Clair-Maltby Comprehensive Impact Study

Year 3 Monitoring Report (2016 – 2018)
City of Guelph
Project # TPB168050

Prepared for:

City of Guelph
1 Carden Street, Guelph, Ontario N1H 3A1

3/8/2019

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Prepared for:

City of Guelph
1 Carden Street, Guelph, Ontario N1H 3A1

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3/8/2019

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3/8/2019

Arun Hindupur, P.Eng.
Infrastructure Planning Engineer

City of Guelph
1 Carden Street
Guelph, ON N1H 3A1

Dear Sir,

Re: Clair-Maltby Comprehensive Environmental Impact Study (CEIS) Year 3 Monitoring Report (2016 to 2018)

The Clair-Maltby CEIS Team of Wood, Matrix Solutions and Beacon Environmental is pleased to provide the City of Guelph with the Year 3 (2016-2018) Monitoring Report. The Monitoring Report summarizes the findings of the surface water, groundwater, wetland and natural heritage monitoring conducted during 2016, 2017 and 2018.

This report is the last of three Monitoring Reports to be provided in support of the Clair-Maltby Secondary Plan. The data in this report has provided the basis for the assessments and analyses in the Phase 1 and 2 Characterization Report (September 2018) and the Phase 3 Impact Assessment Report (March 2019).

We look forward to discussing our results with the City's Project Team, as well as the other technical and community advisory groups involved in this project, and to working with all those involved to use this information to inform the Secondary Plan as it moves towards finalization.

Yours truly,

Wood Environment & Infrastructure Solutions
a Division of Wood Canada Limited

Per: Ron Scheckenberger M. Eng., P. Eng
Principal Consultant, Water Resources

Per: Steve Chipps P. Eng
Associate, Water Resources

RBS/cc

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Executive Summary

To understand and assess the Clair Maltby Secondary Plan (CMSP) area's unique natural heritage character, a three (3) year monitoring program (2016-2018) was developed as part of the Comprehensive Environmental Impact Study (CEIS) for the Clair Maltby Secondary Plan. The monitoring program was conducted to supplement the available data from existing sources. This report summarizes the results from the three years (2016 - 2018) of this monitoring program. The key components of this monitoring are related to: surface water, groundwater, and terrestrial and aquatic natural heritage. For each of the related disciplines, the approaches used to collecting and synthesizing the data are presented along with key findings in this report.

As per the original study Work Plan, the bulk of the study area characterization was completed based on work completed over 2016 and 2017, with the 2018 monitoring data being collected to (a) help confirm and/or refine key findings from the previous two years and (b) fill some key data gaps identified over 2016 and 2017 where feasible within the scope of this study. Three (3) overlapping study areas were identified for this project to support different types of analyses: the Secondary Plan Area (SPA) in which the land use planning is to occur, the Primary Study Area (PSA) which includes the SPA and the Rolling Hills Community plus a 500 m zone around it to allow for consideration of natural heritage functions and connectivity in the landscape, and the Secondary Study Area (SSA), which is a much broader area encompassing portions of adjacent subwatersheds for the purposes of surface and groundwater analyses (ref. Map G-1).

All of the CMSP monitoring reports focus primarily on providing a summary and synthesis of existing conditions for the various study areas. More comprehensive analyses and interpretation of the data provided in the monitoring reports have been provided in the:

- Phase 1 and 2 Comprehensive Environmental Impact Study (CEIS) Characterization Report completed in September 2018, and
- Phase 3 CEIS Impact Assessment completed concurrently with this report in March 2019.

The Clair Maltby SPA lies within the headwaters of the Hanlon, Torrance and Mill Creeks, and is entirely on lands within the Paris Moraine. This unique setting, along with the permeable nature of area soils and subsoils, and the predominantly hummocky landscape, has resulted in a lack of open flowing watercourses. Instead, the hummocky topography supports an abundance of inward draining topographic features which have closed drainage resulting in no offsite drainage contributions, while serving to locally recharge the groundwater system, particularly in areas of permeable soils, which generally exist across the SPA. The well-drained soils and hummocky topography support a range of uplands and lowland habitats including woodlands, wetlands and successional meadows and thickets. The area also currently supports a number of residential estate lots, a few commercial uses, and areas currently supporting agricultural land uses.

The Year 1, 2016 field assessments (ref. Clair Maltby Comprehensive Environmental Impact Study, Year 1 Monitoring Report, March, 2017) provided insight into the study area characterization from a surface and groundwater perspective based on two (2) seasons of monitoring (i.e., summer and fall) and also informed monitoring modifications for Year 2, 2017 for the various disciplines.

The Year 2 (2017) program included three full seasons of monitoring for all disciplines including:

- Surface water quantity and quality monitoring at two flow stations and twelve wetland stations;
- Groundwater level and quality monitoring at up to twenty (20) wells and eighteen (18) mini-piezometers in the SPA, as well as twenty-seven (27) spotflow locations in the SSA; and

A comprehensive range of assessments to verify and expand the understanding of the natural heritage in the SPA including surveys for: plants, vegetation communities, winter wildlife, calling amphibians, breeding birds, turtles and road wildlife movement / mortality. The Year 3 (2018) program included three full seasons of monitoring for all disciplines including:

- Surface water quantity and quality monitoring at two flow stations and twelve wetland stations;
- Groundwater levels at twenty (20) wells and sixteen (16) mini-piezometers in the SPA, quality sampling at seventeen (17) wells, as well monitoring at twenty-six (26) spotflow locations in the SSA; andTargeted natural heritage assessments on properties where access had not been provided in 2017 but was granted in 2018, primarily focused on verification of vegetation community types and extent but also including some winter wildlife, breeding bird and amphibian surveys.

Surface Water Monitoring

One flow surface water monitoring station was established in each of the sub-watersheds that occur in the SPA, however given the lack of any permanent watercourses in the SPA, these stations were established in the SSA (Station 14 in Mill Creek Subwatershed and Station 15 in Hanlon Creek Subwatershed). Two locations within Hanlon Creek Watershed and within the SPA were initially monitored in 2016 (Stations 9A and 9B), however no flow was recorded and therefore Station 15 was established in early 2017 (ref. Map SW-1).

Results to-date from Station 14 in Mill Creek and Station 15 Hanlon Creek indicate that groundwater is an important contributor to baseflow at both stations, with Hanlon Creek baseflow remaining steady at 0.2 m^3/s for most of the monitoring period, while Station 14 at Mill Creek, the baseflow receded from 0.1 m^3/s to 0.05 m^3/s over the monitoring period.

In addition, water levels were measured at 12 wetlands across the SPA in both subwatersheds over 2017 and 2018 (ref. Map GW-1). Notably, surface water level and shallow groundwater stations were established immediately adjacent to each other in order to be able to relate the surface and groundwater data. Assessment of the wetland water level data in relation to the shallow and deep groundwater level monitoring is discussed in the groundwater monitoring section.

Water quality (i.e. temperature and a range of chemical parameters) was also measured at all stations over 2016, 2017 and 2018 in the spring, summer and fall. Analyses were informed by two (2) rainfall gauges within, or very close to, the SPA: one at the EMS station on Clair Road at the west corner of the study area, and one on the roof of the Guelph Home Building Supply in the eastern corner of the SPA (ref. Map SW-1).

Groundwater Monitoring

A comprehensive groundwater monitoring program was initiated in 2016 and extended over 2017 and 2018, including:

- Drive Point Mini Piezometer Installations
- Groundwater Level Monitoring
- Groundwater Quality Sampling
- Borehole Drilling and Monitoring Well Installations
- Surface Water Spotflow Measurements
- Pond Bathymetry Surveys
- Seeps and Springs Observations
- Single Well Hydraulic Response Testing

In total, 17 boreholes at 9 locations were advanced and all boreholes were completed as monitoring wells. A total of 18 drive point mini piezometers were installed at 14 locations identified as areas of potential groundwater – surface water interaction (ref. Figure GW-1). Groundwater quality sampling was conducted at all monitoring wells.

The 2018 field program included the following ongoing data collection that was first initiated in 2016:

- Groundwater Level Monitoring
- Groundwater Quality Sampling
- Surface Water Base Flow Measurements
- Seeps and Springs Observations

The majority of monitoring wells show water levels varying between 330 masl to 335 masl. Seasonal variations tend to indicated lows in early January and highs in late spring/early summer. All monitoring well hydrographs show a downward groundwater flow gradient, except at MW9-D and MW9-S in the northwestern portion of the SPA where the hydraulic gradient is consistently upwards throughout all seasons.

Wetlands surface water hydrographs show that for most of the year, most wetlands have a surface water elevation that exceeds, or is equal to the shallow groundwater (mini piezometer) elevations. As such, it is interpreted that most wetlands are, on the whole, losing water to or in equilibrium with, the shallow groundwater. However, some wetlands show upward hydraulic gradients where the shallow groundwater elevations exceed the surface water elevations for portions of the year and some wetlands show a pattern of seasonal reversal of hydraulic gradient.

Aquatic and Terrestrial Natural Heritage

The bulk of the aquatic and terrestrial natural heritage monitoring work for this study was completed over 2017 with some supplemental refinement worm completed in 2018. The field work (i.e., surveys for: plants, vegetation communities, winter wildlife, calling amphibians, breeding birds, turtles and road wildlife movement / mortality) that was completed was supplemented with the available relevant background data from sites within the SPA collected since 2004, as well as analysis of current air photos. This information was used to generate:

- updated Ecological Land Classification (ELC) mapping for the SPA;
- updated wetland mapping in consultation with the Grand River Conservation Authority and Ministry of Natural Resources and Forestry;
- updated plant and wildlife species lists for the PSA, including significant species lists;
- an updated and refined screening of Provincially Endangered and Threatened species in the PSA; and

- the basis for Significant Wildlife Habitat (SWH) mapping in the SPA.

In general, the SPA is currently characterized by a hummocky and well-drained topography that supports a mixture of natural areas, semi-natural or cultural areas and agriculture.

- In terms of aquatic habitat, there are a few wetlands / ponds known to provide warm water fish habitat in the SPA, but from a fisheries perspective the more significant role of the SPA is to provide infiltration and recharge which in turn is thought to support the baseflows of Hanlon and Mill Creeks in the broader SSA, two systems still able to support cold water fish habitat in some of their tributaries. The SPA also has a few small and localized headwater drainage features (HDFs) that provide seasonal surface water connections between wetlands.
- In terms of terrestrial habitat, the hummocky topography supports scattered wetlands, woodlands and successional meadows and shrub communities. These natural areas provide habitat for a range of plants, including about 20 locally significant species, and a range of wildlife including 55 locally significant wildlife species (i.e., 41 species of birds, six amphibian species, three species of reptile, two mammals, two dragonflies / damselflies and one butterfly species). This diversity of common and locally significant species is reflective of the diversity of natural and cultural vegetation communities in the PSA, as well as the mix of meadow, woodland and wetland habitats.
- The PSA also supports habitat for six Provincially Endangered or Threatened species (one tree, four bird and one bat species) and could potentially support habitat for another seven (one amphibian, one turtle, one bird, three bat and one bee species).

This natural heritage mapping and data have been used to:

- Update the Natural Heritage System (NHS) mapping in the SPA through the characterization analyses, including mapping of Significant Wetlands, Significant Woodlands and Cultural Woodlands, and Candidate and Confirmed Significant Wildlife Habitat;
- Inform alternatives and refinements to the Community Structure Plan for the SPA;
- Identify potential refinements to the City’s existing NHS policies appropriate to the unique biophysical and proposed land use context context of the SPA;
- Identify potential impacts associated with the proposed land use changes as well as appropriate recommendations for mitigation and management (including monitoring); and
- Help scope the needs for and inform the future area or site-specific studies.

  The outcomes of this additional are work have been documented in the other CEIS reports for this project and will be documented in the reports and Secondary Plan policies to be completed over 2019 as the study comes to completion.

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1.0 Introduction

The City of Guelph is undertaking the Clair-Maltby Master Environmental Servicing Plan (MESP) and Clair-Maltby Secondary Plan (CMSP) Study to comprehensively plan the last unplanned greenfield area in the City - the Clair-Maltby Secondary Planning Area. The MESP is intended to satisfy and fulfill the requirements of the Environmental Assessment Act and the Planning Act. A key component of the Clair-Maltby MESP and Secondary Plan process is the Comprehensive Environmental Impact Study (CEIS) and MESP technical studies being conducted by Wood with support from Matrix and Beacon.

Protection of the Paris Moraine, its associated functions, and the unique natural heritage character, presents specific challenges and opportunities. To understand and assess the area's unique natural heritage character, a three (3) year monitoring program (2016-2018) was developed as part of the CEIS. The monitoring program is being conducted to supplement the available data from existing studies and reports and instrumentation.

As part of the monitoring program, a range of field assessments commenced as of June 2016 in accordance with the approved CEIS Work Plan. Preliminary groundwater and surface water field assessments and monitoring were undertaken over the summer and fall of 2016 in order to inform the selection and refinement of monitoring locations, and to start data collection for ground and surface water as soon as possible, so that three (3) years of water-based monitoring data could be assessed.

The Year 1, 2016 field assessments provided insight into the study area characterization from a surface and groundwater perspective based on two seasons of monitoring (i.e., summer and fall) and informed the proposed monitoring modifications for Year 2, 2017 for the various disciplines.

The Year 2 (2017) program included three (3) full seasons of monitoring for all disciplines including:

- Surface water quantity and quality monitoring at two (2) flow stations and twelve (12) wetland stations;
- Groundwater level and quality monitoring at up to twenty (20) wells and eighteen (18) mini-piezometers in the SPA, as well as twenty-seven (27) spotflow locations in the SSA; and
- A comprehensive range of assessments to verify and expand the understanding of the natural heritage in the SPA including surveys for: plants, vegetation communities, winter wildlife, calling amphibians, breeding birds, turtles and road wildlife movement / mortality.

The Year 3 (2018) program included three (3) full seasons of monitoring for all disciplines including:

- Surface water quantity and quality monitoring at two (2) flow stations and twelve (12) wetland stations;
- Groundwater level and quality monitoring at up to twenty (20) wells and sixteen (16) mini-piezometers in the SPA, as well as twenty-six (26) spotflow locations in the SSA; and
- Targeted natural heritage assessments on properties where access had not been provided in 2017 but was granted in 2018, primarily focused on verification of vegetation community types and extent but also including some winter wildlife, breeding bird and amphibian surveys. .

2.0 Defining the Study Areas

Three scales of study area (ref. Map G-1) have been identified for the CEIS, as per the following:

i. The Secondary Plan Area (SPA): The SPA is the area within which land use change will occur in accordance with an approved Secondary Plan. The SPA includes the lands south of Clair Road East, north of Maltby Road East, west of Victoria Road South, and approximately 1 km east of the Hanlon Expressway in the City of Guelph.

ii. The Primary Study Area (PSA): The PSA includes the SPA plus a 500 m zone beyond this boundary to allow for consideration of natural heritage functions and connectivity in the landscape.

iii. The Secondary Study Area (SSA): The SSA includes the PSA plus the receiving systems beyond the Clair-Maltby SPA. This area has been defined based on the area's hydrology and hydrogeology to ensure that landscape scale connectivity is considered from a groundwater and surface water perspective. The SSA is based on appropriate groundwater and surface water model boundaries, which inherently consider subwatershed boundaries (Mill Creek, Hanlon Creek, Torrance Creek, Irish Creek and Lower Speed River), as well as groundwater flow divides.

Since the initiation of this study the study area boundaries for the SPA have been refined in two ways ref. Map G-1):

- In the fall of 2016 the SPA (and consequently the PSA) were expanded slightly from the SPA in the original Terms of Reference to include the two large ponds / wetlands and associated lands located just south of Clair Road and west of Gordon Street.
- Based on feedback from the community and other planning considerations, the Rolling Hills Community was removed by decision of Council in June 2018. Although the SPA boundary has been changed to reflect the decision by Council, the boundaries of the PSA and the SSA have not been modified. From the outset of the study process, the biophysical connections between the SPA and the broader landscape, with respect to groundwater, surface water and natural heritage, was identified as an important consideration. The PSA and the SSA, as originally defined, continue to reflect where field work and analyses have been completed in support of the Secondary Plan process, irrespective of the removal of the Rolling Hills Community from the SPA.

It is anticipated that the natural heritage refinements identified as part of this process in the Rolling Hills Community will be brought forward as part of a future Official Plan Update through the City's Municipal Comprehensive Review process.

3.0 Property Access

The SPA (and the City as a whole) has an identified Natural Heritage System (NHS) which was incorporated into the City's Official Plan in 2010 through Official Plan Amendment (OPA) 42, refined through the Ontario Municipal Board (OMB) settlement process, and finalized through approval of OPA 42 in June 2014 by the OMB. Key tasks identified as part of the CMSP Terms of Reference were to verify and refine the NHS mapping in the context of current legislation, policies and guidelines, and to develop a better understanding of the surface-groundwater dynamics in the SPA and surrounding lands. This was to be done based on a synthesis of background and existing information, collection of field data in the SPA and PSA, and analysis and modelling of the synthesized information.

A preliminary network of monitoring stations for the different disciplines was identified through the draft work plan for this study. However, as virtually all of the land in the SPA is under private ownership, it was recognized at the outset of this study that the willingness of landowners to allow environmental studies on their lands would influence the location and extent of environmental monitoring.

The landowner contact process was initiated in May 2016 with a landowner's information session (held Thursday May 26, 2016) and a subsequent mailout of requests for permission for property access to each of the landowners in the Secondary Plan Area. Permission forms provided options with respect to both the type(s) of field work that may be permitted, as well as the type(s) of follow-up contact required by the landowners. Through this process, monitoring stations for 2016 and 2017 were established based on a combination of site suitability and where access for a given type of monitoring had been provided.

Two follow-up presentations with preliminary NHS refinement mapping were delivered to SPA landowners in the spring of 2018. At this time, landowners were invited to request site visits to review the status and extent of vegetation communities on their properties so that any agreed upon refinements could be captured in the Refined NHS mapping being developed as part of this study.

Between 2016 and 2018, different types of access were provided by different landowners, as shown in Map G-2.

After working with a number of landowners, fairly broad access was provided for undertaking groundwater and surface water monitoring. The level of access provided for undertaking surface water and groundwater monitoring (ref. Map SW-1) is considered adequate in terms of both the numbers of stations and their representation across the PSA, supplemented with access on public lands and other sources of information, to obtain a good understanding of the surface and groundwater dynamics at a level that is appropriate to support a MESP and Secondary Plan.

Between 2017 and 2018, broad access for verification of vegetation community types and extent was also provided. However, more limited access was provided for undertaking wildlife surveys. To compensate for this limited access: (a) more effort was placed on desktop analyses and on integration of data from site-specific studies in the PSA completed over the past decade (ref. Map NH-1), as well as other available background, and (b) monitoring stations were shifted where needed to suitable locations on public lands (including roadside stations) or lands where access has been granted (ref. Map G-2). Given the scale of the SPA, and the fact that a NHS for the PSA has already been identified based on field work done as part of the City's Natural Heritage Strategy, this approach was considered adequate to inform the MESP and Secondary Plan.

4.0 Monitoring Summary

The Clair Maltby Secondary Plan Area lies within the headwaters of the Hanlon, Torrance and Mill Creeks. This unique setting, along with the permeable nature of area soils and subsoils, and the predominantly hummocky landscape, has given rise to a distinct lack of open flowing watercourses. While some depressional features exist, including those associated with roadway infrastructure (i.e. ditches), these tend to be dry with only occasional flowing water conditions. Furthermore, the hummocky topography creates an abundance of inward draining topographic features which have closed drainage resulting in no offsite drainage contributions, while serving to locally recharge the groundwater system, particularly in areas of permeable soils which generally exist across the Secondary Plan area. As such, within the PSA there is a lack of watercourses except for a few small and localized headwater drainage features (HDFs) s and a lack of formal drainage outlets due to the hummocky topography.

The surface water three (3) year monitoring program was developed with consideration to the lack of surface water features within the SSA. GRCA recommended that a spotflow program for the groundwater field assessment be utilized given the headwater conditions (i.e., small intermittent systems). Based on the need for a full seasonal understanding of the local flow regime, continuous water level monitoring has been conducted to supplement spotflow measurements, coupled with rainfall monitoring.

4.1 Rainfall Data

For this CEIS, rainfall data from three local stations are being used:

- From a rainfall gauge installed (July 14, 2016) on the roof of the Guelph Home Building Supply, located at 500 Maltby Road East (ref. Map SW-1) intended to remain in place for the duration of the monitoring for this project, with data downloaded on a monthly basis;
- From the City's rainfall gauge on the EMS Centre at 160 Clair Road West (ref. Figure SW-1); and
- From the University of Guelph's rainfall gauge at the Guelph Turfgrass Institute at 328 Victoria Road South (available on-line).

Monthly precipitation (rainfall) data from the Clair-Maltby gauge for the months of April to December 2016, 2017 and 2018 are summarized in Table 4.1.1 and compared to the monthly totals from Environment Canada's (EC) Elora gauge. The rainfall gauges are approximately 30 km apart which explains the difference in monthly rainfall amounts.

Monthly rainfall totals for both the Clair-Maltby gauge and the Elora gauge for the months of August to November, 2016 were 276.4 mm and 371.1 mm, with the 1981-2010 climate normal for the same period being 326.2 mm. As such, the Clair-Maltby August to November rainfall total was approximately 15% below normal. It is worth noting that the months of April to June, 2016 were also considered below normal based on the Elora gauge monthly amounts compared to the monthly climate normal.

Monthly rainfall totals for both the Clair-Maltby gauge and the Elora gauge for the months of May to November, 2017 were 440.6 mm and 579.3 mm, with the 1981-2010 climate normal for the same period being 589.5 mm. As such, the Clair-Maltby May to November rainfall total was approximately 25% below normal.

Monthly rainfall totals for both the Clair-Maltby gauge and the Elora gauge for the months of May to October, 2017 were 360.5 mm and 409.2 mm, with the 1981-2010 climate normal for the same period being 502.4 mm. As such, the Clair-Maltby May to November rainfall total was approximately 19% below normal.

Table 4.1.1 Monthly Precipitation Totals for 2016, 2017 and 2018 and Climate Normals (mm)

Month	2016, 2017, 2018 Total [2]	1981-2010 Climate Normal [1]	Percent Difference [2]
2016			
April	57.8 (NA)	74.5	-22.42% (NA)
May	57.3 (NA)	82.3	-30.38% (NA)
June	53.0 (NA)	82.4	-35.68% (NA)
July	102.4 (NA)	98.6	+3.85% (NA)
August	152.6 (134.4)	83.9	+81.88% (+60.19%)
September	77.1 (58.2)	87.8	-12.19% (-33.71%)
October	85.8 (43.8)	67.4	+27.30% (-35.01%)
November	55.6 (40)	87.1	-36.17% (-54.08%)
December	90.1 (NA)	71.2	+26.54% (NA)
TOTAL	731.7 (NA)	735.2	-0.48% (NA)
2017			
April	92.0 (NA)	74.5	+23% (NA)
May	120.5 (107.2)	82.3	+46% (+30%)
June	117.8 (94.6)	82.4	+43% (+15%)
July	35.5 (37.4)	98.6	-64% (-62%)
August	68.1 (51.6)	83.9	-19% (-38%)
September	55.5 (23.8)	87.8	-37% (-73%)
October	85.8 (56.2)	67.4	+27% (-17%)
November	96.1 (69.8)	87.1	+10% (-20%)
December	55.6 (NA)	71.2	-22% (NA)
TOTAL	726.9 (NA)	735.2	-1% (NA)
2018			
April	138.6 (NA)	74.5	+86% (NA)
May	63.1 (39.2)	82.3	-23% (-52%)
June	55.9 (80.4)	82.4	-32% (-2%)
July	38.7 (69.4)	98.6	-61% (-30%)
August	74.0 (95.4)	83.9	-12% (+14%)
September	42.4 (40.2)	87.8	-52% (-54%)
October	86.4 (84.6)	67.4	+28% (+26%)
November	96.4 (NA)	87.1	+11% (NA)
December	85.5 (NA)	71.2	+20% (NA)
TOTAL	681.0 (NA)	735.2	-7% (NA)

Notes:

[1] From Environment Canada Waterloo Wellington Airport

[2] First value is based on Environment Canada's Elora RCS gauge, value in brackets is based on Clair Maltby Project gauge

In addition to the monthly data presented in Table 4.1.1, daily rainfall totals for days with major storm events and high recorded water levels have been summarized in Table 4.1.2 for all data sources (ref. Map SW-1) (EC Elora, Clair-Maltby and City of Guelph's Clair Road rainfall gauges). Where storm systems have lasted multiple days, values have been summed. Daily rainfall amounts between the three (3) gauges for most storm events, demonstrate fairly consistent rainfall recordings. The City and the Wood rainfall gauges recorded 2018 storm event totals that are considered reliable, as there is limited deviation in the rainfall amounts, apart June 23, 2018 event which was considered to be a very localized event. It should be noted that in April (14-15), there was a mixed precipitation event which the Clair Maltby gauge was installed for but it is not equipped for events other than rainfall.

Table 4.1.2 Summary of Daily Rainfall Totals for Major Rainfall Events of 2016, 2017 and 2018 (mm)

Day (M/D/Y)	Environment Canada Elora RCS Gauge Total	Wood Clair Maltby Project Gauge Total	City of Guelph Clair Road Emergency Services Gauge Total
2016			
08/11/16 - 08/13/16	59.6	21.0	17.2
08/16/16	24.4	10.6	14.2
08/19/16 - 08/21/16	25.6	58.6	59.2
08/25/16 – 08/26/16	30.3	31.8	33.6
09/07/16 – 09/08/16	41.8	33.6	27.0
09/17/16 - 09/18/16	10.8	8.8	9.6
09/26/16	8.6	6.2	7.2
09/29/16 - 09/30/16	0	7.4	9.6
10/08/16	3.3	8.0	5.2
10/20/16 – 10/21/16	19.4	16.2	16.4
11/02/16 – 11/03/16	NA	8.6	NA
11/19/16	11.5	9.6	NA
11/24/16 – 11/26/16	10.0	10.4	NA
11/28/16 – 11/30/16	12.5	9.0	NA
2017			
04/06/17	22.3	28.2	30.2
04/20/17	NA	26.8	32.0
04/30/17	14.5	9.0	4.6
05/01/17	13.4	13.6	25.8
05/04/17	23.0	19.8	13.8
05/05/17	17.4	14.2	24.2
05/04/17 – 05/05/17	40.4	34.0	38.0
05/21/17	21.9	14.6	10.2
05/25/17	18.9	19.8	27.6
06/23/17	33.7	39.4	31.2
08/11/17	12.6	12.6	12.2
10/09/17	12.7	7.6	7.4
10/23/17	12.4	9.8	15.0
10/24/17	2.5	3.4	12.8
10/23/17- 10/24/17	14.9	13.2	27.8
11/02/17	23.4	12.0	12.2
11/18/17	22.5	16.4	22.2
2018			
04/03/18-04/04/18	22.7	23.6	68.6

Table 4.1.2 Summary of Daily Rainfall Totals for Major Rainfall Events of 2016, 2017 and 2018 (mm)

Day (M/D/Y)	Environment Canada Elora RCS Gauge Total	Wood Clair Maltby Project Gauge Total	City of Guelph Clair Road Emergency Services Gauge Total
04/14/2018	30.00	NA	NA
04/15/2018	15.9	NA	NA
04/16/2018	23.2	27.4	20.0
04/24/2018-04/25/2018	12.4	16.2	18.6
05/04/2018	11.0	14.6	82.8
05/15/2018	9.8	7.4	17.4
06/23/2018	2.2	19.2	16.8
06/24/2018	26.6	22.2	22.4
07/16/2018	2.0	21.6	12.8
08/21/2018	25.6	24.0	29.8
08/25/2018	18.1	17.4	8.0
09/30/2018-10/01/2018	20.6	22.8	21.4
10/31/2018	22.6	26.0	36.4
11/01/2018	25.1	18.8	25.4

Notes: "NA" indicates that data are not available.

4.2 Surface Water: Flow and Wetland Monitoring

The surface water monitoring has consisted of both water level and quality monitoring at two (2) flow stations outside the SPA (i.e. Stations 14 and 15) and twelve (12) wetland stations within the SPA (i.e. Stations 1 through 13, excluding 9A and 9B which were tested as potential flow stations in 2016 but found not to have sufficient flows) (ref. Map SW-1, Appendix SW-1A).

The purpose of the wetland water level and quality monitoring is to (a) provide study-area wide baseline information of the pre-development condition of these features, and (b) help inform the understanding of surface and groundwater interactions in the PSA.

Sampling locations (ref. Map SW-1) were identified based on the objective of collecting samples:

a. From a representative selection of wetlands located within the PSA, as well as falling within both the Hanlon and Mill Creek Subwatersheds;

b. From wetlands expected to be protected for the long-term, therefore within confirmed Provincially Significant Wetlands (PSWs);

c. From wetlands expected to have standing water in them all year round, even in dry years;

d. From a representative selection of wetlands within different land use contexts (e.g. agricultural, natural, near roads); and

e. In proximity to proposed groundwater stations to allow for integration and comparison of the surface water and groundwater data from the same wetlands.

4.2.1 Flow Levels

One (1) gauge to monitor flow quantity in the Mill Creek Subwatershed was established near the south-east limit of the PSA (Station 14).

To monitor flow quantity in the Hanlon Creek Subwatershed, two (2) gauge locations (Stations 9A – Kilkenny Place and 9B – Serena Lane) had been tested over the summer of 2016 to monitor the discharge from the Hanlon Creek Subwatershed, draining to the north. Some minor flow responses were observed at the Serena Lane monitoring location for storms on August 20, August 25, and September 7, 2016 (ref. plots in in Appendix SW-1). However, the responses were minimal, and not considered to be significant enough to continue the monitoring at this location in 2017. A new location outside the PSA in the Hanlon Creek Subwatershed was identified in consultation with the City and GRCA for surface water monitoring (Station 15) and established in April 2017.

In the absence of a station with flow in the Hanlon Creek Subwatershed in 2016, one surface water level logger and quality station was established in the southern extent of the large pond within Hall's Pond Provincially Significant Wetland (Station 7) in July 2016, with surface water level and quality data collected over the summer and fall of 2016. Although data from this station was used to inform the general surface water monitoring results in 2016, starting in 2017 data collected from this station was assessed in conjunction with data from the 11 other wetland monitoring stations (ref. Map SW-1).

Summary plots showing the observed water levels at Halls Pond for 2016 have been included in Appendix SW-1.

Continuous water level monitoring was conducted for an open watercourse south of the study limits, within the municipality of Puslinch. The site is located on a private property at the end of Hammersely Road (Station 14). The site had continuously observed flow at all times during the monitoring period, suggesting a potential groundwater flow contribution. Velocity metering was conducted at this site over the course of 2016, which has been used to develop a preliminary rating curve for the site. The rating curve fit has been completed using a simplified HEC-RAS hydraulic model, based on topographic survey data completed by Matrix Solutions on November 4, 2016.

Plots of the developed rating curves, and the resulting recorded flow series at the Hammersley Road Station 14 site and the Hanlon Channel Station 15 site, have been included in Appendix SW-1. Minimum and maximum water levels for both stations are provided in Table 4.2.1, with the Hammersley minimum and maximum water levels observed on November 29, 2017 and June 4, 2017 respectively. Minimum and maximum observed water levels for Station 14 occurred on April 30, 2017 and June 23, 2017. 2018 water minimum and maximum water levels in Table 4.2.1 are not that dissimilar than 2017 levels.

Table 4.2.1 Observed 2017 and 2018 Water Levels (m)

Minimum/ Maximum	Puslinch Channel (Station 14)	Hanlon Channel (Station 15)
2017 Minimum Water Level	0.068	0.137
2017 Maximum Water Level	0.248	0.327
2018 Minimum Water Level	0.052	0.133
2018 Maximum Water Level	0.212	0.269

Water levels and flows within the Hanlon Channel Station 15 site did not vary considerably during the monitoring period, with depths ranging from 0.14 m to 0.33 m and peak flows ranging from 0.02 m^3/s to 0.08 m^3/s respectively.

Peak flows for the major recorded storm events of 2016 to 2018 are presented in Table 4.2.2.

Table 4.2.2 Estimated Peak Flows at Monitoring Station 14 (Hammersley Road) and Station 15 (Hanlon) for Major Storm Events Based on 2016, 2017 and 2018 Rating Curves

Date (M/D/Y)	Observed Rainfall (mm)	Observed Peak Flow (m^3/s)
Station 14 (Hammersley)		
2016		
7/25/2016	19.2	0.02
8/20/2016	52.0	0.10
8/25/2016	24.0	0.06
9/7/2016	33.6	0.02
11/2/2016	4.2	0.02
2017		
04/06/2017	27.8	0.05
04/20/2017	26.8	0.05
05/05/2017	14.2	0.04
05/25/2017	18.6	0.03
06/23/2017	39.4	0.04
07/01/2017	11.4	0.02
08/11/2017	12.6	0.01
11/05/2017	15.2	0.02
11/18/2017	15.4	0.02
2018		
04/03/2018-04/04/2018	23.4	0.03
04/14/2018	30.0 (EC)	0.02
04/16/2018	27.2	0.02
04/24/2018-04/25/2018	16.0	0.03
05/04/2018	14.6	0.02
05/15/2018	7.4	0.02
06/24/2018	21.8	0.02
10/31/2018	25.8	0.02
11/01/2018-11/02/2018	25.8	0.04
Station 15 (Hanlon)		
2017		
04/06/2017	27.8	0.04
04/20/2017	26.8	0.04
05/05/2017	14.2	0.04
05/25/2017	18.6	0.06
06/23/2017	39.4	0.08
08/11/2017	12.6	0.05
11/18/2017	15.4	0.04
2018		

Table 4.2.2 Estimated Peak Flows at Monitoring Station 14 (Hammersley Road) and Station 15 (Hanlon) for Major Storm Events Based on 2016, 2017 and 2018 Rating Curves

Date (M/D/Y)	Observed Rainfall (mm)	Observed Peak Flow (m^3/s)
04/03/2018-04/04/2018	23.4	0.04
04/16/2018	27.2	0.04
04/24/2018-04/25/2018	16.0	0.05
05/04/2018	14.6	0.04
05/15/2018	7.4	0.03
06/24/2018	21.8	0.03
07/16/2018	21.2	0.03
08/21/2018	24.0	0.04
08/25/2018	17.4	0.03
10/31/2018	25.8	0.04
11/1/2018	25.8	0.06

4.2.2 Wetland Levels

Methods: Year 1

In 2016 only one wetland was sampled for part of the summer and the fall to collect some preliminary data. At Station 7 a Solonist 3000 Levelogger Edge Junior was affixed to an existing staff gauge and collected data from July until November 2016. The device was pre-programmed to record water pressure (psi) and temperature (degrees Celsius) measurements at 15 minute intervals.

Locations for all wetland monitoring stations were also established, in consultation with affected landowners, over 2016.

Methods: Year 2

On April 18, 2017 field staff installed Solonist 3000 Levelogger Edge Junior logging devices at each of the surface water monitoring locations detailed on Map SW-2. The devices were pre-programmed to record water pressure (psi) and temperature (degrees Celsius) measurements at 15 minute intervals. Loggers placed within the Stations 1 and 2 (installed by Matrix Solutions) wetlands measured the same parameters at hourly intervals. Each device was enclosed within a protective PVC sleeve which was perforated to allow infiltration of surrounding waters. T-bars were driven into the wetlands beds and the PVC sleeves were attached. Logging devices were suspended at the bottom of the PVC sleeve using aircraft cable or zip ties. Each PVC sleeve-bottom was capped to reduce fouling from wetland sediments.

Once each logger was installed within the PVC housing, elevations were recorded using a RTK portable surveying unit to account for seasonal elevation changes which may have occurred since the 2017 monitoring season. Three separate elevations were recorded at each water level Station including: 1) top of casing, 2) a ground shot, and 3) water level. These elevations were collected to be used alongside final data recordings collected by the Solonist loggers, to accurately graph individual wetland seasonal water elevation fluctuations.

In addition to the PVC/Solonist setups, a Solonist Barologger was installed approximately 50 m south of Station 6 to record barometric air pressure for the SPA and PSA for use in the barometric compensation process to calculate final wetland water elevations.

Downloading of loggers coincided with water quality sampling events on May 1, August 10, and November 3, 2017 in conjunction with manual measurements for Stations 3-13. Loggers were removed on November 17 and 29, 2017 to prevent internal damage associated with freezing temperatures. Final readings were downloaded from the loggers on November 30, 2017. For each data series, outlying data points – associated with logger downloads – were omitted from the data series and are not represented in the final wetland water level graphs.

In 2017, Station 13 data collection was interrupted from May 1, 2017 (the last data download before the equipment was dislodged by a vehicular accident) until September 27, 2017 (when a new logger was installed following confirmation that the original logger could not be re-located on September 7, 2017). On September 27, 2017 a new Solonist logger and protective sleeve were installed approximately 8 m to the east of the original location.

Methods: Year 3

On April 11 and 26, 2018 field staff installed Solonist 3000 Levelogger Edge Junior logging devices at each of the surface water monitoring locations detailed on Map SW-2. The devices were pre-programmed to record water pressure (psi) and temperature (degrees Celsius) measurements at 15 minute intervals, except for the logger at Station 2 which measured the same parameters but at hourly intervals. Each device was enclosed within a protective PVC sleeve that is perforated to allow infiltration of surrounding water. Logging devices were suspended at the bottom of the PVC sleeve using aircraft cable or zip ties. The bottom of each PVC sleeve was capped to reduce fouling from wetland sediments.

Once each logger was installed within the PVC housing, elevations were recorded using a RTK portable surveying unit to account for seasonal elevation changes which may have occurred since the 2017 monitoring season. Three separate elevations were recorded at each water level Station including: 1) top of casing, 2) a ground shot, and 3) water level. These elevations were collected to be used alongside final data recordings collected by the Solonist loggers, to accurately graph individual wetland seasonal water elevation fluctuations.

In addition to the PVC/Solonist setups, a Solonist Barologger was installed approximately 50 m south of Station 6 to record barometric air pressure for the SPA and PSA for use in the barometric compensation process to calculate final wetland water elevations.

Downloading of loggers coincided with water quality sampling events on April 26, August 24, and November 2, 2018 and manual water level measurements Stations 3-13. Loggers were removed on November 2 and 7, 2018 to prevent internal damage associated with freezing temperatures. Final readings were downloaded from the Beacon loggers on November 3, 2018. For each data series, outlying data points – associated with logger downloads – were omitted from the data series and are not represented in the final wetland water level graphs.

Results

In all years, rainfall data was obtained from the Clair-Maltby rain gauge (refer to Section 4.1) located at the corner of Maltby Road East and Victoria Road South. Note, a mixed precipitation event occurred on April 14 and 15, 2018, that the gauge was not equipped to quantify.

2016 was a drought year and therefore a good year to confirm wetlands that would be expected to have standing water for most or all of the year in 2017 and 2018.

In both 2017 and 2018, wetland surface water levels in the PSA generally followed anticipated seasonal patterns with levels peaking in early to mid-spring followed by a continuous decline until loggers were removed in early November 2018 with some exceptions as follows demonstrating some variability between stations and between years.

- In 2017, Stations 4, 5, 8, 11, and 13 displayed small rebounds in water levels in the late fall prior to logger removal. Similarly, prior to removal on November 2, 2018 a number of stations registered slight rebounds corresponding with late fall precipitation events.
- Of all the wetland surface water stations, all stations had some standing water throughout the 2017 monitoring season except for Stations 3, 4 and 12 which remained wet (i.e., saturated) but did not exhibit visible "standing" water later in the season.
    - Standing water was observed at Station 4 on August 10, 2017 (approximately 0.3 m), followed by saturated soils with no standing water on November 3, 2017. In 2018, Station 4 had one date that was "dry" at the logger location (August 24, 2018),
    - Station 12, situated along the north side of Maltby Road, was found to only contain a very low water elevation on August 10, 2017, and was dry on November 29, 2017. In 2018, Station 12 was dry on August 24 and November 2.
    - Minimal standing water was observed around the Station 3 logger on August 10, 2017, although the central-portion of the wetland feature appeared to retain more standing water into the late summer and fall.
- In 2018, some of the smaller wetlands such as Stations 5 and 6 exhibited an earlier draw-down than in 2017, which was a wetter year.
- The exception to the typical draw-down pattern displayed by the majority of the monitored wetlands in 2017 and 2018 was Station 10. In 2017, at Station 10 water levels were lower at the time of device installation and peaked around early July 2017 before beginning a steady decline until logger removal on November 3, 2017. In 2018, significant increases in overall water levels at Station 10 were not as pronounced as those observed in 2017, however water levels still reached their peak in late spring/early summer which was consistent with 2017 and different from most other stations which reached peak water levels earlier in the spring.

Manual surface water level measurements did not always correspond to the logged data results. It was assumed that the manual measurements were in error due to measuring from the wetlands' beds to the surface of the water (i.e., many of the wetlands beds are composed of soft silts and thick vegetated mats in the summer which can make completing manual measurements difficult). Therefore, the logger results were considered more reliable and accurate.

Graphed results detailing wetland surface water elevations from each station in 2017 and 2018 are summarized in Appendix GW-3 where they have been integrated with the results from the groundwater monitoring to facilitate interpretation. The preliminary findings are discussed in Section 4.3 which focuses on groundwater. More comprehensive interpretation and analyses are provided in the Phase 1 and 2 CEIS Characterization Report (Wood *et al.,* 2018).

4.2.3 Surface Water Quality (including Temperature)

Methods

The water level loggers (Solonist 3000 Levelogger Edge Junior logging devices) include temperature sensors which provide a continuous scan of water temperature over the monitoring period. In 2016, the loggers were not installed until July, 2016, however in 2017 and 2018 the loggers were installed soon after the freshet (i.e., early April) and were removed prior to freeze-up (typically early to mid-November).

In addition to water temperature, the CEIS Work Plan included water quality sampling as part of the surface water monitoring effort. The water quality parameters recommended by GRCA (ref. Table 4.2.3) have been supplemented by metal and pesticides as agreed to by the City. Sampling has been as follows:

- Grab samples and *in situ* data were collected in both dry and wet periods in the summer and fall of 2016, and the spring, summer and fall of 2017 and 2018 at each of the two (2) water gauge locations.
- Grab samples and *in situ* data were also collected once in the summer and fall of 2016, and once in the spring, summer and fall of 2017 and 2018 at each of the 12 wetland monitoring locations. Summer sampling was done during a "dry" period while spring and fall samplings were done in "wet" periods.
- Due to the substantial expense of testing for pesticides, the Consulting Team recommended more targeted testing. As agreed, single samples at six (6) locations across the PSA were collected in the fall of 2017.

For this study, the target was to conduct "wet" sampling within 24 hours of at least 10 mm of rainfall within the previous 48 hours, and "dry" sampling after no rain had fallen for at least 48 hours. Actual sampling parameters are documented in Table 4.2.3.

Water quality sampling was undertaken in 2016 at Station 7 (in the Hanlon Creek Subwatershed) and Station 14 (in the Mill Creek Subwatershed) over the summer and fall of 2016. In 2017 and 2018, water quality sampling was undertaken at Stations 1 through 15, with the exception of Station 9 which was removed as a sampling location due to persistent lack of flows, for a total of 14 sampling locations (ref. Map SW-1). As noted in 2016, there are no creeks in the PSA as the area is essentially a headwater drainage area on the Paris Moraine where wetlands and ponds of various sizes provide the primary drainage. Therefore, wetland water sampling was considered central to this study.

Table 4.2.3 Water Quality Parameters Assessed

Water Quality Parameter	Mechanism of Analysis	Comments
• Total Suspended Solids (TSS) • Total Dissolved Solids (TDS) • Orthophosphate (P) • Total Phosphorus (TP) • Dissolved Sulphate (SO^4) • Dissolved Chloride (Cl) • Total Kjeldahl Nitrogen (TKN) • Nitrite (NO^2)	To be analyzed from grab samples sent to a laboratory	Parameters suggested by GRCA in their comments on the Draft Clair-Maltby MESP Secondary Plan TOR (City of Guelph, 2015a).

Table 4.2.3 Water Quality Parameters Assessed

Water Quality Parameter	Mechanism of Analysis	Comments
• Nitrate (NO^3) • Ammonia (NH^3)		
• Water temperature	To be measured continuously by the data logger and verified in situ three times over the season by field staff (with a water quality meter)	Parameter suggested by GRCA in their comments on the Draft Clair-Maltby MESP Secondary Plan TOR (City of Guelph, 2015a).
• pH • Conductivity, and • Dissolved oxygen (DO)	To be measured in situ by field staff (with a water quality meter)	Parameters suggested by GRCA in their comments on the Draft Clair-Maltby MESP Secondary Plan TOR (City of Guelph, 2015a).
• Metals • Pesticides*	To be analyzed from grab samples sent to a laboratory	Additional parameters suggested by the Consulting Team and agreed to by City.

Note: * Due to the additional cost, pesticide sampling has been targeted be sampled at only six of the 14 stations and only once in the fall of 2017.

Table 4.2.4 summarizes the dates and event type for the water quality sampling events of 2016, 2017 and 2018. Water quality samples were collected in close proximity to the established wetland water level stations (ref. Map SW-1).

Table 4.2.4 Summary of 2016 to 2018 Water Quality Sampling Events

Date	Sites Sampled	Type of Event	Inter-Event Period (days)[1]	24-Hour Rainfall Total (mm) [2.]
August 4, 2016	Station 7, Station 14	Dry	10	0
August 17, 2016	Station 7, Station 14	Wet	5	10.6
September 22, 2016	Station 7, Station 14	Wet	6	6.0
October 20, 2016	Station 7, Station 14	Wet	12	7.0
April 28, 2017	Station 14, Station 15	Dry	8	4.4
May 1, 2017	Stations 1-8, Stations 10-15	Wet	0	20.4
August 10, 2017	Stations 1-8, Stations 10-15	Dry	6	0.0
September 5, 2017	Station 14, Station 15	Wet	0	8.6
October 3, 2017	Station 14, Station 15	Dry	29	0.0
November 3, 2017	Stations 1-8, Stations 10-15	Wet/Pesticides	12	6.8
April 26, 2018	Stations 1-8, Stations 10-15	Wet	0	12.8
May 8, 2018	Station 14, Station 15	Dry	4	0
August 8, 2018	Station 14, Station 15	Wet	0	0.2
August 24, 2018	Stations 1-8, Stations 10-15	Dry	9	0
October 26, 2018	Station 14, Station 15	Dry	19	0
November 2, 2018	Stations 1-8, Stations 10-15	Wet	0	18.8

Notes: " NA" indicates not applicable (dry weather samples)

[1] Between sampling time and end of last event exceeding 5 mm

[2] Rainfall depth for 24-hour period prior to sampling

4.2.3.1 Temperature

Flow Stations

Tables 4.2.5 and 4.2.6 summarize the temperature monitoring results for the Puslinch Channel (Station 14) in 2016 and 2017, and Hanlon Creek (Station 15) respectively in 2017. Based on a comparison of 2016 to 2017, the monthly daily maximums trend lower for 2017 based on it being a wetter year than 2016.

Table 4.2.5 Observed 2016, 2017 and 2018 Water Temperatures – Puslinch Channel (Station 14)

Month	Monthly Extremes		Monthly Averages		
	Daily Minimum	Daily Maximum	Daily Minimum	Daily Average	Daily Maximum
2016					
July	9.26	16.06	10.77	12.28	14.33
August	9.80	18.78	11.22	12.86	14.92
September	7.90	17.20	10.09	11.38	12.91
October	4.06	15.05	7.99	9.24	10.47
November	1.95	11.35	5.28	6.45	7.61
December	1.55	7.46	3.69	4.30	4.85
2017					
April	2.15	15.42	6.52	7.82	9.57
May	5.81	15.21	8.58	9.55	10.95
June	9.00	16.28	10.24	11.30	12.84
July	9.94	15.36	10.84	11.73	13.05
August	8.67	13.82	10.22	11.18	12.66
September	7.83	14.33	9.95	10.59	12.35
October	6.18	14.04	8.01	9.57	11.00
November	2.05	9.78	4.80	5.68	6.58
2018					
April	0.13	9.10	1.98	2.95	4.23
May	5.08	16.49	8.88	10.72	13.24
June	8.47	17.67	10.30	11.84	13.87
July	9.33	17.31	10.84	12.61	15.32
August	9.87	18.29	11.56	13.36	16.08
September	6.95	19.47	10.27	12.03	14.70
October	4.06	16.35	6.92	8.20	9.73
November	1.92	8.46	4.62	5.39	5.89

Table 4.2.6 Observed 2017 and 2018 Water Temperatures – Hanlon (Station 15)

Month	Monthly Extremes		Monthly Averages		
	Daily Minimum	Daily Maximum	Daily Minimum	Daily Average	Daily Maximum
2017					
April	5.31	17.53	8.79	10.64	13.07
May	8.05	17.98	10.35	11.83	14.27
June	11.18	27.91	12.98	15.21	19.00
July	12.75	23.24	14.10	16.68	20.87
August	11.83	22.28	13.32	15.61	19.24
September	10.70	20.58	12.60	14.89	18.79
October	9.25	18.51	11.55	13.08	15.43
November	6.24	13.00	8.62	9.52	11.12
2018					
April	4.19	13.19	6.49	7.77	9.34
May	8.92	18.70	11.02	12.85	15.28
June	10.58	21.90	12.04	14.30	17.69
July	11.82	22.68	13.09	15.72	19.74
August	12.90	21.74	13.95	16.18	19.93
September	11.24	22.46	13.51	15.45	18.75
October	8.04	19.80	10.60	11.93	13.67
November	6.37	13.08	8.44	9.42	10.36

Water temperature graphs have been provided in Appendix SW-1.

Wetland Stations

Overall, the wetland surface water temperatures in 2017 and 2018 within the PSA displayed a relatively consistent seasonal rise in temperatures from spring into summer, as air temperatures increased, and wetland water elevations fell (ref. Table 4.2.7 for a summary of each station's minimum, maximum and average monthly temperatures). Surface water temperatures were also generally higher in 2018 than in 2017, reflecting the air temperatures in those respective years, although this trend was more pronounced in wetlands thought to be more reliant on surface water inputs than groundwater inputs.

Although trends within the same wetlands were comparable from 2017 to 2018, there was considerable variability in both the temperature ranges and the degree to which surface water temperatures mimicked air temperatures among wetlands. Temperature graphs for each station for 2017 and 2018 are provided in Appendix SW-1B.

In both 2017 and 2018, as wetland water elevations declined, particularly in smaller wetlands, surface water temperatures began to show greater variability and more closely mimic daily air temperature changes. This trend was most pronounced at Stations 6 and 12, where wetland water level conditions were very low to dry by mid-September. It was also evident at the two stations located within Hall's Pond (Stations 5 and 7) which began to fluctuate more in mid-August, as surface water levels dropped.

There was also a tremendous amount of variability between different wetlands in terms of both their temperature ranges and patterns of temperature fluctuations as illustrated in Appendix SW-1B. Tables 4.2.7

and 4.2.8 below provide the daily average surface water temperatures for each wetland station, as well as the means. In both 2017 and 2018, the highest recorded temperature readings were noted at Stations 1, 2 and 13 whereas most other stations maintained daily average temperature ranges between about 14°C and 22°C in these same months and several stations consistently maintained temperature ranges below 18°C.

Four different patterns were observed in looking at the data over 2017 and 2018:

1) Stations 1, 2 and 13: The surface water temperature variations mimicked changes in air temperatures quite closely for the entire season, sometimes exceeding air temperatures, with daily average temperature ranges between about 20°C and 27°C in July and August.

2) Stations 3 and 7: The surface water temperature variations mimicked changes in air temperatures quite closely for the entire season, with daily average temperature ranges between about 15°C and 22°C in July and August.

3) Stations 4, 11 and 12: The surface water temperature variations were lower than the air temperature variations for much of the season, with daily average temperature ranges between about 15°C and 19°C in July and August, but the variability was still mimicked (i.e., Station 4, 11, 12); and

4) Stations 5, 8 and 10: The surface water temperature was both lower and much more constant than the air temperature with daily average temperature ranges between 15°C and 18°C in July and August.

Table 4.2.7 2017 Wetland Surface Water Temperatures (°C)

Station No.	April*			May			June			July			August			September			October			November**		
	Daily Min	Daily Avg	Daily Max	Daily Min	Daily Avg	Daily Max	Daily Min	Daily Avg	Daily Max	Daily Min	Daily Avg	Daily Max	Daily Min	Daily Avg	Daily Max	Daily Min	Daily Avg	Daily Max	Daily Min	Daily Avg	Daily Max	Daily Min	Daily Avg	Daily Max
Stn 1	11.98	13.13	14.52	13.81	14.72	15.99	20.32	21.34	22.78	22.22	23.16	24.39	21.21	22.51	24.27	19.22	20.88	23.02	13.41	14.47	15.84	4.91	5.55	6.37
Stn 2	12.68	13.53	14.52	14.22	14.75	15.36	19.16	19.35	19.62	20.26	20.37	20.55	20.13	20.44	20.84	18.05	18.66	19.25	12.28	13.07	13.83	5.68	6.10	6.57
Stn 3	10.83	11.11	11.42	12.16	12.37	12.65	17.18	17.38	17.68	18.65	18.85	19.17	17.61	18.35	19.23	15.83	17.24	18.94	11.09	12.66	14.60	3.27	4.28	5.50
Stn 4	8.06	8.32	8.62	10.10	10.32	10.66	14.78	14.96	15.21	16.34	16.45	16.59	15.62	15.83	16.17	12.91	13.52	14.27	9.61	10.39	11.25	3.27	3.68	4.18
Stn 5	9.64	9.91	10.27	10.48	10.60	10.76	14.97	15.06	15.17	16.54	16.58	16.64	17.28	18.07	19.00	15.31	18.44	21.83	11.10	12.51	14.09	4.96	5.33	5.83
Stn 6	9.62	9.98	10.42	11.22	11.48	11.89	16.01	16.16	16.39	17.68	17.77	17.89	16.52	16.72	17.00	14.01	14.50	15.18	10.08	10.83	11.78	2.94	3.35	3.90
Stn 7	11.02	12.30	13.89	14.10	14.98	16.09	19.62	20.28	21.13	20.78	21.51	22.74	19.04	20.33	22.06	15.65	18.62	24.24	7.06	11.98	23.59	1.84	2.78	3.88
Stn 8	8.86	8.92	9.00	10.43	10.50	10.57	13.98	14.03	14.08	15.40	15.42	15.45	15.66	15.70	15.74	14.55	14.63	14.71	12.56	12.64	12.75	8.08	8.14	8.22
Stn 10	12.14	12.61	13.15	13.26	13.52	13.88	17.70	17.76	17.85	18.49	18.52	18.56	18.32	18.37	18.42	16.83	16.96	17.11	13.13	13.38	13.67	8.07	8.13	8.23
Stn 11	9.44	9.75	10.17	11.05	11.30	11.65	15.08	15.30	15.57	17.06	17.19	17.37	16.22	16.50	16.85	14.54	15.19	15.95	10.82	11.57	12.45	5.36	5.52	5.78
Stn 12	8.04	9.24	10.86	10.91	11.87	13.11	15.98	16.93	17.96	16.92	17.95	19.07	14.56	16.79	19.05	11.44	14.11	17.03	7.93	10.35	12.82	1.87	3.14	4.57
Stn 13***	12.72	13.61	14.72	12.70	12.88	14.50	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	19.98	20.50	21.23	15.21	15.47	15.80	6.42	6.62	7.24

Notes:
Stations 1 and 2 were removed on November 17, 2017
Stations 1 and 2 reflect 2017 temperature data that was recorded hourly
Station 7 reflects temperature from April 5 to Nov 29
* April temperatures include are the 18 to the 30, except Station 7 which began logging on April 5
** November Temperature logged until the 29, with the exception of Station 10 (Nov. 3), and Stations 1 & 2 (Nov. 17)
*** The Station 13 summer data was lost as a result of an accident with a vehicle going into Halligan's Pond and the logger being lost. A new logger was installed in September 2017.

Table 4.2.8: 2018 Wetland Surface Water Temperatures (°C)

Month	April*			May			June			July			August			September			October			November**		
Station Location	**Daily Minimum**	**Daily Average**	**Daily Maximum**	**Daily Minimum**	**Daily Average**	**Daily Maximum**	**Daily Minimum**	**Daily Average**	**Daily Maximum**	**Daily Minimum**	**Daily Average**	**Daily Maximum**	**Daily Minimum**	**Daily Average**	**Daily Maximum**	**Daily Minimum**	**Daily Average**	**Daily Maximum**	**Daily Minimum**	**Daily Average**	**Daily Maximum**	**Daily Minimum**	**Daily Average**	**Daily Maximum**
Station 1	6.83	7.96	9.61	17.47	18.86	20.68	20.95	21.99	23.81	24.11	25.56	27.54	23.23	24.86	27.15	19.35	20.90	22.97	9.54	10.52	11.67	6.30	6.47	6.70
Station 2	8.78	9.08	9.51	16.64	16.95	17.40	20.02	20.41	20.93	23.38	23.97	24.70	23.29	24.04	24.89	18.31	19.49	20.95	7.15	8.35	9.76	4.33	4.74	5.17
Station 3	7.03	7.20	7.44	15.04	15.28	15.59	18.02	18.25	18.58	19.90	20.18	20.62	19.83	20.16	20.68	17.55	18.04	18.80	9.67	10.17	10.82	7.30	7.45	7.65
Station 4	3.58	3.77	4.00	10.33	10.53	10.74	14.69	14.85	15.02	17.38	17.56	17.83	18.04	18.25	18.66	15.58	15.87	16.31	8.85	9.16	9.55	6.30	6.40	6.45
Station 5	5.88	5.94	5.98	10.28	10.40	10.53	13.93	13.97	14.02	15.85	15.91	15.97	18.53	18.66	18.83	17.64	17.81	18.02	10.85	11.03	11.21	7.50	7.57	7.65
Station 6	5.04	5.52	6.08	14.42	14.99	15.76	16.73	17.19	17.84	18.53	19.46	20.75	18.81	20.41	22.61	14.18	17.37	23.06	4.78	7.84	11.88	3.80	4.86	6.35
Station 7	6.07	6.37	6.81	15.56	15.80	16.13	17.82	18.03	18.29	19.84	20.04	20.27	19.94	20.11	20.35	17.47	17.80	18.35	9.87	10.25	10.73	7.60	7.63	7.69
Station 8	4.59	4.68	4.84	10.05	10.15	10.26	13.78	13.83	13.88	15.81	15.86	15.90	16.90	16.94	17.05	15.80	15.90	16.00	11.14	11.24	11.36	8.20	8.20	8.20
Station 10	6.88	7.09	7.34	14.16	14.32	14.46	16.93	17.02	17.10	18.46	18.53	18.58	18.58	18.63	18.68	17.69	17.90	18.14	11.41	11.63	11.91	8.70	8.76	8.80
Station 11	3.65	3.82	4.03	11.49	11.68	11.85	14.90	15.01	15.14	17.13	17.27	17.47	18.31	18.42	18.62	16.23	16.48	16.85	9.73	9.92	10.15	6.85	6.99	7.10
Station 12	1.09	1.45	2.01	11.48	12.28	13.31	15.00	16.20	17.59	16.21	18.47	21.12	16.14	18.66	21.58	12.82	15.88	19.14	5.73	7.98	10.25	4.35	5.23	6.15
Station 13	6.13	6.42	6.96	16.36	16.61	17.17	20.61	20.80	21.11	23.74	23.94	24.23	23.27	23.47	23.76	20.54	20.77	21.12	12.36	12.56	12.84	8.45	8.49	8.60

Notes:
Stations 1 and 2 were removed on November 7, 2018
Station 2 reflect 2018 temperature data that was recorded hourly
Station 7 reflects temperature from April 11 to Nov 2
* April temperatures includes the 18th to the 30th, except Station 7 which began logging on April 11th
** November Temperature logged until the 2nd, with the exception of Stations 1 & 2 (Nov. 7)

In general, wetland temperatures in 2017 and 2018 remained within the range to support cool or coldwater fish habitat with the exception of Station 1 and, to a lesser extent, Stations 2 and 13, even during the summer months. These wetlands are not flowing features and the reasons for surface temperature conditions can relate to a number of factors which tend to vary over the course of a given year including wetland depth, extent to which the wetland (station) is shaded, air temperature and sources of water inputs (i.e., surface versus groundwater). On average, Stations 1 and 2 maintained some of the highest average monthly temperatures of all wetlands sampled. This is presumed to be because, despite their relatively large size, as stated within the EIS (North-South Environmental Inc. 2015) and confirmed by work done as part of this study (Wood *et al.,* 2018), these wetlands are maintained almost entirely by precipitation and surface runoff.

Graphed results of the wetland surface temperature data by watershed in the PSA is presented in Figures 4.2.1 through 4.2.4. Temperature graphs for each station for 2017 and 2018 are provided in Appendix SW-1B. Further interpretation of these results is provided in the Phase 1 and 2 CEIS Characterization Report (Wood *et al.,* 2018).

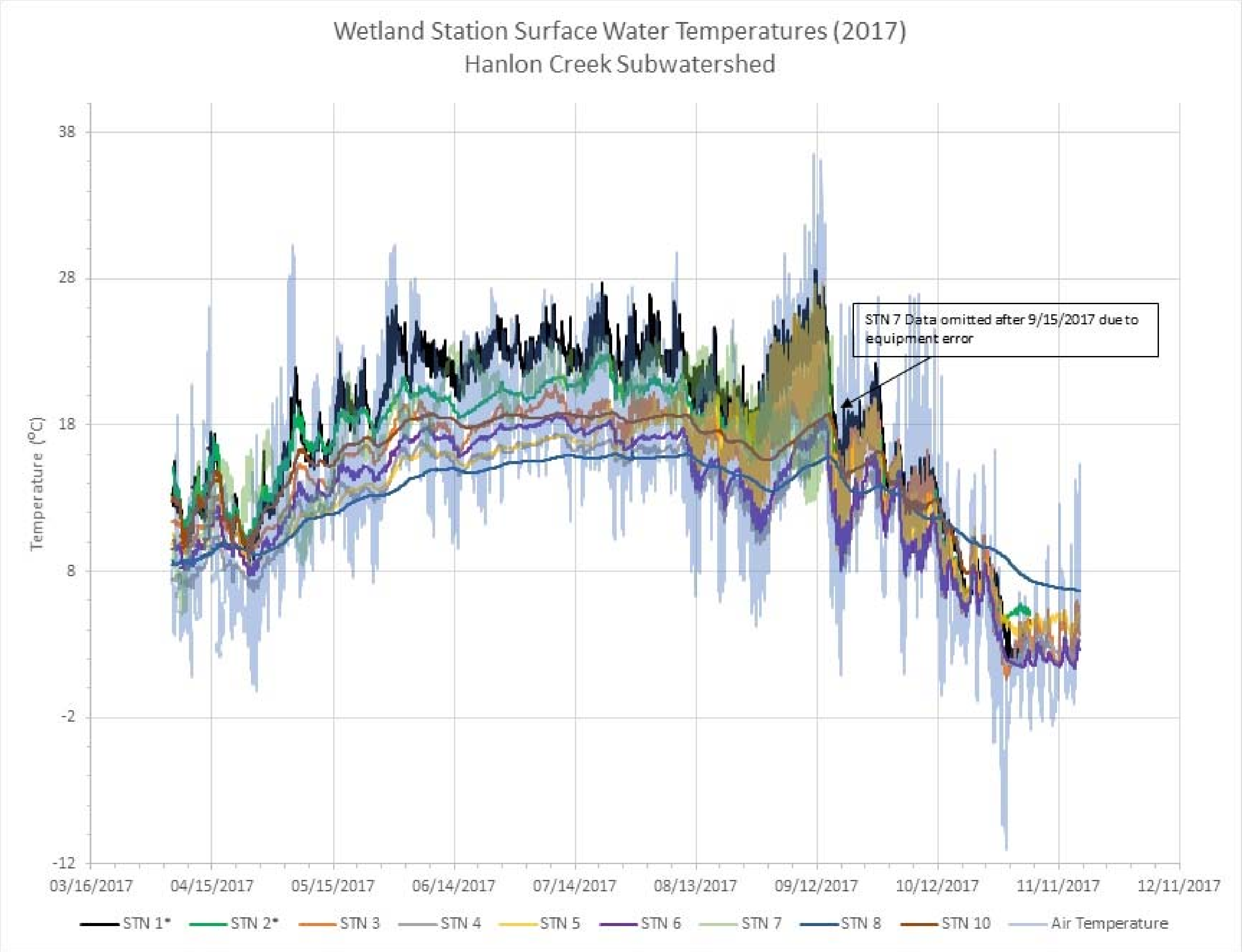

Figure 4.2.1: Surface water temperatures over 2017 in the wetland monitoring stations within the Hanlon Creek Watershed in the Primary Study Area.
(Note: The data for Station 7 were removed after mid-September due to a technical error).

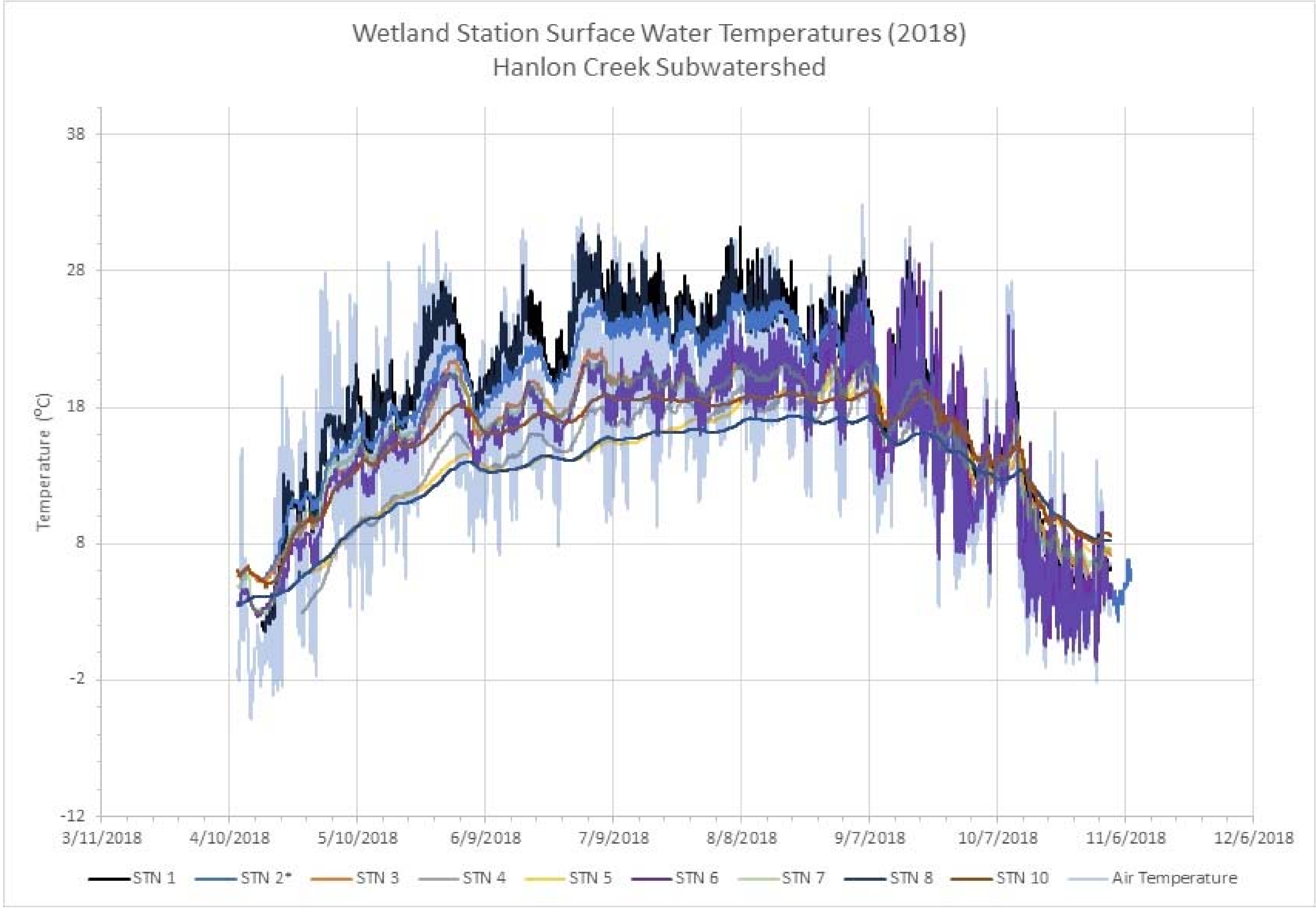

Figure 4.2.2: Surface water temperatures over 2018 in the wetland monitoring stations within the Hanlon Creek Watershed in the Primary Study Area.

