Hydrogeological Assessment, 309 Zephyr Road, Zephyr, Township of Uxbridge

May 8, 2023

Prepared for:
China Canada Jing Bei Xin Min Intl.

In Association With:
EcoVue Consulting Services Inc.

Cambium Reference: 6199-001

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Executive Summary

EcoVue Consulting Services Inc. on behalf of China Canada Jing Bei Xin Min Intl. retained Cambium Inc. to complete a hydrogeological assessment for a proposed development of 17 residential lots at 309 Zephyr Road, in the Township of Uxbridge, Durham Region, Ontario. The assessment included a hydrogeological investigation and terrain analysis/impact assessment to support private servicing of potable water and wastewater for the proposed development. The work program included a surficial soils investigation, the installation and hydraulic testing of three test wells, nitrate attenuation calculations and an impact assessment on an adjacent provincially significant wetland.

The results of the pumping tests indicate that there are adequate groundwater resources available on the site to support the proposed development. Further, the water withdrawal associated with the development will not negatively influence surrounding groundwater users or the adjacent provincially significant wetland. The groundwater quality is relatively good, however well PW3 should be disinfected and re-sampled to confirm the presence of total coliforms.

The nitrate attenuation calculations indicate that the site will provide sufficient effluent dilution for the development of 17 dwellings. The conceptual site layout indicates that there is sufficient space included in the proposed development to account for on-site servicing for potable water and wastewater treatment systems.

Respectfully submitted,

Cambium Inc.

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1.0 Introduction

Cambium Inc. was retained by EcoVue Consulting Services Inc. (EcoVue) on behalf of China Canada Jing Bei Xin Min Intl. (Client) to complete a hydrogeological assessment for a proposed development of 17 residential lots located at 309 Zephyr Road, in the Township of Uxbridge, Durham Region, Ontario (the Site). The assessment included a hydrogeological investigation and terrain analysis/impact assessment to support private servicing of potable water and wastewater for the proposed development, and accounts for Phase 2 of the development of the subject site.

There are no municipal services for water or wastewater near the property; therefore, the proposed development will serviced on-site for potable water and wastewater treatment systems. As such, a hydrogeological assessment was undertaken for potable water supply and wastewater and included a terrain analysis/impact assessment to support the proposed development. The assessment was also completed in accordance with Ministry of Environment, Conservation and Parks (MECP) Guidelines D-5-5 and D-5-4, respectively.

The hydrogeological assessment included the installation and hydraulic testing of three test wells to characterize on-site groundwater resources, determine the impact of water withdrawal on surrounding groundwater users and asses the potability of the supply aquifer. The assessment also included a characterization of the native soils on the property, identifying the position of the shallow water table and an impact evaluation on the adjacent wetland.

1.1 Site Description

The Site is part of Lots 24 and 25, Concession 3 in the Township of Uxbridge. The western portion of the property is a golf course and is accessed by Zephyr Road and Concession Road 3. The regional location map of the Site is represented in Figure 1. The Zephyr-Egypt Provincially Significant Wetland Complex (PSW) occupies the eastern portion of the property. The Site consists of rolling and hilly topography that generally slopes towards the southeast towards the PSW. Residential land use surrounds the Site to the north, west and south. The

Universal Transverse Mercator (UTM) coordinate of the Zephyr Road access to the Site is 638827 mE, 4895716 mN.

The proposed development will occur wholly within the western portion of the property. This portion of the property will hereafter be referred to as the development area and is outlined in Figure 2. The total area of the property is approximately 40 ha; however, 22.2 hectares of the property are located within the PSW environmental protection area.

The proposed development has been split into Phase 1 and Phase 2. The total area of the proposed development area (i.e., Phase 1 and 2) is approximately 17.8 ha.

Phase 1 is located in the northwestern area of the Site and is approximately 5.1 ha. The Phase 1 development includes seven lots and an internal roadway. A 30 m setback from the PSW encroaches into the Phase 1 development area.

Phase 2 is approximately 12.7 ha and is located south of Phase 1. Phase 2 includes the proposed development of 17 lots and internal roadways. The PSW setback does not encroach onto the Phase 2 development area. The proposed development will be provided water and wastewater servicing by on-site systems.

The information referenced herein does not include an assessment of the Phase 1 development lands, and focusses solely on the Phase 2 development lands.

A plan of the proposed development has been attached in Appendix A. A catchment based water balance was also completed by Cambium, and is referenced herein when appropriate (Cambium Inc., 2022).

2.0 Methodology

2.1 Background Information

A thorough review of the available relevant background information was undertaken for this study, which included the following:

- Ministry of Northern Development and Mines, 1991. Quaternary Geology of Ontario, Southern Sheet, Map 2556, scale 1:1,000,000.
- Ontario Geological Survey, 1991. Bedrock Geology of Ontario, Southern Sheet, Map 2544, scale 1:1,000,000.
- Regulated Areas Mapping provided by the Lake Simcoe Region Conservation Authority (LSRCA)
- Lake Simcoe Region Conservation Authority, 2010. Black River Subwatershed Plan
- Tatham Engineering, 2020. Hidden Ridge Subdivision Phase 2 Functional Servicing and Preliminary Stormwater Management Report
- Source Protection Area Mapping provided by the Ministry of Environment, Conservation and Parks (MECP)

2.2 Test Pit Investigation

On August 3, 2017 a test-pit investigation was completed by Cambium to determine the shallow subsurface conditions across the property. The test-pits were excavated using a tracked excavator under the supervision of a Cambium technologist. A total of 13 test-pits, designated as TP101-17 through TP113-17, were advanced throughout the Site in the western portion of the property where the development is proposed to occur. Each soil sample was handled only by the technologist using dedicated nitrile gloves. Soil samples were logged for soil colour, texture, structure, moisture content, and consistency/compactness. Open test-pits were backfilled with the excavated soils and compacted with the backhoe bucket. The test-pit logs are provided in Appendix B. Test-pit locations have been outlined on Figure 3.

2.3 Hydraulic Pumping Tests

Three test wells were installed on-site between June 14 and June 20 of 2018. The well labels and associated well record numbers have been outlined in Table 1. The wells were installed with 0.15 m diameter steel casings to depths ranging between 21.04 metres below ground surface (mbgs) and 29.57 mbgs. Upon installation of well PW1, the water level was recorded to be 6.26 mbgs, while the water levels were recorded to be 1.07 and 2.44 metres above ground surface (mags), for wells PW2 and PW3, respectively. Wells PW2 and PW3 were modified with 0.038 m diameter PVC pipe that extended upwards from the steel casing at a height greater than the static water level to allow the groundwater head pressure to equilibrate. The borehole logs of PW1, PW2 and PW3 have been attached in Appendix C. A summary of the installation details of wells PW1, PW2 and PW3 have been outlined below in Table 1. The static groundwater elevation (presented in metres above sea level (masl)) is also outlined below in Table 1. *Please note that the groundwater elevations outlined herein are approximate and not strictly geodetic.*

Table 1 Test Well Information

Well	Well Tag Number	Date Installed	Depth (mbgs)	Top of Steel Pipe Elevation (masl)	Water Level (upon installation)	Static Water Level (July 16, 2018)	Static Water Elevation (July 16, 2018)
PW1	A222198	June 14, 2018	29.57	255.64	6.26 mbgs	9.34 mtop	246.30 masl
PW2	A222207	June 20, 2018	23.17	246.41	1.07 mags	0.14 mtop	246.27 masl
PW3	A222197	June 18, 2018	21.04	244.94	2.44 mags	1.38 mtop	246.23 masl(1)

1. *The top of PVC pipe elevation was calculated to be 247.61 metres above sea level (masl). Water elevations were calculated from measuring water levels down from this elevation*
2. *The elevations outlined herein are approximate and not strictly geodetic.*

On July 16 and 17 of 2018 Cambium staff were on-site to complete three pumping tests (at wells PW1, PW2 and PW3), each lasting approximately six (6) hours (360 minutes). Well PW1 was tested on July 16, 2018 and wells PW2 and PW3 were tested simultaneously on July 17, 2018. During each pumping test the water levels in each well not being tested were monitored for drawdown. Solinst pressure transducer level loggers (Loggers) were installed in each pumping well to record water levels continuously. A Logger was also used to record

barometric pressure throughout the study period to allow for barometric compensation. Manual water level measurements were also collected for the duration of each test.

Well PW1 was tested at a rate of 95 L/min for the duration of the pumping test.

On the day of testing the water level of well PW2 had lowered below the top of the steel casing; as such a submersible pump could be installed and a pumping test completed. Well PW2 was initially pumped at a rate of 55 L/min, however the rate was reduced to 25 L/min soon after initiation of the test. It is noted that the pumping rate of well PW2 was reduced from 55 L/min to 25 L/min to maintain piezometric pressure (and thereby the flowing conditions) at well PW3.

A tap was installed on the wellhead of PW3 during installation. To test well PW3 the tap was opened and allowed to flow freely. The tap flowed at a rate of approximately 14 L/min for the duration of the test.

The locations of the wells have been outlined on Figure 3 and Figure 4. The water elevations recorded from the test are outlined on Figure 5.

2.3.1 Monitoring Wells

A previous hydrogeological assessment of the northern portion of the Site included the installation of three drilled test wells. However, only two of these wells (TW-2 and TW-3) could be located by Cambium staff. The water level of both of these wells were monitored during the pumping tests completed by Cambium.

In addition, there were two existing dug wells located on-site which were tested by Cambium staff (referred to herein as DW1 and DW2).

The wells which serviced the adjacent residences located at 12820 RR39, 7 Dafoe St. and 340 Zephyr Road were also included in the pumping tests. Each of the wells described above were installed with Loggers during the pumping tests of PW1, PW2 and PW3.

The locations of the wells described above have been outlined on Figure 3 and Figure 4. The water elevations recorded from the monitoring wells have been outlined on Figure 6. The depths and water levels recorded at the monitoring wells have been outlined below in Table 2.

A groundwater sample was collected from the dug well that serviced 1 Foot Road. This well has been included in Table 2, but the waster level was not monitored during the pumping tests since contact could not be re-established with the homeowner.

Table 2 Monitoring Well Construction Details

Well	Type of Well	Well Tag Number	Depth (mtop)	Top of Pipe Elevation (masl)	Static Water Level (mtop) (July 16, 2018)	Static Water Elevation (mtop) (July 16, 2018)
TW-2	Drilled	A123254	31.78	255.74	9.53	246.21
TW-3	Drilled	A123353	29.52	252.44	6.23	246.21
DW-1	Dug	-	10.8	256.65	3.21	253.44
DW-2	Dug	-	7.16	250.74	5.88	244.86
12820 RR39	Drilled	-	19.46	254.97	4.38	250.59
7 Dafoe St.	Drilled	-	20.66	250.51	4.24	246.27
340 Zephyr Rd.	Drilled	-	5.54	238.44	2.49	235.95
1 Foot Road	Dug	-	6.96	-	-	-

1. The elevations outlined herein are approximate and not strictly geodetic.

2.4 Piezometers

On November 24, 2017 Cambium staff visited the Site and installed six piezometers along the boundary between the PSW and the abandoned golf course. The piezometers were constructed from 0.04 m diameter steel risers and 0.61 m long screens. The piezometers were nested in pairs and driven to depth with hand tools. The locations of the piezometers have been outlined on Figure 3 and Figure 4. The water elevations recorded from the piezometers have been outlined on Figure 7. The depths, water levels and elevations of the piezometers have been outlined below in Table 3.

Table 3 Piezometer Construction Details

Piezometer	Depth (mtop)	Stickup (m)	Depth (mbgs)	Top of Pipe Elevation (masl)	Water Level (July 16, 2018) (mtop)	Water Elevation (July 16, 2018) (masl)
P1	3.20	1.23	1.97	238.01	1.79	236.22
P2	2.04	0.74	1.31	237.52	1.24	236.63
P3	2.95	1.35	1.60	237.56	1.87	235.69
P4	1.94	0.79	1.15	237.00	1.31	235.69
P5	3.18	1.45	1.73	237.43	1.89	235.54
P6	1.93	1.10	0.83	237.08	1.49	235.59

1. The elevations outlined herein are approximate and not strictly geodetic.

The piezometers were instrumented with loggers and monitored for the duration of the pumping tests.

On July 23, 2018 Cambium staff returned to the Site to install Loggers for long-term water level monitoring. Water levels from the piezometers were monitored between July 23, 2018 and September 18, 2018. The water elevation fluctuations reported from the piezometers over the long term have been outlined in Figure 8. The fluctuations of the vertical hydraulic gradients between each nested pair of piezometers have been outlined in Figure 9.

2.4.1 Hydraulic Testing Piezometers

On July 29, 2018 in-situ hydraulic tests (bail tests) were completed on each of the piezometers. To complete the bail tests each piezometer was purged of all groundwater and Loggers were installed to monitor recovery. On September 18, 2018 Cambium staff returned to the Site to retrieve the loggers. It is noted that the analysis methods of a bail test assume that a volume of water is instantaneously removed from the well and induces a corresponding instantaneous response of the water level response. Purging the wells dry by hand is not an instantaneous process. Due to the relatively low conductivity of the overburden soils the instantaneous removal of water would induce a similar water level response as would be induce from purging the wells dry. Therefore, the bail test methodology described above is considered satisfactory.

2.5 Survey

Upon completion of the pumping tests Cambium staff surveyed each well and piezometer included in the testing. The survey was completed using a Topcon Real Time Kinematic (RTK) enabled HiPer II system with an FC-25 field controller. A geodetic benchmark was not located during the survey. As such the elevations referenced herein are approximate, and not strictly geodetic.

2.6 Water Quality Sampling

Water characterization sampling was completed on each of the three test wells. The samples were tested for general organic/inorganic parameters in addition to bacteria. Each well was sampled within the final 60 minutes of each pumping test. Field analyses were completed on all samples collected, which included the temperature (°C), pH and conductivity (mS).

As part of the D-5-4 assessment groundwater samples were collected from the private well servicing the residences at 340 Zephyr Road, 1 Foot Road and 12820 RR39. These samples were analyzed for biological oxygen demand (BOD), total kjeldahl nitrogen, ammonia (total and un-ionized), nitrate, nitrite and dissolved organic carbon (DOC). The wells which serviced 340 Zephyr Road and 1 Foot Road were installed at depths of 5.54 mTOP and 6.96 mTOP, respectively. These two wells did not have associated well tags but were interpreted to be installed in the shallow overburden based their measured depths. The well that serviced 12820 RR39 was assumed to be installed in a deeper, confined aquifer. Further discussion on these wells is outlined in the following sections.

The groundwater samples were stored in coolers with freezer packs and maintained less than 10°C during transport to the Caduceon Environmental Laboratories (Caduceon) in Ottawa, Ontario. Caduceon is accredited by the Canadian Association for Laboratory Accreditation Inc. (CALA), for specific environmental tests listed in the scope of accreditation approved by CALA. The Certificates of Analysis are attached as Appendix D. The water quality results were compared against the Ontario Drinking Water Quality Standards (ODWQS) (Ministry of the Environment, June 2006).

2.7 Aquifer Test Analysis

To determine aquifer properties of the water bearing units that the pumping wells and piezometers had been installed in the water level data were imported into AquiferTest Pro TM (Version: 2011.1). The model and results of the analysis are discussed in more detail in Section 4.3. The results of the aquifer test analysis have been included as Appendix E.

3.0 Geological and Hydrogeological Setting

3.1 Topography and Drainage

The Site is located just within the eastern boundary of the Black River subwatershed. The Black River subwatershed is approximately 375 km² and drains northwards to Lake Simcoe (Lake Simcoe Region Conservation Authority, 2010).

The central west area of the Site occupies a local topographic high that exhibits a maximum elevation of approximately 256.5 metres above sea level (masl). Ground surface topography lowers extending north, east and south away from the central west area of the property. The eastern area of the property is relatively flat and ranges in elevation between approximately 240 and 245 masl. The Zephyr-Egypt PSW occupies the eastern portion of the property.

The lowest area the Site is oriented north-south across the Site and forms the border between the western area of the property (the development area) and the flatter areas in the eastern area of the property (generally the PSW). The lowest elevations at the Site range between approximately 238.5 masl at the southern border and 237.5 masl at the northern border of the property. Drainage generated from most of the Site is directed towards the central area of the property, where is it then routed northwards, off-site.

There are two catchments identified on-site as part of existing conditions mapping provided by the Client and information provided by Tatham. The existing catchments have been identified as the following:

- Primary Catchment
- Northwest Catchment

The Primary Catchment is approximately 389,912 m^2 and includes the PSW, most of Phase 1 and 2. Runoff generated within the Primary catchment is routed to the low-lying area centrally located within the property, then flows north off-site. Note, the surface water drainage features of the PSW were not explored as part of this assessment. It is assumed herein that all runoff generated from the PSW is directed to the central drainage feature, then northwards, off-site.

The Primary Catchment includes pre-development catchments 102 and 103 outlined in the stormwater management plan (Tatham Engineering, 2020). It is noted that the stormwater

management plan does not include catchment information for the environmental protection area and Phase 1 of the proposed development.

The Northwest Catchment is approximately 10,345 m^2 and includes small portions of the Phase 1 and Phase 2 areas. Runoff generated within the Northwest Catchment flows to the northwest, off-site, as sheet flow. It is noted that the Northwest Catchment is comprised of two smaller, adjacent catchments which both drain north/northwest. The Northwest Catchment includes pre-development catchment 101 of the stormwater management plan (Tatham Engineering, 2020).

The approximate drainage divide between the Primary and Northwest Catchments is outlined on Figure 2 and was based on the stormwater management plan (Tatham Engineering, 2020) available topographic mapping.

3.2 Physiography

The Site is primarily located within the physiographic region known as the Simcoe Lowlands. The Simcoe Lowlands physiographic region extends from Lake Couchiching, southward along the western edge of Lake Simcoe continuing southward toward the community of Bolton. Morphologically, this region is characterised by flat, low-lying plains composed of silts, clays and fine to medium grained sands deposited within glacial Lake Algonquin. Evidence of glacial Lake Algonquin and its successors is provided by numerous shorelines, wave-cut notches, terraces and beach ridges located throughout the study area. (Chapman, L.J. and D.F. Putnam, 1984).

3.3 Geology

According to Map 2556 of the Ontario Geological Survey (Barnett, P.J.,Cowan, W.R. and Henry, A.P., 1991), the Site is in an area where the following surficial deposits are present:

- Coarse-textured glaciolacustrine deposits (sand, gravel, minor silt and clay, foreshoe and basinal deposits)
- Till (Stone-poor, sandy silt to silty sand-textured till on Paleozoic terrain)

The Site and surrounding area are characterized by one bedrock region composed of Middle Ordovician limestone, dolostone, shale, arkose, and sandstone of the Ottawa Group, Simcoe Group, and Shadow Lake Formation (Ontario Geological Survey, 1991).

3.4 Test Pit Investigation

The soils described in the available mapping were corroborated by the results of the test-pit investigation. Of the 13 test-pits completed at the Site, almost all exhibited similar stratigraphy. The depth of topsoil ranged from 0 mbgs to 0.43 mbgs, underlying the topsoil was a light brown to brown, sand and silt, some clay, some gravel, and trace cobbles. The completed depths of the test-pits ranged between 1.52 mbgs and 2.13 mbgs. Most of the test-pits were open and dry upon completion, however, test-pits TP102-17, TP110-17, and TP111-17 reported water entering the excavation, and TP112-17 exhibited saturated cave-in conditions upon completion.

3.4.1 Grain Size Analysis

Physical laboratory testing was completed for a total of three selected soil samples to confirm textural classification. A percolation rate (T-Time) was assigned to each sample based upon the grain size analysis results. Results are presented in Appendix F and details of the grain-size analysis are presented in Table 4 below.

Table 4 Grain Size Analysis Results

Test Pit	Depth (mbgs)	Soil	% Gravel	% Sand	% Silt	% Clay	Inferred T-Time (min/cm)
TP101-17	1.12 – 1.80	Silty Gravelly Sand trace Clay	28	41	23	8	20
TP104-17	0.91 – 2.00	Silty Sand some Clay trace Gravel	9	46	33	12	25
TP107-17	0.20 – 0.89	Silty Sand trace Clay	0	75	23	2	15

3.5 Water Well Records

To assess the hydrogeological conditions on and around the Site, well records within 500 m of the property boundary were examined. Water well records were acquired through the Ministry of Environment, Conservation and Parks (MECP) water well record database (MECP, 2018).

In total, 70 well records were examined. Of these, 44 records detailed the installation of drilled wells, 13 records detailed the installation of dug wells, 3 records detailed the installation of monitoring wells and 10 records detailed either a well abandonment or upgrade.

The drilled wells were installed to an average depth of 26.87 mbgs and groundwater was found at an average depth of 26.08 mbgs. The static water levels of the drilled wells were recorded to be on average 4.66 mbgs (some flowing conditions were also recorded). The average flow rate of the drilled wells was recorded to be 10 gallons per minute (assumed to be imperial gallons).

The dug wells were installed to an average depth of 8.07 mbgs and groundwater was found at an average depth of 5.42 mbgs. The static water levels of the dug wells were recorded to be on average 3.17 mbgs. The average flow rate of the dug wells was recorded to be 3 imperial gallons per minute (ipgm).

The details pertaining to the installation of the wells have been outline below in Table 5

Table 5 Water Well Record Information

	Count		Depth (mbgs)	Depth Water Found (mbgs)	Static Water Level (mbgs)	Flow Rate (ipgm)
Drilled Wells	44	Average	26.87	26.08	4.66	10
		Max	77.44	75.91	19.82	40
		Min	12.20	10.98	Flowing	3
Dug Wells	13	Average	8.07	5.42	3.17	3
		Max	10.67	9.15	7.01	5
		Min	4.57	2.44	1.52	1

The borehole logs indicated that the sediments in the area typically comprise of fine-grained silt and clay overlying water bearing sand and gravel at depth. Some coarse-grained sediments were occasionally reported at surface, overlying the fine-grained materials. These conditions indicate that a confined supply aquifer is found in the region and is the same aquifer which wells PW1, PW2 and PW3 have been installed.

3.6 Hydrogeological Conditions

A confined aquifer exists on-site and in the area of the Site. Static water levels were measured from each of the supply wells, monitoring wells TW-2, TW-3 and the supply wells that service 12820 RR39 and 7 Dafoe St. on July 16, 2018. Monitoring wells TW-2 and TW-3 have been installed in the confined aquifer (as per their water well records). There were no well tag numbers found on the wells that serviced 12820 RR39 and 7 Dafoe Street; however due to the well depths and water levels it was assumed that they have both been installed in the same confined aquifer as the other drilled monitoring wells and pumping wells. The groundwater elevation of each of these wells was calculated and the direction of groundwater flow in the confined aquifer was determined to be towards the northeast (see Figure 4).

The drilled well that serviced the residence at 340 Zephyr Rd. was installed at a shallow depth; therefore this well was interpreted to not be installed in the confined overburden aquifer.

The average depth of the fine-grained material confining layer was 26 mbgs. The underlying, confined sand and gravel aquifer was pressurized on-site since the static water levels were observed to rise a significant distance above the sand and gravel water bearing sediment (further evidenced by test wells PW2 and PW3 that exhibited flowing conditions upon installation).

A shallow overburden aquifer exists in the area, as described by the water well records for the dug wells. These wells were either installed in shallow surficial deposits of sand and gravel or fine-grained clayey material. The shallow aquifer is interpreted to be perched on top of the confining layer. The spatial continuity of the shallow overburden aquifer across the Site is not known. It was assumed that in the areas near the PSW the shallow overburden and the PSW were hydraulically connected. The direction of groundwater flow in the shallow overburden aquifer on the Site assumed to follow surficial topography.

3.6.1 Piezometer Water Level Elevations and PSW Hydrology

Piezometers P1 through P6 were installed in the shallow overburden aquifer just within the boundaries of the PSW (see Table 3 for more details). The vertical hydraulic gradients

reported from piezometers during the hydraulic pumping test were all downwards. The long term water level monitoring indicated that the vertical hydraulic gradients at piezometer nests P3/P4 and P5/P6 were downwards. Conversely, the vertical hydraulic gradients reported from piezometer nest P1/P2 were typically upwards during August and September.

The greatest downward hydraulic gradients were observed on July 16, 2018 and were likely caused by the rainfall event that occurred at that time. Subsequent to this event, the long term hydraulic gradients reported from the piezometers assumed generally stable patterns. The hydraulic gradients reported from piezometer nests P3/P4 and P5/P6 were always reported to be downwards and increased slightly in magnitude during the monitoring period. The vertical gradients reported from P1/P2 were generally upwards and increased slightly in magnitude during the monitoring period.

As per Figure 8, the direction of groundwater flow between the piezometers was northwards; however a portion of groundwater flow within the shallow overburden is likely directed eastwards following the downward slope in topography. All of the piezometer nests are located in areas that collect surface water runoff; however only piezometer nest P1/P2 reported upward gradients during the long term monitoring. The upward hydraulic gradients reported at piezometer nest P1/P2 are likely a result of groundwater flow from the shallow overburden aquifer pressurizing the area.

Runoff water is routed northwards from piezometer nest P1/P2 and collects in the area of piezometer nests P2/P3 and P5/P6 (as evidenced by the pond located immediately west of these two well nests). Such a scenario induces groundwater mounding in the area of piezometer nests P3/P3 and P5/P6, which generates downward gradients.

As discussed in Section 4.3, the hydraulic conductivity calculated from the deep piezometers was approximately one order of magnitude less than the shallow piezometers; therefore downward hydraulic gradients may sustained at piezometer nests P3/P3 and P5/P6 since groundwater will remain perched on sediments of lower hydraulic conductivity, but the volume of water infiltrating into the deeper sediments may be relatively low.

3.6.2 Vulnerable Areas

As per the MECP Source Protection Information Atlas the majority the proposed development area is mapped as a significant groundwater recharge area (SGRA) and a highly vulnerable aquifer (HVA). These two classifications are interpreted to apply to the shallow overburden aquifer that exists in the area, since the deeper supply aquifer that exists in the region is confined by a thick layer of fine grained sediments. As discussed in the previous section, there is not likely a significant amount of groundwater recharge from the shallow overburden aquifer to the deeper, confined aquifer. The deeper confined overburden aquifer is not considered to be highly vulnerable.

The property is also located within Intake Protection Zone 3 (IPZ3) of a nearby surface water intake. The proposed land use is not considered to be a land use of concern within IPZ3, therefore the surface water intake will not be influenced by the proposed development.

As discussed previously the Zephyr-Egypt Provincially Significant Wetland Complex is located east of the proposed development. The LSRCA regulation mapping and MECP Source Protection Mapping have been attached in Appendix A

4.0 Results and Discussion – Hydraulic Pumping Tests

On July 16 and 17 of 2018 Cambium staff were on-site to complete three pumping tests, each lasting approximately six hours (360 minutes). Pumping tests were completed on wells PW1, PW2 and PW3. Well PW1 was tested on July 16, 2018 and wells PW2 and PW3 were tested simultaneously on July 17, 2018. A summary of the pumping test information have been outlined below in Table 6:

Table 6 Summary of Pumping Test Information

Well	Top of Steel Pipe Elevation (masl)	Static Water Elevation (July 16, 2018) (masl)	Date Started	Time Started	Time Stopped	Duration (mins)	Flow Rate (Lpm)	Total Volume of Water Pumped from Well (L)
PW1	255.64	246.30	July 16, 2018	12:30	18:37	367	95	34,865
PW2	246.41	246.27	July 17, 2018	08:47	14:48	361	25 (1)	10,525 (2)
PW3	244.94	246.23 (3)	July 17, 2018	09:16	15:16	360	14	5,040

1. *Pumping test initially commenced at 55 litres per minute (Lpm) for the initial 55 minutes, then reduced to 25 Lpm.*
2. *Total volume includes the initial pumping rate.*
3. *The top of PVC pipe elevation was calculated to be 247.61 masl. Water elevations were calculated from measuring water levels down from this elevation*
4. *The elevations outlined herein are approximate and not strictly geodetic.*

The loggers remained installed in the pumping wells on July 16 and 17 to continuously monitoring water level fluctuations and have been plotted on Figure 5. The results of each individual pumping test at each of the test wells have been summarized in Table 7.

