposed location of the stormwater management facility preserves the more significant communities and functions of the woodland while balancing the engineering for a pond in this part of the development. Beacon Environmental in their peer review recognizes that a balance was required. It is still our opinion that the upland cedar forest has limited functions and its loss will not have a significant impact on the ecology of the area.

The Special Study Area overlay includes Community 19 and parts of Communities 17 and 2. All of these communities are highly disturbed habitats dominated by European buckthorn. Although there is an overstory in parts of trembling aspen and pockets of eastern white cedar *(Thuja occidentalis)* scattered throughout, the area had a very low diversity of plant species (17 species total). This is due to the dense shade and soil quality, as well as previous disturbance. The main reason for the lack of groundcover is the allelopathic nature of buckthorn, which releases a natural chemical in the tissue, berries and leaves that inhibits other species from growing in the soil beneath the shrub, except other buckthorn seedlings. This is the same quality associated with black walnut trees.

The south edge of Community 19 and likely parts of this community have in the past and continue to be logged for the mature cedar and the poplar trees. The functions of this community as a result are very limited and included cover for wildlife, forested area, wildlife habitat for nesting birds and mammals and green space. There were no wetlands, area sensitive species, creeks, amphibian breeding birds or significant species identified in this community.

The criteria used to define Moderate Constraint areas by Gartner Lee (May 2004) were:

- Smaller, lower functioning wetland areas
- Early successional and degraded forest vegetation that is contiguous to high constraint areas and contributes to forest interior habitat or buffering
- Steep slopes
- Recharge areas
- Habitat linkages between high constraint areas, as well as linkages to external habitats

The Special Study Area overlay only meets one of these criteria specifically, contiguous to high constraint area. Preservation of this entire area was not considered a significant constraint to developing the land.

The plan does preserve a portion of the overlay area adjacent to the open space block. This will maintain the buffering function to the cedar swamp, creek and maintain some of the mixed forest habitat. It also adds to the area preserved on this and the adjacent property with a high constraint designation.

The amphibian breeding habitat in Communities 16 and 18 will be maintained in the environmental protection area. Amphibians use adjacent upland habitat to forage and overwinter the remainder of the year. This would include the denser woodlands with

groundcover and abundant forage where fallen logs, vegetation and diverse habitats are present. The proposed plan retains sufficient area and the key habitats (communities for these species to find those functions. The redesign of Elgin Street and the installation of a new culvert may provide additional mortality from road kills but an oversize culvert may be installed to allow some amphibians to cross under the road.

6.10 Hedgerows

The hedgerows are dominated by European buckthorn. This includes the wider fencerow to the east to Greer Road. The functions of this hedgerow are limited due to the agriculture fields adjacent, Greer Road and lack of core natural areas east of Greer Road. The eastern hedgerow has been widened (~40m wide) to include the existing creek channel and act as a wildlife corridor. Runoff from the fields and Greer Road flows through this hedgerow and into the intermittent creek. The maintenance of the catchment areas post construction will allow the flows to be maintained.

The removal of the north-south hedgerows will not have an impact on wildlife corridors. The presence of Highway 401 serves as a major barrier to wildlife movement.

6.11 Hydrogeology

Ken Goff (July 2006) in a preliminary hydrogeology report concluded:

1. There will be no impacts on local aquifers related to on-site groundwater use or sewage disposal.

2. Development-related reductions in infiltration/recharge would occur on the site as a result of impermeable surfaces such as roofs and paved areas.

3. These reductions would be offset somewhat by recharge from lawn and garden watering.

4. Because the site is underlain by fine-textured soils, the infiltration potential is relatively low. Infiltration potential should be evaluated following completion of on-site geotechnical investigations.

Prior to completion of the development plan and as part of the fisheries compensation it will be necessary to understand the contribution of groundwater to Midtown Creek and the intermittent tributary of Brook Creek. As well the catchment areas should be maintained for each creek. Maintenance of pre-development flows or enhanced flows will also be required to ensure that fish habitat is not impacted through the development. Outfalls for the stormwater

to the creeks will need to be reviewed by a fisheries biologist. Due to the nature of the creek as warm water creek and fish habitat, thermal mitigation is not required but stormwater pond discharges should meet Ministry of Environment water quality objectives for fish habitat.

6.12 Future Trails or Recreational Uses

The Secondary Plan discusses the opportunity for passive outdoor recreation facilities, where appropriate s. 15.4.5.1. h).

The woodlands, wetlands, creeks and other natural features are positive and aesthetic features of this site. However there are some sensitive features such as the creek, amphibian breeding ponds and corridors that are susceptible to a host of negative impacts from nearby residents, domestic animals and off-trail users. If trails are proposed in the future the route should be carefully designed to avoid these sensitive features and provide appropriate setbacks, fencing or other controls to prevent impacts such as untreated runoff, pet wastes, garbage, yard waste dumping, sediment and erosion and human access during critical periods. The subdivision has been designed to include these sensitive features (amphibian pools and creek) in protected areas with sufficient buffers of dense vegetation (20 m minimum). Trails should respect these buffers and setbacks.

Access to woodland is an asset and benefits residents and future naturalists but trails should be cited to minimize impacts to the creek, natural vegetation, wetlands and interior habitats. Well defined and constructed wood chip trails are preferred.

7.0 Conclusions

The development of the site will not impact on the woodland and its features and functions if our recommendations are implemented. Through careful citing of lotting, preservation of the central woodland, Midtown Creek and wetland on the Bell property approximately 20% of the land base is open space. The key natural heritage features and their functions will be maintained by the proposed plan. Most importantly linkages will be retained and an opportunity to reconnect and improve disrupted drainage and fish habitat is possible.

8.0 Recommendations

1) The limits of the development envelope should be clearly marked and staked prior to any site grading or site preparation activities. Installation of a temporary silt/snow fencing/page wire fence and appropriate signage would help operators visually to avoid entering the protected natural areas, including the creek buffers, wetlands and buffers, amphibian ponds, EP areas and central woodland.

2) The limit of development around the central woodland should be clearly marked and surveyed prior to any site preparation activities. The drip line of the outermost trees or a distinct buffer are the defining criteria.

3) Implement a 20 meter buffer from all identified amphibian breeding ponds

4) Implement a 25 meter buffer around all butternut trees unless proposed for removal; a permit should be obtained from the OMNRF in order to remove any retainable butternut trees on the property

5) Maintain a minimum a 30 meter buffer from Midtown Creek and Brook Creek and the Environmental Protection (EP) designation.

6) Silt and snow fence be placed along the north limit of the Street B alignment prior to any site preparation activities in that area. The protection of the amphibian pond is critical. No access to this area or disturbance is permitted at any time.

7) Surface water flows through the wet meadow, roadside ditches and culvert under Elgin Street be maintained.

8) Detailed sediment and erosion control plans be prepared for the site preparation, construction and post-construction periods.

9) Specific measures be included in the sediment and erosion control plan to prevent all sources of sediment to the creeks, via road runoff, mud from trucks, ditches, temporary channels.

10) Protection of fisheries in Midtown Creek will require mitigation measures and a compensation agreement, including detailed drawings if it is to be relocated to accommodate a realignment of Danforth Road.

11) Replacement of existing culverts and new culverts crossing Midtown or Brook Creek

should be oversized and be designed to incorporate fish habitat substrate and wildlife passage/crossings.

12) Engineering and grading of site should maintain existing flow regime (surface water and groundwater to tributaries of Midtown Creek and Brook Creek and associated fish habitat.

13) The design of a restored channel on the tributary of Brook Creek north of Elgin Street and west of the Brook Road road allowance be designed in cooperation with a qualified fisheries biologist and the conservation authority. The design may require input from a fluvial geomorphologist to prevent an increase in erosion.

14) Maintain pre-construction contributions of runoff to Brook Creek tributary and Midtown Creek watershed at post-development.

15) Maintain existing infiltration rates post-development. Infiltration measures may be required.

16) Maintain flows to tributaries of Midtown Creek and Brook Creek post and the amphibian habitats therein.

17) Silt fence be regularly inspected and maintained as necessary until construction is completed and the soil stabilized with vegetation.

18) No vehicles be stored or stockpiles of materials be located within 30 meters of the existing forest edges, top of slope adjacent to Midtown Creek and the dripline of the central woodland.

19) No refueling of vehicles or storage tanks be located within 30 meters of the existing forest edge and top of slope adjacent to Midtown Creek and the dripline of the central woodland.

20) Placement of fill, stumps, slash or other materials not be permitted within the wetlands or below the top of bank (development envelope-west side).

21) Hydrogeology study be conducted to determine groundwater contributions to the Midtown Creek and Brook Creek tributary.

22) Outfall for the future stormwater facilities be located and designed in consultation with a qualified fisheries biologist, the Town of Cobourg and GRCA.

23) Outfall not discharge to amphibian breeding areas south of Elgin Street.

24) Discharge from ponds at Elgin Street to Brook Creek tributary include thermal controls to maintain a cooler water temperature.

25) Use of diffuse lighting and directing lighting away from the corridor facing south to limit light pollution of the corridor. Security lighting should be diffuse and splash onto the paved areas only.

26) Tree clearing activities occur outside of the peak breeding bird season for this area as per Environment Canada guidelines (April 15th-August 15th)

27) If trails are proposed in the future that they be carefully cited to avoid sensitive natural features. This is to be completed in consultation with a qualified biologist, the Town and GRCA.

28) No fording of creeks is to occur during the site preparation and grading stages. Creeks should be clearly marked and fenced prior to these activities.

29) An edge management plan is recommended for the new edge created for the lots within Blocks 5 and 6.

30) Measure to avoid serious harm to fish are provided by a professional fisheries biologist prior to detailed design

31) A DFO self-assessment is conducted by a professional fisheries biologist during the detailed design phase.

32) If site services are to cross Midtown or Brook Creek, a qualified fisheries biologist should be consulted, as well as discussions with the Town and GRCA.

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Appendix I-A Plant Distribution by Community

APPENDIX I - A Plant Species by Community

Families and genera for the plant species found in this appendix are listed in taxonomic order. The species are listed alphabetically by its scientific name within each genus.

Three standard reference works were used for the botanical nomenclature and taxonomy (Newmaster et. al., 1998; Gleason and Cronquist 1991; Voss 1980; 1985). Other published works for botanical names included; ferns (Cody and Britton 1989); grasses (Dore and McNeill 1980); orchids (Whiting and Catling 1986); shrubs (Soper and Heimburger 1982) and trees (Farrar 1995).

Total: Number of communities where plant species was recorded
X : Plant species recorded

			COMMUNITY NUMBER														
Common Name	***Scientific Name***	**Total**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11a**	**11b**	**12**	**13**	**14a**
HORSETAIL FAMILY	*EQUISETACEAE*																
field horsetail	*Equisetum arvense*	12	X	X	X		X	X				X			X	X	X
ROYAL FERN FAMILY	*OSMUNDACEAE*																
cinnamon fern	*Osmunda cinnamonea*	1			X												
BEECH FERN FAMILY	*THELYPTERIDAE*																
New York fern	*Thelypteris noveboracensis*	1			X												

			COMMUNITY NUMBER															
Common Name	***Scientific Name***	**Total**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11a**	**11b**	**12**	**13**	**14a**
WOOD FERN FAMILY	*DRYOPTERIDACEAE*																
bulbet bladder fern	*Cystopteris bulbifera*	2														X	X
spinulose wood-fern	*Dryopteris carthusiana*	1															X
evergreen wood-fern	*Dryopteris intermedia*	3									X	X					
marginal wood-fern	*Dryopteris marginalis*	2		X					X								
oak fern	*Gymnocarpium dryopteris*	1															X
ostrich fern	*Matteuccia struthiopteris*	6	X		X			X			X					X	X
sensitive fern	*Onoclea sensibilis*	12	X	X	X	X		X	X		X	X				X	X
PINE FAMILY	*PINACEAE*																
eastern white pine	*Pinus strobus*	6	X	X	X	X				X		X					
Scot's pine	*Pinus sylvestris*	2		X						X							
eastern hemlock	*Tsuga canadensis*	1															
CYPRESS FAMILY	*CUPRESSACEAE*																
common juniper	*Juniperus communis var. depressa*	1										X					
eastern red cedar	*Juniperus virginiana*	1										X					
eastern white cedar	*Thuja occidentalis*	16	X	X	X	X		X	X	X		X	X	X	X		X
BUTTERCUP FAMILY	*RANUNCULACEAE*																
red baneberry	*Actaea rubra*	2	X														X
thimbleweed	*Anemone virginiana*	2	X					X									
marsh marigold	*Caltha palustris*	2														X	
virgin's bower	*Clematis virginiana*	3			X							X				X	
goldthread	*Coptis trifolia*	2	X					X									
tall buttercup	*Ranunculus acris*	8	X	X				X	X		X					X	X
BARBERRY FAMILY	*BERBERIDACEAE*																
common barberry	*Berberis vulgaris*	2	X		X												
mayapple	*Podophyllum peltatum*	3	X		X						X						
ELM FAMILY	*ULMACEAE*																
American elm	*Ulmus americana*	5	X	X	X			X									

			COMMUNITY NUMBER															
Common Name	***Scientific Name***	**Total**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11a**	**11b**	**12**	**13**	**14a**
NETTLE FAMILY	*URTICACEAE*																
clearweed	*Pilea pumila*	2			X												X
American stinging nettle	*Urtica dioica ssp. Gracilis*	3	X	X							X						
WALNUT FAMILY	*JUGLANDACEAE*																
butternut	*Juglans cinerea*	2	X		X												
BEECH FAMILY	*FAGACEAE*																
American beech	*Fagus grandifolia*	1	X														
red oak	*Quercus rubra*	1			X												
BIRCH FAMILY	*BETULACEAE*																
white birch	*Betula papyrifera*	2			X			X									
ironwood	*Ostrya virginiana*	1	X														
PINK FAMILY	*CARYOPHYLLACEAE*																
mouse-eared chickweed	*Cerastium fontanum*	1		X													
Deptford pink	*Dianthus armeria*	2		X					X								
white campion	*Silene latifolia*	1		X													
BUCKWHEAT FAMILY	*POLYGONACEAE*																
lady's thumb	*Polygonum persicaria*	2			X												X
curled dock	*Rumex crispus*	1														X	
ST. JOHN'S-WORT FAMILY	*GUTTIFERAE*																
common St. John's-wort	*Hypericum perforatum*	1		X													
VIOLET FAMILY	*VIOLACEAE*																
common blue violet	*Viola affinis Le Conte*	2	X								X						
downy yellow violet	*Viola pubescens*	2	X					X									
GOURD FAMILY	*CUCURBITACEAE*																
wild cucumber	*Echinocystis lobata*	3			X			X								X	

			COMMUNITY NUMBER															
Common Name	***Scientific Name***	**Total**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11a**	**11b**	**12**	**13**	**14a**
WILLOW FAMILY	*SALICACEAE*																	
balsam poplar	*Populus balsamifera*	8	X	X	X		X	X									X
large-toothed aspen	*Populus grandidentata*	1	X														
trembling aspen	*Populus tremuloides*	8	X	X	X		X	X		X				X			
weeping willow	*Salix babylonica*	2		X		X											
Bebb's willow	*Salix bebbiana*	1		X													
pussy willow	*Salix discolor*	5		X												X	
crack willow	*Salix fragilis*	3		X													
slender willow	*Salix petiolaris*	5														X	
MUSTARD FAMILY	*BRASSICACEAE*																	
yellow rocket	*Barbarea vulgaris*	1									X						
HEATH FAMILY	*ERICACEAE*																	
velvetleaf blueberry	*Vaccinium myrtilloides*	1						X									
GOOSEBERRY FAMILY	*GROSSULARIACEAE*																	
American black currant	*Ribes americanum*	1														X	
prickly gooseberry	*Ribes cynosbati*	3	X		X			X									
smooth gooseberry	*Ribes hirtellum*	2			X		X										
red currant	*Ribes rubrum*	2	X					X									
SAXIFRAGE FAMILY	*SAXIFRAGACEAE*																	
foam flower	*Tiarella cordifolia*	1			X													

			COMMUNITY NUMBER															
Common Name	***Scientific Name***	**Total**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11a**	**11b**	**12**	**13**	**14a**
ROSE FAMILY	*ROSACEAE*																	
agrimony	*Agrimonia gryposepela*	3	X		X			X										
smooth juneberry	*Amelanchier laevis*	1			X													
hawthorn species	*Crataegus spp.*	9		X	X		X	X				X						X
common strawberry	*Fragaria virginiana*	8	X	X	X		X	X	X			X						
yellow avens	*Geum aleppicum*	5	X		X		X				X							
large-leaved avens	*Geum macrophyllum*	1			X													
apple	*Malus domestica*	1	X															
common crabapple	*Malus pumila*	3			X		X					X						
rough cinquefoil	*Potentilla norvegica*	1		X														
black cherry	*Prunus serotina*	6	X		X		X	X		X		X						
choke cherry	*Prunus virginiana*	6		X	X		X	X	X			X						
smooth rose	*Rosa blanda*	1		X														
rugosa rose	*Rosa rugosa*	1		X														
Alleghany blackberry	*Rubus allegheniensis*	2	X		X													
wild red raspberry	*Rubus idaeus*	7		X	X		X									X		
purple-flowering raspberry	*Rubus odoratus*	2	X		X													
dwarf raspberry	*Rubus pubescens*	1							X									
American mountain ash	*Sorbus americana*	3			X				X	X								
European mountain ash	*Sorbus aucuparia*	4	X	X	X			X										
PEA FAMILY	*FABACEAE*																	
hog-peanut	*Amphicarpa bracteata*	1			X													
bird's-foot trefoil	*Lotus corniculatus*	2		X														
alfalfa	*Medicago sativa ssp. Sativa*	1		X														
white sweet-clover	*Melilotus alba*	2		X														
red clover	*Trifolium pratense*	3		X					X									
white clover	*Trifolium repens*	2		X														
cow vetch	*Vicia cracca*	2		X														

		COMMUNITY NUMBER															
Common Name	***Scientific Name***	**Total**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11a**	**11b**	**12**	**13**	**14a**
LOOSESTRIFE FAMILY	*LYTHRACEAE*																
purple loosestrife	*Lythrum salicaria*	3			X											X	
EVENING PRIMROSE FAMIL	*ONAGRACEAE*																
dwarf enchanter's nightshade	*Circaea alpina*	1														X	
Canada enchanter's nightshade	*Circaea lutetiana L. ssp.canadensis*	4	X		X				X		X						
common evening primrose	*Oenothera biennis*	1		X													
DOGWOOD FAMILY	*CORNACEAE*																
alternate-leaf dogwood	*Cornus alternifolia*	4	X		X		X	X									
red-osier dogwood	*Cornus stolonifera*	6		X	X	X										X	
STAFF-TREE FAMILY	*CELASTRACEAE*																
climbing bittersweet	*Celastrus scandens*	1			X												
BUCKTHORN FAMILY	*RHAMNACEAE*																
European buckthorn	*Rhamnus cathartica*	13	X	X	X	X	X	X	X			X					X
GRAPE FAMILY	*VITACEAE*																
Virginia creeper	*Parthenocissus inserta*	8	X	X	X			X	X								X
wild grape	*Vitis riparia*	7	X	X	X		X	X									X
MAPLE FAMILY	*ACERACEAE*																
Manitoba maple	*Acer negundo*	5	X	X	X		X	X									
Norway maple	*Acer platanoides*	1										X					
silver maple	*Acer saccharinum*	1			X												
sugar maple	*Acer saccharum ssp.saccharum*	3	X	X	X												
CASHEW FAMILY	*ANACARDIACEAE*																
western poison-ivy	*Rhus rydbergii*	5	X		X			X									X
staghorn sumac	*Rhus typhina*	3		X	X							X					
WOOD-SORREL FAMILY	*OXALIDACEAE*																
European wood-sorrel	*Oxalis stricta*	2	X					X									
TOUCH-ME-NOT FAMILY	*BALSAMINACEAE*																
spotted jewelweed	*Impatiens capensis*	7		X	X	X										X	

			COMMUNITY NUMBER															
Common Name	***Scientific Name***	**Total**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11a**	**11b**	**12**	**13**	**14a**
GINSENG FAMILY	*ARALIACEAE*																
wild sarsaparilla	*Aralia nudicaulis*	3			X			X									X
CARROT FAMILY	*APIACEAE*																
spotted water hemlock	*Cicuta maculata*	1		X													
Queen-Anne's lace	*Daucus carota*	3		X					X								
wild parsnip	*Pastinaca sativa*	1			X												
hemlock water parsnip	*Sium suave*	1														X	
GENTIAN FAMILY	*GENTIANACEAE*																
bottle gentian	*Gentiana andrewsii*	2		X													
MILKWEED FAMILY	*ASCLEPIADACEAE*																
swamp milkweed	*Asclepias incarnata*	3														X	X
common milkweed	*Asclepias syriaca*	3	X	X				X									
black swallow-wort	*Cynanchum nigrum*	1	X														
swallow-wort	*Cynanchum rossicum*	5	X	X	X			X	X								
NIGHTSHADE FAMILY	*SOLANACEAE*																
bitter nightshade	*Solanum dulcamara*	7	X	X							X					X	X
WATERLEAF FAMILY	*HYDROPHYLLACEAE*																
Virginia waterleaf	*Hydrophyllum virginianum*	1														X	
BORAGE FAMILY	*BORAGINACEAE*																
Viper's bugloss	*Echium vulgare*	1															
MINT FAMILY	*LAMIACEAE*																
wild basil	*Clinopodium vulgare*	1		X													
ground ivy	*Glechoma hederacea*	1	X														
American water-horehound	*Lycopus americanus*	2			X	X											
wild mint	*Mentha arvensis*	3			X	X										X	
PLANTAIN FAMILY	*PLANTAGINACEAE*																
narrow-leaved plantain	*Plantago lanceolata*	1		X													
broad-leaved plantain	*Plantago major*	2	X	X													
Rugel's plantain	*Plantago rugelii*	2	X	X													