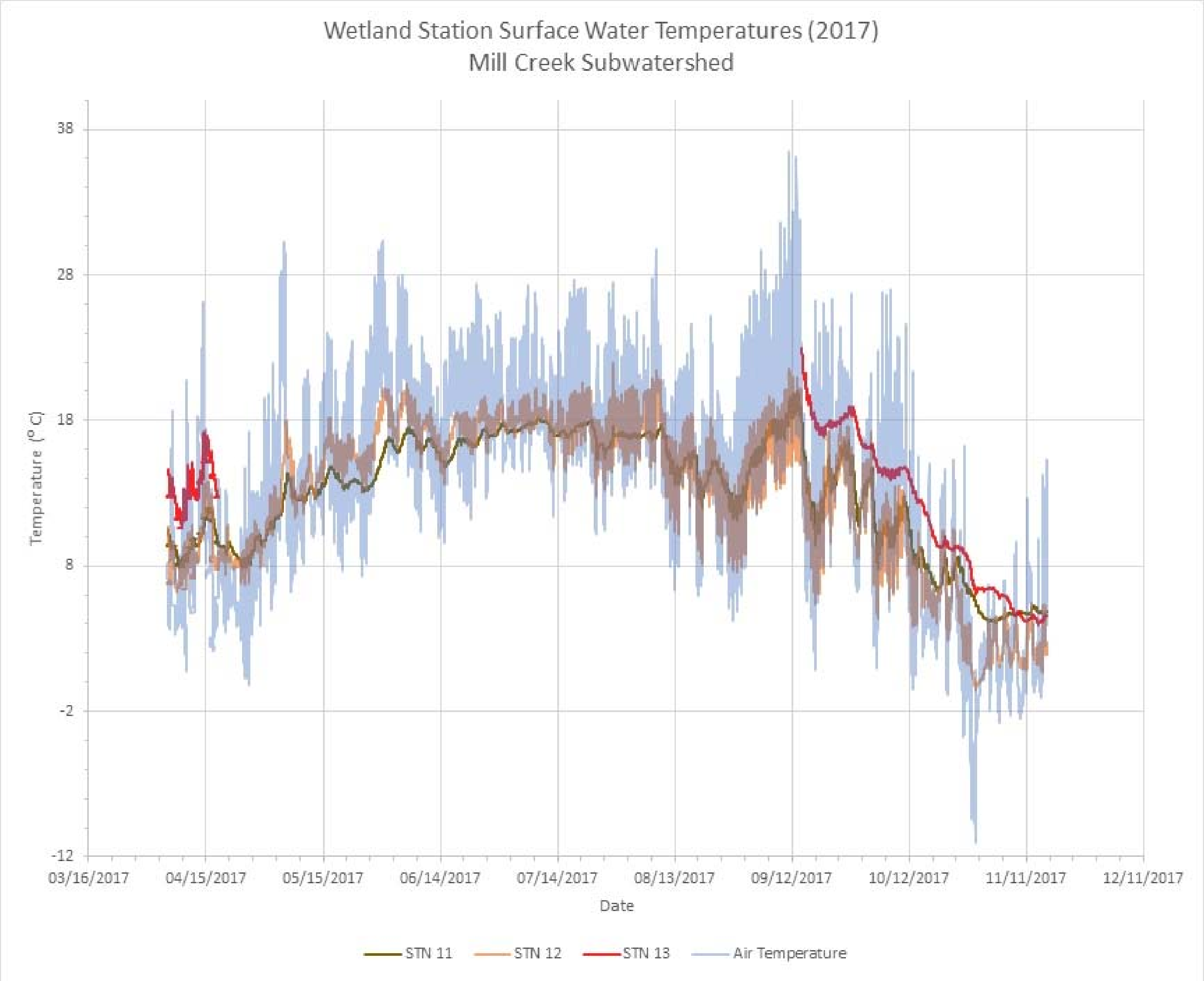

Figure 4.2.3: Surface water temperatures over 2017 in the wetland monitoring stations within the Mill Creek Watershed in the Primary Study Area.

(Note: The data for Station 13 were lost between late April 2017 and early September 2017 due to equipment loss).

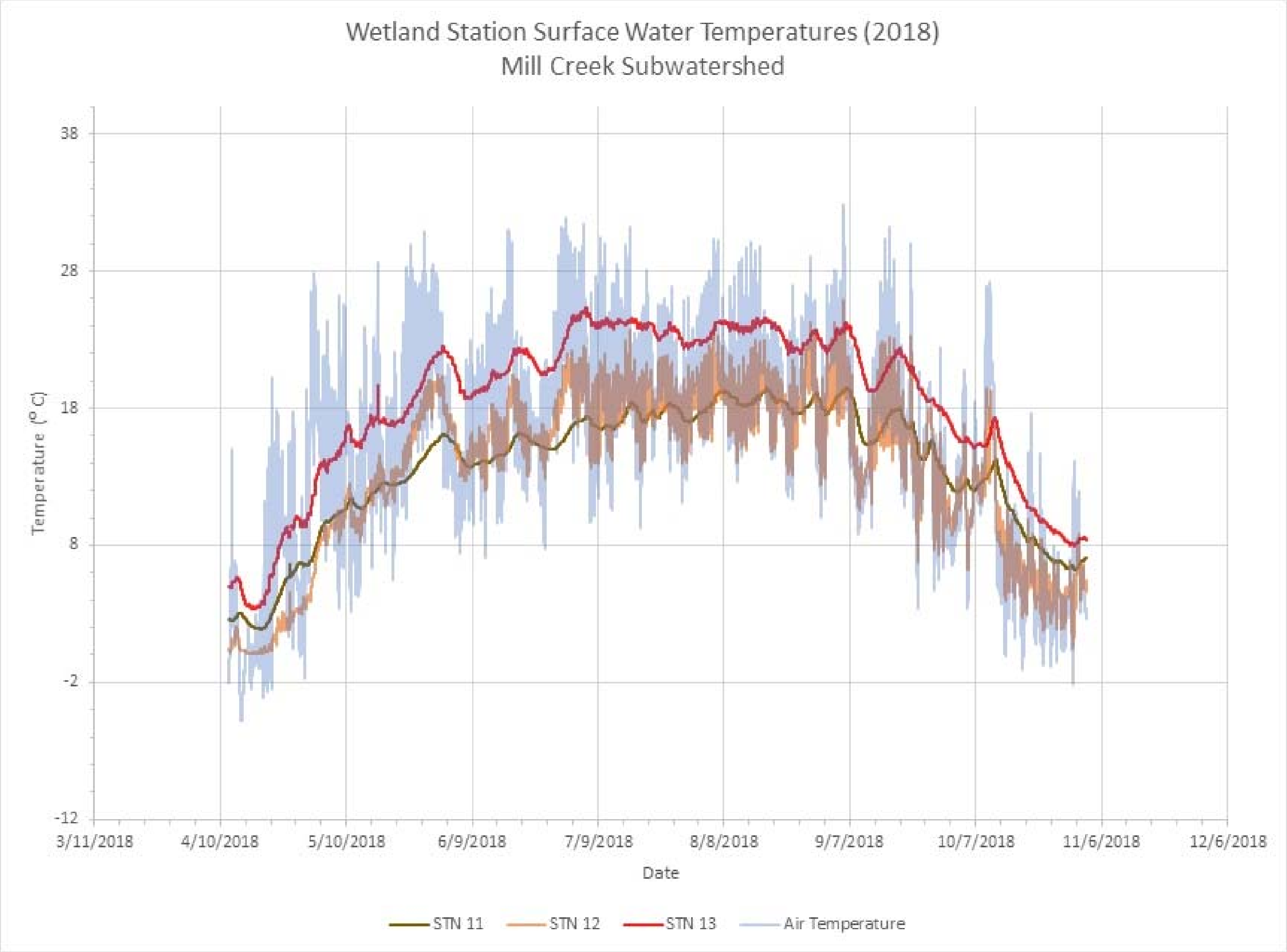

Figure 4.2.4: Surface water temperatures over 2018 in the wetland monitoring stations within the Mill Creek Watershed in the Primary Study Area.

4.2.3.2 Chemistry

Approach for CMSP Surface Water Quality Monitoring

Surface water quality parameters sampled and tested at the twelve wetlands and two flow stations over 2016, 2017 and 2018 (ref. Map SW-1 and Table 4.2.8, 4.2.9 (a-d) and 4.2.10 below), were assessed against three sets of established thresholds:

i. The Provincial Water Quality Objectives (PWQO);

ii. The Canadian Environmental Quality Guidelines (CEQG) for the Protection of Aquatic Life as prescribed by the Canadian Council of Ministers of the Environment; and

iii. The Canadian Drinking Water Quality (CDWQ) guidelines as prescribed by Health Canada.

PWQO and CEQG thresholds are intended to help manage water quality conditions for the protection of aquatic life. CDWQ guidelines base thresholds on the known human health effects associated with each contaminant, aesthetic qualities (taste, odour), and potential impairment to drinking water infrastructure (Health Canada 2014). CDWQ standards include two sub-sets of thresholds including (a) an aesthetic objective (AO) and (b) maximum acceptable concentrations (MAC). For this project, AO thresholds were applied, as they are generally more restrictive than MAC for the majority of parameters tested as part of the surface water sampling program.

These three sets of standards were used in combination to provide a more complete list of potentially relevant exceedances for the various surface water quality parameters of interest tested within the PSA. However, it is important to recognize that the data collected for this project are primarily intended to serve as a baseline reference for the pre-development conditions of a representative series of wetlands in the PSA, and that documented exceedances simply flag which parameters exceed provincial and federal thresholds established for flowing water, not wetlands *per se*. In addition, some of the exceedances relate to human health (i.e. CDWQ) while others are related to aquatic biota (i.e. PWQO and CWQG).

Relevant Background for the Surface Water Quality Monitoring

Surface water quality monitoring was completed for each of the Mill Creek, Torrance Creek and Hanlon Creek Subwatershed studies more than two decades ago. In the 1990's, the Torrance Creek (TSH *et al.,* 1998) water quality was assessed as reasonable, except for nitrates, total phosphorous and *Escherichia coli* (*E. coli*) which exceeded the PWQO standards. Hanlon Creek (MMM and LGL Ltd. 1993) temperatures were measured in the tributaries and, in some locations and certain times of the year, reached above 23°C due to a lack of canopy cover. Water quality for Mill Creek (CH2M Gore & Storrie Ltd. *et al.,* 1996) was noted as impaired in the 1990's due to E. coli, total phosphorus, aluminum, copper, lead manganese and zinc being above the established PWQO standards.

Results from CMSP Surface Water Quality Monitoring

- Table 4.2.3 provides a summary of the *in situ* water quality parameters tested for all stations surveyed over 2016, 2017 and 2018. Key water quality parameter concentrations for nutrients and metals parameters for the one wetland (Station 7) and one flow (Station 14) locations sampled in 2016 are presented in Table 4.2.8.

- Key water quality parameter concentrations for nutrients and metals parameters for the 12 wetland and two flow stations sampled in 2017 and 2018 are presented in Table 4.2.9 and Table 4.2.10 respectively. Exceedances based on PWQO have been highlighted in yellow, CEQG in blue, and CDWQ guidelines in orange. Results that exceed more than one threshold are highlighted in red.
- The full set of water quality chemistry results for all parameters tested in samples taken between 2016 and 2018, including samples for pesticides, is provided in Appendix SW-1C and Appendix SW-1D, with exceedances based on PWQO only highlighted in red.
- A summary of in situ water quality measurements taken in the field at all stations sampled is provided in Table 4.2.11.

Table 4.2.8 Comparison of Measured Concentrations for Key Water Quality Parameters at a Wetland (7) and a Flow (14) Station in 2016 (Nutrients and Metals)

Location	Contaminant Concentration (mg/L)												
	TSS	TKN	Total P	Ammonia	Chloride	Alum	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Zinc
PWQO (Yellow)	**n/a**	**n/a**	**0.03**	**0.02[1]**	**n/a**	**0.075**	**0.0005**	**n/a**	**0.005[2]**	**0.3**	**0.001[2]**	**n/a**	**0.02**
CEQG (Blue)	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**0.005**	**0.00004**	**0.001**	**0.002**	**0.3**	**0.001**	**n/a**	**0.03**
CDWQ (Orange)	**n/a**	**n/a**	**n/a**	**n/a**	**120**	**0.1**	**0.005**	**0.05**	**1**	**0.3**	**n/a**	**0.05**	**5**
Station 7	6.8	1.41	0.054	0.028	9.92	0.027	<0.000010	<0.00050	<0.0010	0.371	0.00038	0.111	0.0043
Station 14	<2.0	0.26	0.0056	<0.02	38.0	<0.010	0.000050	<0.00050	<0.0010	<0.050	<0.0001	0.0103	0.0890
Station 7	10.7	1.65	0.0742	<0.02	10.1	0.027	<0.000010	<0.00050	<0.0010	0.457	0.00053	0.0780	0.0032
Station 14	2.5	<0.15	0.0094	0.043	33.5	<0.010	0.000052	<0.00050	<0.0010	<0.050	<0.0001	0.0145	0.0760
Station 7	79.4	2.3	0.173	0.025	12.3	0.263	0.000022	<0.00050	<0.0010	0.491	0.00207	0.0317	0.0100
Station 14	<2.0	0.21	0.0069	0.032	36.7	<0.010	0.000042	<0.00050	<0.0010	<0.050	<0.0001	0.0101	0.0759
Station 7	15.8	1.68	0.0743	0.082	12.7	<0.010	<0.000010	<0.00050	<0.0010	<0.050	<0.0001	0.0150	<0.0030
Station 14	4.0	0.31	0.0075	0.074	33.6	<0.010	0.000075	<0.00050	<0.0010	<0.050	<0.0001	0.0248	<0.0030

Notes:
[1] PWQO is for un-ionized Ammonia
[2] PWQO varies with hardness as CaCO3, value presented is most stringent limit (lead) or based on initial PWQO (copper)

Table 4.2.9a Comparison of Measured Concentrations for Key Wetland Water Quality Parameters 2017 and 2018

Location				Station 1						Station 2						Station 3					
Parameter (mg/L)	**PWQO (Yellow)**	**CEQG (Blue)**	**CDWQ (Orange)**	**01-May-17**	**10-Aug-17**	**03-Nov-17**	**26-Apr-18**	**24-Aug-18**	**09-Nov-18**	**01-May-17**	**10-Aug-17**	**03-Nov-17**	**26-Apr-18**	**24-Aug-18**	**09-Nov-18**	**01-May-17**	**10-Aug-17**	**03-Nov-17**	**26-Apr-18**	**24-Aug-18**	**02-Nov-18**
Nutrients																					
TSS	**n/a**	**n/a**	**n/a**	15.4	56.7	14	17	126	10.8	<2.0	<2.0	7.7	6.4	88.6	5.4	2.2	38.3	55	3.1	9.5	6.3
Chloride	**n/a**	**n/a**	**120**	6.2	5.78	5.73	5.52	6.16	5.95	2.31	1.41	1.42	1.83	2.71	5.08	152	120	115	147	151	47.7
TKN	**n/a**	**n/a**	**n/a**	1.59	1.85	1.79	1.96	7.8	1.12	0.52	0.69	0.72	0.38	1.35	0.97	0.78	1.2	4.22	0.48	1.13	0.96
Ortho-P	**n/a**	**n/a**	**n/a**	0.0055	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	0.0032	0.0128	<0.0030	<0.0030	<0.0030
Total P	**0.03**	**n/a**	**n/a**	0.0902	0.131	0.0842	0.115	0.277	0.0468	0.0139	0.015	0.0131	0.0124	0.0538	0.0573	0.0247	0.0651	0.242	0.0126	0.0217	0.103
Sulfate	**n/a**	**n/a**	**500**	3.81	1.95	2.51	2.5	0.87	2.07	1.72	0.91	1.7	0.57	<0.030	1.16	5.54	1.87	8.72	5.04	0.68	7.55
Ammonia	**0.021**	**n/a**	**n/a**	0.113	<0.020	0.036	0.059	0.581	<0.020	0.097	0.18	0.307	0.033	0.082	0.174	0.045	0.066	2.52	<0.020	0.296	0.225
Nitrate	**n/a**	**3**	**10**	<0.020	<0.020	<0.020	<0.020	<0.020	0.038	<0.020	<0.020	0.037	<0.020	<0.020	0.035	<0.020	<0.020	0.054	<0.020	0.026	0.042
Nitrite	**n/a**	**0.06**	**1**	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.013	<0.010	<0.010	<0.010
Metals																					
Aluminum	**0.075**	**0.005**	**0.1**	0.019	0.0647	0.0631	0.049	0.414	0.0484	<0.010	0.0074	0.0413	0.0195	0.55	0.0288	0.012	0.0074	0.0698	0.0153	0.029	0.0289
Cadmium	**0.0005**	**0.00004**	**0.005**	<0.00001	0.000014	<0.000010	0.0000176	0.0000841	0.0000069	0.000011	<0.000010	<0.000010	0.0000054	0.0000542	0.0000155	<0.000010	<0.000010	0.000021	0.0000075	0.0000075	0.0000063
Chromium	**n/a**	**0.001**	**0.05**	<0.00050	<0.00050	0.00055	<0.00050	0.00118	<0.00050	<0.00050	<0.00050	0.00056	<0.00050	0.00105	<0.00050	<0.00050	<0.00050	0.00066	0.00051	0.00063	<0.00050
Copper	**0.001^{2}**	**0.002**	**1**	<0.0010	<0.0010	<0.0010	<0.0010	0.0031	0.0013	<0.0010	<0.0010	0.0019	<0.0010	0.0025	0.001	<0.0010	<0.0010	0.0014	<0.0010	<0.0010	<0.0010
Iron	**0.3**	**0.3**	**0.3**	0.174	0.416	0.179	0.156	1.37	0.135	0.161	0.305	0.206	0.139	1.31	0.777	0.061	0.493	0.328	0.051	0.223	0.138
Lead	**0.0012**	**0.001**	**n/a**	0.000114	0.000432	0.000417	0.000326	0.0024	0.000452	0.000117	0.000109	0.000477	0.000146	0.00374	0.000751	0.000103	0.000146	0.00097	0.00012	0.000307	0.000211
Manganese	**n/a**	**n/a**	**0.05**	0.104	0.23	0.0982	0.0808	0.302	0.0531	0.0221	0.0375	0.0153	0.0378	0.0604	0.0921	0.0236	0.443	0.791	0.067	0.0942	0.0766
Zinc	**0.02**	**0.03**	**5**	<0.0030	0.0058	<0.0030	0.005	0.0228	0.0776	<0.0030	<0.0030	0.0377	<0.0030	0.0552	0.064	<0.0030	<0.0030	0.0101	<0.0030	<0.0030	0.004

Table 4.2.9b Comparison of Measured Concentrations for Key Wetland Water Quality Parameters 2017 and 2018

Location				Station 4						Station 5						Station 6					
Parameter (mg/L)	**PWQO (Yellow)**	**CEQG (Blue)**	**CDWQ (Orange)**	**01-May-17**	**10-Aug-17**	**03-Nov-17**	**26-Apr-18**	**24-Aug-18**	**02-Nov-18**	**01-May-17**	**10-Aug-17**	**03-Nov-17**	**26-Apr-18**	**24-Aug-18**	**02-Nov-18**	**01-May-17**	**10-Aug-17**	**03-Nov-17**	**26-Apr-18**	**24-Aug-18**	**02-Nov-18**
Nutrients																					
TSS	**n/a**	**n/a**	**n/a**	<2.0	<2.0	n/a	<2.0	n/a	4.2	<2.0	13.1	26.4	<2.0	51.6	25	<2.0	<2.0	277	2.1	66.5	8.6
Chloride	**n/a**	**n/a**	**120**	4.03	1.97	n/a	2.16	n/a	2.78	33.7	11.2	33.6	23.7	25	47	9.8	11.6	16.3	7.16	3.9	3.42
TKN	**n/a**	**n/a**	**n/a**	1.08	1.53	n/a	0.43	n/a	1.42	0.96	1.51	3.48	0.59	3.56	1.98	0.76	0.68	1.17	1.03	2.22	0.7
Ortho-P	**n/a**	**n/a**	**n/a**	0.0043	0.0105	n/a	<0.0030	n/a	<0.0030	0.0103	<0.0030	0.0031	<0.0030	0.0109	0.0658	<0.0030	<0.0030	0.0073	<0.0030	0.0091	<0.0030
Total P	**0.03**	**n/a**	**n/a**	0.0324	0.0295	n/a	0.0182	n/a	0.0522	0.0248	0.038	0.0874	0.0237	0.231	0.0961	0.0159	0.0163	0.0805	0.0233	0.183	0.0563
Sulfate	**n/a**	**n/a**	**500**	5.94	1.29	n/a	4.15	n/a	15.3	3.2	0.95	4.49	2.96	0.79	27.4	3.72	0.79	0.94	1.1	<0.30	1.5
Ammonia	**0.021**	**n/a**	**n/a**	0.101	0.052	n/a	0.116	n/a	0.427	0.133	<0.020	1.65	0.04	0.837	0.442	0.118	0.038	0.12	0.079	0.325	0.029
Nitrate	**n/a**	**3**	**10**	0.03	<0.020	n/a	<0.020	n/a	1.25	<0.020	<0.020	0.029	0.48	<0.020	0.219	<0.020	<0.020	0.089	<0.020	<0.020	0.046
Nitrite	**n/a**	**0.06**	**1**	<0.010	<0.010	n/a	<0.010	n/a	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Metals																					
Aluminum	**0.075**	**0.005**	**0.1**	0.016	0.0085	n/a	0.0246	n/a	0.0531	<0.010	0.0199	0.0736	0.011	0.0645	0.0333	<0.010	0.0065	0.0091	0.0112	0.0125	0.0971
Cadmium	**0.0005**	**0.00004**	**0.005**	<0.000010	<0.000010	n/a	0.0000133	n/a	0.0000261	0.000015	<0.000010	<0.000010	<0.0000050	0.000008	0.0000118	<0.000010	<0.000010	<0.000010	<0.0000050	<0.0000050	0.0000108
Chromium	**n/a**	**0.001**	**0.05**	<0.00050	<0.00050	n/a	<0.00050	n/a	<0.00050	<0.00050	<0.00050	0.00053	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00169	0.00103	<0.00050	<0.00050
Copper	**0.001[2]**	**0.002**	**1**	<0.0010	<0.0010	n/a	<0.0010	n/a	0.0015	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0029	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Iron	**0.3**	**0.3**	**0.3**	0.121	0.155	n/a	0.105	n/a	0.375	0.168	0.289	0.648	0.083	0.748	0.07	0.06	0.066	0.386	0.077	1.45	0.117
Lead	**0.0012**	**0.001**	**n/a**	0.000097	0.0001	n/a	0.000109	n/a	0.000369	0.000121	0.000102	0.00045	0.000083	0.000411	0.000173	0.000081	0.000061	0.000135	0.00011	0.000167	0.000599
Manganese	**n/a**	**n/a**	**0.05**	0.0219	0.015	n/a	0.0165	n/a	0.0116	0.0806	0.113	0.461	0.0549	0.244	0.0151	0.00361	0.00643	0.192	0.0107	0.373	0.00883
Zinc	**0.02**	**0.03**	**5**	<0.0030	<0.0030	n/a	0.0032	n/a	0.0161	0.007	<0.0030	<0.0030	<0.0030	<0.0030	0.009	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	0.0044

Table 4.2.9c Comparison of Measured Concentrations for Key Wetland Water Quality Parameters 2017 and 2018

Location				Station 7						Station 8						Station 10					
Parameter (mg/L)	**PWQO (Yellow)**	**CEQG (Blue)**	**CDWQ (Orange)**	**01-May-17**	**10-Aug-17**	**03-Nov-17**	**26-Apr-18**	**24-Aug-18**	**02-Nov-18**	**01-May-17**	**10-Aug-17**	**03-Nov-17**	**26-Apr-18**	**24-Aug-18**	**02-Nov-18**	**01-May-17**	**10-Aug-17**	**03-Nov-17**	**26-Apr-18**	**24-Aug-18**	**02-Nov-18**
Nutrients																					
TSS	**n/a**	**n/a**	**n/a**	4.3	4.1	10	4.9	49.2	14.5	2.2	19.2	4.6	<2.0	45.1	3	<2.0	<2.0	<2.0	2.6	3.5	2.4
Chloride	**n/a**	**n/a**	**120**	11.8	12.6	13.1	10.6	9.86	8.26	2.58	2.83	5.65	2.77	4.13	7.94	1.5	1.65	2.35	2.02	1.89	2.17
TKN	**n/a**	**n/a**	**n/a**	0.96	0.93	1.22	0.59	2.44	1.33	1	1.93	1	0.6	1.87	1.2	0.66	0.73	0.65	0.64	0.9	1.3
Ortho-P	**n/a**	**n/a**	**n/a**	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	0.0054	<0.0030	<0.0030	0.0077	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
Total P	**0.03**	**n/a**	**n/a**	0.0303	0.0321	0.062	0.0449	0.127	0.0825	0.0321	0.0625	0.0252	0.0196	0.0689	0.0541	0.0117	0.0163	0.0065	0.0272	0.0304	0.026
Sulfate	**n/a**	**n/a**	**500**	1.41	<0.30	0.67	0.78	<0.30	0.43	1.7	0.9	0.85	1.25	<0.30	7.83	0.95	0.94	0.42	<0.30	<0.30	<0.30
Ammonia	**0.021**	**n/a**	**n/a**	0.077	0.066	0.053	0.079	0.423	0.457	0.07	0.038	0.118	0.035	0.23	0.343	0.055	<0.020	0.08	0.046	<0.020	0.128
Nitrate	**n/a**	**3**	**10**	<0.020	<0.020	<0.020	<0.020	0.021	0.033	<0.020	<0.020	<0.020	<0.020	<0.020	0.047	<0.020	<0.020	<0.020	<0.020	0.025	<0.020
Nitrite	**n/a**	**0.06**	**1**	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Metals																					
Aluminum	**0.075**	**0.005**	**0.1**	<0.010	<0.0050	0.0298	0.0202	0.118	0.0473	0.022	0.0052	0.018	0.0116	0.0219	0.0865	<0.010	<0.0050	0.0106	0.0113	0.0125	0.0094
Cadmium	**0.0005**	**0.00004**	**0.005**	<0.000010	<0.000010	<0.000010	<0.0000050	0.000022	<0.0000050	<0.000010	<0.000010	<0.000010	<0.0000050	<0.0000050	0.0000201	<0.000010	<0.000010	<0.000010	<0.0000050	<0.0000050	<0.0000050
Chromium	**n/a**	**0.001**	**0.05**	<0.00050	<0.00050	<0.00050	<0.00050	0.00064	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00083	<0.00050	<0.00050	<0.00050	0.00051	<0.00050	<0.00050	<0.00050
Copper	**0.001^2**	**0.002**	**1**	<0.0010	<0.0010	0.0013	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0012	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Iron	**0.3**	**0.3**	**0.3**	<0.050	0.081	0.084	0.07	1.36	0.263	0.248	0.415	0.178	0.136	0.634	0.349	0.128	0.162	<0.050	0.124	0.323	0.127
Lead	**0.0012**	**0.001**	**n/a**	0.000119	<0.000050	0.000307	0.000191	0.00113	0.000348	0.000235	0.000082	0.000162	0.000086	0.000268	0.000387	0.000152	<0.000050	<0.000050	0.00015	0.000175	0.000107
Manganese	**n/a**	**n/a**	**0.05**	0.0223	0.0192	0.0278	0.0233	0.037	0.0151	0.0254	0.138	0.027	0.0231	0.191	0.02	0.00899	0.0192	0.00123	0.0301	0.0389	0.0194
Zinc	**0.02**	**0.03**	**5**	<0.0030	<0.0030	0.0038	<0.0030	0.0422	0.0059	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	0.0106	<0.0030	<0.0030	<0.0030	<0.0030	0.0036	<0.0030

Table 4.2.9d **Comparison of Measured Concentrations for Key Wetland Water Quality Parameters 2017 and 2018**

Location				Station 11						Station 12						Station 13					
Parameter (mg/L)	**PWQO (Yellow)**	**CEQG (Blue)**	**CDWQ (Orange)**	**01-May-17**	**10-Aug-17**	**03-Nov-17**	**26-Apr-18**	**24-Aug-18**	**02-Nov-18**	**01-May-17**	**10-Aug-17**	**03-Nov-17**	**26-Apr-18**	**24-Aug-18**	**02-Nov-18**	**01-May-17**	**10-Aug-17**	**03-Nov-17**	**26-Apr-18**	**24-Aug-18**	**02-Nov-18**
Nutrients																					
TSS	**n/a**	**n/a**	**n/a**	<2.0	24.1	23.2	<2.0	88	7.9	16.9	14.3	n/a	8	n/a	n/a	4.5	6.8	15.6	3.5	19.2	9.1
Chloride	**n/a**	**n/a**	**120**	96.9	351	179	86.1	405	64.5	71.3	207	n/a	50.4	n/a	n/a	166	179	177	175	196	181
TKN	**n/a**	**n/a**	**n/a**	1.06	3.75	2.6	0.78	4.18	1.16	0.85	0.61	n/a	0.31	n/a	n/a	1.01	1.37	1.16	0.51	2.57	0.65
Ortho-P	**n/a**	**n/a**	**n/a**	0.0072	0.0382	0.173	0.0077	0.068	0.0058	0.0108	<0.0030	n/a	<0.0030	n/a	n/a	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
Total P	**0.03**	**n/a**	**n/a**	0.0311	0.189	0.362	0.0246	0.681	0.0632	0.129	0.0216	n/a	0.0326	n/a	n/a	0.0316	0.133	0.0363	0.0139	0.0718	0.025
Sulfate	**n/a**	**n/a**	**500**	3.59	1.25	17.3	6.02	1.94	10.5	3.7	2.27	n/a	5.79	n/a	n/a	2.08	1.95	1.28	2.13	1.13	1.65
Ammonia	**0.021**	**n/a**	**n/a**	0.067	0.069	0.66	0.025	0.22	0.707	0.035	<0.020	n/a	<0.020	n/a	n/a	0.059	0.063	<0.020	0.041	0.088	0.056
Nitrate	**n/a**	**3**	**10**	0.02	<0.020	0.048	<0.020	0.025	0.031	0.059	<0.020	n/a	0.021	n/a	n/a	<0.020	<0.020	<0.020	0.032	0.023	0.051
Nitrite	**n/a**	**0.06**	**1**	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	n/a	<0.010	n/a	n/a	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Metals																					
Aluminum	**0.075**	**0.005**	**0.1**	0.036	0.0283	0.0529	0.0407	0.11	0.065	2.61	0.0693	n/a	0.553	n/a	n/a	0.021	0.0149	0.0327	0.022	0.0287	0.0281
Cadmium	**0.0005**	**0.00004**	**0.005**	0.000011	<0.000010	0.000025	0.000015	<0.0000050	0.0000408	0.00019	0.000018	n/a	0.000043	n/a	n/a	<0.000010	<0.000010	<0.000010	0.000007	<0.0000050	0.0000054
Chromium	**n/a**	**0.001**	**0.05**	<0.00050	<0.00050	0.0006	<0.00050	0.00062	<0.00050	0.00454	<0.00050	n/a	0.00103	n/a	n/a	<0.00050	<0.00050	0.00069	<0.00050	<0.00050	<0.00050
Copper	**0.001[2]**	**0.002**	**1**	<0.0010	<0.0010	0.001	<0.0010	0.0011	0.0014	0.012	<0.0010	n/a	0.0032	n/a	n/a	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Iron	**0.3**	**0.3**	**0.3**	0.313	1.32	1.02	0.174	1.2	0.217	3.82	1	n/a	0.621	n/a	n/a	0.093	0.235	0.338	0.105	0.276	0.113
Lead	**0.0012**	**0.001**	**n/a**	0.000224	0.000183	0.000408	0.0002	0.000939	0.000549	0.0204	0.000622	n/a	0.00337	n/a	n/a	0.000365	0.00015	0.000557	0.000344	0.000315	0.000271
Manganese	**n/a**	**n/a**	**0.05**	0.0247	1.69	0.688	0.0157	0.817	0.116	0.246	0.561	n/a	0.0839	n/a	n/a	0.0482	0.145	0.126	0.0223	0.107	0.0211
Zinc	**0.02**	**0.03**	**5**	0.0038	0.004	0.0136	0.0053	0.012	0.0153	0.0838	0.0088	n/a	0.0184	n/a	n/a	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030

LEGEND: Exceedances based on PWQO have been highlighted in yellow, CEQG in blue, and CDWQ guidelines in orange. **Results that exceed more than one threshold are highlighted in red**

Notes:
[1] PWQO is for un-ionized Ammonia
[2] PWQO varies with hardness as CaCO3, value presented is most stringent limit (lead) or based on initial PWQO (Aluminium)
n/a Not available due to dry conditions or shallow water
Yellow: Exceeds PWQO
Blue: Exceeds CEQG
Orange: Exceeds CDWQ
Red: Exceeds more than one guideline (PWQO, CEQG and CDWQ)

Table 4.2.10 Comparison of Measured Concentrations for Key Water Quality Parameters 2017 and 2018 at Flow Stations 14 and 15

Location				Station 14												Station 15											
Parameter (mg/L)	PWQO (Yellow)	CEQG (Blue)	CDWQ (Orange)	April 28,2017	01-May-17	10-Aug-17	05-Sep-17	03-Oct-17	03-Nov-17	26-Apr-18	08-May-18	08-Aug-18	24-Aug-18	26-Oct-18	02-Nov-18	April 28,2017	01-May-17	10-Aug-17	05-Sep-17	03-Oct-17	03-Nov-17	26-Apr-18	08-May-18	08-Aug-18	24-Aug-18	26-Oct-18	02-Nov-18
Nutrients																											
TSS	**n/a**	**n/a**	**n/a**	<2.0	4.5	2.7	3.9	<2.0	<2.0	<2.0	<2.0	4.2	<2.0	<2.0	3.8	3.5	3.3	2.9	<2.0	<2.0	2.7	2.3	2.2	<2.0	<2.0	<2.0	3.5
Chloride	**n/a**	**n/a**	**120**	20.4	12.3	37.9	33.8	38.7	29.5	12.5	24.9	22.8	37.2	37.5	13.4	246	165	184	196	194	195	199	213	180	176	188	140
TKN	**n/a**	**n/a**	**n/a**	0.33	0.38	0.17	0.22	<0.15	0.36	0.35	0.26	0.36	0.19	<0.15	1.25	0.49	0.6	0.61	0.41	0.21	0.51	0.46	0.37	0.36	0.47	0.35	0.68
Ortho-P	**n/a**	**n/a**	**n/a**	0.0035	0.0033	0.006	N/A	N/A	0.0103	0.0049	0.0076	0.0281	0.0125	0.0037	0.0154	<0.0030	<0.0030	0.0044	N/A	N/A	<0.0030	<0.0030	<0.0030	0.0062	<0.0030	<0.0030	0.0083
Total P	**0.03**	**n/a**	**n/a**	0.008	0.0103	0.0067	0.0105	0.0042	0.0389	0.0137	0.013	0.0343	0.0118	<0.0030	0.031	0.0106	0.0087	0.0065	0.0048	0.0044	0.0099	0.0089	0.0054	0.0101	0.0091	<0.0030	0.0326
Sulfate	**n/a**	**n/a**	**500**	10.7	7.6	18.7	15.5	18.2	13.4	7.51	11.8	9.71	17.1	16.9	12.4	20.9	14.7	18.3	17.8	17.9	19.6	20.1	11.9	17.2	18.6	21.6	14.6
Ammonia	**0.021**	**n/a**	**n/a**	<0.020	0.159	<0.020	0.194	0.067	0.036	0.052	0.042	0.086	0.03	<0.020	<0.020	0.029	0.065	<0.020	0.212	0.116	0.194	0.134	0.031	0.083	0.169	0.057	0.178
Nitrate	**n/a**	**3**	**10**	0.298	0.153	0.678	0.551	0.689	0.431	0.203	0.477	0.378	0.85	0.845	0.175	2.73	2.03	2.35	2.53	2.65	2.77	2.44	2.62	2.26	2.42	2.7	1.35
Nitrite	**n/a**	**0.06**	**1**	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Metals																											
Aluminum	**0.075**	**0.005**	**0.1**	<0.0010	0.016	0.0101	0.0115	<0.0050	0.0098	0.0054	0.006	0.0148	0.0077	<0.0050	0.0106	0.019	0.02	0.0065	0.0058	<0.0050	0.0238	0.0134	0.0073	0.0098	0.0068	0.0075	0.336
Cadmium	**0.0005**	**0.00004**	**0.005**	0.000028	0.000064	0.000075	0.000076	0.000057	0.000061	0.000019	0.0000254	0.0000756	0.0000547	0.000027	0.0000311	0.000034	0.000029	0.000018	0.000016	0.000022	0.000029	0.000027	0.0000268	0.000015	0.0000147	0.0000129	0.0000264
Chromium	**n/a**	**0.001**	**0.05**	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00055	<0.00050	<0.00050	<0.00050	0.00057	<0.00050	0.00099
Copper	**0.001[2]**	**0.002**	**1**	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0019
Iron	**0.3**	**0.3**	**0.3**	<0.050	0.063	<0.050	0.056	<0.050	<0.050	0.035	0.021	0.116	0.033	<0.0010	0.073	0.143	0.149	0.139	0.128	0.113	0.184	0.109	0.127	0.276	0.228	0.111	0.481
Lead	**0.0012**	**0.001**	**n/a**	<0.000050	0.000166	0.000112	0.00013	<0.000050	0.000099	<0.000050	<0.000050	0.000186	0.000089	<0.000050	0.000101	0.000204	0.000175	0.000083	0.000116	0.000079	0.000217	0.000152	0.000114	0.000094	0.000089	0.000081	0.00145
Manganese	**n/a**	**n/a**	**0.05**	0.00635	0.0173	0.0163	0.0501	0.0133	0.0219	0.0152	0.0068	0.072	0.0202	0.00844	0.026	0.0417	0.0444	0.0179	0.0129	0.0279	0.0518	0.0306	0.0337	0.0615	0.0335	0.0205	0.0286
Zinc	**0.02**	**0.03**	**5**	0.0506	0.0471	0.0871	0.0823	0.0864	0.071	0.027	0.0509	0.071	0.0705	0.0733	0.0342	0.0085	0.0087	0.0053	0.0055	0.0058	0.0074	0.0058	0.0076	0.0054	0.0051	0.0057	0.012

LEGEND: Exceedances based on PWQO have been highlighted in yellow, CEQG in blue, and CDWQ guidelines in orange. **Results that exceed more than one threshold are highlighted in red**

Notes:
[1] PWQO is for un-ionized Ammonia
[2] PWQO varies with hardness as CaCO3, value presented is most stringent limit (lead) or based on initial PWQO (Aluminium)
n/a Not available
Yellow: Exceeds PWQO
Blue: Exceeds CEQG
Orange: Exceeds CDWQ
Red: Exceeds more than one guideline (PWQO, CEQG and CDWQ)

Table 4.2.11 Comparison of Field Measured Parameters at a Wetland (7) and a Flow (14) Station in 2016, 2017 and 2018

Date	Air Temperature (deg C)	Location	Field Water Temperature (deg C)	Field Conductivity (mS/cm)	Laboratory Total Dissolved Solids (mg/L)	Field Dissolved Oxygen (mg/L)	Field pH
August 4, 2016	29.9	Station 7	23.01	0.214	178	4.44	7.12
		Station 14	10.97	0.441	388	13.51	7.52
August 17, 2016	25.4	Station 7	23.20	NA	170	2.97	8.13
		Station 14	12.30	NA	362	10.04	8.71
Sept. 22, 2016	27.6	Station 7	19.19	0.272	149	0.95	5.79
		Station 14	12.53	0.474	379	13.30	7.11
October 20, 2016	11.5	Station 7	13.394	NA	153	9.42	6.70
		Station 14	10.211	NA	350	9.59	7.46
April 28, 2017	16.3	Station 14	9.45	0.430	284	12.06	7.25
		Station 15	12.41	1.45	272	13.38	7.27
May 1, 2017	7.7	Station 1	10.76	0.332	189	9.89	7.45
		Station 2	11.01	0.260	156	9.88	7.42
		Station 3	10.88	0.591	435	7.68	7.26
		Station 4	8.07	0.370	189	4.10	6.85
		Station 5	9.47	0.369	257	9.76	7.22
		Station 6	9.61	0.308	205	9.18	7.66
		Station 7	11.85	0.195	135	9.00	7.33
		Station 8	10.4	0.171	117	4.05	6.84
		Station 10	10.54	0.234	153	9.71	7.40
		Station 11	8.97	0.549	393	9.30	7.27
		Station 12	10.60	0.400	347	9.91	7.81
		Station 13	11.66	0.868	440	9.66	7.47
		Station 14	8.09	0.347	242	10.87	7.34
		Station 15	10.07	0.936	613	12.08	7.40
August 10, 2017	24.5	Station 1	19.9	0.306	148	4.69	6.61
		Station 2	21.5	0.231	135	4.22	7.37
		Station 3	19.9	0.75	416	3.26	7.2
		Station 4	17.0	0.277	184	1.10	6.56
		Station 5	16.7	0.547	218	0.61	6.39
		Station 6	17.9	0.449	235	2.29	7.12
		Station 7	21.7	0.265	155	2.97	6.98
		Station 8	19.1	0.279	170	1.27	6.51
		Station 10	20.8	0.329	175	5.64	7.28
		Station 11	18.8	1.48	1070	1.26	7.00
		Station 12	17.8	1.13	803	2.02	6.01
		Station 13	26.2	0.77	392	5.59	8.20
		Station 14	12.2	0.649	364	9.78	7.66
		Station 15	20.8	1.11	626	10.7	7.61
September 5, 2017	17.4	Station 14	11.2	0.613	360	9.17	7.84
		Station 15	17.4	1.127	654	12.06	7.56
October 3, 2017	24.6	Station 14	N/A	N/A	391	N/A	N/A
		Station 15	N/A	N/A	664	N/A	N/A

Table 4.2.11 Comparison of Field Measured Parameters at a Wetland (7) and a Flow (14) Station in 2016, 2017 and 2018

Date	Air Temperature (deg C)	Location	Field Water Temperature (deg C)	Field Conductivity (mS/cm)	Laboratory Total Dissolved Solids (mg/L)	Field Dissolved Oxygen (mg/L)	Field pH
November 3, 2017	10.7	Station 1	7.98	0.293	163	13.97	7.89
		Station 2	8.39	0.233	108	13.47	8.01
		Station 3	10.27	0.799	386	9.17	7.25
		Station 4	N/A	N/A	N/A	N/A	N/A
		Station 5	9.70	0.575	271	5.22	6.84
		Station 6	8.72	0.423	175	7.94	6.90
		Station 7	8.24	0.252	156	8.04	7.33
		Station 8	8.28	0.237	148	9.73	7.25
		Station 10	7.58	0.298	164	12.21	7.70
		Station 11	9.43	1.009	631	2.90	6.85
		Station 12	N/A	N/A	N/A	N/A	N/A
		Station 13	8.63	0.820	399	12.23	7.98
		Station 14	8.26	0.557	292	12.24	7.82
		Station 15	12.57	1.133	661	13.01	7.74
April 26, 2018	12	Station 1	8.68	0.207	167	13.07	8.10
		Station 2	9.82	0.165	115	10.57	7.58
		Station 3	9.99	0.544	407	9.63	7.44
		Station 4	1.25	0.185	144	4.81	6.25
		Station 5	7.10	0.240	205	7.80	6.79
		Station 6	7.34	0.139	111	8.64	6.73
		Station 7	10.55	0.143	116	11.13	6.61
		Station 8	8.99	0.104	73	6.74	6.07
		Station 10	9.89	0.176	136	7.57	7.21
		Station 11	10.52	0.431	319	6.71	6.52
		Station 12	7.21	0.473	303	6.27	7.11
		Station 13	11.00	0.595	419	11.68	8.55
		Station 14	5.75	0.255	221	10.09	7.31
		Station 15	13.49	0.876	610	12.81	7.55
May 8, 2018	20	Station 14	11.17	0.519	296	9.42	7.89
		Station 15	14.23	1.16	687	8.42	7.64
August 8, 2018	22	Station 14	15.35	0.391	301	6.15	7.75
		Station 15	17.35	0.899	586	8.81	7.48
August 24, 2018	21	Station 1	19.19	0.218	147	6.02	7.76
		Station 2	18.99	0.277	180	4.65	7.24
		Station 3	18.03	0.640	422	2.52	6.92
		Station 4	Dry	Dry	Dry	Dry	Dry
		Station 5	21.95	0.427	262	4.66	7.05
		Station 6	16.18	0.316	218	0.31	6.25
		Station 7	17.24	0.192	113	3.24	6.55
		Station 8	16.07	0.184	177	1.29	6.15
		Station 10	17.47	0.292	187	1.71	6.77
		Station 11	16.93	1.398	1170	1.10	7.61
		Station 12	Dry	Dry	Dry	Dry	Dry

Table 4.2.11 Comparison of Field Measured Parameters at a Wetland (7) and a Flow (14) Station in 2016, 2017 and 2018

Date	Air Temperature (deg C)	Location	Field Water Temperature (deg C)	Field Conductivity (mS/cm)	Laboratory Total Dissolved Solids (mg/L)	Field Dissolved Oxygen (mg/L)	Field pH
		Station 13	22.52	0.783	419	8.15	8.76
		Station 14	11.13	0.481	366	11.02	7.61
		Station 15	17.24	0.924	575	11.63	7.25
October 26, 2018	8	Station 14	7.17	0.405	357	15.60	8.03
		Station 15	12.00	0.836	631	15.95	7.81
November 2, 2018	3	Station 1	6.92	0.169	145	11.07	7.16
		Station 2	6.98	0.186	164	9.20	7.06
		Station 3	6.25	0.237	237	5.65	6.68
		Station 4	4.99	0.107	111	5.46	6.13
		Station 5	7.34	0.264	307	5.35	6.83
		Station 6	6.84	0.063	59	6.48	6.60
		Station 7	6.61	0.099	94	7.03	6.72
		Station 8	5.20	0.183	144	6.35	6.53
		Station 10	5.57	0.204	180	6.64	6.51
		Station 11	6.77	0.333	296	4.77	6.71
		Station 12	Dry	Dry	Dry	Dry	Dry
		Station 13	6.80	0.502	421	8.42	7.55
		Station 14	6.03	0.249	249	8.52	7.29
		Station 15	8.67	0.539	462	10.89	7.24

Notes: Dry - station was dry at time of sample

Notable water quality results from wetland and flow stations included frequent Ammonia exceedances and exceedances for Total Phosphorus, Aluminium, Copper, Iron, Lead, and Zinc at various sampling stations at different times of the year in both 2016, 2017 and 2018. These findings are discussed below. A summary of the total number of water quality exceedances in 2016, 2017 and 2018 for the various parameters assessed is provided in Table 4.2.12 and 4.2.13 below.

Nutrients

- For Ammonia, a threshold only exists under PWQO, not CEQG or CDWQ. Exceedances were documented in 2016, 2017 and 2018 for Total Ammonia at a number of stations throughout the PSA.
  - Regular Ammonia exceedances were documented at Station 7 in 2016, 2017 and 2018.
  - In 2017 and 2018 regular Ammonia exceedances were documented at half of the stations (i.e., 5, 6, 7, 8, 11, 13, 14).
  - In spring 2018, Ammonia exceedances were documented at all sampling stations except Stations 3 and 12 in the dry sampling period.
  - In summer of 2018, Ammonia exceedances were documented at all sampling stations except Stations 4, 10, and 12 during the summer sampling under dry conditions.
  - Widespread exceedances of Ammonia may be attributed to runoff from adjacent agricultural or golf course nutrient applications in the spring. In addition, both the Hall's Pond subwatershed within the Hanlon Creek and the Mill Creek Subwatershed possess well-drained, hummocky headwater areas in the PSA which may facilitate leaching.
- Several exceedances for Total Phosphorus were documented in a number of the wetland stations but not the flow stations during the spring, summer and fall sampling events sampling events between 2016 and 2018.
  - In Station 1, the Neumann Pond Wetland, which is currently known to be maintained entirely by precipitation and surface runoff (NSE 2015), phosphorus inputs are presumed to be from runoff from the adjacent agricultural lands. Comparable exceedances close to Station 1 were previously documented in the 2013/2014 Monitoring Report for the Bird Subdivision (i.e., 0.074 mg/L) (BluePlan Engineering 2014).
  - In 2017 and 2018, exceedances for Total Phosphorus were recorded at Stations 5, 6, and 11 during the August sampling events, and Station 3 during the November sampling events.
  - Exceedances for Total Phosphorous were documented at Station 7 in 2016, 2017 and 2018.
  - These Stations all exist within proximity to lands currently used for agriculture or golf course uses where additional nutrients may be introduced to the groundwater and surface water through leaching and runoff.
- None of the reference documents provide specific thresholds for Total Suspended Solids (TSS), for background conditions within natural surface water systems. The majority of the wetland sites (i.e., Stations 1, 2, 5, 6, 7, 8, 11 and 13) exhibited relatively high measurements for TSS in both 2017 and 2018 as compared to flowing systems, in particular during the late summer sampling events. Such measurements are anticipated for wetlands which are somewhat stagnant and particularly in locations where standing vegetation (biomass) is accumulating over the season in conjunction with seasonal declines in the water levels.

- For Total Dissolved Solids (TDS) CDWQ standards provide a threshold of 500 mg/L (Health Canada 2014).
    - Exceedances for TDS were documented at Station 15 (in Hanlon Creek outside the PSA) throughout 2017 and in 2018 with the exception the April 28, 2017 dry sampling event the November 2018 wet sampling event. Station 15 consists of an actively flowing system downstream of an online storm water management facility.
    - Exceedances were also documented at Station 11 and 12 (both adjacent to Maltby Road) during the August 10, 2017 sampling event with levels of 1070 mg/L and 803 mg/L, respectively.
- PWQO, CEQG and CDWQ do not provide thresholds for Total Kjeldahl Nitrogen (TKN) or Orthophosphate:
    - In 2017, for TKN, the majority of samples from 2017 resulted in levels between 0.3 to 2.0 mg/L, with the higher levels being found at Station 11 (3.75 mg/L) on August 10, and Stations 3 (4.22 mg/L), 5 (3.48 mg/L), and 11 (2.6mg/L) on November 3, 2017.
    - In 2018, for TKN,, the majority of samples from 2018 resulted in levels between 0.2 to 4.0 mg/L, with the highest level being found at Station 1 (7.8 mg/L) on August 24.
    - The highest levels of Orthophosphate were documented from Station 11 in both 2017 (0.0382 mg/L on August 10, 2017) and 2018 (0.068 mg/L on August 24, 2018). Notably, Orthophosphate results were not provided from the September 5 or October 3 2017 sampling events due to laboratory error.
- Sulfate concentrations were relatively low at all stations in both 2017 and 2018 compared to the thresholds set by CDWQ of 500 mg/L (Health Canada 2014). The highest recorded measurements were at Station 15 - 20.9mg/L on April 28, 2017 and 21.6 mg/L on October 26, 2018. Station 15 was relatively high across the 2017 and 2018 sampling events.
- Thresholds exist for both Nitrate and Nitrite in the CEQG and CDWQ. However, no exceedances were documented for either parameter during the 2017 or 2018 monitoring seasons.
- Acceptable Chloride levels under CEQG are defined at up to 120 mg/L (CCME 1999). CWDQ sets a much higher limit of up to 250 mg/L (Health Canada 2014). Within Table 4.2.9, Chloride exceedances were documented at several stations over 2017 and 2018, primarily at stations close to roads (i.e., Stations 3, 11 and 13) and at Station 15, downstream of a stormwater management facility. Station 15 exceeded the Chloride threshold in all sampling events of 2017 and 2018.

Metals

- Exceedances of Aluminum were observed in 2016, 2017 and 2018 when compared to the CEQG standard of 0.005 mg/L (CCME 1999).
    - One such exceedance was documented at Station 7 in Hall's Pond in 2016 but not at flow Station 14 in the Mill Creek watershed, the only other Station sampled in that year.
    - During the November 3, 2017 event all stations sampled exceeded this limit.
    - For PWQO limits, which are higher, only one (1) exceedance was recorded during the 2017 sampling events at Station 12 in spring.
    - During the April 26 and August 24, 2018 events all stations sampled exceeded this limit except for Station 4 which was too shallow to sample and Station 12 that was dry during the August event.

  - Using the higher PWQO limits, nine exceedances were recorded during the 2018 sampling events. In April, Station 12 exceeded the PWQO limits. In August Stations 1, 2, 7, 11 and 14 and in November Station 6 and 15 exceeded this limit.
  - Station 12 is within a few metres of an active roadway which may influence the wetland's water chemistry as a result of road runoff, but this would not explain the regular exceedances at stations further from roads.
- Cadmium has limit of 0.00004 mg/L under the CEQG (CCME 1999).
  - Flow Station 14 revealed repeated exceedances of Cadmium in 2017 and 2018. Station 12 also exceeded CEQG standards once on May 1, 2017.
  - In 2018, sampling at Stations 1, 2, 11, 14 revealed repeated exceedances of Cadmium during the August sampling event. In April, Station 12 exceeded the CEQG limit.
- Chromium exceeded the established thresholds on two occasions at two individual Stations during the 2017 and 2018 monitoring seasons. Station 12 (0.00454 mg/L) on May 1, 2017 and Station 6 (0.00169 mg/L) on November 3, 2017, and Station 1 (0.00118mg/L) and Station 2 (0.00105mg/L) on August 24, 2018.
- A number of exceedances were documented for Copper in 2017 and 2018, mostly under the PWQO standards which are set at a more restrictive level of 0.001 mg/L (PWQO 1994). However, Stations 1, 2, 5, and 12 were found to exceed the less restrictive CEQG limit of 0.002 mg/L (CCME 1999) as well.
  - In November 2017, Stations 2, 3 and 7 were had Copper levels slightly above the PWQO standard. These exceedances were recorded during sampling events that followed precipitation (i.e., wet events) where surface runoff from surrounding lands may influence sample results.
  - In 2018, Station 12 exceeded both PWQO and CEQG limits in April, Stations 1 and 2 exceeded in August, Station 5 exceeded in November, Station 11 exceeded the PWQO limit in August, and in November Stations 4, 8, 11 and 15 exceeded as well. Most exceedances were recorded during a dry event and observed when TSS levels were high.
- Thresholds for Iron are set at 0.3 mg/L for all three water quality criteria sets used in this study.
  - Exceedances for Iron were recorded sporadically throughout the 2017 monitoring season at several different Stations, and at Station 7 in 2016. The highest Iron levels were recorded at Stations 11 and 12.
  - Exceedances for Iron were recorded sporadically throughout the 2018 monitoring season at several different Stations (i.e., 1, 2, 4, 5, 6, 7, 8, 10, 11, 12, 15). The highest Iron levels were recorded at Stations 6 and 12.
  - Typically, high iron levels are a natural occurrence in areas where groundwater inputs exist as documented within the Mill Creek Subwatershed Plan (CH2M, Gopre & Storrie *et al.,* 1996).
- The threshold for Lead is 0.001 mg/L for both the PWQO and CEQG.
  - For Lead, one exceedance was recorded in 2017 at Station 12 during the May, 2017 sampling event and one was recorded at Station 7 in 2016.
  - Additional exceedances were recorded in 2018 at Station 12 during the April sampling event, and at Stations 1, 2, and 7 in August and Station 15 in November.
  - Close proximity to an active roadway and influence of road runoff can be a factor, but not all exceedances were documented in stations near roads.

- Manganese has a threshold of 0.05 mg/L under the CDWQ criteria (Health Canada 2014). Exceedances were observed throughout the 2017 and 2018 monitoring season at various stations. An increased number of exceedances were observed during, and after, the August, 2017 and August 2018 sampling events.
- During some sample events in 2016 and all sample events in 2017 and 2018, Station 14 was found to exceed the PWQO level for Zinc. The Mill Creek Subwatershed Plan (1996) groundwater quality samples documented high levels of Zinc. Due to the likelihood of groundwater inputs at Station 14 (as indicated by consistently low summer temperature readings in 2016 and 2017), it is possible that these exceedances are a natural occurrence.
  - In 2017, Zinc exceedances were also recorded at Station 12 (also in Mill Creek Subwatershed) during the May and November sampling events.
  - Zinc exceedances were also recorded at Stations 1, 2 and 7 in August 2018, which are not in the Mill Creek Subwatershed.

Water quality results for August 24th, 2018 (dry event) for Stations 1, 2, 5, 6, 7, 8, 11, and 13 observed higher than normal TSS levels and high metal concentrations compared to background. These results are considered natural variation within the wetland features and were not observed in Stations 14 and 15 which are flowing waters.

Pesticides

- For pesticides, sampling was conducted in conjunction with the fall wetland water quality sampling on November 3, 2017. No exceedances based on the available thresholds were recorded at any of the stations. However, Endosulfan, Endrin, Hexachlorobenzene, Hexachloroethane, and Methoxychlor were detected at limits that were higher than the established PWQO and CEQW standards. The complete set of results is provided in Appendix SW-1D.

Table 4.2.12 Summary of PWQO Exceedances for the 2016 Monitoring Program

Date	Total Number of PWQO/CEQG/CDWQ Exceedances by Location	
	Station 7	Station 14
August 4, 2016	3/1/1	1/2/0
August 17, 2016	2/1/1	2/2/0
Sept. 22, 2016	5/3/2	2/2/0
October 20, 2016	2/0/0	1/1/0

Table 4.2.13 Summary of PWQO, CEQG, CDWQ Exceedances for the 2017-2018 Monitoring Program

Date	Station													
	1	2	3	4	5	6	7	8	10	11	12	13	14	15
April 28, 2017													1	3
May 1, 2017	4	1	3	3	2	1	2	3	1	4	9	4	4	3
August 10, 2017	4	3	6	2	3	2	2	5	0	5	4	4	3	2
September 5, 2017													5	3
October 3, 2017													3	2
November 3, 2017	4	4	6	n/a	5	6	4	2	2	7	0	5	5	4
April 26, 2018	4	2	3	2	3	3	3	2	2	2	7	3	3	3
May 8, 2018													3	3
August 8, 2018													5	3
August 24, 2018	10	10	4	n/a	5	5	6	5	3	7	n/a	5	4	3
October 26, 2018													1	3
November 2, 2018	5	7	4	5	4	3	3	5	2	6	n/a	3	3	7

Note: Data gaps in the table are explained by the fact that wetland Stations 1 through 13 (excluding 9, which had no standing water) were sampled once in the spring under wet conditions, once in the summer under dry conditions and once in the fall under wet conditions. Flow Stations 14 and 15 were each sampled under both wet and dry conditions in the spring, summer and fall. Stations 1 and 2 were sampled on November 9. Not applicable indicates a dry station.

4.3 Groundwater

The groundwater field program was designed to support refinements to the existing hydrogeological characterization and establish baseline conditions within the SPA and PSA. An understanding of the three dimensional and time-varying (e.g., seasonal) characteristics of the integrated surface water and groundwater flow systems will be required to support the establishment of Community Structure plans for the SPA. In addition, the field program will contribute to a water balance evaluation of groundwater function, identify constraints and opportunities, and provide monitoring locations that will form part of the long-term monitoring network.

The groundwater field work was coordinated with the work being completed by the other disciplines in recognition of the inter-relationship between the hydrogeological and hydrologic systems, other users of water for anthropogenic needs, and the local ecosystem.

Details of the field work completed in 2016 can be found in the Year 1 Monitoring Report (Amec Foster Wheeler, 2017). Field work initiated and completed in 2016 included:

- Borehole Drilling and Monitoring Well Installations
- Downhole Geophysical Logging
- Drive Point Mini Piezometer Installations
- Single Well Hydraulic Response Testing
- Guelph Permeameter Testing
- Pond Bathymetry Surveys

This section provides the methodology used by Matrix Solutions Inc. (Matrix) to complete the hydrogeological field program, as well as presents the monitoring results. Specifically, the 2017 and 2018 field program included the following ongoing data collection that was first initiated in 2016:

- Groundwater Level Monitoring
- Groundwater Quality Sampling
- Surface Water Base Flow Measurements
- Seeps and Springs Observations

The Phase 1 and 2 Characterization Report (Wood, 2018) provided the detailed interpretation and assessment of the groundwater data and related data from other study components which provided the summary of the conceptual understanding of the groundwater flow system in the study area

4.3.1 Summary of 2016 Borehole Drilling and Monitoring Well Installations

A drilling and well installation program was completed between July 25 and August 24, 2016. The installation of monitoring wells was intended to understand the function of the upper aquifer(s), vertical gradients, groundwater flow directions, and to collect water quality samples.

In total, 17 boreholes at 9 locations were advanced and all boreholes were completed as monitoring wells. The borehole locations were strategically positioned across the study area in a series of three transects trending northwest to southeast with each transect crossing a topographic low through the centre of the transect (Map GW-1). At each location, one shallow and one deep 152 mm borehole was drilled side by side and completed as an overburden monitoring well nest; except at MW07, where only one well was completed due to the availability of existing shallow monitoring wells in the area. The target depth for each deep borehole was just above the top of bedrock, which was guided by the City's Tier Three Water Budget Study. Monitoring well completion data are summarized in Appendix GW-1 (Table GW1.1). Geologic logs indicating borehole lithology and monitoring well construction details are provided in Appendix GW-2. Further details of the borehole drilling methods are described in the Year 1 Monitoring Report (Amec Foster Wheeler, 2017).

Matrix monitoring wells were installed in the following stratigraphic layers:

- MW01-S, MW02-S, MW02-D, MW03-S, MW03-D, MW05-S, MW05-D, MW06-S, MW06 D, MW07-D, MW08-S, MW08-D and MW09-S were completed in primarily sand/gravel to silty sand
- MW01-D, MW04-S, MW04-D, and MW09-D were completed in clayey to sandy silt

4.3.2 Summary of 2016 Drive Point Mini Piezometer Installations

In August and September 2016, a total of 18 drive point mini piezometers were installed by Matrix personnel at 14 wetland locations identified as areas of potential groundwater – surface water interaction and where property access was granted (Map GW-1). These locations were also coordinated with the wetland surface water quantity and quality stations, as well as flow stations where possible (Map SW-1). At four of the locations, pairs of shallow and deep mini piezometers were installed to more closely examine vertical hydraulic gradients. Installation details and observed vertical hydraulic gradients are presented in Appendix GW-1 (Table GW1.2). Further details of the installation are described in the Year 1 Monitoring Report (Amec Foster Wheeler, 2017).

The nested mini piezometers MP13-D and MP13-S were destroyed during a highway traffic collision in August 2017. Data were recovered from MP13-D but have not been successfully recovered from MP13-S.

4.3.3 Groundwater Level Monitoring

Groundwater levels were monitored at all monitoring wells and mini piezometers from their installation in 2016 through 2018 (Map GW-1) with the exception of the mini piezometers during the winter months and MP13-S and MP13-D following their destruction in August 2017. Three additional, pre-existing wells (MW1-11, MW2-11, and MW3-11) located at 132 Clair Road were also monitored with the landowner's permission (Map GW-1). All wells and piezometers were monitored using manual measurements approximately every three months and, with the exception of MW1-11 and MW2-11, were all equipped with a Solinst™ Levelogger Model 3001 non-vented pressure transducer automatically recording every 60 minutes. The pressure transducers were removed from the mini piezometers between December 13, 2016 and April 18, 2017, and between November 17, 2017 and April 17, 2018 to protect them from freezing. Data from a Solinst™ Barologger recording atmospheric pressure at MW02-S were used to correct the water level pressure recordings to gauge pressure. The manual water level was measured at each well and piezometer relative to the top of the PVC/steel pipe using a Solinst™ electronic water level tape.

Groundwater elevations at each station were calculated by subtracting measured depths to water from the surveyed top of casing/pipe elevations. Manual groundwater levels obtained from the monitoring wells and mini piezometers since their installation are presented in Appendix GW-1 (Table GW1.1 and Table GW1.2, respectively). Hydrographs can be found in Appendix GW-3 presenting groundwater fluctuations in each monitoring well outfitted with a pressure transducer. Wetland hydrographs are also included in Appendix GW-3 and include automatically recorded shallow groundwater elevations in the mini piezometers, surface water elevations and, where in close proximity to monitoring wells, deep overburden groundwater elevations are also included.

4.3.3.1 Monitoring Well Hydrographs

The monitoring well hydrographs show that the overburden groundwater elevations have fluctuated seasonally and reached a peak during the late spring or early summer of each year, with the lowest elevations occurring in December, January or February. The majority of monitoring wells show water levels varying between 330 masl to 335 masl.. The vertical groundwater flow gradients can be determined for a given monitoring well nest by comparing the recorded groundwater elevations in each of the nested wells that make up a well pair. Where the shallow groundwater elevation exceeds the deeper groundwater elevations the flow gradient is downwards. Where the gradient is reversed, groundwater flows upwards through the saturated zone. All monitoring well hydrographs show a downward groundwater flow gradient, except at MW9-D and MW9-S where the hydraulic gradient is consistently upwards throughout all seasons.

The monitoring well hydrographs show a series of distinct groundwater drawdown events that occurred between August and September 2017, and June and September 2018, at the following monitoring wells listed from largest drawdown to smallest:

- MW4-D and MW4-S
- MW5-D and MW5-S
- MW6-D and MW6-S

Given that this drawdown occurred during the summer months, and with a distinct drawdown and recovery pattern of a groundwater pumping well, it is likely the drawdown at these wells was a result of nearby irrigation pumping or water taking for construction purposes.

The hydrographs for MW1-S/D through MW9-S/D demonstrate a water level recovery response that is potentially related to the start of seasonal recharge in December, January, or February each year. MW8-S appears to show three distinct recharge events in January and February of 2018. While precipitation data was not collected from the rain gauge installed in the Study Area during the winter months, precipitation data from the Guelph Lake Climate Station maintained by the Grand River Conservation Authority indicates that the recharge events were likely the result of three larger rain events during that time.

4.3.3.2 Wetland Hydrographs

Wetland hydrographs were compared similarly where groundwater and surface water elevations indicate vertical flow directions with water always moving towards the lowest hydrostatic elevation. Hydrographs show that for most of the year, most wetlands have a surface water elevation that exceeds, or is equal to the shallow groundwater (mini piezometer) elevations. As such, it is interpreted that the wetland is losing water to, or is in equilibrium with the shallow groundwater system as is shown in hydrographs for Stations 1, 2, 3, 4, 5, 6, 7, 8, 9, 12 and 13 (Appendix GW-3).

However, some wetlands show the reverse gradient where the shallow groundwater (mini piezometer) elevations exceed the surface water elevations for part of the year as shown in hydrographs for Stations 10, 11 and 14 (Appendix GW-3).

Some wetlands show a pattern of seasonal reversal where the nest of mini piezometers show a reversal of shallow groundwater flow direction where the water elevation in the deep mini piezometer eventually exceeds that of the shallow mini piezometer and in some cases it also exceeds the surface water elevation. This is shown in the following hydrographs:

- Station 1 (Neumann's Pond 1) – gradient in the shallow groundwater system becomes upwards between mid-summer and late fall in 2017 and between late spring and late summer in 2018.
- Station 7 (Hall's Pond) – gradient in the shallow groundwater system becomes upwards in July 2017 with the deep mini piezometer water elevation exceeding the surface water elevation for the remainder of the record in 2017. Similarly, the gradient in the shallow groundwater system changes to upwards starting in June 2018 and that trend continues to the end of 2018 where shallow groundwater elevations also exceed surface water elevations.
- Station 9 – gradient in the shallow groundwater system becomes upwards between July 2018 and early December 2018.