Table 7 Summary of Pumping Test Results

Well	Static Water Elevation (masl)	End of Test Water Elevation (masl)	Total Drawdown (m)	Bottom of Well Elevation (masl)	Available Drawdown at End of Test (m)
PW1	246.30	244.48	1.82	226.07	18.41
PW2	246.27	246.37	0.36	223.24	22.67
PW3	246.23	245.99	0.26	223.90	22.07

1. *The elevations outlined herein are approximate and not strictly geodetic.*

The results of each pumping test are discussed in the following sections.

4.1 Pumping Tests

The pumping test of well PW1 was completed on July 16, 2018 and the pumping tests completed on wells PW2 and PW3 were completed on July 17, 2018. During each day of

testing the wells not being tested were utilized as on-site monitoring wells. Additionally, the wells located in Phase 1 of the Site (TW-2 and TW-3) and those wells servicing the residences located at 12820 RR39, 7 Dafoe St. and, 340 Zephyr Rd. were monitored for drawdown responses. Each test is discussed chronologically below.

4.1.1 July 16, 2018 – Test Well PW1 (A222198)

On July 16, 2018 Cambium Staff were on-Site and began the pumping test at PW1 at 12:30. The static water level was measured to be 9.34 mtop (a static water elevation of 246.30 masl).

The discharge rate was set at 95 Lpm (21 ipgm) for the pumping test. Drawdown occurred relatively quickly and within approximately 3 minutes the static water elevation dropped from 246.30 masl to approximately 244.70 masl. After this instance the water elevation lowered from approximately 244.70 masl to 244.48 masl at a steady rate for the remainder of the test. The pump was shut off at 18:37 which resulted in the test being 367 minutes (6 hours and 7 minutes) long. The flow rate of 95 Lpm was maintained during the test, resulting in a total of 34,865 L of water being pumped from the well. A total drawdown of 1.82 m was observed during the pumping test from well PW1. Steady state was not achieved during the test.

By correlating the final drawdown depths and pumping rates, it was estimated that every metre of drawdown in well PW1 would result in an additional flow rate of 52 Lpm. (It is noted that the correlations are estimates only, since steady state conditions at this wells was never achieved.)

The elevation of the bottom of well PW1 was 226.07 masl, therefore the available drawdown at the end of the test was 18.41 m. The drawdown response recorded in well PW1 has been plotted on Figure 5. The water level in this well recovered to 100% of static at approximately 07:00 on July 17, 2018 (approximately 383 minutes after the pump had been shut off).

4.1.1.1 July 16, 2018 – Monitoring Well Response

The water level fluctuations recorded at wells PW2 and PW3 during the water withdrawal from well PW1 on July 16, 2018 have been outlined on Figure 5. The water level fluctuations reported from all other monitoring wells have been outlined on Figure 6.

The water levels at wells PW2, PW3, TW2, TW3 and the well which serviced 7 Dafoe Street responded to the pumping test at well PW1. No discernable response was recorded at any of the other monitoring wells included in the test.

The static water levels/elevations and their subsequent response to water withdrawal at well PW1 have been outlined below in Table 8.

Table 8 Monitoring Well Response to Pumping at PW1

Well	Static Water Elevation (masl)	Water Elevation at End of Test (masl)	Drawdown (m)	Radial Distance From PW1 (m)
PW2	246.27	246.06	0.21	188.38
PW3	246.23	246.02	0.21	144.28
TW2	246.21	246.05	0.16	118.28
TW3	246.21	246.06	0.15	215.20
7 Dafoe Street	246.27	246.08	0.19	188.00

1. *The elevations outlined herein are approximate and not strictly geodetic.*

The water elevations at wells PW2 and PW3 recovered to 100% of static at approximately 06:00 and 05:00 on July 17, 2018, respectively. The water elevations recorded at 7 Dafoe St, TW2 and TW3 recovered to 100% of static at 04:30, 02:20 and 02:04 on July 17, 2018, respectively.

4.1.1.2 July 16, 2018 – Piezometer Response

The water elevations recorded from the piezometers during the July 16, 2018 pumping test have been outlined on Figure 7. As per Figure 7, the water elevations recorded from the piezometers did not respond to water withdrawal at PW1. Conversely, the water elevations of each piezometer increased on July 16, 2018. The water elevations slowly decreased or remained elevated after the initial increase. The increase was likely caused by localized rainfall that fell in the area on July 16, 2018 just before the pumping test at PW1 commenced.

4.1.2 July 17, 2018 – Test Wells PW2 and PW3

On July 17, 2018 Cambium Staff were on-site to complete the pumping tests at wells PW2 and PW3. The pumping test at well PW2 started at 08:47 at a discharge rate of 55 Lpm. The discharge rate at PW2 was maintained for the initial 55 minutes of the test. After 55 minutes the discharge rate was reduced to 25 Lpm.

The pumping test at well PW3 started at 09:16. The water level at well PW3 was above the well; therefore the tap installed on the wellhead was allow to freely flow at a rate of 14 Lpm for the duration of the test. The static water elevations measured at PW2 and PW3, prior to the pumping tests, were 246.29 masl and 246.27 masl, respectively.

Within the first hour of pumping a significant degree of drawdown had occurred in both wells. After the first hour of pumping drawdown increased but at a much slower rate. At the end of the pumping test the water elevations of wells PW2 and PW3 were recorded to be 245.92 masl and 246.00 masl, respectively. The elevations correspond to drawdown depths of 0.37 m at PW2 and 0.27 m at PW3. Steady state conditions were not achieved at either well.

At PW2 the pump was shut off at 14:48 resulting in 361 minutes of pumping at this well. A total of 10,525 L of water was pumped from PW2 during the pumping test. The tap on PW3 was turned off at 15:16 resulting in 360 minutes of water flow from this well. A total of 5,040 L of water flowed from this well during the pumping test.

The elevations of the bottom of wells PW2 and PW3 were determined to be 233.24 masl and 223.9 masl, resulting in available drawdown depths of 22.68 m and 22.10 m, respectively.

By correlating the final drawdown depths and pumping rates, it was estimated that every metre of drawdown in well PW2 would result in additional flow of 68 Lpm. Every additional metre of drawdown in well PW3 would result in an additional 52 Lpm of flow. (It is noted that these correlations are estimates only since steady state conditions at these wells were never achieved.)

At approximately 3 hours after the pumping tests at wells PW2 and PW3 had ceased the loggers were removed and the water levels had recovered to 91% and 86% (respectively) of their static levels.

4.1.2.1 July 17, 2018 – Monitoring Well Response

The water level fluctuation recorded at well PW1 during the water withdrawal at wells PW2 and PW3 on July 17, 2018 have been outlined on Figure 5. The water level fluctuations reported from all other monitoring wells have been outlined on Figure 6.

The water levels at wells PW1, TW2, TW3 and the wells which serviced 7 Dafoe Street responded to the pumping test at wells PW2 and PW3. No discernable response was recorded at any of the other monitoring wells included in the test.

The static water levels/elevations and their subsequent response to water withdrawal at wells PW2 and PW3 have been outlined below in Table 9.

Table 9 Monitoring Well Response to Pumping at PW2 and PW3

Well	Static Water Elevation (masl)	Water Elevation at End of Test	Drawdown (m)	Radial Distance From PW2
PW1	246.32	246.44	0.09	188.38
TW2	246.27	246.21	0.07	299.66
TW3	246.29	246.22	0.07	397.21
7 Dafoe Street	246.31	246.24	0.07	376.06

1. *The elevations outlined herein are approximate and not strictly geodetic.*

The water elevations at well PW1 recovered to approximately 60% of static at 17:00, at which point the logger was removed. The water elevations recorded at 7 Dafoe St. recovered to 60% of static at approximately 18:00, and the water elevations recorded from wells TW2 and TW3 recovered to 40% of static at between 16:30 and 17:00.

4.1.2.2 July 17, 2018 – Piezometer Response

The water elevations recorded from the piezometers during the July 17, 2018 pumping test have been outlined on Figure 7. As per Figure 7, the water elevations recorded from the piezometers did not respond to water withdrawal at wells PW2 and PW3.

4.2 Zone of Influence

As per Procedure D-5-5, the per person requirement for a supply well is 450 L per day (Lpd). Peak demand occurs for 120 minutes a day, which is an equivalent demand rate of 3.75 Lpm for each person. The basic minimum pumping test rate is this rate multiplied by the "likely number of persons per well" which, for a single family residence, shall be the number of bedrooms plus one.

It is currently unknown how many bedrooms will be included in each residential dwelling that will be constructed at the Site. As a conservative measure the number of bedrooms was

assumed to be four (therefore the number of occupants was 5). The corresponding peak demand rate was therefore determined to be 18.75 Lpm and the total daily water withdrawal rate should be 2,250 Lpd. There are proposed to be 17 dwellings constructed at the Site; as such the daily Site-wide water demand rate is estimated to be 38,250 L (i.e., 17 dwellings x 2,250 L per day).

Well PW1 was tested at a water withdrawal rate of 95 Lpm. The total volume of water withdrawn from this well during the test was 34,865 L. It was demonstrated that well PW1 can sustain pumping rates in excess of required 18.75 Lpm and the total daily water demand volume of 2,250 Lpd.

The water withdrawal from well PW1 induced a maximum drawdown of 0.21 m from the on-site wells. The 7 Dafoe Street well was the only off-site well that recorded drawdown and it was measured to be 0.19 m. The water level in these wells recovered to 100% of static well within a 24 hour time frame. The drawdown depths recorded during the PW1 pumping test are considered to be relatively insignificant. In addition, since the water levels in those wells that recorded drawdown recovered to 100% within 24 hours, surrounding groundwater users are not anticipated to be influenced from continued water withdrawal at the Site. Well PW1 was also pumped at a rate (and total daily water withdrawal volume) far in excess of what is required to prove that adequate groundwater resources are available at the Site, and still only an insignificant influence on surrounding groundwater users was recorded.

The drawdown reported from monitoring wells during the tests at wells PW2 and PW3 ranged between 0.09 m at PW1 and 0.07 m at the 7 Dafoe Street well. These results are similar to those reported during the PW1 pumping test. The total volume of water withdrawn from wells PW2 and PW3 was greater than what is prescribed in procedure D-5-5. The water levels reported at the monitoring wells were not monitored long enough to establish when recovery reached 100% of static, however it is likely that the static levels were reached well within 24 hours (as was recorded during the pumping test at PW1).

It is concluded that the daily water withdrawal associated with the proposed development will not negatively influence surrounding groundwater users since the confined aquifer has a high

capacity to yield water. The actual influence that the proposed development will incur on the surrounding groundwater users will be less than what is described in this section, if any at all.

4.3 Aquifer Test Analysis

The Theis method (Theis, 1935) was used to calculate aquifer properties transmissivity (T as m^2/s) and hydraulic conductivity (K as m/s) of wells PW1, PW2 and PW3. The drawdown and recovery period of each test was use in the analyses. The aquifer properties are described below.

- **Hydraulic Conductivity (K) of the confined aquifer:** The hydraulic conductivity is the net velocity at which water travels through a water bearing unit. It is expressed as m/s (or m/day).
- **Transmissivity (T) of the confined aquifer**: Transmissivity can be described as the amount of water that can be transmitted horizontally through a unit width by the full saturated thickness of the aquifer under a hydraulic gradient of 1. It is expressed as m^2/s (or m^2/day) and is derived from the hydraulic conductivity and the saturated thickness of the aquifer (Fetter, 2001).

The hydraulic properties of the aquifer on-site have been compiled in Table 10, below. Additionally, the raw data produced from the Aquifer Test analysis has been attached as Appendix E. Also included in Table 10 are the hydraulic conductivity results of the bail tests that were completed at the piezometers. The bail test data was processed using the Hvorslev method (Hvorslev, M.J., 1951).

Table 10 Summary of Aquifer Properties

Date of Test	Tested Data	T (m^2/s)	K (m/s)
July 16, 2018	PW1 Drawdown	4.57×10^{-2}	3.05×10^{-2}
	PW1 Recovery	2.51×10^{-2}	1.67×10^{-2}
July 17, 2018	PW2 Drawdown	2.00×10^{-2}	1.33×10^{-2}
	PW2 Recovery	1.12×10^{-1}	7.48×10^{-2}
July 17, 2018	PW3 Drawdown	1.50×10^{-2}	1.00×10^{-2}
	PW3 Recovery	1.68×10^{-1}	1.12×10^{-1}
Average		6.43×10^{-2}	4.29×10^{-2}
July 29, 2018	P1	-	2.88×10^{-7}
	P2	-	1.05×10^{-6}
	P3	-	2.88×10^{-7}
	P4	-	1.20×10^{-6}
	P5	-	5.90×10^{-6}
	P6	-	3.20×10^{-5}

Relatively well matching curves were established for each of the pumping wells during their respective test. As per Table 10 the average values for the transmissivity and hydraulic conductivity were relatively similar. The K values reported for the sand and gravel sediments that each well was installed in were characteristic of those reported in literature for those types of sediments (Fetter, 2001) (J.P.Powers, 2007).

The transmissivity of the confined aquifer is considered to be relatively high. These results are corroborated by the data discussed in the previous section which indicate that the confined aquifer has a high capacity to yield water.

The hydraulic conductivity of the sediments in which the shallow piezometers (P2, P4 and P6) were installed ranged between 1.05×10^{-6} m/s and 3.20×10^{-5} m/s. The hydraulic conductivity of the sediments in which the deep piezometers (P1, P3 and P5) were installed ranged between 2.88×10^{-7} m/s and 5.90×10^{-6} m/s. At each nest pair the hydraulic conductivity of the shallow piezometers was almost always at least one order of magnitude higher the deeper sediments. These results indicate that runoff water can more readily infiltrate in the surficial sediments in the area, while infiltration past depths of 1.6 mbgs to 2.0 mbgs (the depths of the deep piezometers) will be limited.

4.4 Water Quality Results

One water sample was collected from each pumping well within the final 60 minutes of each test. The Certificate of Analyses of the groundwater testing have been attached in Appendix D.

Most parameters were reported at concentrations less than their respective ODWQS criteria. Those parameters reported in excess of the ODWQS criteria have been outlined below in Table 11.

Table 11 Summary of ODWQS Exceedances

Well	Parameter	Parameter Concentration	ODWQS Criteria
PW1	Hardness	268 mg/L	80 – 100 mg/L (OG)
	Turbidity	6.4 NTU	5 NTU (AO)
	Iron	0.642 mg/L	0.3 mg/L (AO)
	Manganese	0.069 mg/L	0.05 mg/L (AO)
PW2	Hardness	241 mg/L	80 – 100 mg/L (OG)
	Turbidity	10.9 NTU	5 NTU (AO)
	Iron	0.796 mg/L	0.3 mg/L (AO)
PW3	Hardness	248 mg/L	80 – 100 mg/L (OG)
	Turbidity	9.9 NTU	5 NTU (AO)
	Iron	0.808 mg/L	0.3 mg/L (AO)
	Total Coliform	15 cfu/100 mL	0 cfu/100 mL (MAC)

1. *"OG" is an operational objective for the specified parameter, as defined in the ODWQS.*
2. *"AG" is an aesthetic objective for the specifies parameter, as defined in the ODWQS*
3. *"MAC" is the maximum acceptable concentration. Parameters with a MAC concentration are health related and can cause illness in humans*

The water quality reported from each pumping well was relatively similar. Each well reported similar exceedances of the ODWQS criteria, most of which were for non-health related parameters. The only ODWQS exceedance of a health related parameter was for total coliform at well PW3. The presence of total coliform at well PW3 should be confirmed as coliforms are typically not present in deep, confined aquifer systems; as such it is recommended that this well be disinfected and re-sampled.

Chloride and sodium were reported at low concentrations from each well, additionally nitrate and nitrite were reported below the record detection limit (RDL) of the laboratory instruments in each sample.

4.5 Conclusions – Water Supply

The pumping tests completed at PW1, PW2 and PW3 indicated that the confined aquifer has a high capacity to yield water. Very minor depths of drawdown occurred at the monitoring wells in relation to the water volumes withdrawn from the test wells. Further, each test well can sustain the water withdrawal rate at which they were tested at.

The peak demand rate for each well was determined to be 18.75 Lpm and the total daily water withdrawal rate was 2,250 L per day.

It was demonstrated that wells PW1 and PW2 can sustain pumping rates in excess of 18.75 Lpm; however well PW3 was only tested at a rate of 14 Lpm. Well PW3 maintained a water level above the well head for the duration of the test, and was observed to have 22.10 m of drawdown at the end of the test. It was estimated that every metre of drawdown from this well could produce an additional flow rate of 52 Lpm. As such, well PW3 can sustain a water withdrawal rate of greater than 18.75 Lpm due to the ample available drawdown and the high capacity of the well. In addition, well PW3 was not pumped during the test, it was allowed to flow freely under its own pressure. Lastly, the total volume of water discharged each of the test wells was well in excess as required by the Procedure.

It is concluded that the water withdrawal associated with the proposed development will not negatively impact surrounding groundwater users.

The groundwater quality was determined to be relatively good, however total coliform was reported at well PW3. This well should be disinfected and re-tested to confirm the presence of total coliform at this well.

4.5.1 Impacts On The Zephyr Eqypt Provincially Significant Wetland Complex

The water elevations reported from the piezometers did not respond to the pumping tests; therefore, water withdrawal for the proposed development will not influence the PSW.

The water elevations of the piezometers did respond to a rainfall event that began just prior to the pumping test on July 16, 2018. The spatial extent of the shallow overburden aquifer is unknown; however, in the area of the PSW the shallow overburden aquifer and the PSW are

considered to be hydraulically connected. This is evidenced by upward gradients present in piezometer nest P1/P2 which were likely caused by hydraulic pressures of the shallow overburden aquifer.

The pumping tests were completed on wells that were installed in the confined overburden aquifer, which is not hydraulically connected to the shallow overburden aquifer. As such, it is unsurprising that no response from the pumping was recorded at the piezometers.

5.0 Wastewater Assessment

As per Procedure D-5-4 Technical Guideline for Individual On-Site Sewage Systems: Water Quality Risk Assessment (MECP, 1996), an assessment was completed to determine the feasibility of utilizing on-site sewage disposal for the development.

The creation of 17 new residential lots will increase wastewater effluent loading on the overburden soils in the area and subsequently the shallow overburden aquifer that is present regionally. Within the effluent, nitrate is considered the limiting contaminant due to the human health concerns. Procedure D-5-4 requires that the effluent plume at the Site boundary to be within the ODWQS limit of 10 mg/L for nitrate to prevent contamination of adjacent properties. Although natural processes and soil interaction can result in nitrate being attenuated in the receiving aquifer system, Procedure D-5-4 states that only dilution can be used as the principal attenuation mechanism to predict future nitrate concentrations. As such, a mass balance calculation is used to determine the impact of developing residential lots on the Site.

5.1 Available Dilution

To complete the assessment the following equations were utilized:

$$QI = A \times S \times I$$

Where:
- QI - Infiltration Volume (m^3/yr)
- A - Area (m^2)
- S - Water surplus (m/yr)
- I - Infiltration factor (dimensionless)

$$QR = A \times S \times (1-I)$$

Where:
- QR - Runoff Volume (m^3/yr)
- A - Area (m^2)
- S - Water surplus (m/yr)
- I - Infiltration factor (dimensionless)

The total infiltration area of Phase 2 of Site is 127,222m^2. The area of the Primary Catchment is 122,222 m^2 of golf course landscaped area. The area of the Northwest Catchment is 5,000 m^2 of golf course landscaped areas.

Supporting information referenced herein (including detailed water balance calculations) is attached in Appendix G.

5.1.1 Water Surplus

Water surplus is calculated by determining the difference between precipitation and evapotranspiration (changes in soil water storage was assumed to be negligible over the course of a year). The volume of water surplus is further sub-divided into portions that infiltrate the on-site soils and that are directed off-site as runoff.

According to the Environment Canada Climatic Normals (1981-2010) for the Udora weather station (Environment Canada, 2022), the average annual precipitation is 886 mm/year. The Thornthwaite method was used to determine the amount of evapotranspiration that will occur at the Site (Dingman, 2008). The calculated depth of evapotranspiration was 528 mm/year. The evapotranspiration calculations are included in Appendix G. The water surplus of the Site was calculated to be 358 mm/yr from pre-development surfaces and landscaped areas.

Evapotranspiration does not occur from structures, paved areas or gravel surfaces. It was assumed that 10% of precipitation falling on these surfaces is lost directly to evaporation. The remaining depth (i.e., 90% of precipitation) was considered surplus and converted to infiltration and/or runoff.

5.1.2 Infiltration Rates

The volume of surplus water that infiltrates through pervious surfaces on-site was determined by applying an infiltration factor to the surplus depth. The surplus water that does not infiltrate into pervious surfaces will leave the Site as surface water runoff. The infiltration factor varies from 0 to 1 and is estimated based on topography, soils, and vegetation cover as per the Stormwater Management Planning and Design Manual (Ministry of the Environment, 2003).

The Site is hilly with slopes around 35 m/km, and the mineral soils are mainly silty sand based on the soil characterization report (Cambium Inc., 2019). The infiltration factor for the landscaped and golf course areas was 0.48.

In addition to calculating the infiltration factor for the Site, the area of the Site was measured (via available mapping) to determine the total volume of available dilution water generated in each portion of the Site. The total available dilution water at the site for Phase 2 of the

development was calculated to be 59,900 L/day. The calculations of available dilution water for each portion of the Site have been outlined below in Table 12.

Table 12 Available Dilution Calculations

Infiltration Factor	
Topography	Hilly = 0.13
Soil	Till (silty sand) = 0.25
Cover	Grass Field = 0.1
Infiltration Factor (I)	**0.48**
Volume of Precipitation Water - Primary Catchment	
Developable Portion Area (A) (m²)	122,222
Surplus (S) (m/day)	0.0009808
Volume of Surplus Water Per Day (AxS)	**119.88 m³/day (119,880 L/day)**
Volume of Available Dilution Water Per Day ((AxS)xI)	**57.54 m³/day (57,540 L/day)**
Volume of Runoff Water Per Day ((AxS)x(1-I))	**62.33 m³/day (62,330 L/day)**
Volume of Precipitation Water – Northwest Catchment	
Developable Portion Area (A) (m²)	5000
Surplus (S) (m/day)	0.0009808
Volume of Surplus Water Per Day (AxS)	**4.90 m³/day (4900 L/day)**
Volume of Available Dilution Water Per Day ((AxS)xI)	**2.35 m³/day (2350 L/day)**
Volume of Runoff Water Per Day ((AxS)x(1-I))	**2.55 m³/day (2550 L/day)**
Site Totals	
Volume of Surplus Water Per Day (AxS)	**124.78 m³/day (124,780 L/day)**
Volume of Available Dilution Water Per Day ((AxS)xI)	**59.90 m³/day (59,900 L/day)**
Volume of Runoff Water Per Day ((AxS)x(1-I))	**64.89 m³/day (64,890 L/day)**

5.2 Predictive Assessment

Based on Procedure D-5-4, each proposed lot is anticipated to generate an average discharge of 1,000 L/day of sewage effluent. Total nitrogen (all species) ultimately convert to nitrate through the wastewater treatment process. Nitrate is considered to be the critical contaminant in sewage effluent. A nitrate loading of 40 grams/lot/day is required to be normally used to determine the effluent loading from conventional septic systems on the receiving groundwater system.

To evaluate the impact of a septic system on a groundwater resource, a reference point or value is established to assist in determining the extent of the impact, if any. In this respect, the quality of the groundwater that is not impacted by septic system on the Site (i.e. background water quality) should be used for comparison purposes. Water quality samples were collected in three (3) surrounding wells. Two of the samples were collected from wells interpreted to be installed in the shallow overburden aquifer (i.e., the wells that serviced 1 Foot Road and 340 Zephyr Road). The well that services 12820 RR39 is considered to be installed in the deeper,

confined overburden aquifer. The concentrations of nitrate reported from the well installed in the shallow overburden were less than reportable detection limit of 0.1 mg/L. The concentration of nitrate reported from the well that services 12820 RR39 was 1 mg/L. The shallow overburden aquifer will be the receiver of septic effluent; therefore the background concentration of nitrate was assumed to be 0.1 mg/L.

To determine the adequate lot density for the Site, a mass balance calculation is used to determine the sewage loading for nitrate on the property boundary. The mass balance calculations is outlined below as:

$$Q_tC_t = Q_eC_e + Q_iC_i$$

Where: Q_t = Total volume ($Q_e + Q_i$)

C_t = Total concentration of nitrate at the property boundary

Q_e = Volume of septic effluent

C_e = Concentration of nitrate in effluent (40 mg/L)

Q_i = Volume of available dilution water (59,900 L/day as per Table 12)

C_i = Concentration of nitrate in dilution water (0.1 mg/L)

In order to determine the concentration of nitrate at the property boundary (C_t), the above mass balance equation is arranged as follows:

$$C_t = \frac{QeCe + QiCi}{Qt}$$

This equation was used for the developable portion of the Site. The results of the equation have been outlined in Table 13 below:

Table 13 Predictive Assessment of Nitrate Concentration

Variable	Value
Number of Lots in Portion	17
Volume of Sewage Effluent (Q_e)	17 Lots x 1,000 L/day = 17,000 L/day
C_e	40 mg/L
Q_i	59,895 L/day
C_i	0.1 mg/L
Q_t	76,895 L/day
C_t	**8.92 mg/L**

The proposed development on Phase 2 includes the construction of 17 residential dwellings (including the existing dwelling). The nitrate loading calculations indicate that the

concentration of nitrate at the boundary of the developable area will be 8.92 mg/L if 17 dwellings are constructed (which is an acceptable condition as per Procedure D-5-4).

5.3 Conceptual Site Layout

A conceptual Site layout is included in Appendix H. The conceptual Site layout includes potential locations of on-site wastewater treatment systems that can service the dwellings to be built on each proposed lot. In addition, potential locations of additional wells are outlined on Appendix H, and other applicable setbacks outlined in the OBC.

The proposed severances will presumably be developed with a single family, four-bedroom, dwellings. According to Table 8.2.1.3.A of the OBC, the daily design flow for a four-bedroom dwelling is 2,000 L/day. As a conservative measure, it was assumed that high groundwater conditions would result in a water level if 0.25 mbgs in some areas of the Site. To accommodate assumed high water conditions the on-site wastewater treatment systems were assumed to be built as filter beds. Based upon OBC calculations the stone area of the filter bed is calculated as follows (if advanced treatment units are included as part of each wastewater treatment system):

$Stone\ Area = \frac{Q}{100}$	Where	:	
	Q	=	The daily design flow
$Contact\ Area = \frac{QT}{850}$	Where	:	
	Q	=	The daily design flow
	T	=	T Time of Native Soils
$Mantle\ Area = \frac{Q}{LR}$	Where	:	
	Q	=	The daily design flow
	LR	=	Loading Rate for T-Time of 25 min/cm is 8 L/m^2

The T-Times of the sampled soils ranged from 15 min/cm to 25 min/cm. As a conservative measure the T-Time referenced in the conceptual layout of the filter bed was 25 mins/cm.