			COMMUNITY NUMBER															
Common Name	***Scientific Name***	**Total**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11a**	**11b**	**12**	**13**	**14a**
OLIVE FAMILY	*OLEACEAE*																
white ash	*Fraxinus americana*	6		X	X					X		X			X		
black ash	*Fraxinus nigra*	2	X	X													
green ash	*Fraxinus pennsylvanica var. subintegerr*	3			X					X				X			
FIGWORT FAMILY	*SCROPHULARIACEAE*																
slender-leaved agalinis	*Agalinis tenuifolia*	2		X													
butter-and-eggs	*Linaria vulgaris*	1							X								
foxglove beardtongue	*Penstemon digitalis*	2		X					X								
MADDER FAMILY	*RUBIACEAE*																
rough bedstraw	*Galium asprellum*	1		X													
marsh bedstraw	*Galium palustre*	2														X	
HONEYSUCKLE FAMILY	*CAPRIFOLIACEAE*																
tartarian honeysuckle	*Lonicera tatarica*	3		X	X				X								
common elderberry	*Sambucus canadensis*	4	X	X	X						X						
red-berried elderberry	*Sambucus racemosa*	1			X												
snowberry	*Symphoricarpos albus*	1			X												
Guelder rose	*Viburnum americanum*	1									X						
high bush cranberry	*Viburnum trilobium*	9	X	X	X		X		X			X					X

			COMMUNITY NUMBER															
Common Name	***Scientific Name***	**Total**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11a**	**11b**	**12**	**13**	**14a**
ASTER FAMILY	*ASTERACEAE*																
common yarrow	*Achillea millefolium*	2		X													
common ragweed	*Ambrosia artemisiifolia L.*	1		X													
common burdock	*Arctium minus*	1	X														
nodding beggarticks	*Bidens cernua*	1			X												
marsh beggar-ticks	*Bidens frondosa*	1			X												
black knapweed	*Centaurea nigra*	2															
ox-eye daisy	*Chrysanthemum leucanthemum*	5		X			X		X			X					
chicory	*Cichorium intybus*	2		X													
Canada thistle	*Cirsium arvense*	2		X													
flat top white aster	*Doellingeria umbellata var.umbellata*	2			X	X											
daisy fleabane	*Erigeron annuus*	1		X													
Philadelphia fleabane	*Erigeron philadelphicus ssp. philadelphi*	2		X			X										
spotted joe-pyeweed	*Eupatorium maculatum*	4		X	X											X	
boneset	*Eupatorium perfoliatum*	6	X	X		X										X	X
grass-leaved goldenrod	*Euthamia graminifolia*	4		X												X	X
field hawkweed	*Hieracium caepitosum ssp.caespitosum*	1		X													
king devil hawkweed	*Hieracium x florbundum*	1							X								
elecampane	*Inula helenium*	1														X	
pineapple weed	*Matricaria matricarioides*	2															
black-eyed Susan	*Rudbeckia hirta*	2		X					X								
Canada goldenrod	*Solidago canadensis*	9		X					X			X				X	X
early goldenrod	*Solidago juncea*	1		X													
goldenrod species	*Solidago spp.*	1		X													
field sow thistle	*Sonchus arvensis ssp.arvensis*	1		X													
heart-leaved aster	*Symphyotrichum cordifolium*	1		X													
calico aster	*Symphyotrichum lateriflorum var.laterifl*	2			X			X									
New England aster	*Symphyotrichum novae- angliae*	5		X	X							X				X	
white heath aster	*Symphyotrichum pilosum var.pilosum*	1															

			COMMUNITY NUMBER															
Common Name	***Scientific Name***	**Total**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11a**	**11b**	**12**	**13**	**14a**
purple-stemmed aster	*Symphyotrichum puniceum*	5		X			X				X					X	
common dandelion	*Taraxacum officinale*	7	X	X	X		X	X									
WATER-PLANTAIN FAMILY	*ALISMATACEAE*																
common waterplantain	*Alisma plantago-aquatica*	2			X												
ARUM FAMILY	*ARACEAE*																
Jack-in-the-pulpit	*Arisaema triphyllum*	4	X		X							X					X
RUSH FAMILY	*JUNCACEAE*																
knotted rush	*Juncus nodosus*	1		X													
path rush	*Juncus tenuis*	1		X													
SEDGE FAMILY	*CYPERACEAE*																
awl-fruited sedge	*Carex stipata*	1		X													
wool-grass	*Scirpus cyperinus*	2		X													
GRASS FAMILY	*POACEAE*																
awnless brome grass	*Bromus inermis ssp.inermis*	4		X			X										
Canada bluejoint grass	*Calamagrostis canadensis*	4									X					X	
fowl manna grass	*Glyceria striata*	1														X	
acuminate panic grass	*Panicum acuminatum var.acuminatum*	1															
reed canary grass	*Phalaris arundinacea*	5		X		X										X	
timothy	*Phleum pratense*	1		X													
common reed	*Phragmites australis*	1		X													
CATTAIL FAMILY	*TYPHACEAE*																
narrow-leaved cattail	*Typha angustifolia*	3				X										X	
common cattail	*Typha latifolia*	3		X												X	

			COMMUNITY NUMBER															
Common Name	***Scientific Name***	**Total**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11a**	**11b**	**12**	**13**	**14a**
LILY FAMILY	*LILIACEAE*																	
asparagus	*Asparagus officinalis*	1																
trout lily	*Erythronium americanum ssp. american*	4	X		X						X							X
tiger lily	*Lilium lancifolium*	1		X														
Canada mayflower	*Maianthemum canadense*	2										X						X
false Solomon's seal	*Smilacina racemosa*	1																X
white trillium	*Trillium grandiflorum*	1																X
ORCHID FAMILY	*ORCHIDACEAE*																	
helleborine	*Epipactis helleborine*	4	X		X			X										X
Total Number of Plant Species	186		56	90	74	13	21	35	23	8	16	23	1	3	3	35	30	
			Number of Plant Species Per Community															

APPENDIX I - A Communities 14b-22

			COMMUNITY NUMBER								
Common Name	***Scientific Name***	**Total**	**14b**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**
HORSETAIL FAMILY	*EQUISETACEAE*										
field horsetail	*Equisetum arvense*	12			X			X			X
ROYAL FERN FAMILY	*OSMUNDACEAE*										
cinnamon fern	*Osmunda cinnamonea*	1									
BEECH FERN FAMILY	*THELYPTERIDAE*										
New York fern	*Thelypteris noveboracensis*	1									
WOOD FERN FAMILY	*DRYOPTERIDACEAE*										
bulbet bladder fern	*Cystopteris bulbifera*	2									
spinulose wood-fern	*Dryopteris carthusiana*	1									
evergreen wood-fern	*Dryopteris intermedia*	3	X								
marginal wood-fern	*Dryopteris marginalis*	2									
oak fern	*Gymnocarpium dryopteris*	1									
ostrich fern	*Matteuccia struthiopteris*	6									
sensitive fern	*Onoclea sensibilis*	12	X					X			
PINE FAMILY	*PINACEAE*										
eastern white pine	*Pinus strobus*	6									
Scot's pine	*Pinus sylvestris*	2									
eastern hemlock	*Tsuga canadensis*	1					X				
CYPRESS FAMILY	*CUPRESSACEAE*										
common juniper	*Juniperus communis var. depressa*	1									
eastern red cedar	*Juniperus virginiana*	1									
eastern white cedar	*Thuja occidentalis*	16			X	X	X	X			
BUTTERCUP FAMILY	*RANUNCULACEAE*										

			COMMUNITY NUMBER								
Common Name	***Scientific Name***	**Total**	**14b**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**
red baneberry	*Actaea rubra*	2									
thimbleweed	*Anemone virginiana*	2									
marsh marigold	*Caltha palustris*	2			X						
virgin's bower	*Clematis virginiana*	3									
goldthread	*Coptis trifolia*	2									
tall buttercup	*Ranunculus acris*	8						X			
BARBERRY FAMILY	*BERBERIDACEAE*										
common barberry	*Berberis vulgaris*	2									
mayapple	*Podophyllum peltatum*	3									
ELM FAMILY	*ULMACEAE*										
American elm	*Ulmus americana*	5									X
NETTLE FAMILY	*URTICACEAE*										
clearweed	*Pilea pumila*	2									
American stinging nettle	*Urtica dioica ssp. Gracilis*	3									
WALNUT FAMILY	*JUGLANDACEAE*										
butternut	*Juglans cinerea*	2									
BEECH FAMILY	*FAGACEAE*										
American beech	*Fagus grandifolia*	1									
red oak	*Quercus rubra*	1									
BIRCH FAMILY	*BETULACEAE*										
white birch	*Betula papyrifera*	2									
ironwood	*Ostrya virginiana*	1									
PINK FAMILY	*CARYOPHYLLACEAE*										
mouse-eared chickweed	*Cerastium fontanum*	1									
Deptford pink	*Dianthus armeria*	2									
white campion	*Silene latifolia*	1									
BUCKWHEAT FAMILY	*POLYGONACEAE*										
lady's thumb	*Polygonum persicaria*	2									
curled dock	*Rumex crispus*	1									

		COMMUNITY NUMBER									
Common Name	***Scientific Name***	**Total**	**14b**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**
ST. JOHN'S-WORT FAMILY	*GUTTIFERAE*										
common St. John's-wort	*Hypericum perforatum*	1									
VIOLET FAMILY	*VIOLACEAE*										
common blue violet	*Viola affinis Le Conte*	2									
downy yellow violet	*Viola pubescens*	2									
GOURD FAMILY	*CUCURBITACEAE*										
wild cucumber	*Echinocystis lobata*	3									
WILLOW FAMILY	*SALICACEAE*										
balsam poplar	*Populus balsamifera*	8						X			X
large-toothed aspen	*Populus grandidentata*	1									
trembling aspen	*Populus tremuloides*	8						X			
weeping willow	*Salix babylonica*	2									
Bebb's willow	*Salix bebbiana*	1									
pussy willow	*Salix discolor*	5	X		X				X		
crack willow	*Salix fragilis*	3					X				X
slender willow	*Salix petiolaris*	5			X		X		X	X	
MUSTARD FAMILY	*BRASSICACEAE*										
yellow rocket	*Barbarea vulgaris*	1									
HEATH FAMILY	*ERICACEAE*										
velvetleaf blueberry	*Vaccinium myrtilloides*	1									
GOOSEBERRY FAMILY	*GROSSULARIACEAE*										
American black currant	*Ribes americanum*	1									
prickly gooseberry	*Ribes cynosbati*	3									
smooth gooseberry	*Ribes hirtellum*	2									
red currant	*Ribes rubrum*	2									
SAXIFRAGE FAMILY	*SAXIFRAGACEAE*										
foam flower	*Tiarella cordifolia*	1									
ROSE FAMILY	*ROSACEAE*										
agrimony	*Agrimonia gryposepela*	3									

		COMMUNITY NUMBER									
Common Name	***Scientific Name***	**Total**	**14b**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**
smooth juneberry	*Amelanchier laevis*	1									
hawthorn species	*Crataegus spp.*	9		X		X		X			
common strawberry	*Fragaria virginiana*	8									X
yellow avens	*Geum aleppicum*	5									X
large-leaved avens	*Geum macrophyllum*	1									
apple	*Malus domestica*	1									
common crabapple	*Malus pumila*	3									
rough cinquefoil	*Potentilla norvegica*	1									
black cherry	*Prunus serotina*	6									
choke cherry	*Prunus virginiana*	6									
smooth rose	*Rosa blanda*	1									
rugosa rose	*Rosa rugosa*	1									
Alleghany blackberry	*Rubus allegheniensis*	2									
wild red raspberry	*Rubus idaeus*	7		X				X			X
purple-flowering raspberry	*Rubus odoratus*	2									
dwarf raspberry	*Rubus pubescens*	1									
American mountain ash	*Sorbus americana*	3									
European mountain ash	*Sorbus aucuparia*	4									
PEA FAMILY	*FABACEAE*										
hog-peanut	*Amphicarpa bracteata*	1									
bird's-foot trefoil	*Lotus corniculatus*	2		X							
alfalfa	*Medicago sativa ssp. Sativa*	1									
white sweet-clover	*Melilotus alba*	2		X							
red clover	*Trifolium pratense*	3		X							
white clover	*Trifolium repens*	2		X							
cow vetch	*Vicia cracca*	2						X			
LOOSESTRIFE FAMILY	*LYTHRACEAE*										
purple loosestrife	*Lythrum salicaria*	3			X						
EVENING PRIMROSE FAMIL	*ONAGRACEAE*										

		COMMUNITY NUMBER									
Common Name	***Scientific Name***	**Total**	**14b**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**
dwarf enchanter's nightshade	*Circaea alpina*	1									
Canada enchanter's nightshade	*Circaea lutetiana L. ssp.canadensis*	4									
common evening primrose	*Oenothera biennis*	1									
DOGWOOD FAMILY	*CORNACEAE*										
alternate-leaf dogwood	*Cornus alternifolia*	4									
red-osier dogwood	*Cornus stolonifera*	6	X		X						
STAFF-TREE FAMILY	*CELASTRACEAE*										
climbing bittersweet	*Celastrus scandens*	1									
BUCKTHORN FAMILY	*RHAMNACEAE*										
European buckthorn	*Rhamnus cathartica*	13	X			X		X			X
GRAPE FAMILY	*VITACEAE*										
Virginia creeper	*Parthenocissus inserta*	8						X			X
wild grape	*Vitis riparia*	7									X
MAPLE FAMILY	*ACERACEAE*										
Manitoba maple	*Acer negundo*	5									
Norway maple	*Acer platanoides*	1									
silver maple	*Acer saccharinum*	1									
sugar maple	*Acer saccharum ssp.saccharum*	3									
CASHEW FAMILY	*ANACARDIACEAE*										
western poison-ivy	*Rhus rydbergii*	5									X
staghorn sumac	*Rhus typhina*	3									
WOOD-SORREL FAMILY	*OXALIDACEAE*										
European wood-sorrel	*Oxalis stricta*	2									
TOUCH-ME-NOT FAMILY	*BALSAMINACEAE*										
spotted jewelweed	*Impatiens capensis*	7			X					X	X
GINSENG FAMILY	*ARALIACEAE*										
wild sarsaparilla	*Aralia nudicaulis*	3									
CARROT FAMILY	*APIACEAE*										
spotted water hemlock	*Cicuta maculata*	1									

			COMMUNITY NUMBER								
Common Name	***Scientific Name***	**Total**	**14b**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**
Queen-Anne's lace	*Daucus carota*	3		X							
wild parsnip	*Pastinaca sativa*	1									
hemlock water parsnip	*Sium suave*	1									
GENTIAN FAMILY	*GENTIANACEAE*										
bottle gentian	*Gentiana andrewsii*	2									X
MILKWEED FAMILY	*ASCLEPIADACEAE*										
swamp milkweed	*Asclepias incarnata*	3			X						
common milkweed	*Asclepias syriaca*	3									
black swallow-wort	*Cynanchum nigrum*	1									
swallow-wort	*Cynanchum rossicum*	5									
NIGHTSHADE FAMILY	*SOLANACEAE*										
bitter nightshade	*Solanum dulcamara*	7	X		X						
WATERLEAF FAMILY	*HYDROPHYLLACEAE*										
Virginia waterleaf	*Hydrophyllum virginianum*	1									
BORAGE FAMILY	*BORAGINACEAE*										
Viper's bugloss	*Echium vulgare*	1		X							
MINT FAMILY	*LAMIACEAE*										
wild basil	*Clinopodium vulgare*	1									
ground ivy	*Glechoma hederacea*	1									
American water-horehound	*Lycopus americanus*	2									
wild mint	*Mentha arvensis*	3									
PLANTAIN FAMILY	*PLANTAGINACEAE*										
narrow-leaved plantain	*Plantago lanceolata*	1									
broad-leaved plantain	*Plantago major*	2									
Rugel's plantain	*Plantago rugelii*	2									
OLIVE FAMILY	*OLEACEAE*										
white ash	*Fraxinus americana*	6									X
black ash	*Fraxinus nigra*	2									
green ash	*Fraxinus pennsylvanica var. subinteg*	3									

		COMMUNITY NUMBER									
Common Name	***Scientific Name***	**Total**	**14b**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**
FIGWORT FAMILY	*SCROPHULARIACEAE*										
slender-leaved agalinis	*Agalinis tenuifolia*	2									X
butter-and-eggs	*Linaria vulgaris*	1									
foxglove beardtongue	*Penstemon digitalis*	2									
MADDER FAMILY	*RUBIACEAE*										
rough bedstraw	*Galium asprellum*	1									
marsh bedstraw	*Galium palustre*	2			X						
HONEYSUCKLE FAMILY	*CAPRIFOLIACEAE*										
tartarian honeysuckle	*Lonicera tatarica*	3									
common elderberry	*Sambucus canadensis*	4									
red-berried elderberry	*Sambucus racemosa*	1									
snowberry	*Symphoricarpos albus*	1									
Guelder rose	*Viburnum americanum*	1									
high bush cranberry	*Viburnum trilobium*	9			X			X			
ASTER FAMILY	*ASTERACEAE*										
common yarrow	*Achillea millefolium*	2		X							
common ragweed	*Ambrosia artemisiifolia L.*	1									
common burdock	*Arctium minus*	1									
nodding beggarticks	*Bidens cernua*	1									
marsh beggar-ticks	*Bidens frondosa*	1									
black knapweed	*Centaurea nigra*	2		X		X					
ox-eye daisy	*Chrysanthemum leucanthemum*	5		X							
chicory	*Cichorium intybus*	2		X							
Canada thistle	*Cirsium arvense*	2		X							
flat top white aster	*Doellingeria umbellata var.umbellata*	2									
daisy fleabane	*Erigeron annuus*	1									
Philadelphia fleabane	*Erigeron philadelphicus ssp. philadel*	2									
spotted joe-pyeweed	*Eupatorium maculatum*	4								X	
boneset	*Eupatorium perfoliatum*	6									X

		COMMUNITY NUMBER									
Common Name	***Scientific Name***	**Total**	**14b**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**
grass-leaved goldenrod	*Euthamia graminifolia*	4									X
field hawkweed	*Hieracium caepitosum ssp.caespitosu*	1									
king devil hawkweed	*Hieracium x florbundum*	1									
elecampane	*Inula helenium*	1									
pineapple weed	*Matricaria matricarioides*	2		X		X					
black-eyed Susan	*Rudbeckia hirta*	2									
Canada goldenrod	*Solidago canadensis*	9						X	X	X	X
early goldenrod	*Solidago juncea*	1									
goldenrod species	*Solidago spp.*	1									
field sow thistle	*Sonchus arvensis ssp.arvensis*	1									
heart-leaved aster	*Symphyotrichum cordifolium*	1									
calico aster	*Symphyotrichum lateriflorum var.late*	2									
New England aster	*Symphyotrichum novae- angliae*	5									X
white heath aster	*Symphyotrichum pilosum var.pilosum*	1									X
purple-stemmed aster	*Symphyotrichum puniceum*	5			X						
common dandelion	*Taraxacum officinale*	7		X				X			
WATER-PLANTAIN FAMILY	*ALISMATACEAE*										
common waterplantain	*Alisma plantago-aquatica*	2			X						
ARUM FAMILY	*ARACEAE*										
Jack-in-the-pulpit	*Arisaema triphyllum*	4									
RUSH FAMILY	*JUNCACEAE*										
knotted rush	*Juncus nodosus*	1									
path rush	*Juncus tenuis*	1									
SEDGE FAMILY	*CYPERACEAE*										
awl-fruited sedge	*Carex stipata*	1									
wool-grass	*Scirpus cyperinus*	2									X
GRASS FAMILY	*POACEAE*										
awnless brome grass	*Bromus inermis ssp.inermis*	4		X				X			
Canada bluejoint grass	*Calamagrostis canadensis*	4							X	X	

			COMMUNITY NUMBER									
Common Name	***Scientific Name***	**Total**	**14b**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**
fowl manna grass	*Glyceria striata*	1									
acuminate panic grass	*Panicum acuminatum var.acuminatu*	1									X
reed canary grass	*Phalaris arundinacea*	5			X						X
timothy	*Phleum pratense*	1									
common reed	*Phragmites australis*	1									
CATTAIL FAMILY	*TYPHACEAE*										
narrow-leaved cattail	*Typha angustifolia*	3							X		
common cattail	*Typha latifolia*	3									X
LILY FAMILY	*LILIACEAE*										
asparagus	*Asparagus officinalis*	1						X			
trout lily	*Erythronium americanum ssp. americ*	4									
tiger lily	*Lilium lancifolium*	1									
Canada mayflower	*Maianthemum canadense*	2									
false Solomon's seal	*Smilacina racemosa*	1									
white trillium	*Trillium grandiflorum*	1									
ORCHID FAMILY	*ORCHIDACEAE*										
helleborine	*Epipactis helleborine*	4									
Total Number of Plant Species	186		6	16	15	5	4	16	5	5	24

Number of Plant Species Per Community

Appendix I-B List of Significant Plant Species

APPENDIX I - B List of Significant Plant Species

Plant species observed by NEA with significant status on national, provincial and relevant regional lists are listed with status codes and where applicable the most current year of publication. Three standard reference works were used for the botanical nomenclature and taxonomy (Newmaster et. al., 1998; Gleason and Cronquist 1991; Voss 1980; 1985). Other published works for botanical names included; ferns (Cody and Britton 1989); grasses (Dore and McNeill 1980); orchids (Whiting and Catling 1986); shrubs (Soper and Heimburger 1982) and trees (Farrar 1995).

NATIONAL RANKING **Committee on the Status of Endangered Wildlife in Canada (COSEWIC), Government of Canada**
Species at Risk Act (SARA), SCHEDULE 1 (Subsections 2(1), 42(2) and 68(2)), Government of Canada

PROVINCIAL RANKING **Species at Risk in Ontario (COSSARO), Government of Ontario**
Provincial Rank (SRANK), Natural Heritage Information Center, Government of Ontario

REGIONAL RANKING **Riley Simcoe** Riley,1989, Simcoe

STATUS CODES

COSEWIC	**END ***	- Endangered Species	***Year of Status Publication included in Code**
COSSARO	**THR ***	- Threatened Species	
SARA	**SC ***	- Species of Concern	
SRANK	**S1**	- Extremely Rare	**Other national or provincial codes not listed**
	S2	- Very Rare	
	S3	- Rare to Uncommon	
Regional Lists	**R**	- Rare native species	**Other Regional codes not listed**
	EXP	- Extirpated native species	

		NATIONAL RANKINGS		PROVINCIAL RANKINGS		REGIONAL RANKINGS				
Common Name	**Scientific Name**	**COSEWIC**	**SARA**	**COSSARO**	**SRank**	**Riley Simcoe**				
butternut	Juglans cinerea	END Apr/14	END Mar/13	END Jun/14	S3?					
purple-flowering raspberry	Rubus odoratus					R				
American mountain ash	Sorbus americana					R				
European wood-sorrel	Oxalis stricta					R				
slender-leaved agalinis	Agalinis tenuifolia					R				

Common Name	Scientific Name		COSEWIC	SARA	COSSARO	SRank	Riley Simcoe				
Plants with Ranking	**Total:** 5	**Status List Totals:**	1	1	1		4	0	0	0	0

Appendix II Breeding Bird Status

APPENDIX II Bird Status Report

Bird species observed by NEA are listed in the order followed the American Ornithologists' Union (AOU) Check-list of North American birds (7th edition, 1999, 47th Supplement). Common and scientific nomenclature are based on those used by AOU. Breeding status and breeding evidence code are listed when observed. Any significant status for a species on national and provincial lists is displayed as well as those from relevant regional lists.