Lastly, hydrographs from monitoring wells located in close proximity to a wetland monitoring location show that some wetlands are located where the deep overburden groundwater system (monitoring well water elevations) are near to or exceed the surface water and shallow groundwater elevations associated with the wetland. In other hydrographs, it is shown that the deep overburden groundwater system is much lower than the surface water and shallow groundwater elevations associated with the wetland. These conditions are shown in the hydrographs (Appendix GW-3) for the following stations and full interpretation is provided in (Wood, 2018):

- Station 1 (Neumann's Pond 1) – The deep overburden groundwater elevations are significantly lower (approximately 10 m) than the wetland water elevations.
- Station 9 – the peak groundwater elevations from the nearby monitoring wells exceed the shallow (mini-piezometer) groundwater and perhaps the surface water elevations in spring 2017. The peak groundwater elevations from the shallowest monitoring well also exceed the shallow groundwater elevations in spring 2018.
- Station 10 – The groundwater elevations from the nearby monitoring well (200 m northeast) were near equal to the shallow groundwater and surface water elevations in the spring of 2017.
- Hall's Pond – A combined hydrograph included at the end of Appendix GW-3 shows all shallow (mini-piezometer) and deep (monitoring well) overburden groundwater elevations associated with Hall's Pond along with the surface water elevation. The shallow groundwater elevations exceed the deep elevations, suggesting a downwards groundwater flow direction. As shown in the hydrograph, the estimated bottom of the pond elevation is often lower than the deep groundwater elevation. The depth of Hall's pond suggests a potentially continuous saturated system between the wetland and the deeper groundwater system in the overburden.

4.3.4 Groundwater Quality Sampling

Five separate groundwater quality sampling events were completed at the Matrix monitoring wells on the following dates:

- October 19 to 21, 2016,
- April 19, 2017,
- October 4, 5 and 10, 2017,
- May 9, May 10 and June 8, 2018, and
- December 18 and 20, 2018

The wells were purged prior to groundwater sampling to obtain samples that represent the water quality in the formation. Matrix personnel purged three casing volumes as per the CCME (1994) method or until dry before collecting groundwater samples using dedicated inertial lift Waterra™ sampling pumps or dedicated Waterra™ bailers.

Field measured parameters, including pH, EC, temperature, dissolved oxygen and turbidity, were conducted on groundwater samples collected from the wells once purging was complete. The instruments were checked for calibration and corrected where necessary prior to measuring the field parameters.

Groundwater samples from each Matrix monitoring well were collected into the appropriate, laboratory supplied, pre-labeled sample bottles. Each groundwater sample collected for dissolved metals analysis was field-filtered using disposable 0.45 micron filters.

Samples collected in 2016, 2017 and 2018 were analyzed for the following parameters:

- general and inorganic parameters, including pH, EC, calcium (Ca), magnesium (Mg), sodium (Na), potassium (K), dissolved iron (Fe), dissolved manganese (Mn), chloride (Cl), carbonate (as CaCO3), bicarbonate (as CaCO3), hydroxide (as CaCO3), sulphate (SO4), nitrite nitrogen (NO2 N), nitrate nitrogen

(NO3 N), total Kjeldahl nitrogen (TKN), total dissolved solids (TDS), total hardness (as CaCO3) and total alkalinity (as CaCO¬3).

- dissolved metals including silver (Ag), aluminum (Al), arsenic (As), boron (B), barium (Ba), beryllium (Be), bismuth (Bi), cadmium (Cd), cesium (Cs), cobalt (Co), chromium (Cr), copper (Cu), lithium (Li), molybdenum (Mo), nickel (Ni), phosphorus (P), lead (Pb), rubidium (Rb), sulfur (S), antimony (Sb), selenium (Se), silicon (Si), tin (Sn), strontium (Sr), tellurium (Te), thorium (Th), titanium (Ti), thallium (Tl), uranium (U), vanadium (V), tungsten (W), zinc (Zn), and zirconium (Zr)

Collected samples were stored in ice-chilled coolers and transported to ALS Laboratory Group in Waterloo, Ontario for analysis. A chain of custody form indicating sample numbers was submitted to and signed at the laboratory. Copies of the signed forms were placed in the project files and are available upon request. Laboratory results were downloaded into Matrix's database management system and are presented in Table GW1.3 (Field Parameters), Table GW1.4 (Routine Parameters), and Table GW1.5 (Dissolved Metals) within Appendix GW-1. Copies of the laboratory Certificates of Analysis are provided in Appendix GW-4.

Laboratory analytical results were compared against the Ontario Drinking Water Standards (MOE, 2006) to provide a relative characterization of the groundwater against the appropriate potable water standard in Ontario. All analytical results to date were reported below the Ontario Drinking Water Quality Standards with the exception of the following:

- Analytical results for dissolved iron exceeded the ODWS at MW02-S/D, MW04-D, MW05-S/D and MW06-S. The peak reported concentration to date is 2.98 mg/L (MW05-D, May 9, 2018) compared to the ODWS aesthetic objective of 0.3 mg/L.
- Analytical results for dissolved manganese exceeded the ODWS at MW02-S/D, MW04-S, MW05-S/D, MW06-S, MW07-D and MW09-D. The peak reported concentration to date is 0.492 mg/L (MW02-S, May 10, 2018) compared to the ODWS aesthetic objective of 0.05 mg/L.
- Analytical results for total dissolved solids (TDS) exceeded the ODWS at MW01-S and MW08-D. The peak reported concentration to date is 718 mg/L (MW08-D, April 19, 2017) compared to the ODWS aesthetic objective of 500 mg/L.
- Analytical results from all monitoring wells exceeded the ODWS for total hardness. Total hardness levels ranged between 131 mg/L (MW01-D) and 411 mg/L (MW06-S) compared to the ODWS operational guideline of 80 to 100 mg/L.
- Analytical results for total alkalinity exceeded the ODWS at MW01-D, MW04-S/D, and MW05-D. The peak reported concentration to date is 730 mg/L (MW04-D, December 18, 2018) compared to the ODWS operational guideline of 30 to 500 mg/L.
- Analytical results from MW01-D, MW02-S/D, and MW04-D, exceeded the ODWS for arsenic. The peak reported concentration to date is 0.0315 mg/L (MW02-S, April 19, 2017) compared to the ODWS maximum acceptable concentration of 0.01 mg/L (ODWS revised January 1, 2018; compared to 0.025 mg/L previously).
- Analytical results from MW06-S exceeded the ODWS for aluminum. The peak reported concentration to date is 0.627 mg/L on April 19, 2017 compared to the ODWS operational guideline of 0.1 mg/L.
- Analytical results from MW05-S exceeded the ODWS for uranium on October 19, 2016 where the concentration was reported as 0.024 mg/L compared to the ODWS maximum acceptable concentration of 0.02 mg/L.

4.3.4.1 Preliminary Discussion of Groundwater Quality Results

Piper plots were used to characterize the groundwater analytical results by plotting each sample of groundwater according to its relative proportion of each major groundwater constituent. The plots illustrate the predominant cations and anions constituting the water from each sample. Piper plots are provided in Appendix GW-5. The 2016 to 2018 analytical results show a consistent calcium-magnesium carbonate groundwater characterization.

The piper plots and analytical results also show that chloride concentrations and TDS at MW08-D and MW01-S are observed to be frequently elevated over the results from other locations. Although elevated, chloride concentrations at these locations have remained below the ODWS aesthetic objective (250 mg/L), whereas TDS has exceeded the ODWS. Additionally, MW08-D and MW01-S show relatively elevated concentrations of dissolved zinc, cadmium and lead over the analytical results from other groundwater sampling locations. These metals are often found in association with one another in the groundwater system, although, surface water analytical results show a similar relationship between total zinc, cadmium and lead at Stations 12 and 14.

4.3.5 Surface Water Base Flow Measurements

Surface water base flow measurements have been collected to observe the seasonal and spatial variability of base flow along watercourses. Base flow conditions are present during periods when overland flow to a watercourse is absent and the watercourse has returned to its “dry” weather level. It is during these conditions that areas of potential groundwater discharge and recharge along the length of a watercourse can be evaluated. For the purposes of the CEIS, “dry” weather conditions were considered to be following any period of three continuous days with less than 5 mm of cumulative rainfall. Base flow measurements were collected during spring (May 2017 and June 2018), summer (August 2016, August 2017 and September 2018) and fall (November 2016, November 2017 and December 2018) field events to capture seasonal variability.

Base flow locations were initially selected at watercourse crossings near the SPA and PSA and were also guided by preliminary particle tracking from the City’s Tier Three Water Budget model. Initial locations included measurements within the Hanlon Creek, Mill Creek and Lower Speed River subwatersheds (Map GW-2). Since the initial base flow event, locations were refined with the addition of three locations in the Torrance Creek Subwatershed and an additional location in the Mill Creek Subwatershed for a total of 27 locations. A total of 26 locations (Map GW-2) were monitored in 2018; the southern-most base flow station along Victoria Road in the Mill Creek Subwatershed (MC-V1) was not monitored in 2018 but had provided consistent measurements on previous monitoring events.

Base flow measurements were completed by securing a measuring tape across the banks of the stream and dividing the cross section of the stream into approximately 10 panels of equal width. A Son-Tek FlowTracker Acoustic Doppler Velocimeter (ADV) was used to record the width, water depth and flow velocity in each panel to produce a final discharge value for the stream at each monitoring location. Surface water temperature was also collected at each location where the ADV was used. The surface water base flow measurement results collected to date are summarized in Table GW1.6 of Appendix GW-1 and 2018 base flow measurements are shown spatially on Map GW-2.

Stream discharge ranged across the regional study area from 0 L/s in headwater areas to 676 L/s (May 11, 2017) at the most downstream station along Mill Creek during the spring 2017 monitoring event. The summer and fall base flow measurements are consistent between 2016 and 2017 in spite of receiving significantly more rainfall in 2017 than in 2016 at the Clair Maltby CEIS rainfall gauge. The relative consistency of summer and fall measurements between 2016 (a dry year) and 2017 (a wet year) indicate:

i. That the measurements were completed during a period representative of base flow conditions, and
ii. Base flow to the surface water features (especially in the Mill Creek subwatershed) appears to be high in the spring and fall and lowest in the summary as expected and this is a consistent pattern observed year to year.

Similarly, base flow measurements were relatively consistent between the fall 2017 and fall 2018 monitoring events; however, a notable difference was observed for the 2018 spring and summer events relative to their 2017 counterparts. Base flow was measured to be 44% and 31% less on average in the spring and summer of 2018, respectively, in comparison to the same flows observed in 2017. While flows were collected during the spring and summer seasons of 2018, they were collected approximately one month later in each respective season relative to observations in 2017 (i.e., June 2018 vs. May 2017 and September 2018 vs. August 2017). As observed from shallow groundwater monitoring (see wetland station hydrographs in Appendix GW-3), shallow groundwater levels tend to reach a maximum in May every year before declining to a minimum level in the fall season. Similarly, one might expect base flow to follow a similar seasonal trend, with declining groundwater discharge to streams and declining base flow values between May and the fall.

4.3.6 Springs and Seeps Observations

Matrix field staff observed and documented a series of springs on May 10, 2017 at 63 Brock Road in the Mill Creek Subwatershed, south of the SPA in the broader SSA, following an invitation by the property owner to visit the springs (Spring 1 on Map GW-1). The property owner reported that their domestic water well is approximately 21 m deep and flowed artesian groundwater to surface when it was originally constructed. The predominantly cedar forested area of the property contains numerous springs and pools of water along an area of topographic relief. Wood field staff observed an additional area of springs within the Mill Creek subwatershed on April 26, 2017 (Spring 2 on Map GW-1). More springs associated with this approximate ground surface elevation are anticipated in the Mill Creek, Hanlon Creek and Speed River subwatersheds.

During the background review, it was noted that two groundwater seeps were previously documented at 132 Clair Rd. (ref. Aquafor Beech 2012), south of Neumann's Pond 1 (Seep 1 and Seep 2 on Map GW-1). Beacon field staff also reported observing a seep at 2162 Gordon Street (Seep 3 on Map GW-1).

4.4 Natural Heritage

A Natural Heritage System (NHS) has been identified for the SPA, as mapped and described in the City's current Official Plan (2018 Consolidation). This NHS was based on the technical work and consultations undertaken as part of the City's Natural Heritage Strategy between 2004 and 2009 (Dougan & Associates 2009a, b) and incorporated into the City-wide Official Plan Amendment (OPA) 42 for the NHS in 2010. This NHS was then refined and finalized through the approval of the City of Guelph Official Plan Amendment 42 in 2014 by the Ontario Municipal Board.

The purpose of the natural heritage work undertaken through the Clair-Maltby Secondary Plan process has been to verify and update the NHS, as needed, within the SPA based on:

- Relevant changes to existing conditions based on site-specific studies completed within the PSA (ref. Appendix NH-1 and Map NH-1) over the past decade or so supplemented with targeted field studies, as well as analysis of current aerial photography;

- Application of current legislation, policies and guidelines, including:
    - Evaluation, Classification and Management of Headwater Drainage Features Guideline (CVC and TRCA 2014);
    - Significant Wildlife Habitat Criteria Schedules for Ecoregion 6E (MNRF 2015); and
    - Species currently listed as Endangered and Threatened under Ontario's Endangered Species Act (2007); and
- Supplemental natural heritage field studies which have included:
    - Scoped headwater drainage feature (HDF) assessments;
    - Scoped vegetation assessments and botanical surveys;
    - Calling amphibian surveys:
    - Amphibian / reptile movement surveys over roads (ref. Map NH-2);
    - Basking turtle surveys;
    - Breeding bird surveys;
    - Winter wildlife surveys (including for deer and raptors); and
    - Incidental surveys in conjunction with other targeted surveys for seeps, springs, terrestrial crayfish burrows and other wildlife.

Representative photos from this work are included in Appendix NH-2.

The following sections provide updates to both the aquatic and terrestrial natural heritage based on information from the field work and the various background sources. These updates focus on the SPA, but have also considered the broader PSA and, to a lesser extent, the SSA.

The updates provided are as accurate as possible given the nature of the access provided (ref. Map G-2) and the scope of work established for the SPA. However, this work does not preclude the need for area or site-specific studies (such as Environmental Impact Studies (EIS)) that will be required for all proposed development within or adjacent to the NHS in the SPA.

4.4.1 Aquatic Natural Heritage

As discussed above in Section 4.2 and 4.2, there are no permanent or intermittent watercourses in the SPA due to the topography, soils and drainage. However, there is there is potential and confirmed aquatic habitat in the SPA the form of:

- Potential localized and relatively small-scale headwater drainage features (HDFs) in the SPA (e.g., providing seasonal hydrologic connections between wet and/or dry closed depressions in the landscape); and
- Some of the wetlands and ponds capable of supporting fish and benthic invertebrates.

In addition, there was also an interest having a high-level understanding of the fish communities in the watercourses in the broader SSA so that potential impacts to these resources could be considered through the characterization process (Wood *et al.*, 2018).

Methods: Fish Habitat

The characterization of the fish and fish habitat within the study areas was based almost entirely on background data obtained from the Ministry of Natural Recourses and Forestry (MNRF) (1999 – 2012), Guelph District on March 3, 2017 (ref. Map NH-3). Supplemental fisheries information was acquired from the following site-specific studies:

- 132 Clair Environmental Impact Study (EIS) (i.e., the Neumann Pond in the Hanlon Creek Watershed) at 132 Clair Road West (Aquafor Beech Limited 2012) in the SPA;
- Southgate Lands Environmental Implementation Report (EIR) including the ponds / ephemeral watercourse in the study area (385 Maltby Road West) (NRSI 2007) in the PSA and Mill Creek Watershed;
- Hanlon Business Park Consolidated EIS (NRSI 2004);
- Hanlon Business Park Environmental Implementation Report (NSRI 2009); and
- Hanlon Business Park Consolidated Monitoring Report (NRSI 2016).

The full citations for sources screened are provided in Appendix NH-1.

As discussed in Section 4.2, the water level and quality monitoring undertaken in wetlands across the SPA (for both surface water and groundwater) also provides information related to aquatic ecology where these features may support fish. The wetland monitoring provides a better understanding of the following in a representative range of wetlands in both the Hanlon Creek and Mill Creek Watersheds in the SPA: hydroperiods, the extent to which they are being supported by groundwater versus surface water, the range of water temperatures, and the types of exceedances that are occurring under current conditions.

The findings of the fish community data for each of the watersheds in the SPA is provided below. Photographs of representative ponds and wetlands in the PSA are provided in Appendix SW-2.

Methods: Scoped Headwater Drainage Features (HDF) Assessment

The only field work related to fish habitat undertaken with in the SPA as part of this study was a scoped assessment using the current standard guidelines for the evaluation of headwater drainage features (HDFs) (CVC and TRCA 2014). The purpose of this assessment, which was undertaken between spring 2017 and spring 2018, was to identify any potential or actual drainage pathways, particularly those connected to wetland or ponds that may support fish. Field work was limited to those lands for which access had been provided in order to help assess the potential for such HDFs to support seasonal aquatic habitats.

A review of aerial imagery of the PSA available through Google Earth™ (2006-2017) and the City of Guelph (2006, 2009, 2012, 2016) was reviewed to identify any areas that exhibited evidence of saturation or concentrated surface flow that might indicate the presence of an HDF. Emphasis was placed on seasonal coverage (i.e., spring) and wet years. The results of this desktop review were then cross-referenced with 2016 and 2017 field data results from other disciplines, including wetland mapping (based on the Ecological Land Classification (ELC) (Lee et al., 1998), observed seeps, surface water monitoring and shallow groundwater monitoring.

Field verification of the potential HDFs was undertaken on April 2, 2018 soon after significant rainfall by a Senior Fluvial Geomorphologist with extensive experience in the application of the CVC and TRCA HDFA Guidelines (2014). In addition to evaluating these potential features with respect to their form and function, the connectivity of these potential HDFs to other existing features, primarily wetlands, was assessed.

The results of this work are discussed below, illustrated in Maps NH-4A and NH-4B, and documented in the photolog in Appendix NH-2A.

4.4.1.1 Scoped Fish Habitat Assessment Results

The MNRF Guelph District Office provided data from fisheries sampling completed within the PSA, as well as within the broader SSA, between 1999 and 2012. Notably, not all MNRF fish data provided included specifics on total numbers of individual species caught. In addition, some data points did not provide species information at all, but rather general habitat markers shared by similar species such as Trout redds.

Of the background studies screened (ref. Appendix NH-1), site-specific fisheries data was only available from two ponds / wetlands: the Neumann Pond in the Hanlon Creek Watershed (132 Clair Road West) (Aquafor Beech Limited 2012) in the SPA, and the ponds / ephemeral watercourse in the Southgate study area (385 Maltby Road West) (NRSI 2007) in the PSA and Mill Creek Watershed.

A summary of the fish communities in the Hanlon Creek and Mill Creek Watersheds is summarized in Table 4.4.1 and Table 4.4.2 respectively. Approximate locations of records are provided in Map NH-3.

Table 4.4.1 Fish Species Records for the Hanlon Creek Watershed in the Secondary Study Area (ref. Map NH-3)

Common Name	Scientific Name	Thermal Regime	Tolerance	Status		MNRF 1999		Aquafor Beech 2012	
				Regional / Local Rank	SRank	Fish Dot Code	# of Specimens	Fish Dot Code	# of Specimens
Brook Stickleback	*Culaea inconstans*	coolwater	intermediate	HR	S5	10-7	300+		
Brook Trout	*Salvelinus fontinalis*	coldwater	intolerant		S5	10-29	N/A		
Brown Bullhead	*Ameiurus nebulosus*	warmwater	tolerant	HR	S5			Neumann Pond A	16
Central Mudminnow	*Umbra limi*	coolwater	tolerant		S5	10-7	37		
Goldfish	*Carassius auratus*	warmwater	tolerant	E	SE			Neumann Pond A	767
Northern Redbelly Dace	*Phoxinus eos*	coolwater	intermediate	HR	S5	10-7	62		

Table 4.4.2 Fish Species Records for the Mill Creek Watershed in the Secondary Study Area (ref. Map NH-3)

Common Name	Scientific Name	Thermal Regime	Tolerance	Status		MNRF 2010		MNRF 2012	
				Regional / Local Rank	SRank	Fish Dot Code	# of Specimens	Fish Dot Code	# of Specimens
Brook Stickleback	*Culaea inconstans*	coolwater	intermediate	HR	S5	1-156	5	1-180	1
Blacknose Dace	*Rhinichthys obtusus*	coolwater	intermediate	HU	S5			1-180	1
Central Mudminnow	*Umbra limi*	coolwater	tolerant		S5	1-156	2	1-180	61
Northern Redbelly Dace	*Phoxinus eos*	coolwater	intermediate	HR	S5	1-156		1-180	25

A review of the Natural Heritage Information Centre (NHIC) database for species occurrences and the MNRF data did not indicate the presence of any federally or provincially listed fish Species at Risk (SAR) occurring in the study areas. The fish species that are known or could be expected to occur in the study areas are common to Ontario, with an S-rank of S5 or S4 (NHIC 2017).

Hanlon Creek Watershed

There are fish records for one pond within the SPA. Neumann Pond is identified as a Provincially Significant Wetland (PSW) by MNRF and is an isolated pond not connected to any permanent or intermittent surface water drainage features. Neumann Pond is entirely perched and reliant on precipitation and surface water contributions to sustain its hydrology. Existing fisheries data for the Neumann Pond historically found several Brown Bullhead (*Ameriurus nebulosus*) (Aquafor Beech 2012). Brown Bullheads are warm water species which are tolerant of degraded water quality and can live in water with extremely low oxygen concentrations (North-South Environmental Inc. 2015). In addition, numerous Goldfish (*Carassius auratus*), an invasive species, were also reported within the pond (ref. Table 4.4.1).

The Hanlon Creek PSW located north of the SPA has several tributaries running through it as shown on Figure 4.4.1. As recorded by MNRF in 1999, portions of Branch E of the Hanlon Creek (PEIL et al., 2004) support cool and coldwater fish species including: brook trout, brook stickleback (*Culaea inconstans*), central mudminnow (*Umbra limi*) and northern redbelly dace. Brook trout is a native coldwater fish species that requires specialized habitat, is sensitive to increases in water temperatures and is vulnerable to environmental changes. All other fish species documented are identified as being common in Ontario and somewhat tolerant to changes and perturbations.

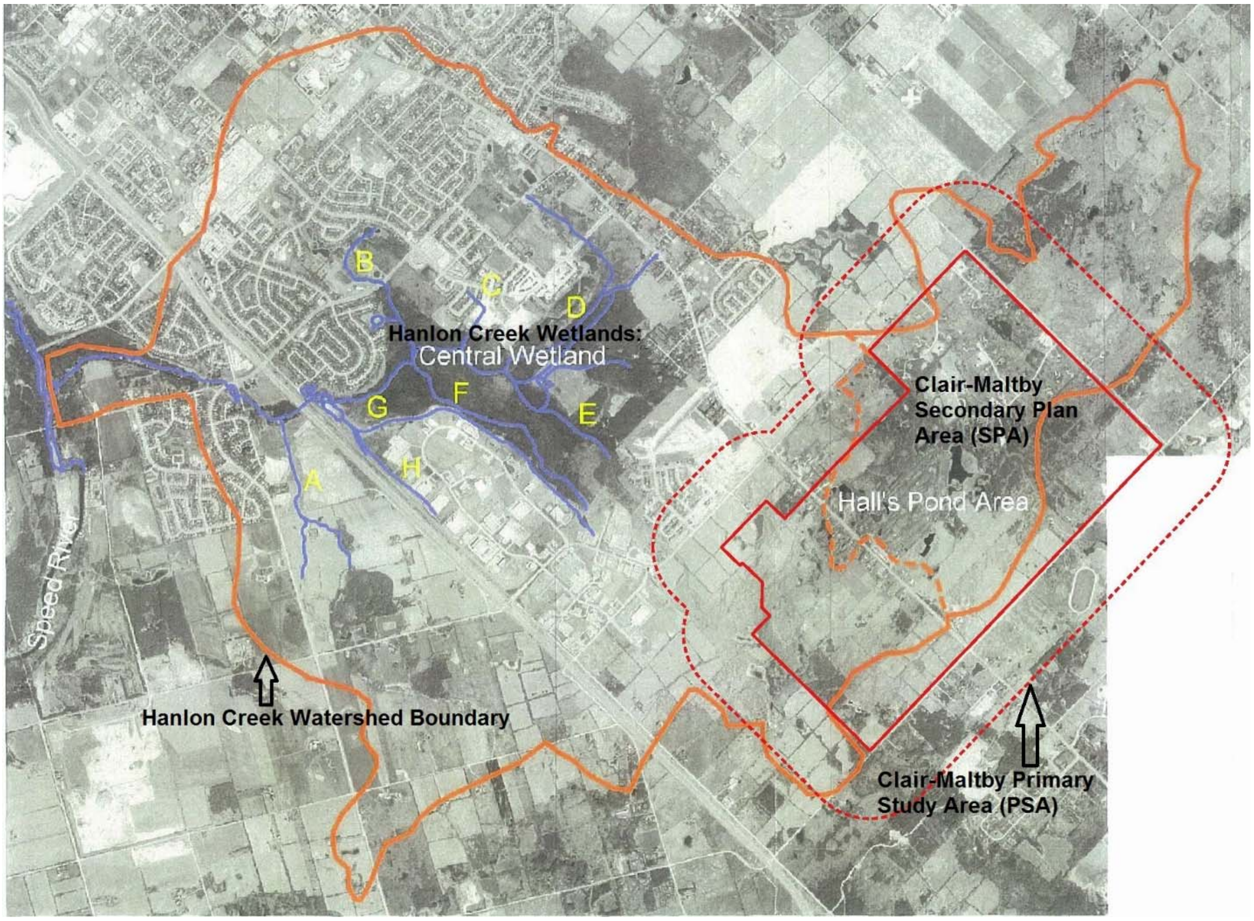

Figure 4.4.1: Tributaries in the Hanlon Creek PSWs and watershed area as mapped in 2004 [adopted from the Hanlon State of the Watershed Study, Figure A1.1 (PEIL et al., 2004)].

West of the Hanlon Expressway in the Hanlon Creek Business Park area (see Map NH-3), NSRI (2016) reported historical records of: blacknose dace (*Rhinichthys obtusus*), brook stickleback, creek chub, fathead minnow (*Pimephales promelas*), northern redbelly dace and white sucker (*Catostomus commersoni*). NSRI also captured four (4) brook trout as part of their environmental studies, confirming the presence of a cool / coldwater thermal regime in the creeks in this area.

Mill Creek Watershed

Mill Creek Watershed is located in the southern part of and south of the SPA as shown on Map G-1. Existing fisheries information was obtained from MNRF (March 3, 2017) from 2012 and an older site-specific study (NRSI 2007). Fish species records are summarized in Table 4.4.2 and illustrated on Map NH-3.

Fisheries sampling conducted within the PSA as part of the Southgate EIR documented no fish species observed within the two onsite ponds although incidental observations of goldfish within the area from 1998 were noted (NSRI 2007). The two (2) culverts passing under Maltby Road in this location were also identified as suitable for fish habitat (NSRI 2007) and MNRF records from 2012 identified Blacknosed Dace, Brook Stickleback, Central Mudminnow, Northern Redbellied Dace and Dace spp. in the area (see Map NH-3 in Appendix F and Table F-2 in Appendix G1). In July of 2016, field staff from the Consulting Team for this study observed this feature to be dry.

These records confirm the presence of intermittent coolwater fish habitat in this location. In addition, GRCA has indicated (T. Zammit, pers. comm. Aug. 13, 2018) that Brook Trout are known to spawn along the main branch of Mill Creek, and that Mill Creek and its tributaries (including tributaries downstream of the SPA) are currently classified as coldwater habitat by the MNRF.

4.4.1.2 Headwater Drainage Feature Assessment (HDFA)

The desktop review process identified seven (7) potential HDFs, as shown in Map NH-4A. Field confirmation took place on April 2, 2018 within those lands for which access was provided (refer to Map NH-4B for extent of HDF assessed). A representative photo log of the field verified features is provided in Appendix NH-2A and a summary of the results by reach is provided in Table 4.4.2.

The location of HDF reaches was confirmed using visual observations and GPS waypoint locations. Field-confirmed HDFs were delineated into reaches based on changes in any one of the following characteristics:

- Flow condition (dry/standing water to flowing)
- Riparian vegetation (within any riparian zone)
- Feature type

Delineated reaches were then identified based on the following naming convention from downstream to upstream:

Stream Code (HC) – HDF (H#) – Reach (R#) (see Map NH-4B)

Stream code referred to the Hanlon Creek watershed, HDF referred to the headwater drainage feature code identified in Map NH-4A. With the exception of HC-H3-R2, all HDF reaches were identified as a standing water or dry hydrologic condition. Reach HC-H3-R2 was observed to be flowing, providing a hydrologic connection between the two PSW units along the property line between Springfield Golf Course and the property to the south.

Field confirmation of HC-H7 determined that no discernible hydrologic connection could be observed between the Laneway wetland and Reach HC-H7-R1. On August 17, 2018 a site visit was undertaken to confirm the extent of wetland versus intermittent watercourse along H3 and the hydrologic function observed for HC-H3-R2 was dry.

Table 4.4.2 Headwater Drainage Feature Assessment Evaluation Matrix

Drainage Feature Segment	Step 1		Step 2	Step 3	Step 4	HDFA Guidelines Management Classification
	Hydrology	Modifiers	Riparian	Fish Habitat	Terrestrial Habitat	
HC-H3-R1	Limited Functions (Dry or standing water condition during first sample event)	N/A	Important Functions (Feature type is wetland)	Contributing Functions (Indirect contributions of flow and allocthonous materials)	Important Functions (Wetlands with breeding amphibians)	**Protection**
HC-H3-R2	Valued Functions (Water is present in the spring as a result of seasonally high groundwater discharge or seasonally extended contributions from wetlands or other areas that support intermittent flow or water storage conditions)	Agriculture and Golf Course	Important Functions (Riparian corridor is dominated by forest or thicket/scrubland communities or wetland)	Contributing Functions (Indirect contributions of flow and allocthonous materials)	Important Functions (Wetlands with breeding amphibians)	**Protection**
HC-H3-R3	Limited Functions (Dry or standing water condition during first sample event)	N/A	Important Functions (Feature type is wetland)	Contributing Functions (Indirect contributions of flow and allocthonous materials)	Important Functions (Wetlands with breeding amphibians)	**Protection**
HC-H3-R4	Limited Functions (Dry or standing water condition during first sample event)	N/A	Important Functions (Feature type is wetland)	Contributing Functions (Indirect contributions of flow and allocthonous materials)	Important Functions (Wetlands with breeding amphibians)	**Protection**

Table 4.4.2 Headwater Drainage Feature Assessment Evaluation Matrix

Drainage Feature Segment	Step 1		Step 2	Step 3	Step 4	HDFA Guidelines Management Classification
	Hydrology	Modifiers	Riparian	Fish Habitat	Terrestrial Habitat	
HC-H3-R5	Limited Functions (Dry or standing water condition during first sample event)	Agriculture	Limited Functions (Riparian corridor is dominated by cropped land)	Contributing Functions (Indirect contributions of flow and allocthonous materials)	Limited Functions (No terrestrial habitat present)	**No Management Required**
HC-H5-R1	Limited Functions (Dry or standing water condition during first sample event)	N/A	Important Functions (Feature type is wetland)	Contributing Functions (Indirect contributions of flow and allocthonous materials)	Important Functions (Wetlands with breeding amphibians)	**Protection**
HC-H5-R2	Limited Functions (Dry or standing water condition during first sample event)	Agriculture	Important Functions (Riparian corridor is dominated by forest or thicket/scrubland communities or wetland)	Contributing Functions (Indirect contributions of flow and allocthonous materials)	Contributing Functions (Provides wildlife movement opportunities)	**Maintain/ Replicate Terrestrial Linkage**
HC-H6-R1	Limited Functions (Dry or standing water condition during first sample event)	N/A	Important Functions (Feature type is wetland)	Contributing Functions (Indirect contributions of flow and allocthonous materials)	Important Functions (Wetlands with breeding amphibians)	**Protection**
HC-H7-R1	Limited Functions (Dry or standing water condition during first sample event)	N/A	Important Functions (Feature type is wetland)	Contributing Functions (Indirect contributions of flow and allocthonous materials)	Important Functions (Wetlands with breeding amphibians)	**Protection**

Results of the HDFA are presented in Table 4.4.2 includes a detailed breakdown of each drainage feature on a reach basis for each of the four assessment steps outlined in the 2014 (CVC and TRCA) HDF Guidelines (i.e., Step 1 – hydrologic function, Step 2 - riparian function, Step 3 - fish habitat function and Step 4 - terrestrial habitat function), as well as a management classification (Step 5A). With the exception of HC-H4-R1, which was identified as No Management Required, and HC-H5-R2, which was identified as Maintain/Replicate Terrestrial Linkage, all other evaluated HDFs were identified for Protection, as defined in the 2014 HDFA Guidelines (CVC and TRCA 2014).

4.4.2 Terrestrial Natural Heritage (including Wetlands)

4.4.2.1 Ecological Land Classification (ELC)

Ecological Land Classification (ELC) mapping (as per Lee *et al.*, 1998) for the PSA within the City of Guelph was first undertaken between 2006 and 2008 as part of the City-wide Natural Heritage Strategy (Dougan & Associates 2009a, 2009b) based on interpretation of aerial photography supplemented by scoped field surveys. The focus of the field surveys was outside of the identified Provincially Significant Wetlands (PSWs) as the primary data gap at that time was the types and extent of upland communities, with an emphasis on the extent and types of woodlands. Plant species were documented incidentally as part of the ELC field work, particularly species considered uncommon or rare in Guelph and Wellington County, but comprehensive botanical surveys were not completed as part of this City-wide initiative to intended to support the identification of a Natural Heritage System (NHS).

The ELC mapping used as the basis for the City's current NHS is the ELC mapping developed for the Natural Heritage Strategy with some site-specific mapping refinements established through agreements reached between the City and appellants as part of the settlement process for OPA 42 as approved by the Ontario Municipal Board.

As part of the CEIS work in support of the CMSP the City's ELC mapping from 2014 has been updated (ref. Map NH-5 as well as NH-5A through NH-5D, Appendix NH-3) and a plant list specific to the study area has also been developed (ref, Appendix NH-4). These updates have been based on:

- A review of current aerial photography (spring 2017) with reference to older aerial photography (i.e. going back to 2012) where appropriate;
- Review of current wetlands mapping from MNRF and GRCA (2013, 2017, 2018);
- Incorporation of ELC and plant data from site-specific studies in the PSA where available (ref. Map NH-1); a
- Field verification where full access was provided in 2017 and 2018 (i.e., 2162 Gordon Street; 1968-1992 Gordon Street; 1, 5 and 12 Kilkenny Place and 24 Serena Lane) (ref. Map G-2, ELC Data Cards in Appendix NH-3); and
- Scoped field verification of ELC in 2018 with the landowner's consultant or representative in attendance included (see Map NH-2) at:
  - 2093 Gordon Street (Oct. 23, 2018);
  - 2187 Gordon Street (Aug. 17, 2018);
  - 260 Maltby Road East (July 31, 2018);
  - 99 Maltby Road East (Sept. 11, 2018);
  - 274 Maltby Road East (Aug. 30, 2018); and

- 2007 Victoria Road (Aug. 30, 2018).

Based on this information, distinct vegetation communities using ELC (as per Lee et al., 1998) were delineated on aerial photos to the finest level possible with the existing information. In the ELC system there are three nested levels of detail: Community Series (e.g., Coniferous Forest, FOC), Ecosite (e.g., Dry-Fresh Pine Coniferous Forest Ecosite, FOC1) and Vegetation Type (e.g., Dry-Fresh White Pine-Red Pine Coniferous Forest Type, FOC1-2).

The ELC mapping includes areas in the PSA within the City of Guelph where access and/or data was available, however the refinements have been focused within the SPA. Notably, the most current available aerial photography (i.e., 2017) was used in all cases except on one property (i.e. 2021 Gordon). In this case the City instructed the Consulting Team to revert to the 2012 aerial photography as these lands are currently before the courts for adjudication related to NHS issues.

The SPA contains a mix of cultural communities, natural forests and wetlands. ELC Community Series types and their areal extent within the SPA and the Rolling Hills Community are summarized in Table 4.4.3. Under current conditions, about 58% of the SPA is accounted for by some type of natural or semi-natural area.

- Approximately 35% (145 ha) of the SPA is comprised of cultural communities, which include meadow, thicket, savannah, cultural woodland, plantation and hedgerows. These communities are largely lands that have been disturbed as a result of past agricultural land use (e.g., cropping, livestock grazing) and, over time, have gradually succeeded into semi-natural areas in the absence of ongoing management or use.
- Natural forests comprise about 15% (59 ha) of the SPA and include a total of 18 forest vegetation types/ecosites, including coniferous, mixed, and deciduous forest types (ref. Maps NH-5A through NH-5D).
- Wetlands and open water make up about 8% (34 ha) of the SPA, including treed swamps, thicket swamps, marshes and shallow aquatic communities. A total of twenty-two (22) wetland vegetation types/ecosites were documented in the PSA (ref. Maps NH-5A through NH-5D).

Table 4.4.3 Overview of Ecological Land Classification (ELC) Community Series Types in the Secondary Plan Area (SPA) and Rolling Hills Community (RHC)

ELC Community Class/Series (ELC Codes)	Total Area (ha)	Area within SPA (ha)	Percentage within SPA (%)	Area within RHC (ha)	Percentage within RHC (%)
Cultural Communities					
Cultural Meadow (CUM)	39.87	20.61	4.98%	12.68	10.43%
Cultural Plantation (CUP)	40.14	32.47	7.84%	5.84	4.80%
Cultural Savannah (CUS)	88.2	53.35	12.88%	4.46	3.67%
Cultural Thicket (CUT)	6.51	4.45	1.07%	0.7	0.58%
Cultural Woodland (CUW)	47.97	25.95	6.26%	20.07	16.51%
Hedgerow (H)	10.88	8.17	1.97%	1.37	1.13%
Upland Forests					
Forest (FOC/FOD/FOM)	84.8	58.73	14.18%	14.47	11.90%
Wetlands (including treed Swamps)					
Meadow Marsh/Shallow Marsh (MAM/MAS)	15.66	9.28	2.24%	1.23	1.01%
Open Water (OAO)	8.69	8.29	2.00%	0.31	0.26%
Shallow Aquatic (SAF/SAM/SAS)	9.31	8.45	2.04%	0.04	0.03%
Deciduous Swamp/Mixed Swamp (SWD/SWM)	9.66	3.43	0.83%	4.26	3.50%
Thicket Swamp (SWT)	6.54	5.00	1.21%	0.00	0.00%
TOTALS	**368.23**	**238.18**	**57.49%**	**65.43**	**53.83%**

4.4.2.2 Plants

Based on a review environmental studies prepared for various properties within and adjacent to the SPA (ref. Appendix NH-1), as well as site visits conducted by Beacon in 2017 and 2018, a total of 471 species of vascular plants have been recorded in the PSA by various sources. A consolidated plant list is provided in Appendix NH-4. The list includes species recorded within the PSA and within 500 m of the study area. Based on review by two experienced Botanists with knowledge of Wellington County flora (C. Cecile, D. Westerhof), some species included in the plant list are considered unlikely to occur in the County and are probable misidentifications. Within the plant list, these species have been marked by an asterisk.

To date, only one plant Species at Risk – Butternut (*Juglans cinerea)* – has been documented in the PSA. Butternut, a provincially and federally Endangered species, was documented by Beacon in 2017 in the SPA[1]. To date, no other Butternut have been documented in the PSA; however, the species was reported in the EIS for the Westminster Woods East lands north of Clair Road (North-South Environmental Inc. 2002), and it is possible that additional Butternuts occur in the SPA but have yet to be documented.

Based on the *Locally Significant Species List* (City of Guelph 2012), a total of 20 locally significant plant species have been documented within and/or adjacent to the SPA. According to this list, locally significant plant species in the PSA include: Black Maple (*Acer nigrum*), Awned Sedge (*Carex atherodes*), Hop Sedge (*Carex lupulina*), Fireweed (*Chamerion angustifolium* ssp. *angustifolium*), Hairy Swamp Loosestrife (*Decadon verticillata*), Downy Willowherb (*Epilobium strictum*), Marsh Horsetail (*Equisetum palustre*), Meadow Horsetail (*Equisetum pratense*), Rough Avens (*Geum laciniatum*), Butternut, Interrupted Fern (*Osmunda claytoniana*), Canada Clearweed (*Pilea pumila*), Yellow Water Crowfoot (*Ranunculus flabellaris*), Small Yellow Water Buttercup (*Ranunculus gmelinii*), Rough-leaved Goldenrod (*Solidago patula*), Freshwater Cordgrass (*Spartina pectinatus*) (a possible misidentification from another report), Heart-leaved Aster (*Symphyotrichum cordifolium*), Sky-blue Aster (*Symphyotrichum oolentangiense*), Wood Lily (*Lilium philadelphicum*), and Buttonbush (*Cephalanthus occidentalis*). The federal, provincial and local conservation statuses of all plants documented is provided in Appendix NH-4.

Notably, one of the previously completed environmental studies in the PSA that was reviewed listed Highbush Blueberry (*Vaccinium corymbosum*). However, based on review by two experienced Botanists with knowledge of Wellington County flora (i.e., Charles Cecile and Daniel Westerhof), Highbush Blueberry is considered this species to be a very unlikely to occurrence in the County and a probable misidentification. Therefore, it has not been included in the list of locally significant plants for the SPA/PSA and 20 (not 21) locally significant plant species are reported for the study area.

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[1] Two Butternut trees were recorded at 2162 Gordon Street at the base of slope adjacent to a small pocket wetland.

4.4.3 Terrestrial Ecology: Wildlife

The wildlife surveys conducted by Beacon in 2017 and 2018 are summarized in Table 4.4.4 below. This data has been supplemented with background information from other environmental studies in the PSA (ref. Appendix NH-1) to help provide a more complete picture of the nature and extent of the various wildlife communities in the SPA.

Table 4.4.4 Summary of Wildlife Surveys Undertaken by Beacon in 2017/2018

Survey Type	Personnel	Date
Winter Wildlife Survey	Rob Aitken	February 15, 2017 February 13, 2018
Amphibian Movement (Frog/Salamander) Surveys	Anna Corrigan Joel Davey	March 27, 2017 April 27, 2017 September 27, 2017 October 4, 2017
Breeding Amphibian (Calling Frog/Toad) Surveys	Rob Aitken Anna Corrigan Joel Davey Devin Upper	April 10, 2017 May 16, 2017 June 22, 2017 June 23, 2017 April 30, 2018 May 16, 2018 June 26, 2018
Breeding Bird Surveys	Rob Aitken Anna Corrigan	June 7, 2017 June 20, 2017 June 1, 2018 June 18, 2018

The specific field survey methods and results for different groups of wildlife are described in the following sub-sections. See Map NH-2 for the locations of terrestrial monitoring stations and transects.

During all surveys, field staff screened for the presence of any Provincially Endangered or Threatened species, as well as any other federally, provincially or locally significant species[2]. Staff also noted habitats that might qualify as Significant Wildlife Habitat (SWH). All of the species documented from the 2017/2018 wildlife field studies and the supplemental background information screening for the PSA are summarized in a comprehensive wildlife list (ref. Appendix NH-5).

Significant terrestrial wildlife species are discussed in Section 4.4.4, including Species at Risk (ref. Appendix NH-6 and NH-7). A comprehensive SWH screening for the PSA is discussed in Section 4.4.5 (ref. Appendix NH-8).

4.4.3.1 Amphibian Breeding (Anurans)

Amphibian breeding surveys were undertaken in the PSA during the spring of 2017 and 2018 to record the presence or absence of early, mid and late season breeding frogs and toads. Surveys were conducted following the Marsh Monitoring Protocol (Bird Studies Canada 2009). Survey details, including dates, times and weather conditions, are summarized in Table 4.4.5.

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[2] The County of Wellington has a Significant Wildlife List which was developed for and published in the City of Guelph Natural Heritage Strategy Phase 2: Terrestrial Inventory & Natural Heritage System (Volume 2, Appendices) (2009b).

Table 4.4.5 Amphibian Breeding Survey Details

Survey Round	Date	Time	Weather Conditions
1	April 10, 2017	20:26 - 22:40	16-18 °C, 40% Cloud Cover, Wind 6-11 km/h, Rain on and off during survey
2	May 16, 2017	21:10 - 23:39	14-16 °C, 10-20% Cloud Cover, Wind 1-5 km/h, No precipitation
3	June 22, 2017	21:33 - 22:51	23-24 °C, 80% Cloud Cover, Wind 6-19 km/h, No precipitation
3	June 23, 2017	21:34 - 22:33	21 °C, 90% Cloud Cover, Wind 6-11 km/h, No precipitation
1	April 30, 2018	20:30 - 21:30	13 °C, <5% Cloud Cover, Wind 1-11 km/h, No precipitation
2	May 16, 2018	20:50 - 21:50	18-20 °C, 20% Cloud Cover, Wind 6-11 km/h, No precipitation
3	June 26, 2018	21:20 - 22:15	18-19 °C, 100% Cloud Cover, Wind 1-11 km/h, No precipitation

Surveys were conducted after dusk at twenty-two (22) survey stations in 2017 and six (6) survey stations in 2018. These stations were established adjacent to suitable habitat for calling breeding amphibians where access was provided or along the road right-of-way (ref. Map NH-2). Surveys were conducted using the point count method whereby the surveyor stands at a set point for a specific period of time and records all species that can be heard calling from that location.

For call codes 1 and 2, the estimated number of calling individuals was recorded. The results of the nocturnal amphibian call surveys are summarized in Table 4.4.6.

Table 4.4.6 Amphibian Breeding Survey Results

2017			
Station Number (ref. Map NH-2)	**April 22, 2017**	**May 16, 2017**	**June 22/23,2017**
A1	SPPE-3	SPPE-3 GRTR-1(2) NLFR-1(1)	GRTR-2(5) GRFR-1(1)
A2	-	SPPE-1(2) GRTR-1(2) AMTO-2(3) SPPE-3* GRTR-2*	GRTR-1(2)
A3	SPPE-3	SPPE-3 GRTR-2(5)	-
A4	-	-	GRTR-2(9)
A5	-	AMTO-1(1)*	-
A6	SPPE-3	SPPE-2(6) AMTO-1(2)	-
A7	SPPE-3 WOFR-1(3) NLFR-1(2)	SPPE-3 GRTR-3 AMTO-1(1)	GRTR-2(5) GRFR-1(2)
A8	Station 7 drowned out this station	Station 7 drowned out this station	GRTR-2(4) GRFR-1(3)
A9	SPPE-2(7) WOFR-1(1)	SPPE-1(5)	GRTR-2(8) GRFR-1(1)
A10	SPPE-1(3)	SPPE-2(10) AMTO-1(2)	GRFR-1(1)
A11	SPPE-2(12) WOFR-1(1)*	SPPE-1(3) GRTR-2(5) AMTO-1(3)	GRTR-2(6) BULL-1(1)
A12	SPPE-1(2)	-	-
A13	SPPE-3 WOFR-3	SPPE-3 GRTR-2(5) AMTO-1(3)	GRTR-2(10) GRFR-1(1)
A14	SPPE-3 WOFR-1(3)	SPPE-1(2) GRTR-1(1) AMTO-1(3)	BULL-1(2)
A15	SPPE-3 WOFR-1(3)	SPPE-1(4) GRTR-1(1) AMTO-1(1) GRTR-2*	GRTR-3
A16	WOFR-1(2)	-	GRFR-1(1)
A17	SPPE-3 WOFR-1(3)	-	GRTR-3
A18	WOFR-1(3)	-	-
A19	SPPE-3 WOFR-3	SPPE-2(5)	GRTR-2(7)
A20	SPPE-3	SPPE-2(10)	GRTR-2(8)

Table 4.4.6 Amphibian Breeding Survey Results

	WOFR-1(1)	GRTR-2(6)	
A21	SPPE-3 WOFR-3	SPPE-3 GRTR-2(10)	GRTR-2(9)
A22	SPPE-3 WOFR-3	SPPE-3 GRTR-3 GRTR-1(1)*	GRTR-2(5) GRTR-1(1)*
2018			
Station Number (ref. Map NH-2)	**April 30, 2018**	**May 16, 2018**	**June 26, 2018**
A23	SPPE-3	SPPE-3 GRTR-1(3)	-
A24	SPPE-1(2)	SPPE-3 GRTR-3	BULL-1(1)
A25	SPPE-3 WOFR-3	SPPE-2(6) GRTR-2(5)*	-
A26	SPPE-3 WOFR-1(3) AMTO-1(3)	SPPE-3 GRTR-3	-
A27	SPPE-3 WOFR-3	SPPE-2(21)	-
A28	SPPE-3 WOFR-1(4)	SPPE-3 GRTR-3	BULL-1(1)

Notes: SPPE = Spring Peeper, AMTO = American Toad, GRTR = Gray Tree Frog, GRFR = Green Frog, BULL = Bullfrog, NLFR = Northern Leopard Frog, WOFR = Wood Frog

Code 1 - Individuals can be counted; calls not simultaneous. Estimated number of individuals indicated in brackets

Code 2 - Calls distinguishable; some simultaneous calling. Estimated number of individuals indicated in brackets

Code 3 - Full chorus; calls continuous and overlapping.

*Calling detected from outside survey station

Six (6) species of breeding frogs and one (1) species of breeding toad were recorded during the breeding amphibian surveys in 2017 and 2018. The majority of these species are ranked S5, meaning they are common, widespread and abundant in Ontario, with the exception of Bullfrog (*Rana catesbeiana*), which is ranked S4, meaning it is uncommon but not rare provincially. Bullfrog is also considered significant and rare in Wellington County.

These seven (7) anuran species were also recorded incidentally during the other field studies conducted in 2017 and 2018. Additionally, Western Chorus Frog (*Pseudacris triseriata*) was recorded as breeding by Beacon staff and was noted as breeding in the PSA in the supplemental background data. Western Chorus Frog is federally ranked as threatened, considered vulnerable in Ontario (ranked S3), and is rare and significant in Wellington County. This species is discussed further in Section 4.4.4.3.

In general, the PSA supports a very healthy population of amphibians, apparently dominated by an abundance of Spring Peepers, Gray Tree Frog and Wood Frog, with some Northern Leopard Frogs, American Toads and the occasional Bullfrog included in the mix. The species composition and abundance is comparable to that documented through the City's Natural Heritage Strategy amphibian surveys undertaken a little over a decade ago in this area (Dougan & Associates 2005). Once exception is Pickerel Frog (*Rana palustris*), an anuran species which is considered uncommon provincially (ranked as S4) and is rare and significant in Wellington County. Pickerel Frog was recorded as breeding in the PSA in previous field studies (Dougan & Associates 2005) but has not been documented since.

4.4.3.2 Amphibian Movement (Anurans and Salamanders)

Beacon also undertook visual road surveys in 2017 to identify amphibian migration in the early spring and early fall, during or immediately after warm rain. Intensive amphibian movement monitoring undertaken on the former Dallan Lands just north of the SPA (east of the Cineplex theatre on Clair Road) (North-South Environmental Ltd. 2016) between 2014 and 2015 found that some of the most abundant movement was documented immediately following a warm rain (i.e., at temperatures of about 17°C) in both the spring and fall. Therefore, this methodology was adopted, except for one early spring round of surveys intended to try and capture salamander movement.

Transects for these surveys were identified in locations where there were prior and recent records of amphibian movement, or in locations where movement might be anticipated based on the presence of suitable habitat on either side of the road (ref. Map NH-2). Survey dates, times and weather conditions are presented in Table 4.4.7.

Table 4.4.7 Amphibian Movement Survey Details (2017)

Date	Time	Weather Conditions
March 27, 2017	20:10 - 00:15	8-11 °C, 100% Cloud Cover, Wind 0 km/h, Precipitation varied between dry, fog and drizzle
April 27, 2017	20:45 - 23:30	12-17 °C, 50-80% Cloud Cover, Wind 1-11 km/h, Thunderstorms in afternoon, drizzle during survey
September 27, 2017	19:38 - 21:55	14-18 °C, 70-80% Cloud Cover, Wind 1-11 km/h, No precipitation
October 4, 2017	19:25-22:06	14-18 °C, 100% Cloud Cover, Wind 1-19 km/h, Heavy rain in the last 24 hours, Fog during survey

Surveys were completed by walking slowly along the transects and identifying the location, species and number of live individuals attempting to cross the road or dead individuals that did not make it across successfully. While walking Transect W3 on Maltby Road (ref. Map NH-2), all existing wildlife culverts were checked for wildlife utilization. Results of the 2017 amphibian movement surveys are shown in Table 4.4.8.

Table 4.4.8 Amphibian Movement Survey Results (2017)

Transect # (ref. Map NH-2)	Species	27/03/2017		27/04/2017		27/09/2017		04/10/2017		Species Total	Transect Total
		Alive	Dead	Alive	Dead	Alive	Dead	Alive	Dead		
W1	Spring Peeper (*Pseudacris crucifer crucifer*)	-	-	-	-	-	-	4	6	**10**	**47**
	Green Frog (Rana *clamitans*)	-	-	-	-	-	-	7	3	**10**	
	Bullfrog (*Rana catesbeiana*)	-	-	-	-	-	-	-	1	**1**	
	Northern Leopard Frog (*Rana pipiens*)	-	-	-	-	-	-	-	2	**2**	
	Unknown Anuran spp.	-	-	-	-	-	-	-	24	**24**	
W2	Spring Peeper (*Pseudacris crucifer crucifer*)	7	1	-	-	1	-	23	6	**38**	**111**
	Gray Treefrog (*Hyla versicolor*)	-	-	1	-	-	-	2	-	**3**	
	Green Frog (*Rana clamitans*	-	-	5	-	-	-	8	2	**15**	
	Bullfrog (*Rana catesbeiana*)	-	-	-	-	-	-	-	1	**1**	
	Northern Leopard Frog (*Rana pipiens*)	3	-	-	-	1	-	1	15	**20**	
	Wood Frog (*Rana sylvatica*)	5	-	-	-	1	-	2	-	**8**	
	Unknown Anuran spp..	-	-	-	-	-	-	-	26	**26**	
W3	Spring Peeper (*Pseudacris crucifer crucifer*)	1	2	-	-	-	1	-	-	**4**	**174**
	American Toad (*Bufo americanus americanus*)	1	-	-	-	-	-	-	-	**1**	
	Gray Treefrog (*Hyla versicolor*)	-	-	-	2	-	-	-	-	**2**	
	Green Frog (*Rana clamitans*	-	-	2	1	-	-	6	19	**28**	
	Northern Leopard Frog (*Rana pipiens*)	1	2	-	-	1	2	4	38	**48**	
	Wood Frog (*Rana sylvatica*)	1	4	2	1	-	-	1	2	**11**	
	Western Chorus Frog (*Pseudacris triseriata*)	1	-	-	-	-	-	-	-	**1**	
	Unknown Anuran spp.	-	-	-	4	-	8	-	64	**76**	
	Blue-Spotted Salamander*	2	-	-	-	-	-	-	-	**2**	
	Eastern Newt (*Notophtalmus viridescens*)	-	-	-	-	-	-	-	1	**1**	
W4	Spring Peeper (*Pseudacris crucifer crucifer*)	-	1	-	-	-	-	-	3	**4**	**34**
	Gray Treefrog (*Hyla versicolor*)	-	-	-	6	-	-	1	2	**9**	
	Green Frog (*Rana clamitans*	-	-	-	-	-	-	-	1	**1**	
	Wood Frog (*Rana sylvatica*)	-	2	-	-	-	-	-	-	**2**	
	Unknown Anuran spp.	-	-	-	3	-	2	-	13	**18**	
W5	Spring Peeper (*Pseudacris crucifer crucifer*)	-	-	-	-	-	-	-	1	**1**	**69**
	Gray Treefrog (*Hyla versicolor*)	-	-	-	3	-	-	-	-	**3**	
	Green Frog (*Rana clamitans*	-	-	-	2	-	-	-	3	**5**	
	Bullfrog (*Rana catesbeiana*)	-	-	-	-	-	1	-	-	**1**	
	Northern Leopard Frog (*Rana pipiens*)	1	1	-	-	-	-	-	15	**17**	
	Unknown Anuran spp.	-	-	-	6	-	9	-	27	**42**	
W6	Spring Peeper (*Pseudacris crucifer crucifer*)	-	4	-	-	-	-	1	8	**13**	**73**
	Gray Treefrog (*Hyla versicolor*)	-	-	-	5	-	-	3	1	**9**	
	Wood Frog (*Rana sylvatica*)	-	2	-	-	-	-	-	-	**2**	
	Unknown Anuran spp.	-	-	-	10	-	16	-	23	**49**	
W7	Spring Peeper (*Pseudacris crucifer crucifer*)	-	-	-	-	-	-	-	1	**1**	**5**
	Gray Treefrog (*Hyla versicolor*)	-	-	-	-	-	-	1	-	**1**	
	Unknown Anuran spp.	-	-	-	1	-	2	-	-	**3**	
Total		23	19	10	44	4	41	64	308	**513**	

Note: *Specimen was not captured or clipped for genetic testing but based on visual observation is identified as Blue-spotted dominated polyploid Salamander or Blue-spotted Salamander (*Ambystoma (2) laterale - jeffersonianum or Ambystoma laterale*).

The anuran species composition documented migrating across roads is similar to that recorded for breeding anurans (ref. Table 4.4.7) and reflects the presence of a healthy population of amphibians apparently dominated by an abundance of Spring Peepers, Gray Tree Frog and Wood Frog, with some Northern Leopard Frogs, American Toads and the occasional Bullfrog. Notably, most of the documented specimens over the four surveys in 2017 (i.e., 412 off 513, or 80.3%) were deceased (i.e., roadkill) and of these, almost half (i.e., 183 specimens or 36.8% of the total documented) could not be identified due to their condition beyond confirming they were anurans (i.e., frogs or toads).

The species of calling amphibians documented are also consistent with those documented during other amphibian movement surveys undertaken since 2000 in the PSA. These have included intensive amphibian movement surveys along Clair Road and Hawkins Drive in the area of the Hawkins SWM Pond and the wetland to the east in the northern section of the PSA over 2014 and 2015 (NSEI 2016), and along Maltby Road West in the vicinity of W3 (McEachren 2012, NRSI 2012b, c).

Two non-calling amphibian species documented during the movement surveys included one Eastern Newt (*Notophtalmus viridescens*) and two Blue-spotted Salamanders/Blue-spotted dominated polyploid Salamanders (identified as *Ambystoma laterale* or *Ambystoma (2) laterale - jeffersonianum* based on visual observation). Both of these species were recorded in Transect W3 (ref. Map NH-2) and are shown in Photos 5 and 7 in Appendix NH-2B. Eastern Newt are ranked S5, meaning they are common, widespread and abundant in Ontario, while Blue-spotted Salamanders/Blue-spotted dominated polyploid Salamanders are considered uncommon provincially, and significant and rare in Wellington County.

In addition to the salamanders observed during the amphibian movement surveys, efforts were made to capture incidental observations of movement during the turtle surveys. Searches for salamanders were also completed by overturning small to medium-sized natural cover objects (e.g., logs and rocks) in proximity to wetland features. These efforts yielded one additional observation in 2017: a juvenile salamander that could not be identified was seen swimming in the pond just south of the South End Community Park (i.e., Turtle Basking Monitoring Station T1, ref. Map NH-2).

Based on the background review, Blue-spotted /Blue-spotted dominated polyploid Salamanders had been noted in the vicinity of Transect W3 in previous years. As part of previous studies, tail samples had been collected to verify if species were Jefferson/Jefferson dominated polyploid Salamanders (*Ambystoma jeffersonianum /Ambystoma laterale - (2) jeffersonianum*), but all the results came back negative for Jefferson Salamander (Dance Environmental Inc. 2014, NRSI 2012b, c). Furthermore, the MNRF response to an inquiry about the need for targeted salamander surveys as part of the Secondary Plan project from the City in the fall of 2015 stated:

> *Ministry staff have reviewed Guelph District data and are of the opinion that there is a very low likelihood of there being any JESA regulated habitat within the Clair Maltby Secondary Plan Area. Based on the information available, it appears that the area has been extensively surveyed and no recent records of JESA have been identified. Ministry staff are of the opinion that the Clair Maltby Secondary Plan Area should not require any further surveys at this time (T. McKenna, September 29, 2015).*

Therefore, comprehensive surveys for salamanders were not undertaken as part of this project (in accordance with the direction above). No incidental evidence from the 2017 studies supports the presence of Jefferson/Jefferson dominated polyploid Salamanders within the PSA.

Two non-calling amphibian species that are rare and significant in Wellington County (Dougan & Associates with Snell and Cecile 2009b) were recorded in previous studies, but were not observed in 2017: Yellow-spotted Salamander (*Ambystoma maculatum*) (NRSI 2012c, Timmerman et al. 2010, NRSI 2007) and Red-spotted Newt (*Notophtalmus viridescens viridescens*) (NRSI 2012c, Dougan & Associates 2005).

As can be seen in Table 4.4.8, Transect W3 had the highest species diversity and abundance (174 individuals) recorded during the amphibian movement surveys conducted in 2017, with the greatest abundance of movement documented in October 2017. Other transects that had relatively high numbers of amphibians crossing over 2017 included: Transect W2 (111 individuals), Transect W6 (73 individuals) and Transect W5 (69 individuals). Amphibian movement corridors are discussed further in Section 4.4.6.

The large migration on October 4, 2017 speaks to the stochastic nature of amphibian movement and the importance of timing surveys appropriately. The relatively high numbers recorded on this night is likely because the survey took place on a warm, foggy night soon after a thunderstorm. On this night, 372 amphibians were documented crossing the road on all 7 transects, of which 308 of them were documented as roadkill.

4.4.3.3 Turtles

Turtle surveys were conducted twice in 2017 within the PSA for the nine (9) ponds/wetlands that were identified as suitable overwintering and basking habitat for turtles. Notably, April 26 and 27, 2017 was one round of surveys spread over two dates. The nine survey stations were located where access had been granted or could be viewed from the road ROW (ref. Map NH-2). The turtle surveys were completed on sunny days when the air temperature was greater than 10°C and was greater than the water temperature (further details are provided in Table 4.4.9).

Table 4.4.9 Turtle Survey Details (2017)

Date	Time	Weather Conditions
April 26, 2017	14:00 - 15:00	18 °C, 90% Cloud Cover, Wind 6-19 km/h, No precipitation
April 27, 2017	10:30 - 16:15	25 °C, 10 - 50% Cloud Cover, Wind 1-28 km/h, No precipitation
May 18, 2017	10:00 - 16:30	25-29 °C, 30-40% Cloud Cover, Wind 12-38 km/h, No precipitation

During each survey, suitable basking areas within the selected wetlands/ponds were surveyed by slowly traveling around the outer edge of the feature, pausing frequently to scan for turtles. The species, number and general location of turtles observed were recorded and noted on field maps. The results are shown in Table 4.4.10.

Table 4.4.10 Turtle Survey Results (2017)

Location (ref. Map NH-2)	Species	Date	Number
T1 (Tim Horton's Pond)	Midland Painted Turtle (*Chrysemys picta marginata*)	April 27, 2017	36
		May 17, 2017	37
	Snapping Turtle (*Chelydra serpentine*)	April 27, 2017	1
		May 17, 2017	0
T2	Midland Painted Turtle (*Chrysemys picta marginata*)	April 27, 2017	10
		May 17, 2017	0
T3	Midland Painted Turtle (*Chrysemys picta marginata*)	April 27, 2017	8
		May 17, 2017	1
T4	Midland Painted Turtle (*Chrysemys picta marginata*)	April 27, 2017	0
		May 17, 2017	0
T5	Midland Painted Turtle (*Chrysemys picta marginata*)	April 27, 2017	2
		May 17, 2017	1
T6	Midland Painted Turtle (*Chrysemys picta marginata*)	April 27, 2017	0
		May 17, 2017	2
	Snapping Turtle (*Chelydra serpentine*)	April 27, 2017	1
		May 17, 2017	1
T7	Midland Painted Turtle (*Chrysemys picta marginata*)	April 27, 2017	4
		May 17, 2017	19
	Snapping Turtle (*Chelydra serpentine*)	April 27, 2017	2
		May 17, 2017	1
T8	Midland Painted Turtle (*Chrysemys picta marginata*)	April 27, 2017	37
		May 17, 2017	58
	Snapping Turtle (*Chelydra serpentine*)	April 27, 2017	1
		May 17, 2017	2
T9 (Halligan's Pond)	Midland Painted Turtle (*Chrysemys picta marginata*)	April 26, 2017	15
		May 17, 2017	5
	Red-eared Slider (*Trachemys scripta elegans*)	April 26, 2017	1
		May 17, 2017	0

Three (3) species of turtle were found in the PSA during the turtle surveys: Midland Painted Turtle (*Chrysemys picta marginata*), Red-eared Slider (*Trachemys scripta elegans*) and Snapping Turtle (*Chelydra serpentine*). Midland Painted Turtle is ranked S5, meaning it is considered common, widespread and abundant in Ontario. Red-eared Slider has a S-rank of SE since it is an exotic species (i.e., non-native). Snapping Turtle is listed as a species of Special Concern both federally and provincially, has an S-rank of S3 (uncommon in Ontario) and is considered significant and rare in Wellington County. A picture of a Snapping Turtle observed is shown in Photo 8 of Appendix NH-2B.

In addition to the turtles recorded in and around the ponds surveyed areas, nine (9) dead turtles were noted along Gordon Street and Maltby Road during the 2017 field surveys, as follows:

- One (1) Snapping Turtle on Gordon Street;
- Three (3) Midland Painted Turtles on Gordon Street (see Photo 5 in Appendix NH-2B);

- One (1) Turtle spp. on Gordon Street (unable to identify species due to decomposition);
- One (1) Snapping Turtle on Maltby Road (east of Gordon Street);
- Two (2) Midland Painted Turtles on Maltby Road (east of Gordon Street); and
- One (1) Midland Painted Turtles on Maltby Road (west of Gordon Street).

Targeted basking turtle surveys were not conducted in 2018 but, one live Snapping Turtle was noted incidentally on the 1992 Gordon Street property during the breeding bird surveys on June 1, 2018.

These results are comparable with others conducted in the PSA in terms of species diversity which also documented Midland Painted Turtle and Snapping Turtle (NSEI 2016, NSEI 2015, NSEI 2014, Dance Environmental Inc. 2014, McEachren 2012, NRSI 2012b, NRSI 2011, NRSI 2010, Timmerman et al. 2010, NRSI 2007, Stantec 2007). 2017 was the first time the exotic Red-eared Slider was observed within the PSA.

4.4.3.4 Snakes

Surveys for snakes were undertaken in conjunction with vegetation and turtle surveys, and included overturning selected natural cover objects (e.g., logs and rocks) and incidental observations within the PSA completed over the summer and fall of 2017 and 2018. Targeted surveys for snakes were not included in the scope of work due to the intensive nature of the surveys required and their relatively low success rates, the somewhat broad scale of this study, and the expectation that such data would not change the outcome of the CEIS exercise.

Species that were observed incidentally during the field surveys conducted in 2017 are summarized in Table 4.4.11.