The stone area was calculated to be 20 m² (and is calculated independent of the T-Time of the receiving soils). The contact area was calculated to be 59 m² and the mantle area was calculated to be 250 m² when a T-Time of 25 mic/cm was referenced. The total height of the filter bed, including cover, was assumed to be 1.6 m above grade. It was assumed that the

mantle could be installed in an excavation 0.25 m deep, therefore the above grade portion of the filter bed reduces to only 1.35 m above grade. It was assumed that the stone area would have dimensions of approximately 4 m x 5 m. The contact area was assumed to have dimensions of 6 m x 10 m. The mantle would have an area of approximately 12 m x 21 m. The conceptual footprint of each filter bed is outlined in Appendix H (please note: the contact area is not shown for clarity). A separation distance of 15 m from the edge of the stone area to the down-gradient edge of the mantle are included in the conceptual designs.

The setback distances outlined in Table 8.2.1.6.B of the OBC apply to the stone area of the filter beds and include a 15 m setback for drilled wells with watertight casing to a depth of at least 6 mbgs. Test wells PW1, PW2 and PW3 meet this criteria (i.e., the water tight casing that these wells ranges in depth from approximately 20 mbgs to 29 mbgs). Presumably all other future wells installed on-site will also meet this criteria.

The OBC also indicates that the setback distances will be increased by twice the height of a raised system. The filter beds described herein will be 1.35 m above grade, as such the setback distance of the stone area and dug wells is 17.7 m. Setback limits from the proposed severance boundaries and structures were also applied (i.e., 5.7 m and 7.7 m, respectively). See Appendix H.

The conceptual layout of the proposed wastewater treatment systems, and water supply wells indicates that there is sufficient space within each of the proposed lots to account for on-site servicing of water and wastewater.

(Note: the conceptual placement/installation of the wastewater treatment systems described in this section do not constitute actual development plans for the proposed severances. The layouts described herein were completed to demonstrate that developing the proposed severances with private on-site water supply and wastewater treatment systems is possible. Soil and groundwater conditions at the Site must be confirmed as part of the detailed design of the wastewater treatment system. The location of all existing and proposed supply wells must also be considered as part of wastewater treatment system design. Off-site wells must also be considered.

6.0 Closing

Cambium Inc. was retained by EcoVue Consulting Services Inc. on behalf of China Canada Jing Bei Xin Min Intl. to complete a hydrogeological assessment for a proposed development of 17 residential lots at 309 Zephyr Road, as part of Phase 2 of the development at that property.

The results of the pumping tests indicate that there are adequate groundwater resources available on the site to support the proposed development. Further, the water withdrawal associated with the development will not negatively influence surrounding groundwater users or the adjacent provincially significant wetland. The groundwater quality is relatively good, however well PW3 should be disinfected and re-sampled to confirm the presence of total coliforms.

The nitrate attenuation calculations indicate that the site will provide sufficient effluent dilution for the development of 17 dwellings. The conceptual site layout indicates that there is sufficient space included in the proposed development to account for on-site servicing for potable water and wastewater treatment systems.

7.0 References

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8.0 Standard Limitations

Limited Warranty

In performing work on behalf of a client, Cambium relies on its client to provide instructions on the scope of its retainer and, on that basis, Cambium determines the precise nature of the work to be performed. Cambium undertakes all work in accordance with applicable accepted industry practices and standards. Unless required under local laws, other than as expressly stated herein, no other warranties or conditions, either expressed or implied, are made regarding the services, work or reports provided.

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The findings and results presented in reports prepared by Cambium are based on the materials and information provided by the client to Cambium and on the facts, conditions and circumstances encountered by Cambium during the performance of the work requested by the client. In formulating its findings and results into a report, Cambium assumes that the information and materials provided by the client or obtained by Cambium from the client or otherwise are factual, accurate and represent a true depiction of the circumstances that exist. Cambium relies on its client to inform Cambium if there are changes to any such information and materials. Cambium does not review, analyze or attempt to verify the accuracy or completeness of the information or materials provided, or circumstances encountered, other than in accordance with applicable accepted industry practice. Cambium will not be responsible for matters arising from incomplete, incorrect or misleading information or from facts or circumstances that are not fully disclosed to or that are concealed from Cambium during the provision of services, work or reports.

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Site Assessments

A site assessment is created using data and information collected during the investigation of a site and based on conditions encountered at the time and particular locations at which fieldwork is conducted. The information, sample results and data collected represent the conditions only at the specific times at which and at those specific locations from which the information, samples and data were obtained and the information, sample results and data may vary at other locations and times. To the extent that Cambium's work or report considers any locations or times other than those from which information, sample results and data was specifically received, the work or report is based on a reasonable extrapolation from such information, sample results and data but the actual conditions encountered may vary from those extrapolations.

Only conditions at the site and locations chosen for study by the client are evaluated; no adjacent or other properties are evaluated unless specifically requested by the client. Any physical or other aspects of the site chosen for study by the client, or any other matter not specifically addressed in a report prepared by Cambium, are beyond the scope of the work performed by Cambium and such matters have not been investigated or addressed.

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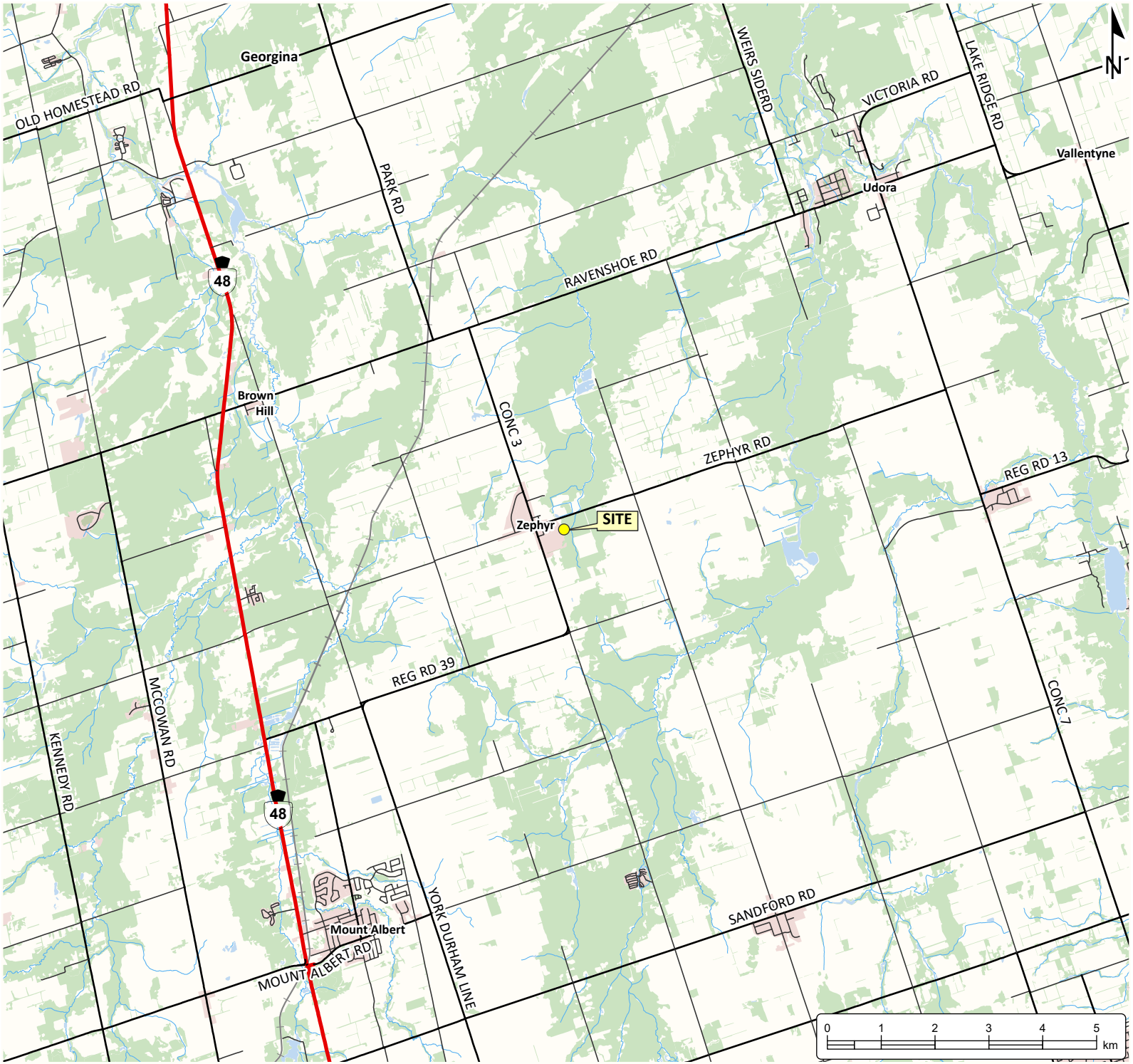
Appended Figures

HYDROGEOLOGICAL ASSESSMENT

CHINA CANADA JING XIN MIN INTL
309 Zephyr Road,
Zephyr, Ontario



LEGEND

- Highway
- Major Road
- Minor Road
- Railway
- Watercourse
- Water Area
- Wooded Area
- Built Up Area

Notes:
- Base mapping features are © Queen's Printer of Ontario, 2019 (this does not constitute an endorsement by the Ministry of Natural Resources or the Ontario Government).
- Distances on this plan are in metres and can be converted to feet by dividing by 0.3048.
- Cambium Inc. makes every effort to ensure this map is free from errors but cannot be held responsible for any damages due to error or omissions. This map should not be used for navigation or legal purposes. It is intended for general reference use only.

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www.cambium-inc.com

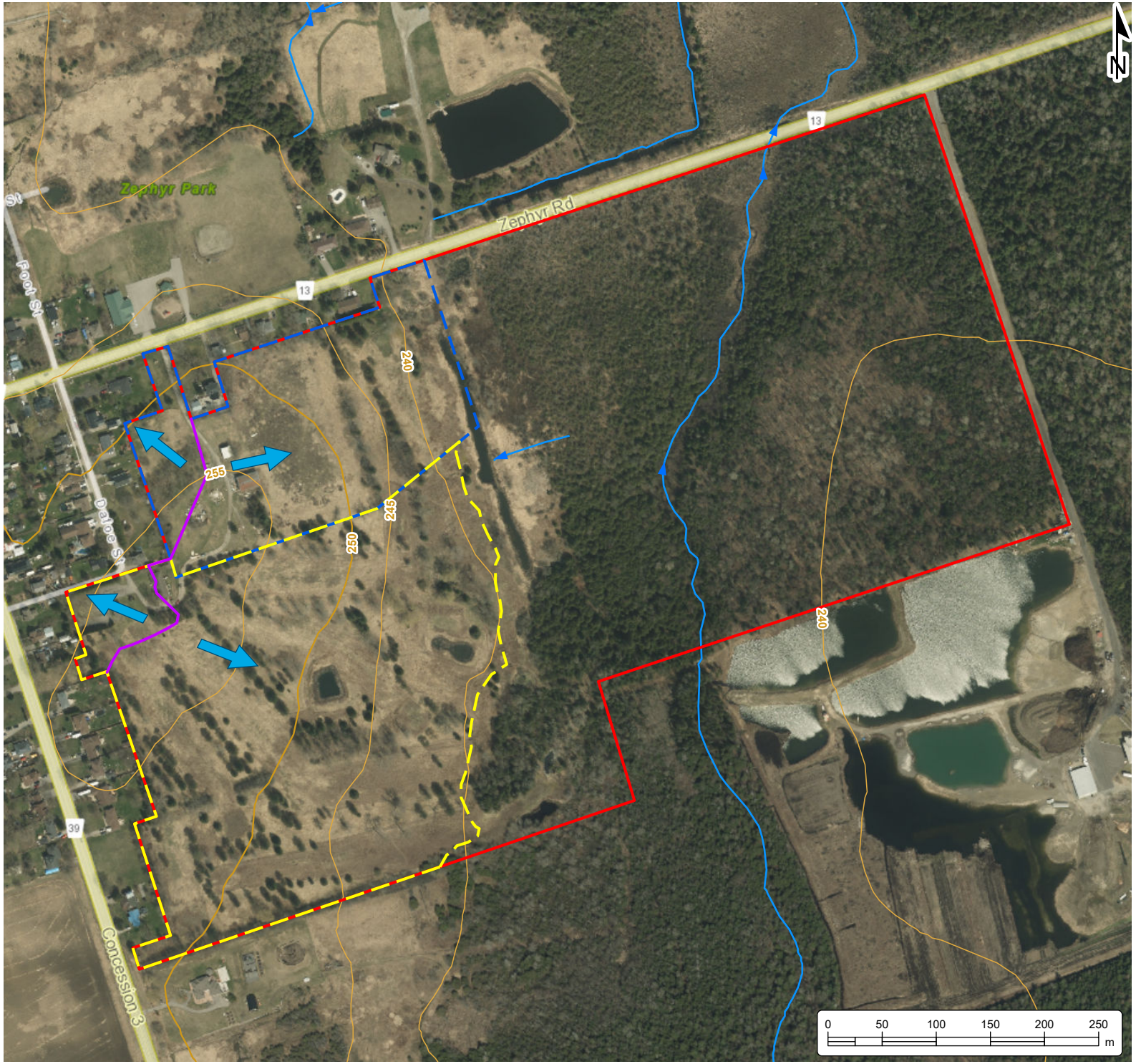
SITE LOCATION MAP

Project No.: 6199-001		Date: May 2023 Rev.:	
Scale: 1:100,000		Projection: NAD 1983 UTM Zone 17N	
Created by: DBB	Checked by: CM	Figure:	1

O:\GIS\MXDs\6100-6199\6199-001 CC JBXM\ cc EcoVue - Hydrogeological Assessment, Hidden Ridge, Uxbridge\2023-05-04 Figure updates.aprx

HYDROGEOLOGICAL ASSESSMENT

CHINA CANADA JING XIN MIN INTL
309 Zephyr Road,
Zephyr, Ontario



LEGEND

- Approximate Catchment Boundary
- Watercourse, Permanent
- Contour 5m Interval (Major)
- Contour 5m Interval (Minor)
- Phase 1 Development
- Phase 2 Development
- Site (approximate)
- Surface Water Drainage

Notes:
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SITE PLAN

Project No.: 6199-001		Date: May 2023 Rev.:	
Scale: 1:5,000		Projection: NAD 1983 UTM Zone 17N	
Created by: DBB	Checked by: CM	Figure:	2

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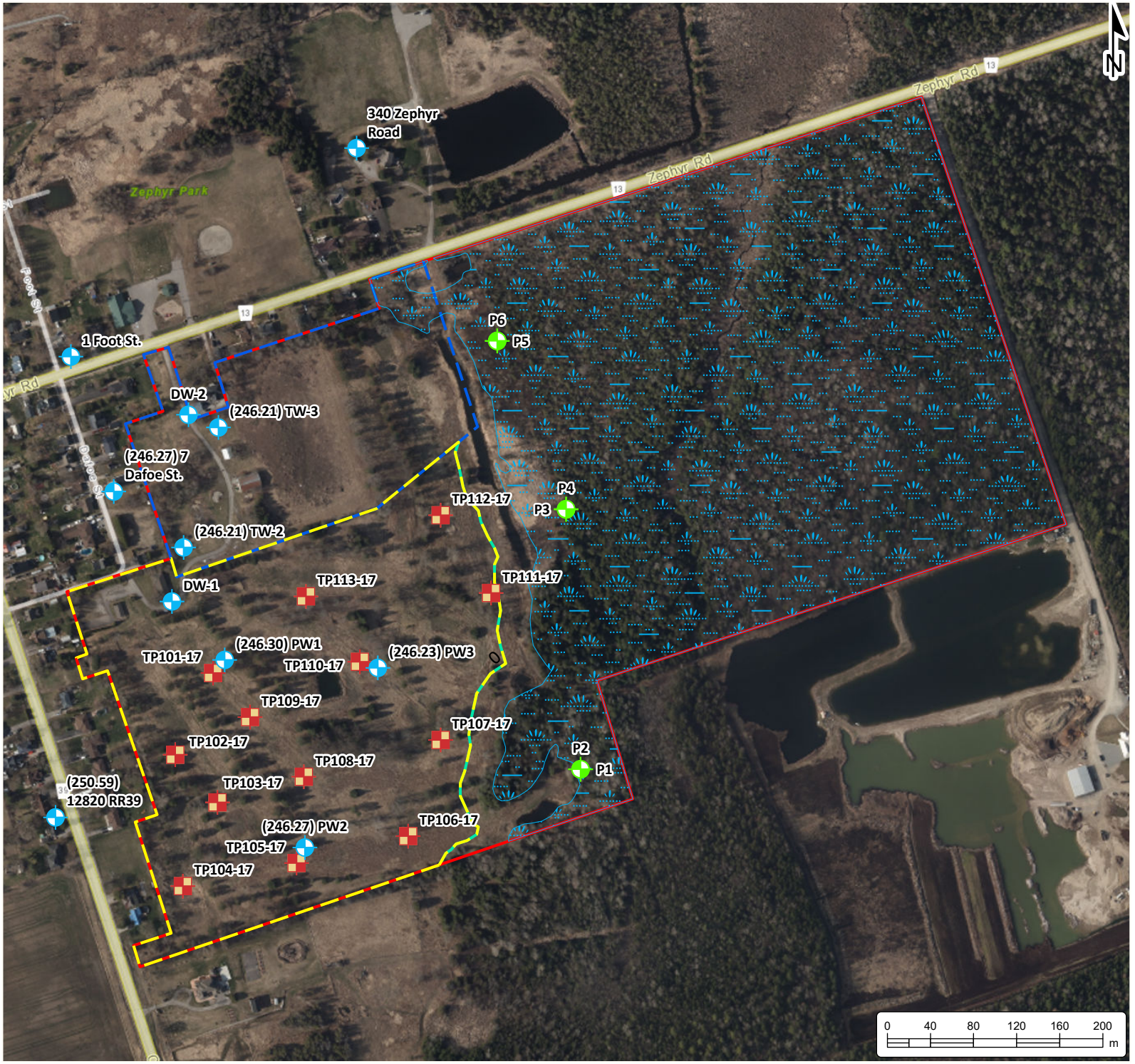

HYDROGEOLOGICAL ASSESSMENT

CHINA CANADA JING XIN MIN INTL
309 Zephyr Road,
Zephyr, Ontario

LEGEND

- Monitoring Well (July 16, 2018)
- Piezometer
- Test Pit
- Wetland Setback (30m)
- Wetland
- Phase 1 Development
- Phase 2 Development
- Site (approximate)

Notes:
- Base mapping features are © Queen's Printer of Ontario, 2019 (this does not constitute an endorsement by the Ministry of Natural Resources or the Ontario Government).
- Distances on this plan are in metres and can be converted to feet by dividing by 0.3048.
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WELL AND TEST PIT LOCATION PLAN

Project No.: 6199-001		Date: May 2023 Rev.:	
Scale: 1:5,000		Projection: NAD 1983 UTM Zone 17N	
Created by: DBB	Checked by: CM	Figure:	3

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HYDROGEOLOGICAL ASSESSMENT

CHINA CANADA JING XIN MIN INTL
309 Zephyr Road,
Zephyr, Ontario

LEGEND

- Monitoring Well (July 16, 2018)
- Piezometer
- Groundwater Contour (July 16, 2018)
- Site (approximate)
- (246.30) Groundwater Elevation (July 16, 2018)
- Confined Aquifer Flow Direction (July 16, 2018)

Notes:
- Base mapping features are © Queen's Printer of Ontario, 2019 (this does not constitute an endorsement by the Ministry of Natural Resources or the Ontario Government).
- Distances on this plan are in metres and can be converted to feet by dividing by 0.3048.
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GROUNDWATER CONTOURS

Project No.: 6199-001		Date: May 2023 Rev.:	
Scale: 1:4,882		Projection: NAD 1983 UTM Zone 17N	
Created by: DBB	Checked by: CM	Figure: 4	

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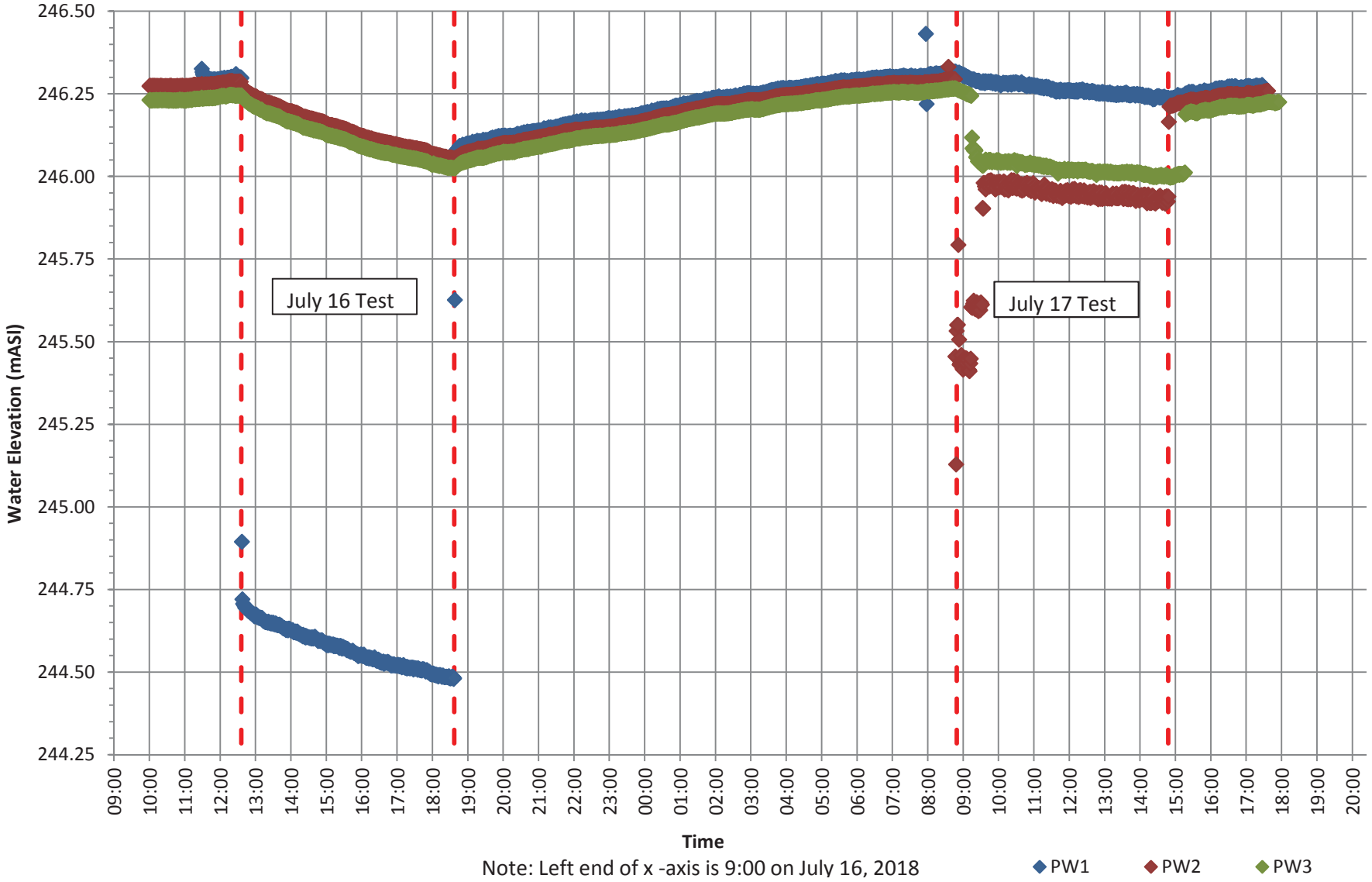