List Status :

END - endangered	A wildlife species facing imminent extirpation or extinction.
END-R -endangered regulated	A wildlife species facing imminent extirpation or extinction in Ontario which has been regulated under Ontario's Endangered Species Act (ESA).
THR - threatened	A wildlife species likely to become endangered if limiting factors are not reversed.
SC - special concern	A wildlife species that may become threatened or an endangered species because of a combination of biological characteristics and identified threats.
YES - Area Sensitive	A wildlife species that requires large areas of suitable habitat in order to sustain their population numbers.

*** Other status levels are not displayed**

List Sources:

COSEWIC	The Committee on the Status of Endangered Wildlife in Canada, May 2015.
COSSARO	The Committee on the Status of Species at Risk in Ontario, June 2015.
SARA	Species At Risk Act, Schedule 1, Government of Canada, 2015.
Area Sensitive	Significant Wildlife Technical Guide, Appendix C, OMNR, Oct. 2000
Region 6	Southern Ontario Wetland Evaluation Appendix 11B, Version 3.2, March 2013

Breeding Status: (Observed By NEA)

B -species observed in breeding season in suitable habitat with some evidence of breeding (confirmed, probable or possible as per Ontario Breeding Bird Atlas, 2002).

F -species observed in breeding season but no evidence of breeding or suitable nest sites available on the study site (includes flyovers, migrants and foraging colonial breeders).

M -species observed outside of breeding season for that species and in area outside of the known

Breeding Evidence Code: (Observed By NEA)

OBSERVED

X -species observed in its breeding season (no evidence of breeding).

POSSIBLE BREEDING

H -species observed in its breeding season in suitable nesting habitat

S -singing male present, or breeding calls heard, in its breeding season in suitable nesting habitat

PROBABLE BREEDING

P -pair observed in their breeding season in suitable nesting habitat

T -permanent territory presumed through registration of territorial song on at least 2days, a week or more apart, at the same place

D -courtship or display between a male and a female or 2 males, including courtship feeding or copulation

V -visiting probable nest site

A -agitated behaviour or anxiety calls of an adult

B -brood patch on adult female or cloacal protuberance on adult male

N -nest-building or excavation of nest hole

CONFIRMED BREEDING

DD -distraction display or injury feigning

NU -used nest or egg shell found (occupied or laid within the period of study)

FY -recently fledged young or downy young, including young incapable of sustained flight

AE -adults leaving or entering nest site in circumstances indicating occupied nest

FS -adult carrying fecal sac

CF -adult carrying food for young

NE -nest containing eggs

NY -nest with young seen or heard

SOURCE: Ontario Breeding Bird Atlas March 2001

AOU Code	Common Name	Scientific Name	Observed Breeding Status	Breed Evidence Code			Area Sensitive Region 6		
TUVU	Turkey Vulture	*Cathartes aura*	B	None			No		
COHA	Cooper's Hawk	*Accipiter cooperii*	B	None			Yes		
RTHA	Red-tailed Hawk	*Buteo jamaicensis*	B	None			No		
RBGU	Ring-billed Gull	*Larus delawarensis*	B	None			No		
MODO	Mourning Dove	*Zenaida macroura*	B	None			No		
GHOW	Great Horned Owl	*Bubo virginianus*	B	None			No		
DOWO	Downy Woodpecker	*Picoides pubescens*	B	None			No		
EWPE	Eastern Wood-Pewee	*Contopus virens*	B	None	SC	SC	No		
WIFL	Willow Flycatcher	*Empidonax traillii*	B	None			No		
EAPH	Eastern Phoebe	*Sayornis phoebe*	B	None			No		
GCFL	Great Crested Flycatcher	*Myiarchus crinitus*	B	None			No		
EAKI	Eastern Kingbird	*Tyrannus tyrannus*	B	None			No		
REVI	Red-eyed Vireo	*Vireo olivaceus*	B	None			No		
BLJY	Blue Jay	*Cyanocitta cristata*	B	None			No		
AMCR	American Crow	*Corvus brachyrhynchos*	B	None			No		
PUMA	Purple Martin	*Progne subis*	B	None			No		
TRSW	Tree Swallow	*Tachycineta bicolor*	B	None			No		
BANS	Bank Swallow	*Riparia riparia*	B	None	THR	THR	No		
BARS	Barn Swallow	*Hirundo rustica*	B	None	THR	THR	No		
BCCH	Black-capped Chickadee	*Poecile atricapillus*	B	None			No		
HOWR	House Wren	*Troglodytes aedon*	B	None			No		
WIWR	Winter Wren	*Troglodytes troglodytes*	B	None			Yes		
VEER	Veery	*Catharus fuscescens*	B	None			Yes		
WOTH	Wood Thrush	*Hylocichla mustelina*	B	None	THR	SC	No		
AMRO	American Robin	*Turdus migratorius*	B	None			No		
GRCA	Gray Catbird	*Dumetella carolinensis*	B	None			No		

EUST	European Starling	*Sturnus vulgaris*	B	None			No		
CEWX	Cedar Waxwing	*Bombycilla cedrorum*	B	None			No		
NAWA	Nashville Warbler	*Vermivora ruficapilla*	B	None			No		
YEWA	Yellow Warbler	*Dendroica petechia*	B	None			No		
BWWA	Black-and-white Warbler	*Mniotilta varia*	B	None			Yes		
AMRE	American Redstart	*Setophaga ruticilla*	B	None			Yes		
OVEN	Ovenbird	*Seiurus aurocapillus*	B	None			Yes		
MOWA	Mourning Warbler	*Geothlypis philadelphia*	B	None			No		
COYE	Common Yellowthroat	*Geothlypis trichas*	B	None			No		
FISP	Field Sparrow	*Spizella pusilla*	B	None			No		
VESP	Vesper Sparrow	*Pooecetes gramineus*	B	None			No		
SASP	Savannah Sparrow	*Passerculus sandwichensi*	B	None			Yes		
SOSP	Song Sparrow	*Melospiza melodia*	B	None			No		
SWSP	Swamp Sparrow	*Melospiza georgiana*	B	None			No		
WTSP	White-throated Sparrow	*Zonotrichia albicollis*	B	None			No		
NOCA	Northern Cardinal	*Cardinalis cardinalis*	B	None			No		
RBGR	Rose-breasted Grosbeak	*Pheucticus ludovicianus*	B	None			No		
INBU	Indigo Bunting	*Passerina cyanea*	B	None			No		
BOBO	Bobolink	*Dolichonyx oryzivorus*	B	None	THR	THR	No		
RWBL	Red-winged Blackbird	*Agelaius phoeniceus*	B	None			No		
EAME	Eastern Meadowlark	*Sturnella magna*	B	None	THR	THR	No		
COGR	Common Grackle	*Quiscalus quiscula*	B	None			No		
BHCO	Brown-headed Cowbird	*Molothrus ater*	B	None			No		
BAOR	Baltimore Oriole	*Icterus galbula*	B	None			No		
PUFI	Purple Finch	*Carpodacus purpureus*	B	None			No		
AMGO	American Goldfinch	*Carduelis tristis*	B	None			No		
HOSP	House Sparrow	*Passer domesticus*	B	None			No		
TOTAL SPECIES OBSERVED:	**53**	**BREEDING SPECIES OBSERVED:**	**53**				**7**	**0**	**0**	**0**

Appendix III Detailed Fish Sampling Results, NEA 2015

Appendix III: Fish Sampling Record - Detailed

Project : 14-056

Waterbody/Watercourse: Trib of Brook Cr & Midtow

Sample Site: 14056_01 **SiteType:** **Site Northing:** 4873711 **Site Easting:** 728082

SAMPLE: S14056_01FC04

	SET/START	LIFT/STOP	FISHING METHOD		SHOCKING PROPERTIES		SAMPLE/GEAR COORDINATES		
Date	07-May-15	07-May-15	**Fishing Method:**	Electrofishing	**Shocker:**	ALS	**Location**	Downstream	Upstream
Time	11:20 AM	11:40 AM	**Velocity (m/s):**	n/a	**ShockTime (sec):**	273	**Northing**	4873710	4873714
WaterTemp	9.5		**Net Orientation:**	n/a	**Voltage:**	100	**Easting**	728084	728082
AirTemp	22.6		**Area Length (m):**	0	**Frequency:**	60	**Longitude**		
Weather	sunny, warm, slight breeze (BS2)						**Latitude**		

FISH OBSERVATIONS - INDIVIDUALS

MNR Code	Common Name	Scientific Name	Mesh Size	Total Length (mm)	Weight (g)	Mercury (ug/g)
280	Stickleback Family	*Gasterosteidae*				
281	Brook Stickleback	*Culaea inconstans*	0	49	1.3	

FISH OBSERVATIONS - BULK

MNR Code	Common Name	Scientific Name	Mesh Size	Weight (g)	Number of Fish	Mercury (ug/g)
0	None	-----				
0	None	-----	0		0	

Number of Species in Sample: 1

Number of Fish Collected in Sample: 0

Sample Site: 14056_02 **SiteType:** **Site Northing:** 4874852
Site Easting: 728033

SAMPLE: S14056_02FC04

	SET/START	LIFT/STOP	FISHING METHOD		SHOCKING PROPERTIES		SAMPLE/GEAR COORDINATES		
Date	07-May-15	07-May-15	**Fishing Method:**	Electrofishing	**Shocker:**	SAZ	**Location**	Downstream	Upstream
Time	1:19 PM	1:45 PM	**Velocity (m/s):**	n/a	**ShockTime (sec):**	676	**Northing**	4874843	4874862
WaterTemp	17.5		**Net Orientation:**	n/a	**Voltage:**	280	**Easting**	728033	728041
AirTemp	25		**Area Length (m):**	17.3	**Frequency:**	70	**Longitude**		
Weather	sunny, hot, slight breeeze (BS2)						**Latitude**		

FISH OBSERVATIONS - INDIVIDUALS

MNR Code	Common Name	Scientific Name	Mesh Size	Total Length (mm)	Weight (g)	Mercury (ug/g)
180	Minnow Family	*Cyprinidae*				
208	Bluntnose Minnow	*Pimephales notatus*	0	29	0.3	
208	Bluntnose Minnow	*Pimephales notatus*	0	66	3.3	
208	Bluntnose Minnow	*Pimephales notatus*	0	56	1.3	
208	Bluntnose Minnow	*Pimephales notatus*	0	47	1	
209	Fathead Minnow	*Pimephales promelas*	0	55	1	
209	Fathead Minnow	*Pimephales promelas*	0	56	2	
212	Creek Chub	*Semotilus atromaculatus*	0	33	0.5	
212	Creek Chub	*Semotilus atromaculatus*	0	117	18.5	
212	Creek Chub	*Semotilus atromaculatus*	0	39	0.7	
212	Creek Chub	*Semotilus atromaculatus*	0	54	1.2	
212	Creek Chub	*Semotilus atromaculatus*	0	55	1.6	
212	Creek Chub	*Semotilus atromaculatus*	0	33	0.4	
212	Creek Chub	*Semotilus atromaculatus*	0	30	0.3	

212	Creek Chub	*Semotilus atromaculatus*	0	54	1.2	
212	Creek Chub	*Semotilus atromaculatus*	0	35	0.5	
212	Creek Chub	*Semotilus atromaculatus*	0	51	0.9	
280	Stickleback Family	*Gasterosteidae*				
281	Brook Stickleback	*Culaea inconstans*	0	41	0.5	
281	Brook Stickleback	*Culaea inconstans*	0	39	0.5	
281	Brook Stickleback	*Culaea inconstans*	0	43	0.9	
281	Brook Stickleback	*Culaea inconstans*	0	41	0.5	

FISH OBSERVATIONS - BULK

MNR Code	Common Name	Scientific Name	Mesh Size	Weight (g)	Number of Fish	Mercury (ug/g)
180	Minnow Family	*Cyprinidae*				
225	Minnow sp.	Pimephales sp.	0	27	144	
212	Creek Chub	Semotilus atromaculatus	0	4.6	8	

Number of Species in Sample: 5

Number of Fish Collected in Sample: 172

Appendix IV Detailed Surface Water Quality Results, NEA 2015

APPENDIX IV: Water Quality Results

PN 14-056

Sample Site 14056_01

Site Type:

Waterbody/Watercourse: Trib of Brook Cr &

Northing: 4873711

Easting: 728082

Comments:

UTM at general site location

Sample ID: S14056_01WQ01

Date: 07-May-15 Start Time: 11:43 AM Water Depth (m) 0.18 Velocity (m/s):

Weather: sunny, warm with a slight End Time: 11:50 AM Sample Depth (m) 0.09 Surface Conditions Calm

Current: Slow (<1 m/s)

Air Temp *C	Water Temp *C	DO2 (mg/L)	pH	TDS (mg/L)	Phosporus (ppb)	Conductivity (us/cm)	Turbidity (NTU)	Water Colour	Salinity (ppt)
22.6	9.5	7.54	6.9	452.9		491	0.42	Colourless	0.3

Sample Site 14056_02

Site Type:

Waterbody/Watercourse: Trib of Brook Cr &

Northing: 4874852

Easting: 728033

Comments:

UTM at general site location

Sample ID: S14056_01WQ01

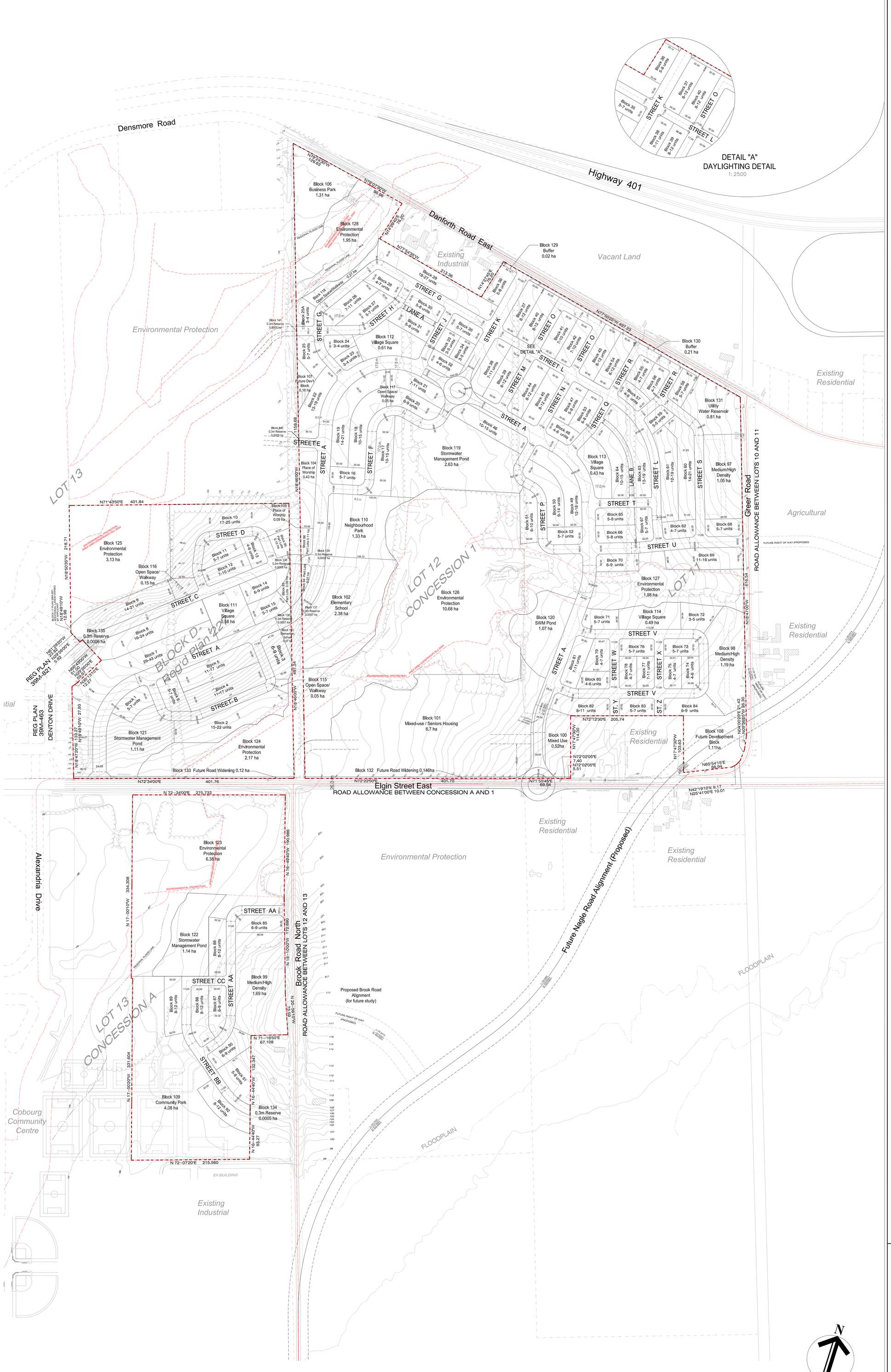
Date: 07-May-15 Start Time: 2:40 PM Water Depth (m) 0.14 Velocity (m/s):

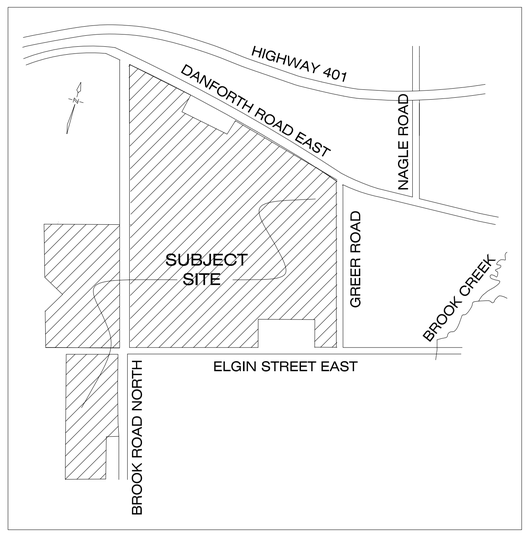
Weather: sunny, BS=1 End Time: 2:50 PM Sample Depth (m) 0.1 Surface Conditions Calm

Current: Slow (<1 m/s)

Air Temp *C	Water Temp *C	DO2 (mg/L)	pH	TDS (mg/L)	Phosporus (ppb)	Conductivity (us/cm)	Turbidity (NTU)	Water Colour	Salinity (ppt)
25	17.5	9.44	7.1	604		786	1.68	Colourless	0.5

Appendix V Draft Plan (Option A)





Key Map NTS

DRAFT PLAN OF SUBDIVISION

Section 51, Planning Act

a) As shown on the draft plan
b) As shown on the draft plan
c) As shown on the draft plan
d) As shown on the Land Use Table
e) As shown on the draft plan
f) As shown on the draft plan
g) As shown on the draft plan
h) Municipal piped water
i) Sandy Loam
j) As shown on the draft plan
k) Full Municipal services
l) As shown on the draft plan

Land Use Table	Lot/Block No.	Area (ha)
Single Detached Semi-Detached Townhouse	Bocks 1-92	32.38
Part Lots	Blocks 93-96	0.41
Medium/High Density	Blocks 97-99	3.93
Mixed Use	Blocks 100-101	7.22
Elementary School	Blocks 102-103	2.45
Place of Worship	Blocks 104-105	0.52
Business Park	Block 106	1.31
Future Development	Blocks 107-108	1.27
Community Park	Block 109	4.08
Neighbourhood Park	Block 110	1.33
Village Square	Blocks 111-114	2.11
Open Space/Walkway	Blocks 115-118	0.52
Stormwater Management	Blocks 119-122	5.95
Environmental Protection	Blocks 123-128	26.29
Buffer/Trail	Blocks 129-130	0.23
Utility - Water Reservoir	Block 131	0.81
Future Road Widening	Blocks 132-133	0.27
0.3m Reserve	Blocks 134-141	0.004
Public Right-of-Way	---	16.22
TOTAL		107.30 ha

Unit Table	No. of Units
12.8m Single-Detached 11.0m Single-Detached 16.5m Semi-Detached 7.3m Townhouse	Range of units 668 - 1,003
Subtotal	668 - 1,003 units
Medium/High Density @ 75 u/ha	295
Mixed Use @125 u/ha	65
Mixed Use/Seniors @150 u/ha	600
Subtotal	960
TOTAL	1,628 - 1,963 units

R.O.W.	Length (m)	Area (ha)
26.0m Collector	327.69	0.85
24.5m Minor Collector	1,829.04	4.48
20.0m Local	268.37	0.53
17.0m Local	5,853.00	9.95
8.5m Lane	233.43	0.20
Roundabout	---	0.21
TOTAL	8,511.53 metres	16.22 ha

Owners Authorization

We being the registered owners of the subject lands hereby authorize THE PLANNING PARTNERSHIP to prepare a draft plan of subdivision and to make application to the Town of Cobourg for approval thereof:

May 20, 2016 Signed:

Richard Rondeau, President
Rondeau (Cobourg) LTD.
513 Westney Road S.
Ajax, ON L1S 6W8

Surveyor's Certificate

I hereby certify that the boundaries of the land to be subdivided and their relationship to the adjacent lands are accurately and correctly shown on this plan.

Date: May 20, 2016 Signed:

Fred Petrich, Ontario Land Surveyor
DFP Surveyors
1101 Boundary Rd.
Oshawa, ON L1J 8P8

Revisions

Drawing No.	Date	Description
A	May 2016	New Draft Plan 'A'
B	May 2017	New Draft Plan 'B'. Revisions based on Town comments.
C	Sept. 2017	New Draft Plan 'C'. Revisions based on Town and agency comments.

METRIC: DISTANCES AND COORDINATES SHOWN ON THIS PLAN ARE IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048.

Revised Draft Plan of Subdivision

Rondeau (Cobourg) Ltd.