Table 4.4.11 Incidental Snake Observations in 2017

Survey Dates	Species	Number of Individuals	Location (ref. Map NH-2)
Amphibian Movement Surveys (March 27, April 27, September 27, and October 4, 2017)	Eastern Garter Snake (*Thamnophis sirtalis sirtalis*)	2	Maltby Road West (W3)
		1	Maltby Road East (W2)
		1	Gordon Street (W5)
		1	Victoria Road (W6)
	Northern Water Snake (*Nerodia sipedon sipedon*)	1	Maltby Road East (W2)
	Brown Snake (*Storeria dekayi dekayi*)	1	Maltby Road West (W3)
	Snake spp. (roadkill)	1	Victoria Road (W7)
Turtle Surveys (April 26/27 and May 18, 2017)	Eastern Ribbon Snake (*Thamnophis sauritus septentrionalis*)	4*	Tim Horton's Pond - Station 1 (T1)
	Eastern Garter Snake (*Thamnophis sirtalis sirtalis*)	4	Tim Horton's Pond - Station 1 (T1)
Breeding Bird Surveys (June 18, 2018)	Eastern Garter Snake (*Thamnophis sirtalis sirtalis*)	1	1992 Gordon Street

Note: * Four (4) Eastern Ribbon Snakes seen on April 7, 2017 and three (3) seen on May 18, 2017 so assumed 4 species located here in total.

In total, four (4) species of snakes were recorded in 2017. These species included: Eastern Garter Snake (*Thamnophis sirtalis sirtalis*), Northern Water Snake (*Nerodia sipedon sipedon*), Brown Snake (*Storeria dekayi dekayi*) and Eastern Ribbon Snake (*Thamnophis sauritus septentrionalis*). Note that one snake species could not be identified due to its condition on the road. Additionally, an Eastern Garter Snake was recorded incidentally on the 1992 Gordon Street property during the breeding bird survey on June 18, 2018. The majority of these species are considered common, widespread and abundant provincially, with the exception of Eastern Ribbon Snake, which is ranked as S4 (uncommon in Ontario). This snake is also listed federally and provincially as Special Concern. A picture of an Eastern Ribbon Snake is shown in Photo 8 in Appendix NH-2B. Northern Water Snake, Brown Snake and Eastern Ribbon Snake are all considered rare and significant in Wellington County.

These findings are consistent with other studies in the PSA which have documented the same snake species (NRSI 2017, NSEI 2016, NSEI 2015, NSEI 2014, Dance Environmental Inc. 2014, McEachren 2012, NRSI 2012b, NRSI 2012c, NRSI 2011, NRSI 2010, NRSI 2007, Black et al. 2005, NSEI 2001), except for Northern Water Snake, which was documented for the first time in the PSA in 2017. Previous field studies also documented Redbelly Snake (*Storeria o. occipitomaculata*) (NSEI 2016, NSEI 2015, NSEI 2014, Dance Environmental Inc. 2014, McEachren 2012, NRSI 2012c, NRSI 2011, NRSI 2010, NRSI 2007, Black et al. 2005, NSEI 2001), which is a rare and significant species in Wellington County, and was not documented in 2017 or 2018.

4.4.3.5 Birds

Two rounds of surveys for breeding birds each took place in 2017 and 2018 in the PSA to confirm what species of birds are nesting in the area. A total of fifteen (15) point count survey stations were surveyed along roads and where access was provided (ref. Maps G-2 and NH-2) in 2017. Point count survey stations were established within and adjacent the various representative habitat types within the PSA (ref. Table 4.4.3). No stations were established along Gordon Street, as it was assumed that there is too much traffic along this road, even in the early morning, to yield useful results. In 2018, due to the size of the area being surveyed (1968 and 1992 Gordon Street), a roving technique was used to survey for breeding birds. Birds were recorded on an aerial photograph in the approximate location that they were observed.

Surveys were conducted using the protocols provided in the Ontario Breeding Bird Atlas (OBBA) Guide for Participants (Cadman *et al.,* 2007) at an appropriate time of day (i.e., between dawn and five hours after dawn) and under suitable weather conditions (i.e., no thick fog or precipitation; winds generally less than 20 km/h). Observations made were recorded using a form based on the OBBA protocols (as provided in the Work Plan for this project). Observations made between point count stations will also be recorded. Survey details are presented in Table 4.4.12.

Table 4.4.12 Breeding Bird Survey Details

Date	Time	Weather Conditions
June 7, 2017	5:30 - 9:30	6-15 °C, 10% cloud cover, wind 1-11 km/h, No precipitation
June 20, 2017	5:21 - 8:55	16 °C, 100% cloud cover, wind 6-11 km/h, No precipitation
June 1, 2018	6:00 - 9:00	20 °C, 80% cloud cover, wind 0 km/h, no precipitation
June 18, 2018	5:30 - 9:15	25 °C, 100% cloud cover, wind 1-11 km/h, no precipitation

A total of seventy-one (71) species of birds were recorded in the PSA in 2017 and 2018, sixty-five (65) of which were breeding or suspected to be breeding. An additional forty-one (41) species were documented through other studies in the PSA since 2000, for a total of one-hundred and twelve (112) bird species recorded, one hundred and one (101) of which were confirmed breeding or suspected to be breeding. These differences likely related to variations in species composition over the years and limited access to certain habitat types in the SPA during the 2017 and 2018 surveys. Most of the bird species documented are considered common, abundant and widespread in Ontario (S5) or uncommon in the Province (S4), or not a suitable target for conservation activities (SNA).

Of the one-hundred and twelve (112) bird species documented, six are SAR. Four are provincially Endangered or Threatened, and two are listed as Special Concern provincially:

- Yellow-breasted Chat (*Icteria virens*) (Endangered) – documented just west of the SPA on the 385 Maltby Road West lands (NRSI 2012b, NRSI 2012c, NRSI 2007);
- Barn Swallow (*Hirundo rustica*) (Threatened) - documented around the barn on 2162 Gordon Street during the field surveys conducted by Beacon in 2017, in the west section of the SPA on the 132 Clair Road West lands (NSEI 2015), west of SPA on the 424 Maltby Road property (Dance Environmental Inc. 2014), on the 385 Maltby Road West lands (NRSI 2012c, NRSI 2007), just north of SPA at the 1897 Gordon Street property (Aboud and Associates Inc. 2010), at 331 Clair Road (NRSI 2012a) and on 1858 Gordon Street (the former Pergola Lands) (Stantec 2014);
- Bobolink (*Dolichonyx oryzivorus*) (Threatened) - documented in the west section of the SPA on the 132 Clair Road West lands (NSEI 2015), north of the SPA near Dallan Drive (Stantec 2009) and at 1858 Gordon Street (Stantec 2014);
- Eastern Meadowlark (*Sturnella magna*) (Threatened) - documented west of the SPA on the 950 Southgate Drive property and east of the SPA on the 1825 Victoria Road South property during the breeding bird surveys conducted by Beacon in 2017, in the west section of the SPA on the 132 Clair Road West lands (NSEI 2015), west of the SPA on the 385 Maltby Road West lands (NRSI 2012c, NRSI 2007), and north of the SPA at 1858 Gordon Street (Stantec 2014);
- Eastern Wood-pewee (*Contopus virens*) (Special Concern) - documented throughout the SPA and PSA by Beacon in 2017/2018, including breeding bird stations 2, 5, 6, 8, and 10, on the 1992 Gordon Street property, north of the SPA near Dallan Drive (NSEI 2014, Stantec 2007), and west of SPA at the 424 Maltby Road property (Dance Environmental Inc. 2014) and the 385 Maltby Road West lands (NRSI 2007); and
- Wood Thrush (*Hylocichla mustelina*) (Special Concern) - documented in 2018 at the 1992 Gordon Street property and north of the SPA near Dallan Drive (NSEI 2014, Stantec 2007).

Significant Wildlife Species are discussed further in Section 4.4.4.

Forty-six (46) of the total one-hundred and twelve (112) bird species documented are considered significant in Wellington County, and twenty-one (21) of these are also are considered rare in Wellington County (Dougan & Associates with Snell and Cecile 2009b*)*. These locally significant species are listed in Section 4.4.4.3 below. The Significant Wildlife list for Wellington County (Dougan & Associates with Snell and Cecile 2009b) qualifies that some species' habitats should only be considered significant if they support, or have recently supported, active nests. Four additional species of birds observed within the PSA and SPA (i.e., Great Blue Heron (*Ardea herodias*), Ring-billed Gull (*Larus delawarensis*), Herring Gull (*Larus argentatus*) and Cliff Swallow (*Petrochelidon pyrrhonota*)), would have been classified as significant had nest been documented.

A complete list of bird species documented within the PSA with details about their statuses is provided in Appendix NH-5.

4.4.3.6 Other Wildlife

Winter Wildlife

Winter wildlife surveys were included in the scope of work for this study to document site utilization by certain wildlife during the winter months and to help screen for certain types of SWH. This included searches for seepage areas, which can be observed in the winter (ref. Photo 18, Appendix NH-2B).

Beacon completed one winter wildlife survey under snow cover on February 15, 2017 along five established transects excluding 1968-1992 Gordon Street (ref. Map NH-2). An additional survey on February 13, 2018, included reviewing these transects for a second time, including the 1968-1992 Gordon Street property. These site visits specifically recorded evidence of mammal (with a particular focus on deer movement) and raptor use by walking transects in areas that are representative of the various habitats present within the PSA, and where access was provided.

The winter wildlife surveys in 2017 documented evidence of: Eastern Cottontail (*Sylvilagus floridanus*), Gray Squirrel (*Sciurus carolinensis*), Coyote (*Canis latrans*), Raccoon (Procyon lotor), White-tailed Deer (*Odocoileus virginianus*). In 2018, species documented during winter wildlife surveys included Eastern Cottontail, Gray Squirrel, Red Squirrel (*Tamiasciurus hudsonicus*) and White-tailed Deer.

These results are consistent with previous studies' findings conducted in the PSA and SPA (NSEI 2016, NSEI 2015, Dance Environmental Inc. 2014, Stantec 2014, McEachren 2012, NRSI 2012b, NRSI 2012c, NRSI 2011, Aboud and Associates 2010, NRSI 2010, Timmerman et al. 2010, NRSI 2007, Stantec 2007, Black et al. 2005, NRSI 2001).

The supplemental background information also indicates there are additional mammals present in the SPA and PSA including species such as Northern Short-tailed Shrew (*Blarina brevicauda*), Woodchuck (*Marmota monax*), Muskrat (*Ondatra zibethicus*) and Mink (*Mustela vison*). A complete list of mammals that were recorded by previous studies that were not observed by Beacon in 2017/2018 are is provided in Appendix NH-5.

Additionally, common bird species that do not migrate were observed during the 2017/2018 winter wildlife surveys, which included:

- Black-capped Chickadee (*Poecile atricapillus*);
- Wild Turkey (*Meleagris gallopavo*);
- Blue Jay (*Cyanocitta cristata*);
- Northern Cardinal (*Cardinalis cardinalis*);
- Mourning Dove (*Zenaida macroura*);
- Downy Woodpecker (*Picoides pubescens*);
- Ruffed Grouse (*Bonasa umbellus*);
- Dark-eyed Junco (*Junco hyemalis*);
- White-breasted Nuthatch (*Sitta carolinensis*);
- Pine Siskin (*Spinus pinus*); and,
- American Crow (*Corvus brachyrhynchos*).

These species of birds were observed during other field surveys conducted by Beacon in 2017/2018 and have also been documented by numerous studies previously conducted in the PSA and SPA (for more details refer to Appendix NH-5).

No raptors or stick nests were observed during the winter wildlife surveys in 2017. However, during the winter wildlife survey in 2018, one Red-tailed Hawk was observed within the Dallan Lands and one Great-horned Owl was observed at 1992 Gordon Street. There is suitable habitat for raptor wintering (one of the SWH types, see Section 4.4.5) in the PSA. Raptors (i.e., hawks and owls) require at least 20 ha that is comprised of a combination of forest (deciduous, coniferous or mixed) and open or semi-open successional uplands. A comprehensive screening for all SWH categories is provided in Appendix NH-8.

A large number of deer tracks were recorded in the agricultural fields and woodlands on 2162 Gordon Street (ref. Photo 1, Appendix NH-2B).

Incidental Wildlife

Observations of wildlife in the PSA were made incidentally as part of all other targeted field surveys in 2017 and 2018 (ref. Table 4.4.4). This included scanning for Terrestrial (or Chimney) Crayfish around the margins of wet meadows and fields during surveys conducted between April and June in 2017 and 2018. This species is further discussed in the SWH screening in Appendix NH-8.

Along with the incidental amphibian, reptile and bird species discussed in the preceding sub-sections, three (3) incidental mammal species, two (2) Odonate species (dragonflies and damselflies) and two (2) butterfly species were recorded by Beacon in 2017/2018, as follows:

- Eastern Chipmunk (*Tamias striatus*);
- Red Fox (*Vulpes Vulpes*);
- Domestic Dog (*Canis spp.*);
- Darner spp. (*Aeshna spp.*);
- Meadowfly spp. (*Sympetrum spp.*);
- Cabbage White (*Pieris rapae*); and,
- Monarch (*Danaus plexippus*).

All incidental wildlife recorded in 2017/2018 and the supplemental field surveys are listed in Appendix NH-5. Incidental species that are considered significant are discussed in Section 4.4.4.

4.4.4 Significant Wildlife Species

Significant plant species documented within the PSA are discussed in Section 4.4.2.2. Significant wildlife species are discussed according to the following three categories, as different policies and regulation apply to each category:

a) Species at Risk (SAR) that are provincially Endangered and Threatened (which are subject to the *Endangered Species Act* (2007) under MNRF's jurisdiction) (ref. Section 4.4.4.1, Appendix NH-6);

b) Species of conservation concern under the City's policies for SWH (i.e., ranked as S1, S2 or S3 by the Ontario's Natural Heritage Information Centre (NHIC) and SAR not captured under (a)) (ref. Section 4.4.4.2, Appendix NH-7); and

c) Locally significant species (i.e., listed as rare or significant in the County of Wellington (Dougan & Associates with Snell and Cecile 2009b) but not captured under (a) or (b) (ref. Section 4.4.4.1, Appendix NH-5).

4.4.4.1 Provincially Endangered and Threatened Species at Risk

A list of twenty-four (24) wildlife SAR species that could potentially occur in the City of Guelph was provided for this project by the Guelph District MNRF on February 27, 2017. The thirteen (13) SAR that are provincially Endangered or Threatened from this list were screened in Appendix NH-6. This appendix describes the preferred habitat for each species, describes the known species range, indicates if suitable habitat is present in the SPA and/or PSA, and whether the species was confirmed in the SPA and/or PSA by recent field studies.

The following provincially Endangered or Threatened SAR have been confirmed in the SPA and/or PSA by Beacon or other studies (as noted in Appendix NH-5):

- Yellow-breasted Chat (*Icteria virens*) provincially and federally Endangered and confirmed as breeding in the southwestern portion of the PSA on 385 Maltby Road West (NRSI 2012b, NRSI 2012c, NRSI 2007);
- Barn Swallow (*Hirundo rustica*), provincially and federally Threatened and confirmed as nesting in barns/sheds in both the SPA and PSA near 2162 Gordon Street by Beacon, on 424 Maltby Road (Dance Environmental Inc. 2014) and 331 Clair Road (NRSI 2012a), and was also observed foraging in the west section of the SPA on the 132 Clair Road West lands (NSEI 2015), the 385 Maltby Road West lands (NRSI 2012c, NRSI 2007), north of SPA at the 1897 Gordon Street property (Aboud and Associates Inc. 2010) and on 1858 Gordon Street (former Pergola Lands) (Stantec 2014);
- Bobolink (*Dolichonyx oryzivorus*) provincially and federally Threatened and confirmed as breeding in grasslands in both the SPA and PSA in the west section of the SPA in the vicinity of the 132 Clair Road West lands (NSEI 2015), and north of the SPA near Dallan Drive (Stantec 2009) and Former Pergola Lands (Stantec 2014);
- Eastern Meadowlark (*Sturnella magna*) provincially and federally Threatened and confirmed as breeding in grasslands in both the SPA and PSA west of the SPA on the 950 Southgate Drive property and east of the SPA on the 1825 Victoria Road South property during the breeding bird surveys conducted by Beacon in 2017 (outside the City limits), in the west section of the SPA in the vicinity of the 132 Clair Road West lands (NSEI, 2015), west of the SPA on the 385 Maltby Road West lands (NRSI 2012c, NRSI 2007) and north of the SPA on the Former Pergola lands (Stantec 2014); and
- Eastern Small-footed Myotis (*Myotis leibii*), provincially Endangered, a bat species confirmed as breeding in the southwestern portion of the PSA within treed habitats on 424 Maltby Road West (Dance Environmental Inc. 2014).

Field studies for SAR bats were not included in the scope of work for this project, and were only undertaken by the most recent site-specific study in the PSA for 424 Maltby Road West (Dance Environmental Inc. 2014) as bats have only became listed as provincially Endangered in 2012, and provincial guidelines for assessing their habitat were still draft until April 2017. Therefore, site-specific surveys for SAR bats are likely to be required on properties with trees, particularly where trees are proposed for removal, as part of the EIS or EA process in the future.

Screening for all SAR listed in Appendix NH-6 should also be undertaken at the EIS or EA stage as suitable habitat is generally present in the area. Screening should also be undertaken for any newly listed species that may have suitable habitat in the SPA.

4.4.4.2 Species of Conservation Concern

In the City of Guelph, species of conservation concern (as defined under the City's SWH policies) (City of Guelph 2014) include:

- SAR that are not provincially Endangered or Threatened (i.e., that are only federally Endangered or Threatened, or Special Concern provincially or federally) (ref. Appendix NH-7), and
- Provincially "significant" for being ranked as S1, S2 or S3 by the NHIC.

A list of 24 wildlife SAR species that could potentially occur in the City of Guelph was provided for this project by the Guelph District MNRF on February 27, 2017. Western Chorus Frog, which is federally Threatened and has been documented in the PSA (ref. Section 4.4.3.1), was added to the list. The 12 SAR that are not provincially Endangered or Threatened from this list were screened in Appendix NH-7. This appendix describes the preferred habitat for each species, describes the known species range, indicates if suitable habitat is present in the SPA and/or PSA, and whether the species was confirmed in the SPA and/or PSA by recent field studies.

The following non-provincially Endangered or Threatened SAR have been confirmed in the SPA and/or PSA by Beacon or other studies (as noted in Appendix NH-7):

- Western Chorus Frog, federally Threatened, and confirmed in the western portion of the SPA and PSA by Beacon in 2017 along Transect W3 (ref. Map NH-2), by Dougan & Associates (2005) on 201 Maltby Road West and by NRSI (2012b and 2007) on the 385 Maltby Road West property, and was also previously noted near 161, 205 and 253 Clair Road East (NRSI 2016, Stantec 2009, Stantec 2007). Dougan & Associates (2005) also recorded Western Chorus Frog within the ponds east and west of Gordon Road in the SPA (near Transect W3, ref. to Map NH-2);
- Eastern Ribbon Snake, Special Concern provincially and federally and confirmed in the "Tim Horton's" pond (Basking Turtle Monitoring Station T1 ref. Map NH-2) behind the baseball diamonds south of Bishop MacDonell High School by Beacon in 2017, and also within ponds on the 385 Maltby Road West property (NRSI 2012b, NRSI 2012c, NRSI 2007);
- Snapping Turtle, Special Concern provincially and federally, was confirmed basking by Beacon in 2017 in various ponds in the SPA and PSA (ref. Section 4.4.3.3, Table 4.4.10, Map NH-2), and was also observed nesting within wetlands located in the northern central PSA in the vicinity of Dallan Drive. North-South Environmental (2016) noted Snapping Turtle basking and nesting close to the SWM Pond and wetland just east of Hawkins Drive, while Stantec (2007) observed nesting Snapping Turtle in a wetland south of Dallan Drive within the SPA. Additionally, Snapping Turtle was confirmed within the Halls' Pond Wetland Evaluation (Timmerman et al. 2010) and on the 385 Maltby Road West Lands (NRSI 2007) ;
- Wood Thrush (Hylocichla mustelina), Special Concern provincially and federally Threatened, confirmed on the 1992 Gordon Street property in 2018 by Beacon, and in the forested mid-northern portion of the PSA in close proximity to Dallan Drive (NSEI 2014, Stantec 2007);
- Eastern Wood-pewee (Contopus virens), Special Concern provincially and federally, confirmed in various forested habitats in the SPA and PSA by Beacon in 2017 and 2018, including Breeding Bird stations B2, B5, B6, B8, and B10, within the property of 1992 Gordon Street, north of the SPA near Dallan Drive (NSEI 2014, Stantec 2007) and west of SPA at the 424 Maltby Road property (Dance Environmental Inc. 2014) and the 385 Maltby Road West lands (NRSI 2007); and
- Monarch (*Danaus plexippus*), Special Concern provincially and federally, confirmed in the SPA and PSA in some meadow habitats in the following locations: 132 Clair Road West (NSEI 2015), 161, 205 and 253

Clair Road East (NSEI 2014, Stantec 2007), 424 Maltby Road (Dance Environmental Inc. 2014), Westminster Wood East (Stantec 2009, 2007), along Victoria Road (McCormick Rankin Corporation, and Gamsby and Mannerow Limited 2003) and 385 Maltby Road West. Additionally, Monarch was noted dead on the side of the road twice during the amphibian movement surveys (as discussed in Section 4.4.3.2) on Transect W3 and W6 (ref. to Map NH-2).

There are no other wildlife species considered provincially significant confirmed in the SPA and/or PSA by Beacon or other studies other than those listed above (ref. Appendix NH-5).

Although not all species listed in Appendix NH-7 have been confirmed in the SPA, screening for all SAR listed should be undertaken at the EIS or EA stage as suitable habitat is generally present in the area. Screening should also be undertaken for any newly listed species that may have suitable habitat in the SPA.

4.4.4.3 Locally Significant Species

In the City of Guelph, "locally significant species" are those wildlife species listed in the Significant Species List for Wellington County developed as part of the Natural Heritage Strategy (Dougan & Associates with Snell & Cecile 2009b) that are not already captured as provincially Endangered or Threatened, or as conservation concern (as described in Section 4.4.4.2 above).

The detailed methods used for determining what wildlife are locally significant or rare are provided in the Natural Heritage Strategy, Phase 2, Volume 2 (Dougan & Associates with Snell & Cecile 2009b). In brief, the methods to identify species beyond those that are federally or provincially of Endangered, Threatened or Special Concern, or with NHIC statuses of S1, S2, S3 or S3/S4 were as follows:

- Most species identified as "significant" in Wellington County were also considered "rare", with the exception of a number of birds identified as "significant" based primarily on their specialized habitat requirements (e.g., area sensitivity) and not their relative abundance in the County;
- Species were generally confirmed as being documented in the County based on their presence in at least one of 10 km by 10 km UTM squares (also called "atlas squares") overlapping with the County;
- Birds with probable or confirmed breeding evidence 23.33% of the atlas squares or less were considered rare and significant;
- Amphibians and reptiles recorded in 23.33% of the atlas squares or less were considered rare and significant;
- Mammals documented in evidence 10% of the atlas squares or less and representing less than 1% of all records were considered rare and significant; and
- For damselflies, dragonflies and butterflies no locally significant or rare species were added beyond those already identified as provincially significant due to the lack of data.

Data from the field studies conducted by Beacon in 2017/2018 and the background reports in the PSA (ref. Appendix NH-1) were screened for wildlife species that are considered locally significant or rare. From this analysis, it was determined that significant species that have been documented in the PSA included forty-tone (41) species of birds, six amphibian species, three species of reptile, two mammals, two Odonates and one butterfly species. These species did not include provincially endangered or threatened, or species of conservation concern, as discussed in the preceding two sections. These species are listed in Table 4.4.13. Details of studies in which each of these species was documented is provided in Appendix NH-5.

Table 4.4.13 Summary of Locally Significant Wildlife Species in the Primary Study Area (PSA)

Common Name	Scientific Name	Wellington County Status*	Breeding Status**	Location
		Birds		
Pied-billed Grebe	*Podilymbus podiceps*	S,R	Y	PSA and SPA
Ring-necked Duck	*Aythya collaris*	S,R	N	PSA and SPA
Common Merganser	*Mergus merganser*	S,R	N	SPA
Turkey Vulture	*Cathartes aura*	S,R	N	PSA
Osprey	*Pandion haliaetus*	S,R	Y	PSA and SPA
Northern Harrier	*Circus cyaneus*	S	Y	PSA
Sharp-shinned Hawk	*Accipiter striatus*	S	Y	PSA
Cooper's Hawk	*Accipiter cooperi*	S	Y	PSA and SPA
Red-shouldered Hawk	*Buteo lineatus*	S,R	N	PSA
Broad-winged Hawk	*Buteo platypterus*	S,R	Y	PSA
Sora	*Porzana carolina*	S,R	Y	PSA
Black-billed Cuckoo	*Coccyzus erythropthalmus*	S	Y	PSA
Yellow-billed Cuckoo	*Coccyzus americanus*	S,R	Y	PSA
Yellow-bellied Sapsucker	*Sphyrapicus varius*	S	Y	PSA
Hairy Woodpecker	*Picoides villosus*	S	Y	PSA and SPA
Northern Flicker	*Colaptes auratus*	S	Y	PSA and SPA
Pileated Woodpecker	*Dryocopus pileatus*	S	Y	PSA and SPA
Willow Flycatcher	*Empidonax traillii*	S	Y	PSA and SPA
Least Flycatcher	*Empidonax minimus*	S	Y	PSA and SPA
Eastern Kingbird	*Tyrannus tyrannus*	S	Y	PSA and SPA
Common Raven	*Corvus corax*	S,R	Y	PSA
Red-breasted Nuthatch	*Sitta canadensis*	S	Y	PSA
Brown Creeper	*Certhia americana*	S	Y	PSA
Winter Wren	*Troglodytes hiemalis*	S	Y	PSA
Ruby-crowned Kinglet	*Regulus calendula*	S,R	N	PSA
Brown Thrasher	*Toxostoma rufum*	S	Y	PSA and SPA
Magnolia Warbler	*Setophaga magnolia*	S,R	Y	PSA
Black-throated Green Warbler	*Setophaga virens*	S,R	Y	PSA
Pine Warbler	*Setophaga pinus*	S	Y	PSA and SPA
Black-and-white Warbler	*Mniotilta varia*	S	Y	PSA
American Redstart	*Setophaga ruticilla*	S	Y	PSA and SPA
Scarlet Tanager	*Piranga olivacea*	S,R	Y	SPA
Rose-breasted Grosbeak	*Pheucticus ludovicianus*	S	Y	PSA and SPA
Eastern Towhee	*Pipilio erythrophthalmus*	S	Y	PSA and SPA
Field Sparrow	*Spizella pusilla*	S	Y	PSA and SPA
Vesper Sparrow	*Pooecetes gramineus*	S	Y	PSA and SPA

Table 4.4.13 Summary of Locally Significant Wildlife Species in the Primary Study Area (PSA)

Common Name	Scientific Name	Wellington County Status*	Breeding Status**	Location
Savannah Sparrow	*Passerculus sandwichensis*	S	Y	PSA and SPA
Grasshopper Sparrow	*Ammodramus savannarum*	S,R	Y	PSA
Dark-eyed Junco	*Junco hyemalis*	S,R	Y	PSA
Brewer's Blackbird	*Euphagus cyanocephalus*	S,R	Y	PSA
Baltimore Oriole	*Icterus galbula*	S	Y	PSA and SPA
Amphibians				
Bullfrog	*Rana catesbeiana*	S,R	Y	PSA and SPA
Pickerel Frog	*Rana palustris*	S,R	Y	PSA and SPA
Blue-spotted Salamander	*Ambystoma laterale*	S,R	Y	PSA
Blue-spotted dominated polyploid Salamander	*Ambystoma (2) laterale - jeffersonianum*	S,R	Y	PSA
Yellow (Spotted) Salamander	*Ambystoma maculatum*	S,R	Y	PSA and SPA
Red-spotted Newt	*Notophtalmus viridescens viridescens*	S,R	Y	PSA and SPA
Reptiles				
Northern Water Snake	*Nerodia sipedon sipedon*	S,R	Y	PSA
Brown Snake	*Storeria dekayi dekayi*	S,R	Y	PSA
Redbelly Snake	*Storeria o. occipitomaculata*	S,R	Y	PSA and SPA
Mammals				
Long-tailed Weasel	*Mustela frenata*	S,R	N	PSA
Woodland Jumping Mouse**	*Napeozapus insignis***	S	Y	PSA
Insects				
Sweetflag Spreadwing	*Lestes forcipatus*	S,R	Y	PSA
Citrine Forktail	*Ischnura hastata*	S,R	Y	PSA
Giant Swallowtail	*Papilio cresphontes*	S,R	Y	PSA

Notes: *Significant Wildlife List for Wellington County from the City of Guelph Natural Heritage Strategy, Volume 2 (Dougan & Associates with Snell and Cecile 2009). S = Significant, R = Rare
**Species confirmed or suspected to be breeding. Y = Yes, N = No

4.4.5 Significant Wildlife Habitat Assessments

The habitat and species assessments (described above) were synthesized to identify Significant Wildlife Habitat (SWH) in accordance with the applicable guidelines in the SPA. SWH had not previously identified or mapped in the SPA as part of the City's NHS (2014) in part due to the absence of site-specific data and in part due to the fact that specific Ecoregional criteria had not yet been developed. Therefore, the SWH assessments and mapping developed through the CMSP is new.

SWH is an umbrella for a wide range of unique and specialized habitat types that are often, but not always, captured within other significant natural heritage features and areas. The applicable Provincial guidance documents (MNRF 2015, MNRF 2000) divide SWH into the following four categories, with a total of thirty-seven (37) specific SWH types identified for Ecoregion 6E (MNRF 2015):

- seasonal concentration areas (15 types);
- rare vegetation communities or specialized habitats for wildlife (15 types);
- habitats of species of conservation concern (excluding the habitats of Endangered and Threatened species) (5 types); and,
- animal movement corridors (2 types).

SWH may be identified as "Candidate" areas where suitable habitat is present but actual species or species numbers required to meet the established criteria have not been confirmed, or "confirmed" once an area meeting the established criteria has been field-verified. Although guidance for identifying SWH is provided by MNRF, it is ultimately the municipal planning authority (in this case, the City of Guelph) who is responsible for confirming SWH.

Approach for the CMSP

The SWH assessment resulted in the following categories of SWH being assigned:

- Confirmed SWH (mapped): Confirmed SWH was only identified where both the suitable habitat and the suggested criteria were considered to be met based on: (a) data collected by Beacon in 2017 and 2018 or (b) SWH identified by others in the PSA that would have been based on data unlikely to have changed since the time of the original identification (e.g., rare vegetation community, NRSI 2007).
- Candidate SWH (mapped): Candidate SWH was identified where suitable habitat could be fairly confidently mapped based on the available information, but data was insufficient to determine if the specific criteria were met or species listed were present. In these cases, site-specific studies should screen for this category of SWH where suitable habitat occurs.
- In the case of raptor wintering habitat and shrub/early successional breeding bird habitat, Candidate SWH areas have been identified approximately with asterisks with the understanding that these areas will need to be screened at the site-specific level to assess the presence and extent of habitat.
- SWH type may occur but is not mapped: In some cases, neither confirmed nor Candidate SWH could be mapped based on the available data but may still occur within the SPA based on known conditions. In these cases, site-specific studies will need to screen for this category of SWH where suitable habitat exists.
- Not Applicable: Finally, some types of SWH are considered not applicable within the PSA based on the absence of suitable habitat. These would presumably not need to be screened as part of future site-specific studies.

Summary of SWH Findings and Application in the SPA and PSA

The findings of the SWH analyses are summarized in Table 4.4.13 below and presented in more detail (including the applicable criteria) in Appendix NH-8. Candidate and confirmed SWH that could be mapped is illustrated in Map NH-6.

Table 4.4.14 Overview of Significant Wildlife Habitat (SWH) Assessment

SWH Type* (ref. Appendix G4 for more details)	Application to the Secondary Plan Area (SPA) and Primary Study Area (PSA)**	Assessed SWH Status in the SPA
	Seasonal Concentration Areas	
Waterfowl Stopover and Staging Areas (Terrestrial)	No suitable habitat identified in the SPA or PSA, and none would be expected to occur.	Not Applicable
Waterfowl Stopover and Staging Areas (Aquatic)	All marshes with open water where incidental observations of migratory waterfowl have been recorded that could potentially support the required aggregations to be considered Confirmed SWH in the SPA are considered suitable habitat and have been mapped as Candidate SWH. Site specific study may be required where suitable habitat exists to confirm the status of this SWH type.	Candidate SWH is mapped (ref. Map NH-6)
Shorebird Migratory Stopover Area	No suitable habitat identified in the SPA or PSA, and none would be expected to occur.	Not Applicable
Raptor Wintering Area	Extensive potentially suitable habitat is present within the PSA due to the relatively abundant areas of cultural meadows and thickets adjacent to deciduous, coniferous or mixed forests. Two listed species (Red-tailed Hawk and Northern Harrier) have been confirmed in the PSA. However, no observations were within the SPA and observations in the adjacent PSA were not in adequate numbers or frequency to meet the suggested criteria (i.e., 10 individuals from at least 2 species of hawk or owl for 20 days of use). Site-specific study will be needed to capture the best and most representative area(s) in the SPA, assuming more than one of the Candidate areas meets the established criteria.	Several Candidate SWH areas are shown approximately (ref. Map NH-6) with an asterisk
Bat Hibernacula	No suitable habitat identified in the SPA or PSA, and none would be expected to occur.	Not Applicable
Bat Maternity Colonies	All deciduous forest (FO-) and swamp (SW-) communities in the SPA are considered suitable habitat and have been mapped as Candidate SWH. Site specific study may be required where suitable habitat exists to confirm the status of this SWH type.	Candidate SWH is mapped (ref. Map NH-6)
Turtle Wintering Areas	Midland Painted Turtles and Snapping Turtles have been documented in ponds throughout the SPA and PSA. Not all ponds were assessed as part of the Clair-Maltby Secondary Plan study. Suitable habitat for wintering is presumed to be present within the PSA and SPA in ponds where these turtles have been observed. Confirmed SWH has been mapped in ponds where at least five Painted Turtles and/or at least one Snapping Turtle were documented in 2017. Candidate SWH includes Other Wetlands or ponds with permanent open water in the SPA. Site specific study may be required where suitable habitat exists to confirm the status of this SWH type.	Candidate and Confirmed SWH are mapped Map NH-6)
Reptile Hibernaculum	Suitable habitat may be present within the SPA and/or PSA (e.g. in animal burrows, old housing foundation and wetlands that go below the frost line) but has not been mapped. While a number of individual listed snake species (i.e., Northern Water Snake, Northern Brownsnake, Eastern Ribbonsnake, Northern Red-bellied Snake and Eastern Gartersnake) have been documented in the PSA, no concentrations (i.e., >5 individuals) of reptiles have been recorded. Site specific study may be required where suitable habitat exists to confirm the status of this SWH type.	One candidate SWH is mapped with an asterisk (ref. Map NH-6); others communities may be identified
Colonially-Nesting Bird Breeding Habitat (Bank and Cliff)	No suitable habitat identified in the SPA or PSA, and none would be expected to occur.	Not Applicable
Colonially-Nesting Bird Breeding Habitat (Tree/Shrubs)	Suitable habitat may be present within the PSA in treed wetlands (i.e., swamps) and ponds. Great Blue Heron has been observed in the SPA), but nests were not found. Site specific study may be required where suitable habitat exists to confirm the status of this SWH type.	This type of SWH may occur but has not been mapped
Colonially-Nesting Bird Breeding Habitat (Ground)	Only one of the listed species has been recorded in the PSA (Brewer's Blackbird) and none of the listed species would be expected to occur in the PSA in sufficient numbers to meet the criteria.	Not Applicable
Migratory Butterfly Stopover Areas	No suitable habitat identified in the SPA or PSA due to its distance from Lake Ontario and Lake Erie.	Not Applicable
Landbird Migratory Stopover Areas	No suitable habitat identified in the SPA or PSA due to its distance from Lake Ontario and Lake Erie.	Not Applicable
Deer Yarding Areas	This SWH type is determined by MNRF, typically in areas with higher levels of snowfall. No suitable habitat has been identified in the SPA or PSA by MNRF.	Not Applicable
Deer Winter Congregation Areas	White-tailed deer are known to be common in the PSA, but this SWH type is determined by MNRF and no suitable habitat has been identified in the PSA by MNRF. It typically applies to woodlands and/or swamps that are at least 100 ha but may also apply to smaller coniferous plantations. Verification should occur through site-specific study.	This type of SWH may occur but has not been mapped

Table 4.4.14 Overview of Significant Wildlife Habitat (SWH) Assessment

SWH Type* (ref. Appendix G4 for more details)	Application to the Secondary Plan Area (SPA) and Primary Study Area (PSA)**	Assessed SWH Status in the SPA
Rare Vegetation Communities		
Cliffs and Talus Slopes	No suitable habitat identified in the PSA, and none would be expected to occur.	Not Applicable
Sand Barren	No suitable habitat identified in the SPA or PSA, and none would be expected to occur.	Not Applicable
Alvar	No suitable habitat identified in the SPA or PSA, and none would be expected to occur.	Not Applicable
Old Growth Forest	No suitable habitat identified in the SPA or PSA, and none would be expected to occur.	Not Applicable
Savannah	No suitable habitat identified in the SPA or PSA, and none would be expected to occur.	Not Applicable
Tallgrass Prairie	No suitable habitat identified in the SPA or PSA, and none would be expected to occur.	Not Applicable
Other Rare Vegetation Communities	In 2006, NRSI identified a small Buttonbush Mineral Deciduous Thicket Swamp Type (SWT3-4) community within the southwestern PSA, which is considered rare in Ontario (with an S-rank of S3). Additional provincially rare communities may be identified through site specific study.	One confirmed SWH is mapped (ref. Map NH-6); other rare communities may be identified
Specialized Habitat for Species		
Waterfowl Nesting Area	Suitable habitat may be present within the SPA and/or PSA in the vicinity of ponds, but surveys conducted as part of the Clair-Maltby Secondary Plan studies did not document adequate numbers of listed species. Site specific study may be required where suitable habitat exists to confirm the status of this SWH type.	One candidate SWH is mapped with an asterisk (ref. Map NH-6); others communities may be identified
Bald Eagle and Osprey Nesting, Foraging and Perching Habitat	Suitable habitat is present within the SPA and/or PSA in the vicinity of ponds and wetlands. No evidence for Bald Eagle has been documented in the PSA. One active Osprey nest was located on the lighting posts around the baseball diamonds in the northwestern PSA in 2017, but is on a man-made object, so it is not SWH. Site specific study may be required where suitable habitat exists to confirm the status of this SWH type.	This type of SWH may occur but has not been mapped
Woodland Raptor Nesting Habitat	No suitable habitat identified in the SPA or PSA, and none would be expected to occur.	Not Applicable
Turtle Nesting Areas	Potential suitable habitat is present within the PSA and SPA in areas surrounding marshes and open aquatic ecosites, particularly adjacent to ponds where Midland Painted Turtles and /or Snapping Turtle have been documented by Beacon (see Section 4.4.3.3 and SWH Type #7). Two Snapping Turtle nests were documented on the 132 Clair Road lands (North-South Environmental Inc. 2015) but the specific locations are unknown. Snapping Turtle was also observed nesting within areas of marshes located in the northern central PSA in the vicinity of Dallan Drive. North-South Environmental (2016) noted Snapping Turtle basking and nesting close to the SWM Pond and wetland just east of Hawkins Drive, while Stantec (2007) observed nesting Snapping Turtle in a wetland south of Dallan Drive within the SPA. Additional turtle nesting areas may be identified through site specific study.	This type of SWH occurs and is to be mapped through site-specific study
Seeps and Springs	Suitable habitat occurs within the SPA and PSA. One seep was confirmed by Beacon in 2017 within the SPA on the 2162 Gordon Street property. Additional seepage areas may be identified through site specific study.	One Confirmed SWH is mapped (ref. One confirmed SWH is mapped (ref. Map NH-6); other rare communities may be identified); additional seeps or springs may occur
Amphibian Breeding Habitat (Woodland)	Suitable habitat occurs within wetlands in the SPA and PSA, and as documented in the amphibian surveys over 2017, these areas support very healthy levels of Spring Peepers, Gray Treefrogs and Wood Frogs with Eastern Newt, Blue-spotted Salamander and Western Chorus Frog documented in the area as well. All wetlands greater than 500 m^2 located in, or within 120 m of, a woodland (i.e., FOC, FOD or FOM) or swamp in the SPA have been identified as Candidate SWH for this category. Wetlands meeting the suggested criteria based on data collected in 2017 have been identified as Confirmed SWH for this category. Additional areas may be confirmed through site specific study. Candidate areas should be verified through site-specific study. Additional areas may also be identified through site specific study.	Candidate and Confirmed SWH is mapped (ref. Map NH-6)
Amphibian Breeding Habitat (Wetland)	Suitable habitat occurs within wetlands in the SPA and PSA, as do the listed species (see SWH Type #28). All wetlands greater than 500 m^2 located more than 120 m from a woodland (i.e., FOC, FOD or FOM) or wooded swamps in the SPA have been identified as Candidate SWH for this category. Wetlands meeting the suggested criteria based on data collected in 2017 have been identified as Confirmed SWH for this category. Candidate areas should be verified through site-specific study. Additional areas may also be identified through site specific study.	Candidate SWH is mapped (ref. Map NH 6)
Woodland Area-Sensitive Bird Breeding Habitat	No suitable habitat has been identified in the SPA or PSA due to the lack of interior forest, although a few of the listed species have been documented.	Not Applicable

Table 4.4.14 Overview of Significant Wildlife Habitat (SWH) Assessment

SWH Type* (ref. Appendix G4 for more details)	Application to the Secondary Plan Area (SPA) and Primary Study Area (PSA)**	Assessed SWH Status in the SPA
Habitat for Species of Conservation Concern		
Marsh Bird Breeding Habitat	Limited suitable habitat occurs within the PSA and SPA, but most of the listed species have not been documented in the area and would not be expected to occur, with the exception of Sora, Pied-billed Grebe and Green Heron. Site specific study may be required where suitable habitat exists to confirm the status of this SWH type.	This type of SWH may occur but has not been mapped
Open Country Bird Breeding Habitat	No suitable habitat has been identified in the SPA or PSA due to the absence of large enough contiguous meadow / grassland habitats, although a few of the listed species have been documented.	Not Applicable
Shrub/Early Successional Bird Breeding Habitat	Potentially suitable habitat is present within the SPA and PSA due to the presence of cultural thickets of at least 10 ha. Several of the listed species were documented in the SPA and PSA, particularly west of Victoria., by Beacon in 2017 and in previous studies. Site-specific study is needed to refine the mapping and capture the best and most representative area(s) in the SPA.	Several Candidate SWH areas are shown approximately with an asterisk (ref. Map NH-6)
Terrestrial Crayfish	Suitable habitat occurs within the PSA and SPA, and this type of SWH has been confirmed elsewhere in the City. No evidence of Terrestrial Crayfish was documented during field studies within the PSA and SPA. However, surveys for this species were incidental and not targeted and access was limited, therefore they may occur. Site specific study may be required where suitable habitat exists to confirm the status of this SWH type.	This type of SWH may occur but has not been mapped
Special Concern and Rare Wildlife Species	Suitable habitat occurs within the SPA and PSA for a number of Special Concern species as well as some species list provincially as S1, S2, S3 or SH. These were documented by Beacon in 2017 and in other background studies (ref. Appendix G3). Site specific studies should include screening for these species to confirm the status of this SWH type.	This type of SWH may occur but has not been mapped
Animal Movement Corridors		
Amphibian Movement Corridors	The amphibian movement documented through the Clair Maltby Secondary Plan studies, and through previous work (Dougan & Associates with Snell and Cecile 2009a), has been primarily across existing roads. The City has identified several Ecological Linkages which are intended to, among other functions, support amphibian movement. Other portions of the NHS which connect Candidate or Confirmed amphibian breeding habitats with summer foraging or wintering habitats may also provide linkage functions. One or more of these areas may meet the criteria for amphibian movement corridors. Site specific studies should include screening for amphibian movement where suitable habitat exists to confirm the status of this SWH type.	This type of SWH may occur but has not been mapped
Deer Movement Corridors	No deer movement corridors meeting the SWH criteria have been identified by MNRF to date in the SPA. However, the City has identified Ecological Linkages that, based on the available information, are in appropriate locations to support deer movement in an urbanized context.	Not Applicable

Notes: * Adapted from the listed species and habitat criteria provided in the Significant Wildlife Habitat Criteria Schedules for Ecoregion 6E (MNRF 2015) but updated to reflect any relevant changes in species status. For example, Tri-coloured Bat (*Perimyotis subflavus*) is now listed as Threatened so needs to be addressed as a Species at Risk under the Endangered Species Act (2007) and not under SWH. Descriptions of suitable habitat and the applicable criteria for each type is included in Appendix G4

** The SWH assessment considered the broader PSA (i.e., a 500 m zone surrounding the SPA) where contiguous or adjacent natural and semi-natural areas occur in this zone. The SPA was included in the assessment in two ways: (a) to screen for suitable habitat and (b) to screen for data from background studies (ref. Appendix NH-1) that may inform the assessment. However, ultimate refinements to the SWH mapping will be restricted to within the City's boundaries and will be focussed within the SPA.

In summary, of the 37 types of SWH have been confirmed or may occur in the SPA and/or adjacent PSA:

1. Waterfowl Stopover and Staging Areas (Aquatic)
2. Raptor Wintering Area
3. Bat Maternity Colonies
4. Turtle Wintering Areas
5. Reptile Hibernaculum
6. Colonially-Nesting Bird Breeding Habitat (Tree/Shrubs)
7. Deer Winter Congregation Areas
8. Other Rare Vegetation Communities
9. Waterfowl Nesting Area
10. Bald Eagle and Osprey Nesting, Foraging and Perching Habitat
11. Turtle Nesting Areas
12. Seeps and Springs
13. Amphibian Breeding Habitat (Woodland)
14. Amphibian Breeding Habitat (Wetland)
15. Marsh Bird Breeding Habitat
16. Shrub/Early Successional Bird Breeding Habitat
17. Terrestrial Crayfish
18. Special Concern and Rare Wildlife Species
19. Amphibian Movement Corridors

SWH category #19 above includes a wide range of species. The following species that have been confirmed in the SPA and/or PSA by Beacon or other studies are Provincially or Federally significant but not Provincially Endangered or Threatened SAR and would be considered under this SWH category:

- Western Chorus Frog (*Pseudacris triseriata*) is Federally Threatened and was confirmed in the western portion of the SPA and PSA by Beacon in 2017 along Transect W3 (ref. Map NH-2 in the 2017 Monitoring Report), by Dougan & Associates (2005) on 201 Maltby Road West and by NRSI (2012b and 2007) on the 385 Maltby Road West property, and near 161, 205 and 253 Clair Road East (NRSI 2016, Stantec 2009, Stantec 2007). Dougan & Associates (2005) also recorded Western Chorus Frog within the ponds east and west of Gordon Road in the SPA.
- Eastern Ribbon Snake (*Thamnophis sauritus sauritus*) is a species of Special Concern Provincially and Federally and was confirmed in the "Tim Horton's" pond (Basking Turtle Monitoring Station T1 ref. Map NH-2 in the 2017 Monitoring Report) behind the baseball diamonds south of Bishop MacDonell High School by Beacon in 2017, and also within ponds on the 385 Maltby Road West property by others (NRSI 2012b, NRSI 2012c, NRSI 2007).
- Snapping Turtle (*Chelydra serpentine*) is a species of Special Concern Provincially and Federally. Midland Painted Turtle (*Chrysemys picta*) was also recently listed as Special Concern Federally. Both species were confirmed basking by Beacon in 2017 in various ponds in the SPA and PSA (see Figure 4.6.1 and Table 4.4.10 in the 2017 Monitoring Report) and Snapping Turtle also observed nesting within wetlands

located in the northern central PSA in the vicinity of Dallan Drive. North-South Environmental (2016) also noted Snapping Turtle basking and nesting close to the SWM Pond and wetland just east of Hawkins Drive, while Stantec (2007) observed nesting Snapping Turtle in a wetland south of Dallan Drive within the SPA. Additionally, Snapping Turtle was confirmed in the Halls' Pond Wetland Evaluation (Timmerman et al. 2010) and on the 385 Maltby Road West Lands (NRSI 2007).

- Wood Thrush (*Hylocichla mustelina*) is a species of Special Concern Provincially and Federally Threatened, confirmed in the forested mid-northern portion of the PSA in close proximity to Dallan Drive (NSEI 2014, Stantec 2007);
- Eastern Wood-pewee (*Contopus virens*) is a species of Special Concern Provincially and Federally, was confirmed in various forested habitats in the SPA and PSA by Beacon in 2017, including Breeding Bird stations B2, B5, B6, B8, and B10, north of the SPA near Dallan Drive (NSEI 2014, Stantec 2007), and west of SPA at the 424 Maltby Road property (Dance Environmental Inc. 2014) and the 385 Maltby Road West lands (NRSI 2007); and
- Monarch (*Danaus plexippus*) is a species of Special Concern provincially and federally and was confirmed in the SPA and PSA in some meadow habitats in the following locations: 132 Clair Road West (NSEI 2015), 161, 205 and 253 Clair Road East (NSEI 2014, Stantec 2007), 424 Maltby Road (Dance Environmental Inc. 2014), Westminster Wood East (Stantec 2009, 2007), along Victoria Road (McCormick Rankin Corporation, and Gamsby and Mannerow Limited 2003) and 385 Maltby Road West. Additionally, Monarch was noted dead on the side of the road twice during the amphibian movement surveys on Transect W3 and W6 (see Map NH-2 in the 2017 Monitoring Report).

Yellow Banded Bumble Bee (*Bombus terricola*) identified as Special Concern Federally has also been confirmed in the City although there have been no searches within the PSA to date. There are no other wildlife species considered Provincially significant confirmed in the SPA and/or PSA by Beacon or other studies other than those listed above.

5.0 Concluding Remarks

The surface water, groundwater and natural heritage data collected and assessed between 2016 and 2018 has formed the basis for the Phase 1, 2 and 3 Characterization and Impact Assessment reports for the CMSP. This work will, in turn, be used to inform the Preferred Concept and Land Use Structure, as well as the secondary Plan policies for the SPA.

6.0 References

Aboud and Associates Inc. (2010). 1897 Gordon Street (Bird Property) - Environmental Impact Study and Tree Conservation Plan (2nd Submission). Prepared for Thomasfield Homes, September 3, 2010. 145 pp.

Aboud and Associates Inc. and GM BluePlan Engineering. (2010). 2013/2014 Monitoring Report, Bird Landing Subdivision, City of Guelph. Prepared for Bird Landing Subdivision, November 10, 2014. 109 pp.

Aboud and Associates Inc., Banks Groundwater Engineering Limited, and Gamsby and Mannerow Limited. (2013). Environmental Implementation Report, Bird Landing Subdivision, Draft Plan of Subdivision 23T-08505 (1897 Gordon Street), City of Guelph. Prepared for Thomasfield Homes Limited, February 13, 2013. 995 pp.

Aquafor Beech Limited. 2012. 132 Clair Road West, Guelph Environmental Impact Study – Draft. September 2012.

Black, Shoemaker, Robinson and Donaldson, Hoyle, K. J., North-South Environmental Inc., Stantec Consulting. (2005). West Minster Wood East, Phase 2, Environmental Implementation Report. First Draft. 33pp.

Bouwer, H., and Rive, R.C. 1976. *A slug test for determining hydraulic conductivity of unconfined aquifers with completely or partially penetrating wells.* Water Resources Research, 12(3), 423.

BSC (Bird Studies Canada). (2009). Marsh Monitoring Program Participant's Handbook for Surveying Amphibians. 2009 Edition. Bird Studies Canada, Environment Canada, U.S. Environmental Protection Agency. February 2009.

Canadian Council of Ministers of the Environment (CCME). 1994. *Subsurface Assessment Handbook for Contaminated Sites*. Prepared by the Waterloo Centre for Groundwater Research, University of Waterloo. Report CCME-EPC-NCSRP-48E. March 1994.

Research, University of Waterloo. Report CCME-EPC-NCSRP-48E. March 1994.

Canadian Environmental Quality Guidelines (CEQG). 1999. *Canadian Environmental Quality Guidelines for the Protection of Aquatic Life – Freshwater Summary Table (1987-2015)*. Canadian Council of Ministers of the Environment, Winnipeg, Manitoba

Coulson, D., Ertel, P. and Michalak, L. (1993). Cranberry – Oil Well Bog Complex Wetland Evaluation.

City of Guelph. 2012. Locally Significant Plant List. 24 pp.

City of Guelph. 2001. Official Plan 2001, September 2014 Consolidation. 369 pp.

CVC (Credit Valley Conservation) and TRCA (Toronto and Region Conservation Authority). (2014). Evaluation, Classification and Management of Headwater Drainage Features Guideline. Toronto and Region Conservation Authority and Credit Valley Conservation, TRCA Approval July 2013 (Finalized January 2014).

Dance Environmental Inc. (2014). Scoped E.I.S., 424 Maltby Road, Wellington County, Township of Puslinch. Prepared for Persian Investments Ltd., April 14, 2014. 94 pp.

Dougan & Associates (2005). Guelph Amphibian Survey Database.

Dougan & Associates. (2005). Guelph Amphibian Survey Database 2004 - 2005. Included in the Guelph Natural Heritage Strategy, Phase 1.

Dougan & Associates with Snell & Cecile Environmental Research. (2009a). Guelph Natural Heritage Strategy, Phase 2: Terrestrial Inventory & Natural Heritage System, Volume 1. March 2009.

Dougan & Associates with Snell & Cecile Environmental Research. (2009). Guelph Natural Heritage Strategy, Phase 2: Terrestrial Inventory & Natural Heritage System, Volume 2: Technical Appendices. March 2009.

Health Canada (2014). *Guidelines for Canadian Drinking Water Quality – Summary Table*. Water and Air Quality Bureau, Healthy Environments and Consumer Safety Branch, Health Canada, Ottawa, Ontario.

Hyder et. al. 1994. *Slug tests in partially penetrating wells*. Water Resources Research, 30(11), 2945.

International Atomic Energy Agency (IAEA) 2001. Annual Report 2000. Prepared by the IAEA. Austria. July 2001.

Lee, H.T., W.D. Bakowsky, J. Riley, J. Bowles, M. Puddister, P. Uhlig and S. McMurray. 1998. Ecological Land Classification for Southern Ontario: First Approximation and Its Application. Ontario Ministry of Natural Resources. SCSS Field Guide FG-02. 225 pp.

LGL Limited. (2003). Bird Property, Gordon Street, City of Guelph, Thomasfield Homes Re-Zoning Application, Environmental Overview and Impact Analysis. Received by Scott Hannah, January 20, 2003. 9 pp.

McCormick Rankin Corporation, and Gamsby and Mannerow Limited (2003). Victoria Road Class Environmental Assessment, Environmental Study Report. City of Guelph. 486 pp.

McEachren, J. (2012). Maltby Road Reconstruction, Post Construction Monitoring 2012. City of Guelph. 8 pp.

Mitz, C. W. (2007). Southgate Business Park Post-Development Water Balance: Wetland Impacts." Prepared for Joh Perks, December 4, 2007. 5 pp.

MMAH (Ministry of Municipal Affairs and Housing). (2014). Provincial Policy Statement.

MNRF (Ministry of Natural Resources and Forests - formerly MNR). (2000). Significant Wildlife Habitat Technical Guide.

MNRF (Ministry of Natural Resources and Forests - formerly MNR). (2010). Natural Heritage Reference Manual for Natural Heritage Policies of the Provincial Policy Statement 2005.

MNRF (Ministry of Natural Resources and Forests - formerly MNR). (2015). Significant Wildlife Habitat Criteria Schedules for Ecoregion 6E. January 2015.

MOECC (Ministry of Environment and Climate Change – formerly MOE). (1994). *Policies Guidelines and Provincial Water Quality Objectives of the Ministry of Environment and Energy*. Queen's Printer for Ontario. Toronto, ON.

Natural Resource Solutions Inc. (2004). Hanlon Creek Business Park, Consolidated Environmental Impact Study. Prepared for the City of Guelph, November 2004. 110 pp.

Natural Resource Solutions Inc. (2007). Southgate Business Park, Draft Plan of Subdivision, Environmental Impact Study. Prepared for Industrial Equities Guelph Corporation, July 2007.164 pp.

Natural Resource Solutions Inc. (2009). Hanlon Creek Business Park, Environmental Implementation Report. Prepared for the City of Guelph, February 2009. 433 pp.

Natural Resource Solutions Inc. (2010). Maltby Road Wildlife Movement Surveys, 2009-2010 Summary Report. Prepared for the City of Guelph, July 2010. 24 pp.

Natural Resource Solutions Inc. (2011). Maltby Road Wildlife Movement Surveys, 2009-2011 Summary Report. Prepared for the City of Guelph, June 2011. 26 pp.

Natural Resource Solutions Inc. (2012). Species at Risk Habitat Screening - Results, 331 Clair Road, Guelph Ontario. Prepared for Acorn Developments, September 10, 2012. 12 pp.

Natural Resource Solutions Inc. (2012). Southgate Business Park 23T-06503 Environmental Implementation Report. Prepared for Industrial Equities Guelph Corporation, February 2012. 928 pp.

Natural Resource Solutions Inc. (2012). Southgate Business Park 23T-06503 Environmental Implementation Report, Phase 2 Addendum. Prepared for Industrial Equities Guelph Corporation, November 2012. 331 pp.

Natural Resource Solutions Inc. (2014). Southgate Business Park Environmental Implementation Report, Phase 2 Addendum Response Package (Final Submission). Prepared for the City of Guelph, January 9, 2014. 148 pp.

Natural Resource Solutions Inc., AECOM, and Banks Groundwater Engineering Limited. (2016). Hanlon Creek Business Park, 2013 Consolidated Monitoring Report. Prepared for the City of Guelph, January 18, 2016. 125 pp.

North-South Environmental Inc. (2001). Environmental Impact Study, Westminster Wood East (Adam's Farm). Prepared for Westminster Woods Ltd., July 2001. 82 pp.

North-South Environmental Inc. (2002). West Minster Wood East, Phase 1, Environmental Implementation Report (Including Tree Conservation Plan). Prepared for Westminster Woods, March 15, 2002. 26 pp.

North-South Environmental Inc. (2014). 161, 205 and 253 Clair Road East, Guelph - Environmental Implementation Report. Prepared for Victoria Wood (Dallan) GP Inc., February 2014. 189 pp.

North-South Environmental Inc. (2016). 161, 205 and 253 Clair Road East, Guelph - Year-End Report (2013-2015). Prepared for the City of Guelph and the Grand River Conservation Authority, August 2016. 61 pp.

North-South Environmental Inc. (2015). 132 Clair Road West, Guelph - Scoped Environmental Impact Study. Prepared for Mr. Jeff Neumann, August 28, 2015. 250 pp.

Ontario Ministry of the Environment (MOE). 2006. *Technical Support Document for Ontario Drinking Water Standards, Objectives and Guidelines.* PIBS 4449e01. June 2003. Revised June 2006.

Paradigm Transportation Solutions Limited, ESG International Inc. and Braun Consulting Engineers. (2003). Clair Road Class Environmental Assessment. City of Guelph. 265 pp.

Springer, R.K. and Gelhar, L.W. 1991. *Characterization of large-scale aquifer heterogeneity in glacial outwash by analysis of slug tests with oscillatory responses, Cape Cod, Massachusetts.* U.S. Geological Survey Water Resources Investigation Report. 91-4034, 36.

Stantec Consulting Ltd. (2009). Dallan Lands EIS Addendum Report. Prepared for Victoria Wood, August 2009. 77 pp.

Stantec Consulting Ltd. (2014). 23T-03507 Former Pergola Lands Subdivision Phase II: Environmental Implementation Report. Prepared for Reid's Heritage Homes, February 4, 2014. 204 pp.

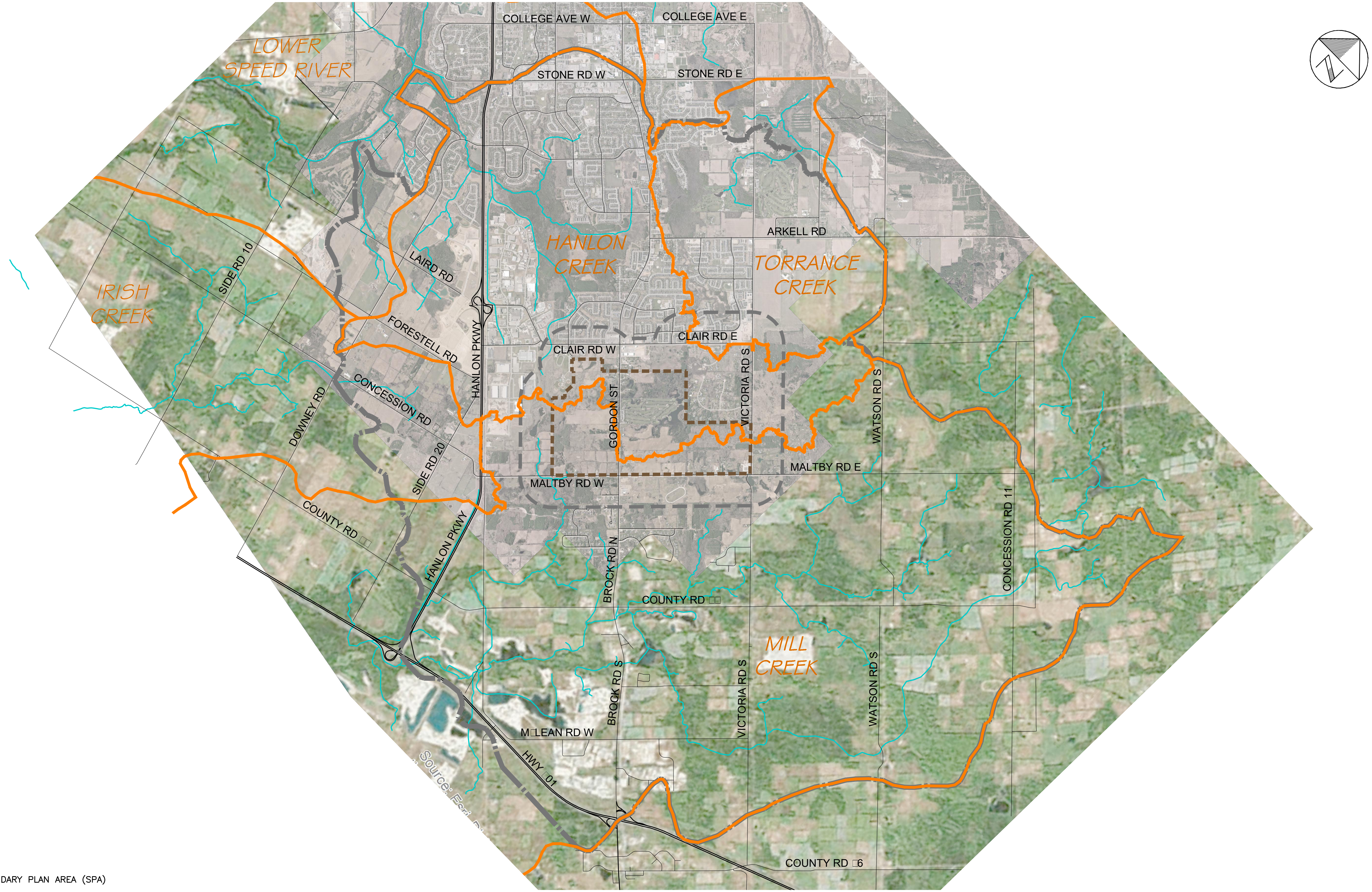
Tilt, N., Ferguson, M. S., McCracken, J. D., Coulson, D., Peluch, J. and Kempf, F. (1984). Mill Creek Wetland Evaluation.

Timmerman, A., Adams, P., Marshall, J., Weeks, G., Ursic, K. and Ursic, M. (2010). Hall's Pond Wetland Evaluation.

Totten Sims Hubicki Associates, Engineers, Architects, Planners. (2000). Gordon Street, Wellington Road 46, Class Environmental Assessment, Environmental Study Report, Volume One: Main Report. City of Guelph and the County of Wellington. 122 pp.

TSH Engineers Architects Planners. (2007). Hanlon Creek Business Park - SWM Design Report. Prepared for the City of Guelph, November 2007. 188 pp.

Wood PLC. (2018). Clair-Maltby Secondary Plan and Master Environmental Servicing Plan (CMSP / MESP) Comprehensive Environmental Impact Study (CEIS) Phase 1 and 2: Characterization Report Project # TPB168050; City of Guelph. September 5, 2018.



LEGEND

▪ ▪ ▪	SECONDARY PLAN AREA (SPA)
— — —	PRIMARY STUDY AREA (PSA)
—·—	SECONDARY STUDY AREA (SSA)
—	SUBWATERSHED BOUNDARY
~	WATERCOURSE
—	ROADWAY

CLAIR-MALTBY
MASTER ENVIRONMENTAL
SERVICING PLAN AND
SECONDARY PLAN
CITY OF GUELPH

STUDY AREA PLAN

wood.