Figure 5: Groundwater Elevations - Test Wells

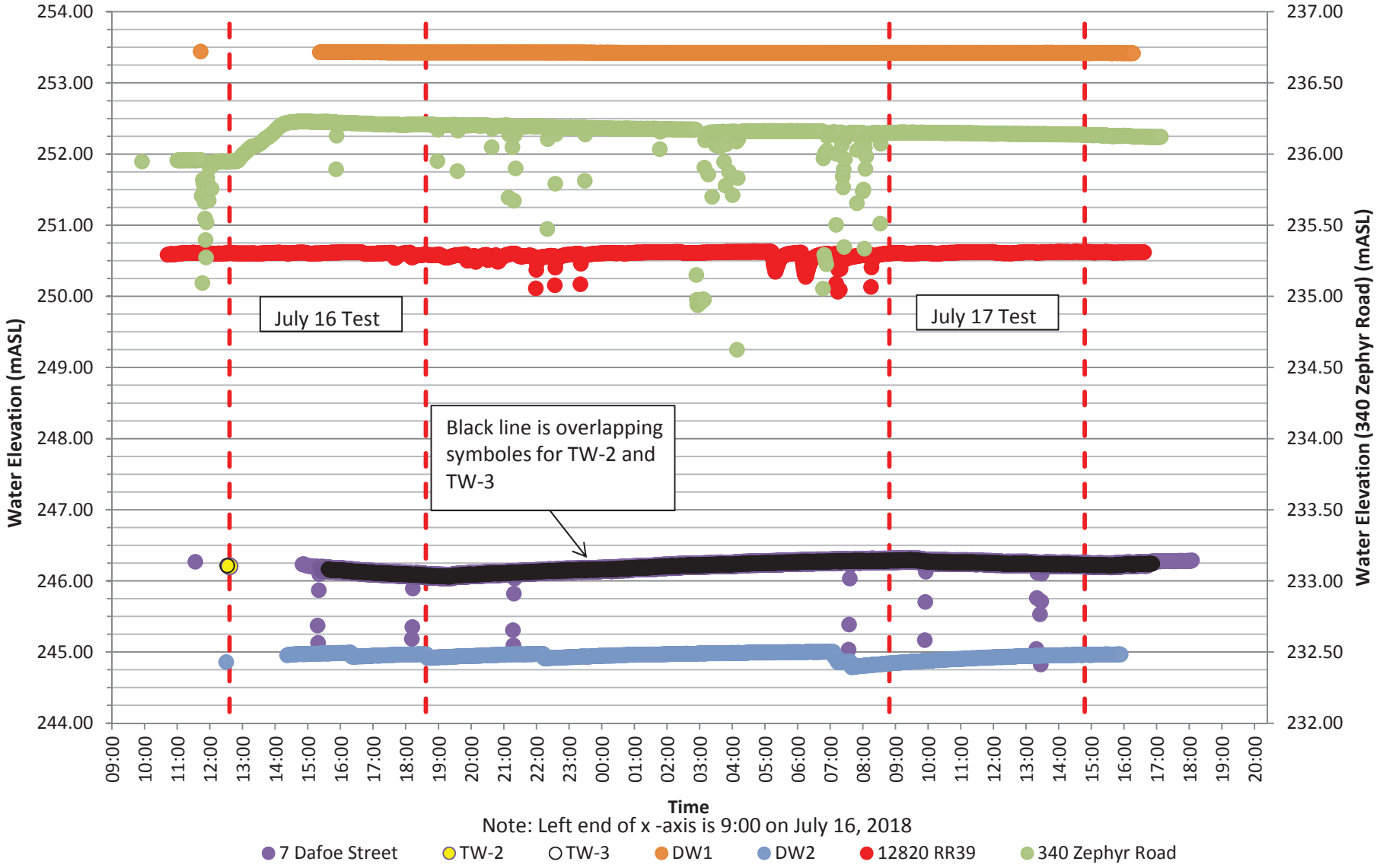


Figure 6: Groundwater Elevations - Monitoring Wells

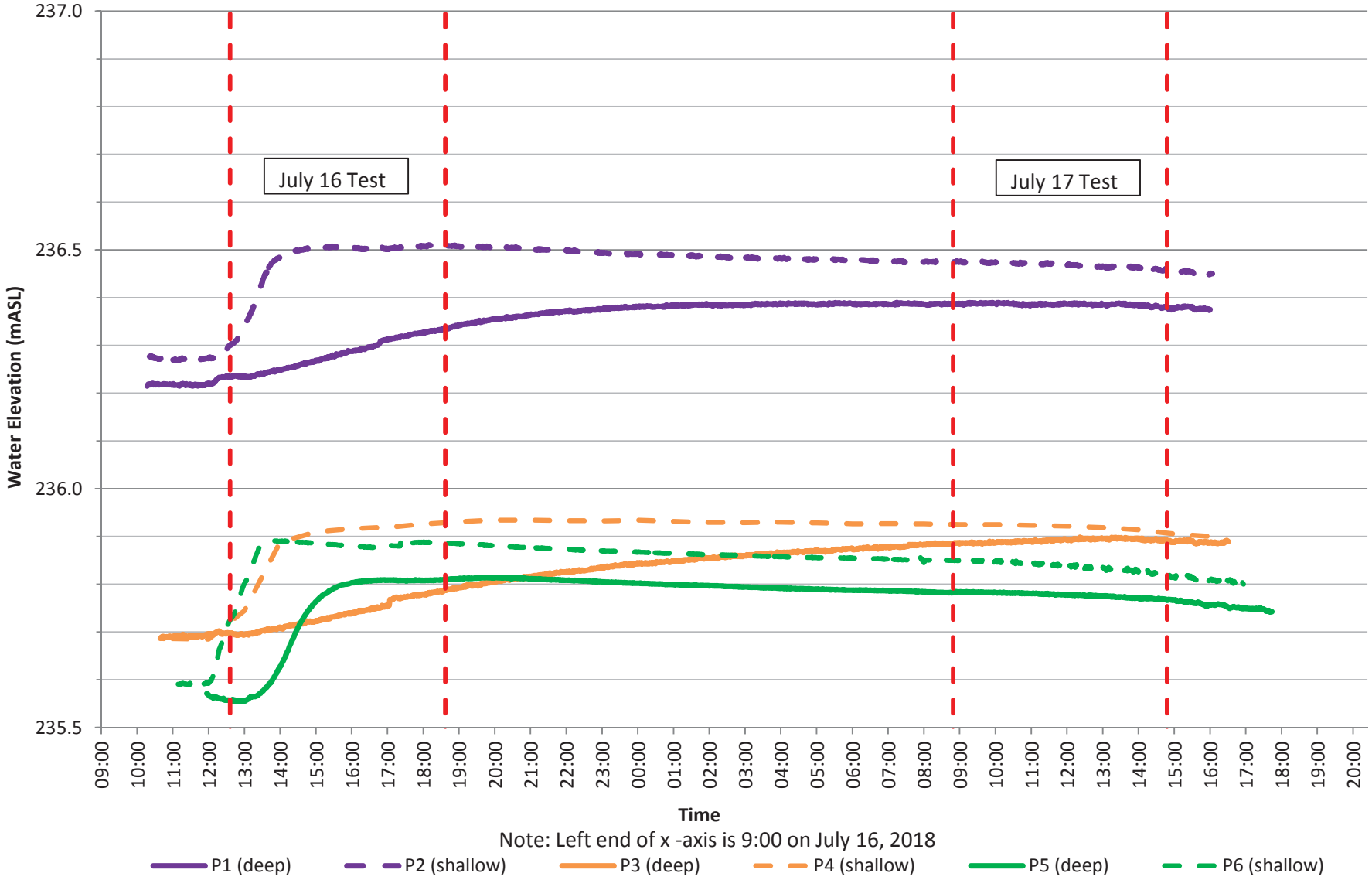


Figure 7: Groundwater Elevations - Piezometers

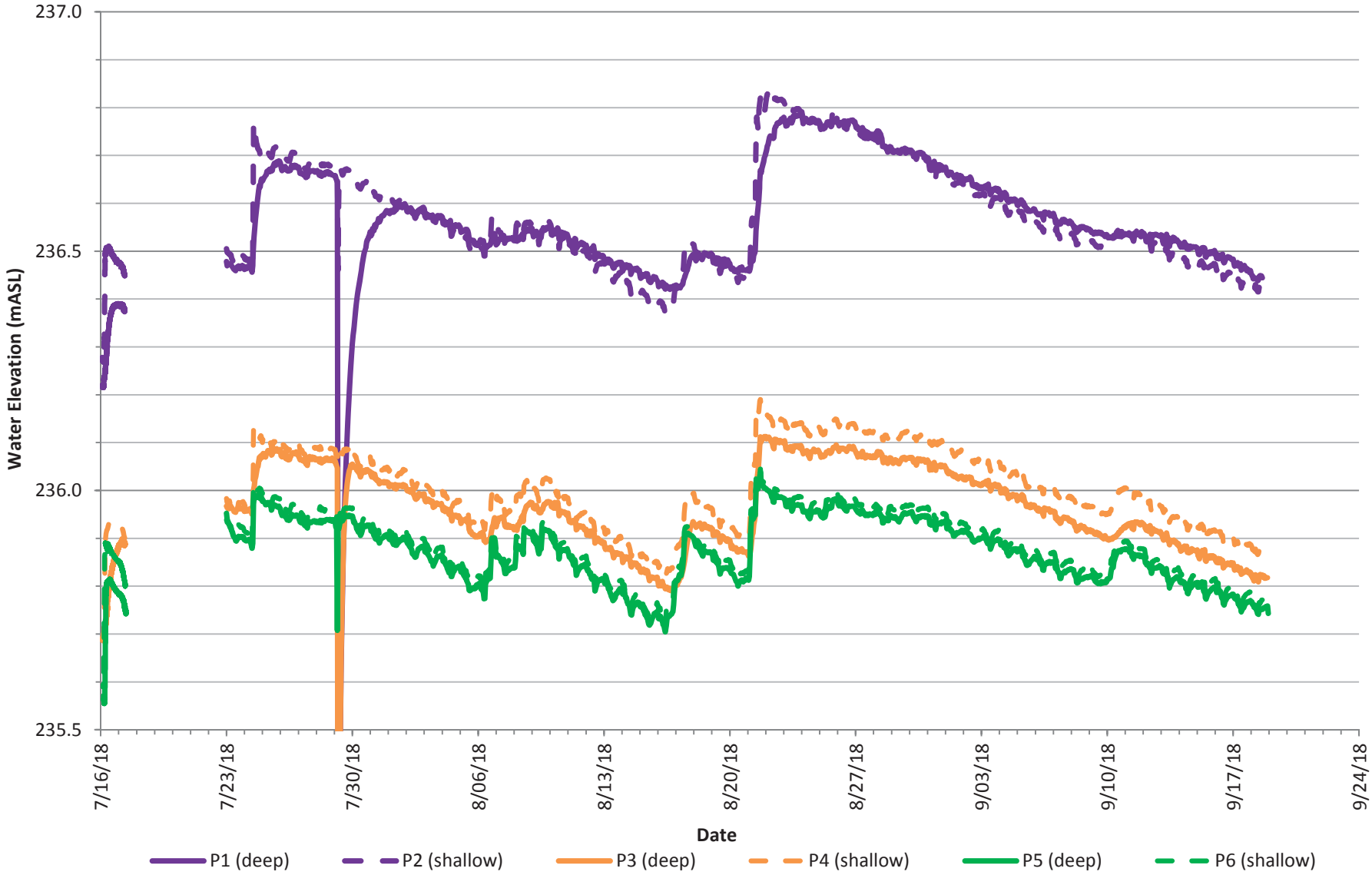


Figure 8: Long Term Groundwater Elevations - Piezometers

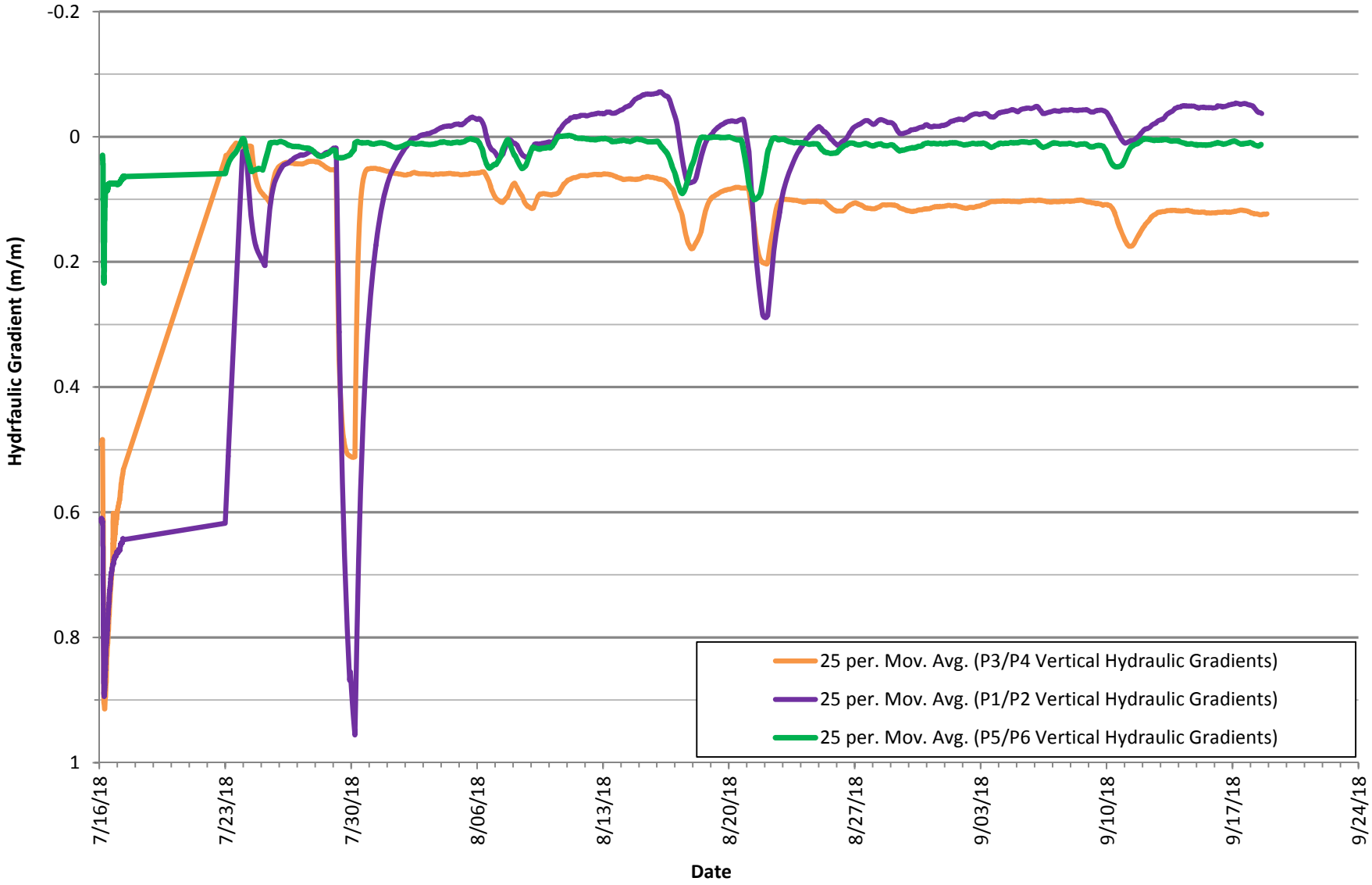
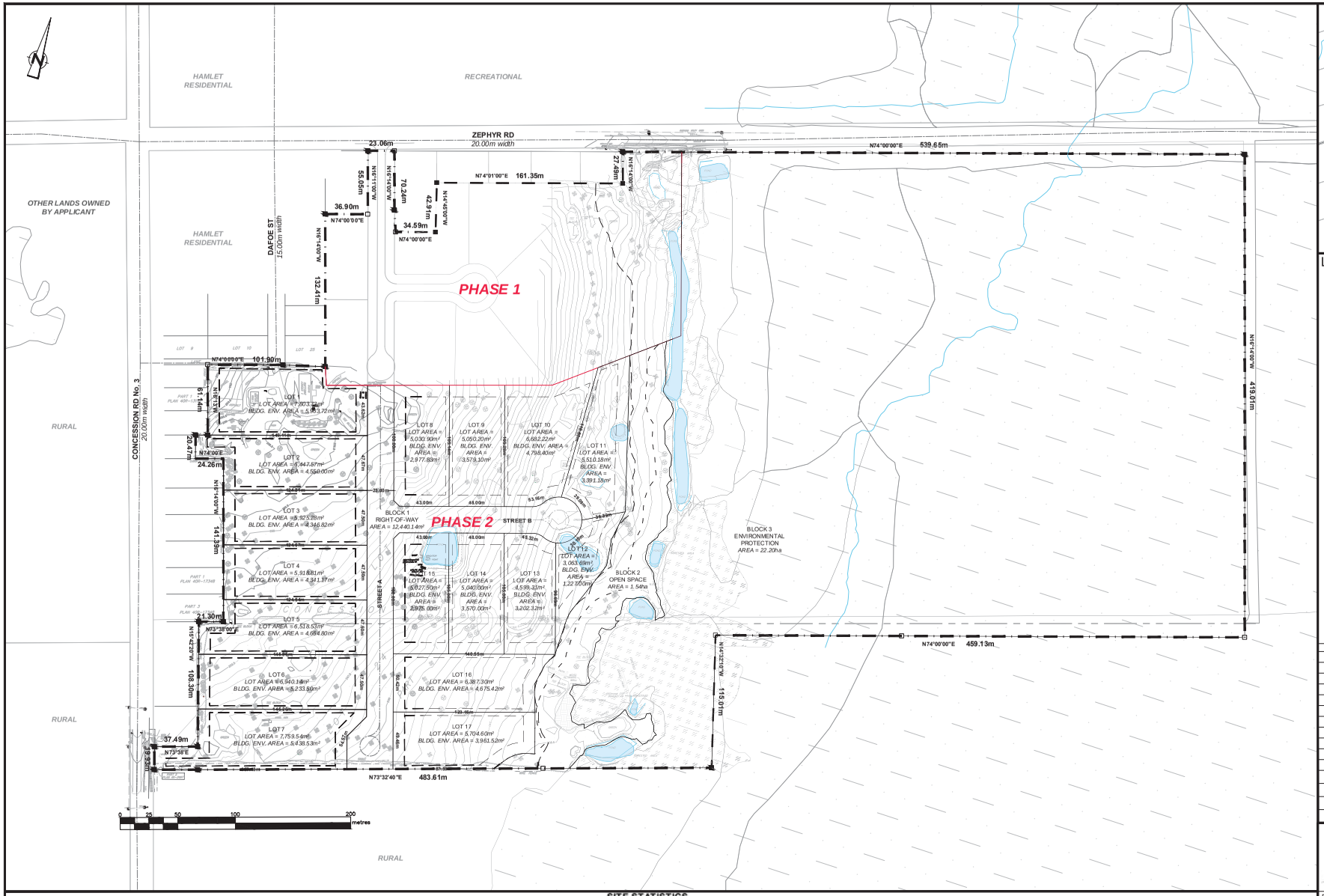
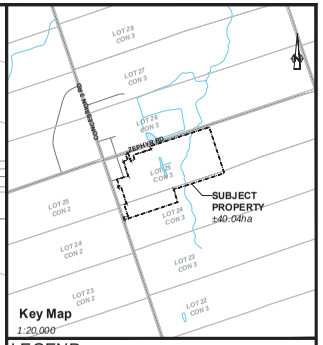


Figure 9: Vertical Hydraulic Gradients - Piezometers

Appendix A

Proposed Development Plans and Land Information





LEGEND

- SUBJECT BOUNDARY
- EXISTING PARCEL
- PROPOSED LOT LINE
- EXISTING BUILDING
- WATERBODY / WATERCOURSE
- EXISTING ENVIRONMENTAL PROTECTION AREA
- EP BUFFER *(30m)*
- EXISTING WETLAND COMMUNITY
- WETLAND BUFFER *(30m)*
- EXISTING FOREST COMMUNITY
- BUILDING ENVELOPE *as per Hamlet Residential (HR) Zone*
  Front Yard: 10m, Ext. Side Yard: 10m, Int. Side Yard: 3m, Rear Yard: 10m

OWNER'S CERTIFICATE
I hereby authorize EcoVue Consulting Services Inc. to prepare and submit this plan to the Region of Durham

Date

SURVEYOR'S CERTIFICATE
This Draft Plan accurately shows the boundaries of all lands proposed to be subdivided.
Certified by:

Date
Ontario Land Surveyor

REVISIONS

DATE	DESCRIPTION
2021-10-01	NHE mapping addition and lot revisions

EcoVue Consulting Services Inc.
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www.ecovueconsulting.com

NOTES:
1. Property boundaries are approximate and based on Plan of Survey 40R-24457.
2. Survey monuments shown on this plan have not been verified.
3. Topographic survey was done by EcoVue Consulting Services Inc. on April 18th, 2017.
4. Temporary benchmarks
   - 4.1. TBM 1: Set survey spike on southerly face of hydro pole on north side of Zephyr Rd, first pole west of driveway into No. 322. Elevation = 238.74
   - 4.2. TBM 2: Top of standard iron bar at the south westerly corner of plan part 2 plan 40R-3497. Elevation = 250.59.
5. Elevations shown here are referenced to G.P.S. observations on the power net GPS Real Time Network, U.T.M. Zone 17, NAD83.
6. Natural Heritage Evaluation mapping provided by GHD, project no. 12562874.

Submission Requirements

ADDITIONAL INFORMATION REQUIRED UNDER SECTION 51-17 (a-l) THE PLANNING ACT
- a) As shown on this Draft Plan
- b) As shown on this Draft Plan
- c) As shown on this Draft Plan
- d) As shown on this Draft Plan
- e) As shown on this Draft Plan
- f) As shown on this Draft Plan
- g) As shown on this Draft Plan
- h)
- i)
- j) As shown on this Draft Plan
- k)
- l)

SITE STATISTICS

LOT/BLOCK No.	PROPOSED USE	PROPOSED USE AREA (sq. m)	PROPOSED USE AREA (ha)	PROPOSED USE FRONTAGE (m)	PROPOSED USE PERCENTAGE (%)	PROPOSED UNITS	UNITS/NET ha
	PHASE 1 LANDS	51,197.12	5.12		12.79%		
LOT 1-17	RESIDENTIAL (SINGLE DETACHED)	99,349.73	9.93	811.22	24.83%	17	0.95
BLOCK 1	RIGHT-OF-WAY	12,440.14	1.24		3.11%	0	
BLOCK 2	OPEN SPACE	15,372.77	1.54		3.84%	0	
BLOCK 3	ENVIRONMENTAL PROTECTION	221,837.81	22.18		55.43%	0	
	GROSS SITE AREA	400,197.99	40.02				
	NET SITE AREA (GSA - BLOCK 3)	178,360.18	17.84				
	TOTAL			811.22	100.00%	17	0.95

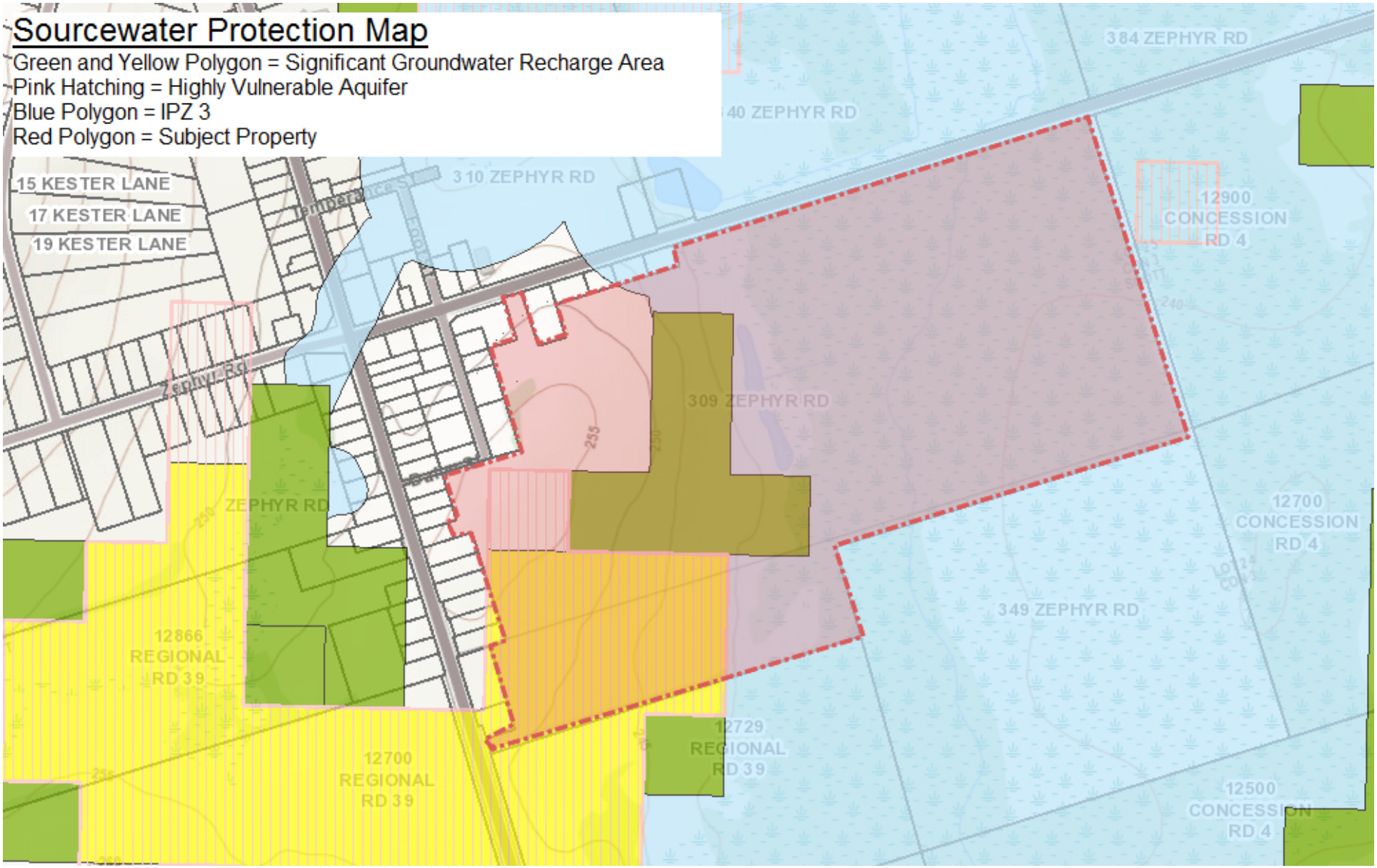
DRAWN BY: TB	PROJECT No.: 17-1672
APPROVED BY:	HORIZ. SCALE: 1:1,500
REVISION DATE: OCTOBER 1, 2021	PLOT DATE: OCTOBER 1, 2021

HIDDEN RIDGE GOLF COURSE
CHINA CANADA JING BEI XIN MIN INTERNATIONAL CO. LTD.
300 ZEPHYR RD
PART OF LOT 24 & 25, CONCESSION 3
GEOG. TWP. OF SCOTT
TOWNSHIP OF UXBRIDGE | REGION OF DURHAM

DRAFT PLAN OF SUBDIVISION | DP1

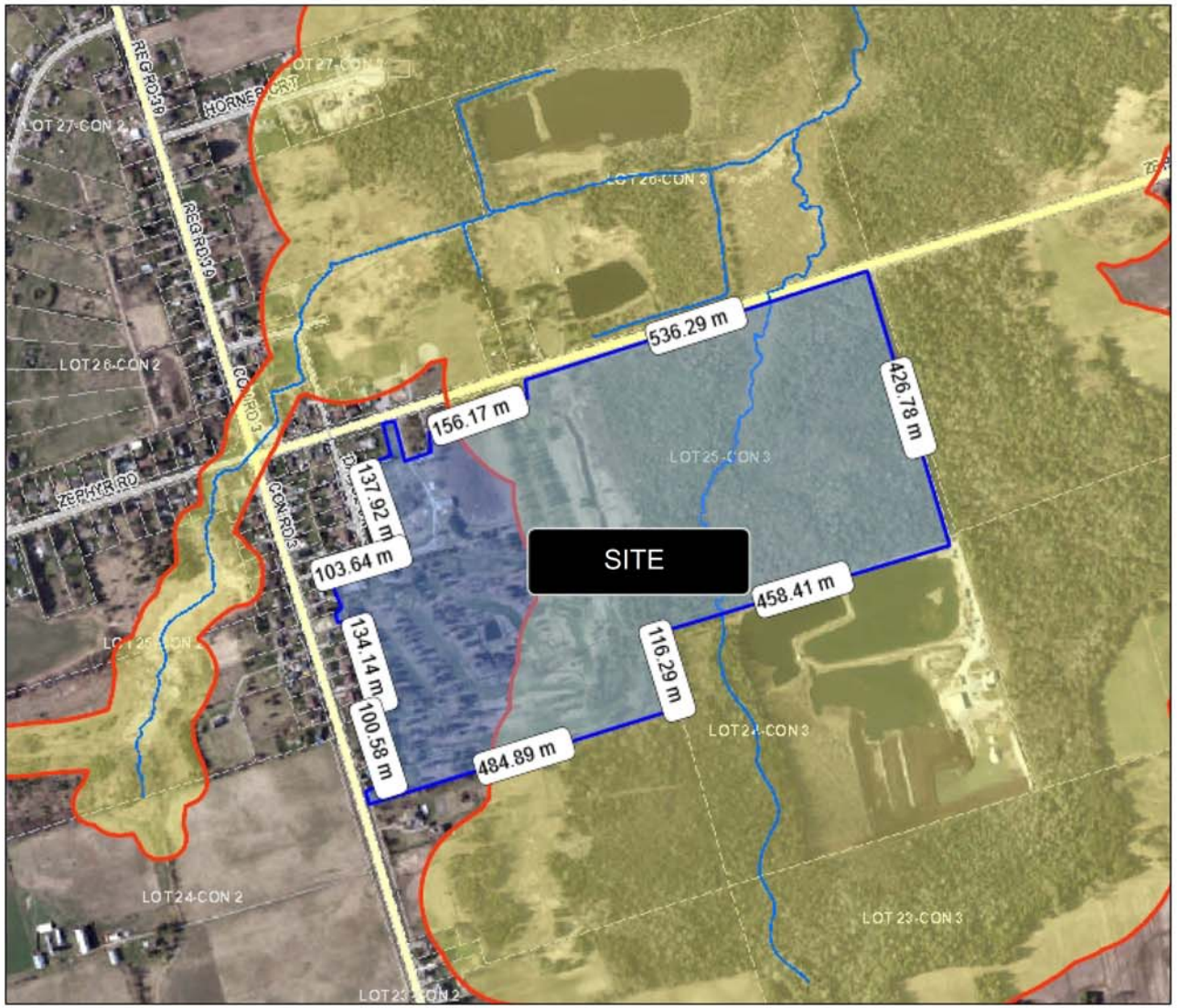
Sourcewater Protection Map

Green and Yellow Polygon = Significant Groundwater Recharge Area
Pink Hatching = Highly Vulnerable Aquifer
Blue Polygon = IPZ 3
Red Polygon = Subject Property