14T-06001-R

Part of Lots 11, 12, and 13,
Concessions A and 1
Block D Registered Plan 277
Town of Cobourg
County of Northumberland

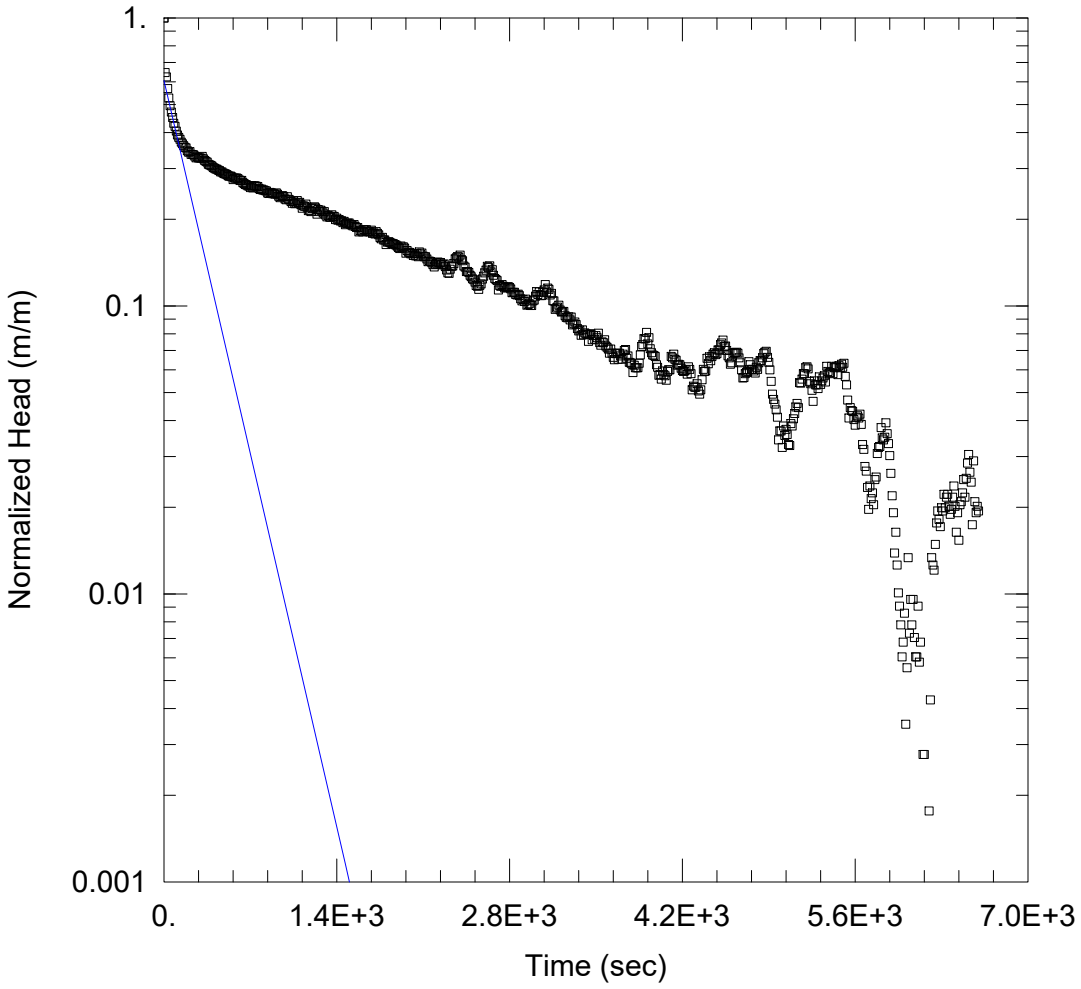
The Planning Partnership
1255 Bay Street, Suite 201
Toronto, Ontario, Canada M5R 2A9

Job.No. 1613	Designed: SLM	Drawing No. C
Date: Sept.28, 2017	Drawn: SLM	
Scale: 1:2500	Checked: DHL	

Appendix 4

Hydrogeology Data Calculations

PGL
ENVIRONMENTAL CONSULTANTS



TEST 1

Data Set: Y:\...\MW6-Test1.aqt
Date: 06/21/19 Time: 12:11:12

PROJECT INFORMATION

Company: PGL Environmental
Client: V.A. Wood Associates
Project: 4027-21.01
Test Well: MW6
Test Date: May 31, 2019

AQUIFER DATA

Saturated Thickness: 5.646 m Anisotropy Ratio (Kz/Kr): 0.1

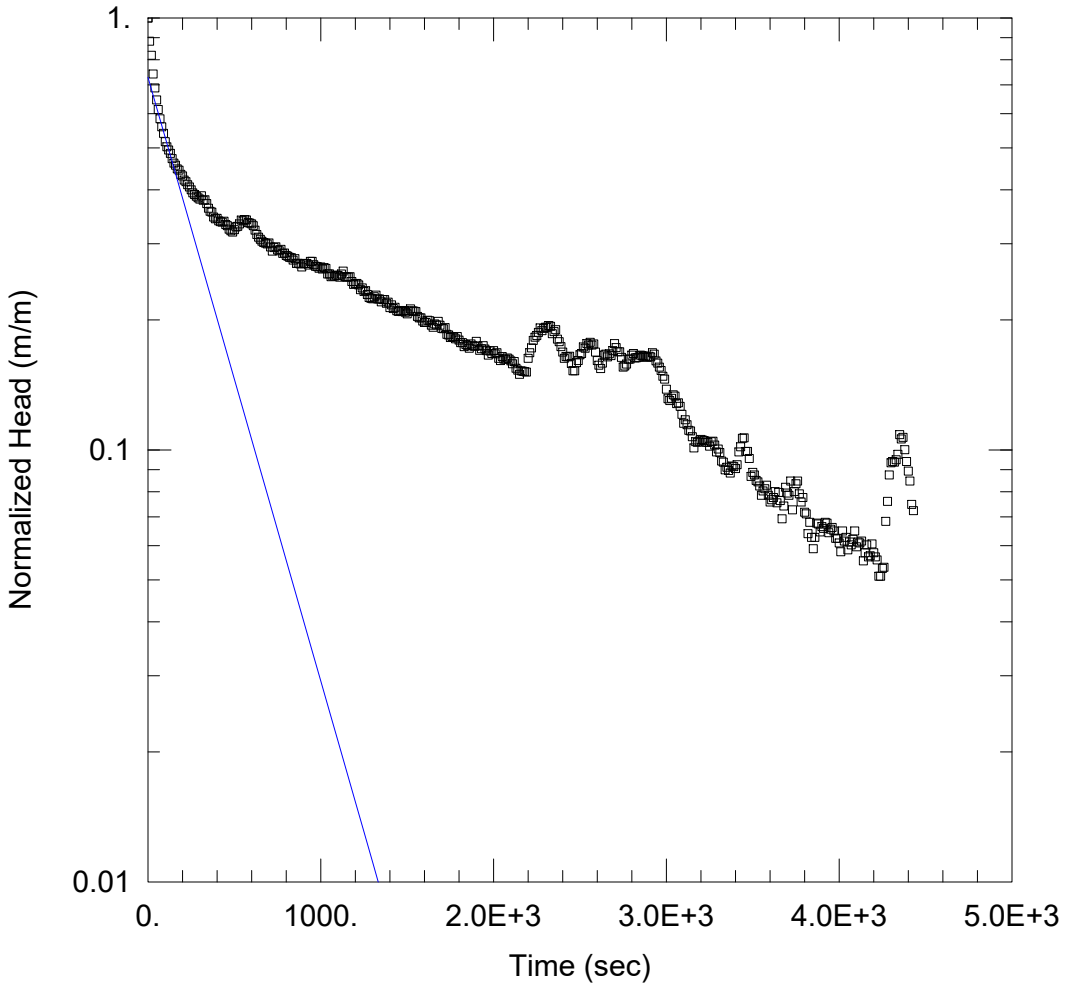
WELL DATA (Test 1)

Initial Displacement: 0.3969 m
Total Well Penetration Depth: 5.646 m
Casing Radius: 0.0214 m
Static Water Column Height: 5.646 m
Screen Length: 4.5 m
Well Radius: 0.079 m
Gravel Pack Porosity: 0.

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 9.079E-7 m/sec y0 = 0.2405 m



TEST 2

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PROJECT INFORMATION

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Client: V.A. Wood Associates
Project: 4027-21.01
Test Well: MW6
Test Date: May 31, 2019

AQUIFER DATA

Saturated Thickness: 5.646 m Anisotropy Ratio (Kz/Kr): 0.1

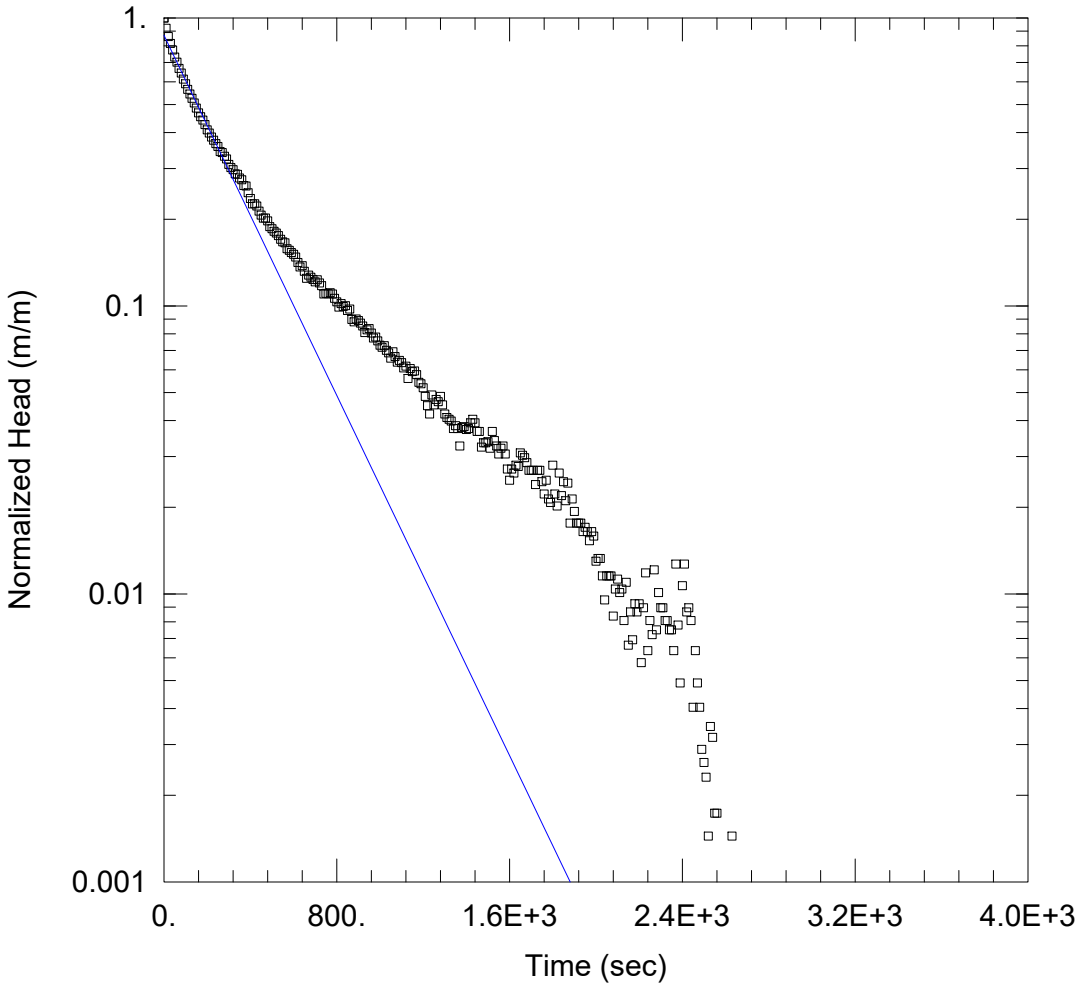
WELL DATA (Test 1)

Initial Displacement: 0.3235 m
Total Well Penetration Depth: 5.646 m
Casing Radius: 0.0214 m
Static Water Column Height: 5.646 m
Screen Length: 4.5 m
Well Radius: 0.079 m
Gravel Pack Porosity: 0.

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 6.854E-7 m/sec y0 = 0.2356 m



TEST 1

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Date: 06/21/19 Time: 12:10:45

PROJECT INFORMATION

Company: PGL Environmental
Client: V.A. Wood Associates
Project: 4027-21.01
Test Well: MW14
Test Date: May 31, 2019

AQUIFER DATA

Saturated Thickness: 7.244 m Anisotropy Ratio (Kz/Kr): 0.1

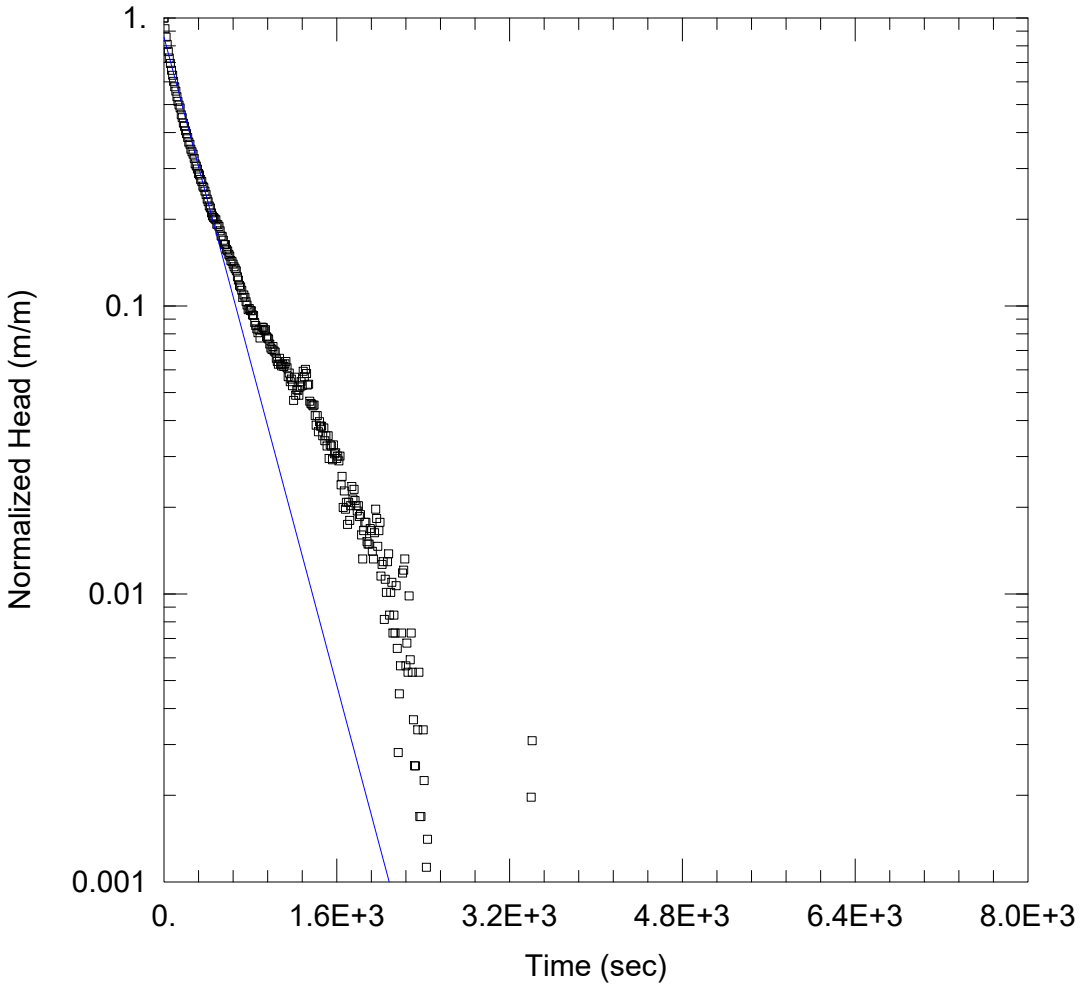
WELL DATA (Test 1)

Initial Displacement: 0.3464 m
Total Well Penetration Depth: 7.244 m
Casing Radius: 0.0214 m
Static Water Column Height: 7.244 m
Screen Length: 4.5 m
Well Radius: 0.079 m
Gravel Pack Porosity: 0.

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 7.964E-7 m/sec y0 = 0.3014 m



TEST 2

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PROJECT INFORMATION

Company: PGL Environmental
Client: V.A. Wood Associates
Project: 4027-21.01
Test Well: MW14
Test Date: May 31, 2019

AQUIFER DATA

Saturated Thickness: 7.244 m Anisotropy Ratio (Kz/Kr): 0.1

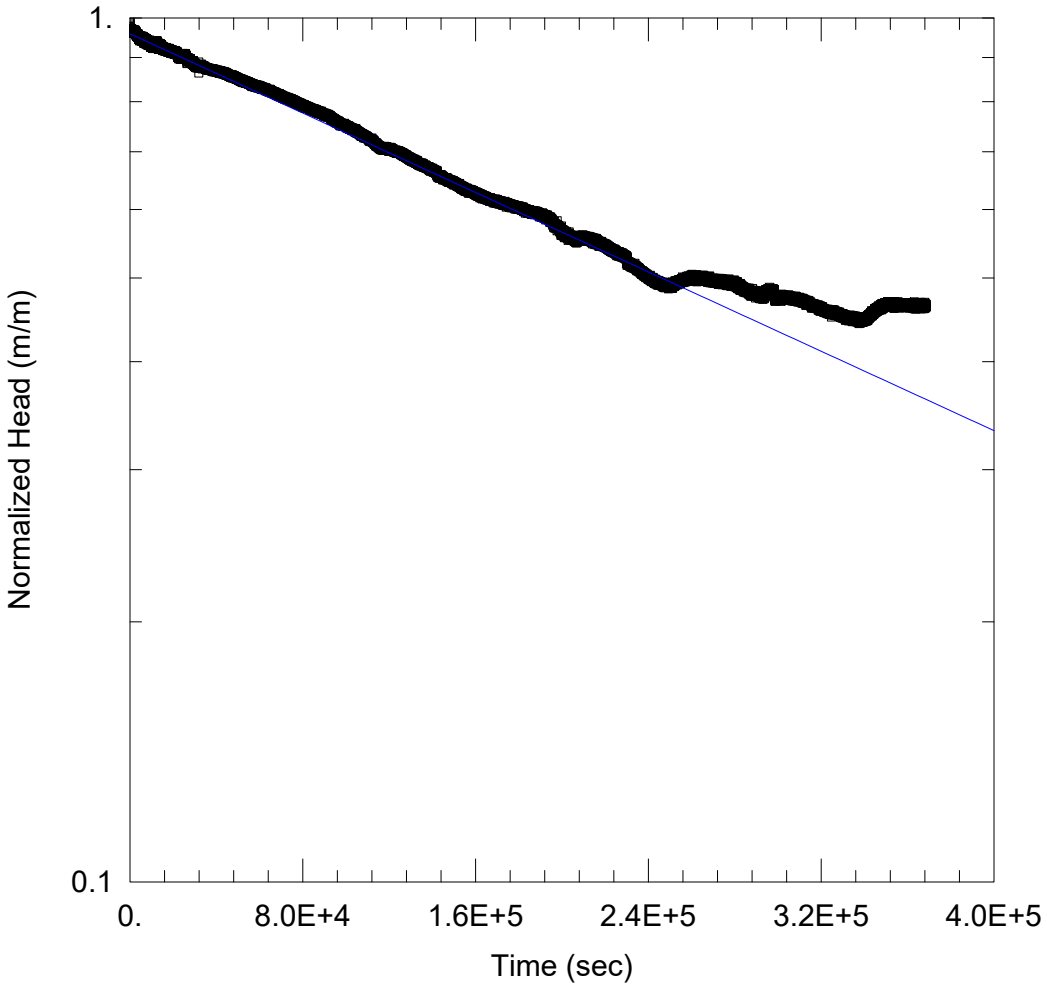
WELL DATA (Test 2)

Initial Displacement: 0.3556 m
Total Well Penetration Depth: 7.244 m
Casing Radius: 0.0214 m
Static Water Column Height: 7.244 m
Screen Length: 4.5 m
Well Radius: 0.079 m
Gravel Pack Porosity: 0.

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 7.166E-7 m/sec y0 = 0.3047 m



TEST 1

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PROJECT INFORMATION

Company: PGL Environmental
Client: V.A. Wood Associates
Project: 4027-21.01
Test Well: MW95
Test Date: May 31, 2019

AQUIFER DATA

Saturated Thickness: 10.75 m Anisotropy Ratio (Kz/Kr): 0.1

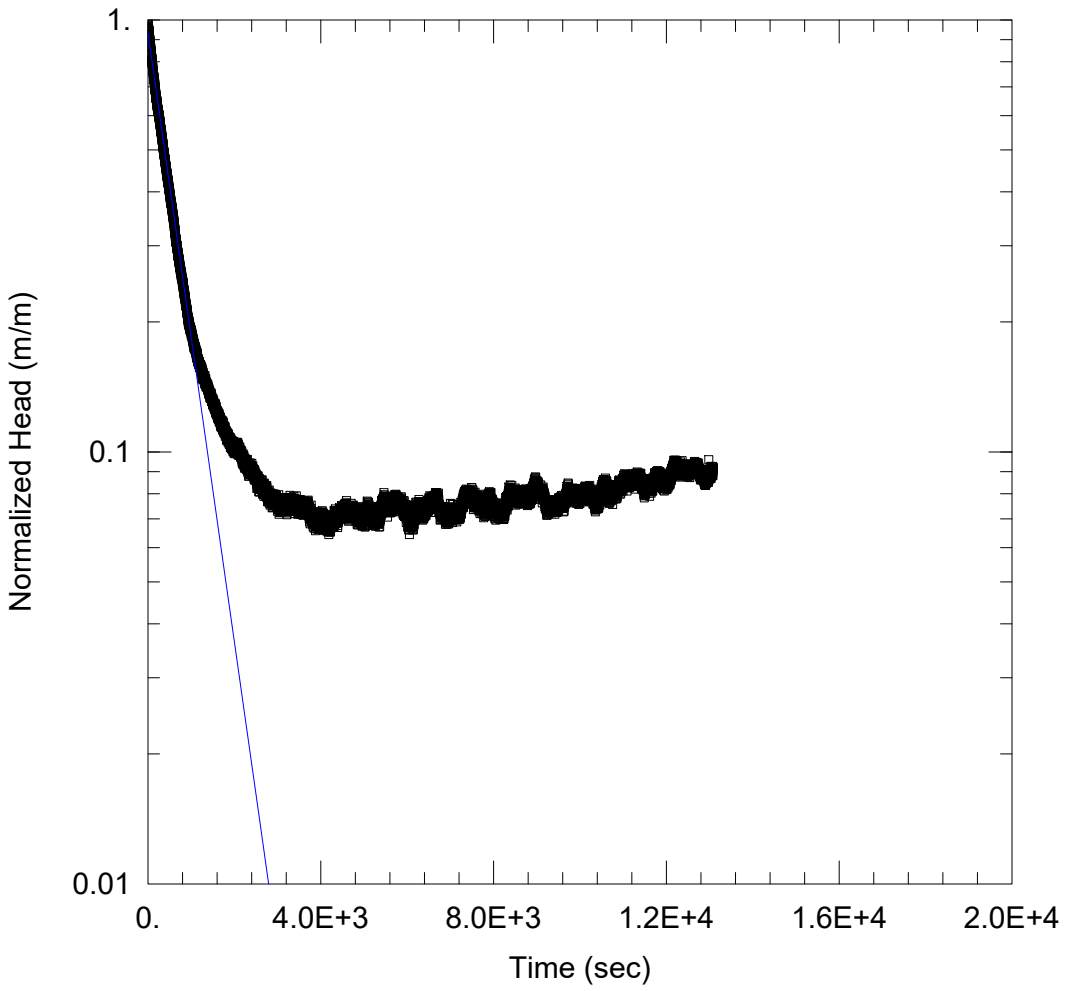
WELL DATA (Test 1)

Initial Displacement: 0.4585 m
Total Well Penetration Depth: 10.75 m
Casing Radius: 0.0214 m
Static Water Column Height: 10.75 m
Screen Length: 3.1 m
Well Radius: 0.055 m
Gravel Pack Porosity: 0.