SCALE VALID ONLY FOR
24"x36" VERSION

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Consultant File No.
TPB168050

Figure No.
G1

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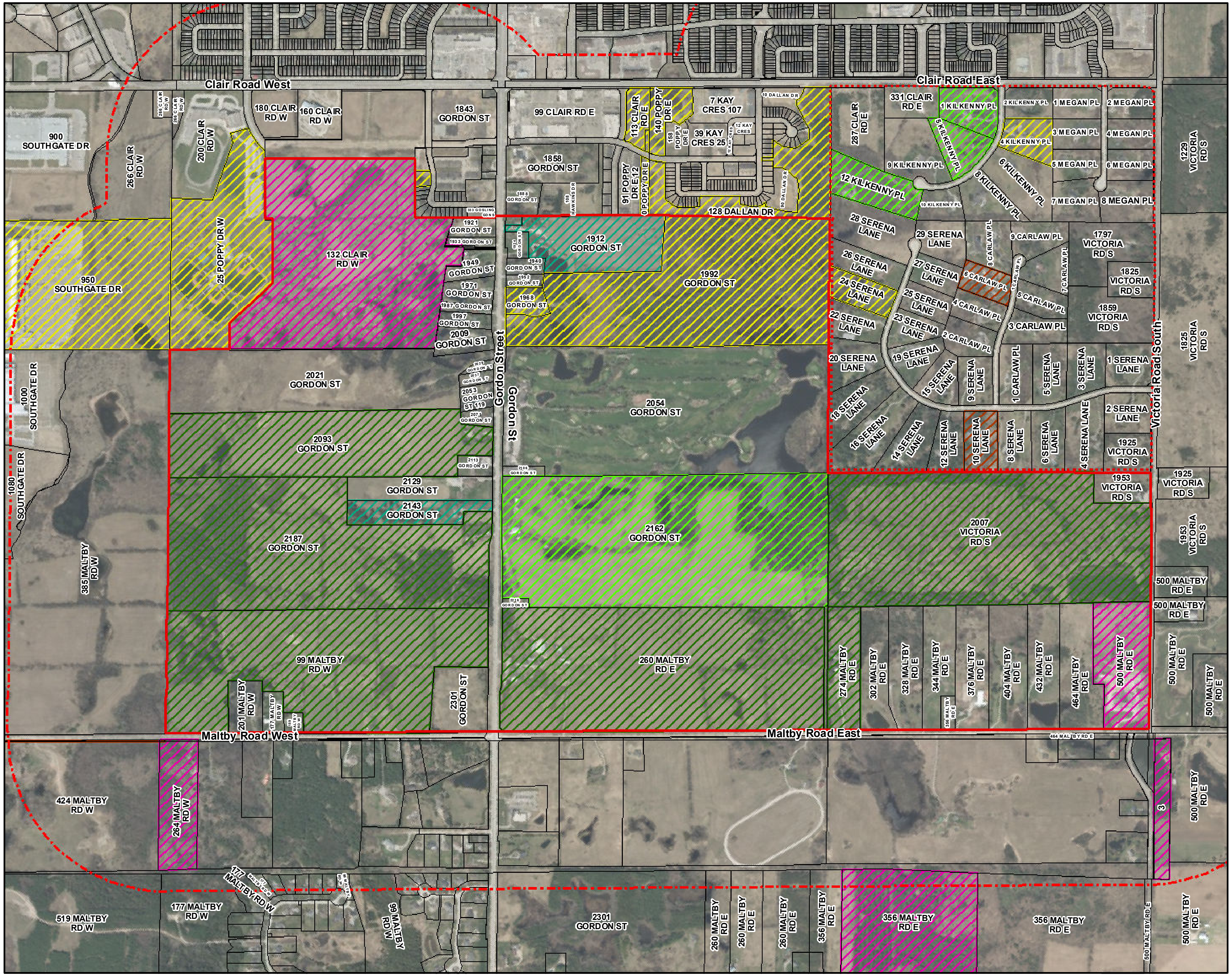

Access to Properties for Environmental Monitoring

Map G-2

Clair-Maltby Secondary Plan
2018 Monitoring Report

Legend

- □ Secondary Plan Area (SPA)
- ⬚ Rolling Hills Community
- ⬚ Primary Study Area (PSA)
- □ Parcel Fabric

Type of Access Granted

- ▨ Deep groundwater monitoring (well)
- ▨ Deep and/or shallow ground water and surface water monitoring
- ▨ Deep and shallow groundwater, surface water, amphibian, bird and vegetation monitoring
- ▨ Shallow groundwater, surface water, amphibian, bird and vegetation monitoring
- ▨ Deep and/or shallow groundwater, surface water and amphibian monitoring
- ▨ Scoped vegetation assessments

First Base Solutions
Web Mapping Service 2017

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Project 216002
March, 2019

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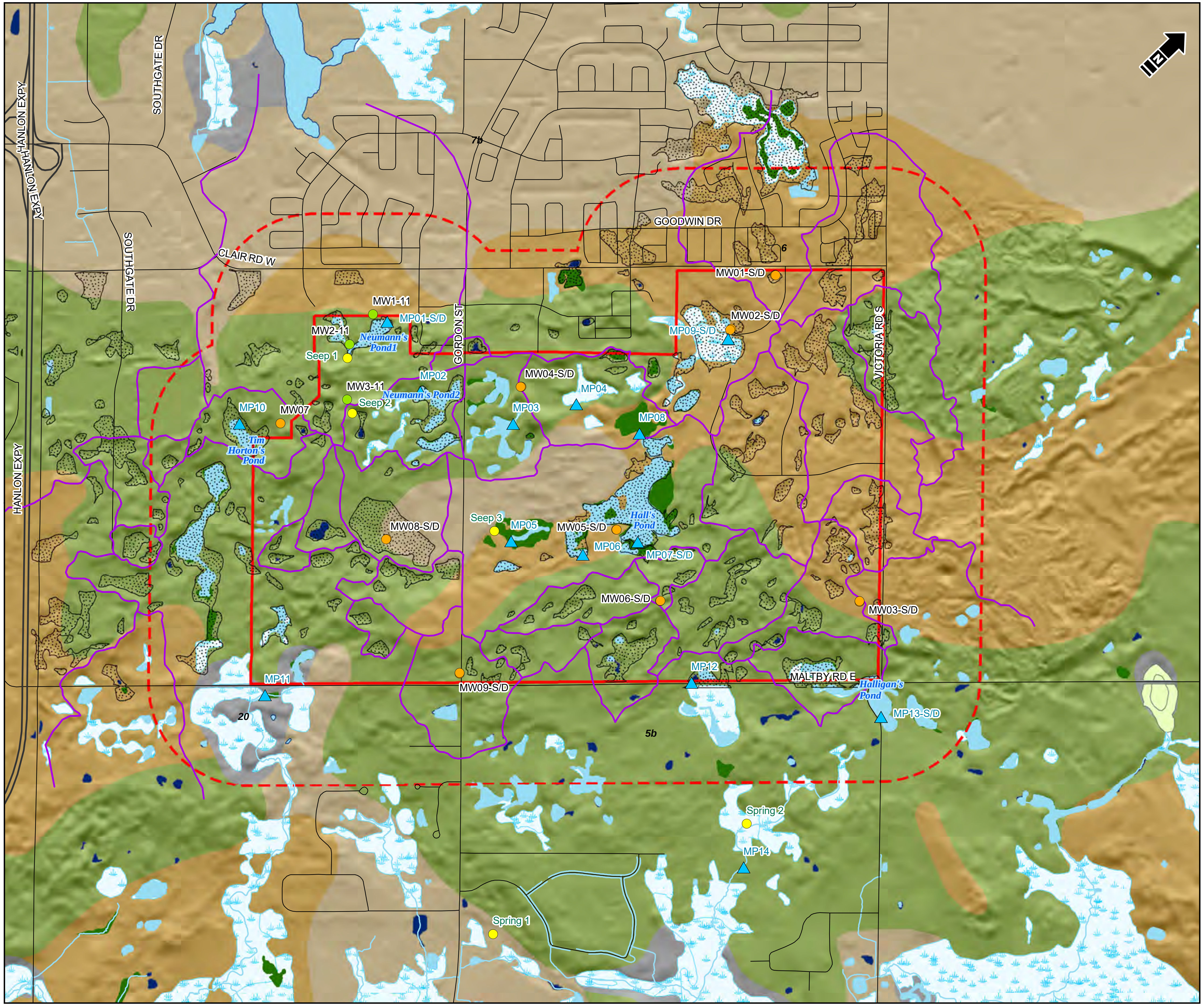

- Primary Study Area Boundary
- Secondary Plan Area Boundary
- Closed Depression
- Subcatchment
- Fen
- Bog
- Swamp
- Marsh
- Open Water
- Unknown Wetland
- Water Body
- Watercourse
- Highway
- Road
- ▲ Mini Piezometer
- ● Monitoring Well (Matrix)
- ● Monitoring Well (132 Clair Rd.)
- ● Observed Seep and Spring

Surficial Geology

- 5b: Stone-poor, sandy silt to silty sand till
- 6: Ice-contact stratified sand and gravel deposits
- 7b: Glaciofluvial Gravel Deposits
- 20: Organic deposits (e.g., peat, marl)

Reference: Data provided by the City of Guelph, Geo Base® and Province of Ontario used under license.
Ontario Geological Survey 2010. Surficial geology of southern Ontario; Ontario Geological Survey, Miscellaneous Release— Data 128 – Revised.

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Matrix Solutions Inc.
ENVIRONMENT & ENGINEERING

City of Guelph
Clair- Maltby Comprehensive Environmental Impact Study
Year 3 Monitoring Report

Hydrogeology Monitoring Locations

Date:	Project:	Submitter:	Reviewer:
February, 2019	23089	S. Miller	D. Abbey

Figure
GW-1

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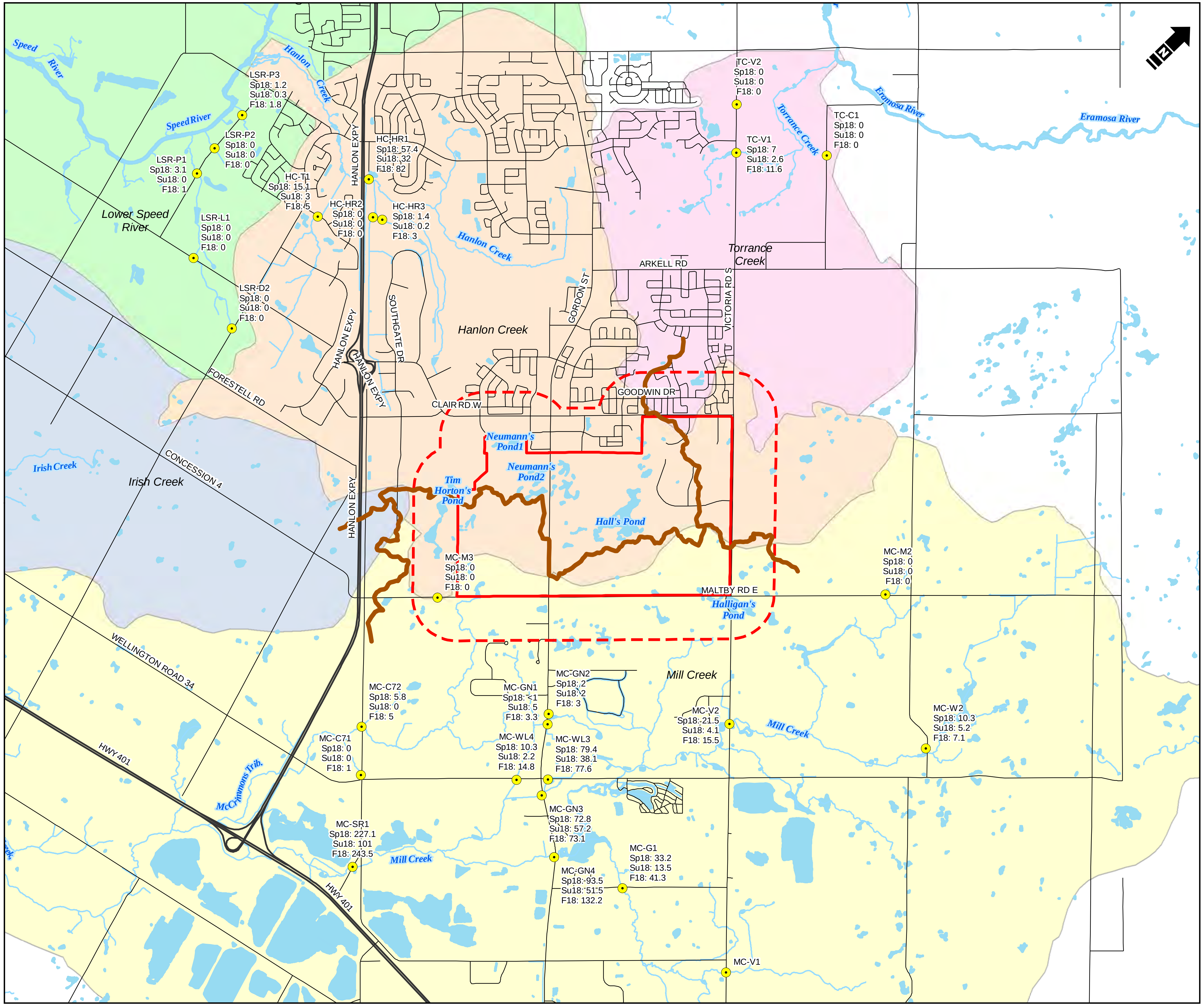

Primary Study Area Boundary
Secondary Plan Area Boundary
Water Body
Watercourse
Updated Subwatershed Boundary (Wood PLC, 2018)
Highway
Road
● Spot Flow Location

Subwatershed

Hanlon Creek
Irish Creek
Lower Speed River
Mill Creek
Torrance Creek

HC-D2 Spot Flow Location
Sp18:0 Spring 2018 (Jun. 7/8) Flow Rate (L/s)
Su18:0 Summer 2018 (Sep. 18/19) Flow Rate (L/s)
F18:0 Fall 2018 (Dec. 12) Flow Rate (L/s)

Reference: Data provided by the City of Guelph and GeoBase® used under license.

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Matrix Solutions Inc.
ENVIRONMENT & ENGINEERING

City of Guelph
Clair- Maltby Comprehensive Environmental Impact Study
Year 3 Monitoring Report

2018 Surface Water Spotflow Results

Date:	Project:	Submitter:	Reviewer:
March, 2019	23089	S. Miller	D. Abbey

Figure
GW-2

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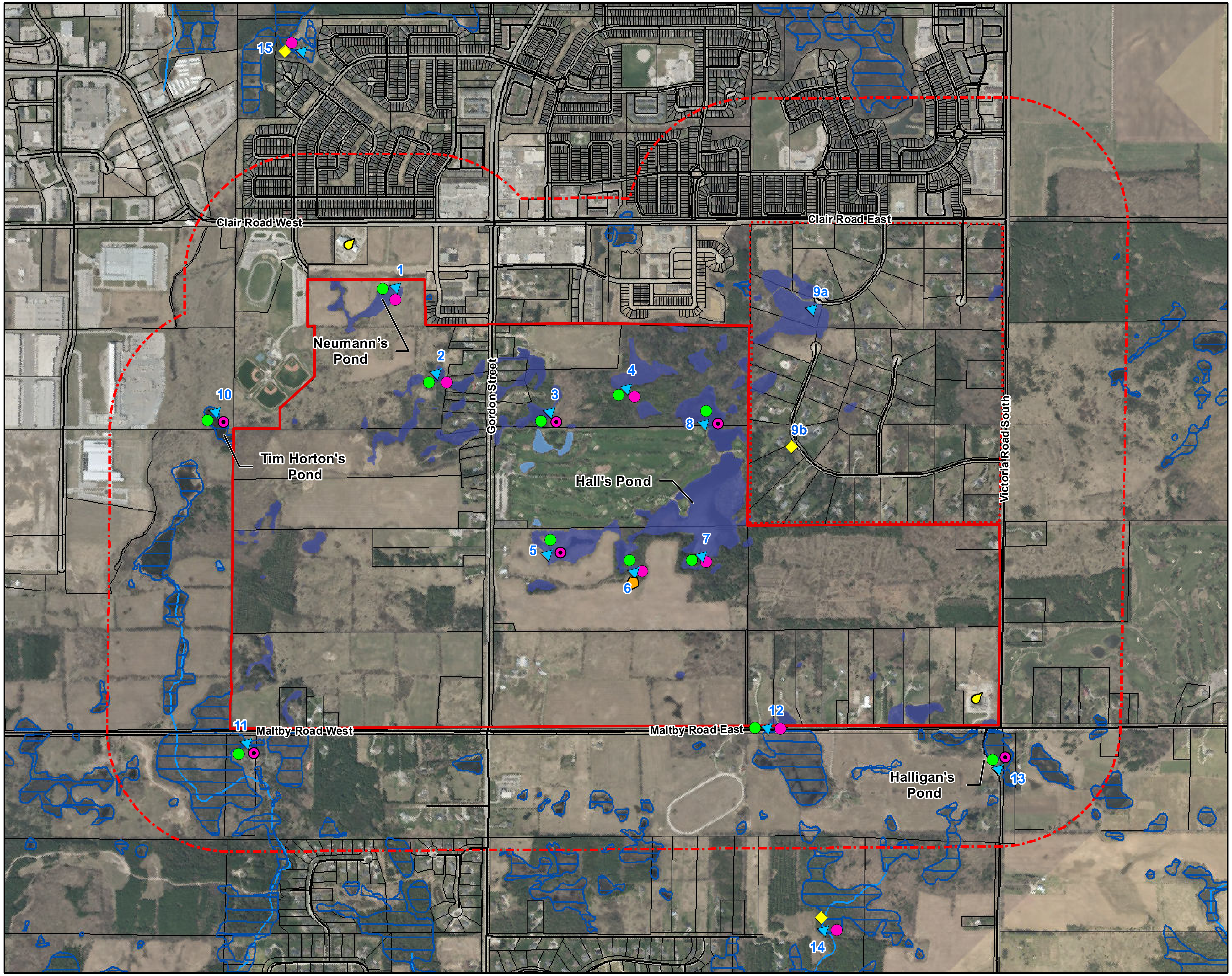

Surface Water Monitoring Locations

Map SW-1

Clair-Maltby Secondary Plan
2018 Monitoring Report

Legend

▭	Primary Study Area
▭	Secondary Plan Area
▭	Rolling Hills Community
▭	Parcel Fabric

Monitoring Stations

●	Surface Water Quality*
⊙	Surface Water Quality* + Pesticides
●	Surface Water Quantity
▲	Mini.piezometer
■	Surface Water Flow
💧	Rain Gauge
⬟	Baro Logger
—	Watercourse (MNRF 2017)
■	Ponds (Beacon 2018)
■	Refined Provincially Significant Wetlands (PSWs) (Beacon 2018)
▨	PSW and Other Wetlands Outside SPA (GRCA 2018)

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March, 2019

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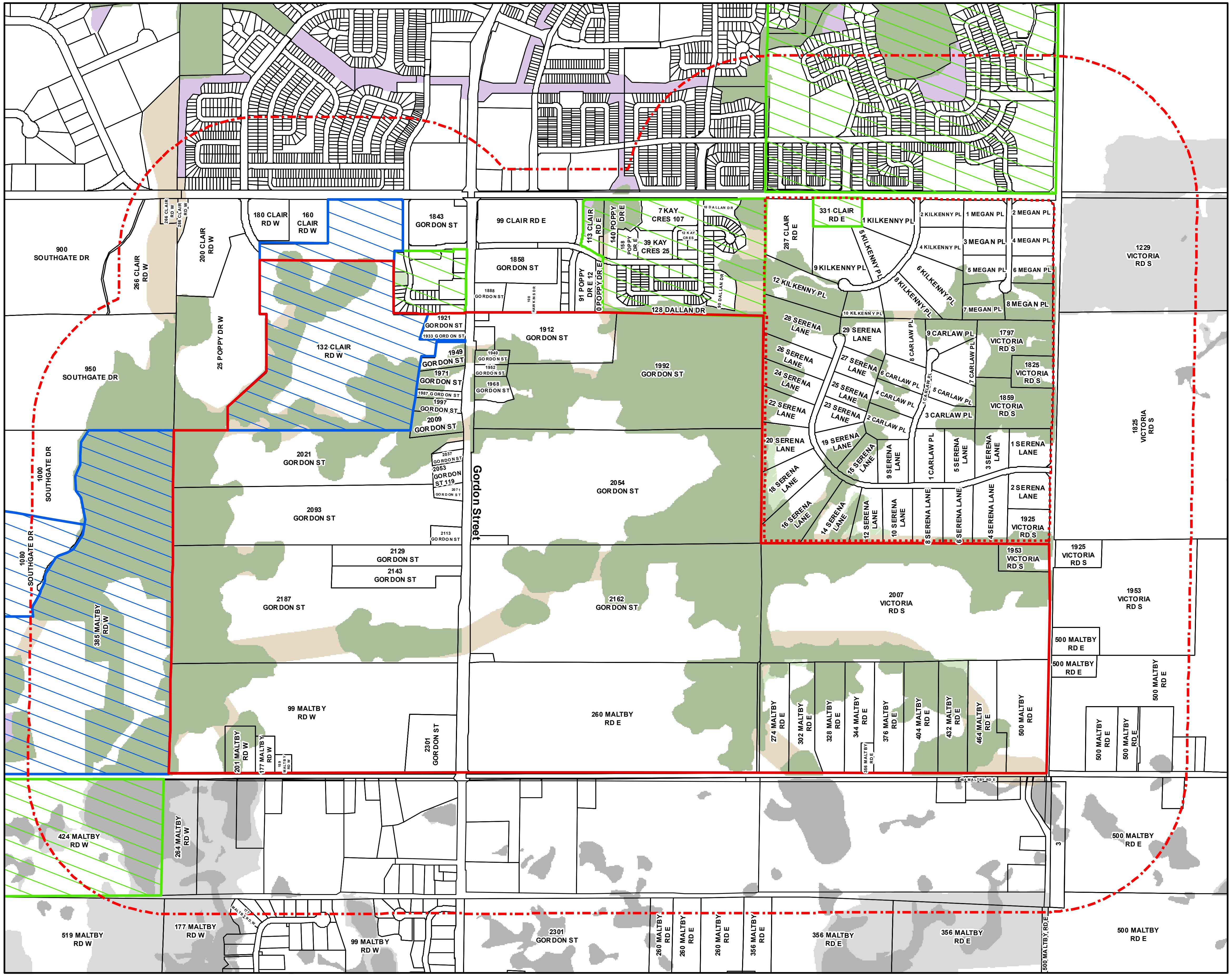

Site-Specific Natural Heritage Background Available

Map NH-1

Clair-Maltby Secondary Plan
2018 Monitoring Report

Legend

- ⬚ Primary Study Area (PSA)
- ☐ Secondary Plan Area (SPA)
- ⬚ Rolling Hills Community
- ☐ Parcel Fabric

Available Natural Heritage Data

- ☐ Vegetation and Wildlife Data
- ☐ Vegetation, Wildlife and Fisheries Data

City of Guelph Natural Heritage System (2014)

- 🟩 Significant Natural Areas
- 🟩 Natural Areas
- 🟩 Natural Areas Overlay
- 🟫 Ecological Linkages
- 🟪 Restoration Areas

County of Wellington Greenlands System

- ⬛ Core Greenlands
- ⬜ Greenlands

* This map shows data available from site-specific studies undertaken within the Primary Study Area between 2005 and 2018.

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March, 2019

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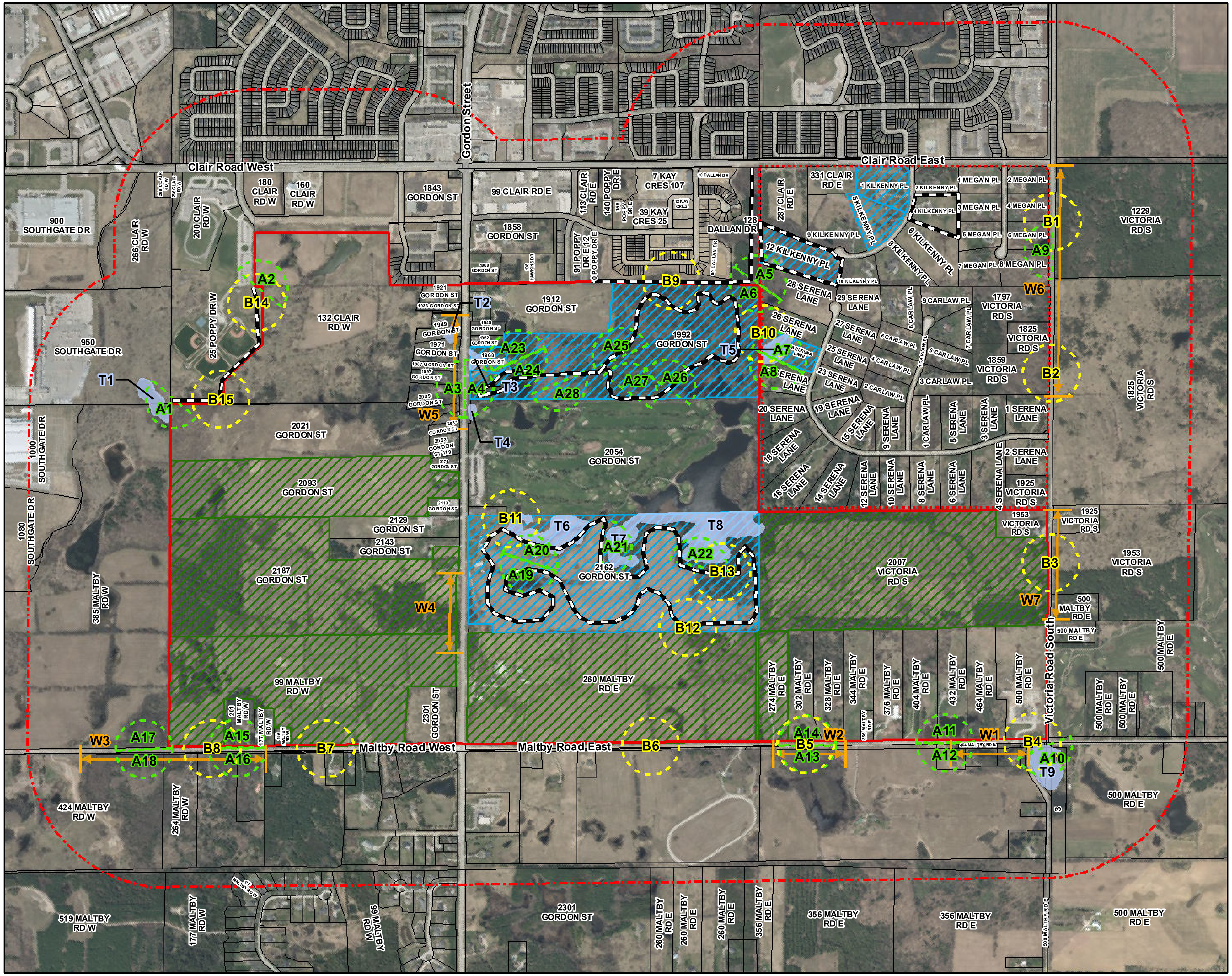

Terrestrial Monitoring Locations

Map NH-2

Clair-Maltby Secondary Plan
2018 Monitoring Report

Legend

- 🟥 Primary Study Area (PSA)
- 🟥 Secondary Plan Area (SPA)
- 🟥 Rolling Hills Community
- ☐ Parcel Fabric
- ▨ Comprehensive Site-Specific Vegetation Assessments
- ▨ Scoped Site-Specific Vegetation Assessments
- A1 Amphibian Monitoring Stations (28)
- B1 Breeding Bird Stations (15)
- ■ Basking Turtle Monitoring Stations (8)
- ━ Winter Wildlife Transects (6)
- ↔ Road Wildlife Transects (7)

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March, 2019

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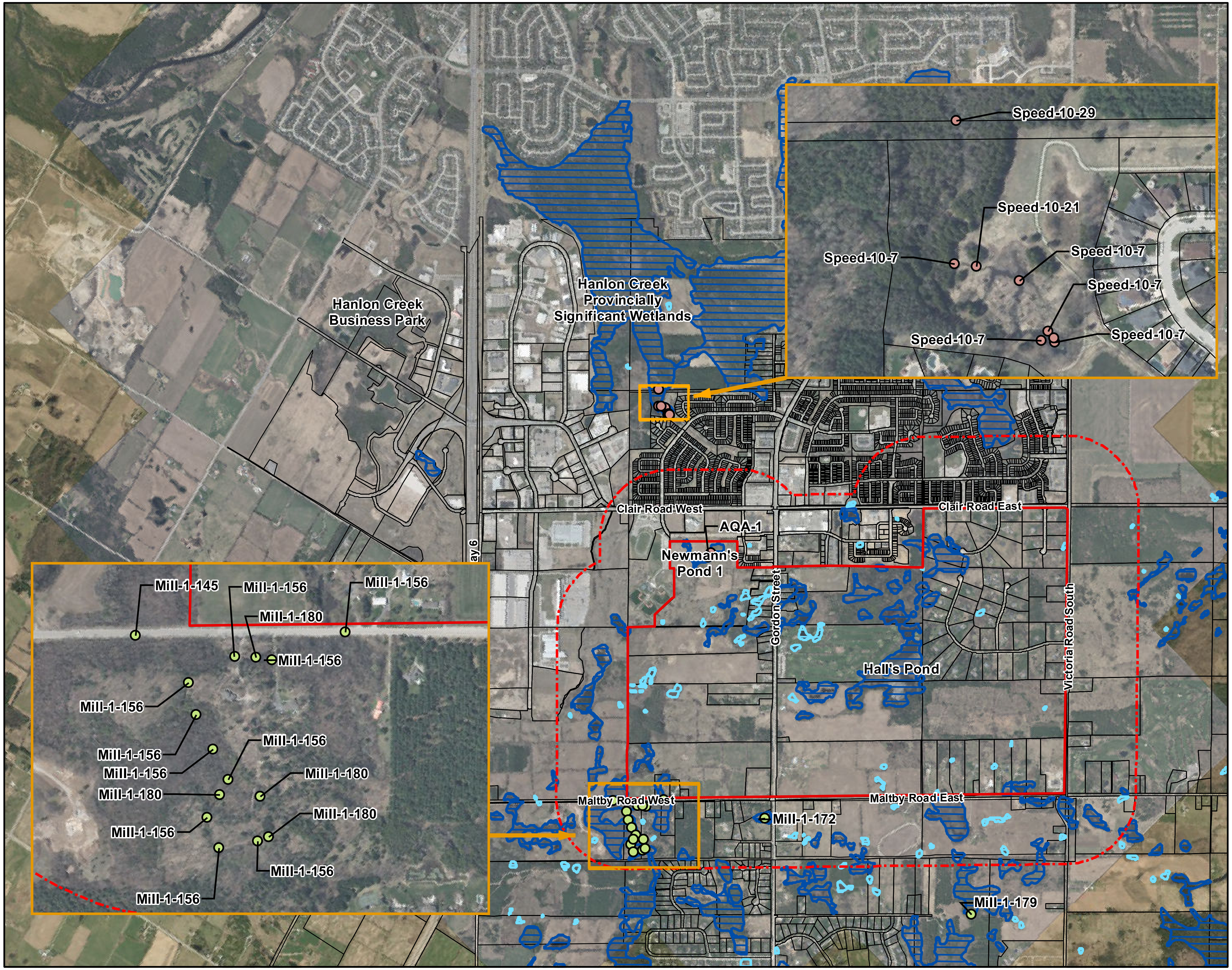

Scoped Fisheries Assessment

Map NH-3

Clair-Maltby Secondary Plan
2018 Monitoring Report

Legend

- ▭ Primary Study Area Boundary
- ▭ Secondary Plan Area Boundary
- — Watercourse (MNRF 2017)
- ● Hanlon Creek (MNRF 1999)
- ● Mill Creek (MNRF 2010-2012)
- ● Aquafor Beech Limited Data (2012)

Wetlands

- ▨ Provincially Significant Wetlands (MNRF 2017)
- ▨ Unevaluated Wetlands (MNRF 2017)

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Web Mapping Service 2017

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BEACON
ENVIRONMENTAL

Project 216002
March, 2019

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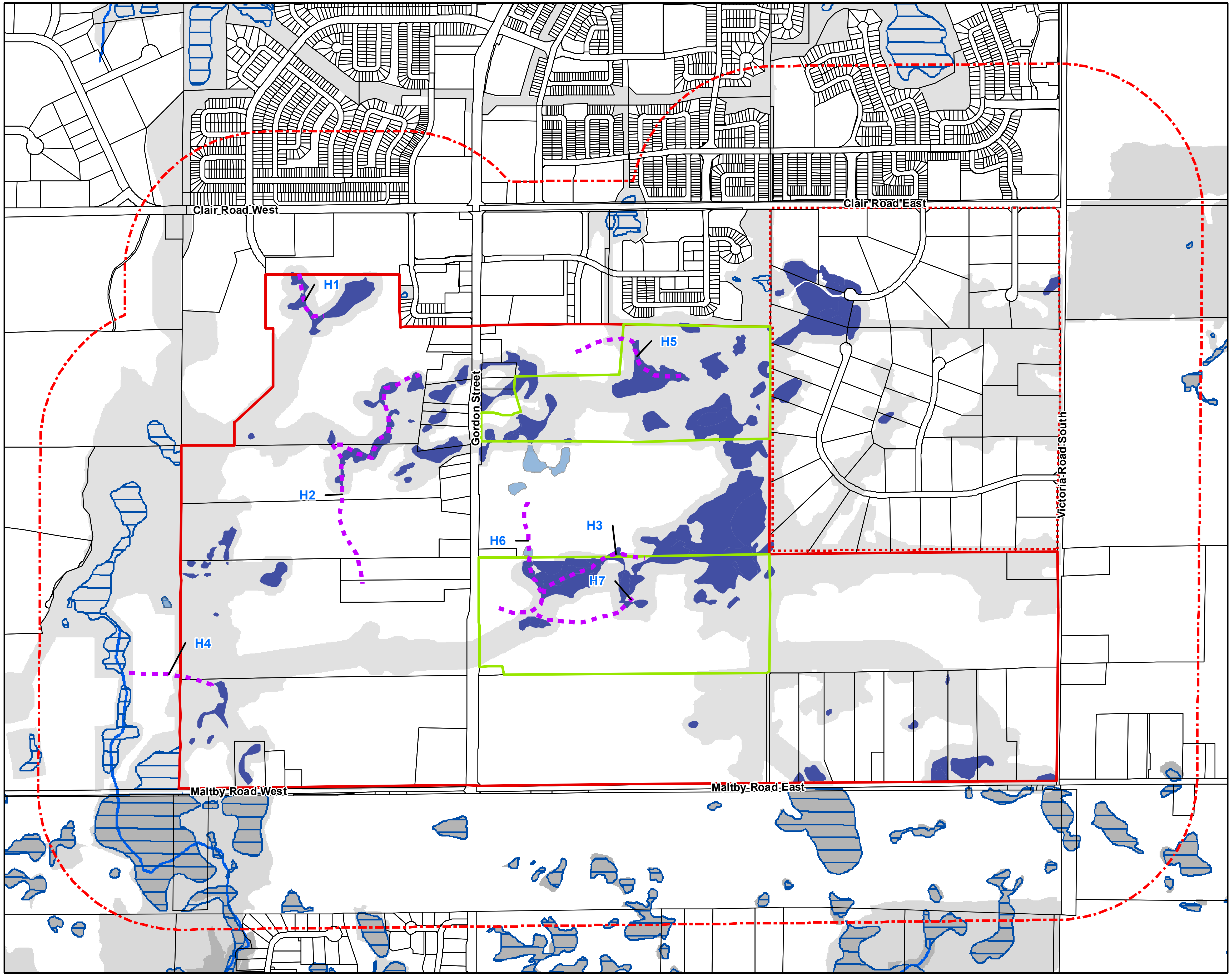

Scoped Headwater Drainage Feature Assessment (Potential HDFs)

Map NH-4A

Clair-Maltby Secondary Plan
2018 Monitoring Report

Legend

- ▭ Primary Study Area
- ▭ Secondary Plan Area
- ▭ Rolling Hills Community
- ▭ Parcel Fabric
- ▭ Access Provided for HDF Assessment
- ■ Refined Provincially Significant Wetlands (PSWs) (Beacon 2018)
- ■ Ponds (Beacon 2018)
- ▨ GRCA Wetlands (2018) outside of SPA and Rolling Hills
- ■ City of Guelph Natural Heritage System (2014)

County of Wellington Greenlands Systems

- ■ Core Greenlands
- ■ Greenlands
- ┅ Potential Headwater Drainage Feature (HDF) (Beacon 2018)
- ─ Watercourse (MNRF 2017)

Notes

1. NHS refinements in the Rolling Hills area (outside of the revised Secondary Plan Area boundary) will be incorporated as part of a future Official Plan update rather than through the Clair-Maltby Secondary Plan process.

City of Guelph: Secondary Plan Area, Parcel Fabric, Existing Natural Heritage System, 2016.

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First Base Solutions
Web Mapping Service 2017

UTM Zone 17 N, NAD 83

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ENVIRONMENTAL

Project 216002
March, 2019

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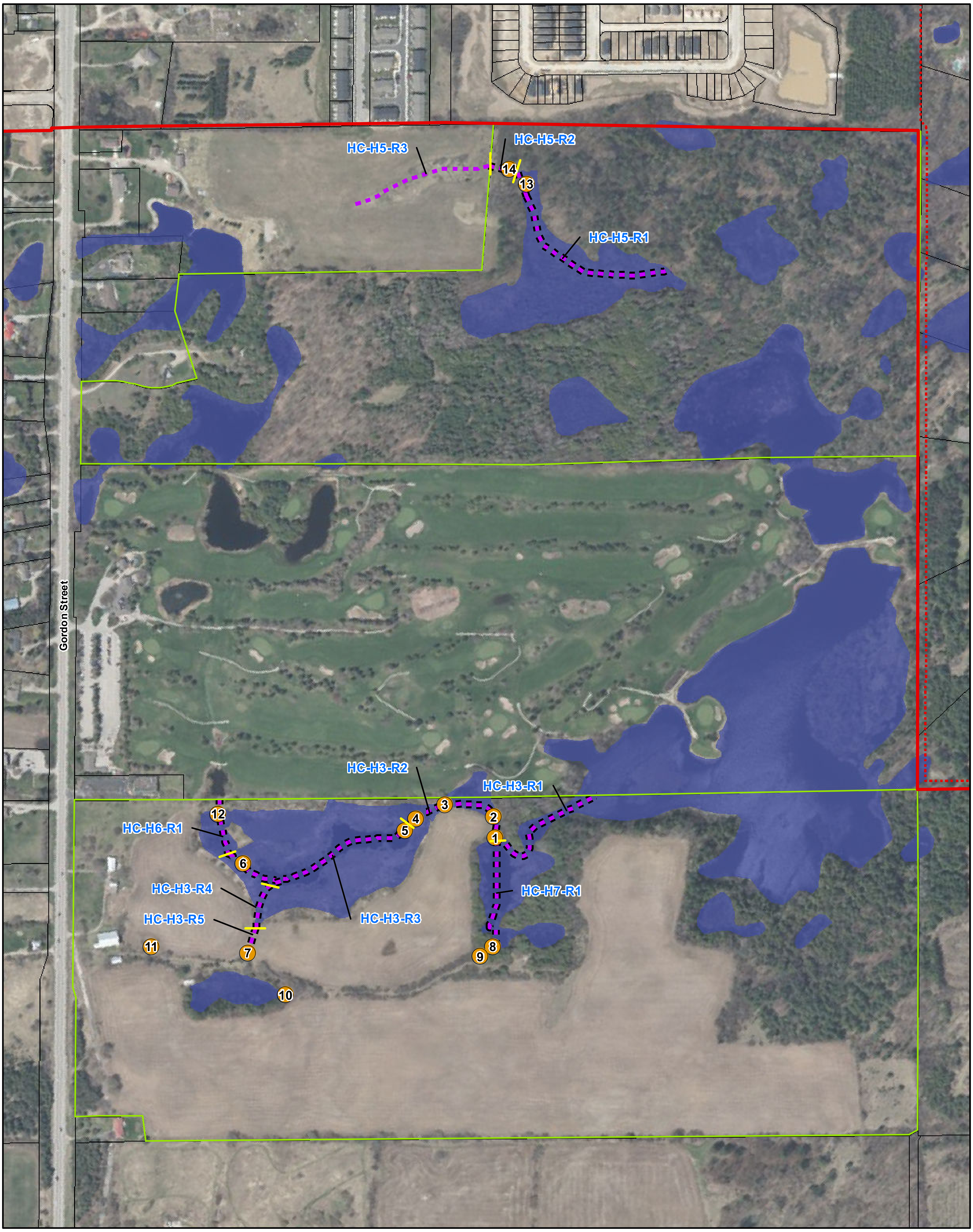


Legend

🟥 Secondary Plan Area

Rolling Hills Community

Parcel Fabric

🟩 Access Provided for HDF

● Photo Location

Refined Provincially Significant Wetlands (PSWs) (Beacon 2018)

Ponds (Beacon 2018)

Reach Break

Potential Headwater Drainage Feature (HDF) (Beacon 2018)

Confirmed Headwater Drainage Feature (HDF) (Beacon 2018)

Notes

1. NHS refinements in the Rolling Hills area (outside of the revised Secondary Plan Area boundary) will be incorporated as part of a future Official Plan update rather than through the Clair-Maltby Secondary Plan process.

City of Guelph: Secondary Plan Area, Parcel Fabric, Existing Natural Heritage System, 2016.

Confirmed Headwater Drainage Features

Figure 4B

Clair-Maltby Secondary Plan
2018 Monitoring Report

BEACON ENVIRONMENTAL

Project: 216002
Last Revised: March, 2019

Client: City of Guelph

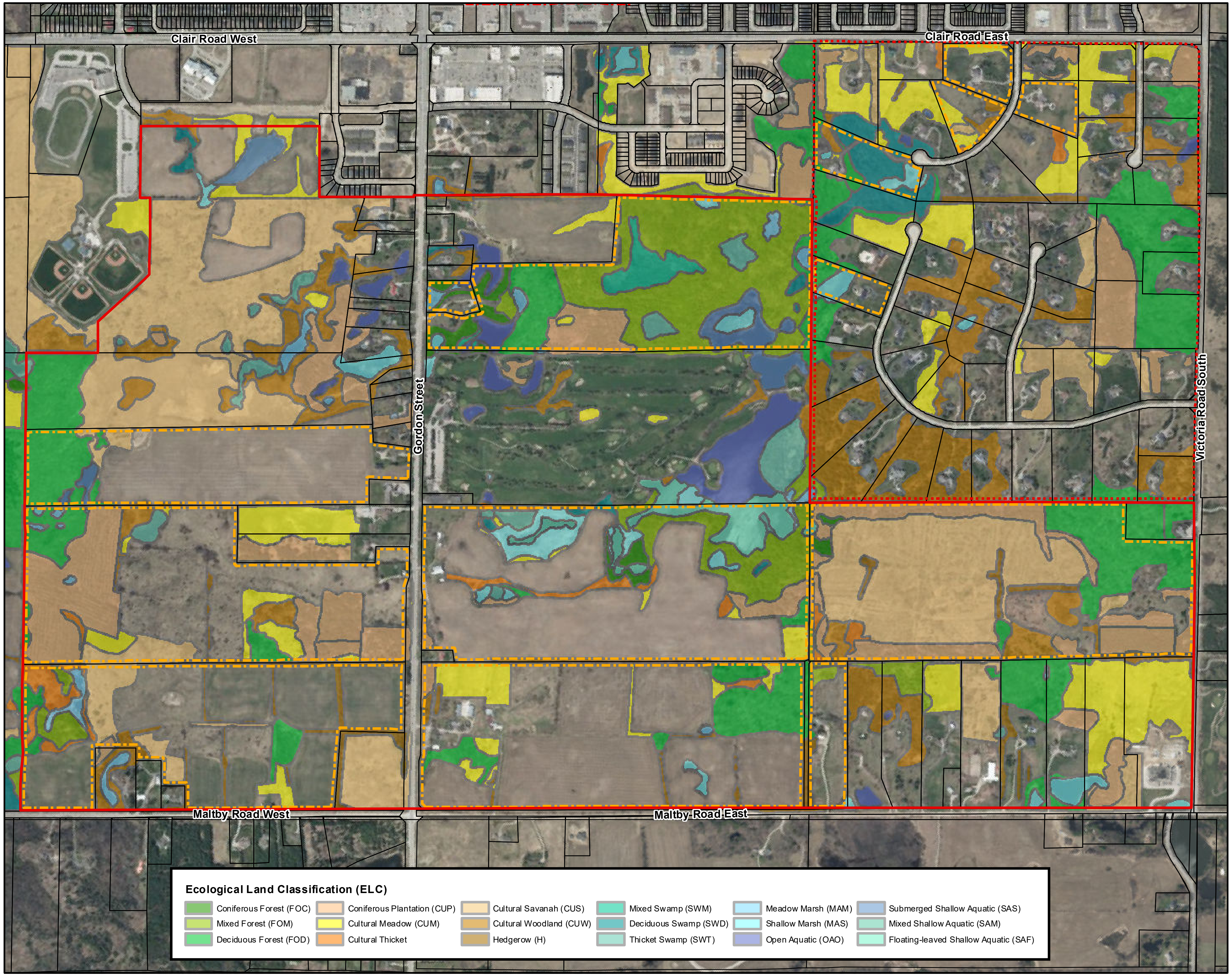
Prepared by: DU
Checked by: MU

1:4,500

0 75 150 m

Contains information licensed under the Open Government License– Ontario Orthoimagery Baselayer: FBS Guelph and Kitchener, 2017

C:\Dropbox\Dropbox (Beacon)\All GIS Projects\2016\216002 Clair Maltby Secondary Plan\MXD\2018 Monitoring Report\216002_2_MapNH-4B_Confirmed_HDFA_2019-03-06.mxd



Ecological Land Classification (ELC)

- ■ Coniferous Forest (FOC)
- ■ Mixed Forest (FOM)
- ■ Deciduous Forest (FOD)
- ■ Coniferous Plantation (CUP)
- ■ Cultural Meadow (CUM)
- ■ Cultural Thicket
- ■ Cultural Savanah (CUS)
- ■ Cultural Woodland (CUW)
- ■ Hedgerow (H)
- ■ Mixed Swamp (SWM)
- ■ Deciduous Swamp (SWD)
- ■ Thicket Swamp (SWT)
- ■ Meadow Marsh (MAM)
- ■ Shallow Marsh (MAS)
- ■ Open Aquatic (OAO)
- ■ Submerged Shallow Aquatic (SAS)
- ■ Mixed Shallow Aquatic (SAM)
- ■ Floating-leaved Shallow Aquatic (SAF)

Refined Ecological Land Classification

Map NH-5

Clair-Maltby Secondary Plan
2018 Monitoring Report

Legend

- ▭ Primary Study Area (PSA)
- ▭ Secondary Plan Area (SPA)
- ▭ Rolling Hills Community
- ▭ Access to Field Verify ELC Provided
- ▭ Parcel Fabric

Note: All ELC mapping has been updated from the City's 2014 ELC mapping using 2017 aerial photography except for the 2021 Gordon Street property where the City has indicated the 2014 ELC should be retained as the City and Owner are currently before the courts under the City's Tree By-law.

City of Guelph: Secondary Plan Area Boundary, Parcel Fabric, 2016.

First Base Solutions
Web Mapping Service 2017

UTM Zone 17 N, NAD 83

0 100 200 400 Metres

1:10,500

W N S E

BEACON
ENVIRONMENTAL

Project 216002
March, 2019

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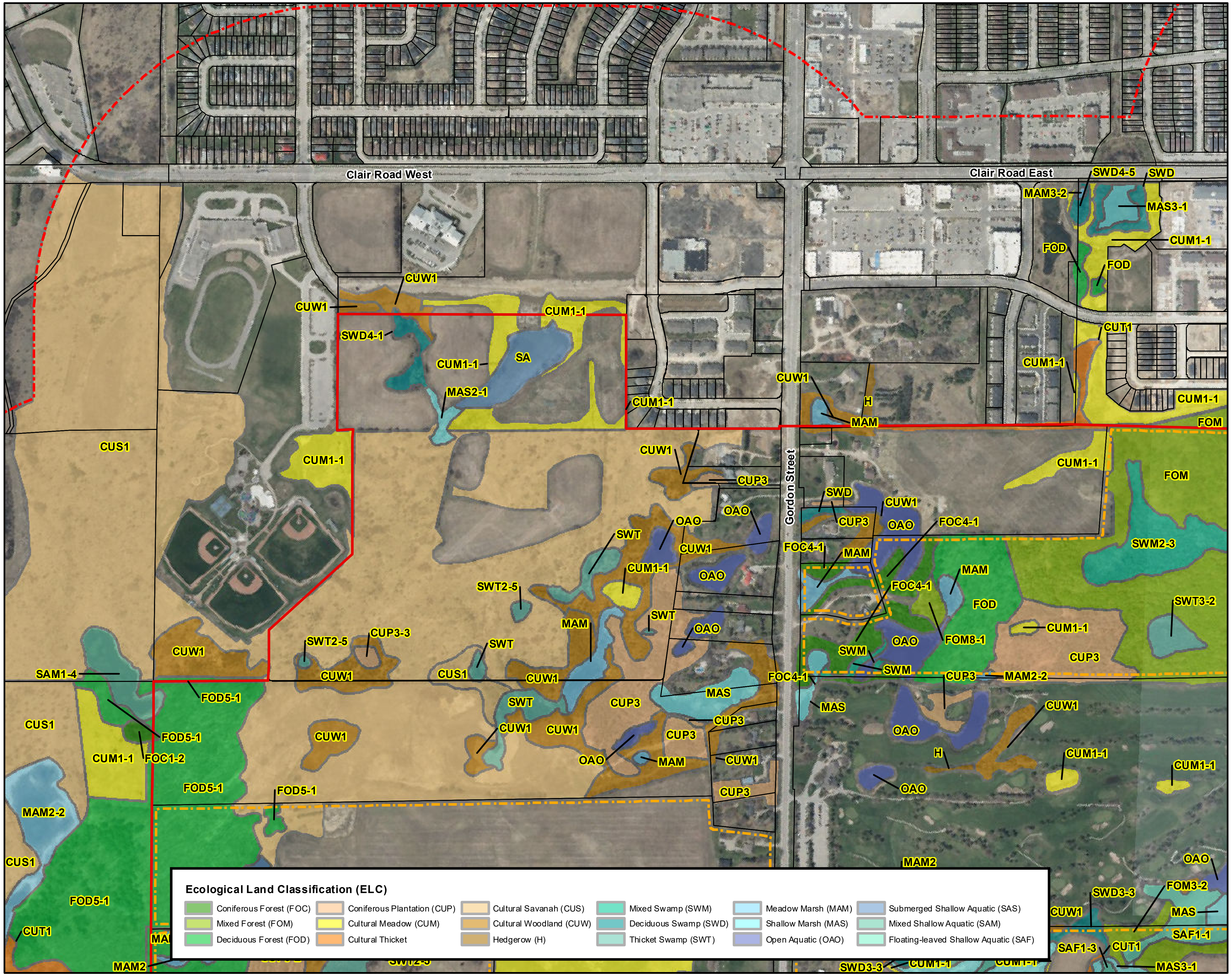


Ecological Land Classification (ELC)

Coniferous Forest (FOC)	Coniferous Plantation (CUP)	Cultural Savanah (CUS)	Mixed Swamp (SWM)	Meadow Marsh (MAM)	Submerged Shallow Aquatic (SAS)
Mixed Forest (FOM)	Cultural Meadow (CUM)	Cultural Woodland (CUW)	Deciduous Swamp (SWD)	Shallow Marsh (MAS)	Mixed Shallow Aquatic (SAM)
Deciduous Forest (FOD)	Cultural Thicket	Hedgerow (H)	Thicket Swamp (SWT)	Open Aquatic (OAO)	Floating-leaved Shallow Aquatic (SAF)

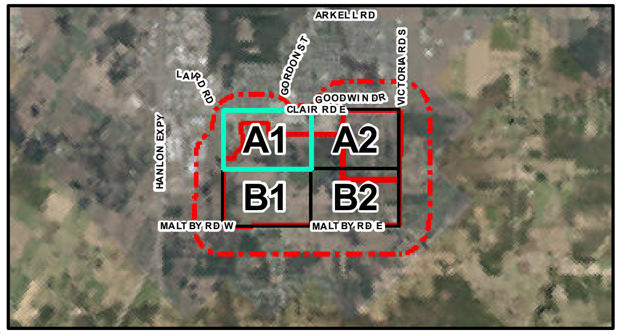
Refined Ecological Land Classification

Map NH-5
Page A1

Clair-Maltby Secondary Plan
2018 Monitoring Report

Legend

- Primary Study Area (PSA)
- Secondary Plan Area (SPA)
- Rolling Hills Community
- Access to Field Verify ELC Provided
- Parcel Fabric



Note: All ELC mapping has been updated from the City's 2014 ELC mapping using 2017 aerial photography except for the 2021 Gordon Street property where the City has indicated the 2014 ELC should be retained as the City and Owner are currently before the courts under the City's Tree By-law.

City of Guelph: Secondary Plan Area Boundary, Parcel Fabric, 2016.

First Base Solutions
Web Mapping Service 2017

UTM Zone 17 N, NAD 83

W N S E

0 62.5 125 250 Metres

1:6,500

BEACON
ENVIRONMENTAL

Project 216002
March, 2019

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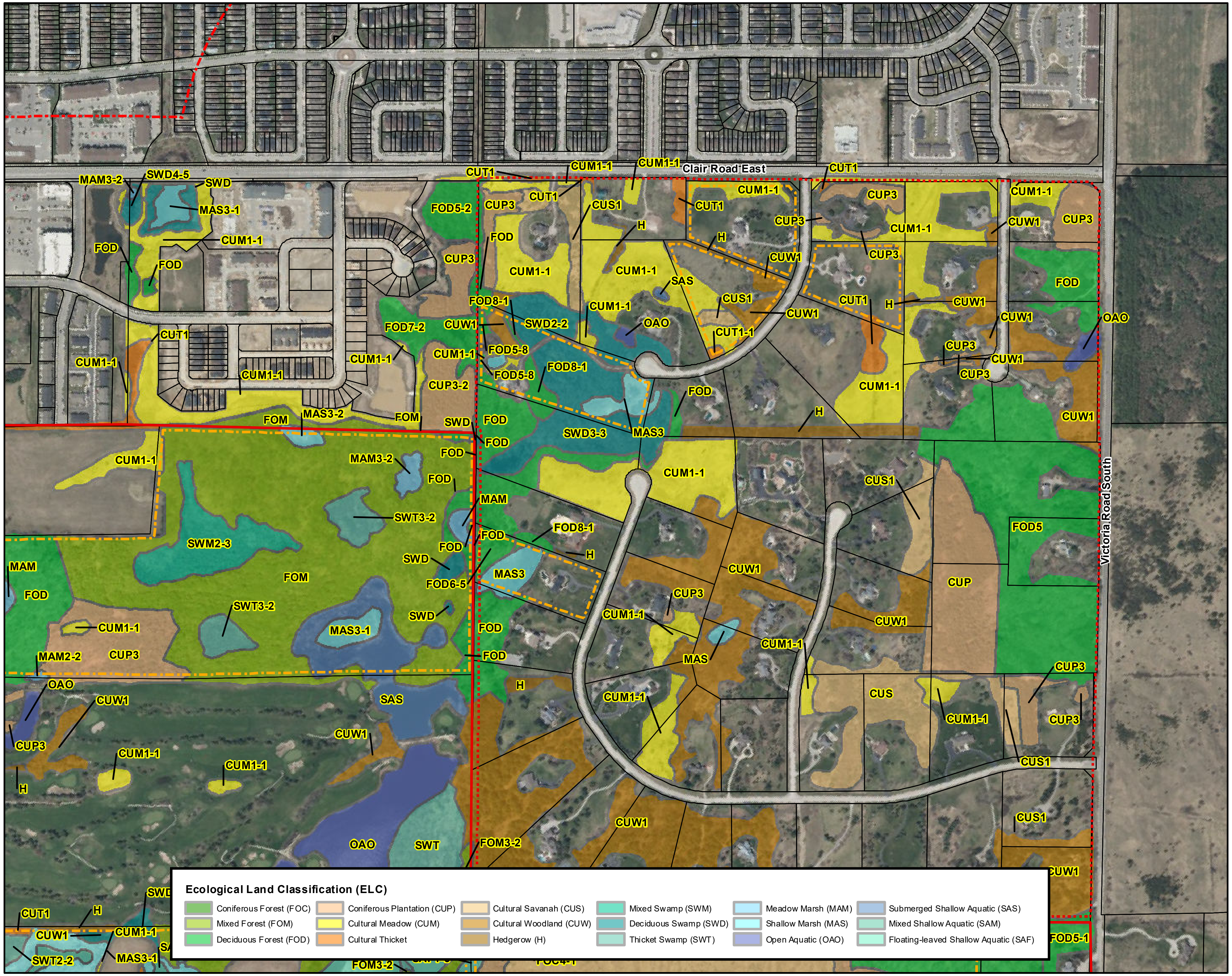


Ecological Land Classification (ELC)

Coniferous Forest (FOC)	Coniferous Plantation (CUP)	Cultural Savanah (CUS)	Mixed Swamp (SWM)	Meadow Marsh (MAM)	Submerged Shallow Aquatic (SAS)
Mixed Forest (FOM)	Cultural Meadow (CUM)	Cultural Woodland (CUW)	Deciduous Swamp (SWD)	Shallow Marsh (MAS)	Mixed Shallow Aquatic (SAM)
Deciduous Forest (FOD)	Cultural Thicket	Hedgerow (H)	Thicket Swamp (SWT)	Open Aquatic (OAO)	Floating-leaved Shallow Aquatic (SAF)

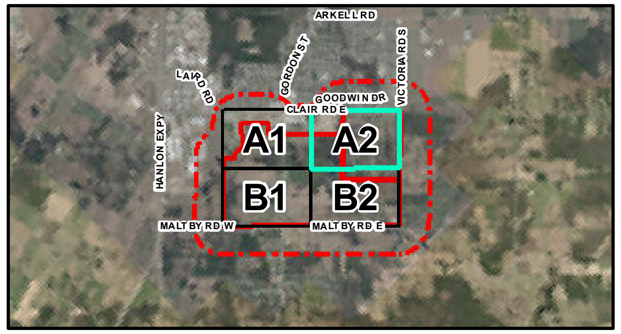
Refined Ecological Land Classification

Map NH-5
Page A2

Clair-Maltby Secondary Plan
2018 Monitoring Report

Legend

- Primary Study Area (PSA)
- Secondary Plan Area (SPA)
- Rolling Hills Community
- Access to Field Verify ELC Provided
- Parcel Fabric



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City of Guelph: Secondary Plan Area Boundary, Parcel Fabric, 2016.

First Base Solutions
Web Mapping Service 2017

UTM Zone 17 N, NAD 83

0 62.5 125 250 Metres

1:6,500

BEACON
ENVIRONMENTAL

Project 216002
March, 2019

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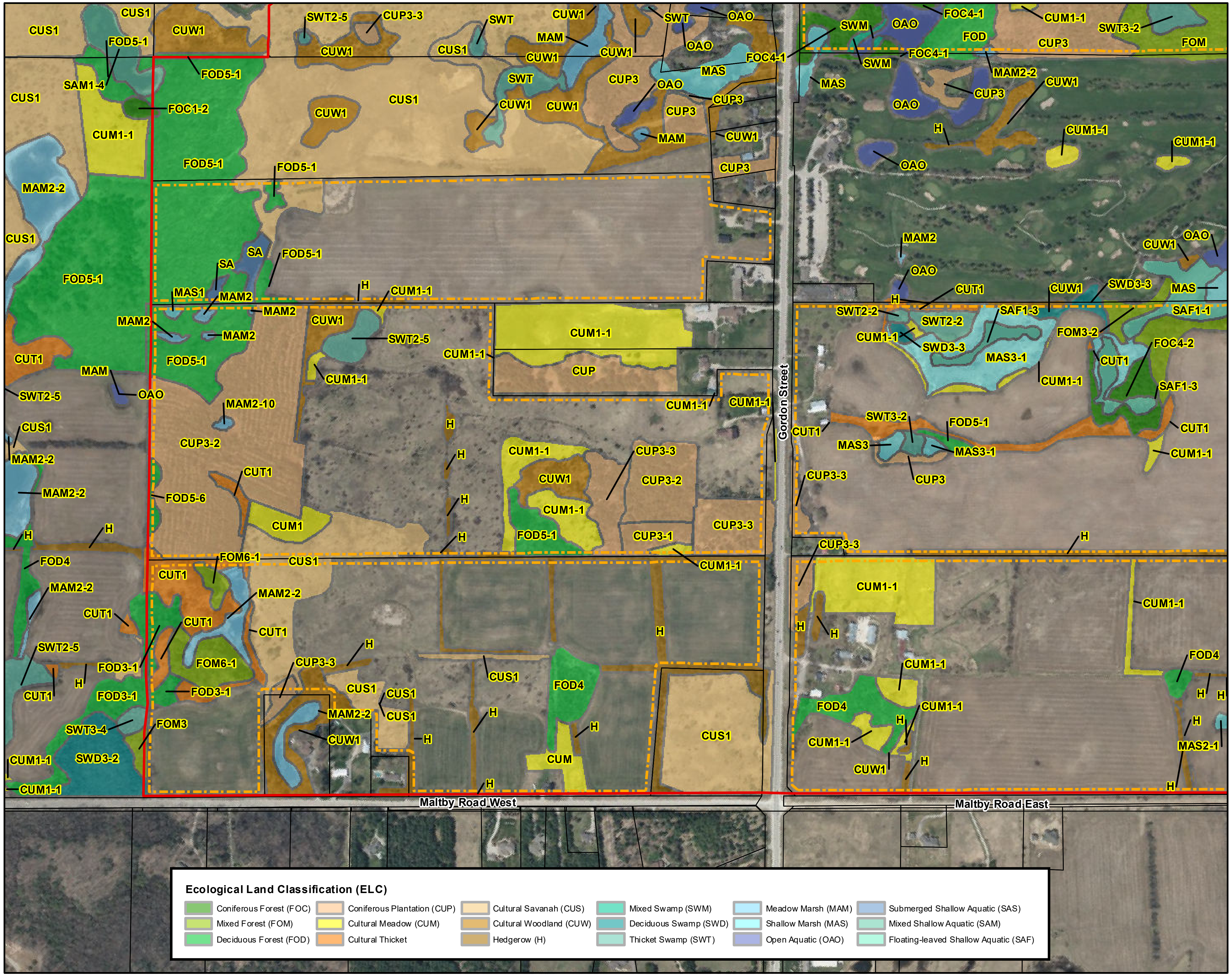
Refined Ecological Land Classification

Map NH-5 Page B1

Clair-Maltby Secondary Plan
2018 Monitoring Report

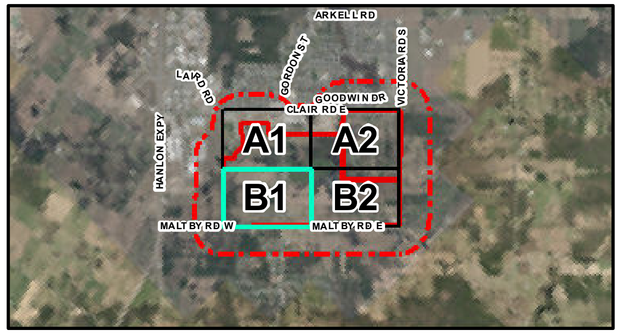


Ecological Land Classification (ELC)

🟩 Coniferous Forest (FOC)	🟧 Coniferous Plantation (CUP)	🟫 Cultural Savanah (CUS)	🟦 Mixed Swamp (SWM)	🟦 Meadow Marsh (MAM)	🟦 Submerged Shallow Aquatic (SAS)
🟩 Mixed Forest (FOM)	🟨 Cultural Meadow (CUM)	🟫 Cultural Woodland (CUW)	🟦 Deciduous Swamp (SWD)	🟦 Shallow Marsh (MAS)	🟦 Mixed Shallow Aquatic (SAM)
🟩 Deciduous Forest (FOD)	🟧 Cultural Thicket	🟫 Hedgerow (H)	🟦 Thicket Swamp (SWT)	🟦 Open Aquatic (OAO)	🟦 Floating-leaved Shallow Aquatic (SAF)

Legend

- 🟥 Primary Study Area (PSA)
- 🟥 Secondary Plan Area (SPA)
- 🟥 Rolling Hills Community
- 🟧 Access to Field Verify ELC Provided
- ☐ Parcel Fabric



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City of Guelph: Secondary Plan Area Boundary, Parcel Fabric, 2016.

First Base Solutions
Web Mapping Service 2017

UTM Zone 17 N, NAD 83

0 62.5 125 250 Metres

1:6,500

W N S E

BEACON
ENVIRONMENTAL

Project 216002
March, 2019

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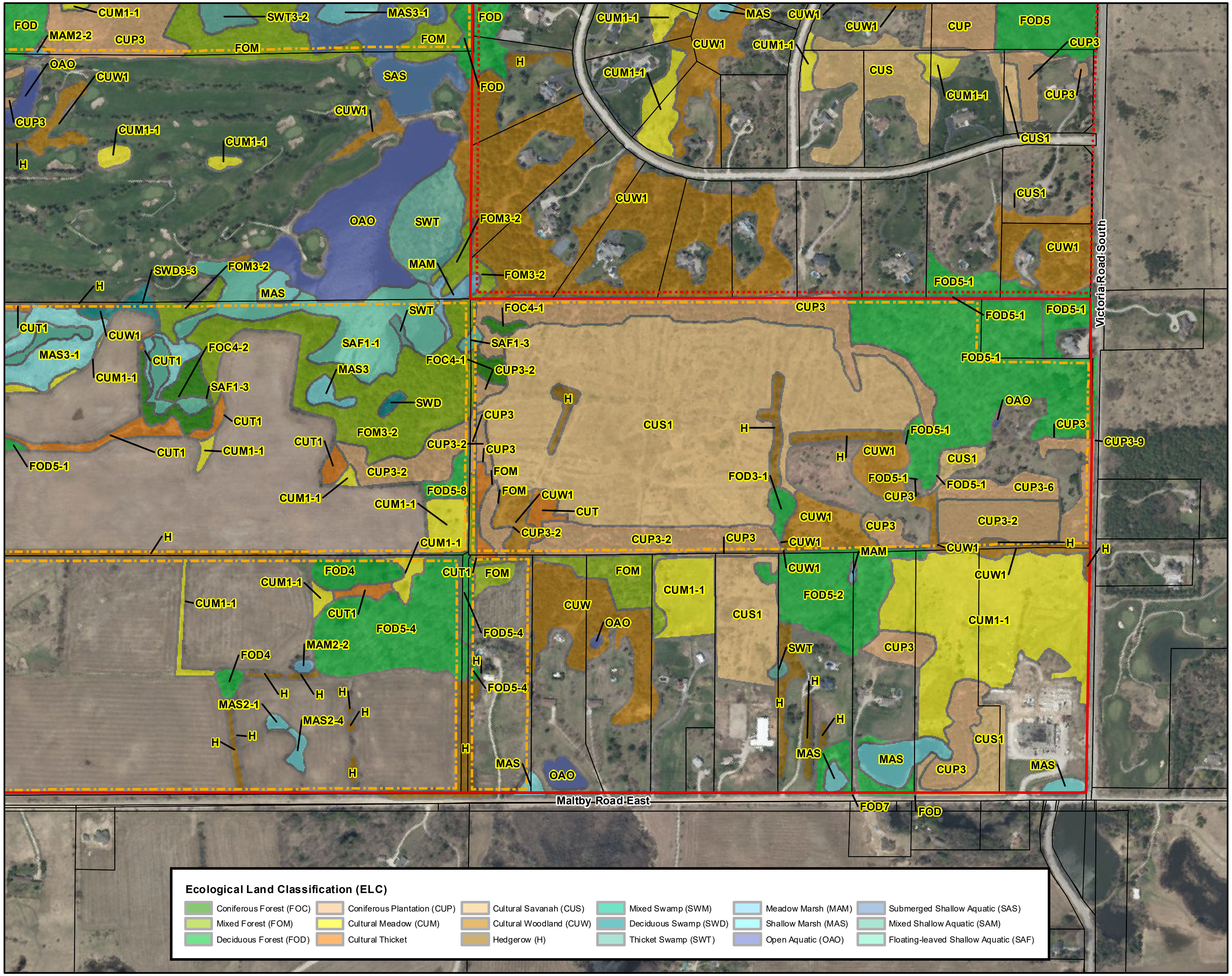

Ecological Land Classification (ELC)

- Coniferous Forest (FOC)
- Mixed Forest (FOM)
- Deciduous Forest (FOD)
- Coniferous Plantation (CUP)
- Cultural Meadow (CUM)
- Cultural Thicket
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- Thicket Swamp (SWT)
- Meadow Marsh (MAM)
- Shallow Marsh (MAS)
- Open Aquatic (OAO)
- Submerged Shallow Aquatic (SAS)
- Mixed Shallow Aquatic (SAM)
- Floating-leaved Shallow Aquatic (SAF)

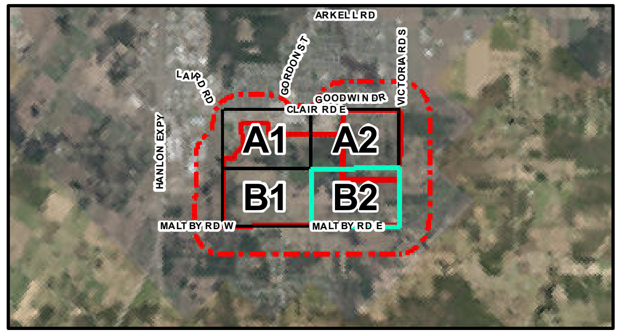
Refined Ecological Land Classification

Map NH-5 Page B2

Clair-Maltby Secondary Plan
2018 Monitoring Report

Legend

- Primary Study Area (PSA)
- Secondary Plan Area (SPA)
- Rolling Hills Community
- Access to Field Verify ELC Provided
- Parcel Fabric



Note: All ELC mapping has been updated from the City's 2014 ELC mapping using 2017 aerial photography except for the 2021 Gordon Street property where the City has indicated the 2014 ELC should be retained as the City and Owner are currently before the courts under the City's Tree By-law.

City of Guelph: Secondary Plan Area Boundary, Parcel Fabric, 2016.