Lake Simcoe Region conservation authority

LSRCA Regulated Areas



Features

- Regulation Map Index
- LSRCA Watershed Boundary
- Lake Simcoe
- Watercourse
- Regulated Area Boundary
- Regulated Area
- Assessment Parcel
- Lot and Concession
- Roads
  - Hwy 400 Series
  - Highway, Arterials
  - Local Road
- Railway

Printed On:
10/19/2018

WGS_1984_Web_Mercator_Auxiliary_Sphere

Mapped By:

Scale 1: 9,160

465 0 233 465 Meters

Appendix B
Test Pit Logs

TEST PIT LOGS
309 Zephyr Rd, Zephyr, Ontario
Cambium Reference No. 6199-001

Test Pit ID	Depth (mbgs[1])	Sample Number	Material Description	UTM (Zone 17T)
TP101-17	0 - 0.20		Topsoil, dry, fine sandy organics	638877
	0.20 - 1.12	1	Light brown silt and fine sand, some gravel, stiff block structure, dry	4895421
	1.12 - 1.8	2	Silty gravelly sand, trace clay, moist, firm, blocky structure No water in hole upon completion	
TP102-17	0 - 0.25		Topsoil, fine sandy organics	
	0.25 - 0.84	1	Brown sandy silt, trace gravel, moist, soft	638842
	0.84 - 2.00	2	Brown silt and sand, some gravel, trace clay, moist, blocky structure Water entering bottom of hole	4895345
TP103-17	0 - 0.23		Topsoil, moist, fine sandy organics	
	0.23 - 0.81	1	Brown silty gravelly sand, trace clay, moist, loose to firm, variable to silt platy structure	638881 4895301
	0.81 - 2.00	2	Brown to grey silty sand, some clay, trace gravel, mostly blocky structure. No water in hole upon completion	
TP104-17	0 - 0.18		Topsoil	
	0.18 - 0.91	1	Brown silt and clay, some sand, trace gravel, soft, moist	638849
	0.91 - 2.00	2	Brown silty sand, some clay, trace gravel, moist, stiff to soft Hole open and dry upon completion	4895223
TP105-17	0 - 0.30		Topsoil	
	0.30 - 1.07	1	Variable soils - Tills, silts, sandy tills. Mostly soft. Soils appear to be disturbed from prior grading work at this location.	638954 4895245
	1.07 - 1.52	2	Brown silty sand, some clay, trace gravel, moist, soft. Hole excavated to 6'10". Open and dry.	
TP106-17	0 - 0.20		Topsoil	
	0.20 - 0.84	1	Various soils and materials: brown fine sand, dry; garbage; brown silt; cobbles and gravel, blocky.	639058
	0.84 - 1.22	2	Brown silt and clay till, moist, blocky	4895270
	1.22 - 2.13	3	Grey blue silt and clay, some sand and gravel. Cobbles approx. 25% of volume, moist, firm. Hole open and dry upon completion.	
TP107-17	0 - 0.20		Topsoil	
	0.20 - 0.89	1	Brown silty sand, trace clay, loose, moist	639088
	0.89 - 1.93	2	Grey silt and clay, soft, moist, mottled, same soil at depth, slightly more silt. Some saturated lenses at ~5 feet. Hole open and dry upon completion	4895359
TP108 -17	0 - 0.36		Topsoil, sand to silty sand	638961
	0.36 - 2.00	1	Light brown fine sandy silt, some gravel, dry, stiff, blocky structure Hole open and dry upon completion	4895325

TEST PIT LOGS
309 Zephyr Rd, Zephyr, Ontario
Cambium Reference No. 6199-001

Test Pit ID	Depth (mbgs[1])	Sample Number	Material Description	Depth (mbgs)
TP109-17	0 - 0.25		Topsoil	
	0.25 - 0.94	1	Sandy silt till, some gravel, dry, some platy structure, firm	638911
	0.94 - 2.00	2	Brown silty sand, some gravel, till, moist, loose	4895380
			Hole open and dry upon completion	
TP110-17	0 - 0.33		Topsoil, sand and silt, moist	
	0.33 - 0.76	1	Light brown silt and fine sand, trace gravel, some staining, soft, moist	639013
	0.76	2	Grey silt and clay, moist, orange mottling	4895432
	0.76 - 2.00	3	Brown silt and clay, some gravel, moist	
			Water entering bottom of hole	
TP111-17	0 - 0.43		Topsoil	
	0.43 - 0.69	1	Blue silt and clay, some fine sand, moist to saturated, soft	639135
	1.24		Water entering at 1.24m, buried organics throughout, moist to saturated	4895495
	1.24 - 2.13	2	Blue medium sand, moist to saturated, loose	
			Hole terminated at 2.13m, water entering hole	
TP112-17	0 - 0.18		Topsoil	
	0.18 - 1.52	1	Brown silty sand, trace clay, moist, soft, loose	639088
			Water entering hole at 1.5m, some red staining. Unable to excavate past 1.5m due to saturated cave-in conditions	4895568
	1.52	2	Brown silt and clay, firm, moist	
TP113-17	0 - 0.30		Topsoil	638963
	0.30 - 2.00	1	Sand and gravel till, firm, dry	4895492
			Hole open and dry upon completion	

Notes: 1. mbgs = metres below ground surface

Appendix C
Borehole Logs

Ontario

Ministry of the Environment and Climate Change

Measurements recorded in: ☐ Metric ☑ Imperial

Well Tag No. *(Place Sticker and/or Print Below)*: A222207

Well Record

Regulation 903 Ontario Water Resources Act

Page 1 of 1

Well Owner's Information

First Name	Last Name / Organization	E-mail Address	☐ Well Constructed by Well Owner
China Canada Jing Bei xin min Intl			

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. (inc. area code)
118 Gemini Cres	Richmond Hill	ON	L4S2K7	

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
Dafoe St	Uxbridge/Scott	25	3

County/District/Municipality	City/Town/Village	Province	Postal Code
Durham	Zeph	Ontario	

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83	17	639858	4859526		

Overburden and Bedrock Materials/Abandonment Sealing Record *(see instructions on the back of this form)*

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	Depth (m/ft) To
Brown	clay	silt, stones	Hard	0	10'
Grey	clay	stones	Dense	10	45'
Grey	sand	gravel	Loose	45	76'

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m^3/ft^3)
0	20'	Hole plug	7.86 ft^3

Method of Construction

☐ Cable Tool ☐ Diamond
☐ Rotary (Conventional) ☐ Jetting
☐ Rotary (Reverse) ☐ Driving
☐ Boring ☐ Digging
☐ Air percussion
☑ Other, *specify* rotary air

Well Use

☐ Public ☐ Commercial ☐ Not used
☑ Domestic ☐ Municipal ☐ Dewatering
☐ Livestock ☐ Test Hole ☐ Monitoring
☐ Irrigation ☐ Cooling & Air Conditioning
☐ Industrial
☐ Other, *specify*

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	Depth (m/ft) To
10"	Steel	.188"	0	73'

Construction Record - Screen

Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft) From	Depth (m/ft) To
6"	Steel	18	73	76'

Status of Well

☑ Water Supply
☐ Replacement Well
☐ Test Hole
☐ Recharge Well
☐ Dewatering Well
☐ Observation and/or Monitoring Hole
☐ Alteration (Construction)
☐ Abandoned, Insufficient Supply
☐ Abandoned, Poor Water Quality
☐ Abandoned, other, *specify*
☐ Other, *specify*

Results of Well Yield Testing

After test of well yield, water was:
☑ Clear and sand free
☐ Other, *specify*

If pumping discontinued, give reason:

Pump intake set at (m/ft): 60'

Pumping rate (l/min / GPM): 10 GPM

Duration of pumping: 1 hrs + 0 min

Final water level end of pumping (m/ft): Flow

If flowing give rate (l/min / GPM): 15 GPM

Recommended pump depth (m/ft): 60

Recommended pump rate (l/min / GPM): 20

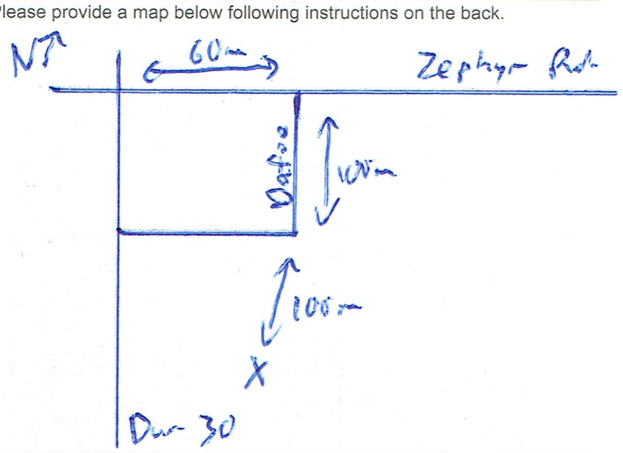
Well production (l/min / GPM): 30

Disinfected? ☑ Yes ☐ No

	Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level	+ 3.5'			
1	Flow		1	Flow
2	Flow		2	Flow
3	Flow		3	Flow
4	Flow		4	Flow
5	Flow		5	Flow
10	Flow		10	Flow
15	Flow		15	Flow
20	Flow		20	Flow
25	Flow		25	Flow
30	Flow		30	Flow
40	Flow		40	Flow
50	Flow		50	Flow
60	Flow		60	Flow

Map of Well Location

Please provide a map below following instructions on the back.



Water Details

Water found at Depth	Kind of Water	
76' (m/ft) ☐ Gas	☑ Fresh ☐ Untested	☐ Other, *specify*
(m/ft) ☐ Gas	☐ Fresh ☐ Untested	☐ Other, *specify*
(m/ft) ☐ Gas	☐ Fresh ☐ Untested	☐ Other, *specify*

Hole Diameter

Depth (m/ft) From	To	Diameter (cm/in)
0	20'	10"
0	76'	6"

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
Wilsons Water Wells Ltd.	5459

Business Address (Street Number/Name)	Municipality
13787 Hwy 48	Stouffville

Province	Postal Code	Business E-mail Address
ON	L4A7X3	

Bus. Telephone No. (inc. area code)	Name of Well Technician (Last Name, First Name)
9056404369	Ferguson, Eric

Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted
3490		2018 06 21

Comments: Chlorinated 200ppm
Residual chlorine 50 ppm → 21 hrs

Well owner's information package delivered	Date Package Delivered	Date Work Completed
☑ Yes ☐ No	2018 06 20	2018 06 20

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Audit No. Z265420

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Ministry of the Environment and Climate Change

Measurements recorded in: ☐ Metric ☑ Imperial

W... Tag#: A 222198 ...Below)

A222198

Well Record

Regulation 903 Ontario Water Resources Act

Page 1 of 1

Well Owner's Information

First Name	Last Name / Organization	E-mail Address	☐ Well Constructed by Well Owner
China Canada Jing	Bei xin min intl.		

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. (inc. area code)
118 Gemini Crest	Richmond hill	on	L4S2M7	

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
Dafoe Street	Uxbridge/scott	25	3

County/District/Municipality	City/Town/Village	Province	Postal Code
Durham	Zephr	Ontario	

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83	17	638975	4895482		

Overburden and Bedrock Materials/Abandonment Sealing Record *(see instructions on the back of this form)*

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	To
Brown	Sand	stone, silt, gravel	Hard	0	25'
Grey	Clay	stones	Dense	25	85'
Grey	Sand	gravel	Loose	85	97'

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
0	20'	Bentonite slurry	7.84 ft³

Method of Construction

☐ Cable Tool ☐ Diamond
☐ Rotary (Conventional) ☐ Jetting
☐ Rotary (Reverse) ☐ Driving
☐ Boring ☐ Digging
☐ Air percussion
☑ Other, specify: Rotary air

Well Use

☐ Public ☐ Commercial ☐ Not used
☑ Domestic ☐ Municipal ☐ Dewatering
☐ Livestock ☐ Test Hole ☐ Monitoring
☐ Irrigation ☐ Cooling & Air Conditioning
☐ Industrial
☐ Other, specify

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	To
6"	Steel	.188"	0	94'

Construction Record - Screen

Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft) From	To
6"	Steel	14	94	97'

Status of Well

☑ Water Supply
☐ Replacement Well
☐ Test Hole
☐ Recharge Well
☐ Dewatering Well
☐ Observation and/or Monitoring Hole
☐ Alteration (Construction)
☐ Abandoned, Insufficient Supply
☐ Abandoned, Poor Water Quality
☐ Abandoned, other, specify
☐ Other, specify

Water Details

Water found at Depth (m/ft)	Gas	Kind of Water	Fresh	Untested	Other, specify
97'	☐		☑	☐	
	☐		☐	☐	
	☐		☐	☐	

Hole Diameter

Depth (m/ft) From	To	Diameter (cm/in)
0	20'	10"
0	97'	6"

Results of Well Yield Testing

After test of well yield, water was:
☑ Clear and sand free
☐ Other, specify

If pumping discontinued, give reason:

Pump intake set at (m/ft): 85'

Pumping rate (l/min / GPM): 12 GPM

Duration of pumping: 1 hrs + 0 min

Final water level end of pumping (m/ft): 21'4

If flowing give rate (l/min / GPM)

Recommended pump depth (m/ft): 70

Recommended pump rate (l/min / GPM): 20

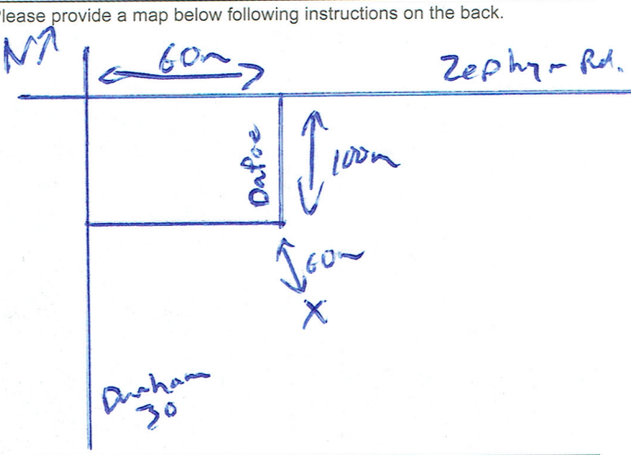
Well production (l/min / GPM): 30 +

Disinfected? ☑ Yes ☐ No

	Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level		20'2		
1	20'4		1	20.3
2	21.3		2	20.2
3	21.4		3	20.2
4	21.4		4	20.2
5	21.4		5	20.2
10	21.4		10	20.2
15	21.4		15	20.2
20	21.4		20	20.2
25	21.4		25	20.2
30	21.4		30	20.2
40	21.4		40	20.2
50	21.4		50	20.2
60	21.4		60	20.2

Map of Well Location

Please provide a map below following instructions on the back.



Comments: Disinfected 200ppm
Residual chlorine 100ppm → 17 hrs.

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
Wilson's Water Wells Ltd.	5459

Business Address (Street Number/Name)	Municipality
13787 Hwy 48	Stouffville

Province	Postal Code	Business E-mail Address
ON	L4A7X3	

Bus. Telephone No. (inc. area code)	Name of Well Technician (Last Name, First Name)
9056404369	Ferguson, Eric

Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted
3490		2018061 8

Well owner's information package delivered	Date Package Delivered	Date Work Completed
☑ Yes ☐ No	2018061 8	2018061 4

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Ontario — Ministry of the Environment and Climate Change

Measurements recorded in: ☐ Metric ☑ Imperial

Tag#: A 222197 (t Below)

A 222197

Well Record

Regulation 903 Ontario Water Resources Act

Page 1 of 1

Well Owner's Information

First Name	Last Name / Organization	E-mail Address	☐ Well Constructed by Well Owner
China Canada Jing Bei Xin Min Shall			

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. (inc. area code)
118 Gemini Cres	Richmond Hill	ON	L4S 2K7	

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
Dafoe Street	Uxbridge/Scott	25	3

County/District/Municipality	City/Town/Village	Province	Postal Code
Durham	- Beph	Ontario	

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 8 3	17	639030	4895426		

Overburden and Bedrock Materials/Abandonment Sealing Record *(see instructions on the back of this form)*

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	Depth (m/ft) To
Brown	clay	stones, silt	Hard	0	6'
Grey	clay	stones	Dense	6	50'
Grey	sand	gravel	Loose	50	69'

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
0	20'	Hole plug	7.86 ft³

Method of Construction

☐ Cable Tool ☐ Diamond ☐ Rotary (Conventional) ☐ Jetting ☐ Rotary (Reverse) ☐ Driving ☐ Boring ☐ Digging ☐ Air percussion ☑ Other, specify: Rotary air

Well Use

☐ Public ☐ Commercial ☐ Not used ☑ Domestic ☐ Municipal ☐ Dewatering ☐ Livestock ☐ Test Hole ☐ Monitoring ☐ Irrigation ☐ Cooling & Air Conditioning ☐ Industrial ☐ Other, specify

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	Depth (m/ft) To
6"	Steel	.188"	0	66'

Construction Record - Screen

Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft) From	Depth (m/ft) To
6"	Steel	16	66	69'

Status of Well

☑ Water Supply ☐ Replacement Well ☐ Test Hole ☐ Recharge Well ☐ Dewatering Well ☐ Observation and/or Monitoring Hole ☐ Alteration (Construction) ☐ Abandoned, Insufficient Supply ☐ Abandoned, Poor Water Quality ☐ Abandoned, other, specify ☐ Other, specify

Water Details

Water found at Depth (m/ft)	Gas	Kind of Water	Fresh	Untested	Other, specify
69'	☐		☑	☐	
	☐		☐	☐	
	☐		☐	☐	

Hole Diameter

Depth (m/ft) From	To	Diameter (cm/in)
0	20'	10"
0	69'	6"

Results of Well Yield Testing

After test of well yield, water was: ☑ Clear and sand free ☐ Other, specify

If pumping discontinued, give reason:

Pump intake set at (m/ft): 55'

Pumping rate (l/min / GPM): 10 GPM

Duration of pumping: 1 hrs + 0 min

Final water level end of pumping (m/ft): Flowing

If flowing give rate (l/min / GPM): 20 GPM

Recommended pump depth (m/ft): 30

Recommended pump rate (l/min / GPM): 20

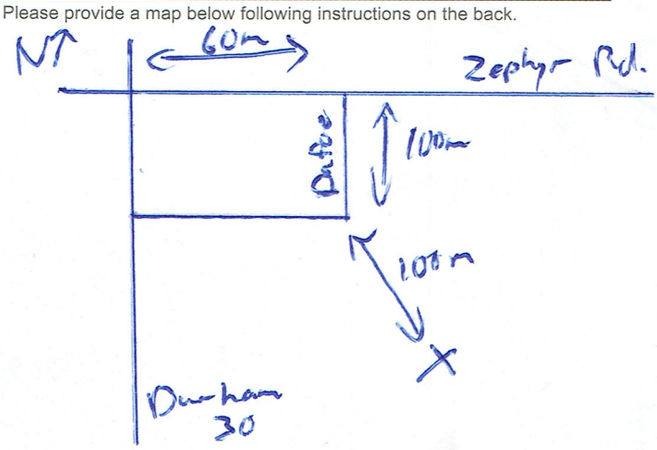
Well production (l/min / GPM): 30+

Disinfected? ☑ Yes ☐ No

Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level	+8'		
1	Flow	1	Flow
2	Flow	2	Flow
3	Flow	3	Flow
4	Flow	4	Flow
5	Flow	5	Flow
10	Flow	10	Flow
15	Flow	15	Flow
20	Flow	20	Flow
25	Flow	25	Flow
30	Flow	30	Flow
40	Flow	40	Flow
50	Flow	50	Flow
60	Flow	60	Flow

Map of Well Location

Please provide a map below following instructions on the back.



Comments: Disinfected 200 ppm
Residual Chlorine 100 ppm → 17 hrs

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
Wilson's Water Wells Ltd.	5459

Business Address (Street Number/Name)	Municipality
13787 Hwy 48	Stouffville

Province	Postal Code	Business E-mail Address
ON	L4A 7X3	

Bus. Telephone No. (inc. area code)	Name of Well Technician (Last Name, First Name)
9056404369	Ferguson, Eric

Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted
3490		2015061 8

Well owner's information package delivered	Date Package Delivered	Date Work Completed
☑ Yes ☐ No	2015061 8	2015061 8

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Appendix D
Certificates of Analysis

CADUCEON ENVIRONMENTAL LABORATORIES
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CERTIFICATE OF ANALYSIS

Final Report

C.O.C.: ---

REPORT No. B17-23016

Report To:

Cambium Environmental
PO Box 325, 52 Hunter Street East
Peterborough ON K9H 1G5 Canada
Attention: Cameron MacDougall

Caduceon Environmental Laboratories
285 Dalton Ave
Kingston Ontario K7K 6Z1
Tel: 613-544-2001
Fax: 613-544-2770

DATE RECEIVED: 11-Aug-17
DATE REPORTED: 17-Aug-17
SAMPLE MATRIX: Groundwater

JOB/PROJECT NO.: 6199-001
P.O. NUMBER:
WATERWORKS NO.

	Client I.D.	340 Zephyr Rd.	1 Foot Rd.	12820 Durham Rd. 39	
	Sample I.D.	B17-23016-1	B17-23016-2	B17-23016-3	
	Date Collected	09-Aug-17	09-Aug-17	09-Aug-17	

Parameter	Units	R.L.	Reference Method	Date/Site Analyzed				
BOD(5 day)	mg/L	2	SM 5210B	11-Aug-17/K	3	< 2	< 2	
Total Kjeldahl Nitrogen	mg/L	0.1	E3199A.1	15-Aug-17/K	0.1	0.6	< 0.1	
Ammonia (N)-Total	mg/L	0.01	SM4500-NH3-H	15-Aug-17/K	0.10	0.30	0.01	
Ammonia (N)-unionized	mg/L	0.01	CALC	15-Aug-17/K	< 0.01	< 0.01	< 0.01	
Nitrite (N)	mg/L	0.1	SM4110C	14-Aug-17/O	< 0.1	< 0.1	< 0.1	
Nitrate (N)	mg/L	0.1	SM4110C	14-Aug-17/O	< 0.1	< 0.1	1.0	
Dissolved Organic Carbon	mg/L	0.2	EPA 415.1	14-Aug-17/O	0.8	2.5	0.3	

Michelle Dubien
Lab Manager

R.L. = Reporting Limit
Test methods may be modified from specified reference method unless indicated by an *
Site Analyzed=K-Kingston,W-Windsor,O-Ottawa,R-Richmond Hill,B-Barrie

CADUCEON ENVIRONMENTAL LABORATORIES
Client committed. Quality assured.

CERTIFICATE OF ANALYSIS

Final Report

C.O.C.: G39405 **REPORT No. B18-21068**

Report To:

Cambium Environmental
PO Box 325, 52 Hunter Street East
Peterborough ON K9H 1G5 Canada
Attention: Cameron MacDougall

Caduceon Environmental Laboratories
2378 Holly Lane
Ottawa Ontario K1V 7P1
Tel: 613-526-0123
Fax: 613-526-1244

DATE RECEIVED: 18-Jul-18
DATE REPORTED: 24-Jul-18
SAMPLE MATRIX: Groundwater

JOB/PROJECT NO.: 6199-001
P.O. NUMBER:
WATERWORKS NO.

	Client I.D.:	PW1		ODWS	
	Sample I.D.:	B18-21068-1		Objective	Type of Objective
	Date Collected:	16-Jul-18			

Parameter	Units	R.L.	Reference Method	Date/Site Analyzed				
Hardness (as CaCO3)	mg/L	1	SM 3120	19-Jul-18/O	**268**		80-100	OG
Alkalinity(CaCO3) to pH4.5	mg/L	5	SM 2320B	18-Jul-18/O	211		30-500	OG
pH @25°C	pH Units		SM 4500H	18-Jul-18/O	8.04		6.5-8.5	OG
Conductivity @25°C	µmho/cm	1	SM 2510B	18-Jul-18/O	544			
Turbidity	NTU	0.1	SM 2130	20-Jul-18/O	**6.4**		5	AO
Total Suspended Solids	mg/L	3	SM 2540D	19-Jul-18/O	< 3			
Colour	TCU	2	SM 2120C	20-Jul-18/O	< 2		5	AO
Fluoride	mg/L	0.1	SM4110C	18-Jul-18/O	< 0.1		1.5	MAC
Chloride	mg/L	0.5	SM4110C	18-Jul-18/O	17.2		250	AO
Nitrite (N)	mg/L	0.1	SM4110C	18-Jul-18/O	< 0.1		1	MAC
Nitrate (N)	mg/L	0.1	SM4110C	18-Jul-18/O	< 0.1		10	MAC
Sulphate	mg/L	1	SM4110C	18-Jul-18/O	36		500	AO
Calcium	mg/L	0.02	SM 3120	19-Jul-18/O	79.4			
Magnesium	mg/L	0.02	SM 3120	19-Jul-18/O	16.9			
Sodium	mg/L	0.2	SM 3120	19-Jul-18/O	6.6		200,20	AO,MAC
Potassium	mg/L	0.1	SM 3120	19-Jul-18/O	1.1			
Aluminum	mg/L	0.01	SM 3120	19-Jul-18/O	0.06		0.1	OG
Antimony	mg/L	0.0001	EPA 200.8	24-Jul-18/O	0.0001		0.006,0.006	IMAC,MAC
Arsenic	mg/L	0.0001	EPA 200.8	24-Jul-18/O	0.0001		0.025,0.010	IMAC,MAC
Barium	mg/L	0.001	SM 3120	19-Jul-18/O	0.159		1	MAC
Beryllium	mg/L	0.002	SM 3120	19-Jul-18/O	< 0.002			
Bismuth	mg/L	0.02	SM 3120	19-Jul-18/O	< 0.02			
Boron	mg/L	0.005	SM 3120	19-Jul-18/O	0.007		5,5.0	IMAC,MAC
Cadmium	mg/L	0.000015	EPA 200.8	24-Jul-18/O	< 0.000015		0.005	MAC
Chromium	mg/L	0.002	SM 3120	19-Jul-18/O	< 0.002		0.05	MAC
Cobalt	mg/L	0.005	SM 3120	19-Jul-18/O	< 0.005			
Copper	mg/L	0.002	SM 3120	19-Jul-18/O	< 0.002		1	AO
Iron	mg/L	0.005	SM 3120	19-Jul-18/O	**0.642**		0.3	AO

ODWS - Ontario Drinking Water Standards
AO - Aesthetic Objectives
IMAC - Interim Maximum Acceptable Concentration
MAC - Maximum Acceptable Concentration
OG - Operational Guidelines

R.L. = Reporting Limit
Test methods may be modified from specified reference method unless indicated by an *
Site Analyzed=K-Kingston,W-Windsor,O-Ottawa,R-Richmond Hill,B-Barrie

Greg Clarkin , BSc., C. Chem
Lab Manager - Ottawa District

CADUCEON ENVIRONMENTAL LABORATORIES
Client committed. Quality assured.