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 9.424E-10 m/sec y0 = 0.4396 m



TEST 1

Data Set: Y:\...\MW96-Test1.aqt
Date: 06/21/19 Time: 12:09:49

PROJECT INFORMATION

Company: PGL Environmental
Client: V.A. Wood Associates
Project: 4027-21.01
Test Well: MW96
Test Date: May 31, 2019

AQUIFER DATA

Saturated Thickness: 12.28 m Anisotropy Ratio (Kz/Kr): 0.1

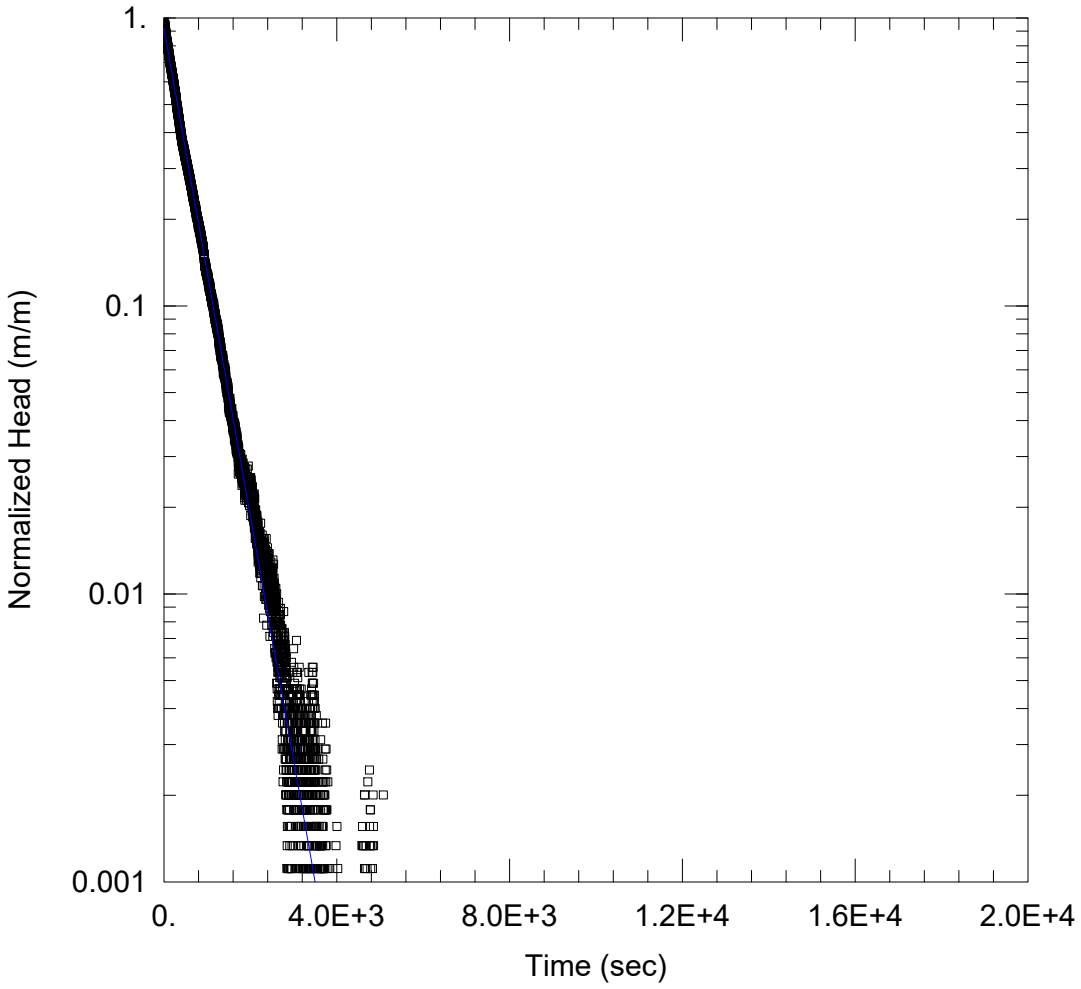
WELL DATA (New Well)

Initial Displacement: 0.4473 m
Total Well Penetration Depth: 12.28 m
Casing Radius: 0.0214 m
Static Water Column Height: 12.28 m
Screen Length: 3.1 m
Well Radius: 0.055 m
Gravel Pack Porosity: 0.

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 5.886E-7 m/sec y0 = 0.418 m



TEST 2

Data Set: Y:\...\MW96-Test2.aqt
Date: 06/21/19 Time: 12:10:08

PROJECT INFORMATION

Company: PGL Environmental
Client: V.A. Wood Associates
Project: 4027-21.01
Test Well: MW96
Test Date: May 31, 2019

AQUIFER DATA

Saturated Thickness: 12.28 m Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (Test 2)

Initial Displacement: 0.4493 m
Total Well Penetration Depth: 12.28 m
Casing Radius: 0.0214 m
Static Water Column Height: 12.28 m
Screen Length: 3.1 m
Well Radius: 0.055 m
Gravel Pack Porosity: 0.

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 7.071E-7 m/sec y0 = 0.4142 m

Appendix 5

Groundwater Chemical Data

PGL
ENVIRONMENTAL CONSULTANTS

Pottinger Gaherty Environmental (Whitby)
ATTN: Debra Cohen
102 - 250 Water Street
Whitby ON L1N 0G5

Date Received: 13-JUN-19
Report Date: 24-JUN-19 07:22 (MT)
Version: FINAL REV. 2

Client Phone: 905-668-4908

Certificate of Analysis

Lab Work Order #: L2291415

Project P.O. #:	NOT SUBMITTED
Job Reference:	4027-21.01
C of C Numbers:	17-822384
Legal Site Desc:	ELGIN ST. W, COBOURG

Comments: JUN-24-19:
Cobourg storm + sanitary limits attached.

Mathy Mahadeva
Account Manager

ANALYTICAL REPORT

Summary of Guideline Exceedances

ALS ID	Client ID	Grouping	Analyte	Result	Guideline Limit	Unit
Guideline						
Ontario Sewer Use Bylaws - Cobourg Sanitary Sewer Use By-Law (22-2008)						
(No parameter exceedances)						
Ontario Sewer Use Bylaws - Cobourg Storm Sewer Use By-Law (22-2008)						
L2291415-1	BH96	Inorganic Parameters	Chlorine, Free	<0.050	0.02	mg/L
		Total Metals	Manganese (Mn)-Total	0.156	0.05	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: L2291415-1 / Sample Date: 12-JUN-19 / Sample ID: BH96
Hardness (as CaCO3)	mg/L	-	-	386 HTC
pH	pH units	6.00-10.5	6-9	8.01
Total Suspended Solids	mg/L	300	15	<2.0

Guide Limit #1: Cobourg Sanitary Sewer Use By-Law (22-2008)
Guide Limit #2: Cobourg Storm Sewer Use By-Law (22-2008)

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

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

ANALYTICAL REPORT

Anions and Nutrients - WATER

			Lab ID	L2291415-1
			Sample Date	12-JUN-19
			Sample ID	BH96
		Guide Limits		
Analyte	Unit	#1	#2	
Fluoride (F)	mg/L	10	-	0.30 DLDS
Total Kjeldahl Nitrogen	mg/L	100	-	<1.5 DLM
Phosphorus, Total	mg/L	10	0.4	0.271

Guide Limit #1: Cobourg Sanitary Sewer Use By-Law (22-2008)
Guide Limit #2: Cobourg Storm Sewer Use By-Law (22-2008)

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

Cyanides - WATER

		Guide Limits		
Analyte	**Unit**	**#1**	**#2**	
Lab ID				L2291415-1
Sample Date				12-JUN-19
Sample ID				BH96
Cyanide, Total	mg/L	1.0	0.02	<0.0020

Guide Limit #1: Cobourg Sanitary Sewer Use By-Law (22-2008)
Guide Limit #2: Cobourg Storm Sewer Use By-Law (22-2008)

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	L2291415-1
			Sample Date	12-JUN-19
			Sample ID	BH96
		Guide Limits		
Analyte	Unit	#1	#2	
Chlorine, Free	mg/L	-	0.02	<0.050 PEHR

Guide Limit #1: Cobourg Sanitary Sewer Use By-Law (22-2008)
Guide Limit #2: Cobourg Storm Sewer Use By-Law (22-2008)

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

Bacteriological Tests - WATER

			Lab ID	L2291415-1
			Sample Date	12-JUN-19
			Sample ID	BH96
		Guide Limits		
Analyte	Unit	#1	#2	
E. Coli	CFU/100mL	-	200	0

Guide Limit #1: Cobourg Sanitary Sewer Use By-Law (22-2008)
Guide Limit #2: Cobourg Storm Sewer Use By-Law (22-2008)

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

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

ANALYTICAL REPORT

Total Metals - WATER

			Lab ID	L2291415-1
			Sample Date	12-JUN-19
			Sample ID	BH96
		Guide Limits		
Analyte	**Unit**	**#1**	**#2**	
Aluminum (Al)-Total	mg/L	50	-	3.70
Antimony (Sb)-Total	mg/L	5	-	<0.00010
Arsenic (As)-Total	mg/L	1.0	0.02	0.00142
Barium (Ba)-Total	mg/L	-	-	0.167
Beryllium (Be)-Total	mg/L	-	-	0.00014
Bismuth (Bi)-Total	mg/L	-	-	<0.000050
Boron (B)-Total	mg/L	-	-	0.044
Cadmium (Cd)-Total	mg/L	0.7	0.008	0.0000259
Calcium (Ca)-Total	mg/L	-	-	119
Cesium (Cs)-Total	mg/L	-	-	0.000429
Chromium (Cr)-Total	mg/L	4.0	0.08	0.00681
Cobalt (Co)-Total	mg/L	5.0	-	0.00189
Copper (Cu)-Total	mg/L	2.0	0.04	0.0044
Iron (Fe)-Total	mg/L	-	-	4.06
Lead (Pb)-Total	mg/L	1.0	0.12	0.00169
Lithium (Li)-Total	mg/L	-	-	0.0113
Magnesium (Mg)-Total	mg/L	-	-	21.6
Manganese (Mn)-Total	mg/L	-	0.05	0.156
Mercury (Hg)-Total	mg/L	0.05	0.0004	<0.000010
Molybdenum (Mo)-Total	mg/L	5.0	-	0.00330
Nickel (Ni)-Total	mg/L	2.0	0.08	0.00353
Phosphorus (P)-Total	mg/L	10	0.4	0.236
Potassium (K)-Total	mg/L	-	-	3.44
Rubidium (Rb)-Total	mg/L	-	-	0.00752
Selenium (Se)-Total	mg/L	1.0	0.02	0.000962
Silicon (Si)-Total	mg/L	-	-	16.0
Silver (Ag)-Total	mg/L	5.0	0.12	<0.000050
Sodium (Na)-Total	mg/L	-	-	16.8
Strontium (Sr)-Total	mg/L	-	-	0.546
Sulfur (S)-Total	mg/L	-	-	10.3

Guide Limit #1: Cobourg Sanitary Sewer Use By-Law (22-2008)
Guide Limit #2: Cobourg Storm Sewer Use By-Law (22-2008)

* 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: L2291415-1 Sample Date: 12-JUN-19 Sample ID: BH96
Tellurium (Te)-Total	mg/L	-	-	<0.00020
Thallium (Tl)-Total	mg/L	-	-	0.000054
Thorium (Th)-Total	mg/L	-	-	0.00120
Tin (Sn)-Total	mg/L	-	-	0.00083
Titanium (Ti)-Total	mg/L	-	-	0.206
Tungsten (W)-Total	mg/L	-	-	0.00017
Uranium (U)-Total	mg/L	-	-	0.00183
Vanadium (V)-Total	mg/L	-	-	0.00959
Zinc (Zn)-Total	mg/L	2.0	0.04	0.0101
Zirconium (Zr)-Total	mg/L	-	-	0.00148

Guide Limit #1: Cobourg Sanitary Sewer Use By-Law (22-2008)
Guide Limit #2: Cobourg Storm Sewer Use By-Law (22-2008)

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	L2291415-1
			Sample Date	12-JUN-19
			Sample ID	BH96
		Guide Limits		
Analyte	**Unit**	**#1**	**#2**	
Chromium, Hexavalent	mg/L	2.0	0.04	<0.00050

Guide Limit #1: Cobourg Sanitary Sewer Use By-Law (22-2008)
Guide Limit #2: Cobourg Storm Sewer Use By-Law (22-2008)

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

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

ANALYTICAL REPORT

Aggregate Organics - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID: L2291415-1 Sample Date: 12-JUN-19 Sample ID: BH96
BOD	mg/L	300	15	<3.0 BODL
Oil and Grease, Total	mg/L	-	-	<5.0
Animal/Veg Oil & Grease	mg/L	150	-	<5.0
Mineral Oil and Grease	mg/L	15	-	<2.5
Phenols (4AAP)	mg/L	1.0	0.008	0.0015

Guide Limit #1: Cobourg Sanitary Sewer Use By-Law (22-2008)
Guide Limit #2: Cobourg Storm Sewer Use By-Law (22-2008)

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

Volatile Organic Compounds - WATER

			Lab ID	L2291415-1
			Sample Date	12-JUN-19
			Sample ID	BH96
		Guide Limits		
Analyte	Unit	#1	#2	
Acetone	ug/L	-	-	<20
Benzene	ug/L	10	2	<0.50
Bromodichloromethane	ug/L	-	-	<1.0
Bromoform	ug/L	-	-	<1.0
Bromomethane	ug/L	-	-	<0.50
Carbon Disulfide	ug/L	-	-	<1.0
Carbon tetrachloride	ug/L	-	-	<0.50
Chlorobenzene	ug/L	-	-	<0.50
Dibromochloromethane	ug/L	-	-	<1.0
Chloroethane	ug/L	-	-	<1.0
Chloroform	ug/L	40	2	<1.0
Chloromethane	ug/L	-	-	<1.0
1,2-Dibromoethane	ug/L	-	-	<0.20
1,2-Dichlorobenzene	ug/L	50	5.6	<0.50
1,3-Dichlorobenzene	ug/L	-	-	<0.50
1,4-Dichlorobenzene	ug/L	80	6.8	<0.50
Dichlorodifluoromethane	ug/L	-	-	<1.0
1,1-Dichloroethane	ug/L	-	-	<0.50
1,2-Dichloroethane	ug/L	-	-	<0.50
1,1-Dichloroethylene	ug/L	-	-	<0.50
cis-1,2-Dichloroethylene	ug/L	4000	5.6	<0.50
trans-1,2-Dichloroethylene	ug/L	-	-	<0.50
Dichloromethane	ug/L	2000	5.2	<2.0
1,2-Dichloropropane	ug/L	-	-	<0.50
cis-1,3-Dichloropropene	ug/L	-	-	<0.50
trans-1,3-Dichloropropene	ug/L	140	5.6	<0.50
Ethylbenzene	ug/L	160	2	<0.50
n-Hexane	ug/L	-	-	<0.50
2-Hexanone	ug/L	-	-	<20
Methyl Ethyl Ketone	ug/L	-	-	<20

Guide Limit #1: Cobourg Sanitary Sewer Use By-Law (22-2008)
Guide Limit #2: Cobourg Storm Sewer Use By-Law (22-2008)

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

Volatile Organic Compounds - WATER

			Lab ID	L2291415-1
			Sample Date	12-JUN-19
			Sample ID	BH96
		Guide Limits		
Analyte	Unit	#1	#2	
Methyl Isobutyl Ketone	ug/L	-	-	<20
MTBE	ug/L	-	-	<0.50
Styrene	ug/L	-	-	<0.50
1,1,1,2-Tetrachloroethane	ug/L	-	-	<0.50
1,1,2,2-Tetrachloroethane	ug/L	1000	17	<0.50
Tetrachloroethylene	ug/L	1000	4.4	<0.50
Toluene	ug/L	20	2	<0.50
1,1,1-Trichloroethane	ug/L	-	-	<0.50
1,1,2-Trichloroethane	ug/L	-	-	<0.50
Trichloroethylene	ug/L	400	7.6	<0.50
Trichlorofluoromethane	ug/L	-	-	<1.0
Vinyl chloride	ug/L	-	-	<0.50
o-Xylene	ug/L	-	-	<0.50
m+p-Xylenes	ug/L	-	-	<1.0
Xylenes (Total)	ug/L	1400	4.4	<1.1
Surrogate: 4-Bromofluorobenzene	%	-	-	100.3
Surrogate: 1,4-Difluorobenzene	%	-	-	103.3

Guide Limit #1: Cobourg Sanitary Sewer Use By-Law (22-2008)
Guide Limit #2: Cobourg Storm Sewer Use By-Law (22-2008)

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

Polycyclic Aromatic Hydrocarbons - WATER

			Lab ID	L2291415-1
			Sample Date	12-JUN-19
			Sample ID	BH96
		Guide Limits		
Analyte	Unit	#1	#2	
Acenaphthene	ug/L	-	-	<0.010
Acenaphthylene	ug/L	-	-	<0.010
Anthracene	ug/L	-	-	<0.010
Benzo(a)anthracene	ug/L	-	-	<0.010
Benzo(a)pyrene	ug/L	-	-	<0.010
Benzo(b)fluoranthene	ug/L	-	-	<0.010
Benzo(e)pyrene	ug/L	-	-	<0.050
Benzo(ghi)perylene	ug/L	-	-	<0.010
Benzo(k)fluoranthene	ug/L	-	-	<0.010
Chrysene	ug/L	-	-	<0.010
Dibenz(a,h)acridine	ug/L	-	-	<0.050
Dibenz(a,j)acridine	ug/L	-	-	<0.050
Dibenzo(a,e)pyrene	ug/L	-	-	<0.050
Dibenzo(a,h)anthracene	ug/L	-	-	<0.010
Dibenzo(a,h)pyrene	ug/L	-	-	<0.050
Dibenzo(a,i)pyrene	ug/L	-	-	<0.050
7H-Dibenzo(c,g)carbazole	ug/L	-	-	<0.050
1,3-Dinitropyrene	ug/L	-	-	<1.0
1,6-Dinitropyrene	ug/L	-	-	<1.0
1,8-Dinitropyrene	ug/L	-	-	<1.0
Fluoranthene	ug/L	-	-	<0.010
Fluorene	ug/L	-	-	<0.010
Indeno(1,2,3-cd)pyrene	ug/L	-	-	<0.010
3-Methylcholanthrene	ug/L	-	-	<0.050
1-Methylnaphthalene	ug/L	-	-	<0.010
2-Methylnaphthalene	ug/L	-	-	<0.010
Naphthalene	ug/L	-	-	<0.010
Perylene	ug/L	-	-	<0.010
Phenanthrene	ug/L	-	-	<0.010
Pyrene	ug/L	-	-	<0.010

Guide Limit #1: Cobourg Sanitary Sewer Use By-Law (22-2008)
Guide Limit #2: Cobourg Storm Sewer Use By-Law (22-2008)

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

ANALYTICAL REPORT

Polycyclic Aromatic Hydrocarbons - WATER

			Lab ID	L2291415-1
			Sample Date	12-JUN-19
			Sample ID	BH96
		Guide Limits		
Analyte	Unit	#1	#2	
Surrogate: 2-Fluorobiphenyl	%	-	-	84.6
Surrogate: d14-Terphenyl	%	-	-	64.6
Surrogate: p-Terphenyl d14	%	-	-	86.5
Total PAHs	ug/L	5	2	<1.7

Guide Limit #1: Cobourg Sanitary Sewer Use By-Law (22-2008)
Guide Limit #2: Cobourg Storm Sewer Use By-Law (22-2008)

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

Phthalate Esters - WATER

			Lab ID	L2291415-1
			Sample Date	12-JUN-19
			Sample ID	BH96
		Guide Limits		
Analyte	**Unit**	**#1**	**#2**	
Bis(2-ethylhexyl)phthalate	ug/L	10	15	<0.60
Surrogate: 2-fluorobiphenyl	%	-	-	79.0
Surrogate: p-Terphenyl d14	%	-	-	100.2

Guide Limit #1: Cobourg Sanitary Sewer Use By-Law (22-2008)
Guide Limit #2: Cobourg Storm Sewer Use By-Law (22-2008)