First Base Solutions
Web Mapping Service 2017

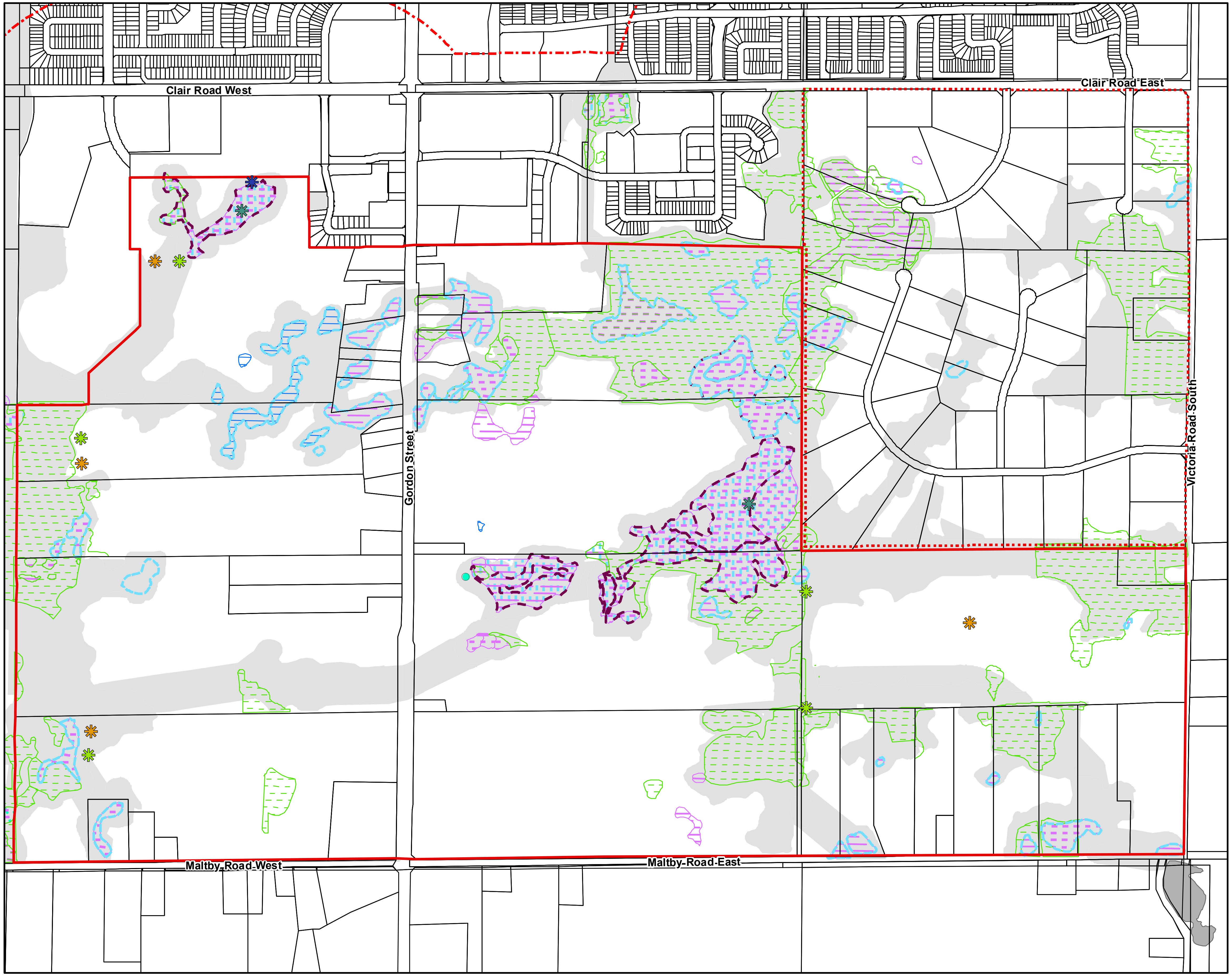
UTM Zone 17 N, NAD 83

0 62.5 125 250 Metres

1:6,500

BEACON
ENVIRONMENTAL

Project 216002
March, 2019



Detailed Significant Wildlife Habitat (SWH) Mapping

Map NH-6

Clair-Maltby Secondary Plan
2018 Monitoring Report

Legend

- Primary Study Area Boundary (PSA)
- Secondary Plan Area (SPA)
- Rolling Hills Area
- Parcel Fabric

Significant Wildlife Habitat

- ▨ Candidate Amphibian Breeding Habitat (Woodland)
- ▨ Confirmed Amphibian Breeding Habitat (Woodland)
- ▨ Candidate Amphibian Breeding Habitat (Wetland)
- Candidate Turtle Winter Areas
- Confirmed Turtle Winter Areas
- Candidate Waterfowl Stopover and Staging Habitat (Aquatic)
- ● Confirmed Seeps and Springs
- Confirmed Rare Vegetation Community
- ▨ Candidate Bat Maternity Colonies
- ✱ Candidate Shrub/Early Successional Bird Breeding Habitat *
- ✱ Candidate Raptor Wintering Areas *
- ✱ Candidate Reptile Hibernaculum *
- ✱ Candidate Waterfowl Nesting Area *
- ■ Halligan's Pond**

* Several Candidate SWH areas are shown approximately with asterisks; Site-specific studies will be needed to a) capture the best and most representative area(s) in the SPA or b) confirm the significance and extent of these habitats.

** Halligan's pond could be considered Candidate SWH for amphibian breeding, waterfowl stopover and turtle wintering but has not been mapped as such as it is outside the City of Guelph.

City of Guelph: Secondary Plan Area Boundary, Parcel Fabric, 2016.

First Base Solutions
Web Mapping Service 2017

UTM Zone 17 N, NAD 83

0 100 200 400 Metres

1:10,500

BEACON
ENVIRONMENTAL

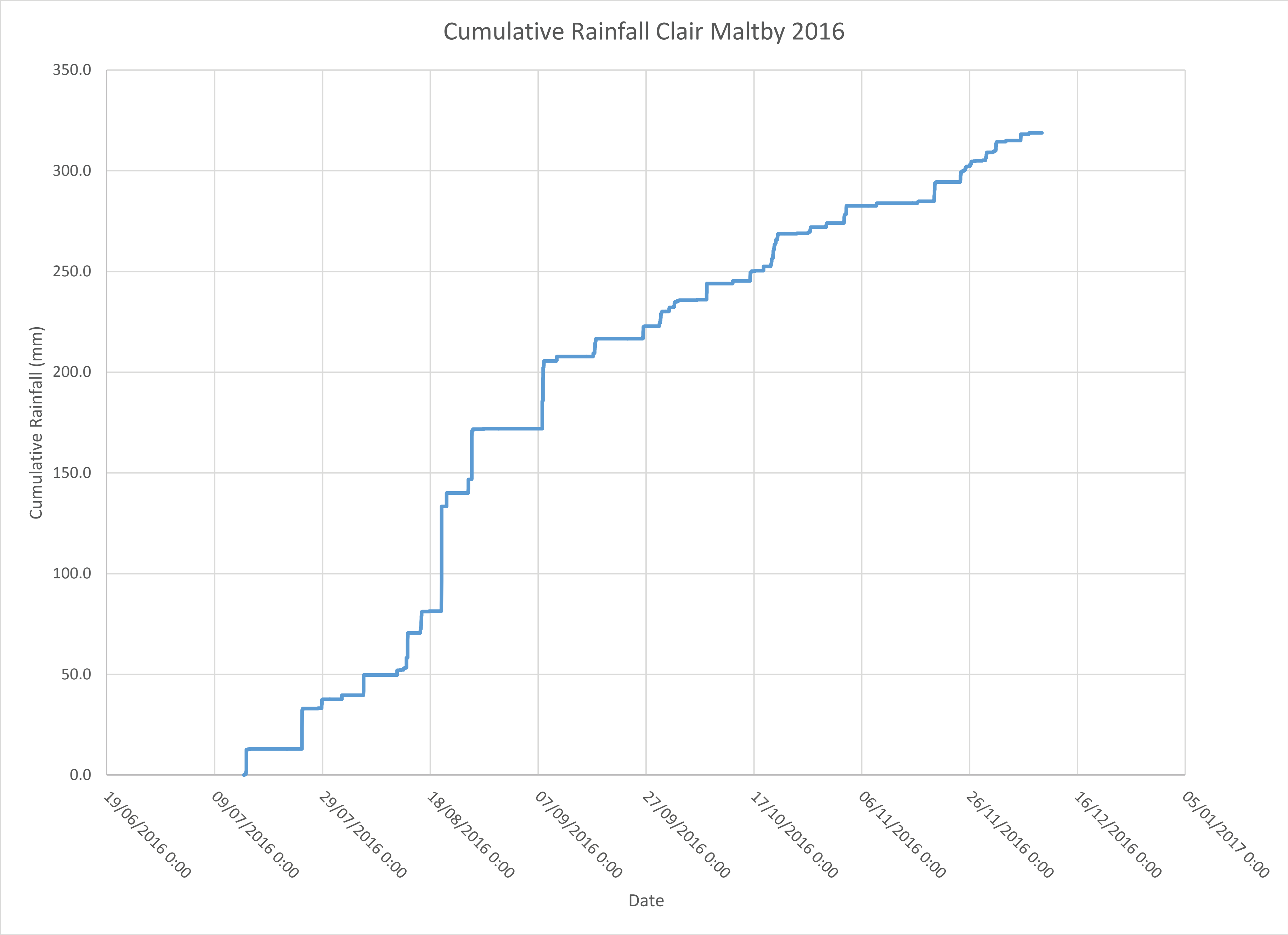
Project 216002
March, 2019

C:\Dropbox\Dropbox (Beacon)\All GIS Projects\2016\216002 Clair Maltby Secondary Plan\MXD\2018 Monitoring Report\216002_2_MapNH-9_SWH_2019-03-04.mxd

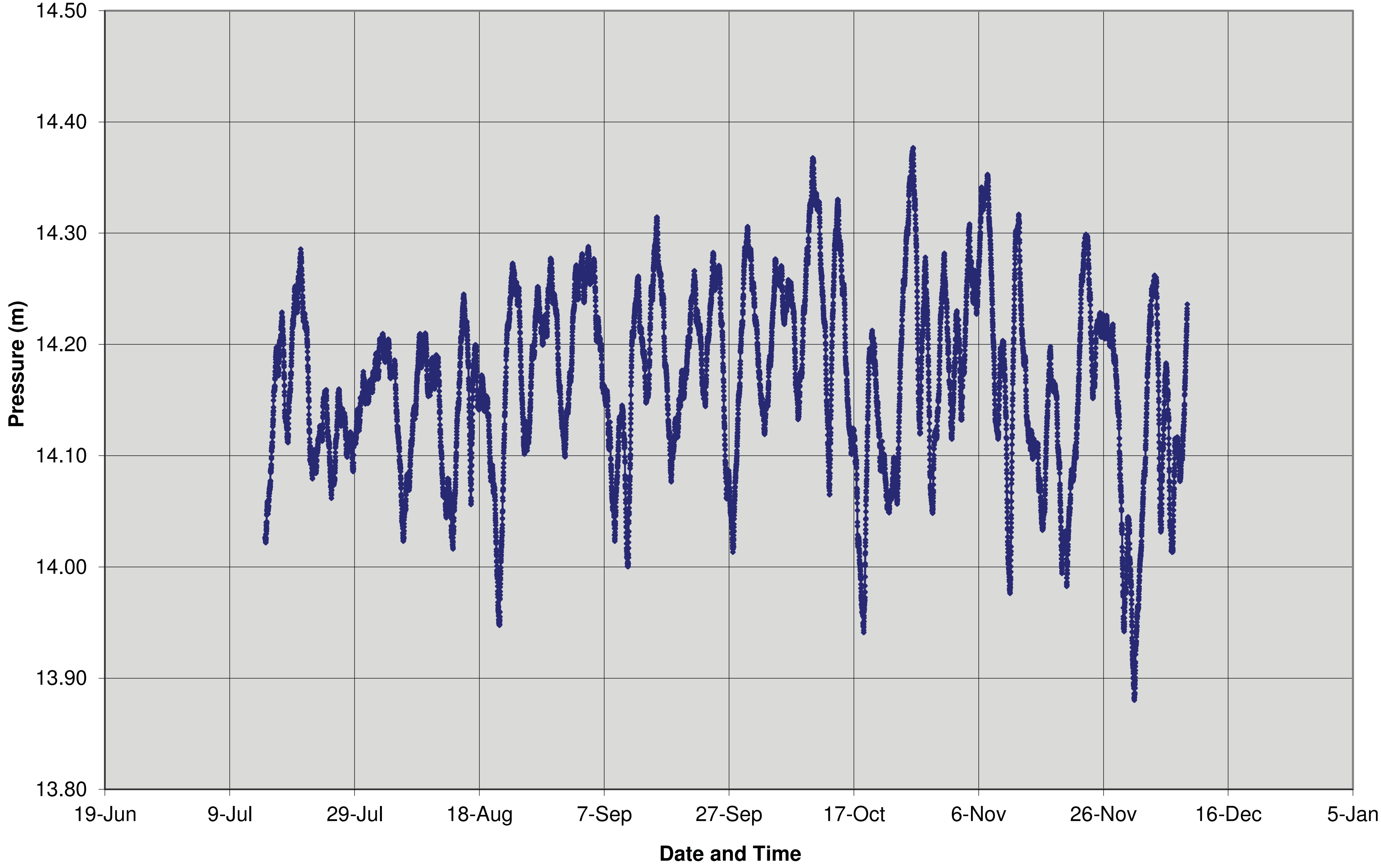
Appendix SW-1

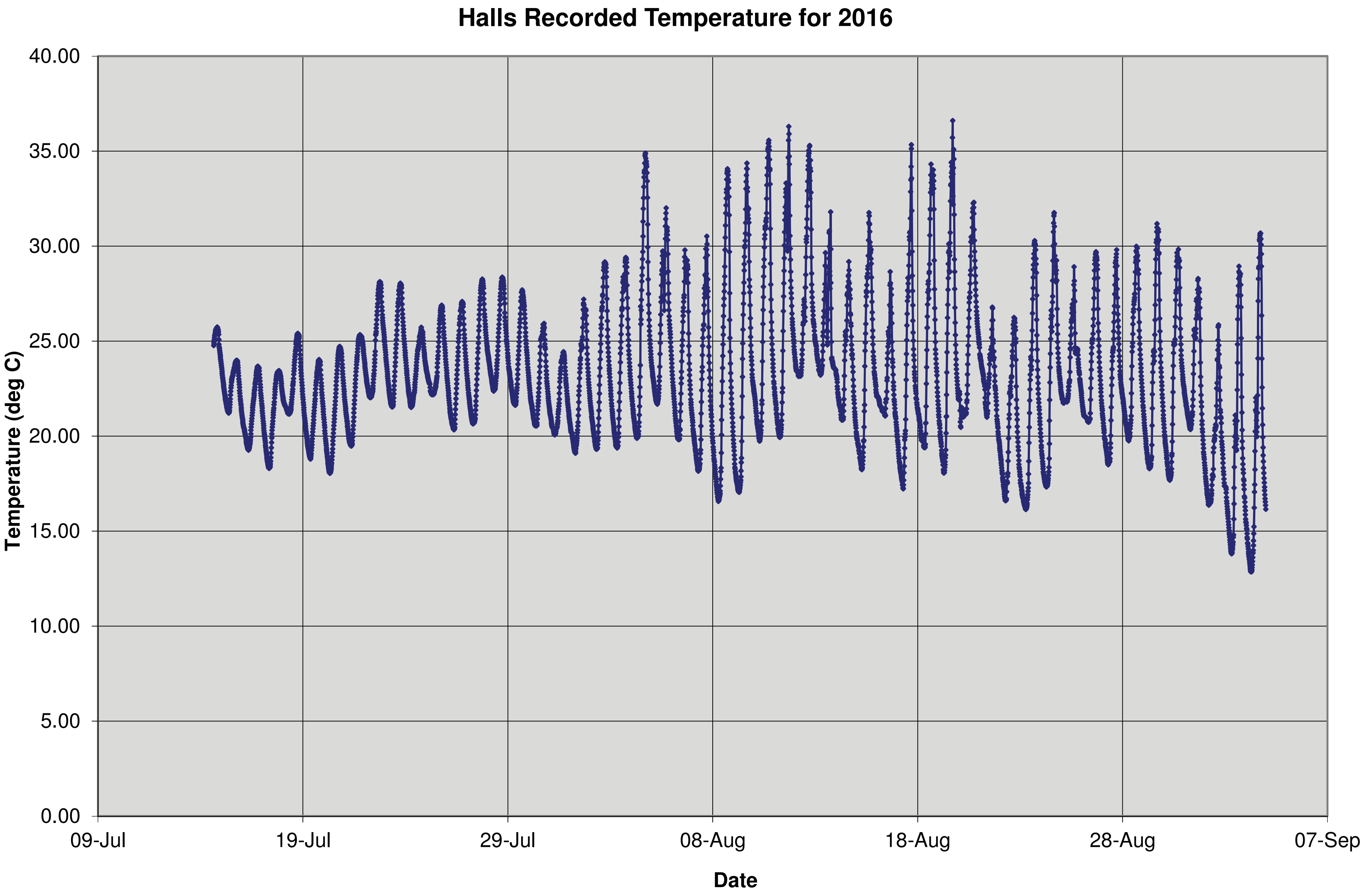
Surface Water

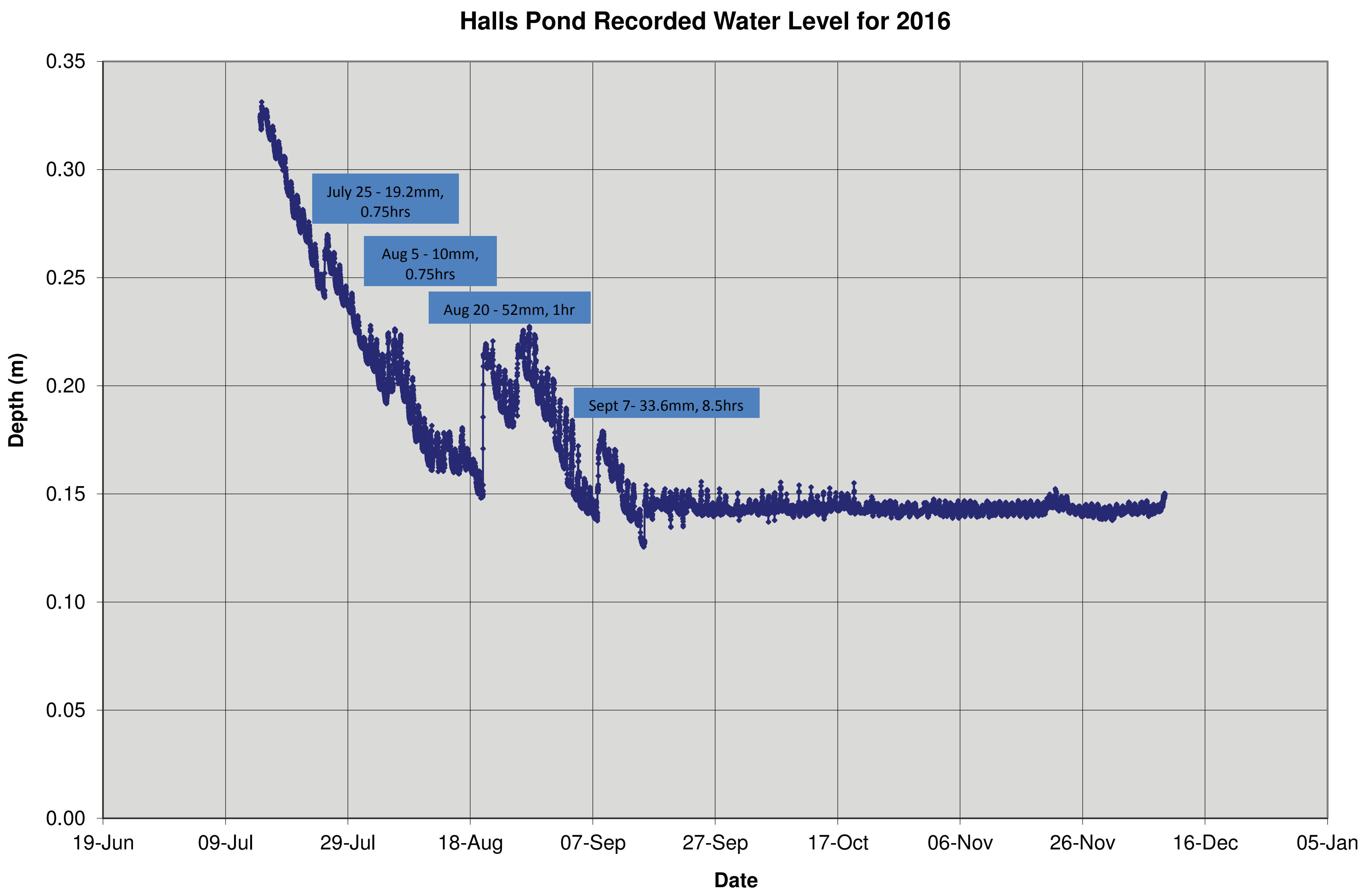
2016 Results


Cumulative Rainfall Clair Maltby 2016
Cumulative Rainfall (mm)
350.0
300.0
250.0
200.0
150.0
100.0
50.0
0.0
19/06/2016 0:00
09/07/2016 0:00
29/07/2016 0:00
18/08/2016 0:00
07/09/2016 0:00
27/09/2016 0:00
17/10/2016 0:00
06/11/2016 0:00
26/11/2016 0:00
16/12/2016 0:00
05/01/2017 0:00
Date

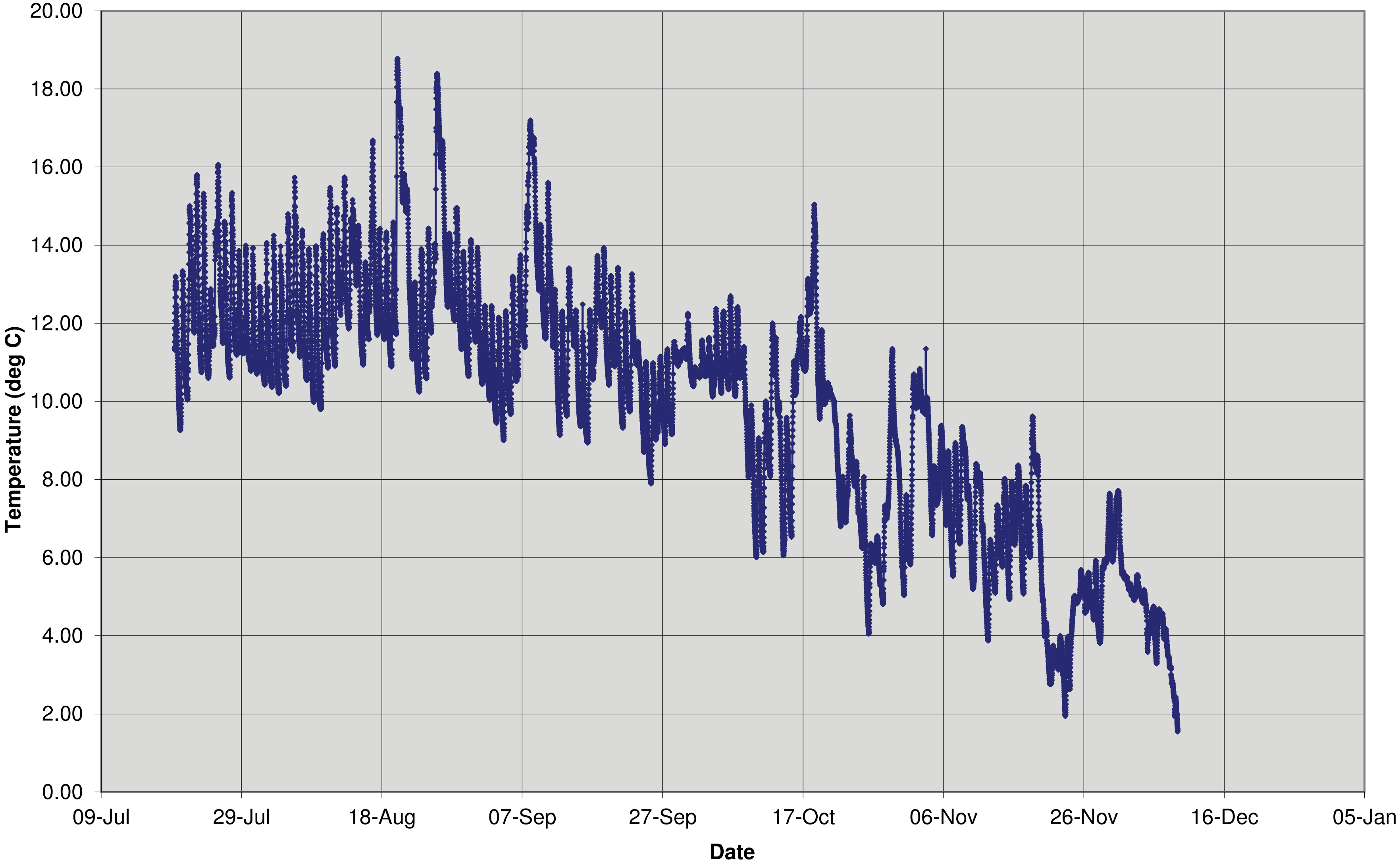
Barologger Recorded Pressure at Victoria/Maltby for 2016

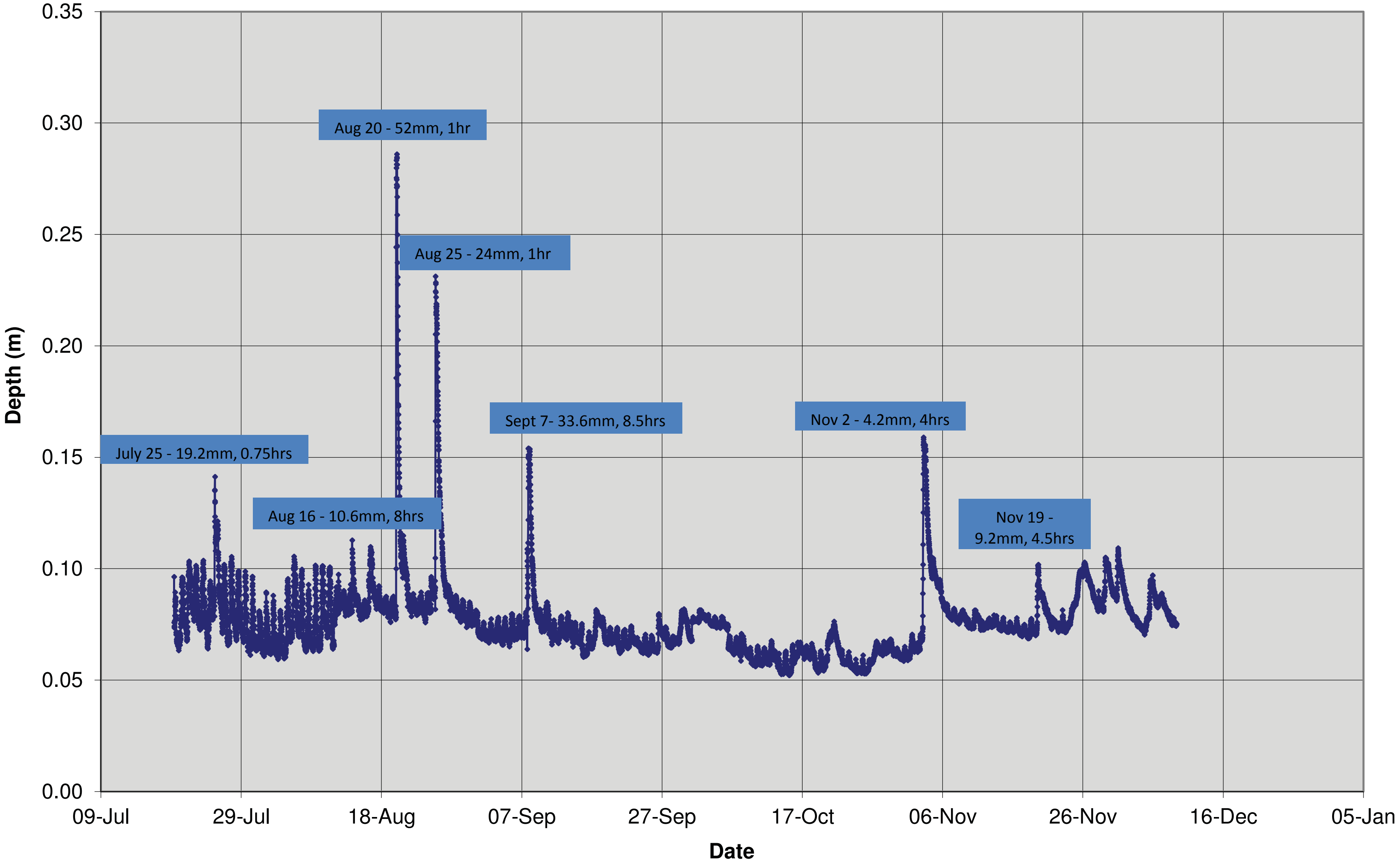



Halls Recorded Temperature for 2016
Temperature (deg C)
40.00
35.00
30.00
25.00
20.00
15.00
10.00
5.00
0.00
09-Jul
19-Jul
29-Jul
08-Aug
18-Aug
28-Aug
07-Sep
Date

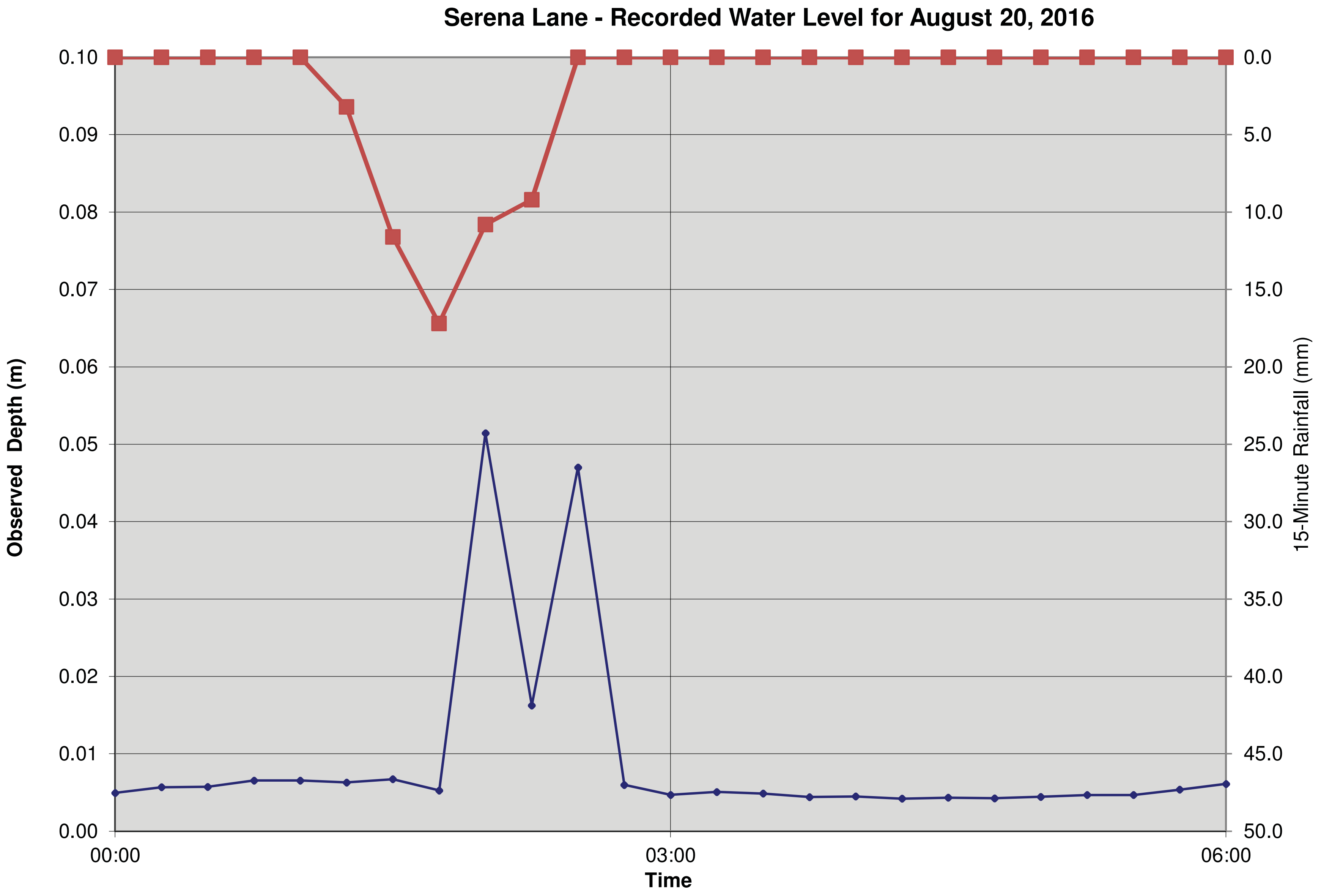

Halls Pond Recorded Water Level for 2016
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
Depth (m)
19-Jun
09-Jul
29-Jul
18-Aug
07-Sep
27-Sep
17-Oct
06-Nov
26-Nov
16-Dec
05-Jan
Date
July 25 - 19.2mm, 0.75hrs
Aug 5 - 10mm, 0.75hrs
Aug 20 - 52mm, 1hr
Sept 7- 33.6mm, 8.5hrs

Hammersley Recorded Temperature for 2016

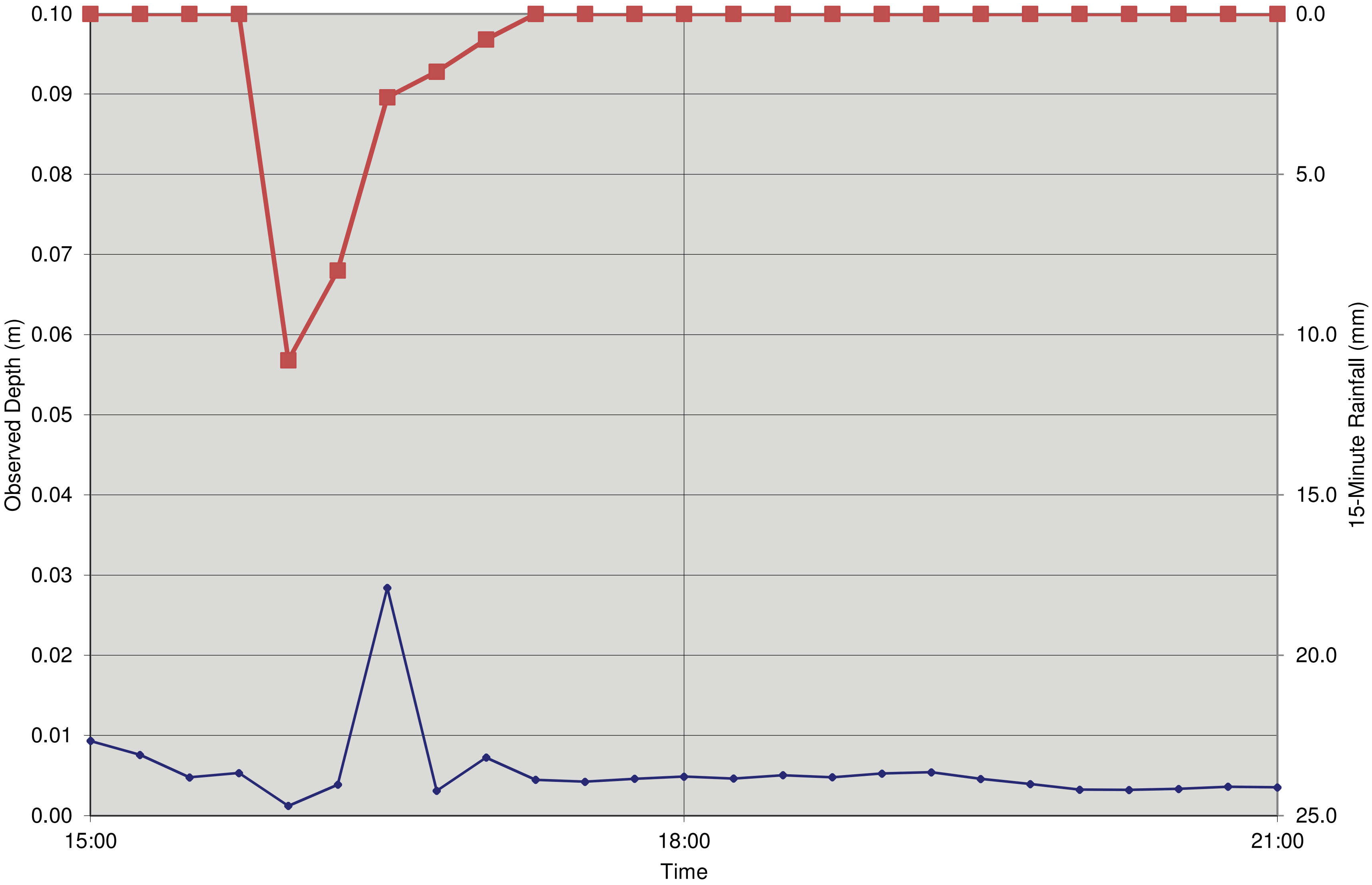


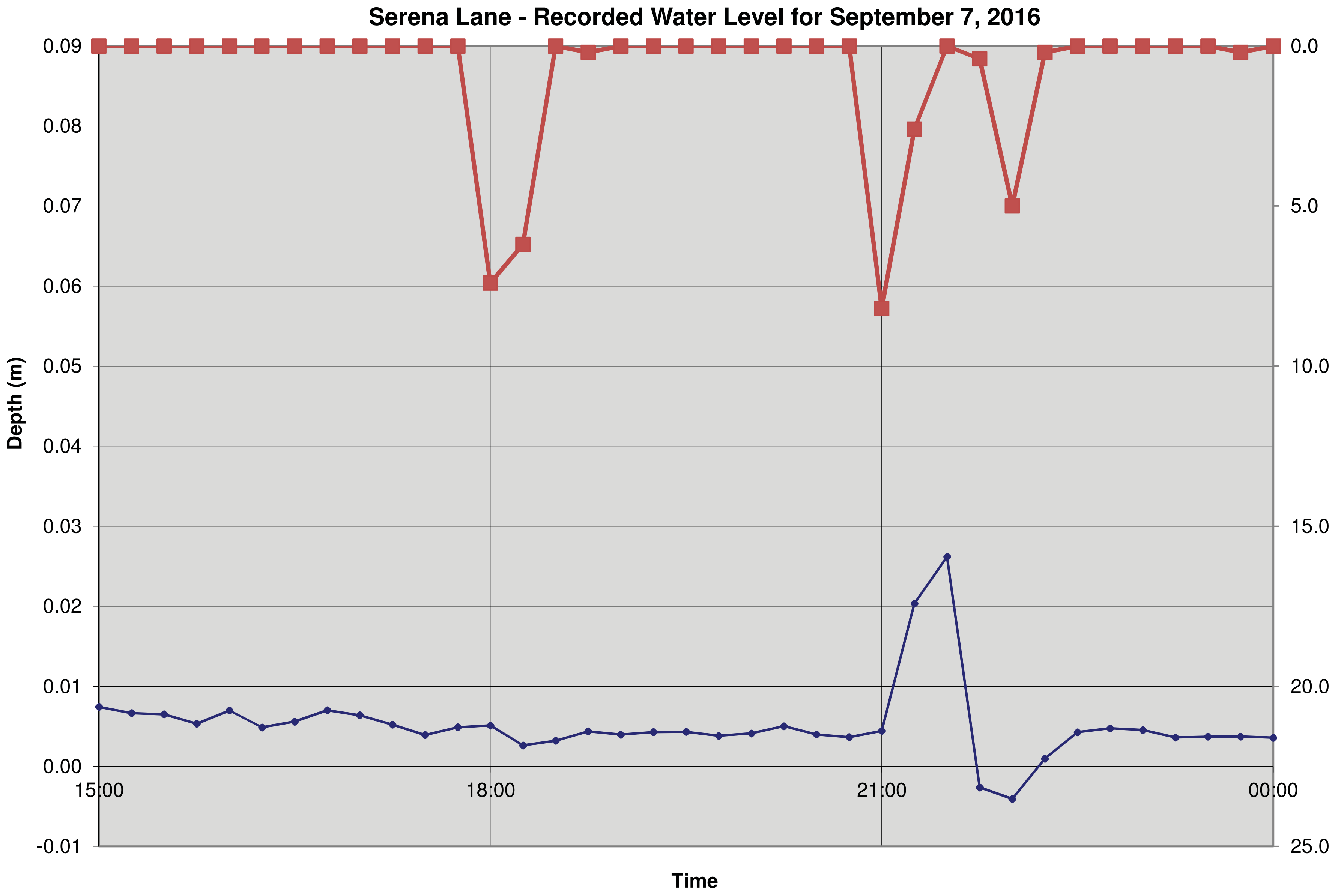


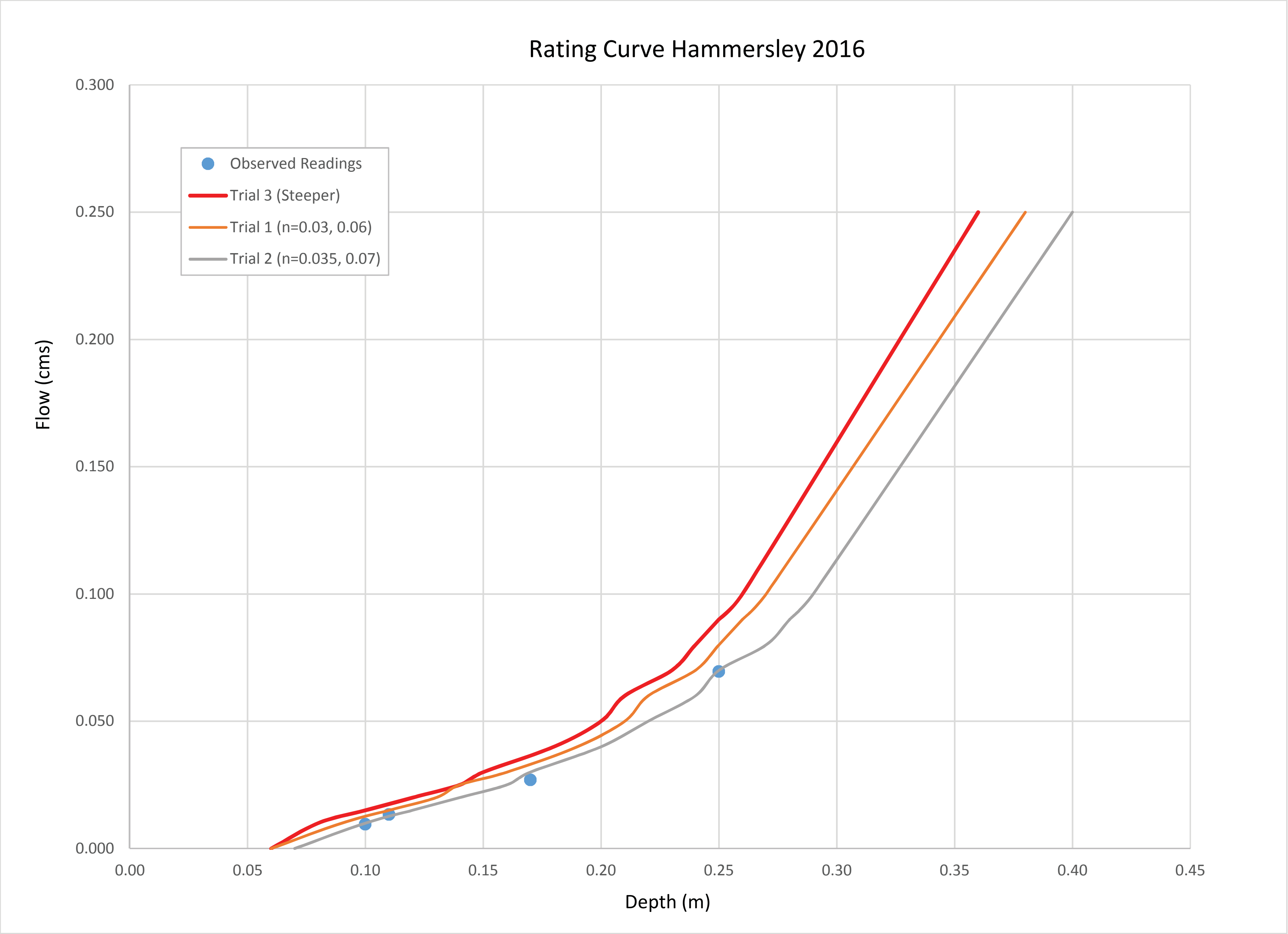
Hammersley Recorded Water Level for 2016

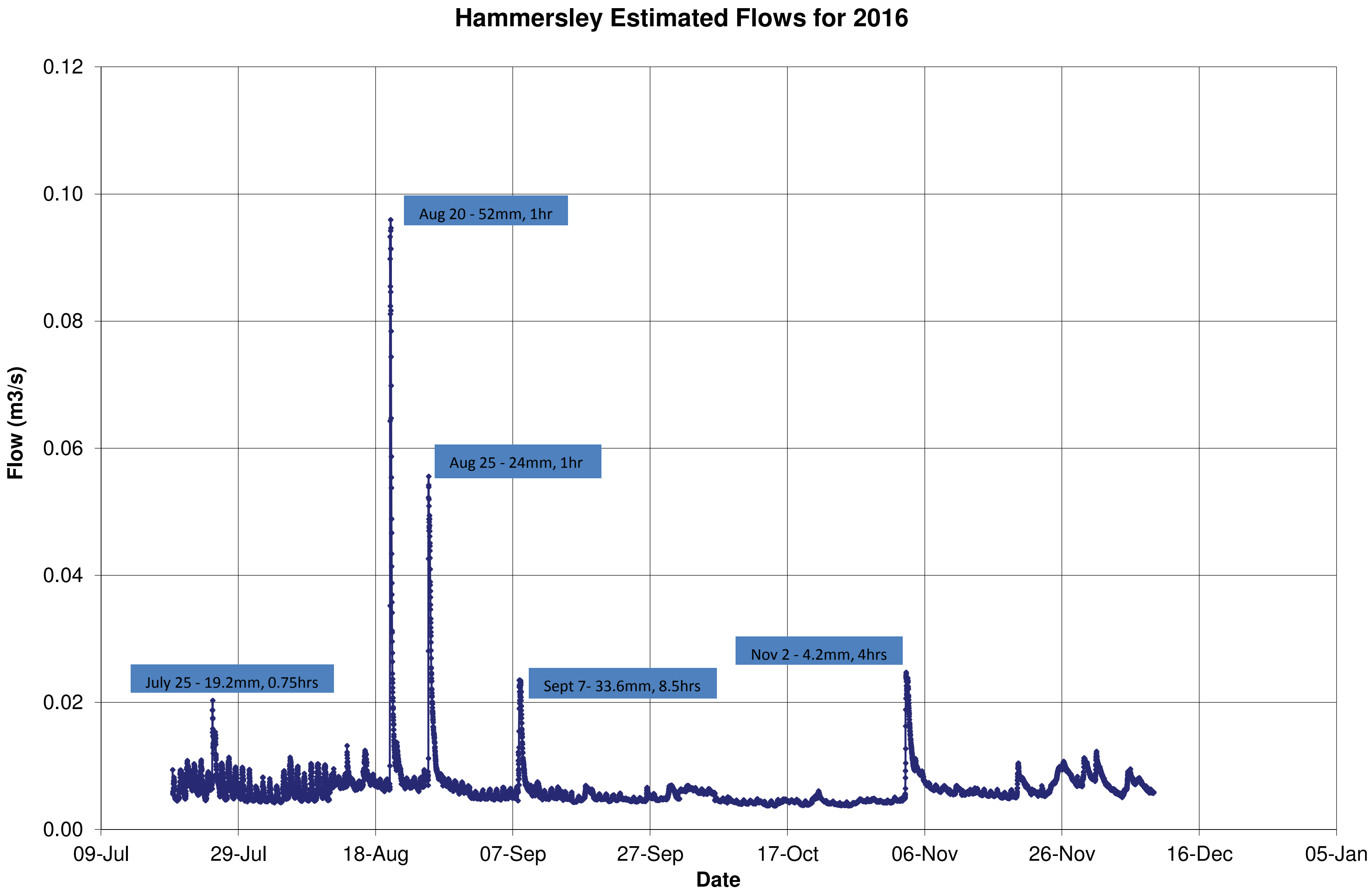

Serena Lane - Recorded Water Level for August 20, 2016
Observed Depth (m)
0.10
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0.00
15-Minute Rainfall (mm)
0.0
5.0
10.0
15.0
20.0
25.0
30.0
35.0
40.0
45.0
50.0
00:00
03:00
06:00
Time

Serena Lane - Recorded Water Level for August 25, 2016




Serena Lane - Recorded Water Level for September 7, 2016
Depth (m)
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0.00
-0.01
0.0
5.0
10.0
15.0
20.0
25.0
15:00
18:00
21:00
00:00
Time


Rating Curve Hammersley 2016
Flow (cms)
Depth (m)
0.300
0.250
0.200
0.150
0.100
0.050
0.000
0.00
0.05
0.10
0.15
0.20
0.25
0.30
0.35
0.40
0.45
Observed Readings
Trial 3 (Steeper)
Trial 1 (n=0.03, 0.06)
Trial 2 (n=0.035, 0.07)


Hammersley Estimated Flows for 2016
Flow (m3/s)
0.12
0.10
0.08
0.06
0.04
0.02
0.00
09-Jul
29-Jul
18-Aug
07-Sep
27-Sep
17-Oct
06-Nov
26-Nov
16-Dec
05-Jan
Date
Aug 20 - 52mm, 1hr
Aug 25 - 24mm, 1hr
July 25 - 19.2mm, 0.75hrs
Sept 7- 33.6mm, 8.5hrs
Nov 2 - 4.2mm, 4hrs

Station 7 WQ 2016 Summary
216002 - Clair/Maltby

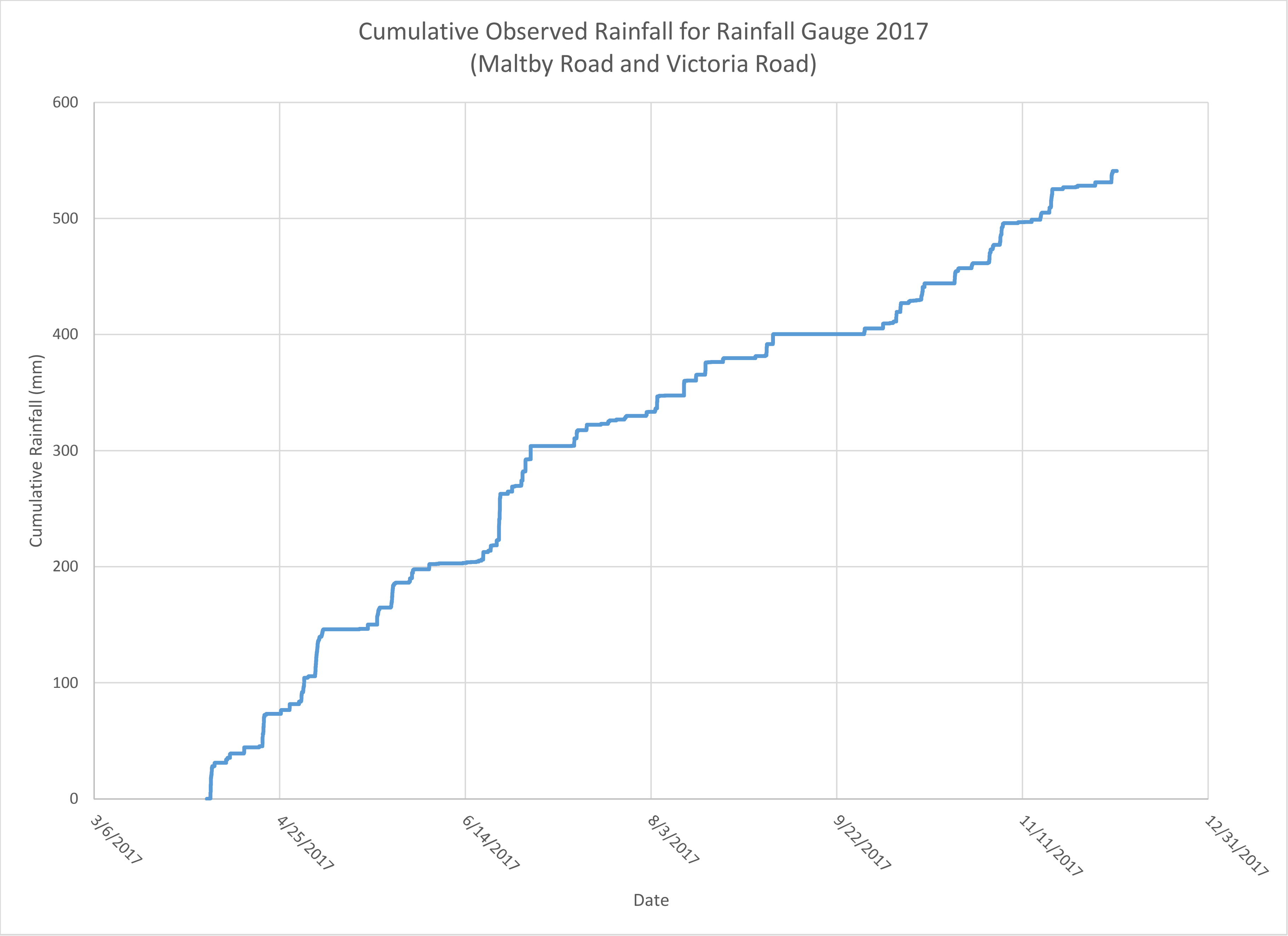
				4-Aug-2016 11:00	17-Aug-2016 11:40	22-Sep-2016 14:55	20-Oct-2016 13:55
Parameter	Lowest Detection Limit	Units	PWQO Surface Water Parameter Limits	8/4/2016 (11:00)	8/17/2016 (11:40)	9/22/2016 (14:55)	10/20/2016 (13:55)
Physical Tests (Water)							
Total Suspended Solids	2.0	mg/L		6.8	10.7	79.4	15.8
Total Dissolved Solids	20	mg/L		178	170	149	153
Anions and Nutrients (Water)							
Ammonia, Total (as N)	0.020	mg/L	0.02	0.028	<0.020	0.025	0.082
Bromide (Br)	0.10	mg/L		<0.10	<0.10	<0.10	<0.10
Chloride (Cl)	0.50	mg/L		9.92	10.1	12.3	12.7
Fluoride (F)	0.020	mg/L		0.042	0.043	0.067	0.044
Nitrate (as N)	0.020	mg/L		<0.020	<0.020	<0.020	<0.020
Nitrite (as N)	0.010	mg/L		<0.010	<0.010	<0.010	<0.010
Total Kjeldahl Nitrogen	0.15	mg/L		1.41	1.65	2.30	1.68
Orthophosphate-Dissolved (as P)	0.0030	mg/L		<0.0030	<0.0030	<0.0030	<0.0030
Phosphorus, Total	0.0030	mg/L	0.03	**0.0540**	**0.0742**	**0.173**	**0.0743**
Sulfate (SO4)	0.30	mg/L		<0.30	<0.30	<0.30	<0.30
Total Metals (Water)							
Aluminum (Al)-Total	0.010	mg/L	0.075	**0.027**	**0.027**	**0.263**	<0.010
Antimony (Sb)-Total	0.00010	mg/L	0.02	<0.00010	0.00012	<0.00010	0.00018
Arsenic (As)-Total	0.00010	mg/L	0.1	0.00064	0.00079	0.00062	0.00049
Barium (Ba)-Total	0.00020	mg/L		0.0502	0.0130	0.0123	0.0084
Beryllium (Be)-Total	0.00010	mg/L	0.011	<0.00010	<0.00010	<0.00010	<0.00010
Bismuth (Bi)-Total	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050
Boron (B)-Total	0.010	mg/L	0.2	0.013	0.014	0.015	0.011
Cadmium (Cd)-Total	0.000010	mg/L	0.0002	<0.000010	<0.000010	0.000022	<0.000010
Calcium (Ca)-Total	0.50	mg/L		32.7	30.9	24.4	30.6
Cesium (Cs)-Total	0.000010	mg/L		<0.000010	<0.000010	0.000026	<0.000010
Chromium (Cr)-Total	0.00050	mg/L		<0.00050	<0.00050	<0.00050	<0.00050
Cobalt (Co)-Total	0.00010	mg/L	0.0009	<0.00010	<0.00010	0.00015	<0.00010
Copper (Cu)-Total	0.0010	mg/L	0.005	<0.0010	<0.0010	<0.0010	<0.0010
Iron (Fe)-Total	0.050	mg/L	0.3	**0.371**	**0.457**	**0.491**	<0.050
Lead (Pb)-Total	0.00010	mg/L	0.001	0.00038	0.00053	**0.00207**	<0.00010
Magnesium (Mg)-Total	0.050	mg/L		8.72	7.55	7.65	6.98
Manganese (Mn)-Total	0.00050	mg/L		0.111	0.0780	0.0317	0.0150
Molybdenum (Mo)-Total	0.000050	mg/L	0.04	<0.000050	<0.000050	0.000069	<0.000050
Nickel (Ni)-Total	0.00050	mg/L	0.025	<0.00050	<0.00050	<0.00050	<0.00050
Potassium (K)-Total	0.050	mg/L		1.37	1.80	1.26	2.02
Rubidium (Rb)-Total	0.00020	mg/L		0.00045	0.00073	0.00088	0.00105
Selenium (Se)-Total	0.000050	mg/L	0.1	0.000062	0.000068	0.000082	<0.000050
Silicon (Si)-Total	0.050	mg/L		0.685	1.13	1.42	0.72
Silver (Ag)-Total	0.000050	mg/L	0.0001	<0.000050	<0.000050	<0.000050	<0.000050

Strontium (Sr)-Total	0.0010	mg/L		0.0650	0.0368	0.0340	0.0412
Sulfur (S)-Total	0.50	mg/L		0.52	<0.50	<0.50	<0.50
Tellurium (Te)-Total	0.00020	mg/L		<0.00020	<0.00020	<0.00020	<0.00020
Thallium (Tl)-Total	0.000010	mg/L	0.0003	<0.000010	<0.000010	<0.000010	<0.000010
Thorium (Th)-Total	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010
Tin (Sn)-Total	0.00010	mg/L		0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Total	0.00030	mg/L		0.00051	0.00078	0.00690	<0.00030
Tungsten (W)-Total	0.00010	mg/L	0.03	<0.00010	<0.00010	<0.00010	<0.00010
Uranium (U)-Total	0.000010	mg/L	0.005	<0.000010	<0.000010	0.000016	<0.000010
Vanadium (V)-Total	0.00050	mg/L	0.006	<0.00050	<0.00050	0.00083	<0.00050
Zinc (Zn)-Total	0.0030	mg/L	0.02	0.0043	0.0032	0.0100	<0.0030
Zirconium (Zr)-Total	0.00030	mg/L	0.004	<0.00030	<0.00030	<0.00030	<0.00030

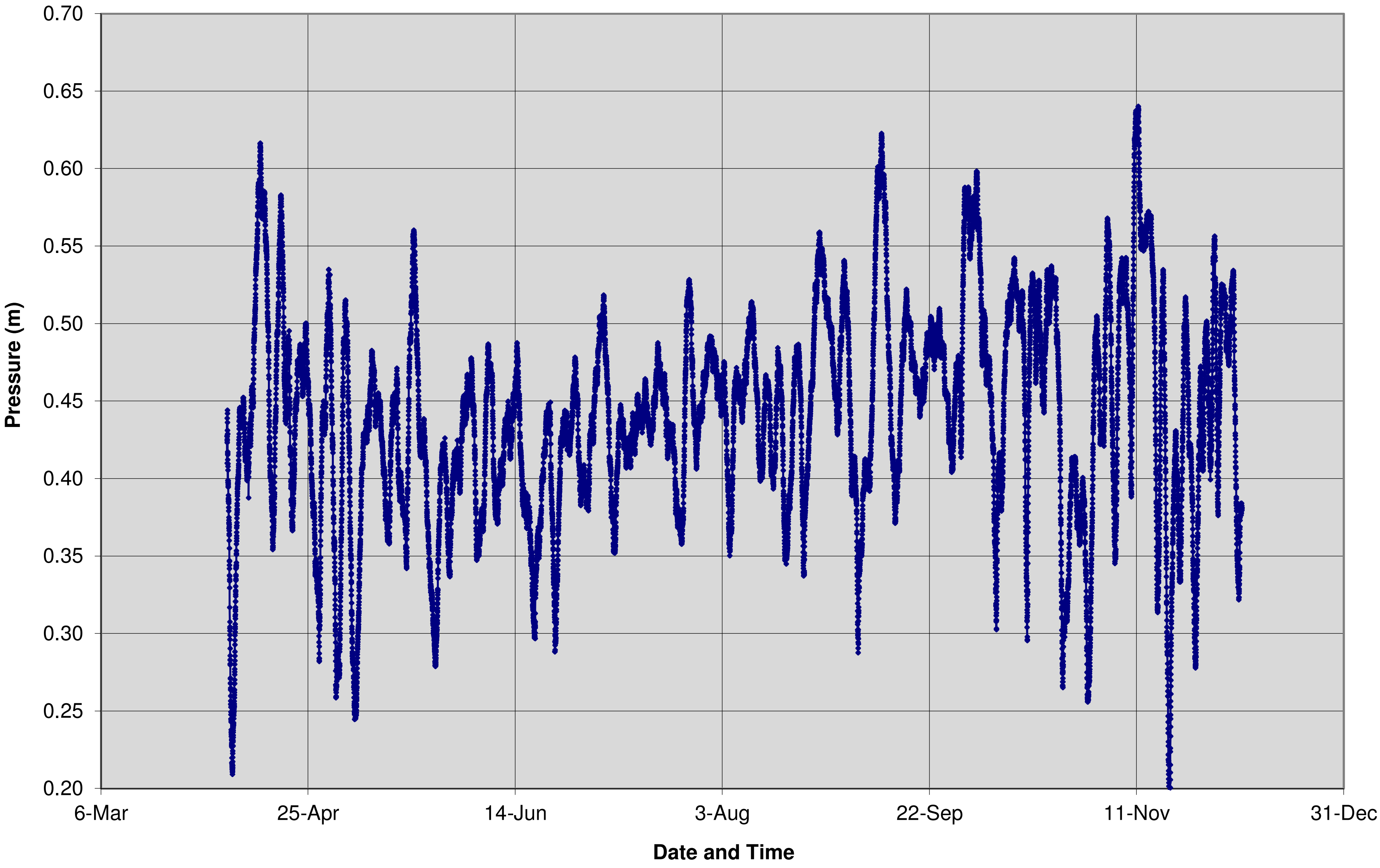
Station 14 WQ 2016 Summary 216002- Clair/Maltby				4-Aug-2016 10:12	17-Aug-2016 10:55	22-Sep-2016 14:17	20-Oct-2016 13:55
Parameter	Lowest Detection Limit	Units	PWQO Surface Water Parameter Limits	8/4/2016 (10:12)	8/17/2016 (10:55)	9/22/2016 (14:17)	10/20/2016 (13:55)
Physical Tests (Water)							
Total Suspended Solids	2.0	mg/L		<2.0	2.5	<2.0	4.0
Total Dissolved Solids	20	mg/L		388	362	379	350
Anions and Nutrients (Water)							
Ammonia, Total (as N)	0.020	mg/L	0.02	<0.020	0.043	0.032	0.074
Bromide (Br)	0.10	mg/L		<0.10	<0.10	<0.10	<0.10
Chloride (Cl)	0.50	mg/L		38.0	33.5	36.7	33.6
Fluoride (F)	0.020	mg/L		0.050	0.051	0.064	0.042
Nitrate (as N)	0.020	mg/L		0.741	0.610	0.704	0.497
Nitrite (as N)	0.010	mg/L		<0.010	<0.010	<0.010	<0.010
Total Kjeldahl Nitrogen	0.15	mg/L		0.26	<0.15	0.21	0.31
Orthophosphate-Dissolved (as P)	0.0030	mg/L		0.0046	0.0097	0.0050	<0.0030
Phosphorus, Total	0.0030	mg/L	0.03	0.0056	0.0094	0.0069	0.0075
Sulfate (SO4)	0.30	mg/L		20.0	17.2	18.9	18.1
Total Metals (Water)							
Aluminum (Al)-Total	0.010	mg/L	0.075	<0.010	<0.010	<0.010	<0.010
Antimony (Sb)-Total	0.00010	mg/L	0.02	<0.00010	0.00011	<0.00010	0.00018
Arsenic (As)-Total	0.00010	mg/L	0.1	0.00017	0.00020	0.00017	0.00049
Barium (Ba)-Total	0.00020	mg/L		0.0609	0.0519	0.0586	0.00840
Beryllium (Be)-Total	0.00010	mg/L	0.011	<0.00010	<0.00010	<0.00010	<0.00010
Bismuth (Bi)-Total	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050
Boron (B)-Total	0.010	mg/L	0.2	0.010	0.011	0.011	0.011
Cadmium (Cd)-Total	0.000010	mg/L	0.0002	0.000050	0.000052	0.000042	<0.000010
Calcium (Ca)-Total	0.50	mg/L		83.0	74.8	80.2	30.6
Cesium (Cs)-Total	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010
Chromium (Cr)-Total	0.00050	mg/L		<0.00050	<0.00050	<0.00050	<0.00050
Cobalt (Co)-Total	0.00010	mg/L	0.0009	<0.00010	<0.00010	<0.00010	<0.00010
Copper (Cu)-Total	0.0010	mg/L	0.005	<0.0010	<0.0010	<0.0010	<0.0010
Iron (Fe)-Total	0.050	mg/L	0.3	<0.050	<0.050	<0.050	<0.050
Lead (Pb)-Total	0.00010	mg/L	0.001	<0.00010	<0.00010	<0.00010	<0.00010
Magnesium (Mg)-Total	0.050	mg/L		28.0	24.8	24.8	6.98
Manganese (Mn)-Total	0.00050	mg/L		0.0103	0.0145	0.0101	0.0150
Molybdenum (Mo)-Total	0.000050	mg/L	0.04	0.000432	0.000412	0.000419	<0.000050
Nickel (Ni)-Total	0.00050	mg/L	0.025	<0.00050	<0.00050	0.00053	<0.00050
Potassium (K)-Total	0.050	mg/L		1.24	1.11	1.15	2.02
Rubidium (Rb)-Total	0.00020	mg/L		0.00135	0.00122	0.00127	0.00105
Selenium (Se)-Total	0.000050	mg/L	0.1	0.000154	0.000160	0.000145	<0.000050
Silicon (Si)-Total	0.050	mg/L		5.24	4.89	4.84	0.716
Silver (Ag)-Total	0.000050	mg/L	0.0001	<0.000050	<0.000050	<0.000050	<0.000050