CERTIFICATE OF ANALYSIS

Final Report

C.O.C.: G39405 **REPORT No. B18-21068**

Report To:

Cambium Environmental
PO Box 325, 52 Hunter Street East
Peterborough ON K9H 1G5 Canada
Attention: Cameron MacDougall

Caduceon Environmental Laboratories
2378 Holly Lane
Ottawa Ontario K1V 7P1
Tel: 613-526-0123
Fax: 613-526-1244

DATE RECEIVED: 18-Jul-18
DATE REPORTED: 24-Jul-18
SAMPLE MATRIX: Groundwater

JOB/PROJECT NO.: 6199-001
P.O. NUMBER:
WATERWORKS NO.

	Client I.D.:	PW1		ODWS	
	Sample I.D.:	B18-21068-1		Objective	Type of Objective
	Date Collected:	16-Jul-18			

Parameter	Units	R.L.	Reference Method	Date/Site Analyzed				
Lead	mg/L	0.00002	EPA 200.8	24-Jul-18/O	0.00004		0.010	MAC
Manganese	mg/L	0.001	SM 3120	19-Jul-18/O	**0.069**		0.05	AO
Molybdenum	mg/L	0.01	SM 3120	19-Jul-18/O	< 0.01			
Nickel	mg/L	0.01	SM 3120	19-Jul-18/O	< 0.01			
Selenium	mg/L	0.001	EPA 200.8	24-Jul-18/O	< 0.001		0.05	MAC
Silicon	mg/L	0.01	SM 3120	19-Jul-18/O	7.46			
Silver	mg/L	0.0001	EPA 200.8	24-Jul-18/O	< 0.0001			
Strontium	mg/L	0.001	SM 3120	19-Jul-18/O	0.281			
Thallium	mg/L	0.00005	EPA 200.8	24-Jul-18/O	< 0.00005			
Tin	mg/L	0.05	SM 3120	19-Jul-18/O	< 0.05			
Titanium	mg/L	0.005	SM 3120	19-Jul-18/O	< 0.005			
Uranium	mg/L	0.00005	EPA 200.8	24-Jul-18/O	0.00014		0.020	MAC
Vanadium	mg/L	0.005	SM 3120	19-Jul-18/O	< 0.005			
Zinc	mg/L	0.005	SM 3120	19-Jul-18/O	0.005		5	AO
Ammonia (N)-Total	mg/L	0.01	SM4500-NH3-H	19-Jul-18/K	0.18			
Total Kjeldahl Nitrogen	mg/L	0.1	E3199A.1	19-Jul-18/K	0.2			
Organic Nitrogen	mg/L	0.1	E3199A.1	24-Jul-18/K	< 0.1		0.15	OG
Phosphorus-Total	mg/L	0.01	E3199A.1	19-Jul-18/K	0.05			
Phenolics	mg/L	0.001	MOEE 3179	20-Jul-18/O	< 0.001			
Tannins and Lignins	mg/L	0.5	SM5500B	23-Jul-18/K	< 0.5			
Sulphide	mg/L	0.01	SM4500-S2	20-Jul-18/K	< 0.01		0.05	AO
Dissolved Organic Carbon	mg/L	0.2	EPA 415.1	19-Jul-18/O	2.8		5	AO
Total Organic Carbon	mg/L	0.2	EPA 415.1	20-Jul-18/O	2.6			
Total Coliform	cfu/100mL	1	MOE E3407	18-Jul-18/O	0		0	MAC
E coli	cfu/100mL	1	MOE E3407	18-Jul-18/O	0		0	MAC
Heterotrophic Plate Count	cfu/mL	2	SM 9215C	18-Jul-18/O	4			
Anion Sum	meq/L		Calc.	23-Jul-18/O	5.45			

ODWS - Ontario Drinking Water Standards
AO - Aesthetic Objectives
IMAC - Interim Maximum Acceptable Concentration
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OG - Operational Guidelines

R.L. = Reporting Limit
Test methods may be modified from specified reference method unless indicated by an *
Site Analyzed=K-Kingston,W-Windsor,O-Ottawa,R-Richmond Hill,B-Barrie

Greg Clarkin , BSc., C. Chem
Lab Manager - Ottawa District

CADUCEON ENVIRONMENTAL LABORATORIES
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CERTIFICATE OF ANALYSIS

Final Report

C.O.C.: G39405 **REPORT No. B18-21068**

Report To:

Cambium Environmental
PO Box 325, 52 Hunter Street East
Peterborough ON K9H 1G5 Canada
Attention: Cameron MacDougall

Caduceon Environmental Laboratories
2378 Holly Lane
Ottawa Ontario K1V 7P1
Tel: 613-526-0123
Fax: 613-526-1244

DATE RECEIVED: 18-Jul-18
DATE REPORTED: 24-Jul-18
SAMPLE MATRIX: Groundwater

JOB/PROJECT NO.: 6199-001
P.O. NUMBER:
WATERWORKS NO.

			Client I.D.:		PW1		ODWS	
			Sample I.D.:		B18-21068-1		Objective	Type of Objective
			Date Collected:		16-Jul-18			
Parameter	**Units**	**R.L.**	**Reference Method**	**Date/Site Analyzed**				
Cation Sum	meq/L		Calc.	23-Jul-18/O	5.72			
% Difference	%		Calc.	23-Jul-18/O	2.36			
Ion Ratio	AS/CS		Calc.	23-Jul-18/O	0.954			
Sodium Adsorption Ratio	-		Calc.	23-Jul-18/O	0.174			
TDS(ion sum calc.)	mg/L	1	Calc.	23-Jul-18/O	285		500	AO
Conductivity (calc.)	µmho/cm		Calc.	23-Jul-18/O	529			
TDS(calc.)/EC(actual)	-		Calc.	23-Jul-18/O	0.524			
EC(calc.)/EC(actual)	-		Calc.	23-Jul-18/O	0.973			
Langelier Index(25°C)	S.I.		Calc.	23-Jul-18/O	0.822			
Saturation pH (25°C)	-		Calc.	23-Jul-18/O	7.22			

ODWS - Ontario Drinking Water Standards
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Site Analyzed=K-Kingston,W-Windsor,O-Ottawa,R-Richmond Hill,B-Barrie

Greg Clarkin , BSc., C. Chem
Lab Manager - Ottawa District

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CERTIFICATE OF ANALYSIS

Final Report

C.O.C.: G78623 **REPORT No. B18-21231**

Report To:

Cambium Environmental
PO Box 325, 52 Hunter Street East
Peterborough ON K9H 1G5 Canada
Attention: Cameron MacDougall

Caduceon Environmental Laboratories
2378 Holly Lane
Ottawa Ontario K1V 7P1
Tel: 613-526-0123
Fax: 613-526-1244

DATE RECEIVED: 19-Jul-18
DATE REPORTED: 27-Jul-18
SAMPLE MATRIX: Groundwater

JOB/PROJECT NO.: 6199-001
P.O. NUMBER: Zephyr
WATERWORKS NO.

			Client I.D.:		PW3	PW2	ODWS	
			Sample I.D.:		B18-21231-1	B18-21231-2	Objective	Type of Objective
			Date Collected:		17-Jul-18	17-Jul-18		
Parameter	Units	R.L.	Reference Method	Date/Site Analyzed				
Hardness (as CaCO3)	mg/L	1	SM 3120	20-Jul-18/O	241	248	80-100	OG
Alkalinity(CaCO3) to pH4.5	mg/L	5	SM 2320B	20-Jul-18/O	191	202	30-500	OG
pH @25°C	pH Units		SM 4500H	20-Jul-18/O	8.28	8.30	6.5-8.5	OG
Conductivity @25°C	µmho/cm	1	SM 2510B	20-Jul-18/O	497	517		
Turbidity	NTU	0.1	SM 2130	20-Jul-18/O	10.9	9.9	5	AO
Total Suspended Solids	mg/L	3	SM 2540D	23-Jul-18/O	< 3	< 3		
Colour	TCU	2	SM 2120C	20-Jul-18/O	< 2	< 2	5	AO
Fluoride	mg/L	0.1	SM4110C	21-Jul-18/O	< 0.1	< 0.1	1.5	MAC
Chloride	mg/L	0.5	SM4110C	21-Jul-18/O	14.5	9.5	250	AO
Nitrite (N)	mg/L	0.1	SM4110C	21-Jul-18/O	< 0.1	< 0.1	1	MAC
Nitrate (N)	mg/L	0.1	SM4110C	21-Jul-18/O	< 0.1	< 0.1	10	MAC
Sulphate	mg/L	1	SM4110C	21-Jul-18/O	44	50	500	AO
Calcium	mg/L	0.02	SM 3120	20-Jul-18/O	63.7	75.7		
Magnesium	mg/L	0.02	SM 3120	20-Jul-18/O	19.9	14.4		
Sodium	mg/L	0.2	SM 3120	20-Jul-18/O	5.4	4.7	200,20	AO,MAC
Potassium	mg/L	0.1	SM 3120	20-Jul-18/O	1.3	1.0		
Aluminum	mg/L	0.01	SM 3120	20-Jul-18/O	0.04	0.06	0.1	OG
Antimony	mg/L	0.0001	EPA 200.8	24-Jul-18/O	< 0.0001	< 0.0001	0.006,0.006	IMAC,MAC
Arsenic	mg/L	0.0001	EPA 200.8	24-Jul-18/O	0.0003	0.0003	0.025,0.010	IMAC,MAC
Barium	mg/L	0.001	SM 3120	20-Jul-18/O	0.139	0.091	1	MAC
Beryllium	mg/L	0.002	SM 3120	20-Jul-18/O	< 0.002	< 0.002		
Bismuth	mg/L	0.02	SM 3120	20-Jul-18/O	< 0.02	< 0.02		
Boron	mg/L	0.005	SM 3120	20-Jul-18/O	0.010	0.005	5,5.0	IMAC,MAC
Cadmium	mg/L	).000015	EPA 200.8	24-Jul-18/O	< 0.000015	< 0.000015	0.005	MAC
Chromium	mg/L	0.002	SM 3120	20-Jul-18/O	< 0.002	< 0.002	0.05	MAC
Cobalt	mg/L	0.005	SM 3120	20-Jul-18/O	< 0.005	< 0.005		
Copper	mg/L	0.002	SM 3120	20-Jul-18/O	< 0.002	< 0.002	1	AO
Iron	mg/L	0.005	SM 3120	20-Jul-18/O	0.796	0.808	0.3	AO

ODWS - Ontario Drinking Water Standards
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OG - Operational Guidelines

R.L. = Reporting Limit
Test methods may be modified from specified reference method unless indicated by an *
Site Analyzed=K-Kingston,W-Windsor,O-Ottawa,R-Richmond Hill,B-Barrie

Greg Clarkin , BSc., C. Chem
Lab Manager - Ottawa District

CADUCEON ENVIRONMENTAL LABORATORIES
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CERTIFICATE OF ANALYSIS

Final Report

C.O.C.: G78623 **REPORT No. B18-21231**

Report To:

Cambium Environmental
PO Box 325, 52 Hunter Street East
Peterborough ON K9H 1G5 Canada
Attention: Cameron MacDougall

Caduceon Environmental Laboratories
2378 Holly Lane
Ottawa Ontario K1V 7P1
Tel: 613-526-0123
Fax: 613-526-1244

DATE RECEIVED: 19-Jul-18
DATE REPORTED: 27-Jul-18
SAMPLE MATRIX: Groundwater

JOB/PROJECT NO.: 6199-001
P.O. NUMBER: Zephyr
WATERWORKS NO.

			Client I.D.:		PW3	PW2	ODWS	
			Sample I.D.:		B18-21231-1	B18-21231-2	Objective	Type of Objective
			Date Collected:		17-Jul-18	17-Jul-18		
Parameter	**Units**	**R.L.**	**Reference Method**	**Date/Site Analyzed**				
Lead	mg/L	0.00002	EPA 200.8	24-Jul-18/O	< 0.00002	< 0.00002	0.010	MAC
Manganese	mg/L	0.001	SM 3120	20-Jul-18/O	0.050	0.048	0.05	AO
Molybdenum	mg/L	0.01	SM 3120	20-Jul-18/O	< 0.01	< 0.01		
Nickel	mg/L	0.01	SM 3120	20-Jul-18/O	< 0.01	< 0.01		
Selenium	mg/L	0.001	EPA 200.8	24-Jul-18/O	< 0.001	< 0.001	0.05	MAC
Silicon	mg/L	0.01	SM 3120	20-Jul-18/O	8.49	7.14		
Silver	mg/L	0.0001	EPA 200.8	24-Jul-18/O	< 0.0001	< 0.0001		
Strontium	mg/L	0.001	SM 3120	20-Jul-18/O	0.331	0.195		
Thallium	mg/L	0.00005	EPA 200.8	24-Jul-18/O	< 0.00005	< 0.00005		
Tin	mg/L	0.05	SM 3120	20-Jul-18/O	< 0.05	< 0.05		
Titanium	mg/L	0.005	SM 3120	20-Jul-18/O	< 0.005	< 0.005		
Uranium	mg/L	0.00005	EPA 200.8	24-Jul-18/O	0.00035	0.00011	0.020	MAC
Vanadium	mg/L	0.005	SM 3120	20-Jul-18/O	< 0.005	< 0.005		
Zinc	mg/L	0.005	SM 3120	20-Jul-18/O	< 0.005	< 0.005	5	AO
Ammonia (N)-Total	mg/L	0.01	SM4500-NH3-H	20-Jul-18/K	0.11	0.08		
Total Kjeldahl Nitrogen	mg/L	0.1	E3199A.1	20-Jul-18/K	0.2	0.1		
Organic Nitrogen	mg/L	0.10	E3199A.1	27-Jul-18/K	< 0.10	< 0.10	0.15	OG
Phosphorus-Total	mg/L	0.01	E3199A.1	20-Jul-18/K	0.02	0.02		
Phenolics	mg/L	0.001	MOEE 3179	27-Jul-18/O	< 0.001	< 0.001		
Tannins and Lignins	mg/L	0.5	SM5500B	23-Jul-18/K	< 0.5	< 0.5		
Sulphide	mg/L	0.01	SM4500-S2	20-Jul-18/K	< 0.01	< 0.01	0.05	AO
Dissolved Organic Carbon	mg/L	0.2	EPA 415.1	20-Jul-18/O	2.1	1.4	5	AO
Total Organic Carbon	mg/L	0.2	EPA 415.1	20-Jul-18/O	2.2	1.5		
Total Coliform	cfu/100mL	1	MOE E3407	19-Jul-18/O	0	**15**	0	MAC
E coli	cfu/100mL	1	MOE E3407	19-Jul-18/O	0	0	0	MAC
Heterotrophic Plate Count	cfu/mL	2	SM 9215C	19-Jul-18/O	2	6		
Anion Sum	meq/L		Calc.	23-Jul-18/O	5.14	5.35		

ODWS - Ontario Drinking Water Standards
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R.L. = Reporting Limit
Test methods may be modified from specified reference method unless indicated by an *
Site Analyzed=K-Kingston,W-Windsor,O-Ottawa,R-Richmond Hill,B-Barrie

Greg Clarkin , BSc., C. Chem
Lab Manager - Ottawa District

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CERTIFICATE OF ANALYSIS

Final Report

C.O.C.: G78623 **REPORT No. B18-21231**

Report To:

Cambium Environmental
PO Box 325, 52 Hunter Street East
Peterborough ON K9H 1G5 Canada
Attention: Cameron MacDougall

Caduceon Environmental Laboratories
2378 Holly Lane
Ottawa Ontario K1V 7P1
Tel: 613-526-0123
Fax: 613-526-1244

DATE RECEIVED: 19-Jul-18
DATE REPORTED: 27-Jul-18
SAMPLE MATRIX: Groundwater

JOB/PROJECT NO.: 6199-001
P.O. NUMBER: Zephyr
WATERWORKS NO.

			Client I.D.:		PW3	PW2	ODWS	
			Sample I.D.:		B18-21231-1	B18-21231-2	Objective	Type of Objective
			Date Collected:		17-Jul-18	17-Jul-18		
Parameter	**Units**	**R.L.**	**Reference Method**	**Date/Site Analyzed**				
Cation Sum	meq/L		Calc.	23-Jul-18/O	5.13	5.25		
% Difference	%		Calc.	23-Jul-18/O	0.0170	0.970		
Ion Ratio	AS/CS		Calc.	23-Jul-18/O	1.00	1.02		
Sodium Adsorption Ratio	-		Calc.	23-Jul-18/O	0.151	0.131		
TDS(ion sum calc.)	mg/L	1	Calc.	23-Jul-18/O	264	277	500	AO
Conductivity (calc.)	µmho/cm		Calc.	23-Jul-18/O	489	503		
TDS(calc.)/EC(actual)	-		Calc.	23-Jul-18/O	0.531	0.537		
EC(calc.)/EC(actual)	-		Calc.	23-Jul-18/O	0.984	0.972		
Langelier Index(25°C)	S.I.		Calc.	23-Jul-18/O	0.932	1.04		

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Site Analyzed=K-Kingston,W-Windsor,O-Ottawa,R-Richmond Hill,B-Barrie

Greg Clarkin , BSc., C. Chem
Lab Manager - Ottawa District

Appendix E

Aquifer Test Results

Cambium Inc.
52 Hunter St. East
Peterborough, Ontatio, Canada
K9H 1G5

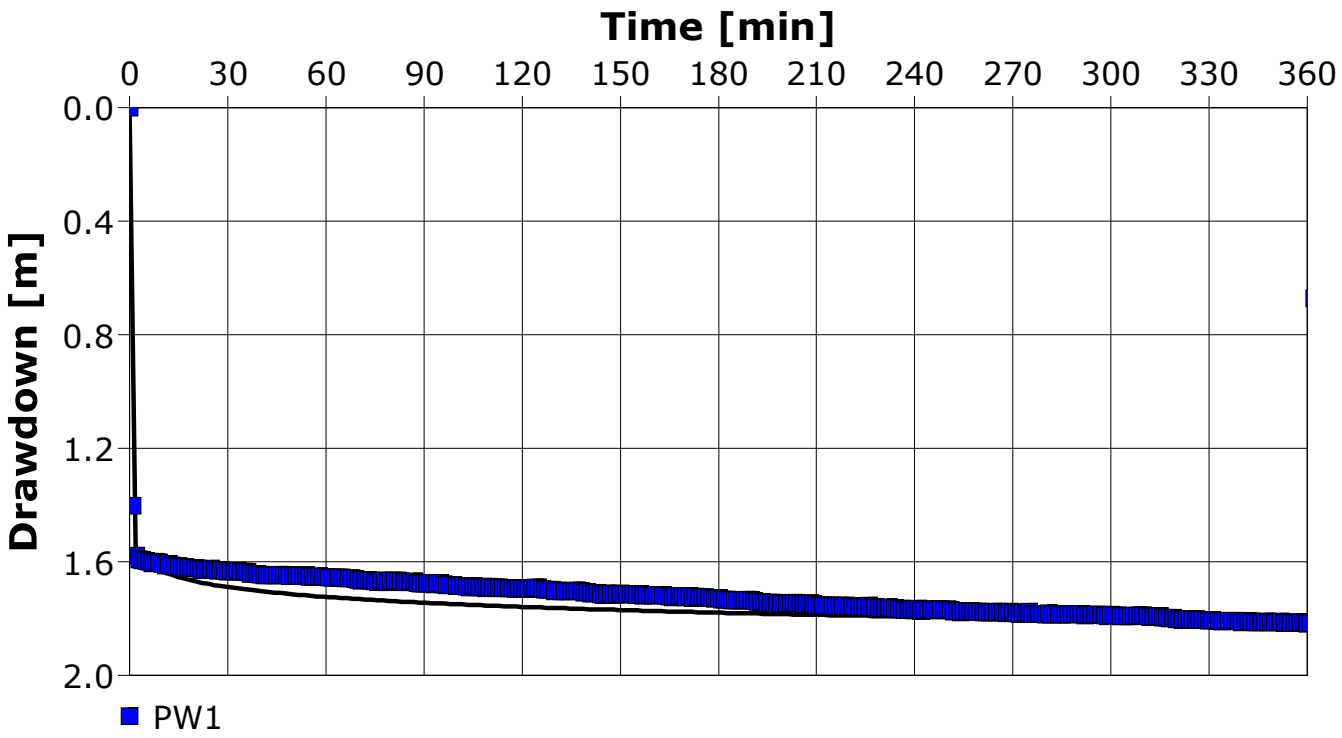
Pumping Test Analysis Report

Project: Hydrogeological Assessment

Number: 6199-001

Client: China Canada Jing Bei Xin Min Intl.

Location: Zephyr, Ontario	Pumping Test: PW1 (A222198)	Pumping Well: PW1
Test Conducted by: Jeremy Tracey		Test Date: 16/07/2018
Analysis Performed by: Cam MacDougall	PW1 Pumping Test	Analysis Date: 01/08/2018
Aquifer Thickness: 1.50 m	Discharge: variable, average rate 0.095 [m³/s]	



Calculation using Theis

Observation Well	Transmissivity [m²/s]	Hydraulic Conductivity [m/s]	Storage coefficient	Radial Distance to PW [m]	
PW1	4.57×10^{-2}	3.05×10^{-2}	7.91×10^{-11}	0.08	

Cambium Inc.
52 Hunter St. East
Peterborough, Ontatio, Canada
K9H 1G5

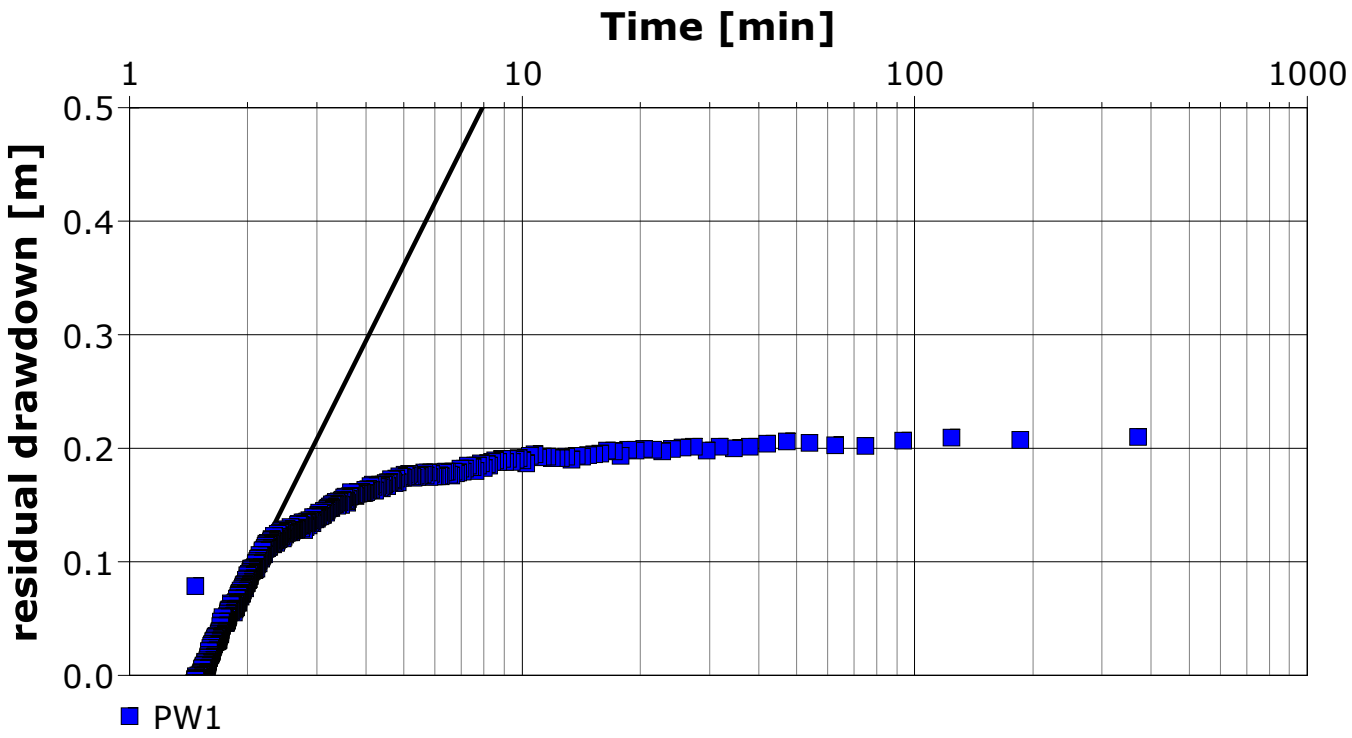
Pumping Test Analysis Report

Project: Hydrogeological Assessment

Number: 6199-001

Client: China Canada Jing Bei Xin Min Intl.

Location: Zephyr, Ontario	Pumping Test: PW1 (A222198)	Pumping Well: PW1
Test Conducted by: Jeremy Tracey		Test Date: 16/07/2018
Analysis Performed by: Cam MacDougall	PW1 Pumping Test (Recovery)	Analysis Date: 01/08/2018
Aquifer Thickness: 1.50 m	Discharge: variable, average rate 0.095 [m³/s]	



Calculation using THEIS & JACOB

Observation Well	Transmissivity [m²/s]	Hydraulic Conductivity [m/s]	Radial Distance to PW [m]	
PW1	2.51×10^{-2}	1.67×10^{-2}	0.08	

Cambium Inc.
52 Hunter St. East
Peterborough, Ontatio, Canada
K9H 1G5

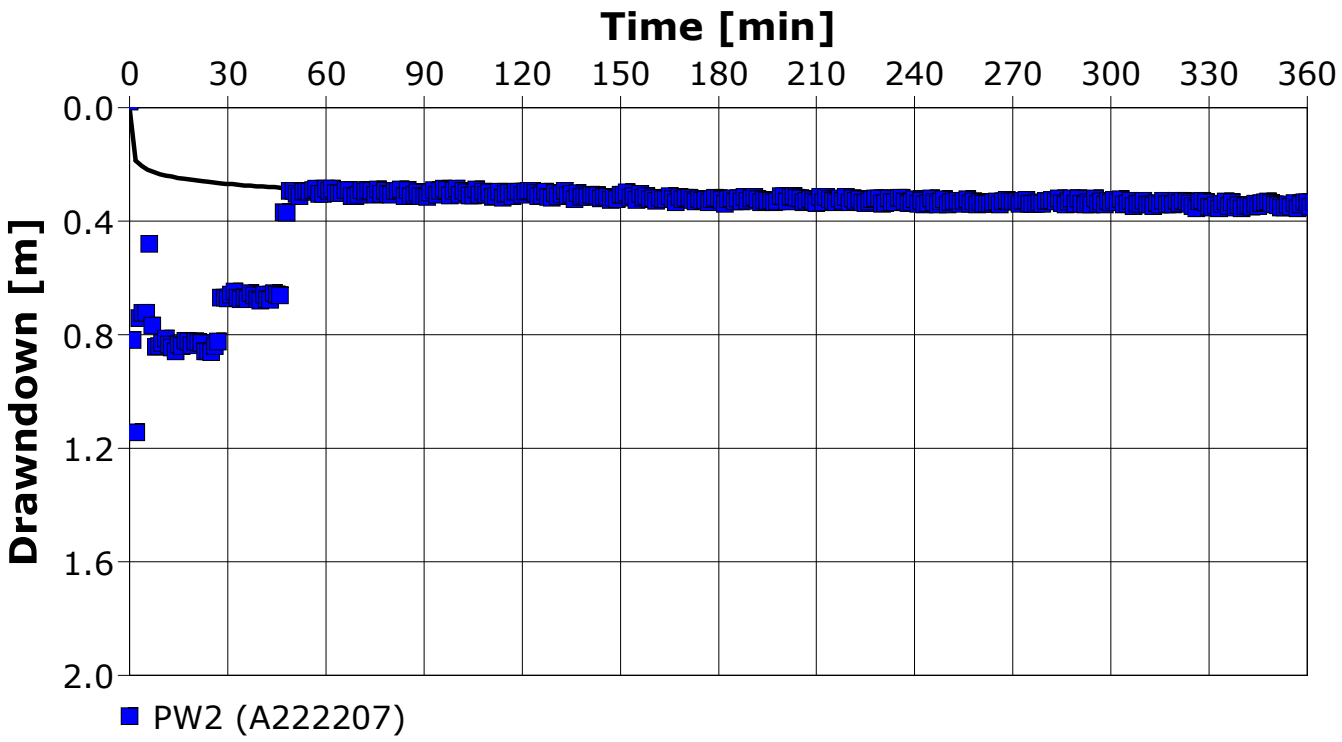
Pumping Test Analysis Report

Project: Hydrogeological Assessment

Number: 6199-001

Client: China Canada Jing Bei Xin Min Intl.