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	L2291415-1
			Sample Date	12-JUN-19
			Sample ID	BH96
Analyte	**Unit**	**Guide Limits #1**	**#2**	
Acenaphthene	ug/L	-	-	<0.20
Acenaphthylene	ug/L	-	-	<0.20
Anthracene	ug/L	-	-	<0.20
Benzo(a)anthracene	ug/L	-	-	<0.20
Benzo(a)pyrene	ug/L	-	-	<0.020
Benzo(b)fluoranthene	ug/L	-	-	<0.10
Benzo(ghi)perylene	ug/L	-	-	<0.20
Benzo(k)fluoranthene	ug/L	-	-	<0.10
Biphenyl	ug/L	-	-	<0.20
4-Chloroaniline	ug/L	-	-	<0.40
Bis(2-chloroethyl)ether	ug/L	-	-	<0.40
Bis(2-chloroisopropyl)ether	ug/L	-	-	<0.40
2-Chlorophenol	ug/L	-	-	<0.30
Chrysene	ug/L	-	-	<0.10
Dibenzo(a,h)anthracene	ug/L	-	-	<0.20
3,3'-Dichlorobenzidine	ug/L	-	-	<0.40
2,4-Dichlorophenol	ug/L	-	-	<0.30
Diethylphthalate	ug/L	-	-	<0.20
Dimethylphthalate	ug/L	-	-	<0.20
2,4-Dimethylphenol	ug/L	-	-	<0.50
Di-n-butylphthalate	ug/L	80	15	<1.0
2,4-Dinitrophenol	ug/L	-	-	<1.0
2,4-Dinitrotoluene	ug/L	-	-	<0.40
2,6-Dinitrotoluene	ug/L	-	-	<0.40
Fluoranthene	ug/L	-	-	<0.20
Fluorene	ug/L	-	-	<0.20
Indeno(1,2,3-cd)pyrene	ug/L	-	-	<0.20
1-Methylnaphthalene	ug/L	-	-	<0.40
2-Methylnaphthalene	ug/L	-	-	<0.40
Naphthalene	ug/L	-	-	<0.20

Guide Limit #1: Cobourg Sanitary Sewer Use By-Law (22-2008)
Guide Limit #2: Cobourg Storm Sewer Use By-Law (22-2008)

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

ANALYTICAL REPORT

Semi-Volatile Organics - WATER

			Lab ID	L2291415-1
			Sample Date	12-JUN-19
			Sample ID	BH96
		Guide Limits		
Analyte	**Unit**	**#1**	**#2**	
Phenanthrene	ug/L	-	-	<0.20
Phenol	ug/L	-	-	<0.50
Pyrene	ug/L	-	-	<0.20
1,2,4-Trichlorobenzene	ug/L	-	-	<0.40
2,4,5-Trichlorophenol	ug/L	-	-	<0.20
2,4,6-Trichlorophenol	ug/L	-	-	<0.20
Surrogate: 2-Fluorobiphenyl	%	-	-	79.0
Surrogate: Nitrobenzene d5	%	-	-	82.1
Surrogate: Phenol d5	%	-	-	44.4
Surrogate: p-Terphenyl d14	%	-	-	100.2
Surrogate: 2,4,6-Tribromophenol	%	-	-	84.6

Guide Limit #1: Cobourg Sanitary Sewer Use By-Law (22-2008)
Guide Limit #2: Cobourg Storm Sewer Use By-Law (22-2008)

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

Phenolics - WATER

			Lab ID	L2291415-1
			Sample Date	12-JUN-19
			Sample ID	BH96
Analyte	**Unit**	**Guide Limits #1**	**#2**	
Pentachlorophenol	ug/L	5	2	<0.50
Surrogate: 2,4,6-Tribromophenol	%	-	-	84.6

Guide Limit #1: Cobourg Sanitary Sewer Use By-Law (22-2008)
Guide Limit #2: Cobourg Storm Sewer Use By-Law (22-2008)

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

Polychlorinated Biphenyls - WATER

			Lab ID	L2291415-1
			Sample Date	12-JUN-19
			Sample ID	BH96
		Guide Limits		
Analyte	Unit	#1	#2	
Aroclor 1242	ug/L	-	-	<0.020
Aroclor 1248	ug/L	-	-	<0.020
Aroclor 1254	ug/L	-	-	<0.020
Aroclor 1260	ug/L	-	-	<0.020
Total PCBs	ug/L	1	0.4	<0.040
Surrogate: d14-Terphenyl	%	-	-	70.7

Guide Limit #1: Cobourg Sanitary Sewer Use By-Law (22-2008)
Guide Limit #2: Cobourg Storm Sewer Use By-Law (22-2008)

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

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

ANALYTICAL REPORT

Organochlorine Pesticides - WATER

		Lab ID		L2291415-1
		Sample Date		12-JUN-19
		Sample ID		BH96
		Guide Limits		
Analyte	**Unit**	**#1**	**#2**	
Aldrin	ug/L	-	-	<0.010
gamma-hexachlorocyclohexane	ug/L	100	40	<0.010
a-chlordane	ug/L	-	-	<0.040
Chlordane (Total)	ug/L	-	40	<0.057
g-chlordane	ug/L	-	-	<0.040
o,p-DDD	ug/L	-	-	<0.030
pp-DDD	ug/L	-	-	<0.030
Total DDD	ug/L	-	-	<0.042
o,p-DDE	ug/L	-	-	<0.0080
pp-DDE	ug/L	-	-	<0.0080
Total DDE	ug/L	-	-	<0.011
op-DDT	ug/L	-	-	<0.030
pp-DDT	ug/L	-	-	<0.030
Total DDT	ug/L	-	-	<0.042
Dieldrin	ug/L	-	-	<0.050
Endosulfan I	ug/L	-	-	<0.030
Endosulfan II	ug/L	-	-	<0.030
Endosulfan (Total)	ug/L	-	-	<0.042
Endrin	ug/L	-	-	<0.040
Heptachlor	ug/L	-	-	<0.010
Heptachlor Epoxide	ug/L	-	-	<0.010
Hexachlorobenzene	ug/L	0.1	0.04	<0.010
Hexachlorobutadiene	ug/L	-	-	<0.010
Hexachloroethane	ug/L	-	-	<0.010
Methoxychlor	ug/L	-	-	<0.050
Surrogate: 2-Fluorobiphenyl	%	-	-	85.9
Surrogate: d14-Terphenyl	%	-	-	102.5

Guide Limit #1: Cobourg Sanitary Sewer Use By-Law (22-2008)
Guide Limit #2: Cobourg Storm Sewer Use By-Law (22-2008)

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

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

ANALYTICAL REPORT

Organic Parameters - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID: L2291415-1 Sample Date: 12-JUN-19 Sample ID: BH96
Nonylphenol	ug/L	-	1	<1.0
Nonylphenol Diethoxylates	ug/L	-	-	<0.10
Total Nonylphenol Ethoxylates	ug/L	-	10	<2.0
Nonylphenol Monoethoxylates	ug/L	-	-	<2.0

Guide Limit #1: Cobourg Sanitary Sewer Use By-Law (22-2008)
Guide Limit #2: Cobourg Storm Sewer Use By-Law (22-2008)

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

Qualifiers for Individual Parameters Listed:

Qualifier	Description
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.
HTC	Hardness was calculated from Total Ca and/or Mg concentrations and may be biased high (dissolved Ca/Mg results unavailable).
BODL	Limit of Reporting for BOD was increased to account for the largest volume of sample tested.
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Method Reference**
625-33DCBENZIDINE-WT	Water	3,3-Dichlorobenzidine	SW846 8270

Aqueous samples are extracted and extracts are analyzed on GC/MSD.

625-511-WT	Water	ABN,CP,PAH-O.Reg 153/04	SW846 8270 (511)

Ground water sample extraction is carried out at a pH <2 (acid extractables) and pH>11 (base neutral extractables). Extracts are dried, concentrated and exchanged into a solvent compatible with the cleanup. Analysis is by GC/MS. Depending on the analytical GC/MS column used benzo(j)fluoranthene may chromatographically co-elute with benzo(b)fluoranthene or benzo(k)fluoranthene.

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).

625-BIS-2-PHTH-WT	Water	Bis(2-ethylhexyl)phthalate	SW846 8270

Aqueous samples are extracted and extracts are analyzed on GC/MSD.

625-DNB-PHTH-WT	Water	Di-n-Butyl Phthalate	SW846 8270

Aqueous samples are extracted and extracts are analyzed on GC/MSD.

625-PAH-LOW-WT	Water	EPA 8270 PAH (Low Level)	SW846 8270

Aqueous samples are extracted and extracts are analyzed on GC/MSD. Depending on the analytical GC/MS column used benzo(j)fluoranthene may chromatographically co-elute with benzo(b)fluoranthene or benzo(k)fluoranthene.

625-PCP-WT	Water	Pentachlorophenol	SW846 8270
BOD-WT	Water	BOD	APHA 5210 B

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.

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.

CL2-FREE-WT	Water	Free Chlorine	SM 4500-CL G, EPA 330.5

Chlorine (residual), as free or total, is analyzed using the DPD colourimetric method. The recommended hold time for these tests is 15 minutes; field testing is recommended for best results. Chlorine can be rapidly consumed by organic matter, if present, and dissipates rapidly into headspace.

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

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

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.

EC-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

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.

ENDOSULFAN-T-CALC-WT	Water	Endosulfan 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.

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-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.

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).

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.

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

Reference Information

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Method Reference**

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

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-EXTRA-WT	Water	Sanitary Sewer Use By-Law Additional PAH	SW846 8270
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.

PEST-OC-511-WT	Water	OC Pesticides-O. Reg 153/04 (July 2011)	SW846 8270 (511)

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.

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).

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.

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-WT	Water	Total Kjeldahl Nitrogen	APHA 4500-Norg D

This analysis is carried out using procedures adapted from APHA Method 4500-Norg "Nitrogen (Organic)". Total Kjeldahl Nitrogen is determined by sample digestion at 380 Celsius with analysis using an automated colorimetric method.

VOC-ROU-HS-WT	Water	Volatile Organic Compounds	SW846 8260

Aqueous samples are analyzed by headspace-GC/MS.

Reference Information

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Method Reference**
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:

17-822384

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

Client: Pottinger Gaherty Environmental (Whitby)
102 - 250 Water Street
Whitby ON L1N 0G5
Contact: Debra Cohen

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
625-33DCBENZIDINE-WT	**Water**							
Batch	**R4673528**							
WG3079408-2	**LCS**							
3,3'-Dichlorobenzidine			84.2		%		50-140	19-JUN-19
WG3079408-1	**MB**							
3,3'-Dichlorobenzidine			<0.40		ug/L		0.4	19-JUN-19
Surrogate: p-Terphenyl d14			105.9		%		40-130	19-JUN-19
625-511-WT	**Water**							
Batch	**R4673528**							
WG3079408-2	**LCS**							
1-Methylnaphthalene			80.4		%		50-140	19-JUN-19
1,2,4-Trichlorobenzene			68.4		%		50-140	19-JUN-19
2-Chlorophenol			96.6		%		50-140	19-JUN-19
2-Methylnaphthalene			82.0		%		50-140	19-JUN-19
2,4-Dichlorophenol			107.5		%		50-140	19-JUN-19
2,4-Dimethylphenol			107.0		%		30-130	19-JUN-19
2,4-Dinitrophenol			102.7		%		50-140	19-JUN-19
2,4-Dinitrotoluene			103.7		%		50-140	19-JUN-19
2,4,5-Trichlorophenol			112.5		%		50-140	19-JUN-19
2,4,6-Trichlorophenol			109.2		%		50-140	19-JUN-19
2,6-Dinitrotoluene			100.4		%		50-140	19-JUN-19
4-Chloroaniline			87.6		%		30-130	19-JUN-19
Acenaphthene			93.3		%		50-140	19-JUN-19
Acenaphthylene			96.6		%		50-140	19-JUN-19
Anthracene			97.6		%		50-140	19-JUN-19
Benzo(a)anthracene			97.0		%		50-140	19-JUN-19
Benzo(a)pyrene			97.9		%		50-140	19-JUN-19
Benzo(b)fluoranthene			104.4		%		50-140	19-JUN-19
Benzo(ghi)perylene			99.9		%		50-140	19-JUN-19
Benzo(k)fluoranthene			94.9		%		50-140	19-JUN-19
Biphenyl			91.8		%		50-140	19-JUN-19
Bis(2-chloroethyl)ether			90.3		%		50-140	19-JUN-19
Bis(2-chloroisopropyl)ether			97.1		%		50-140	19-JUN-19
Chrysene			99.3		%		50-140	19-JUN-19
Dibenzo(a,h)anthracene			98.9		%		50-140	19-JUN-19
Diethylphthalate			104.3		%		50-140	19-JUN-19
Dimethylphthalate			103.2		%		50-140	19-JUN-19

Quality Control Report

Client: Pottinger Gaherty Environmental (Whitby)
102 - 250 Water Street
Whitby ON L1N 0G5
Contact: Debra Cohen

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
625-511-WT	**Water**							
Batch R4673528								
WG3079408-2 LCS								
Fluoranthene			107.9		%		50-140	19-JUN-19
Fluorene			98.6		%		50-140	19-JUN-19
Indeno(1,2,3-cd)pyrene			105.2		%		50-140	19-JUN-19
Naphthalene			87.6		%		50-140	19-JUN-19
Phenanthrene			99.7		%		50-140	19-JUN-19
Phenol			58.7		%		30-130	19-JUN-19
Pyrene			105.5		%		50-140	19-JUN-19
WG3079408-1 MB								
1-Methylnaphthalene			<0.40		ug/L		0.4	19-JUN-19
1,2,4-Trichlorobenzene			<0.40		ug/L		0.4	19-JUN-19
2-Chlorophenol			<0.30		ug/L		0.3	19-JUN-19
2-Methylnaphthalene			<0.40		ug/L		0.4	19-JUN-19
2,4-Dichlorophenol			<0.30		ug/L		0.3	19-JUN-19
2,4-Dimethylphenol			<0.50		ug/L		0.5	19-JUN-19
2,4-Dinitrophenol			<1.0		ug/L		1	19-JUN-19
2,4-Dinitrotoluene			<0.40		ug/L		0.4	19-JUN-19
2,4,5-Trichlorophenol			<0.20		ug/L		0.2	19-JUN-19
2,4,6-Trichlorophenol			<0.20		ug/L		0.2	19-JUN-19
2,6-Dinitrotoluene			<0.40		ug/L		0.4	19-JUN-19
4-Chloroaniline			<0.40		ug/L		0.4	19-JUN-19
Acenaphthene			<0.20		ug/L		0.2	19-JUN-19
Acenaphthylene			<0.20		ug/L		0.2	19-JUN-19
Anthracene			<0.20		ug/L		0.2	19-JUN-19
Benzo(a)anthracene			<0.20		ug/L		0.2	19-JUN-19
Benzo(a)pyrene			<0.020		ug/L		0.02	19-JUN-19
Benzo(b)fluoranthene			<0.10		ug/L		0.1	19-JUN-19
Benzo(ghi)perylene			<0.20		ug/L		0.2	19-JUN-19
Benzo(k)fluoranthene			<0.10		ug/L		0.1	19-JUN-19
Biphenyl			<0.40		ug/L		0.4	19-JUN-19
Bis(2-chloroethyl)ether			<0.40		ug/L		0.4	19-JUN-19
Bis(2-chloroisopropyl)ether			<0.40		ug/L		0.4	19-JUN-19
Chrysene			<0.10		ug/L		0.1	19-JUN-19
Dibenzo(a,h)anthracene			<0.20		ug/L		0.2	19-JUN-19
Diethylphthalate			<0.20		ug/L		0.2	19-JUN-19

Quality Control Report

Client: Pottinger Gaherty Environmental (Whitby)
102 - 250 Water Street
Whitby ON L1N 0G5
Contact: Debra Cohen

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
625-511-WT	**Water**							
Batch R4673528								
WG3079408-1 MB								
Dimethylphthalate			<0.20		ug/L		0.2	19-JUN-19
Fluoranthene			<0.20		ug/L		0.2	19-JUN-19
Fluorene			<0.20		ug/L		0.2	19-JUN-19
Indeno(1,2,3-cd)pyrene			<0.20		ug/L		0.2	19-JUN-19
Naphthalene			<0.20		ug/L		0.2	19-JUN-19
Phenanthrene			<0.20		ug/L		0.2	19-JUN-19
Phenol			<0.50		ug/L		0.5	19-JUN-19
Pyrene			<0.20		ug/L		0.2	19-JUN-19
Surrogate: 2-Fluorobiphenyl			89.8		%		50-140	19-JUN-19
Surrogate: 2,4,6-Tribromophenol			89.6		%		50-140	19-JUN-19
Surrogate: Nitrobenzene d5			92.9		%		50-140	19-JUN-19
Surrogate: p-Terphenyl d14			105.9		%		60-140	19-JUN-19
Surrogate: Phenol d5			52.2		%		30-130	19-JUN-19
625-BIS-2-PHTH-WT	**Water**							
Batch R4673528								
WG3079408-2 LCS								
Bis(2-ethylhexyl)phthalate			122.9		%		50-140	19-JUN-19
WG3079408-1 MB								
Bis(2-ethylhexyl)phthalate			<2.0		ug/L		2	19-JUN-19
Surrogate: 2-fluorobiphenyl			89.8		%		40-130	19-JUN-19
Surrogate: p-Terphenyl d14			105.9		%		40-130	19-JUN-19
625-DNB-PHTH-WT	**Water**							
Batch R4673528								
WG3079408-2 LCS								
Di-n-butylphthalate			111.8		%		50-150	19-JUN-19
WG3079408-1 MB								
Di-n-butylphthalate			<1.0		ug/L		1	19-JUN-19
Surrogate: 2-Fluorobiphenyl			89.8		%		40-130	19-JUN-19
Surrogate: p-Terphenyl d14			105.9		%		40-130	19-JUN-19
625-PAH-LOW-WT	**Water**							
Batch R4672803								
WG3079408-2 LCS								
1-Methylnaphthalene			86.8		%		50-140	18-JUN-19
2-Methylnaphthalene			83.3		%		50-140	18-JUN-19

Quality Control Report

Client: Pottinger Gaherty Environmental (Whitby)
102 - 250 Water Street
Whitby ON L1N 0G5
Contact: Debra Cohen

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
625-PAH-LOW-WT	**Water**							
Batch R4672803								
WG3079408-2 LCS								
Acenaphthene			101.9		%		50-140	18-JUN-19
Acenaphthylene			106.0		%		50-140	18-JUN-19
Anthracene			100.9		%		50-140	18-JUN-19
Benzo(a)anthracene			111.7		%		50-140	18-JUN-19
Benzo(a)pyrene			105.1		%		60-130	18-JUN-19
Benzo(b)fluoranthene			109.0		%		50-140	18-JUN-19
Benzo(ghi)perylene			103.7		%		50-140	18-JUN-19
Benzo(k)fluoranthene			100.8		%		50-140	18-JUN-19
Chrysene			107.4		%		50-140	18-JUN-19
Dibenzo(a,h)anthracene			110.0		%		50-140	18-JUN-19
Fluoranthene			105.6		%		50-140	18-JUN-19
Fluorene			106.0		%		50-140	18-JUN-19
Indeno(1,2,3-cd)pyrene			113.6		%		50-140	18-JUN-19
Naphthalene			93.6		%		50-130	18-JUN-19
Perylene			96.8		%		50-140	18-JUN-19
Phenanthrene			100.9		%		50-140	18-JUN-19
Pyrene			104.8		%		50-140	18-JUN-19
WG3079408-1 MB								
1-Methylnaphthalene			<0.010		ug/L		0.01	18-JUN-19
2-Methylnaphthalene			<0.010		ug/L		0.01	18-JUN-19
Acenaphthene			<0.010		ug/L		0.01	18-JUN-19
Acenaphthylene			<0.010		ug/L		0.01	18-JUN-19
Anthracene			<0.010		ug/L		0.01	18-JUN-19
Benzo(a)anthracene			<0.010		ug/L		0.01	18-JUN-19
Benzo(a)pyrene			<0.010		ug/L		0.01	18-JUN-19
Benzo(b)fluoranthene			<0.010		ug/L		0.01	18-JUN-19
Benzo(ghi)perylene			<0.010		ug/L		0.01	18-JUN-19
Benzo(k)fluoranthene			<0.010		ug/L		0.01	18-JUN-19
Chrysene			<0.010		ug/L		0.01	18-JUN-19
Dibenzo(a,h)anthracene			<0.010		ug/L		0.01	18-JUN-19
Fluoranthene			<0.010		ug/L		0.01	18-JUN-19
Fluorene			<0.010		ug/L		0.01	18-JUN-19
Indeno(1,2,3-cd)pyrene			<0.010		ug/L		0.01	18-JUN-19
Naphthalene			<0.010		ug/L		0.01	18-JUN-19

Quality Control Report

Client: Pottinger Gaherty Environmental (Whitby)
102 - 250 Water Street
Whitby ON L1N 0G5
Contact: Debra Cohen

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
625-PAH-LOW-WT	**Water**							
Batch R4672803								
WG3079408-1 MB								
Perylene			<0.010		ug/L		0.01	18-JUN-19
Phenanthrene			<0.010		ug/L		0.01	18-JUN-19
Pyrene			<0.010		ug/L		0.01	18-JUN-19
Surrogate: 2-Fluorobiphenyl			96.4		%		40-130	18-JUN-19
Surrogate: p-Terphenyl d14			96.4		%		40-130	18-JUN-19
625-PCP-WT	**Water**							
Batch R4673528								
WG3079408-2 LCS								
Pentachlorophenol			118.3		%		50-140	19-JUN-19
WG3079408-1 MB								
Pentachlorophenol			<0.50		ug/L		0.5	19-JUN-19
Surrogate: 2,4,6-Tribromophenol			89.6		%		40-150	19-JUN-19
BOD-WT	**Water**							
Batch R4675008								
WG3077430-10 DUP		**L2290710-2**						
BOD		<2.0	<2.0	RPD-NA	mg/L	N/A	20	19-JUN-19
WG3077430-11 LCS								
BOD			92.4		%		85-115	19-JUN-19
WG3077430-9 MB								
BOD			<2.0		mg/L		2	19-JUN-19
CL2-FREE-WT	**Water**							
Batch R4678651								
WG3082959-3 DUP		**L2291415-1**						
Chlorine, Free		<0.050	<0.050	RPD-NA	mg/L	N/A	15	20-JUN-19
WG3082959-2 LCS								
Chlorine, Free			103.2		%		75-125	20-JUN-19
WG3082959-1 MB								
Chlorine, Free			<0.050		mg/L		0.05	20-JUN-19
WG3082959-4 MS		**L2291415-1**						
Chlorine, Free			92.5		%		70-130	20-JUN-19
CN-TOT-WT	**Water**							
Batch R4671655								
WG3077344-11 DUP		**L2290697-3**						
Cyanide, Total		<0.0020	<0.0020	RPD-NA	mg/L	N/A	20	14-JUN-19
WG3077344-10 LCS								