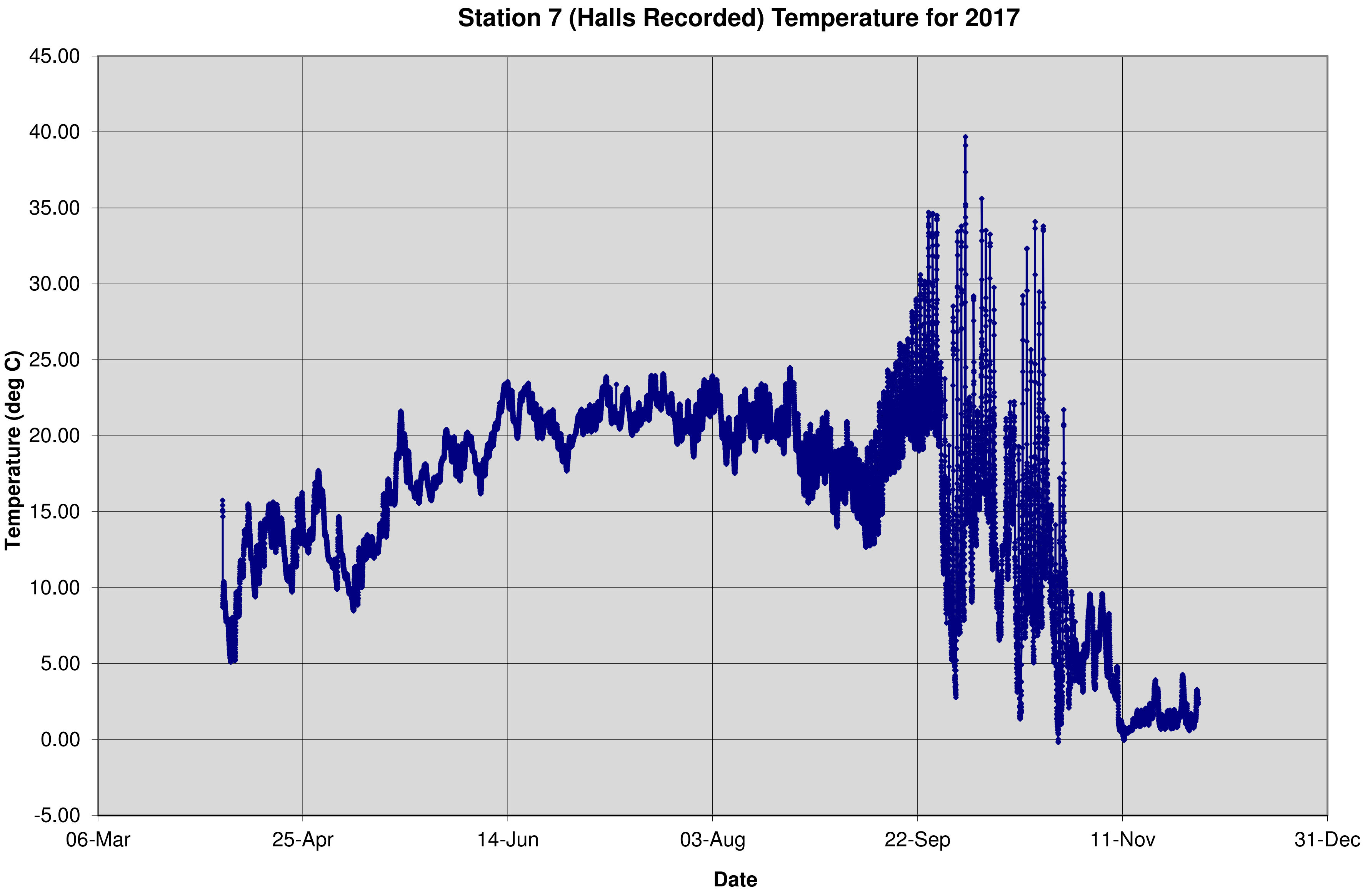
Strontium (Sr)-Total	0.0010	mg/L		0.107	0.107	0.109	0.0412
Sulfur (S)-Total	0.50	mg/L		7.40	6.42	6.59	<0.50
Tellurium (Te)-Total	0.00020	mg/L		<0.00020	<0.00020	<0.00020	<0.00020
Thallium (Tl)-Total	0.000010	mg/L	0.0003	0.000017	0.000013	0.000012	<0.000010
Thorium (Th)-Total	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010
Tin (Sn)-Total	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Total	0.00030	mg/L		<0.00030	<0.00030	<0.00030	<0.00030
Tungsten (W)-Total	0.00010	mg/L	0.03	<0.00010	<0.00010	<0.00010	<0.00010
Uranium (U)-Total	0.000010	mg/L	0.005	0.000577	0.000501	0.000538	<0.000010
Vanadium (V)-Total	0.00050	mg/L	0.006	<0.00050	<0.00050	<0.00050	<0.00050
Zinc (Zn)-Total	0.0030	mg/L	0.02	**0.0890**	**0.0760**	**0.0759**	<0.0030
Zirconium (Zr)-Total	0.00030	mg/L	0.004	<0.00030	<0.00030	<0.00030	<0.00030

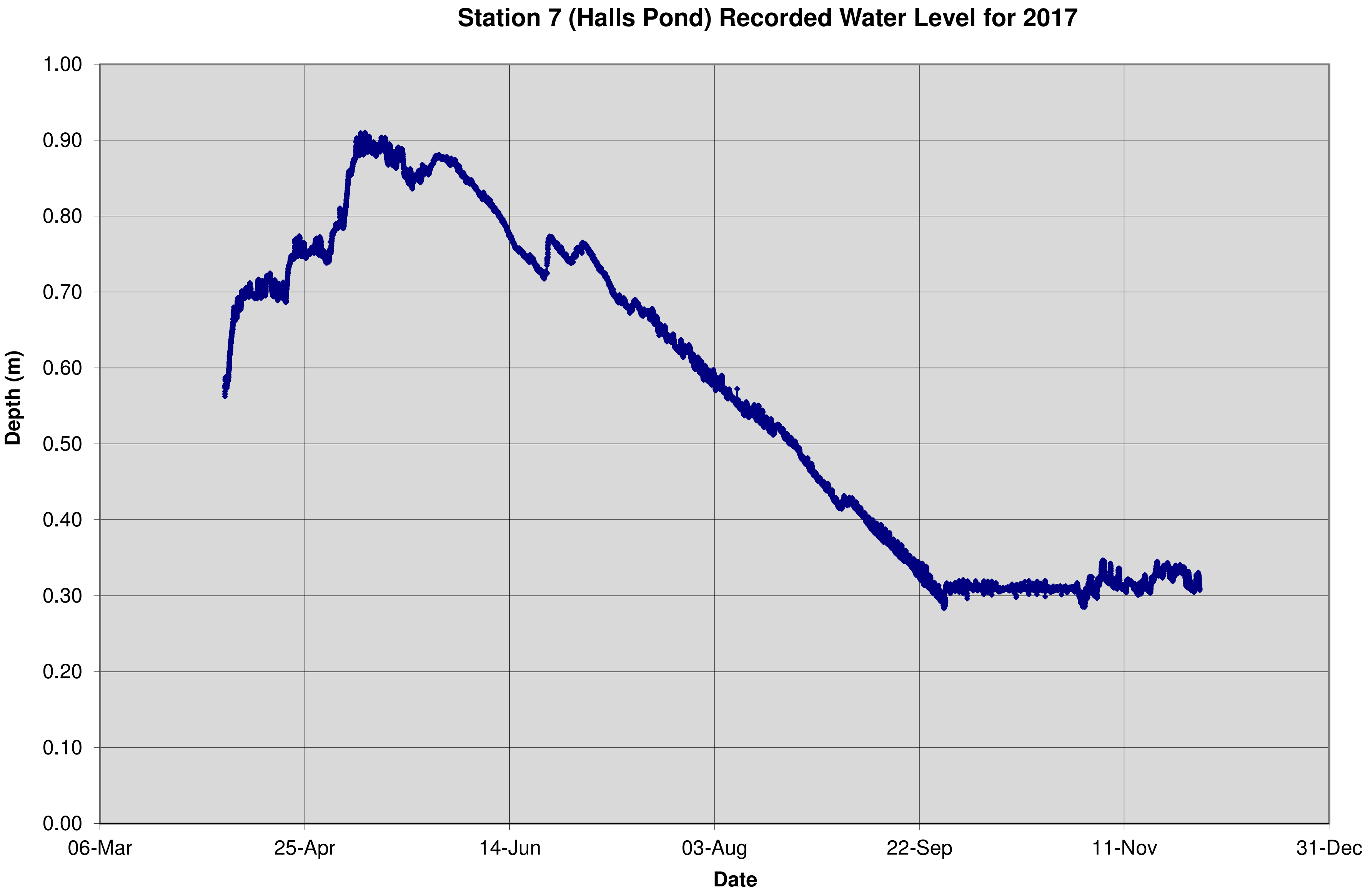
2017 Results

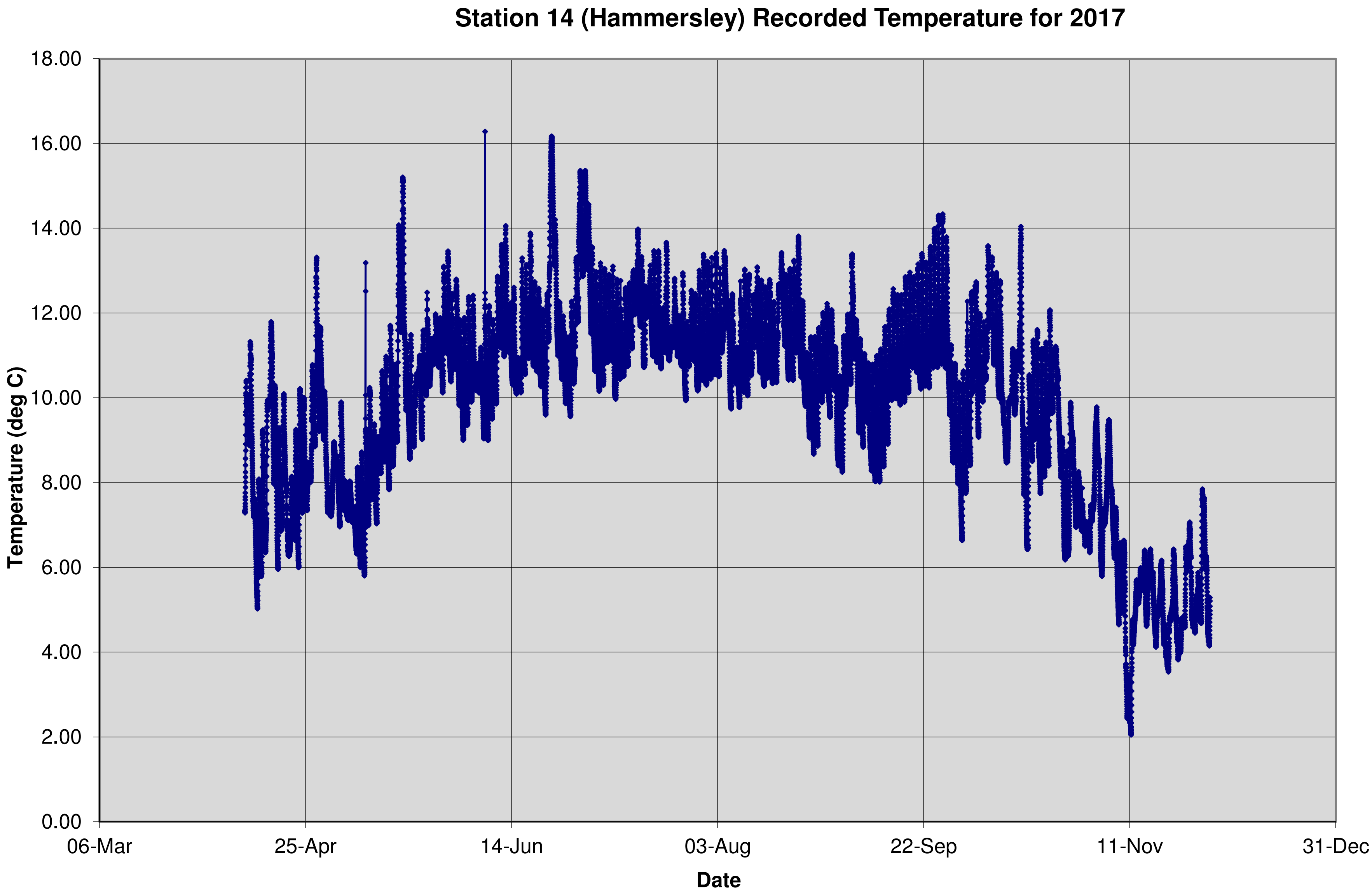

Cumulative Observed Rainfall for Rainfall Gauge 2017
(Maltby Road and Victoria Road)
Cumulative Rainfall (mm)
600
500
400
300
200
100
0
3/6/2017
4/25/2017
6/14/2017
8/3/2017
9/22/2017
11/11/2017
12/31/2017
Date

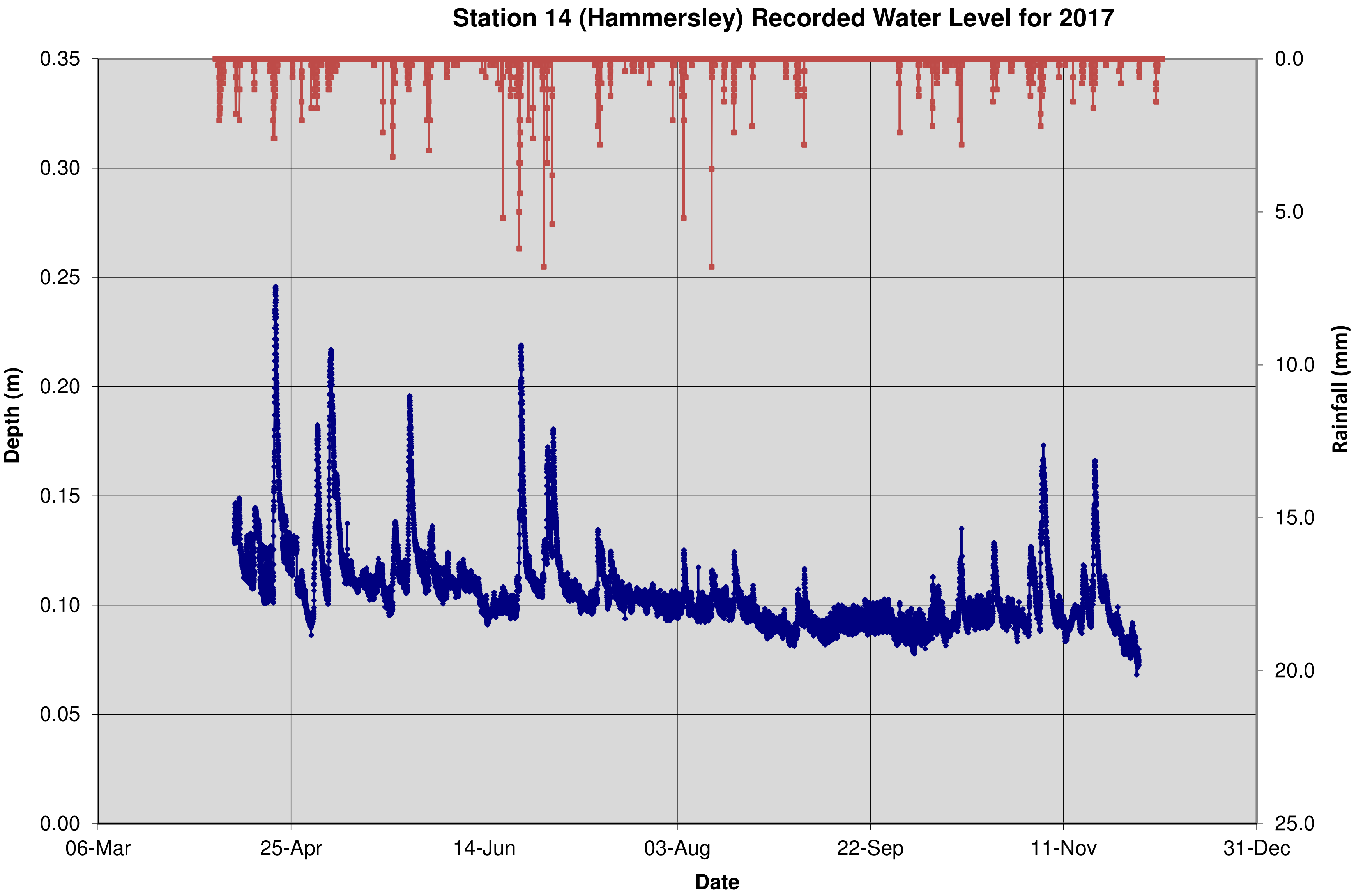
Barologger Recorded Pressure at Victoria/Maltby for 2017

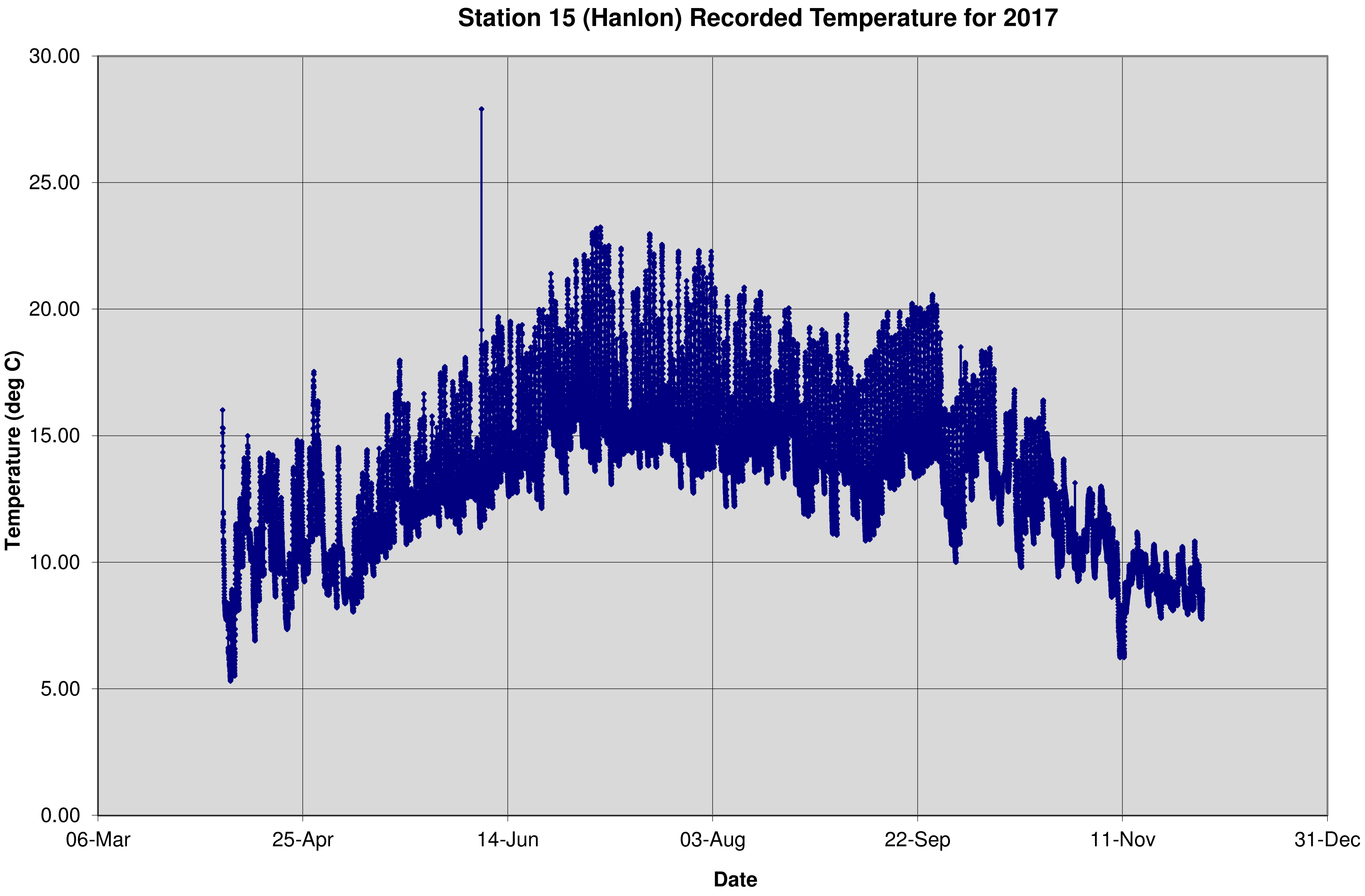


Station 7 (Halls Recorded) Temperature for 2017
Temperature (deg C)
45.00
40.00
35.00
30.00
25.00
20.00
15.00
10.00
5.00
0.00
-5.00
06-Mar
25-Apr
14-Jun
03-Aug
22-Sep
11-Nov
31-Dec
Date


Station 7 (Halls Pond) Recorded Water Level for 2017
Depth (m)
1.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
06-Mar
25-Apr
14-Jun
03-Aug
22-Sep
11-Nov
31-Dec
Date

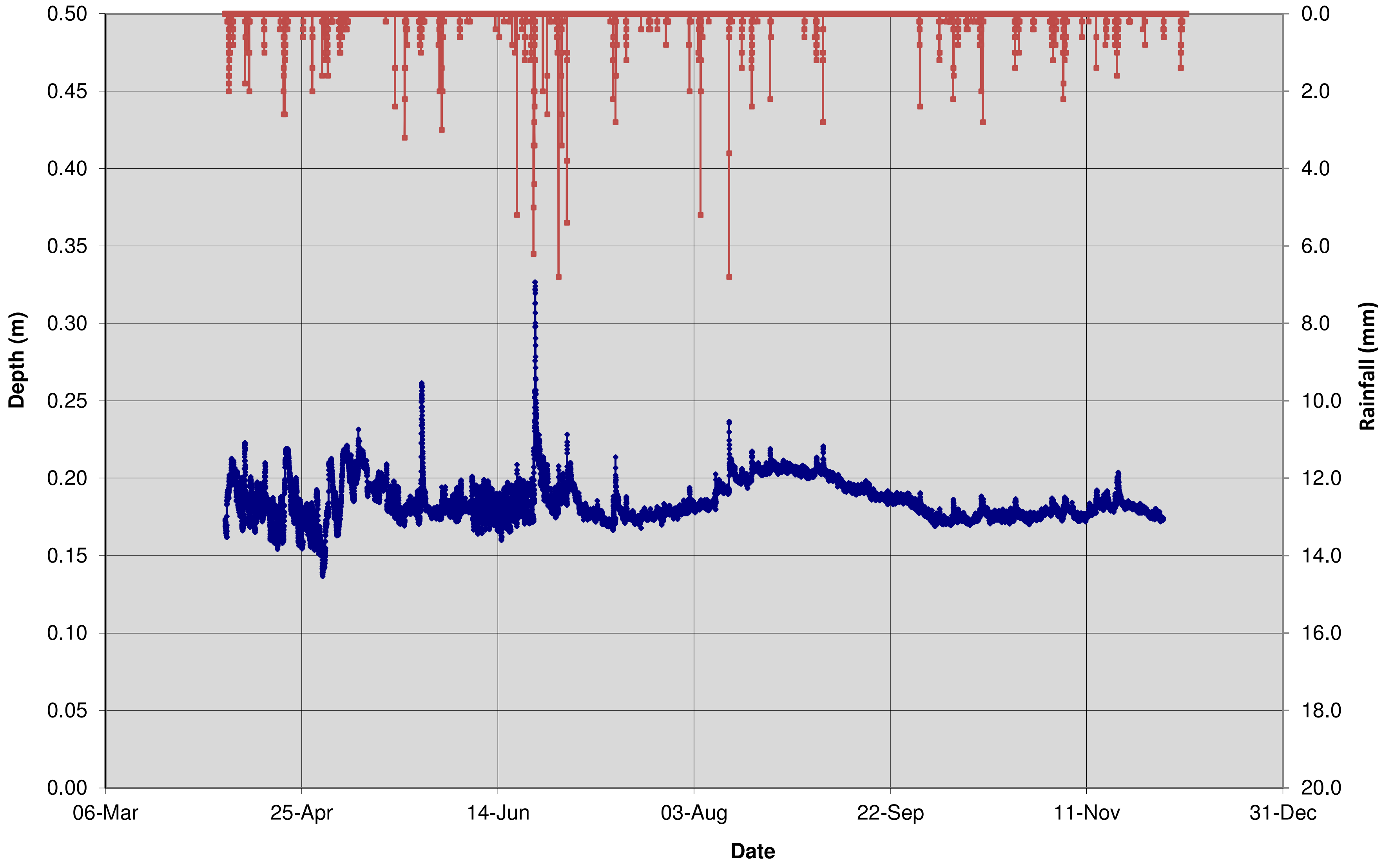

Station 14 (Hammersley) Recorded Temperature for 2017
Temperature (deg C)
18.00
16.00
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
06-Mar
25-Apr
14-Jun
03-Aug
22-Sep
11-Nov
31-Dec
Date

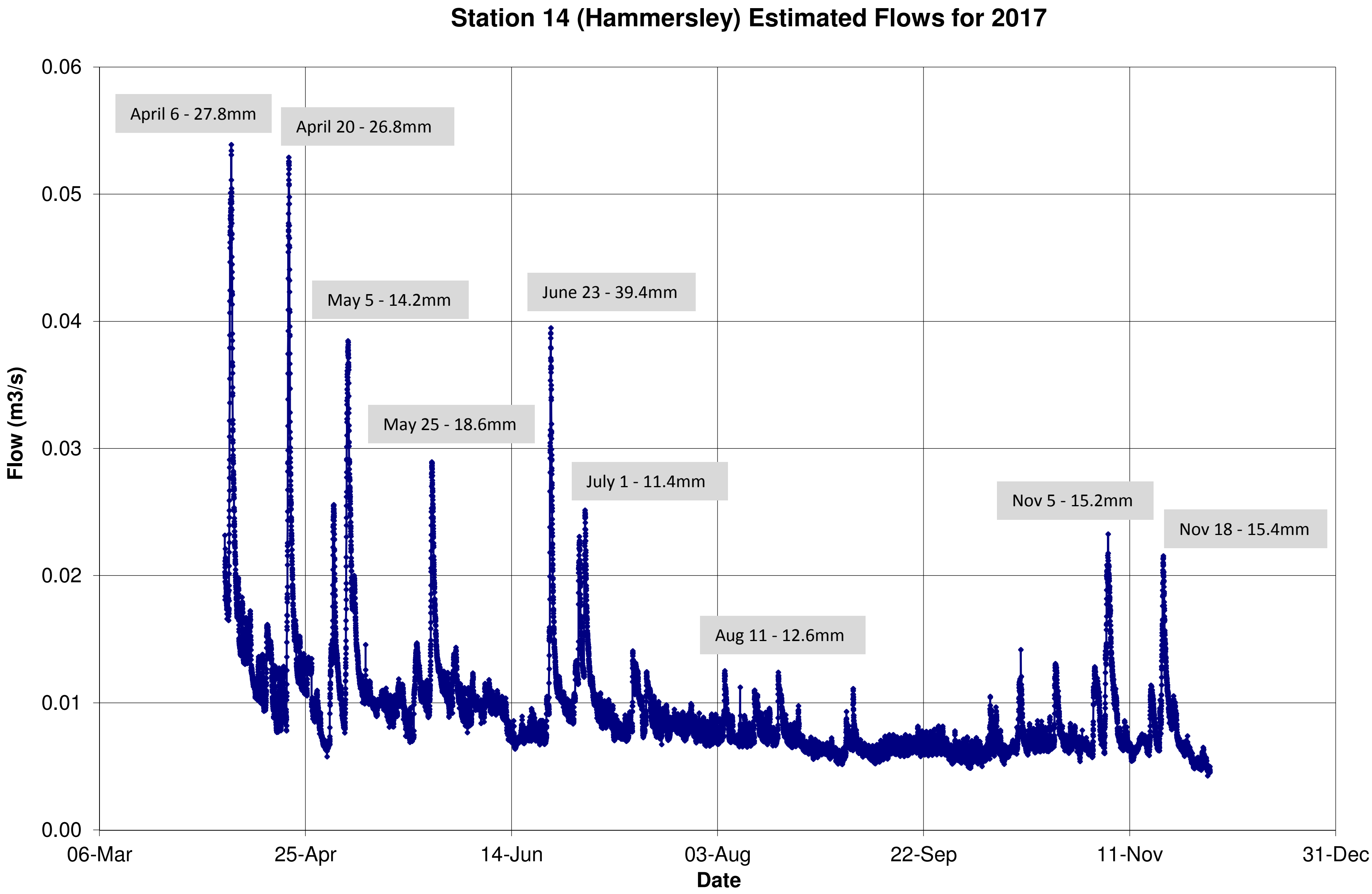

Station 14 (Hammersley) Recorded Water Level for 2017
Depth (m)
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
Rainfall (mm)
0.0
5.0
10.0
15.0
20.0
25.0
06-Mar
25-Apr
14-Jun
03-Aug
22-Sep
11-Nov
31-Dec
Date

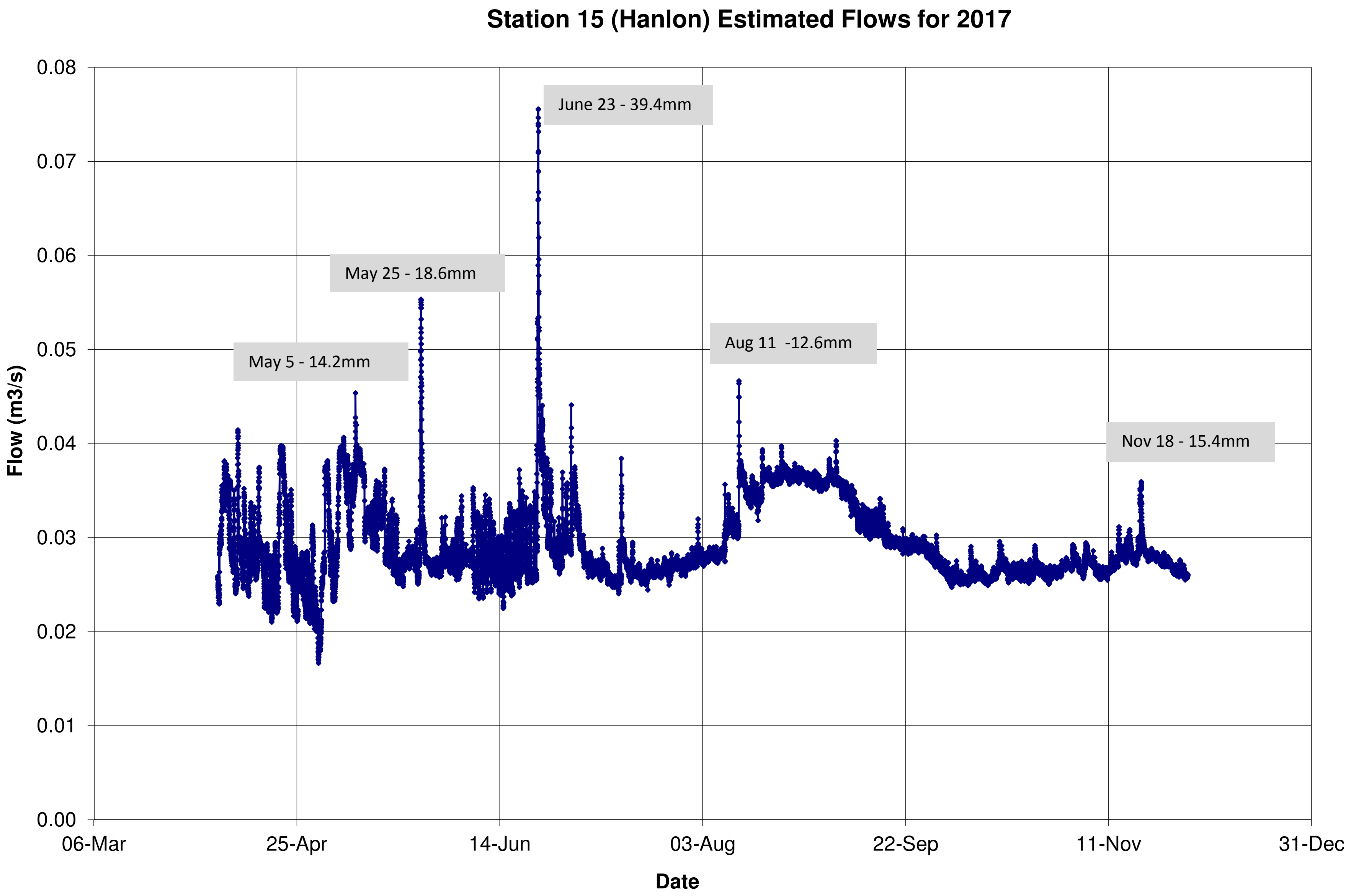


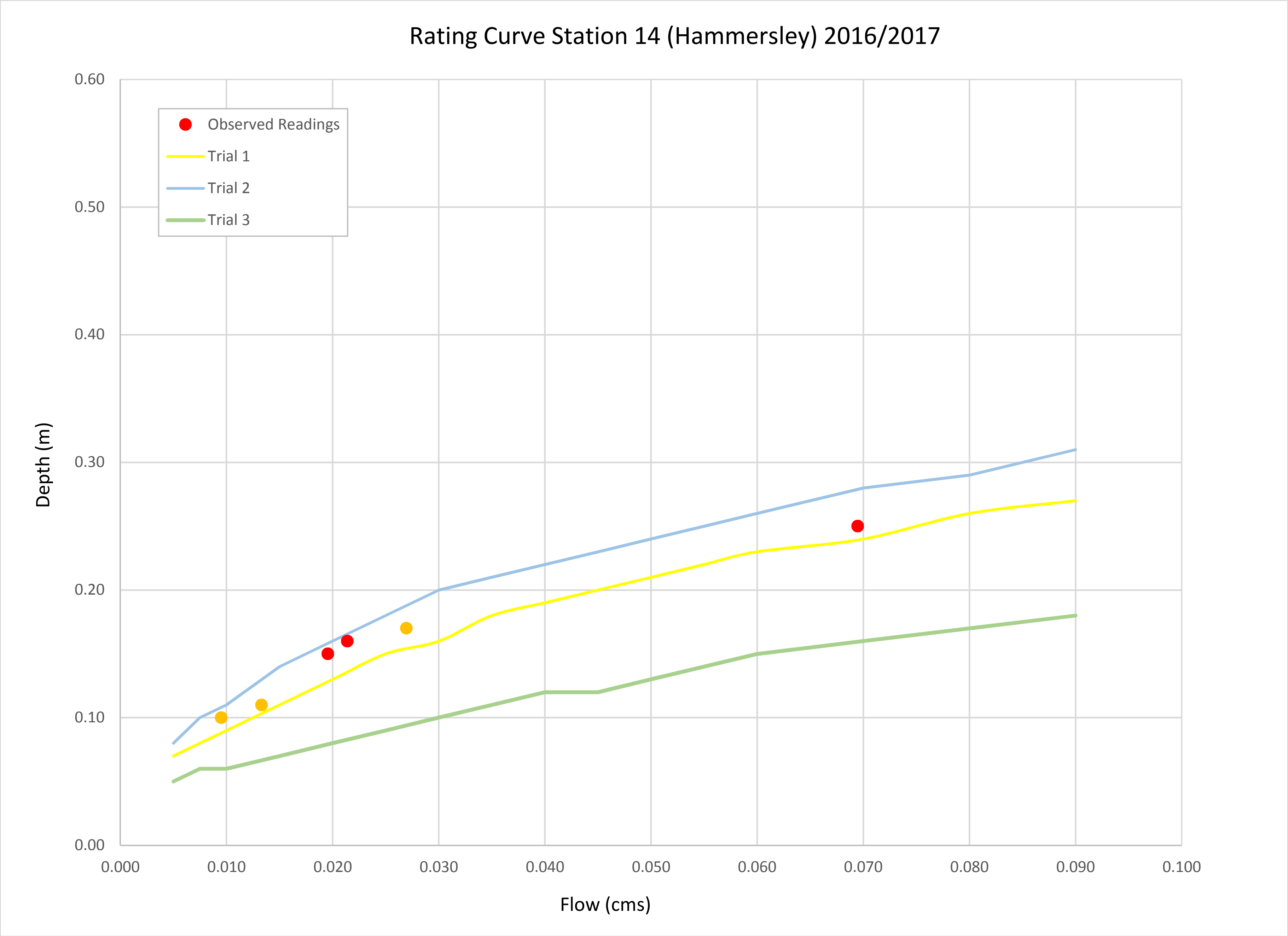
Station 15 (Hanlon) Recorded Temperature for 2017
Temperature (deg C)
30.00
25.00
20.00
15.00
10.00
5.00
0.00
06-Mar
25-Apr
14-Jun
03-Aug
22-Sep
11-Nov
31-Dec
Date

Station 15 (Hanlon) Recorded Water Level for 2017

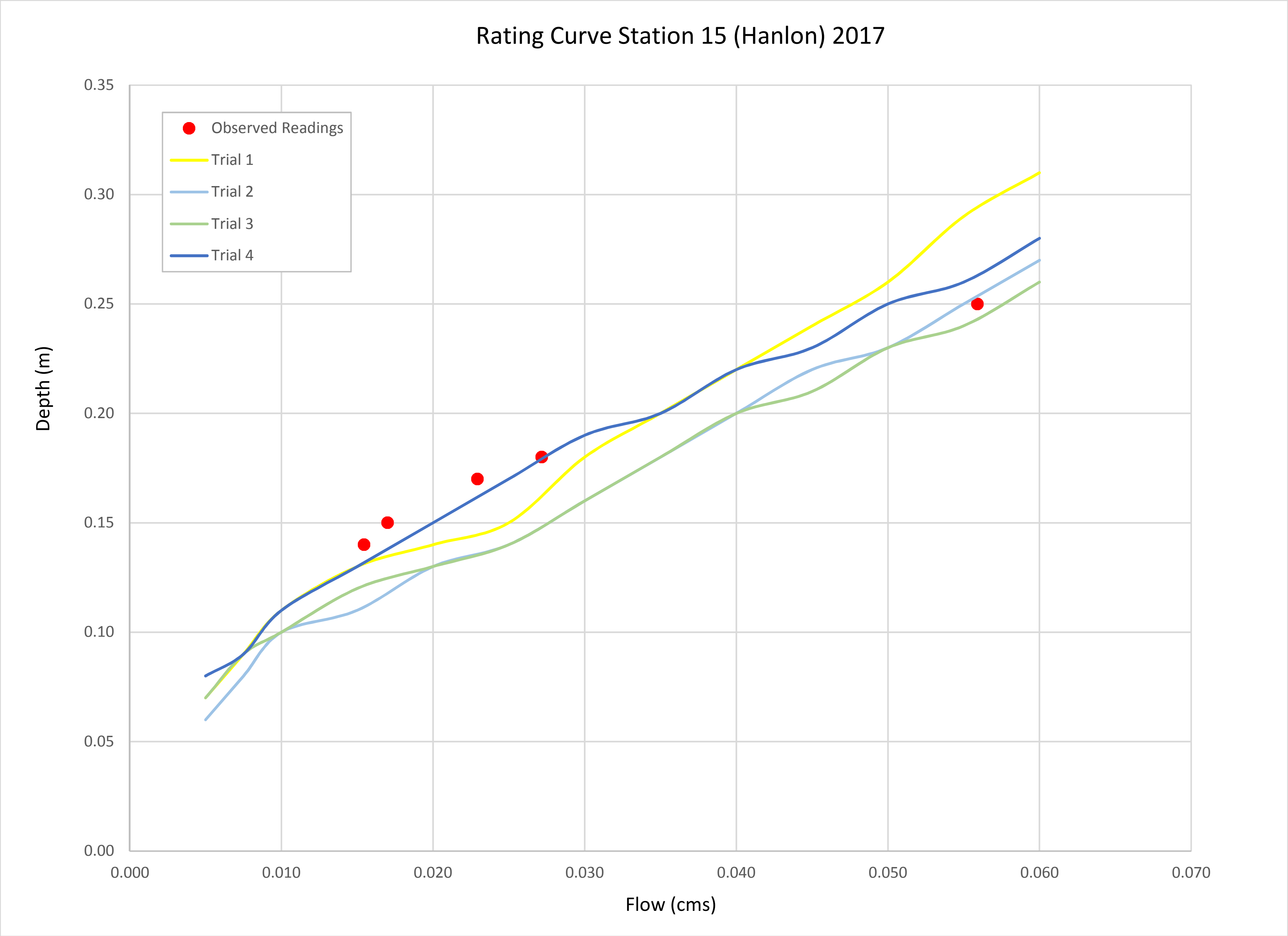



Station 14 (Hammersley) Estimated Flows for 2017
Flow (m3/s)
0.06
0.05
0.04
0.03
0.02
0.01
0.00
06-Mar
25-Apr
14-Jun
03-Aug
22-Sep
11-Nov
31-Dec
Date
April 6 - 27.8mm
April 20 - 26.8mm
May 5 - 14.2mm
June 23 - 39.4mm
May 25 - 18.6mm
July 1 - 11.4mm
Nov 5 - 15.2mm
Nov 18 - 15.4mm
Aug 11 - 12.6mm


Station 15 (Hanlon) Estimated Flows for 2017
Flow (m3/s)
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0.00
06-Mar
25-Apr
14-Jun
03-Aug
22-Sep
11-Nov
31-Dec
Date
June 23 - 39.4mm
May 25 - 18.6mm
May 5 - 14.2mm
Aug 11 -12.6mm
Nov 18 - 15.4mm

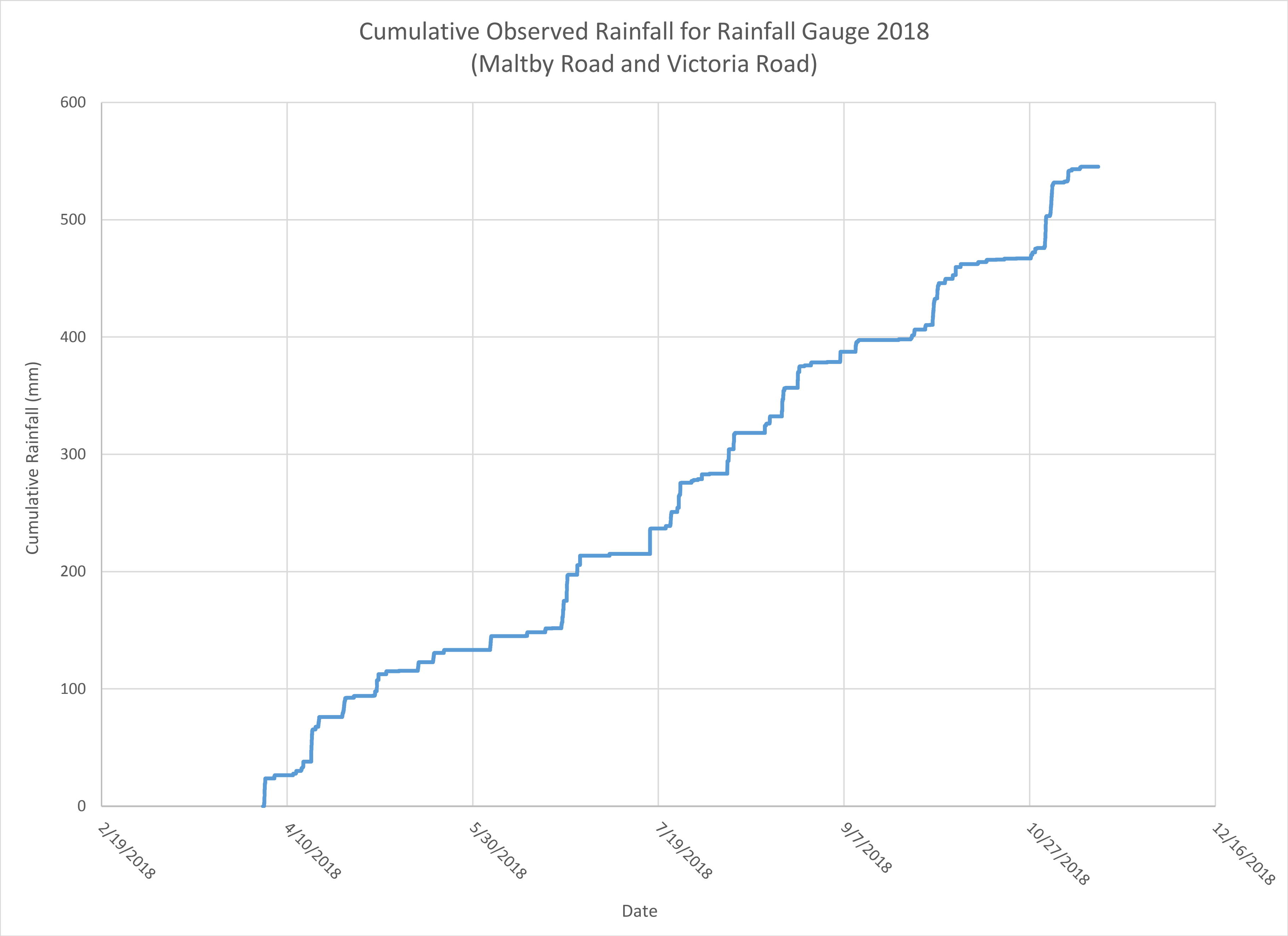


Rating Curve Station 14 (Hammersley) 2016/2017
Observed Readings
Trial 1
Trial 2
Trial 3
Depth (m)
0.60
0.50
0.40
0.30
0.20
0.10
0.00
0.000
0.010
0.020
0.030
0.040
0.050
0.060
0.070
0.080
0.090
0.100
Flow (cms)

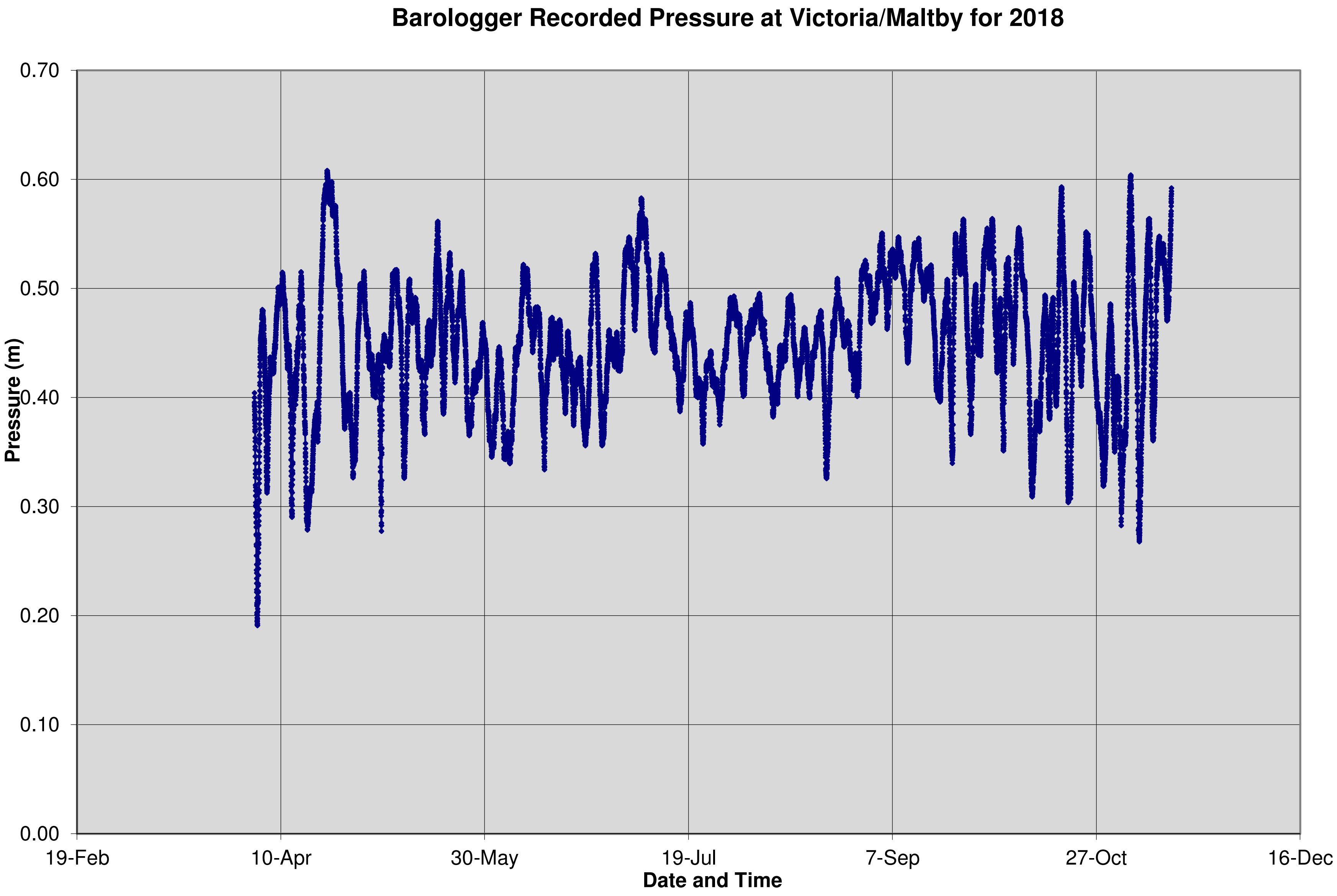

Rating Curve Station 15 (Hanlon) 2017
Observed Readings
Trial 1
Trial 2
Trial 3
Trial 4
Depth (m)
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.000
0.010
0.020
0.030
0.040
0.050
0.060
0.070
Flow (cms)

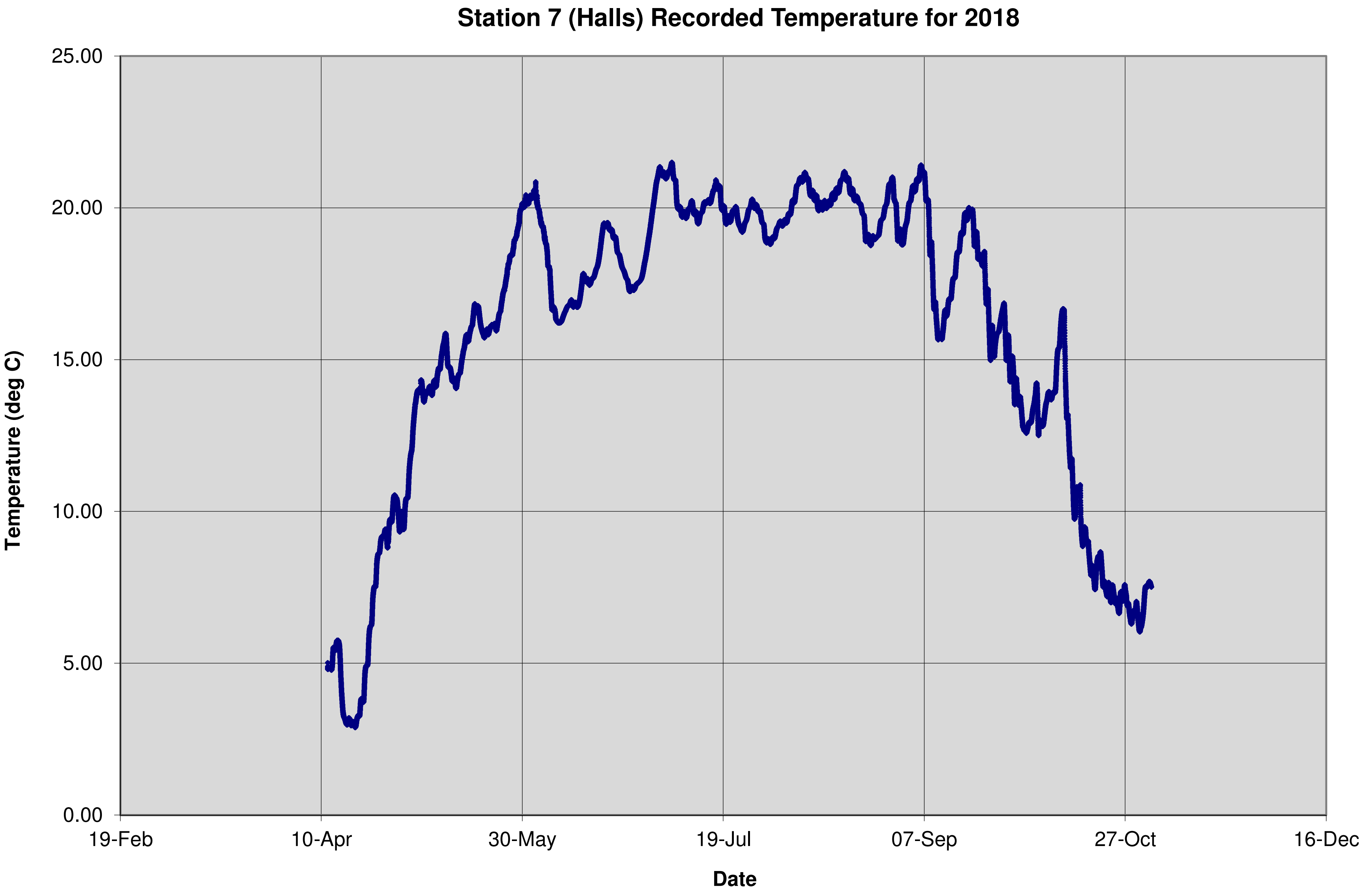
wood.

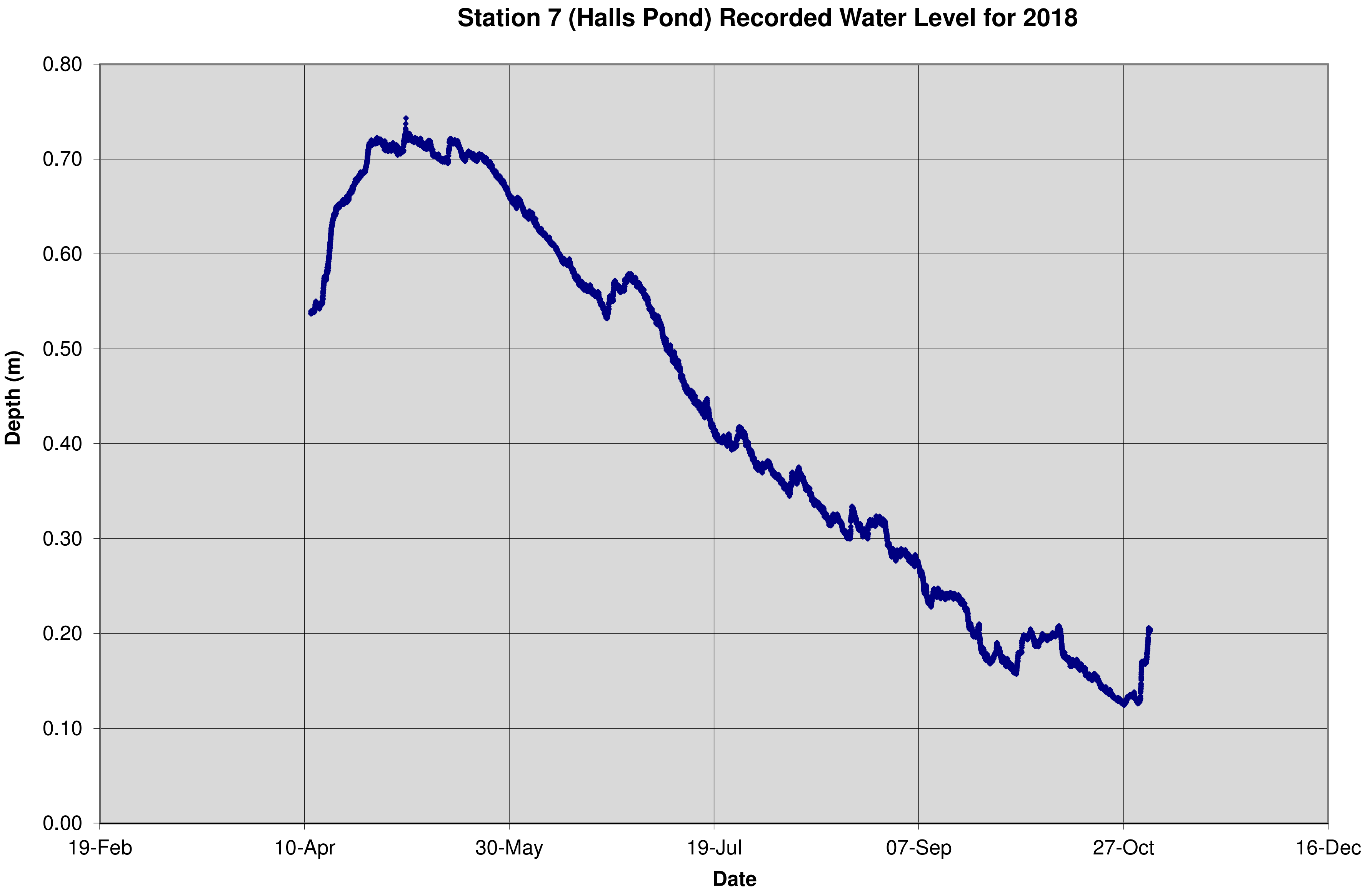
2018 Results

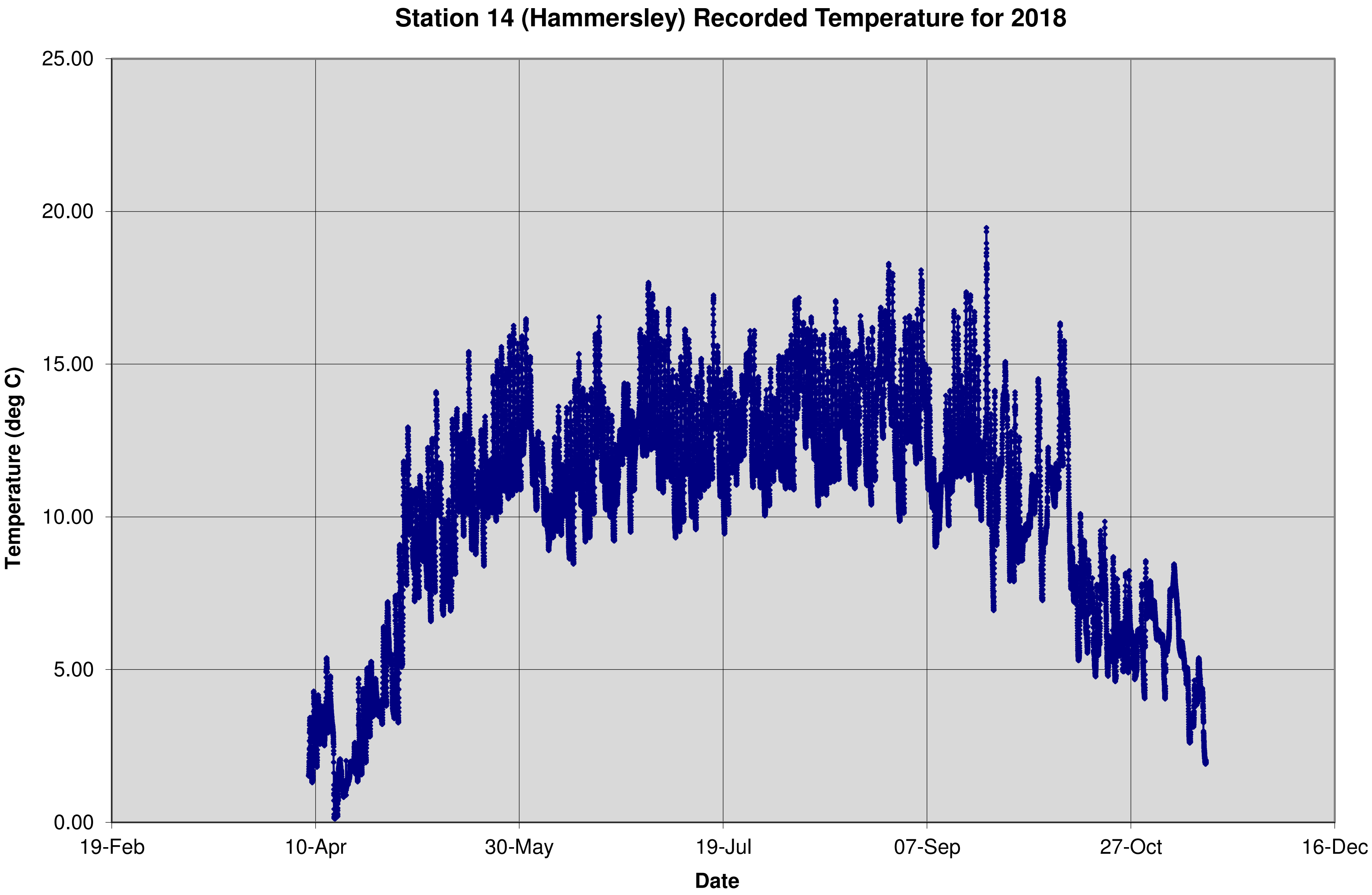


Cumulative Observed Rainfall for Rainfall Gauge 2018
(Maltby Road and Victoria Road)

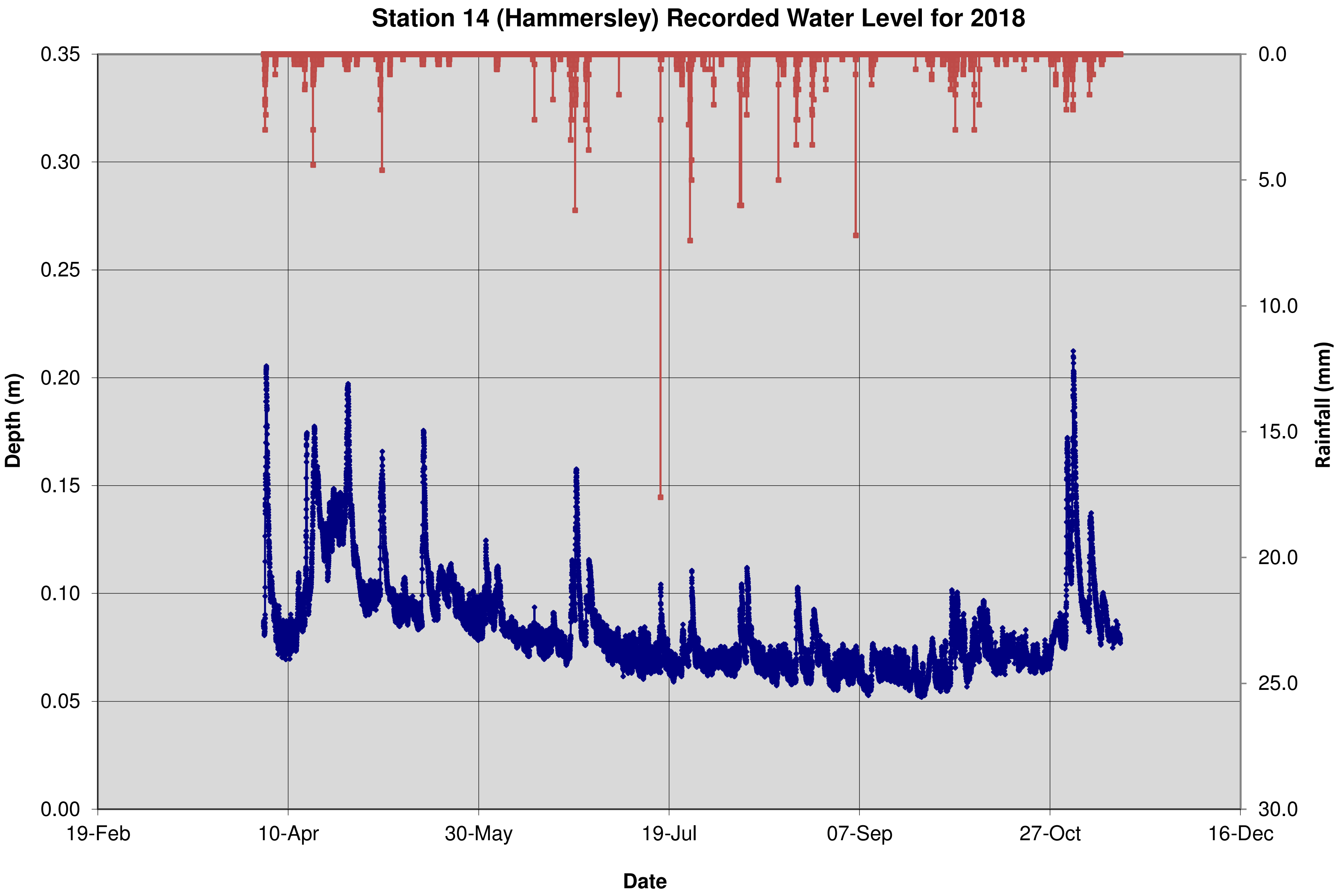

Barologger Recorded Pressure at Victoria/Maltby for 2018
Pressure (m)
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
19-Feb
10-Apr
30-May
19-Jul
7-Sep
27-Oct
16-Dec
Date and Time

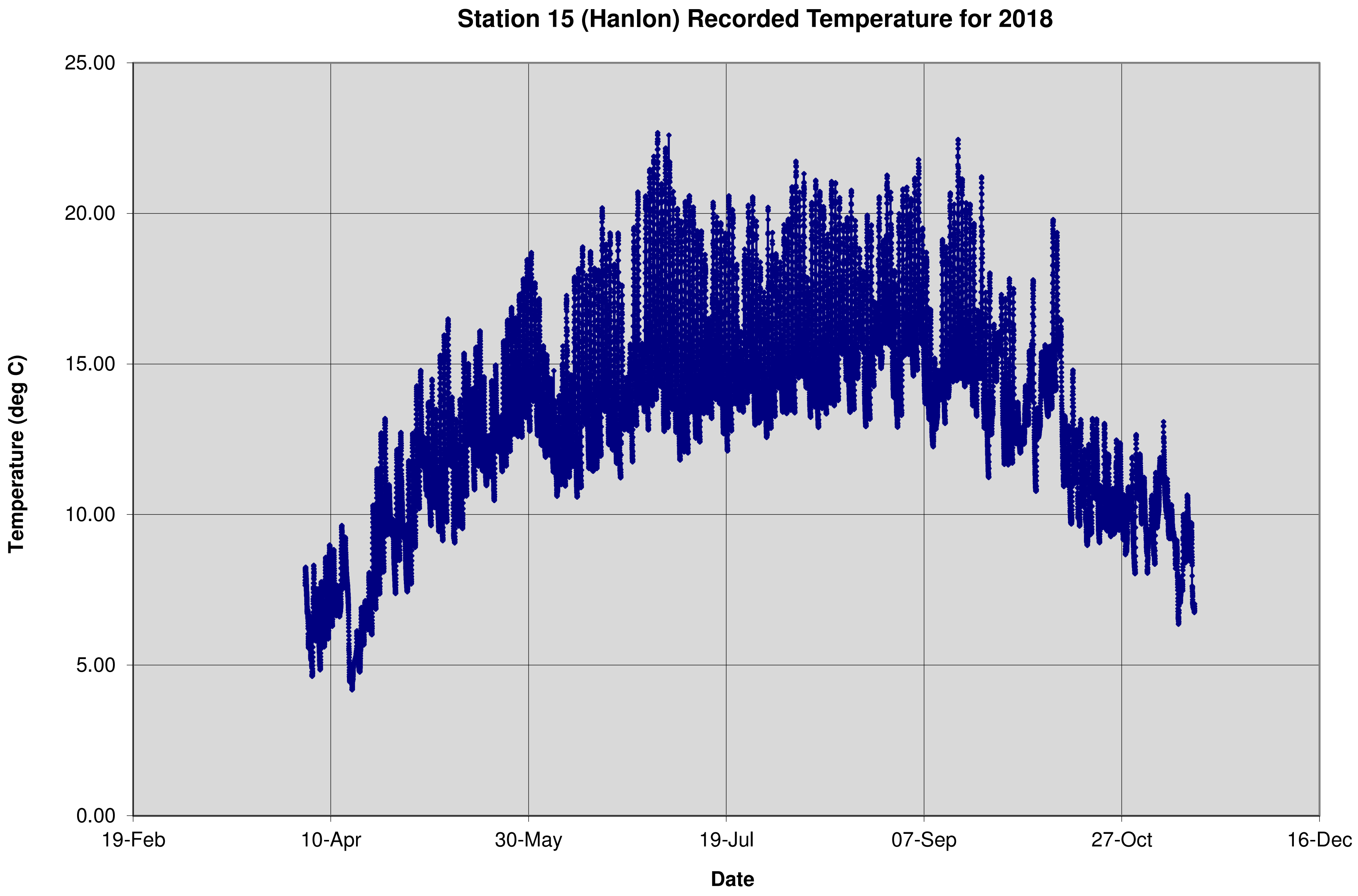

Station 7 (Halls) Recorded Temperature for 2018
Temperature (deg C)
25.00
20.00
15.00
10.00
5.00
0.00
19-Feb
10-Apr
30-May
19-Jul
07-Sep
27-Oct
16-Dec
Date