Location: Zephyr, Ontario	Pumping Test: PW2 (A222207)	Pumping Well: PW2 (A222207)
Test Conducted by: Jeremy Tracey		Test Date: 17/07/2018
Analysis Performed by: Cam MacDougall	PW2 Pumping Test	Analysis Date: 01/08/2018
Aquifer Thickness: 1.50 m	Discharge: variable, average rate 0.025 [m³/s]	



Calculation using Theis

Observation Well	Transmissivity [m²/s]	Hydraulic Conductivity [m/s]	Radial Distance to PW [m]	
PW2 (A222207)	2.00×10^{-2}	1.33×10^{-2}	0.08	

Cambium Inc.
52 Hunter St. East
Peterborough, Ontatio, Canada
K9H 1G5

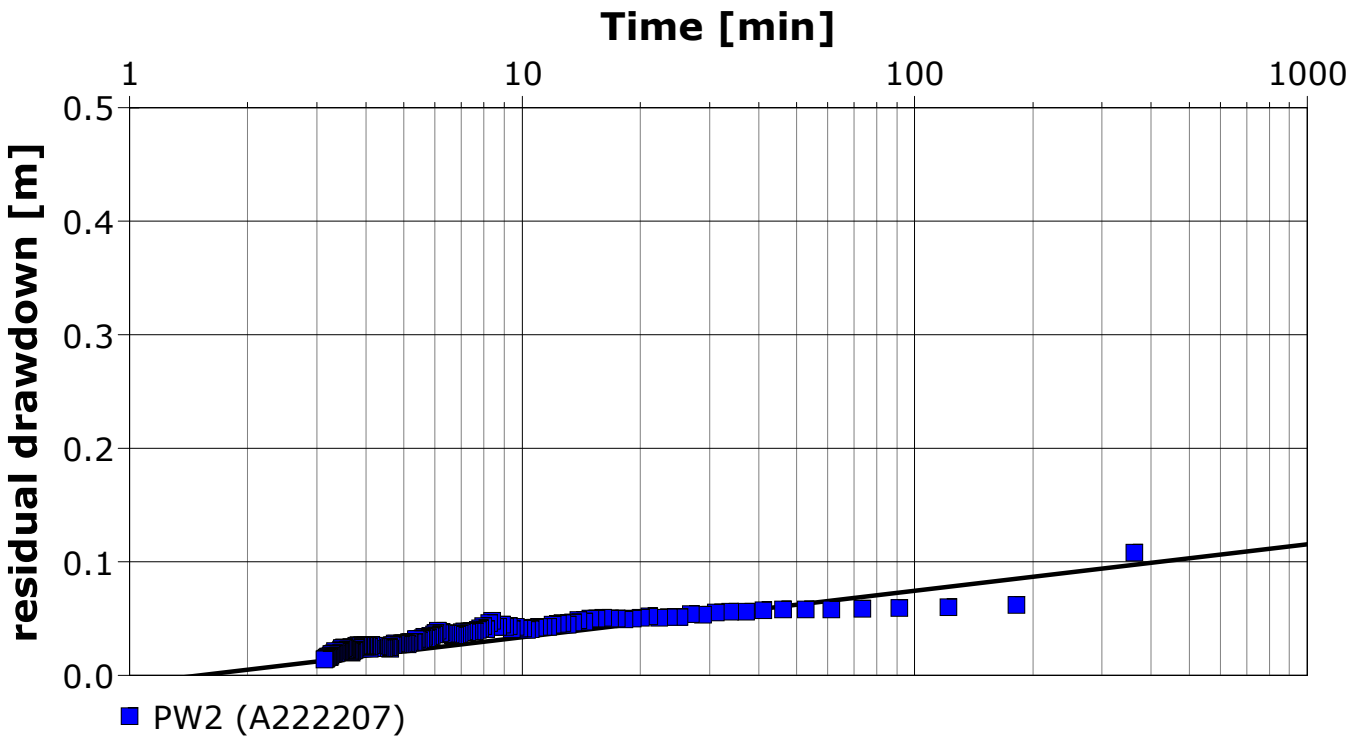
Pumping Test Analysis Report

Project: Hydrogeological Assessment

Number: 6199-001

Client: China Canada Jing Bei Xin Min Intl.

Location: Zephyr, Ontario	Pumping Test: PW2 (A222207)	Pumping Well: PW2 (A222207)
Test Conducted by: Jeremy Tracey		Test Date: 17/07/2018
Analysis Performed by: Cam MacDougall	PW2 Pumping Test (Recovery)	Analysis Date: 01/08/2018
Aquifer Thickness: 1.50 m	Discharge: variable, average rate 0.025 [m³/s]	



Calculation using THEIS & JACOB

Observation Well	Transmissivity [m²/s]	Hydraulic Conductivity [m/s]	Radial Distance to PW [m]	
PW2 (A222207)	1.12×10^{-1}	7.48×10^{-2}	0.08	

Cambium Inc.
52 Hunter St. East
Peterborough, Ontatio, Canada
K9H 1G5

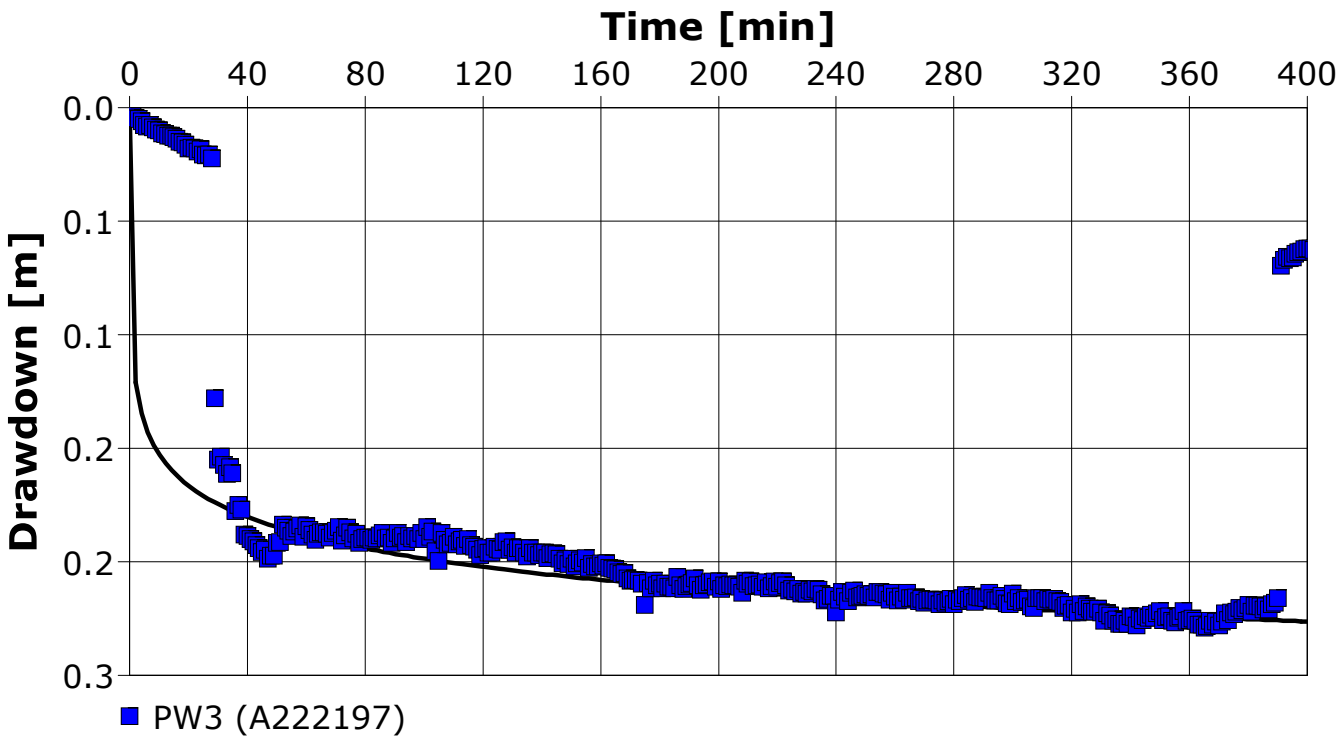
Pumping Test Analysis Report

Project: Hydrogeological Assessment

Number: 6199-001

Client: China Canada Jing Bei Xin Min Intl.

Location: Zephyr, Ontario	Pumping Test: PW3 (A222197)	Pumping Well: PW3 (A222197)
Test Conducted by: Jeremy Tracey		Test Date: 17/07/2018
Analysis Performed by: Cam MacDougall	PW3 Pumping Test	Analysis Date: 01/08/2018
Aquifer Thickness: 1.50 m	Discharge: variable, average rate 0.014 [m³/s]	



Calculation using Theis

Observation Well	Transmissivity [m²/s]	Hydraulic Conductivity [m/s]	Radial Distance to PW [m]	
PW3 (A222197)	1.50×10^{-2}	1.00×10^{-2}	0.08	

Cambium Inc.
52 Hunter St. East
Peterborough, Ontatio, Canada
K9H 1G5

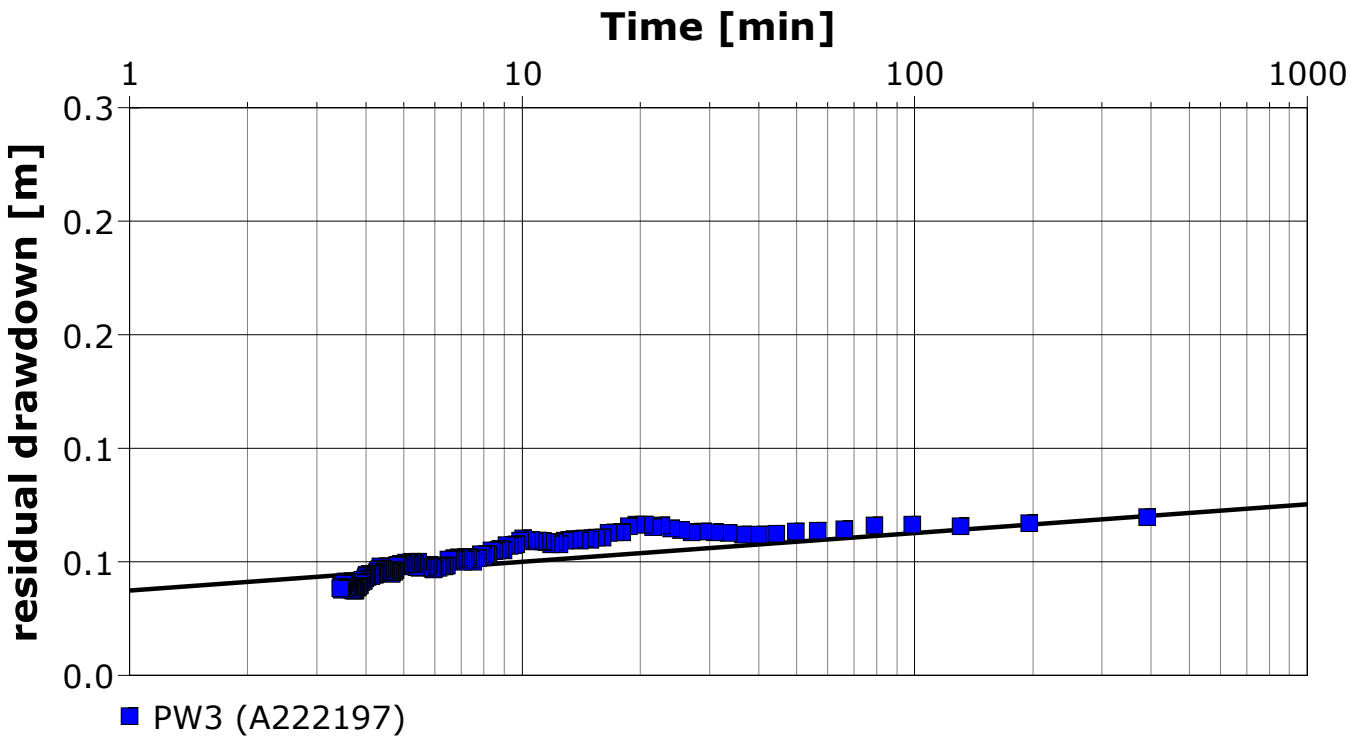
Pumping Test Analysis Report

Project: Hydrogeological Assessment

Number: 6199-001

Client: China Canada Jing Bei Xin Min Intl.

Location: Zephyr, Ontario	Pumping Test: PW3 (A222197)	Pumping Well: PW3 (A222197)
Test Conducted by: Jeremy Tracey		Test Date: 17/07/2018
Analysis Performed by: Cam MacDougall	PW3 Pumping Test (Recovery)	Analysis Date: 01/08/2018
Aquifer Thickness: 1.50 m	Discharge: variable, average rate 0.014 [m³/s]	

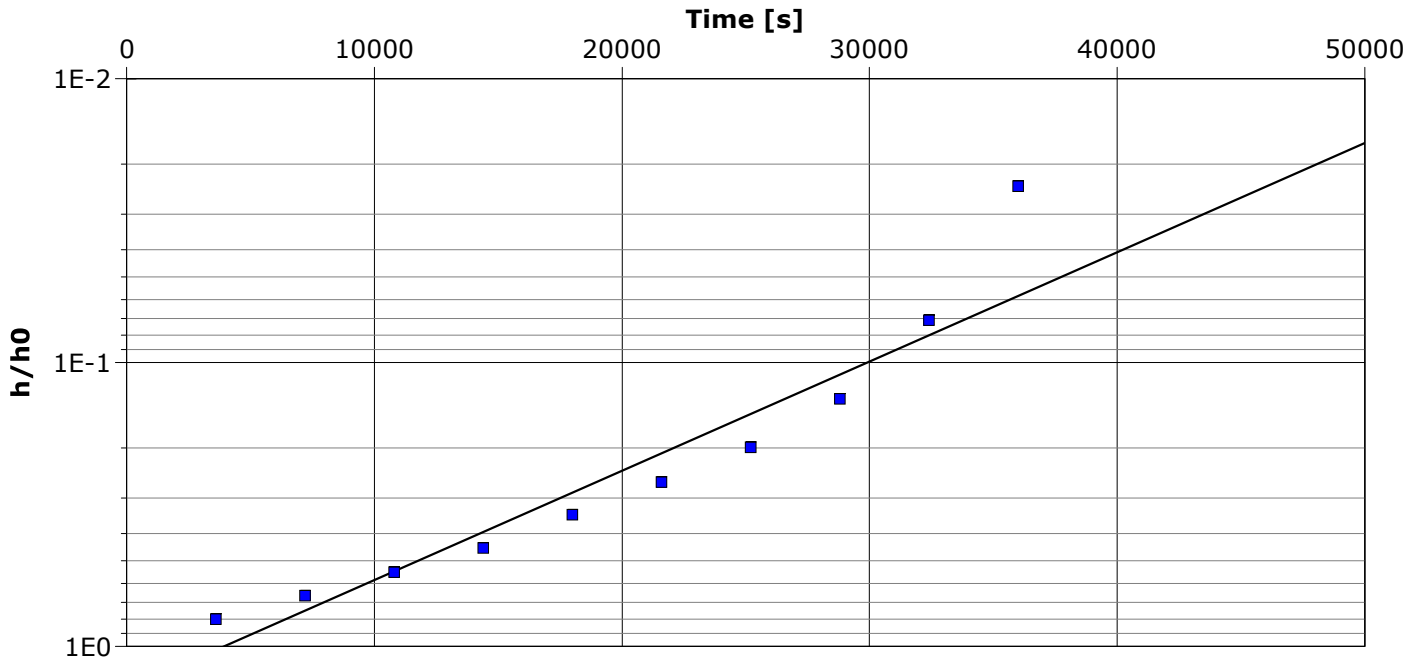


Calculation using THEIS & JACOB

Observation Well	Transmissivity [m²/s]	Hydraulic Conductivity [m/s]	Radial Distance to PW [m]	
PW3 (A222197)	1.68×10^{-1}	1.12×10^{-1}	0.08	

Cambium Inc. **52 Hunter St. East** **Peterborough, Ontatio, Canada** **K9H 1G5**	**Slug Test Analysis Report** Project: Hydrogeological Assessment Number: 6199-001 Client: China Canada Jing Bei Xin Min Intl.

Location: Zephyr, Ontairo	Slug Test: Piezometer P1	Test Well: P1
Test Conducted by: Cam MacDougall		Test Date: 7/29/18
Analysis Performed by: Cam MacDougall	P1 Slug Test	Analysis Date: 9/25/18
Aquifer Thickness: 1.84 m		



Calculation using Hvorslev

Observation Well	Hydraulic Conductivity [m/s]	
P1	2.88×10^{-7}	

Cambium Inc.
52 Hunter St. East
Peterborough, Ontatio, Canada
K9H 1G5

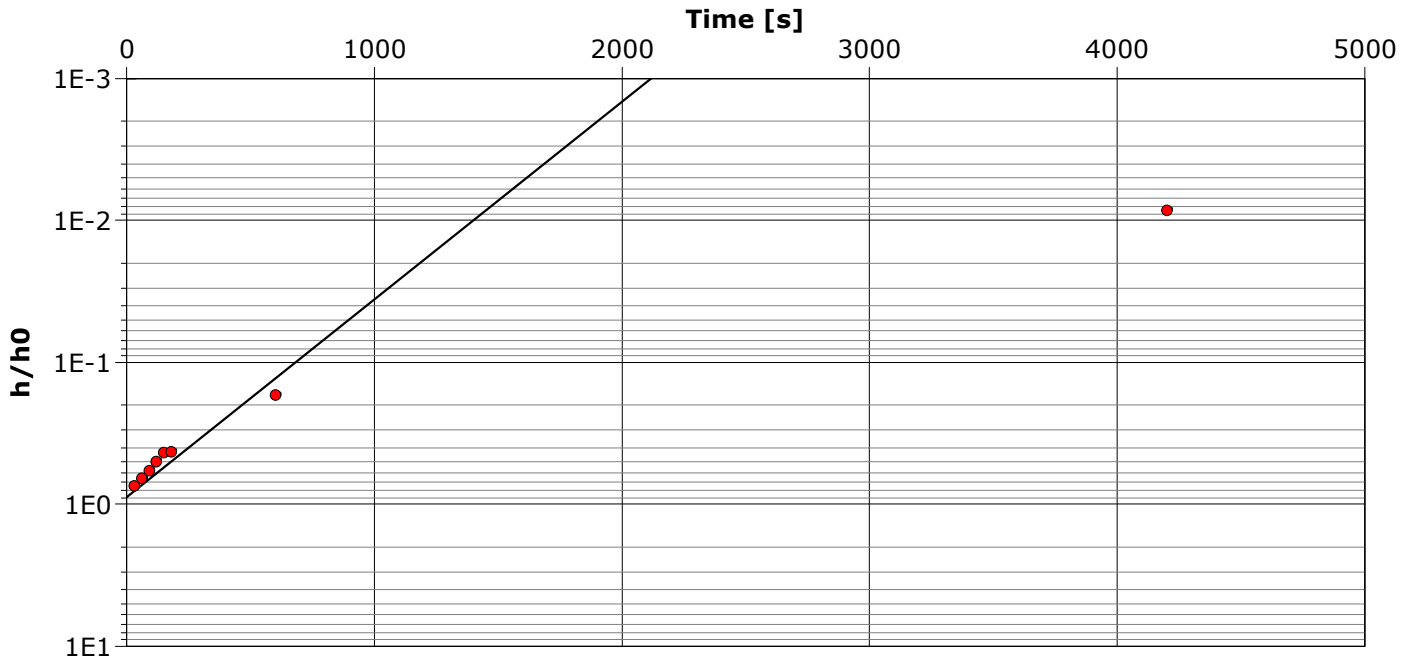
Slug Test Analysis Report

Project: Hydrogeological Assessment

Number: 6199-001

Client: China Canada Jing Bei Xin Min Intl.

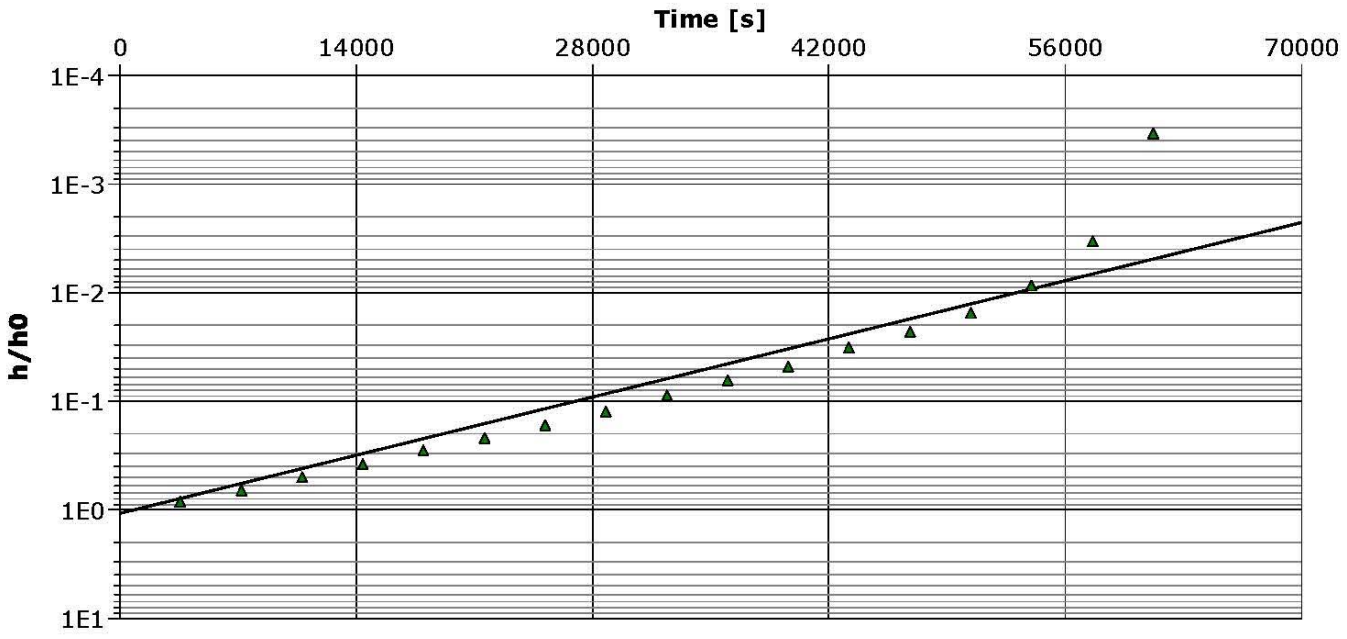
Location: Zephyr, Ontairo	Slug Test: Piezometer P2	Test Well: P2
Test Conducted by: Cam MacDougall		Test Date: 7/29/18
Analysis Performed by: Cam MacDougall	P2 Slug Test	Analysis Date: 9/25/18
Aquifer Thickness: 1.18 m		



Calculation using Hvorslev

Observation Well	Hydraulic Conductivity [m/s]	
P2	1.05×10^{-5}	

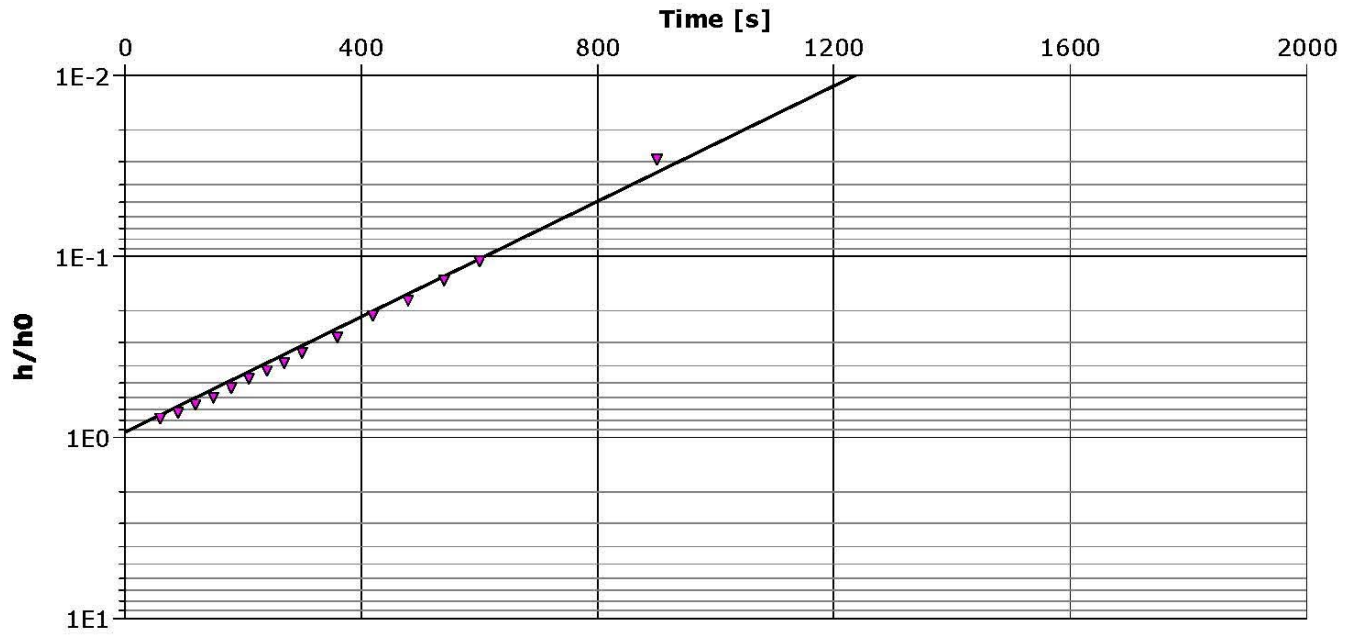
Cambium Inc. **52 Hunter St. East** **Peterborough, Ontatio, Canada** **K9H 1G5**	**Slug Test Analysis Report**	
	Project: Hydrogeological Assessment	
	Number: 6199-001	
	Client: China Canada Jing Bei Xin Min Intl.	
Location: Zephyr, Ontairo	Slug Test: Piezometer P3	Test Well: P3
Test Conducted by: Cam MacDougall		Test Date: 7/29/18
Analysis Performed by: Cam MacDougall	P3 Slug Test	Analysis Date: 9/25/18
Aquifer Thickness: 1.44 m		



Calculation using Hvorslev

Observation Well	Hydraulic Conductivity [m/s]	
P3	2.88×10^{-7}	

Cambium Inc. **52 Hunter St. East** **Peterborough, Ontatio, Canada** **K9H 1G5**	**Slug Test Analysis Report**	
	Project: Hydrogeological Assessment	
	Number: 6199-001	
	Client: China Canada Jing Bei Xin Min Intl.	
Location: Zephyr, Ontairo	Slug Test: Piezometer P4	Test Well: P4
Test Conducted by: Cam MacDougall		Test Date: 7/29/18
Analysis Performed by: Cam MacDougall	P4 Slug Test	Analysis Date: 9/25/18
Aquifer Thickness: 1.03 m		



Calculation using Hvorslev

Observation Well	Hydraulic Conductivity [m/s]	
P4	1.20×10^{-5}	

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K9H 1G5

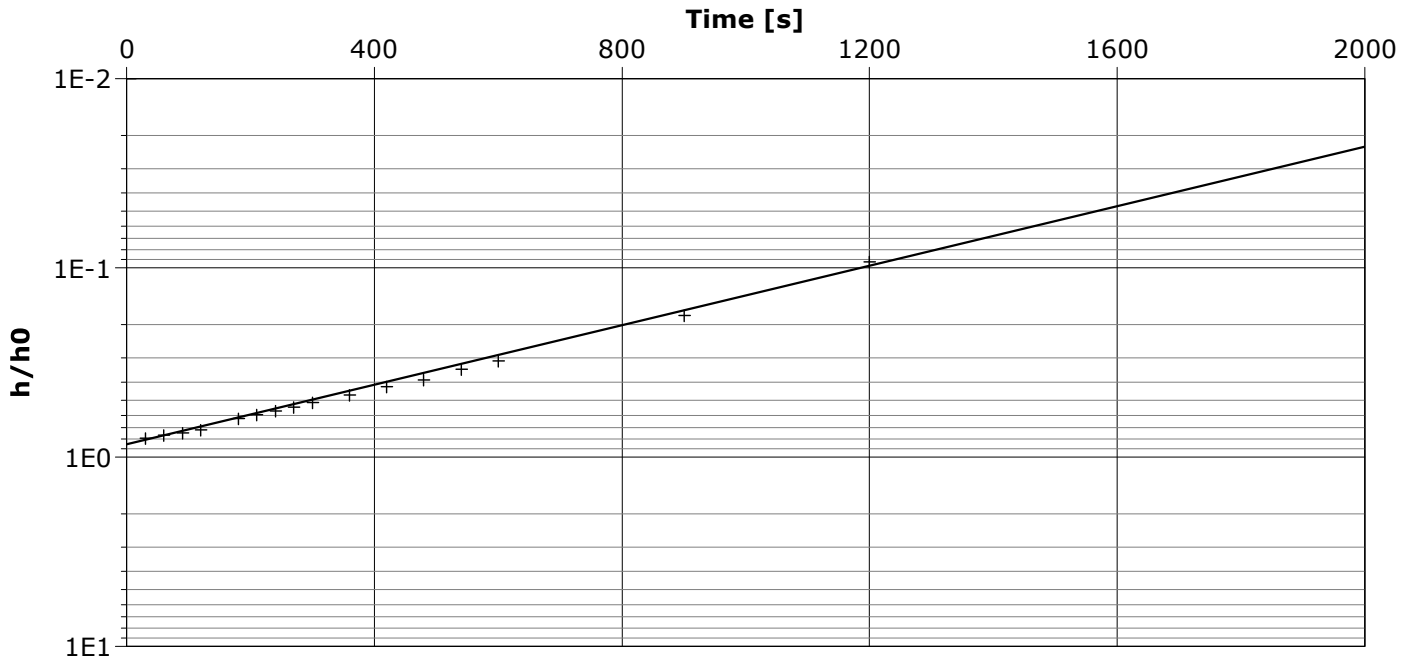
Slug Test Analysis Report

Project: Hydrogoelogical Assessment

Number: 6199-001

Client: China Canada Jing Bei Xin Min Intl.