Quality Control Report

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
CN-TOT-WT	**Water**							
Batch R4671655								
WG3077344-10 LCS								
Cyanide, Total			90.5		%		80-120	14-JUN-19
WG3077344-9 MB								
Cyanide, Total			<0.0020		mg/L		0.002	14-JUN-19
WG3077344-12 MS		**L2290697-3**						
Cyanide, Total			93.2		%		70-130	14-JUN-19
CR-CR6-IC-WT	**Water**							
Batch R4671695								
WG3078982-14 DUP		**WG3078982-13**						
Chromium, Hexavalent		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	17-JUN-19
WG3078982-12 LCS								
Chromium, Hexavalent			102.8		%		80-120	17-JUN-19
WG3078982-11 MB								
Chromium, Hexavalent			<0.00050		mg/L		0.0005	17-JUN-19
WG3078982-15 MS		**WG3078982-13**						
Chromium, Hexavalent			99.6		%		70-130	17-JUN-19
EC-MF-WT	**Water**							
Batch R4670793								
WG3077287-3 DUP		**L2291295-1**						
E. Coli		0	0		CFU/100mL	0.0	65	15-JUN-19
WG3077287-1 MB								
E. Coli			0		CFU/100mL		1	15-JUN-19
F-IC-N-WT	**Water**							
Batch R4672707								
WG3079479-4 DUP		**WG3079479-3**						
Fluoride (F)		0.701	0.702		mg/L	0.2	20	17-JUN-19
WG3079479-2 LCS								
Fluoride (F)			100.8		%		90-110	17-JUN-19
WG3079479-1 MB								
Fluoride (F)			<0.020		mg/L		0.02	17-JUN-19
WG3079479-5 MS		**WG3079479-3**						
Fluoride (F)			100.0		%		75-125	17-JUN-19
HG-T-CVAA-WT	**Water**							
Batch R4672653								
WG3080163-4 DUP		**WG3080163-3**						
Mercury (Hg)-Total		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	18-JUN-19
WG3080163-2 LCS								

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
HG-T-CVAA-WT	**Water**							
Batch R4672653								
WG3080163-2 LCS								
Mercury (Hg)-Total			99.8		%		80-120	18-JUN-19
WG3080163-1 MB								
Mercury (Hg)-Total			<0.000010		mg/L		0.00001	18-JUN-19
WG3080163-6 MS		**WG3080163-5**						
Mercury (Hg)-Total			94.5		%		70-130	18-JUN-19
MET-T-CCMS-WT	**Water**							
Batch R4671543								
WG3078882-4 DUP		**WG3078882-3**						
Aluminum (Al)-Total		<0.050	<0.050	RPD-NA	mg/L	N/A	20	17-JUN-19
Antimony (Sb)-Total		0.0039	0.0037		mg/L	5.9	20	17-JUN-19
Arsenic (As)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	17-JUN-19
Barium (Ba)-Total		0.288	0.289		mg/L	0.1	20	17-JUN-19
Beryllium (Be)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	17-JUN-19
Bismuth (Bi)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	17-JUN-19
Boron (B)-Total		<0.10	<0.10	RPD-NA	mg/L	N/A	20	17-JUN-19
Cadmium (Cd)-Total		0.000050	0.000068	J	mg/L	0.000018	0.0001	17-JUN-19
Calcium (Ca)-Total		490	493		mg/L	0.6	20	17-JUN-19
Chromium (Cr)-Total		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	17-JUN-19
Cesium (Cs)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	17-JUN-19
Cobalt (Co)-Total		0.0032	0.0033		mg/L	1.6	20	17-JUN-19
Copper (Cu)-Total		<0.010	<0.010	RPD-NA	mg/L	N/A	20	17-JUN-19
Iron (Fe)-Total		2.23	2.24		mg/L	0.5	20	17-JUN-19
Lead (Pb)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	17-JUN-19
Lithium (Li)-Total		0.012	0.014		mg/L	11	20	17-JUN-19
Magnesium (Mg)-Total		102	105		mg/L	2.9	20	17-JUN-19
Manganese (Mn)-Total		9.98	9.83		mg/L	1.5	20	17-JUN-19
Molybdenum (Mo)-Total		0.00108	0.00097		mg/L	11	20	17-JUN-19
Nickel (Ni)-Total		0.0058	0.0055		mg/L	4.1	20	17-JUN-19
Phosphorus (P)-Total		<0.50	<0.50	RPD-NA	mg/L	N/A	20	17-JUN-19
Potassium (K)-Total		9.56	9.61		mg/L	0.5	20	17-JUN-19
Rubidium (Rb)-Total		<0.0020	<0.0020	RPD-NA	mg/L	N/A	20	17-JUN-19
Selenium (Se)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	17-JUN-19
Silicon (Si)-Total		9.9	9.7		mg/L	2.1	20	17-JUN-19

Quality Control Report

Client: Pottinger Gaherty Environmental (Whitby)
102 - 250 Water Street
Whitby ON L1N 0G5
Contact: Debra Cohen

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R4671543								
WG3078882-4 DUP		**WG3078882-3**						
Silver (Ag)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	17-JUN-19
Sodium (Na)-Total		408	407		mg/L	0.4	20	17-JUN-19
Strontium (Sr)-Total		1.51	1.46		mg/L	3.2	20	17-JUN-19
Sulfur (S)-Total		37.7	37.8		mg/L	0.2	25	17-JUN-19
Thallium (Tl)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	17-JUN-19
Tellurium (Te)-Total		<0.0020	<0.0020	RPD-NA	mg/L	N/A	20	17-JUN-19
Thorium (Th)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	25	17-JUN-19
Tin (Sn)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	17-JUN-19
Titanium (Ti)-Total		<0.0030	<0.0030	RPD-NA	mg/L	N/A	20	17-JUN-19
Tungsten (W)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	17-JUN-19
Uranium (U)-Total		0.00391	0.00404		mg/L	3.1	20	17-JUN-19
Vanadium (V)-Total		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	17-JUN-19
Zinc (Zn)-Total		0.058	0.058		mg/L	0.3	20	17-JUN-19
Zirconium (Zr)-Total		<0.0020	<0.0020	RPD-NA	mg/L	N/A	20	17-JUN-19
WG3078882-2 LCS								
Aluminum (Al)-Total			102.7		%		80-120	17-JUN-19
Antimony (Sb)-Total			99.7		%		80-120	17-JUN-19
Arsenic (As)-Total			98.9		%		80-120	17-JUN-19
Barium (Ba)-Total			102.0		%		80-120	17-JUN-19
Beryllium (Be)-Total			102.2		%		80-120	17-JUN-19
Bismuth (Bi)-Total			102.0		%		80-120	17-JUN-19
Boron (B)-Total			98.5		%		80-120	17-JUN-19
Cadmium (Cd)-Total			99.5		%		80-120	17-JUN-19
Calcium (Ca)-Total			102.7		%		80-120	17-JUN-19
Chromium (Cr)-Total			99.6		%		80-120	17-JUN-19
Cesium (Cs)-Total			97.6		%		80-120	17-JUN-19
Cobalt (Co)-Total			97.9		%		80-120	17-JUN-19
Copper (Cu)-Total			98.4		%		80-120	17-JUN-19
Iron (Fe)-Total			98.0		%		80-120	17-JUN-19
Lead (Pb)-Total			102.3		%		80-120	17-JUN-19
Lithium (Li)-Total			102.3		%		80-120	17-JUN-19
Magnesium (Mg)-Total			99.0		%		80-120	17-JUN-19
Manganese (Mn)-Total			97.5		%		80-120	17-JUN-19

Quality Control Report

Client: Pottinger Gaherty Environmental (Whitby)
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Whitby ON L1N 0G5
Contact: Debra Cohen

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R4671543								
WG3078882-2 LCS								
Molybdenum (Mo)-Total			98.5		%		80-120	17-JUN-19
Nickel (Ni)-Total			99.1		%		80-120	17-JUN-19
Phosphorus (P)-Total			109.9		%		70-130	17-JUN-19
Potassium (K)-Total			102.2		%		80-120	17-JUN-19
Rubidium (Rb)-Total			102.7		%		80-120	17-JUN-19
Selenium (Se)-Total			101.0		%		80-120	17-JUN-19
Silicon (Si)-Total			101.3		%		60-140	17-JUN-19
Silver (Ag)-Total			97.9		%		80-120	17-JUN-19
Sodium (Na)-Total			99.9		%		80-120	17-JUN-19
Strontium (Sr)-Total			94.4		%		80-120	17-JUN-19
Sulfur (S)-Total			99.1		%		80-120	17-JUN-19
Thallium (Tl)-Total			102.9		%		80-120	17-JUN-19
Tellurium (Te)-Total			92.6		%		80-120	17-JUN-19
Thorium (Th)-Total			101.7		%		70-130	17-JUN-19
Tin (Sn)-Total			97.8		%		80-120	17-JUN-19
Titanium (Ti)-Total			99.7		%		80-120	17-JUN-19
Tungsten (W)-Total			99.5		%		80-120	17-JUN-19
Uranium (U)-Total			103.9		%		80-120	17-JUN-19
Vanadium (V)-Total			101.5		%		80-120	17-JUN-19
Zinc (Zn)-Total			97.1		%		80-120	17-JUN-19
Zirconium (Zr)-Total			95.2		%		80-120	17-JUN-19
WG3078882-1 MB								
Aluminum (Al)-Total			<0.0050		mg/L		0.005	17-JUN-19
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	17-JUN-19
Arsenic (As)-Total			<0.00010		mg/L		0.0001	17-JUN-19
Barium (Ba)-Total			<0.00010		mg/L		0.0001	17-JUN-19
Beryllium (Be)-Total			<0.00010		mg/L		0.0001	17-JUN-19
Bismuth (Bi)-Total			<0.000050		mg/L		0.00005	17-JUN-19
Boron (B)-Total			<0.010		mg/L		0.01	17-JUN-19
Cadmium (Cd)-Total			<0.000005(		mg/L		0.000005	17-JUN-19
Calcium (Ca)-Total			<0.050		mg/L		0.05	17-JUN-19
Chromium (Cr)-Total			<0.00050		mg/L		0.0005	17-JUN-19
Cesium (Cs)-Total			<0.000010		mg/L		0.00001	17-JUN-19
Cobalt (Co)-Total			<0.00010		mg/L		0.0001	17-JUN-19

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Contact: Debra Cohen

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R4671543								
WG3078882-1 MB								
Copper (Cu)-Total			<0.0010		mg/L		0.001	17-JUN-19
Iron (Fe)-Total			<0.010		mg/L		0.01	17-JUN-19
Lead (Pb)-Total			<0.000050		mg/L		0.00005	17-JUN-19
Lithium (Li)-Total			<0.0010		mg/L		0.001	17-JUN-19
Magnesium (Mg)-Total			<0.0050		mg/L		0.005	17-JUN-19
Manganese (Mn)-Total			<0.00050		mg/L		0.0005	17-JUN-19
Molybdenum (Mo)-Total			<0.000050		mg/L		0.00005	17-JUN-19
Nickel (Ni)-Total			<0.00050		mg/L		0.0005	17-JUN-19
Phosphorus (P)-Total			<0.050		mg/L		0.05	17-JUN-19
Potassium (K)-Total			<0.050		mg/L		0.05	17-JUN-19
Rubidium (Rb)-Total			<0.00020		mg/L		0.0002	17-JUN-19
Selenium (Se)-Total			<0.000050		mg/L		0.00005	17-JUN-19
Silicon (Si)-Total			<0.10		mg/L		0.1	17-JUN-19
Silver (Ag)-Total			<0.000050		mg/L		0.00005	17-JUN-19
Sodium (Na)-Total			<0.050		mg/L		0.05	17-JUN-19
Strontium (Sr)-Total			<0.0010		mg/L		0.001	17-JUN-19
Sulfur (S)-Total			<0.50		mg/L		0.5	17-JUN-19
Thallium (Tl)-Total			<0.000010		mg/L		0.00001	17-JUN-19
Tellurium (Te)-Total			<0.00020		mg/L		0.0002	17-JUN-19
Thorium (Th)-Total			<0.00010		mg/L		0.0001	17-JUN-19
Tin (Sn)-Total			<0.00010		mg/L		0.0001	17-JUN-19
Titanium (Ti)-Total			<0.00030		mg/L		0.0003	17-JUN-19
Tungsten (W)-Total			<0.00010		mg/L		0.0001	17-JUN-19
Uranium (U)-Total			<0.000010		mg/L		0.00001	17-JUN-19
Vanadium (V)-Total			<0.00050		mg/L		0.0005	17-JUN-19
Zinc (Zn)-Total			<0.0030		mg/L		0.003	17-JUN-19
Zirconium (Zr)-Total			<0.00020		mg/L		0.0002	17-JUN-19
WG3078882-5 MS		**WG3078882-6**						
Aluminum (Al)-Total			N/A	MS-B	%		-	17-JUN-19
Antimony (Sb)-Total			93.5		%		70-130	17-JUN-19
Arsenic (As)-Total			98.7		%		70-130	17-JUN-19
Barium (Ba)-Total			95.4		%		70-130	17-JUN-19
Beryllium (Be)-Total			97.4		%		70-130	17-JUN-19
Bismuth (Bi)-Total			93.6		%		70-130	17-JUN-19

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Contact: Debra Cohen

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R4671543								
WG3078882-5 MS		**WG3078882-6**						
Boron (B)-Total			N/A	MS-B	%		-	17-JUN-19
Cadmium (Cd)-Total			99.95		%		70-130	17-JUN-19
Calcium (Ca)-Total			N/A	MS-B	%		-	17-JUN-19
Chromium (Cr)-Total			90.8		%		70-130	17-JUN-19
Cesium (Cs)-Total			94.5		%		70-130	17-JUN-19
Cobalt (Co)-Total			94.6		%		70-130	17-JUN-19
Copper (Cu)-Total			97.4		%		70-130	17-JUN-19
Iron (Fe)-Total			93.4		%		70-130	17-JUN-19
Lead (Pb)-Total			94.1		%		70-130	17-JUN-19
Lithium (Li)-Total			101.1		%		70-130	17-JUN-19
Magnesium (Mg)-Total			96.1		%		70-130	17-JUN-19
Manganese (Mn)-Total			92.3		%		70-130	17-JUN-19
Molybdenum (Mo)-Total			96.5		%		70-130	17-JUN-19
Nickel (Ni)-Total			98.0		%		70-130	17-JUN-19
Phosphorus (P)-Total			112.5		%		70-130	17-JUN-19
Potassium (K)-Total			N/A	MS-B	%		-	17-JUN-19
Rubidium (Rb)-Total			93.2		%		70-130	17-JUN-19
Selenium (Se)-Total			97.2		%		70-130	17-JUN-19
Silicon (Si)-Total			N/A	MS-B	%		-	17-JUN-19
Silver (Ag)-Total			89.4		%		70-130	17-JUN-19
Sodium (Na)-Total			N/A	MS-B	%		-	17-JUN-19
Strontium (Sr)-Total			N/A	MS-B	%		-	17-JUN-19
Sulfur (S)-Total			N/A	MS-B	%		-	17-JUN-19
Thallium (Tl)-Total			92.5		%		70-130	17-JUN-19
Tellurium (Te)-Total			84.4		%		70-130	17-JUN-19
Thorium (Th)-Total			88.6		%		70-130	17-JUN-19
Tin (Sn)-Total			93.3		%		70-130	17-JUN-19
Titanium (Ti)-Total			94.3		%		70-130	17-JUN-19
Tungsten (W)-Total			92.1		%		70-130	17-JUN-19
Uranium (U)-Total			96.1		%		70-130	17-JUN-19
Vanadium (V)-Total			99.9		%		70-130	17-JUN-19
Zinc (Zn)-Total			N/A	MS-B	%		-	17-JUN-19
Zirconium (Zr)-Total			97.4		%		70-130	17-JUN-19

Quality Control Report

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102 - 250 Water Street
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Contact: Debra Cohen

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NP,NPE-LCMS-WT	**Water**							
Batch R4671922								
WG3078833-3 DUP		**L2291241-1**						
Nonylphenol		<1.0	<1.0	RPD-NA	ug/L	N/A	30	16-JUN-19
Nonylphenol Monoethoxylates		<2.0	<2.0	RPD-NA	ug/L	N/A	30	16-JUN-19
Nonylphenol Diethoxylates		<0.10	<0.10	RPD-NA	ug/L	N/A	30	16-JUN-19
WG3078833-2 LCS								
Nonylphenol			106.0		%		75-125	16-JUN-19
Nonylphenol Monoethoxylates			101.5		%		75-125	16-JUN-19
Nonylphenol Diethoxylates			79.5		%		75-125	16-JUN-19
WG3078833-1 MB								
Nonylphenol			<1.0		ug/L		1	16-JUN-19
Nonylphenol Monoethoxylates			<2.0		ug/L		2	16-JUN-19
Nonylphenol Diethoxylates			<0.10		ug/L		0.1	16-JUN-19
WG3078833-4 MS		**L2291241-1**						
Nonylphenol			104.5		%		50-150	16-JUN-19
Nonylphenol Monoethoxylates			103.4		%		50-150	16-JUN-19
Nonylphenol Diethoxylates			75.4		%		50-150	16-JUN-19
OGG-SPEC-WT	**Water**							
Batch R4674734								
WG3080022-2 LCS								
Oil and Grease, Total			88.8		%		70-130	18-JUN-19
Mineral Oil and Grease			80.7		%		70-130	18-JUN-19
WG3080022-1 MB								
Oil and Grease, Total			<5.0		mg/L		5	18-JUN-19
Mineral Oil and Grease			<2.5		mg/L		2.5	18-JUN-19
P-T-COL-WT	**Water**							
Batch R4681355								
WG3083437-3 DUP		**L2291012-2**						
Phosphorus, Total		0.489	0.521		mg/L	6.3	20	21-JUN-19
WG3083437-2 LCS								
Phosphorus, Total			101.2		%		80-120	21-JUN-19
WG3083437-1 MB								
Phosphorus, Total			<0.0030		mg/L		0.003	21-JUN-19
WG3083437-4 MS		**L2291012-2**						
Phosphorus, Total			N/A	MS-B	%		-	21-JUN-19
PAH-EXTRA-WT	**Water**							

Quality Control Report

Client: Pottinger Gaherty Environmental (Whitby)
102 - 250 Water Street
Whitby ON L1N 0G5
Contact: Debra Cohen

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PAH-EXTRA-WT	**Water**							
Batch **R4673150**								
WG3079408-2 LCS								
Benzo(e)pyrene			93.2		%		60-130	19-JUN-19
3-Methylcholanthrene			98.2		%		60-130	19-JUN-19
1,3-Dinitropyrene			104.1		%		60-130	19-JUN-19
1,6-Dinitropyrene			76.6		%		60-130	19-JUN-19
Dibenz(a,h)acridine			95.5		%		60-130	19-JUN-19
1,8-Dinitropyrene			62.8		%		60-130	19-JUN-19
Dibenz(a,j)acridine			72.9		%		60-130	19-JUN-19
7H-Dibenzo(c,g)carbazole			92.3		%		60-130	19-JUN-19
Dibenzo(a,e)pyrene			85.6		%		60-130	19-JUN-19
Dibenzo(a,i)pyrene			99.7		%		60-130	19-JUN-19
Dibenzo(a,h)pyrene			84.3		%		60-130	19-JUN-19
WG3079408-1 MB								
Benzo(e)pyrene			<0.050		ug/L		0.05	19-JUN-19
3-Methylcholanthrene			<0.050		ug/L		0.05	19-JUN-19
1,3-Dinitropyrene			<1.0		ug/L		1	19-JUN-19
1,6-Dinitropyrene			<1.0		ug/L		1	19-JUN-19
Dibenz(a,h)acridine			<0.050		ug/L		0.05	19-JUN-19
1,8-Dinitropyrene			<1.0		ug/L		1	19-JUN-19
Dibenz(a,j)acridine			<0.050		ug/L		0.05	19-JUN-19
7H-Dibenzo(c,g)carbazole			<0.050		ug/L		0.05	19-JUN-19
Dibenzo(a,e)pyrene			<0.050		ug/L		0.05	19-JUN-19
Dibenzo(a,i)pyrene			<0.050		ug/L		0.05	19-JUN-19
Dibenzo(a,h)pyrene			<0.050		ug/L		0.05	19-JUN-19
Surrogate: d14-Terphenyl			70.3		%		40-130	19-JUN-19
PCB-WT	**Water**							
Batch **R4672627**								
WG3077633-2 LCS								
Aroclor 1242			91.9		%		65-130	18-JUN-19
Aroclor 1248			81.7		%		65-130	18-JUN-19
Aroclor 1254			95.1		%		65-130	18-JUN-19
Aroclor 1260			106.8		%		65-130	18-JUN-19
WG3077633-1 MB								
Aroclor 1242			<0.020		ug/L		0.02	18-JUN-19
Aroclor 1248			<0.020		ug/L		0.02	18-JUN-19

Quality Control Report

Client: Pottinger Gaherty Environmental (Whitby)
102 - 250 Water Street
Whitby ON L1N 0G5
Contact: Debra Cohen

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PCB-WT	**Water**							
Batch R4672627								
WG3077633-1 MB								
Aroclor 1254			<0.020		ug/L		0.02	18-JUN-19
Aroclor 1260			<0.020		ug/L		0.02	18-JUN-19
Surrogate: d14-Terphenyl			70.9		%		50-150	18-JUN-19
PEST-OC-511-WT	**Water**							
Batch R4671733								
WG3077633-2 LCS								
Aldrin			88.1		%		50-140	17-JUN-19
a-chlordane			82.7		%		50-140	17-JUN-19
g-chlordane			86.0		%		50-140	17-JUN-19
o,p-DDD			87.2		%		50-140	17-JUN-19
pp-DDD			87.1		%		50-140	17-JUN-19
o,p-DDE			70.4		%		50-140	17-JUN-19
pp-DDE			62.7		%		50-140	17-JUN-19
op-DDT			75.3		%		50-140	17-JUN-19
pp-DDT			76.0		%		50-140	17-JUN-19
Dieldrin			116.1		%		50-140	17-JUN-19
Endosulfan I			87.8		%		50-140	17-JUN-19
Endosulfan II			105.1		%		50-140	17-JUN-19
Endrin			132.3		%		50-140	17-JUN-19
gamma-hexachlorocyclohexane			94.9		%		50-140	17-JUN-19
Heptachlor			87.1		%		50-140	17-JUN-19
Heptachlor Epoxide			83.2		%		50-140	17-JUN-19
Hexachlorobenzene			86.0		%		40-130	17-JUN-19
Hexachlorobutadiene			72.1		%		40-130	17-JUN-19
Hexachloroethane			65.5		%		40-130	17-JUN-19
Methoxychlor			97.9		%		50-140	17-JUN-19
WG3077633-1 MB								
Aldrin			<0.010		ug/L		0.01	17-JUN-19
a-chlordane			<0.040		ug/L		0.04	17-JUN-19
g-chlordane			<0.040		ug/L		0.04	17-JUN-19
o,p-DDD			<0.030		ug/L		0.03	17-JUN-19
pp-DDD			<0.030		ug/L		0.03	17-JUN-19
o,p-DDE			<0.0080		ug/L		0.008	17-JUN-19
pp-DDE			<0.0080		ug/L		0.008	17-JUN-19