Location: Zephyr, Ontairo	Slug Test: Piezometer P5	Test Well: P5
Test Conducted by: Cam MacDougall		Test Date: 7/29/18
Analysis Performed by: Cam MacDougall	P5 Slug Test	Analysis Date: 9/25/18
Aquifer Thickness: 1.67 m		



Calculation using Hvorslev

Observation Well	Hydraulic Conductivity [m/s]	
P5	5.90×10^{-6}	

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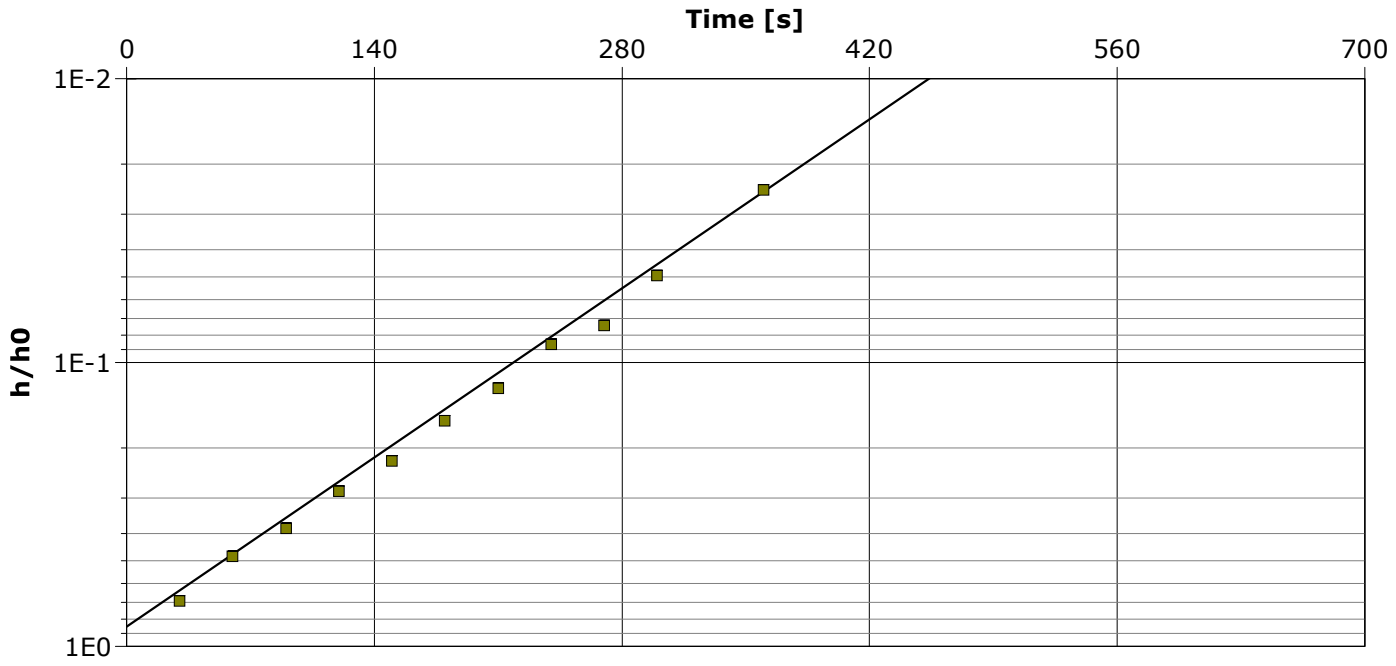
Slug Test Analysis Report

Project: Hydrogoelogical Assessment

Number: 6199-001

Client: China Canada Jing Bei Xin Min Intl.

Location: Zephyr, Ontairo	Slug Test: Piezometer P6	Test Well: P6
Test Conducted by: Cam MacDougall		Test Date: 7/29/18
Analysis Performed by: Cam MacDougall	P6 Slug Test	Analysis Date: 9/25/18
Aquifer Thickness: 1.67 m		



Calculation using Hvorslev

Observation Well	Hydraulic Conductivity [m/s]	
P6	3.20×10^{-5}	

Appendix F
Grain Size Analyses

Grain Size Distribution Chart

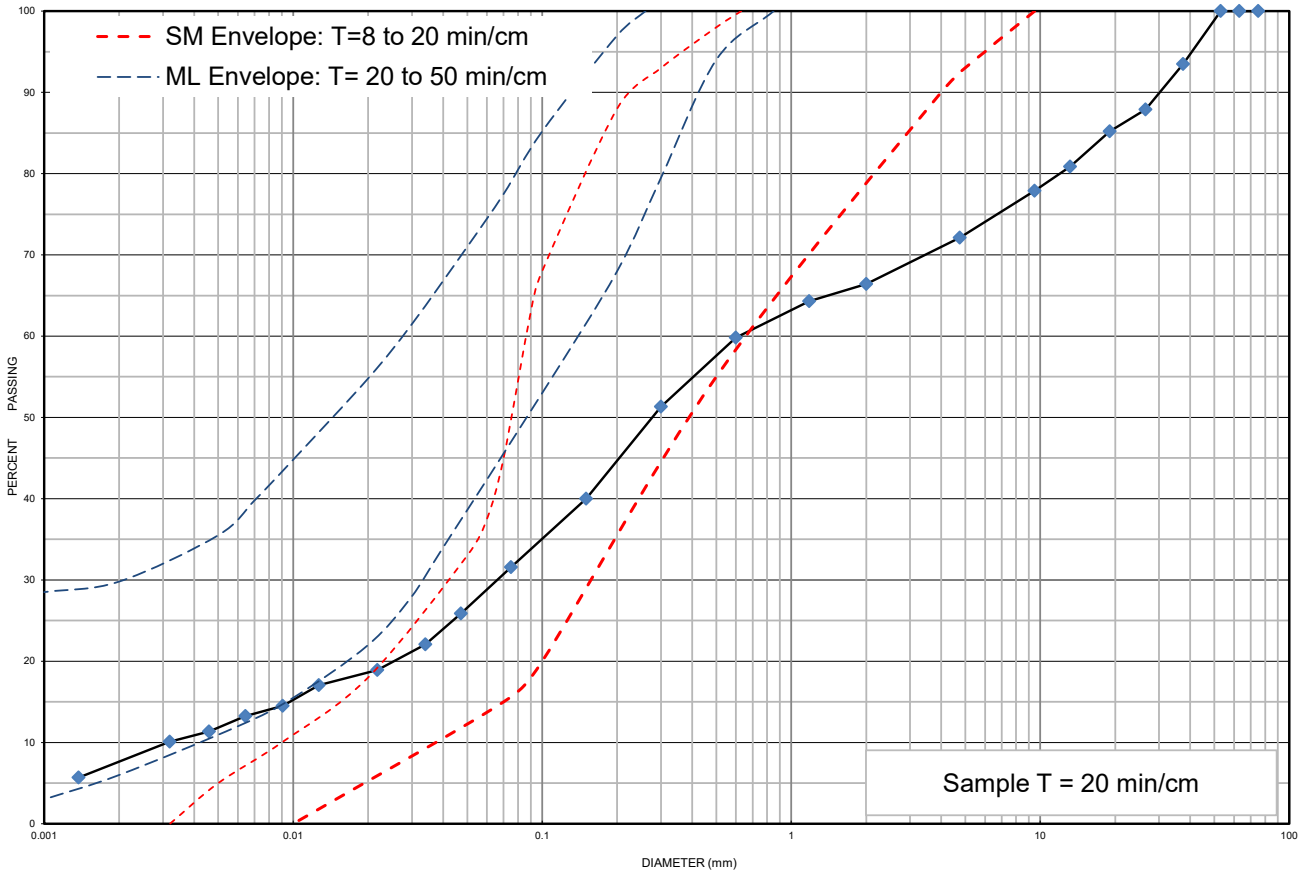
Project Number: 6199-001 **Client:** China Canada Jing Bei Xin Min Intl. c/o EcoVue Consulting Servi

Project Name: Hidden Ridge, Uxbridge August

Sample Date: 3, 2017 **Sampled By:** Cam MacDougall - Cambium Inc.

Hole No.: TP 101 2 **Depth:** 1.1 m to 1.8 m **Lab Sample No:** S-17-651

UNIFIED SOIL CLASSIFICATION SYSTEM					
CLAY & SILT (<0.075 mm)	SAND (<4.75 mm to 0.075 mm)			GRAVEL (>4.75 mm)	
	FINE	MEDIUM	COARSE	FINE	COARSE



MIT SOIL CLASSIFICATION SYSTEM								
CLAY	SILT	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	BOULDERS
		SAND			GRAVEL			

Borehole No.	Sample No.	Depth	Gravel	Sand	Silt	Clay	Moisture
TP 101	2	1.1 m to 1.8 m	28	41	23	8	5.9

Description	Classification	D_{60}	D_{30}	D_{10}	C_u	C_c
Silty Gravelly Sand trace Clay	SW	0.60	0.07	0.0032	187.5	2.3

Issued By: _____ *Date Issued:* May 8, 2023

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Grain Size Distribution Chart

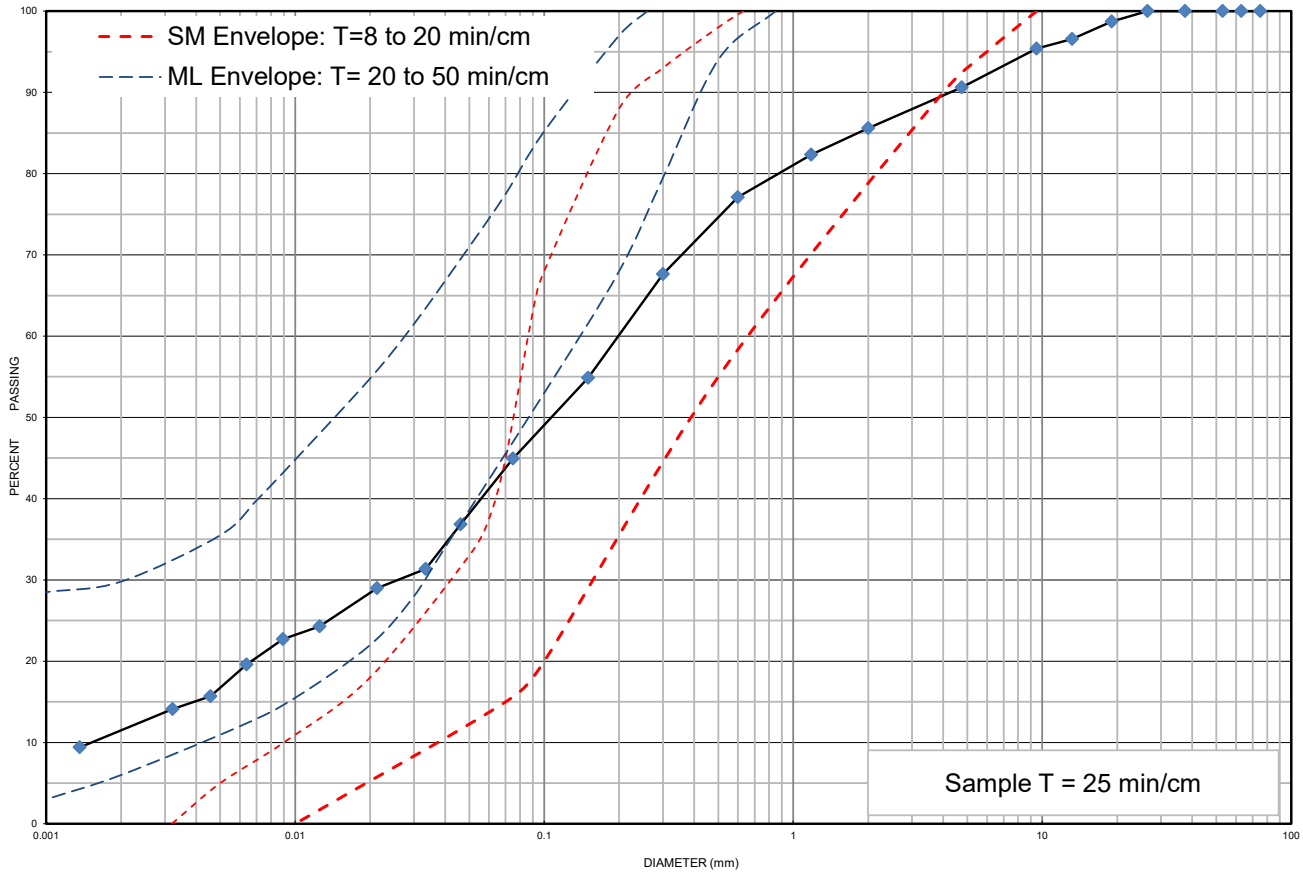
Project Number: *6199-001* **Client:** *China Canada Jing Bei Xin Min Intl. c/o EcoVue Consulting Servi*

Project Name: *Hidden Ridge, Uxbridge August*

Sample Date: *3, 2017* **Sampled By:** *Cam MacDougall - Cambium Inc.*

Hole No.: *TP 104 2* **Depth:** **Lab Sample No:** *S-17-652*

UNIFIED SOIL CLASSIFICATION SYSTEM					
CLAY & SILT (<0.075 mm)	SAND (<4.75 mm to 0.075 mm)			GRAVEL (>4.75 mm)	
	FINE	MEDIUM	COARSE	FINE	COARSE



MIT SOIL CLASSIFICATION SYSTEM								
CLAY	SILT	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	BOULDERS
		SAND			GRAVEL			

Borehole No.	Sample No.	Depth	Gravel	Sand	Silt	Clay	Moisture
TP 104	2		9	46	33	12	11.2

Description	Classification	D_{60}	D_{30}	D_{10}	C_u	C_c
Silty Sand some Clay trace Gravel	SM	0.20	0.03	0.00	117.6	2.3

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(Senior Project Manager)

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Grain Size Distribution Chart

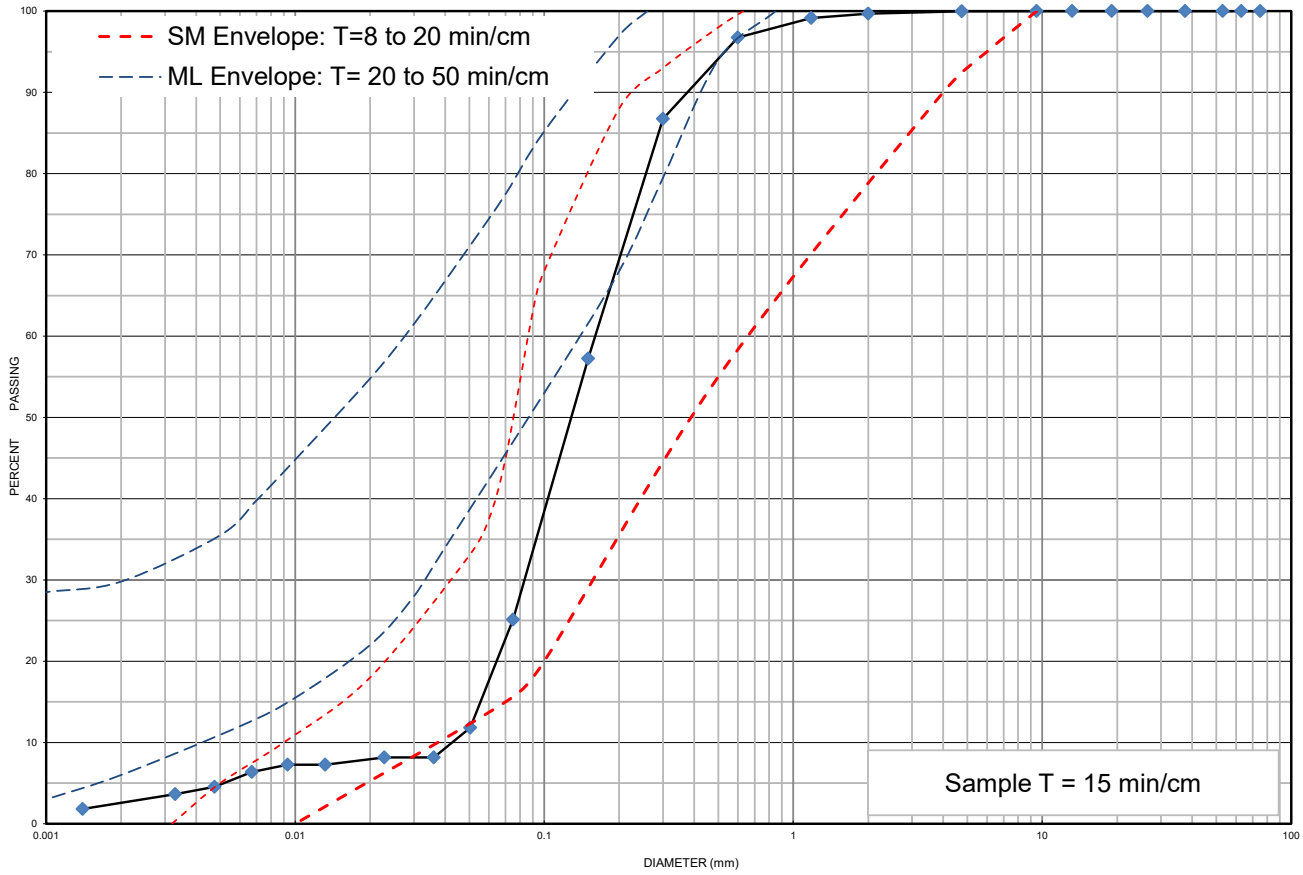
Project Number: 6199-001 **Client:** China Canada Jing Bei Xin Min Intl. c/o EcoVue Consulting Servi

Project Name: Hidden Ridge, Uxbridge August

Sample Date: 3, 2017 **Sampled By:** Cam MacDougall - Cambium Inc.

Hole No.: TP 107 1 **Depth:** **Lab Sample No:** S-17-653

UNIFIED SOIL CLASSIFICATION SYSTEM					
CLAY & SILT (<0.075 mm)	SAND (<4.75 mm to 0.075 mm)			GRAVEL (>4.75 mm)	
	FINE	MEDIUM	COARSE	FINE	COARSE



MIT SOIL CLASSIFICATION SYSTEM								
CLAY	SILT	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	BOULDERS
		SAND			GRAVEL			

Borehole No.	Sample No.	Depth	Gravel	Sand	Silt	Clay	Moisture
TP 107	1		0	75	23	2	15.9

Description	Classification	D_{60}	D_{30}	D_{10}	C_u	C_c
Silty Sand trace Clay	SM	0.16	0.08	0.04	3.8	1.1

Issued By: (Senior Project Manager) *Date Issued:* *May 8, 2023*

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Appendix G
Evapotranspiration Calculations

Water Balance Calculations

Hidden Ridge Development, Zephyr, Ontario

THORNTHWAITE-TYPE MONTHLY WATER-BALANCE MODEL

modified from Dingman 2015: Box 6-8 (pg 299) using ET model of Hamon (1963)

		Input Data				Computed Values							
											Surplus	358	mm/yr
Weather Station Location:	**Udora, ON**					**Latitude:**	**44.2**	**degree**					
Solar Declination (degree)	-20.6	-12.6	-1.5	10.0	19.0	23.1	21.0	13.4	2.6	-9.0	-18.5	-23.0	
DayLength (hr)*	9.1	10.3	11.8	13.3	14.6	15.3	14.9	13.8	12.3	10.8	9.5	8.7	
Available Water Storage Capacity	0.18	m/m		**Root Depth**	500	mm		**SOILmax**	90.0	mm			

MONTHLY WATER BALANCE DATA

Temperatures in C, water-balance terms in mm.

Month:	J	F	M	A	M	J	J	A	S	O	N	D	Year
TEMPERATURE (T)	-7.0	-6.6	-1.3	5.7	12.2	18.0	19.9	19.3	15.1	8.6	2.4	-4.0	
PRECIPITATION (P)	64.9	45.9	53.1	67.9	82.1	106.6	86.4	73.9	87.3	74.9	83.2	60.0	886
RAIN	25.7	18.3	27.2	58.9	82.1	106.6	86.4	73.9	87.3	72.9	64.8	24.6	729
SNOW	39	28	26	9	0	0	0	0	0	2	18	35	158
MELT FACTOR (F)	0.00	0.00	0.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	0.40	0.00	
PACK	86	113	139	7	0	0	0	0	0	0	11	46	
MELT	0	0	0	141	7	0	0	0	0	2	7	0	158
INPUT (W)	26	18	27	200	90	107	86	74	87	75	72	25	886
POTENTIAL ET (PET)	0	0	0	39	67	97	110	98	66	40	22	0	539
NET INPUT (ΔW)	26	18	27	160	22	10	-23	-24	21	35	50	25	
SOIL MOISTURE (SOIL)	90	90	90	90	90	90	70	53	75	90	90	90	
ΔSOIL	0	0	0	0	0	0	-20	-16	21	15	0	0	0
ET	0	0	0	39	67	97	107	90	66	40	22	0	528
SURPLUS=W-ET-Δ SOIL	26	18	27	160	22	10	0	0	0	20	50	25	358

Notes:

Precipitation, Rain, Temperature, and Latitude are inputted parameters

SOILmax = available water storage capacity * root depth

m = month

D = Day length (hrs) $=2*\cos^{-1}(-\tan(\text{Latitude})*\tan(\text{Declination}))/0.2618$ [calculation is in radians]

$SNOW_m = P_m - RAIN_m$

$F_m = 0$ if $T_m <= 0^oC$; $F_m = 0.167*T_m$ if $0^oC<T_m<6^oC$; $F_m = 1$ if $T_m>=6^oC$

$PACK_m = (1-F_m)*(SNOW_m+PACK_{m-1})$

$MELT = F_m*(SNOW_m+PACK_{m-1})$

$W_m = RAIN_m+MELT_m$.

PET = 0 if $T_m<0$; otherwise $PET = 2.98*0.611*\exp(17.3*T_m/(T_m+237))/(T_m+237.2)*$Number of days in month [Hamon ET model (1963)]

$\Delta W_m = W_m - PET_m$

$SOIL = \min\{[\Delta W_m+SOIL_{m-1}], SOILmax\}$, if $\Delta Wm>0$; otherwise $SOIL = SOIL_{m-1}* \exp(\Delta W/SOILmax)$

$\Delta SOIL = SOIL_{m-1}-SOIL_m$

ET = PET if W_m > PET; otherwise, $ET=W_m-\Delta SOIL$

Appendix H

Conceptual Site Layout

APPENDIX H

CHINA CANADA JING XIN MIN INTL
309 Zephyr Road,
Zephyr, Ontario

LEGEND

- Monitoring Well
- Potential Well Location
- Well Setback (17.7m)
- Primary Bed
- Reserve Bed
- Stone Area
- Stone Area
- Potential Structure
- Building Setback (7.7m)
- Lot Boundary
- Lot Setback (5.7m)

Notes:
- Base mapping features are © Queen's Printer of Ontario, 2019 (this does not constitute an endorsement by the Ministry of Natural Resources or the Ontario Government).
- Distances on this plan are in metres and can be converted to feet by dividing by 0.3048.
- Cambium Inc. makes every effort to ensure this map is free from errors but cannot be held responsible for any damages due to error or omissions. This map should not be used for navigation or legal purposes. It is intended for general reference use only.

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CONCEPTUAL LAYOUT

Project No.: 6199-001		Date: May 2023 Rev.:	
Scale: 1:2,500		Projection: NAD 1983 UTM Zone 17N	
Created by: DBB	Checked by: CM	Figure: 5	

O:\GIS\MXDs\6100-6199\6199-001 CC JBXM\ co EcoVue - Hydrogeological Assessment, Hidden Ridge, Uxbridge\2023-05-04 Figure updates.aprx