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Client: Pottinger Gaherty Environmental (Whitby)
102 - 250 Water Street
Whitby ON L1N 0G5
Contact: Debra Cohen

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PEST-OC-511-WT	**Water**							
Batch R4671733								
WG3077633-1 MB								
op-DDT			<0.030		ug/L		0.03	17-JUN-19
pp-DDT			<0.030		ug/L		0.03	17-JUN-19
Dieldrin			<0.050		ug/L		0.05	17-JUN-19
Endosulfan I			<0.030		ug/L		0.03	17-JUN-19
Endosulfan II			<0.030		ug/L		0.03	17-JUN-19
Endrin			<0.040		ug/L		0.04	17-JUN-19
gamma-hexachlorocyclohexane			<0.010		ug/L		0.01	17-JUN-19
Heptachlor			<0.010		ug/L		0.01	17-JUN-19
Heptachlor Epoxide			<0.010		ug/L		0.01	17-JUN-19
Hexachlorobenzene			<0.010		ug/L		0.01	17-JUN-19
Hexachlorobutadiene			<0.010		ug/L		0.01	17-JUN-19
Hexachloroethane			<0.010		ug/L		0.01	17-JUN-19
Methoxychlor			<0.050		ug/L		0.05	17-JUN-19
Surrogate: 2-Fluorobiphenyl			83.9		%		50-140	17-JUN-19
Surrogate: d14-Terphenyl			78.7		%		60-140	17-JUN-19
PH-WT	**Water**							
Batch R4671552								
WG3078285-8 DUP		**WG3078285-7**						
pH		6.97	6.96	J	pH units	0.01	0.2	15-JUN-19
WG3078285-6 LCS								
pH			7.03		pH units		6.9-7.1	15-JUN-19
PHENOLS-4AAP-WT	**Water**							
Batch R4671560								
WG3079055-12 DUP		**L2291798-1**						
Phenols (4AAP)		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	17-JUN-19
WG3079055-10 LCS								
Phenols (4AAP)			104.8		%		85-115	17-JUN-19
WG3079055-9 MB								
Phenols (4AAP)			<0.0010		mg/L		0.001	17-JUN-19
WG3079055-11 MS		**L2291798-1**						
Phenols (4AAP)			100.6		%		75-125	17-JUN-19
SOLIDS-TSS-WT	**Water**							

Quality Control Report

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Whitby ON L1N 0G5
Contact: Debra Cohen

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
SOLIDS-TSS-WT	**Water**							
Batch R4673210								
WG3080333-3 DUP		**L2290781-2**						
Total Suspended Solids		218	221		mg/L	1.4	20	19-JUN-19
WG3080333-2 LCS								
Total Suspended Solids			100.9		%		85-115	19-JUN-19
WG3080333-1 MB								
Total Suspended Solids			<2.0		mg/L		2	19-JUN-19
TKN-WT	**Water**							
Batch R4678592								
WG3082060-3 DUP		**L2291694-1**						
Total Kjeldahl Nitrogen		1.52	1.63		mg/L	6.6	20	20-JUN-19
WG3082060-2 LCS								
Total Kjeldahl Nitrogen			91.1		%		75-125	20-JUN-19
WG3082060-1 MB								
Total Kjeldahl Nitrogen			<0.15		mg/L		0.15	20-JUN-19
WG3082060-4 MS		**L2291694-1**						
Total Kjeldahl Nitrogen			107.7		%		70-130	20-JUN-19
VOC-ROU-HS-WT	**Water**							
Batch R4677195								
WG3082306-4 DUP		**WG3082306-3**						
1,1,1,2-Tetrachloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	20-JUN-19
1,1,2,2-Tetrachloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	20-JUN-19
1,1,1-Trichloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	20-JUN-19
1,1,2-Trichloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	20-JUN-19
1,2-Dibromoethane		<0.20	<0.20	RPD-NA	ug/L	N/A	30	20-JUN-19
1,1-Dichloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	20-JUN-19
1,1-Dichloroethylene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	20-JUN-19
1,2-Dichlorobenzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	20-JUN-19
1,2-Dichloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	20-JUN-19
1,2-Dichloropropane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	20-JUN-19
1,3-Dichlorobenzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	20-JUN-19
1,4-Dichlorobenzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	20-JUN-19
2-Hexanone		<20	<20	RPD-NA	ug/L	N/A	30	20-JUN-19
Acetone		<20	<20	RPD-NA	ug/L	N/A	30	20-JUN-19
Benzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	20-JUN-19
Bromodichloromethane		<1.0	<1.0	RPD-NA	ug/L	N/A	30	20-JUN-19

Quality Control Report

Client: Pottinger Gaherty Environmental (Whitby)
102 - 250 Water Street
Whitby ON L1N 0G5
Contact: Debra Cohen

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-ROU-HS-WT	**Water**							
Batch R4677195								
WG3082306-4 DUP		**WG3082306-3**						
Bromoform		<1.0	<1.0	RPD-NA	ug/L	N/A	30	20-JUN-19
Bromomethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	20-JUN-19
Carbon Disulfide		<1.0	<1.0	RPD-NA	ug/L	N/A	30	20-JUN-19
Carbon tetrachloride		<0.50	<0.50	RPD-NA	ug/L	N/A	30	20-JUN-19
Chlorobenzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	20-JUN-19
Chloroethane		<1.0	<1.0	RPD-NA	ug/L	N/A	30	20-JUN-19
Chloroform		<1.0	<1.0	RPD-NA	ug/L	N/A	30	20-JUN-19
Chloromethane		<1.0	<1.0	RPD-NA	ug/L	N/A	30	20-JUN-19
cis-1,2-Dichloroethylene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	20-JUN-19
cis-1,3-Dichloropropene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	20-JUN-19
Dibromochloromethane		<1.0	<1.0	RPD-NA	ug/L	N/A	30	20-JUN-19
Dichlorodifluoromethane		<1.0	<1.0	RPD-NA	ug/L	N/A	30	20-JUN-19
Dichloromethane		<2.0	<2.0	RPD-NA	ug/L	N/A	30	20-JUN-19
Ethylbenzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	20-JUN-19
m+p-Xylenes		<1.0	<1.0	RPD-NA	ug/L	N/A	30	20-JUN-19
Methyl Ethyl Ketone		<20	<20	RPD-NA	ug/L	N/A	30	20-JUN-19
Methyl Isobutyl Ketone		<20	<20	RPD-NA	ug/L	N/A	30	20-JUN-19
n-Hexane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	20-JUN-19
MTBE		<0.50	<0.50	RPD-NA	ug/L	N/A	30	20-JUN-19
o-Xylene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	20-JUN-19
Styrene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	20-JUN-19
Tetrachloroethylene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	20-JUN-19
Toluene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	20-JUN-19
trans-1,2-Dichloroethylene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	20-JUN-19
trans-1,3-Dichloropropene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	20-JUN-19
Trichloroethylene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	20-JUN-19
Trichlorofluoromethane		<1.0	<1.0	RPD-NA	ug/L	N/A	30	20-JUN-19
Vinyl chloride		<0.50	<0.50	RPD-NA	ug/L	N/A	30	20-JUN-19
WG3082306-1 LCS								
1,1,1,2-Tetrachloroethane			101.2		%		70-130	20-JUN-19
1,1,2,2-Tetrachloroethane			74.2		%		70-130	20-JUN-19
1,1,1-Trichloroethane			104.9		%		70-130	20-JUN-19
1,1,2-Trichloroethane			98.6		%		70-130	20-JUN-19

Quality Control Report

Client: Pottinger Gaherty Environmental (Whitby)
102 - 250 Water Street
Whitby ON L1N 0G5
Contact: Debra Cohen

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-ROU-HS-WT	**Water**							
Batch R4677195								
WG3082306-1 LCS								
1,2-Dibromoethane			96.6		%		70-130	20-JUN-19
1,1-Dichloroethane			104.8		%		70-130	20-JUN-19
1,1-Dichloroethylene			99.6		%		70-130	20-JUN-19
1,2-Dichlorobenzene			102.2		%		70-130	20-JUN-19
1,2-Dichloroethane			98.0		%		70-130	20-JUN-19
1,2-Dichloropropane			101.3		%		70-130	20-JUN-19
1,3-Dichlorobenzene			102.7		%		70-130	20-JUN-19
1,4-Dichlorobenzene			101.0		%		70-130	20-JUN-19
2-Hexanone			80.5		%		60-140	20-JUN-19
Acetone			92.3		%		60-140	20-JUN-19
Benzene			104.4		%		70-130	20-JUN-19
Bromodichloromethane			99.9		%		70-130	20-JUN-19
Bromoform			93.9		%		70-130	20-JUN-19
Bromomethane			103.8		%		60-140	20-JUN-19
Carbon Disulfide			104.0		%		70-130	20-JUN-19
Carbon tetrachloride			105.8		%		70-130	20-JUN-19
Chlorobenzene			101.2		%		70-130	20-JUN-19
Chloroethane			95.0		%		70-130	20-JUN-19
Chloroform			102.3		%		70-130	20-JUN-19
Chloromethane			101.2		%		60-140	20-JUN-19
cis-1,2-Dichloroethylene			99.3		%		70-130	20-JUN-19
cis-1,3-Dichloropropene			100.5		%		70-130	20-JUN-19
Dibromochloromethane			98.2		%		70-130	20-JUN-19
Dichlorodifluoromethane			91.0		%		50-140	20-JUN-19
Dichloromethane			99.1		%		70-130	20-JUN-19
Ethylbenzene			104.7		%		70-130	20-JUN-19
m+p-Xylenes			103.7		%		70-130	20-JUN-19
Methyl Ethyl Ketone			84.8		%		60-140	20-JUN-19
Methyl Isobutyl Ketone			83.8		%		50-150	20-JUN-19
n-Hexane			98.9		%		70-130	20-JUN-19
MTBE			102.1		%		70-130	20-JUN-19
o-Xylene			103.3		%		70-130	20-JUN-19
Styrene			102.2		%		70-130	20-JUN-19

Quality Control Report

Client: Pottinger Gaherty Environmental (Whitby)
102 - 250 Water Street
Whitby ON L1N 0G5
Contact: Debra Cohen

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-ROU-HS-WT	**Water**							
Batch R4677195								
WG3082306-1 LCS								
Tetrachloroethylene			107.1		%		70-130	20-JUN-19
Toluene			101.7		%		70-130	20-JUN-19
trans-1,2-Dichloroethylene			97.9		%		70-130	20-JUN-19
trans-1,3-Dichloropropene			97.0		%		70-130	20-JUN-19
Trichloroethylene			102.8		%		70-130	20-JUN-19
Trichlorofluoromethane			106.3		%		60-140	20-JUN-19
Vinyl chloride			85.8		%		60-140	20-JUN-19
WG3082306-2 MB								
1,1,1,2-Tetrachloroethane			<0.50		ug/L		0.5	20-JUN-19
1,1,2,2-Tetrachloroethane			<0.50		ug/L		0.5	20-JUN-19
1,1,1-Trichloroethane			<0.50		ug/L		0.5	20-JUN-19
1,1,2-Trichloroethane			<0.50		ug/L		0.5	20-JUN-19
1,2-Dibromoethane			<0.20		ug/L		0.2	20-JUN-19
1,1-Dichloroethane			<0.50		ug/L		0.5	20-JUN-19
1,1-Dichloroethylene			<0.50		ug/L		0.5	20-JUN-19
1,2-Dichlorobenzene			<0.50		ug/L		0.5	20-JUN-19
1,2-Dichloroethane			<0.50		ug/L		0.5	20-JUN-19
1,2-Dichloropropane			<0.50		ug/L		0.5	20-JUN-19
1,3-Dichlorobenzene			<0.50		ug/L		0.5	20-JUN-19
1,4-Dichlorobenzene			<0.50		ug/L		0.5	20-JUN-19
2-Hexanone			<20		ug/L		20	20-JUN-19
Acetone			<20		ug/L		20	20-JUN-19
Benzene			<0.50		ug/L		0.5	20-JUN-19
Bromodichloromethane			<1.0		ug/L		1	20-JUN-19
Bromoform			<1.0		ug/L		1	20-JUN-19
Bromomethane			<0.50		ug/L		0.5	20-JUN-19
Carbon Disulfide			<1.0		ug/L		1	20-JUN-19
Carbon tetrachloride			<0.50		ug/L		0.5	20-JUN-19
Chlorobenzene			<0.50		ug/L		0.5	20-JUN-19
Chloroethane			<1.0		ug/L		1	20-JUN-19
Chloroform			<1.0		ug/L		1	20-JUN-19
Chloromethane			<1.0		ug/L		1	20-JUN-19
cis-1,2-Dichloroethylene			<0.50		ug/L		0.5	20-JUN-19
cis-1,3-Dichloropropene			<0.50		ug/L		0.5	20-JUN-19

Quality Control Report

Client: Pottinger Gaherty Environmental (Whitby)
102 - 250 Water Street
Whitby ON L1N 0G5
Contact: Debra Cohen

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-ROU-HS-WT	**Water**							
Batch R4677195								
WG3082306-2 MB								
Dibromochloromethane			<1.0		ug/L		1	20-JUN-19
Dichlorodifluoromethane			<1.0		ug/L		1	20-JUN-19
Dichloromethane			<2.0		ug/L		2	20-JUN-19
Ethylbenzene			<0.50		ug/L		0.5	20-JUN-19
m+p-Xylenes			<1.0		ug/L		1	20-JUN-19
Methyl Ethyl Ketone			<20		ug/L		20	20-JUN-19
Methyl Isobutyl Ketone			<20		ug/L		20	20-JUN-19
n-Hexane			<0.50		ug/L		0.5	20-JUN-19
MTBE			<0.50		ug/L		0.5	20-JUN-19
o-Xylene			<0.50		ug/L		0.5	20-JUN-19
Styrene			<0.50		ug/L		0.5	20-JUN-19
Tetrachloroethylene			<0.50		ug/L		0.5	20-JUN-19
Toluene			<0.50		ug/L		0.5	20-JUN-19
trans-1,2-Dichloroethylene			<0.50		ug/L		0.5	20-JUN-19
trans-1,3-Dichloropropene			<0.50		ug/L		0.5	20-JUN-19
Trichloroethylene			<0.50		ug/L		0.5	20-JUN-19
Trichlorofluoromethane			<1.0		ug/L		1	20-JUN-19
Vinyl chloride			<0.50		ug/L		0.5	20-JUN-19
Surrogate: 1,4-Difluorobenzene			103.3		%		70-130	20-JUN-19
Surrogate: 4-Bromofluorobenzene			101.7		%		70-130	20-JUN-19
WG3082306-5 MS		**WG3082306-3**						
1,1,1,2-Tetrachloroethane			101.4		%		50-150	20-JUN-19
1,1,2,2-Tetrachloroethane			72.5		%		50-150	20-JUN-19
1,1,1-Trichloroethane			103.4		%		50-150	20-JUN-19
1,1,2-Trichloroethane			98.6		%		50-150	20-JUN-19
1,2-Dibromoethane			95.2		%		50-150	20-JUN-19
1,1-Dichloroethane			102.8		%		50-150	20-JUN-19
1,1-Dichloroethylene			94.3		%		50-150	20-JUN-19
1,2-Dichlorobenzene			102.4		%		50-150	20-JUN-19
1,2-Dichloroethane			97.7		%		50-150	20-JUN-19
1,2-Dichloropropane			100.9		%		50-150	20-JUN-19
1,3-Dichlorobenzene			103.5		%		50-150	20-JUN-19
1,4-Dichlorobenzene			101.8		%		50-150	20-JUN-19
2-Hexanone			79.1		%		50-150	20-JUN-19

Quality Control Report

Client: Pottinger Gaherty Environmental (Whitby)
102 - 250 Water Street
Whitby ON L1N 0G5
Contact: Debra Cohen

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-ROU-HS-WT	**Water**							
Batch R4677195								
WG3082306-5 MS		**WG3082306-3**						
Acetone			92.3		%		50-150	20-JUN-19
Benzene			103.2		%		50-150	20-JUN-19
Bromodichloromethane			99.7		%		50-150	20-JUN-19
Bromoform			94.2		%		50-150	20-JUN-19
Bromomethane			94.1		%		50-150	20-JUN-19
Carbon Disulfide			97.8		%		50-150	20-JUN-19
Carbon tetrachloride			103.8		%		50-150	20-JUN-19
Chlorobenzene			101.6		%		50-150	20-JUN-19
Chloroethane			87.8		%		50-150	20-JUN-19
Chloroform			101.8		%		50-150	20-JUN-19
Chloromethane			88.5		%		50-150	20-JUN-19
cis-1,2-Dichloroethylene			98.2		%		50-150	20-JUN-19
cis-1,3-Dichloropropene			97.3		%		50-150	20-JUN-19
Dibromochloromethane			97.2		%		50-150	20-JUN-19
Dichlorodifluoromethane			75.0		%		50-150	20-JUN-19
Dichloromethane			95.8		%		50-150	20-JUN-19
Ethylbenzene			104.6		%		50-150	20-JUN-19
m+p-Xylenes			104.3		%		50-150	20-JUN-19
Methyl Ethyl Ketone			79.7		%		50-150	20-JUN-19
Methyl Isobutyl Ketone			83.4		%		50-150	20-JUN-19
n-Hexane			90.8		%		50-150	20-JUN-19
MTBE			102.6		%		50-150	20-JUN-19
o-Xylene			103.6		%		50-150	20-JUN-19
Styrene			102.6		%		50-150	20-JUN-19
Tetrachloroethylene			105.9		%		50-150	20-JUN-19
Toluene			101.0		%		50-150	20-JUN-19
trans-1,2-Dichloroethylene			95.8		%		50-150	20-JUN-19
trans-1,3-Dichloropropene			91.7		%		50-150	20-JUN-19
Trichloroethylene			102.7		%		50-150	20-JUN-19
Trichlorofluoromethane			98.0		%		50-150	20-JUN-19
Vinyl chloride			76.4		%		50-150	20-JUN-19

Quality Control Report

Workorder: L2291415 Report Date: 24-JUN-19

Client: Pottinger Gaherty Environmental (Whitby)
102 - 250 Water Street
Whitby ON L1N 0G5
Contact: Debra Cohen

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.

Quality Control Report

Workorder: L2291415 Report Date: 24-JUN-19

Client: Pottinger Gaherty Environmental (Whitby)
102 - 250 Water Street
Whitby ON L1N 0G5
Contact: Debra Cohen

Hold Time Exceedances:

ALS Product Description	Sample ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Inorganic Parameters							
Free Chlorine							
	1	12-JUN-19 12:00	20-JUN-19 14:00	0.25	194	hours	EHTR-FM

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 L2291415 were received on 13-JUN-19 18:25.

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.

Chain of Custody (COC) / Analytical Request Form

ALS Environmental
www.alsglobal.com

Canada Toll Free: 1 800 668 9878

L2291415-COFC

COC Number: 17 - 822384

Page 1 of 1

Report To	Contact and company name below will appear on the final report	Report Distribution		Select Service Level Below - Contact your AM to confirm all E&P TATs (surcharges may apply)	
Company:	PGL Environmental	Select Report Format:	PDF EXCEL EDD (DIGITAL)	Regular [R]	Standard TAT if received by 3 pm - business days - no surcharges apply
Contact:	Debra Cohen	Quality Control (QC) Report with Report	YES NO	PRIORITY (Business Days) 4 day [P4-20%]	EMERGENCY 1 Business day [E - 100%]
Phone:	905 430 5523	Compare Results to Criteria on Report - provide details below if box checked		3 day [P3-25%]	Same Day, Weekend or Statutory holiday [E2 -200% (Laboratory opening fees may apply)]
	Company address below will appear on the final report	Select Distribution:	EMAIL MAIL FAX	2 day [P2-50%]	
Street:	250 water st, unit 102	Email 1 or Fax	dcohen@pggroup.com	Date and Time Required for all E&P TATs:	dd-mmm-yy hh:mm
City/Province:	Whitby, ON	Email 2	labdata ON@pggroup.com	For tests that can not be performed according to the service level selected, you will be contacted.	
Postal Code:	L1N 0G5	Email 3			

Invoice To		Invoice Distribution	
	Same as Report To YES NO	Select Invoice Distribution:	EMAIL MAIL FAX
	Copy of Invoice with Report YES NO	Email 1 or Fax	dcohen@pggroup.com
Company:	PGL Environmental	Email 2	
Contact:	Debra Cohen		

Project Information		Oil and Gas Required Fields (client use)	
ALS Account # / Quote #:		AFE/Cost Center:	PO#
Job #:	4027-21.01	Major/Minor Code:	Routing Code:
PO / AFE:		Requisitioner:	
LSD:	Elgin St. W, Cobourg	Location:	
ALS Lab Work Order # (lab use only):	L2291415 130	ALS Contact: Mathy	Sampler: CRC

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	P	Cobourg Sanitary + Sewer	SAMPLES ON HOLD	SUSPECTED HAZARD (see Special Instructions)
1.	BH9	12-JUN-19	NOON	GW	20	X			

Drinking Water (DW) Samples[1] (client use)	Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)
Are samples taken from a Regulated DW System? YES NO	→ TO table 1 GW Standards for detection limits
Are samples for human consumption/ use? YES NO	Cobourg Sanitary + sewer limits attached.

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen		SIF Observations	Yes	No
Ice Packs	Ice Cubes	Custody seal intact	Yes	No
Cooling Initiated				

INITIAL COOLER TEMPERATURES °C	FINAL COOLER TEMPERATURES °C
	11.4

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by:	Date:	Time:	Received by:	Date:	Time:	Received by: MG	Date: June 13, 2019	Time: 18:25
Carlo Filia	JUNE 13, 2019	9 AM						

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION — WHITE - LABORATORY COPY — YELLOW - CLIENT COPY — JUNE 2018 FRONT

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