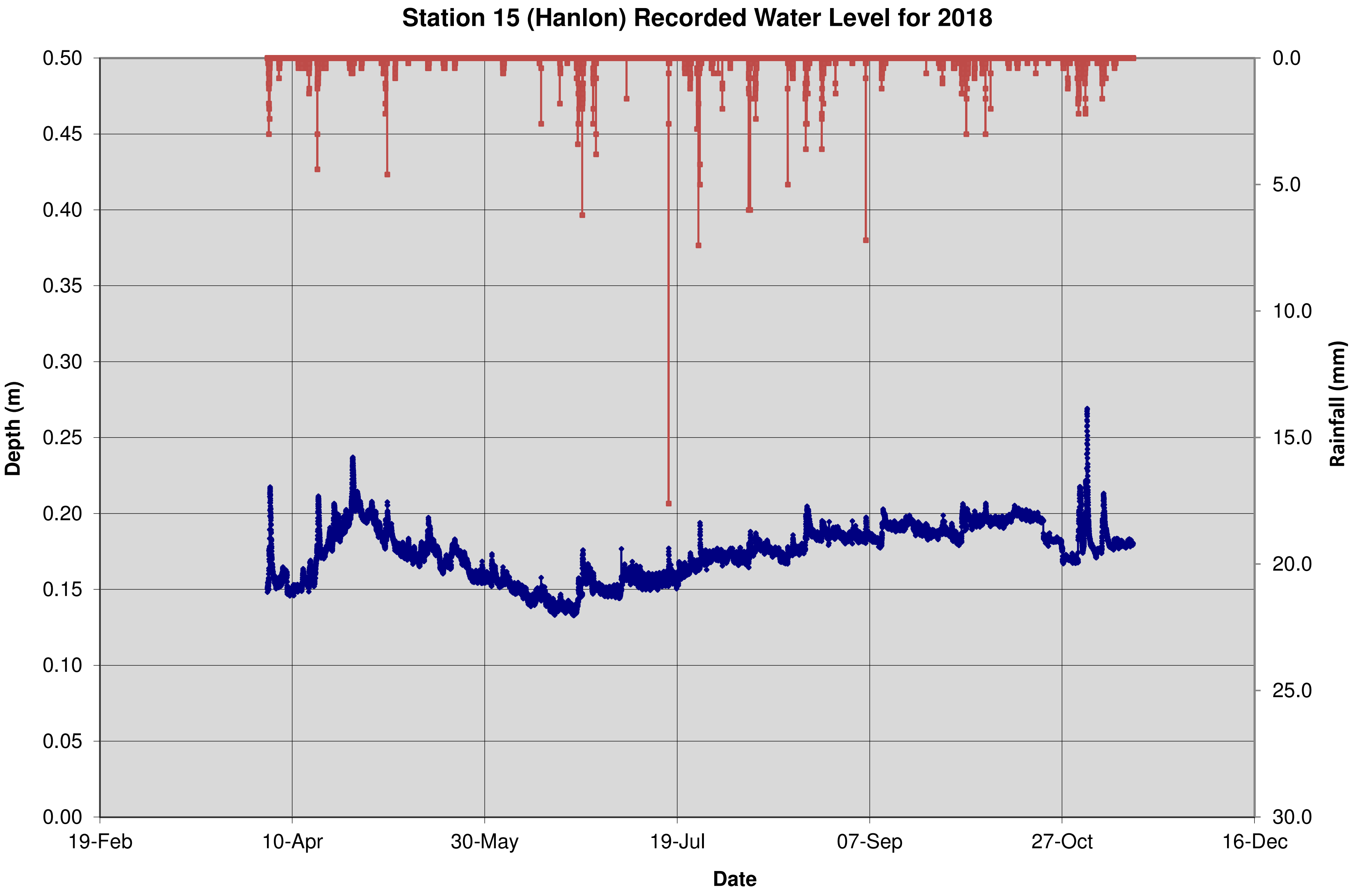
Station 7 (Halls Pond) Recorded Water Level for 2018
Depth (m)
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
19-Feb
10-Apr
30-May
19-Jul
07-Sep
27-Oct
16-Dec
Date

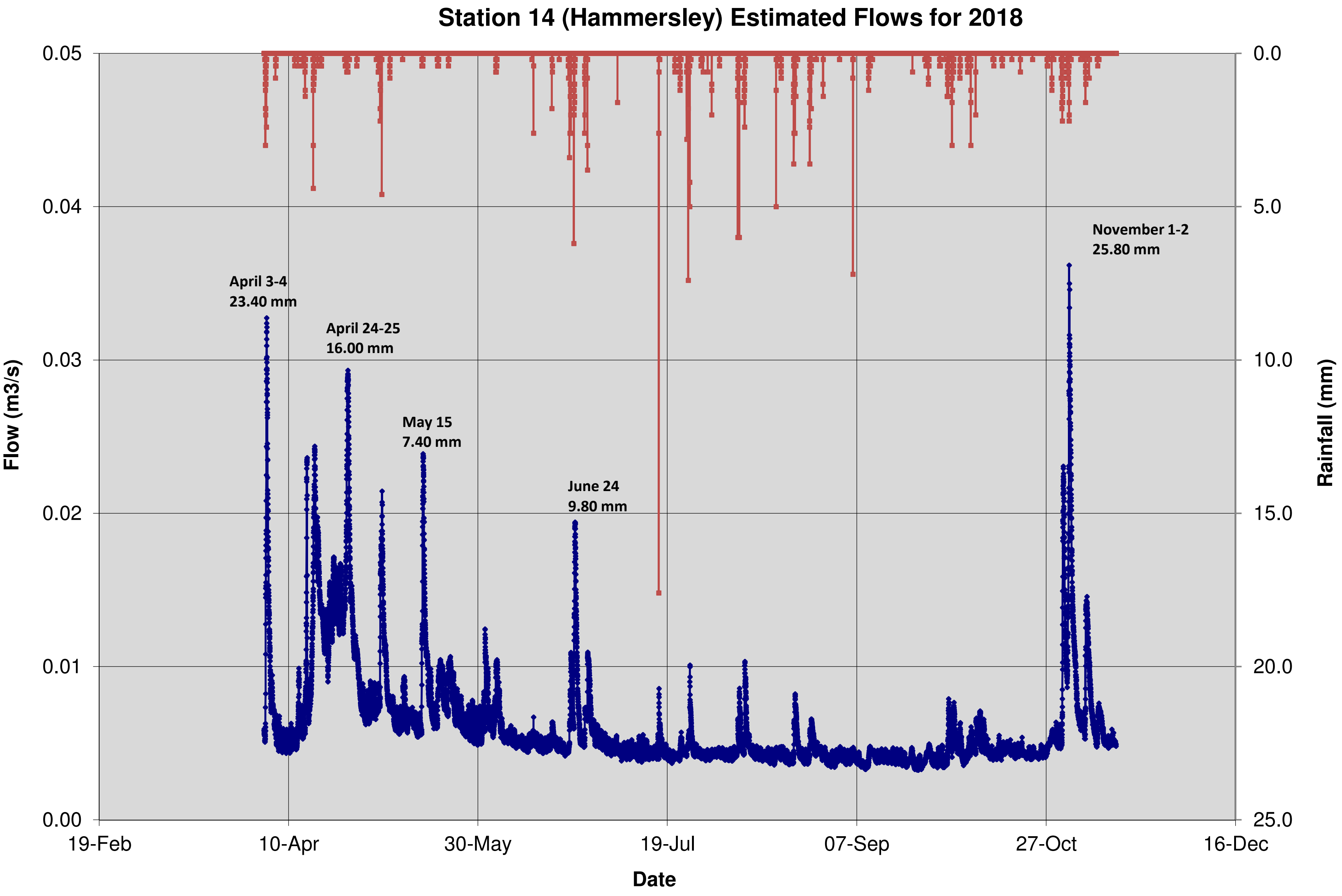


Station 14 (Hammersley) Recorded Temperature for 2018

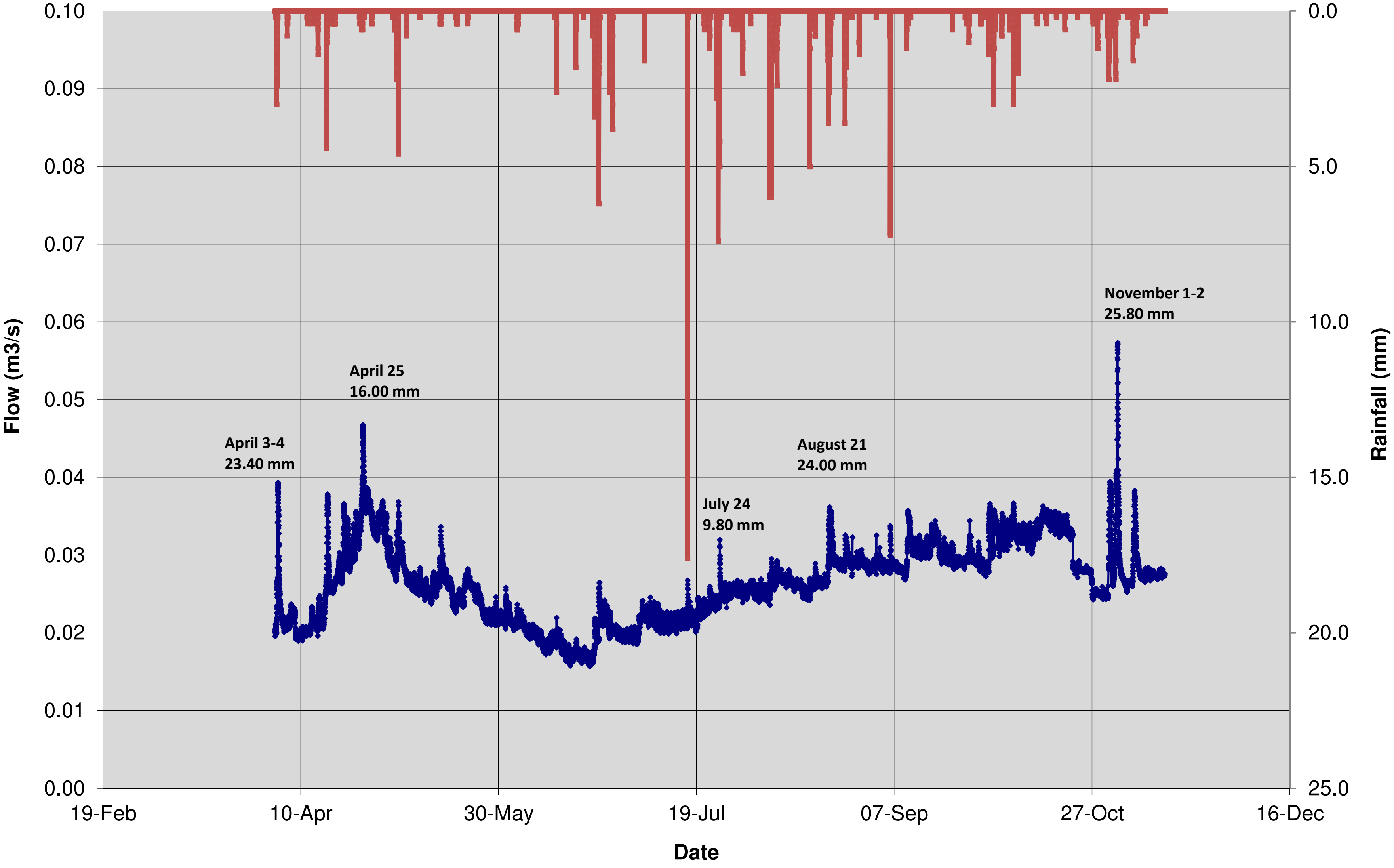

Station 14 (Hammersley) Recorded Water Level for 2018
Depth (m)
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
Rainfall (mm)
0.0
5.0
10.0
15.0
20.0
25.0
30.0
19-Feb
10-Apr
30-May
19-Jul
07-Sep
27-Oct
16-Dec
Date


Station 15 (Hanlon) Recorded Temperature for 2018
Temperature (deg C)
25.00
20.00
15.00
10.00
5.00
0.00
19-Feb
10-Apr
30-May
19-Jul
07-Sep
27-Oct
16-Dec
Date

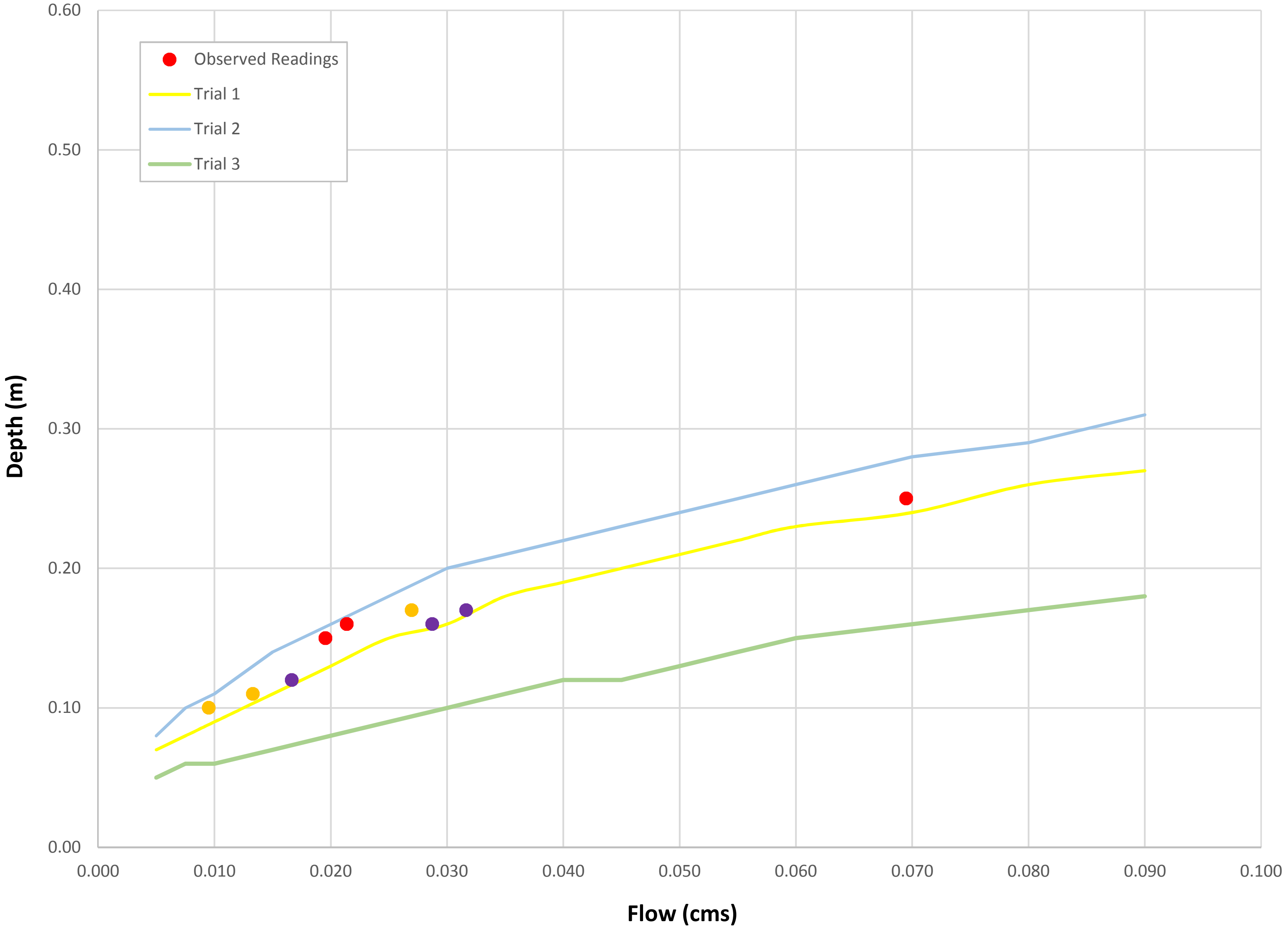

Station 15 (Hanlon) Recorded Water Level for 2018
Depth (m)
0.50
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
Rainfall (mm)
0.0
5.0
10.0
15.0
20.0
25.0
30.0
19-Feb
10-Apr
30-May
19-Jul
07-Sep
27-Oct
16-Dec
Date

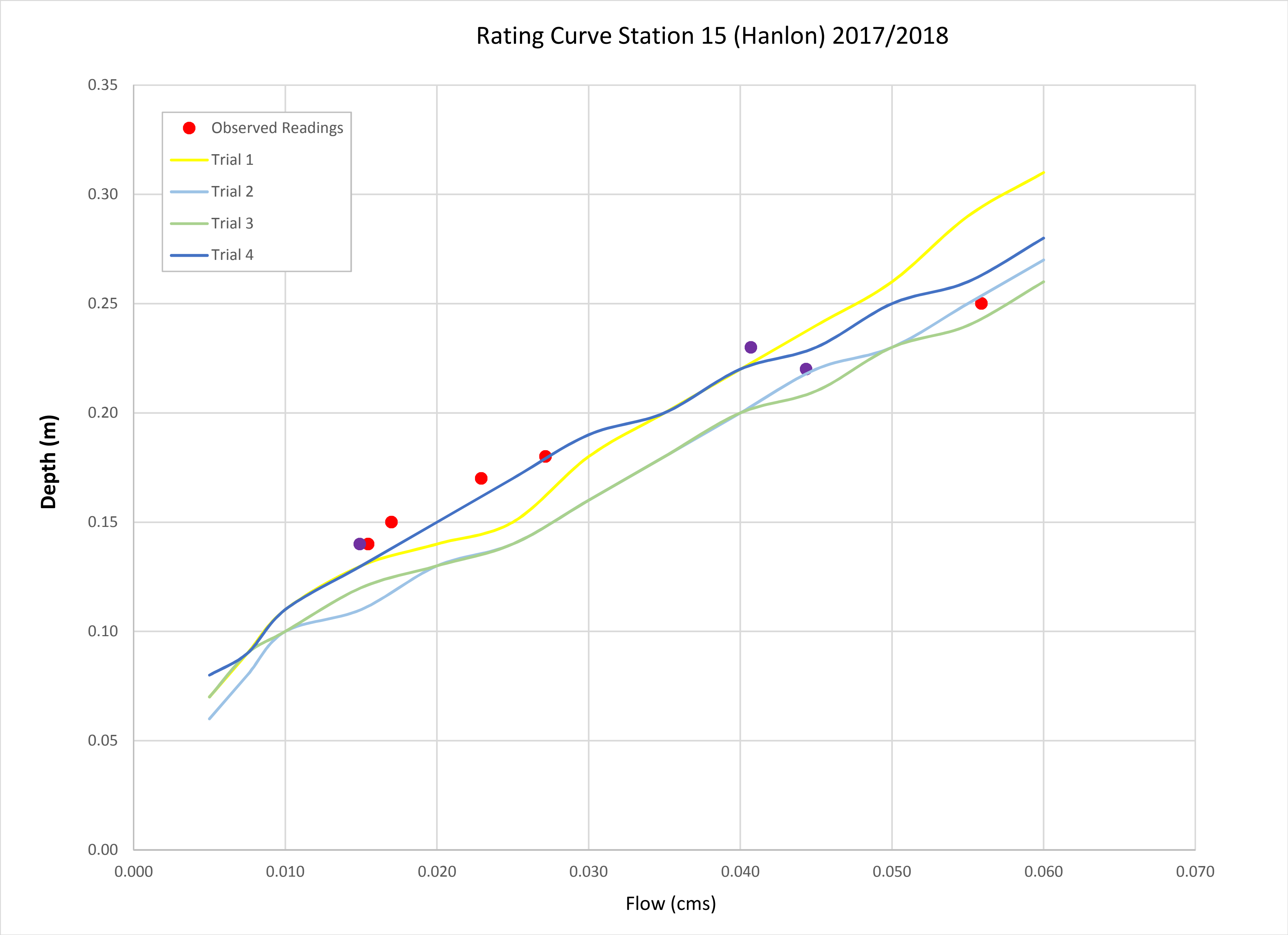

Station 14 (Hammersley) Estimated Flows for 2018
Flow (m3/s)
Rainfall (mm)
Date
0.05
0.04
0.03
0.02
0.01
0.00
0.0
5.0
10.0
15.0
20.0
25.0
19-Feb
10-Apr
30-May
19-Jul
07-Sep
27-Oct
16-Dec
April 3-4
23.40 mm
April 24-25
16.00 mm
May 15
7.40 mm
June 24
9.80 mm
November 1-2
25.80 mm

Station 15 (Hanlon) Estimated Flows for 2018



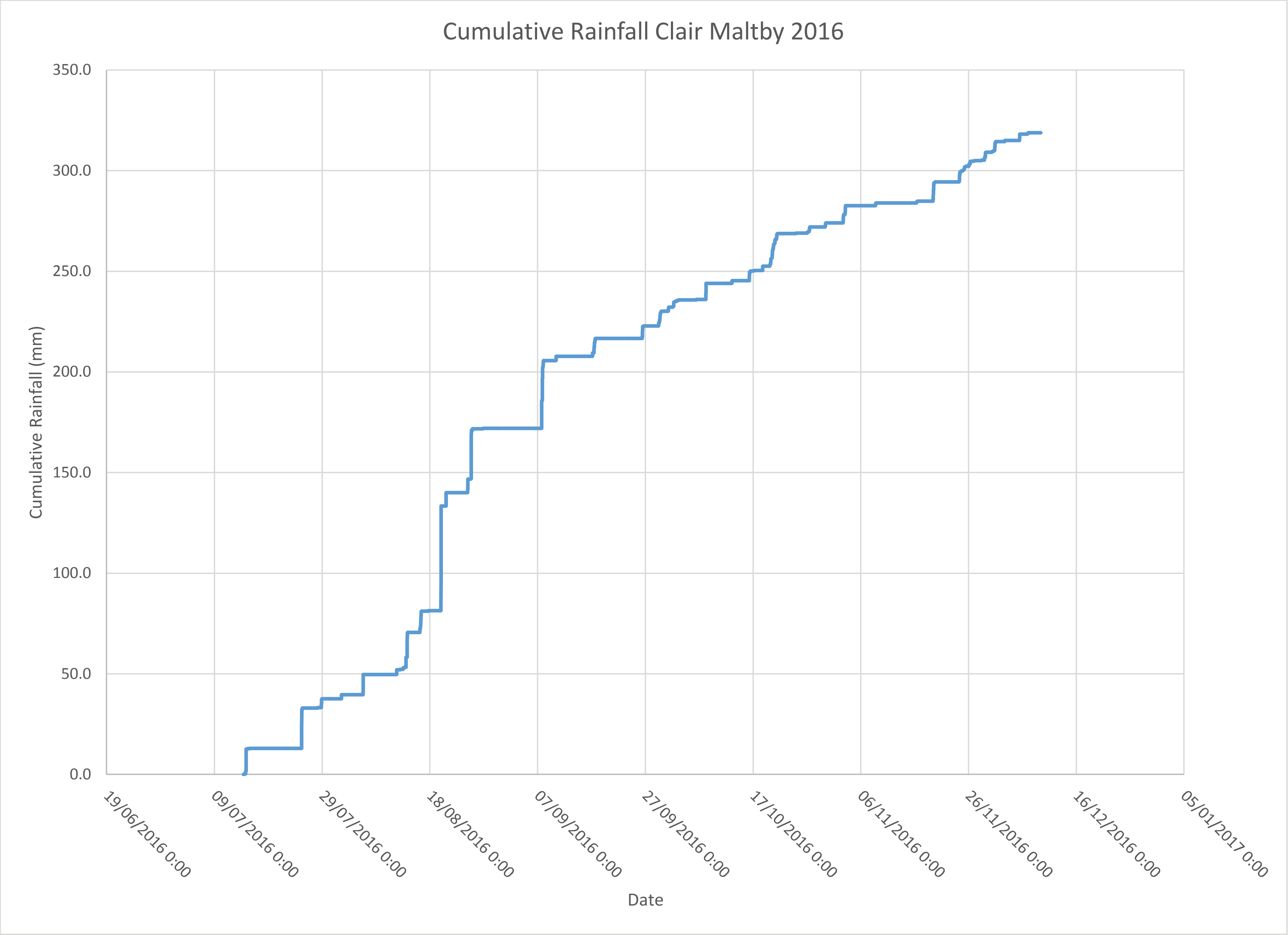
Rating Curve Station 14 (Hammersley) 2016/2017/2018

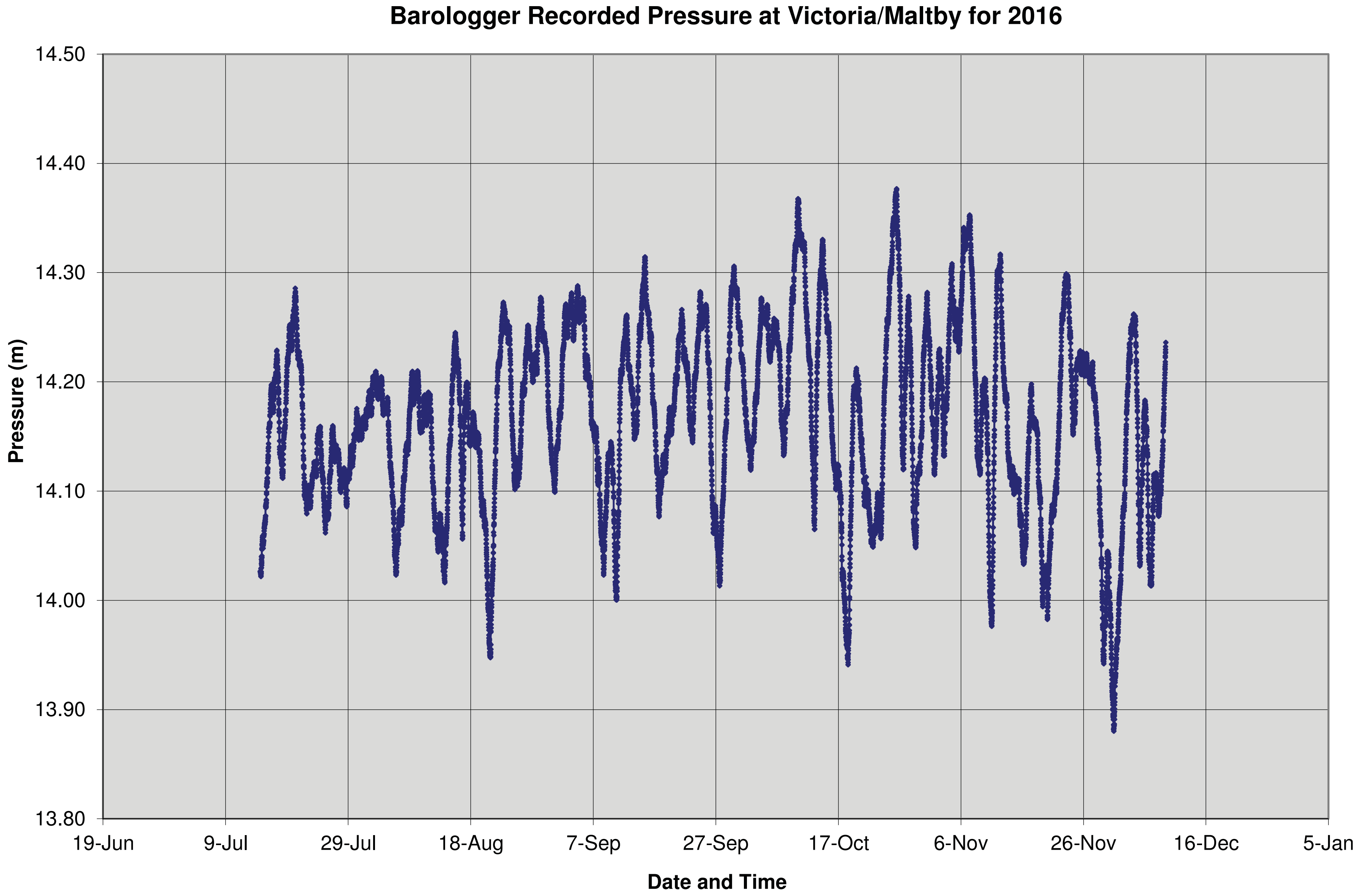


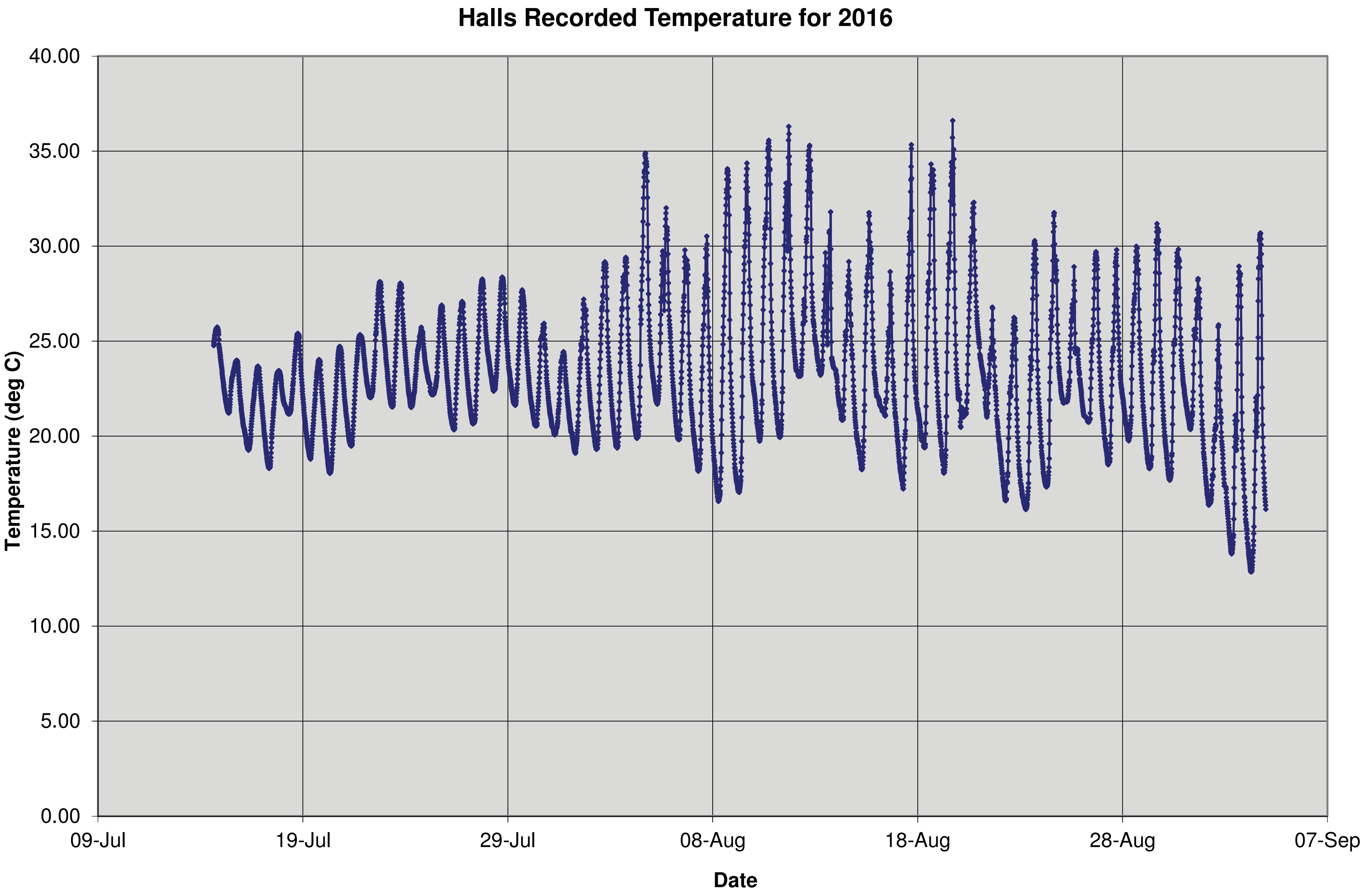

Rating Curve Station 15 (Hanlon) 2017/2018
Observed Readings
Trial 1
Trial 2
Trial 3
Trial 4
Depth (m)
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.000
0.010
0.020
0.030
0.040
0.050
0.060
0.070
Flow (cms)

Appendix SW-1A

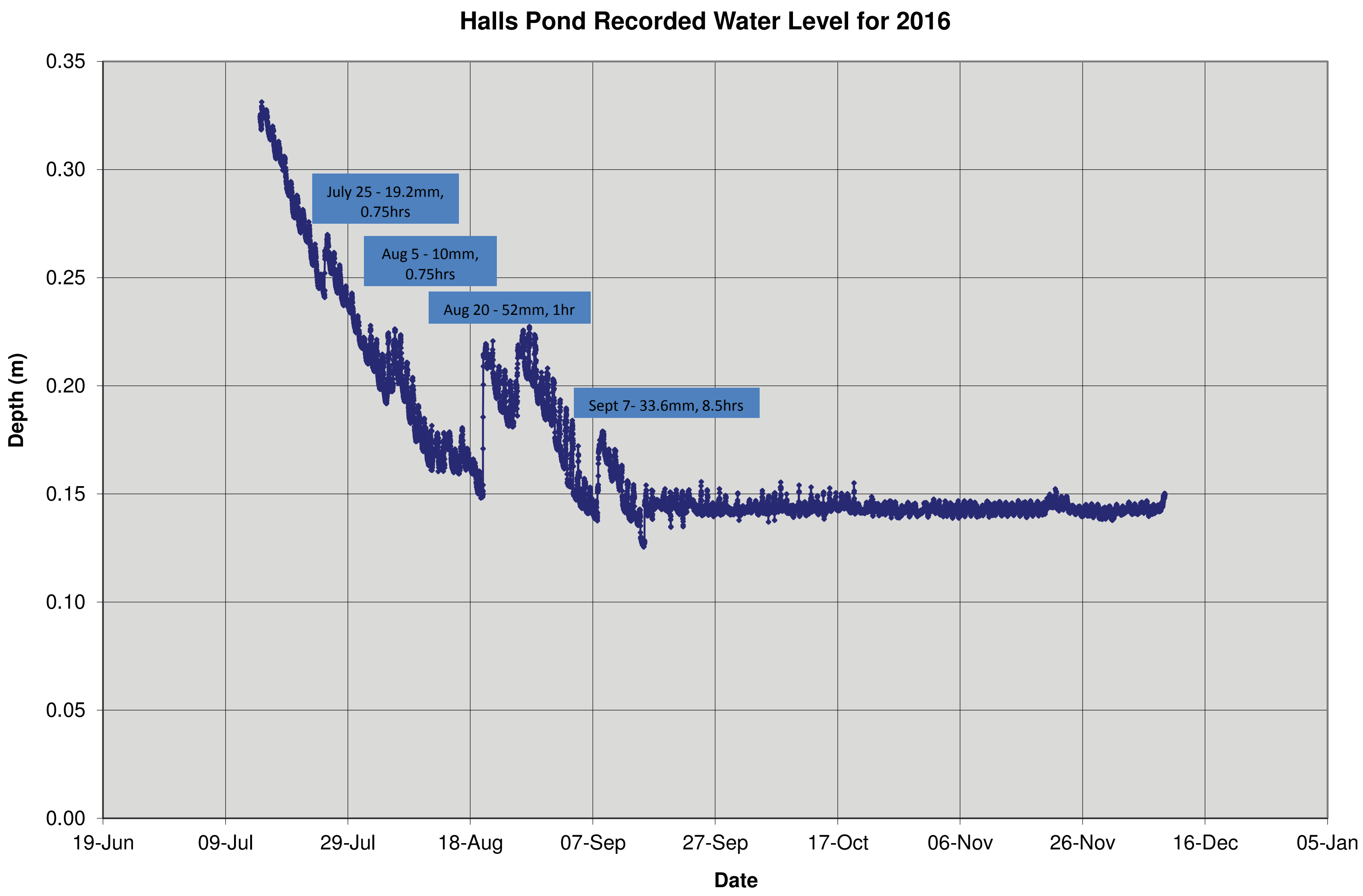
Wetland Water Flow Data
(2017 - 2018)


Cumulative Rainfall Clair Maltby 2016
Cumulative Rainfall (mm)
350.0
300.0
250.0
200.0
150.0
100.0
50.0
0.0
19/06/2016 0:00
09/07/2016 0:00
29/07/2016 0:00
18/08/2016 0:00
07/09/2016 0:00
27/09/2016 0:00
17/10/2016 0:00
06/11/2016 0:00
26/11/2016 0:00
16/12/2016 0:00
05/01/2017 0:00
Date

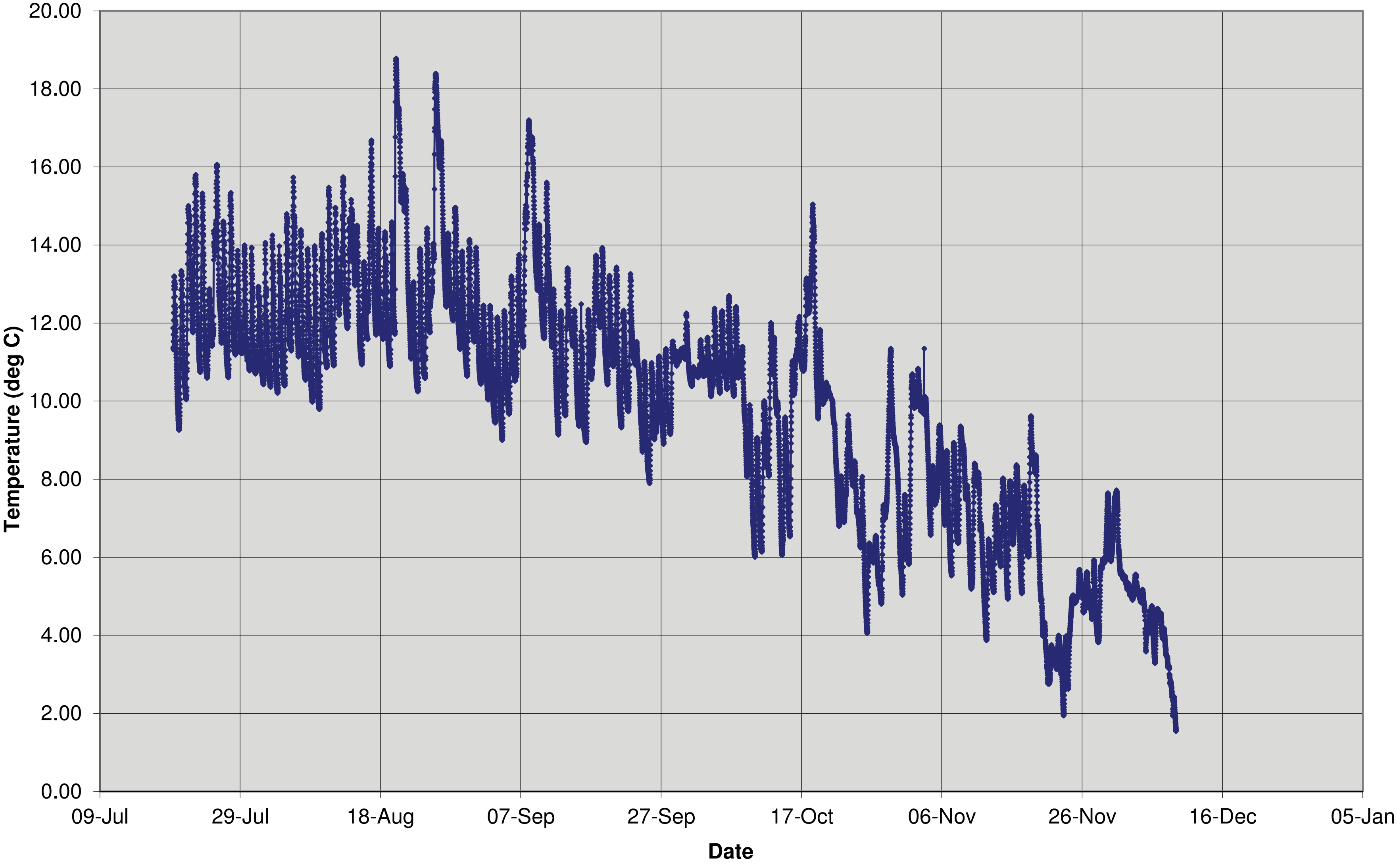

Barologger Recorded Pressure at Victoria/Maltby for 2016
Pressure (m)
14.50
14.40
14.30
14.20
14.10
14.00
13.90
13.80
19-Jun
9-Jul
29-Jul
18-Aug
7-Sep
27-Sep
17-Oct
6-Nov
26-Nov
16-Dec
5-Jan
Date and Time

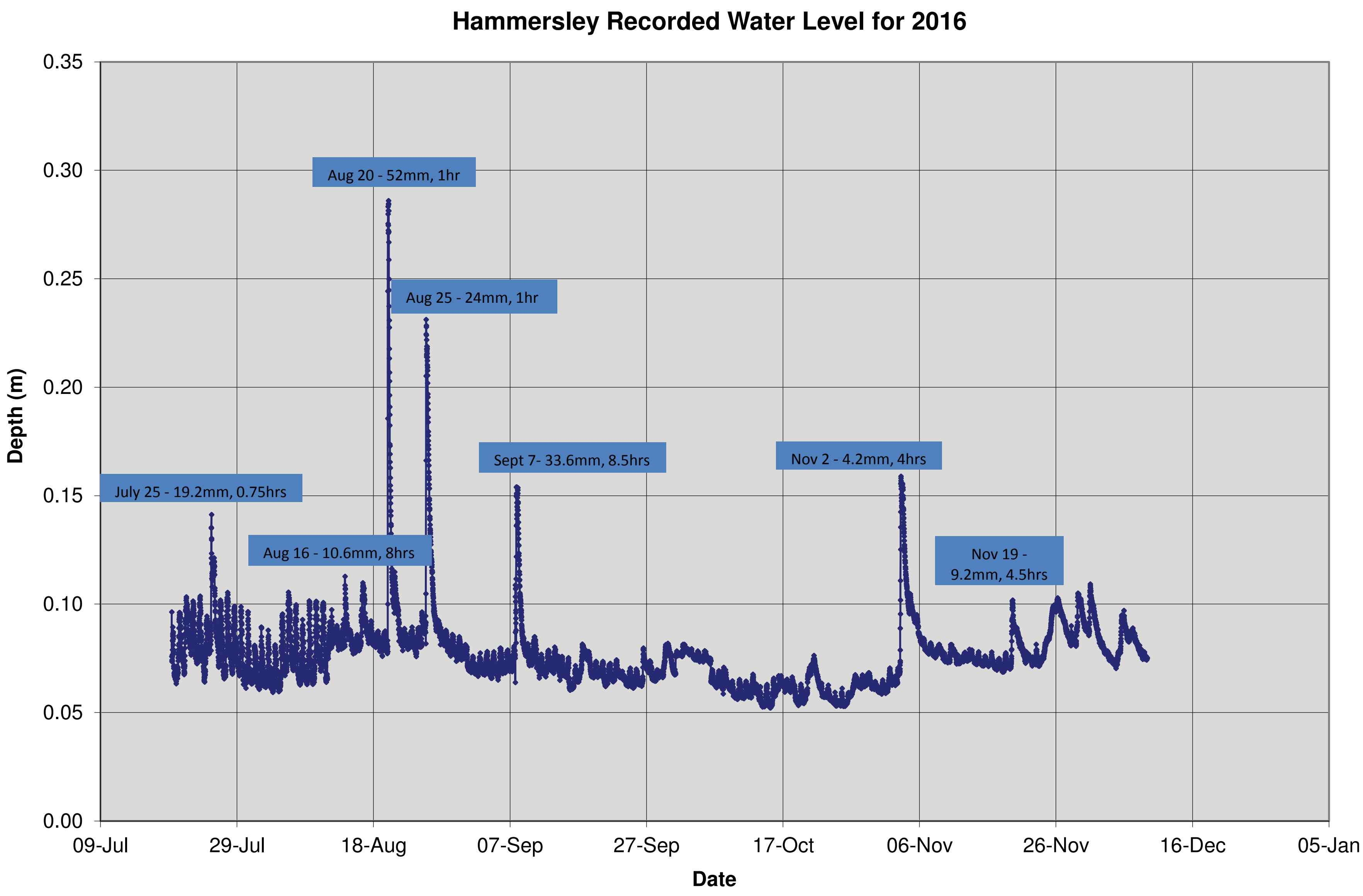


Halls Recorded Temperature for 2016
Temperature (deg C)
40.00
35.00
30.00
25.00
20.00
15.00
10.00
5.00
0.00
09-Jul
19-Jul
29-Jul
08-Aug
18-Aug
28-Aug
07-Sep
Date

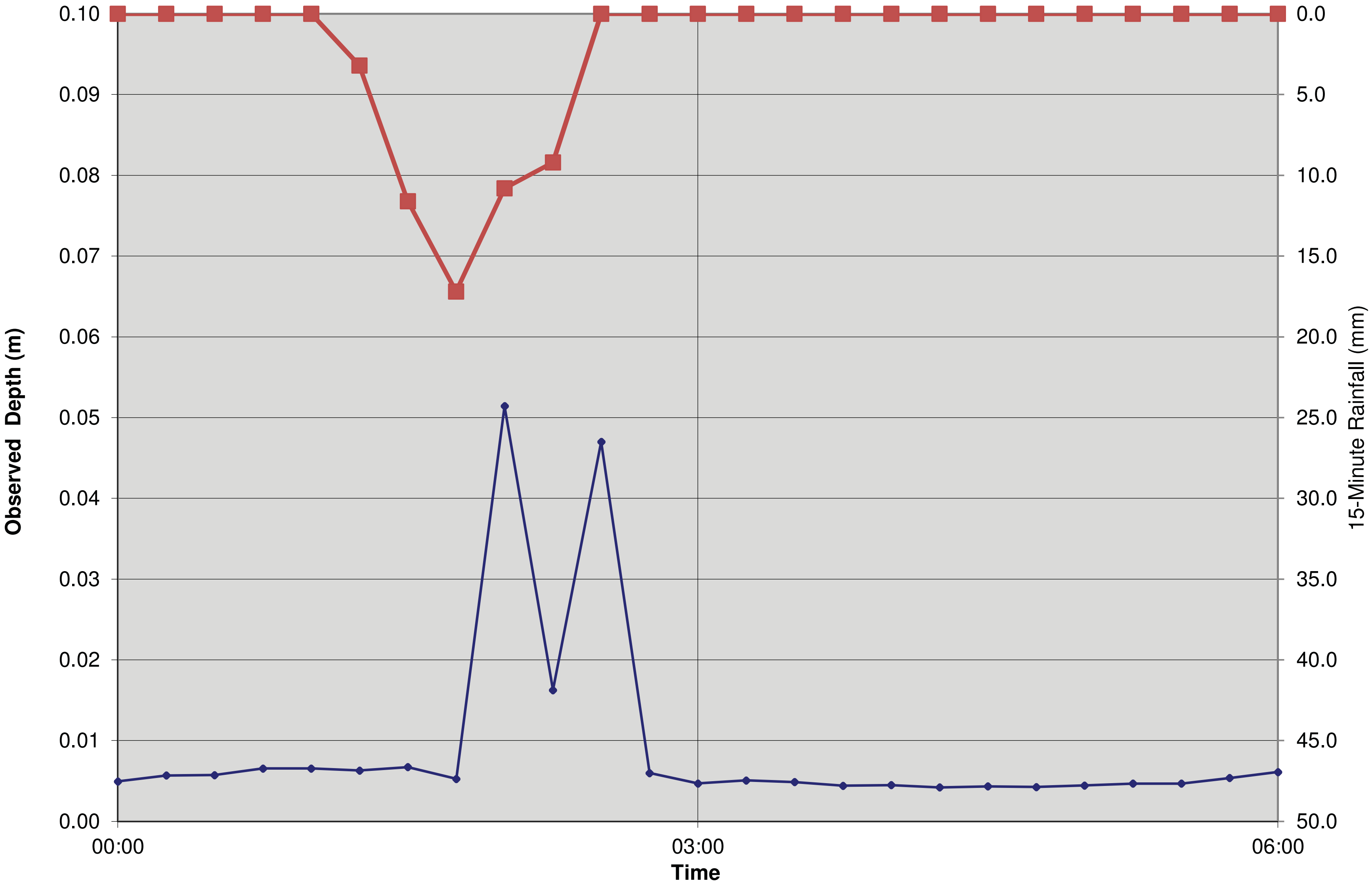

Halls Pond Recorded Water Level for 2016
Depth (m)
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
19-Jun
09-Jul
29-Jul
18-Aug
07-Sep
27-Sep
17-Oct
06-Nov
26-Nov
16-Dec
05-Jan
Date
July 25 - 19.2mm, 0.75hrs
Aug 5 - 10mm, 0.75hrs
Aug 20 - 52mm, 1hr
Sept 7- 33.6mm, 8.5hrs

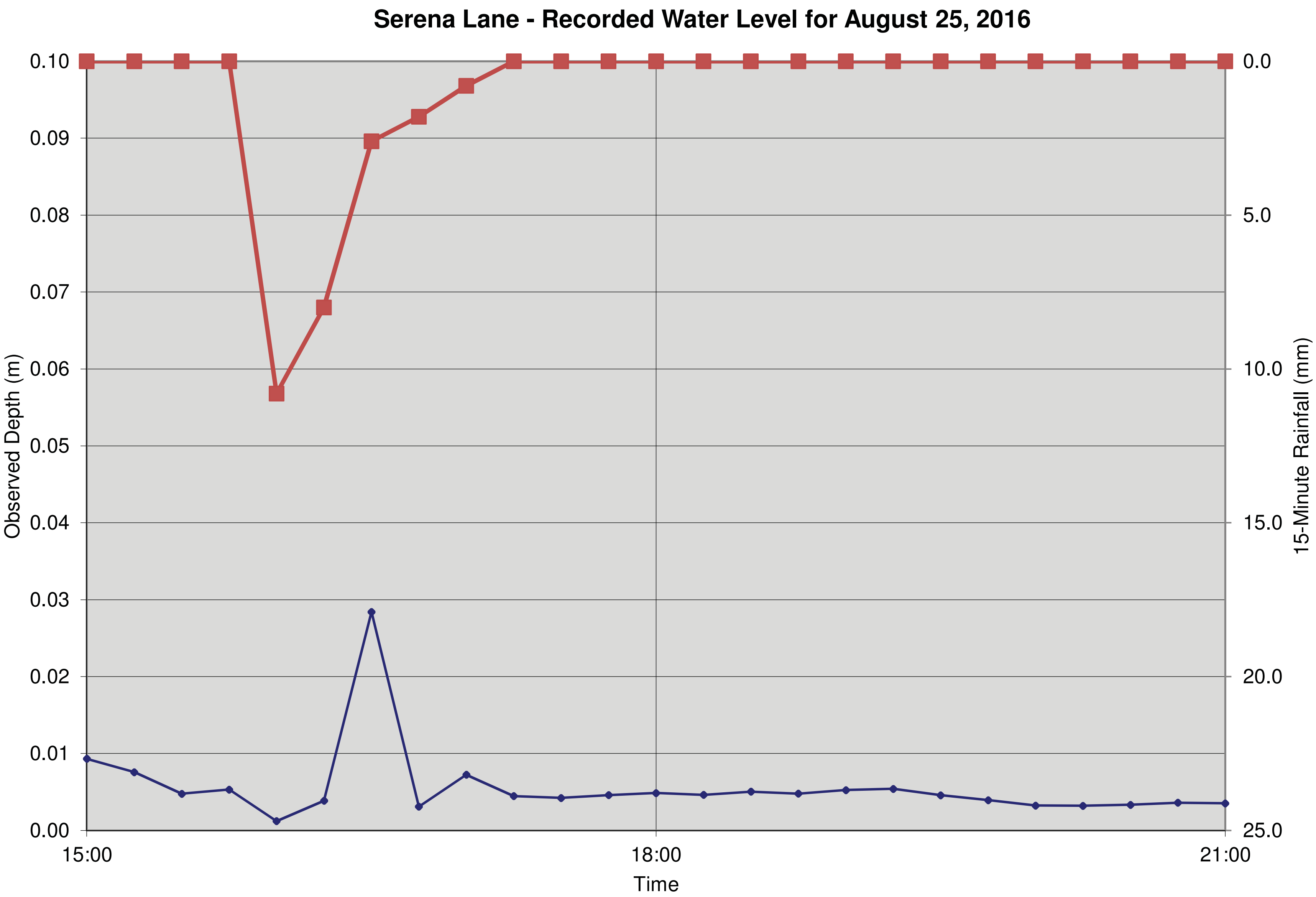
Hammersley Recorded Temperature for 2016



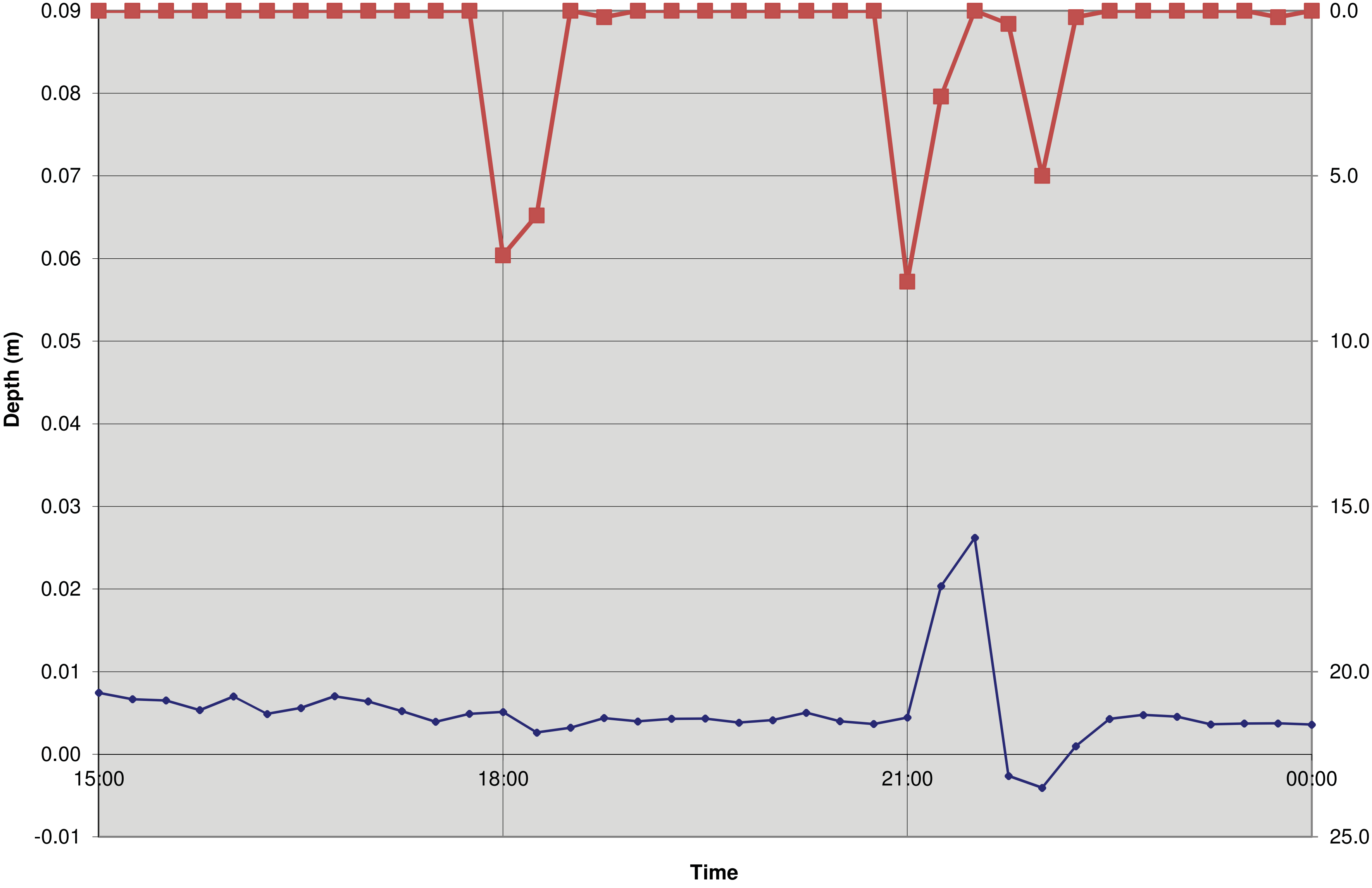

Hammersley Recorded Water Level for 2016
Depth (m)
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
09-Jul
29-Jul
18-Aug
07-Sep
27-Sep
17-Oct
06-Nov
26-Nov
16-Dec
05-Jan
Date
Aug 20 - 52mm, 1hr
Aug 25 - 24mm, 1hr
Sept 7- 33.6mm, 8.5hrs
Nov 2 - 4.2mm, 4hrs
July 25 - 19.2mm, 0.75hrs
Aug 16 - 10.6mm, 8hrs
Nov 19 -
9.2mm, 4.5hrs

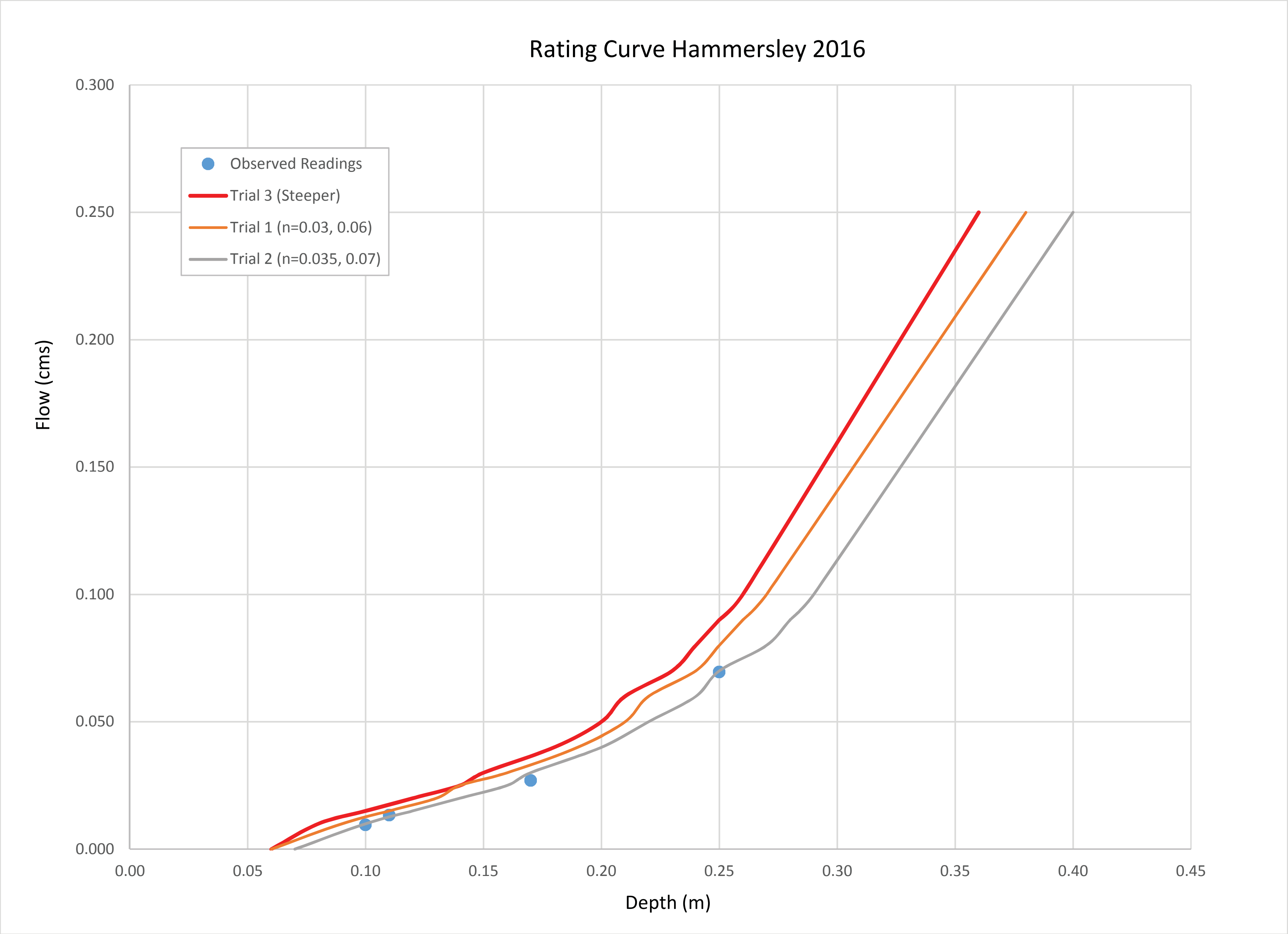
Serena Lane - Recorded Water Level for August 20, 2016

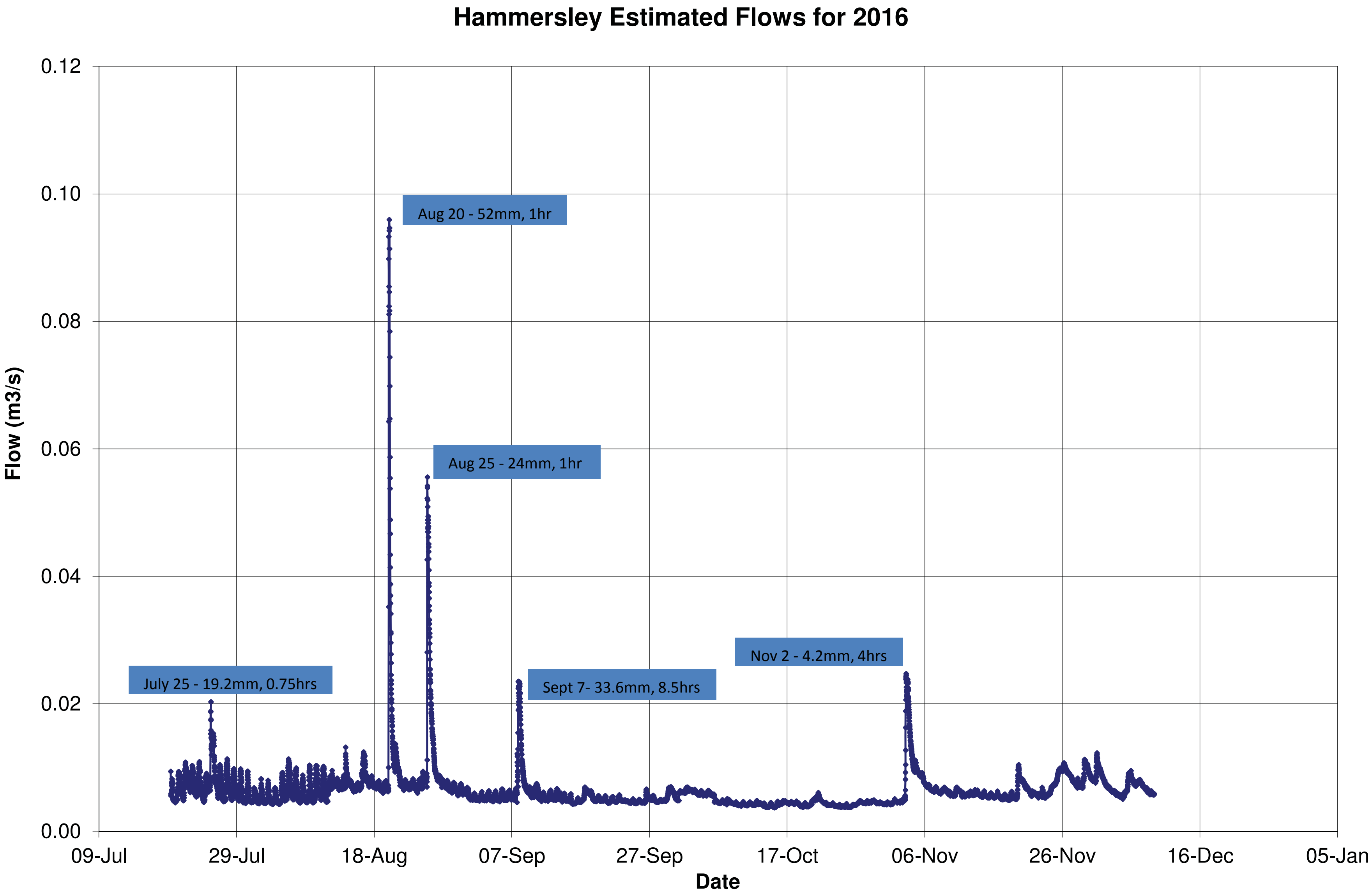


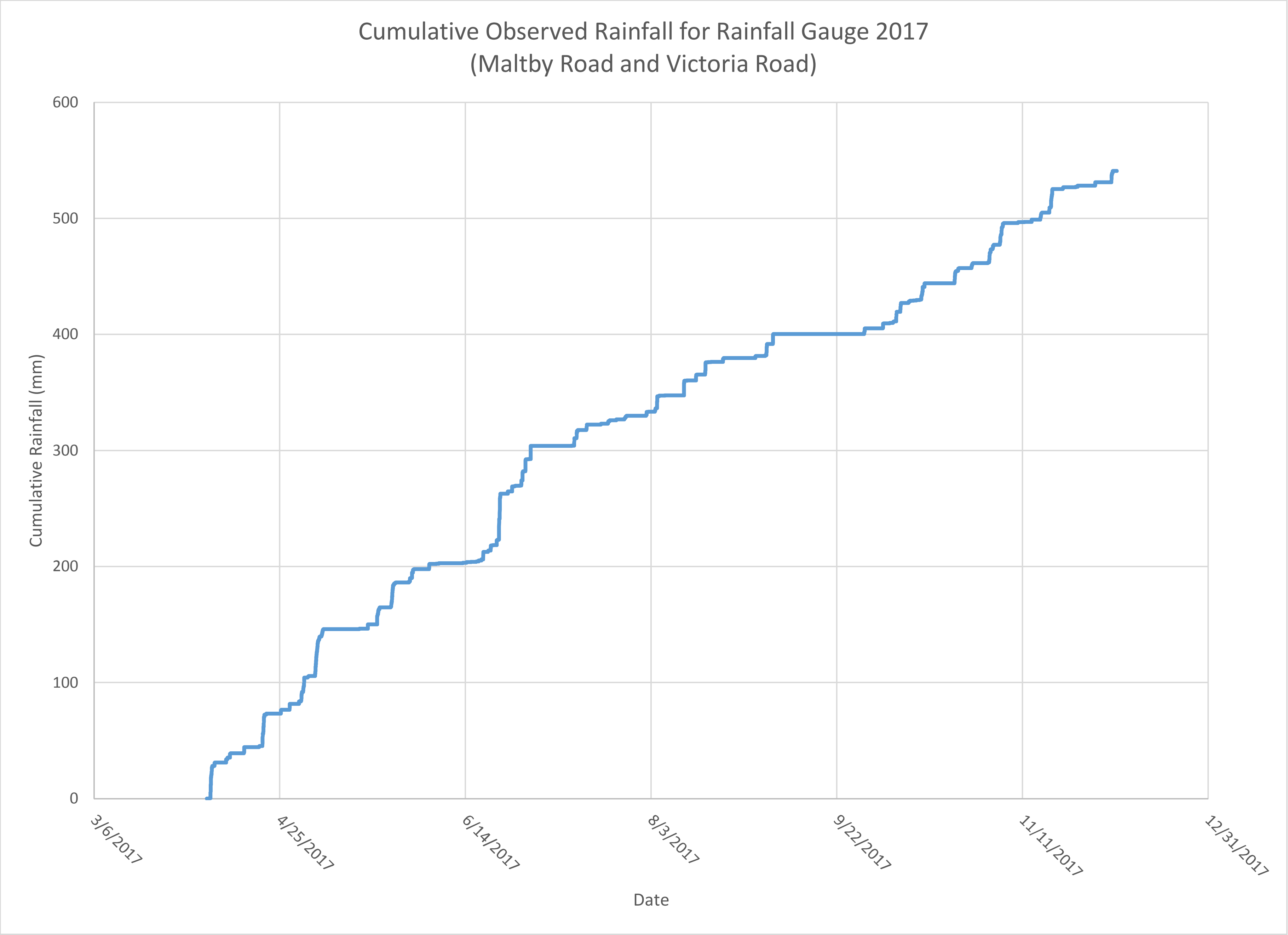

Serena Lane - Recorded Water Level for August 25, 2016
Observed Depth (m)
0.10
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0.00
15-Minute Rainfall (mm)
0.0
5.0
10.0
15.0
20.0
25.0
15:00
18:00
21:00
Time

Serena Lane - Recorded Water Level for September 7, 2016

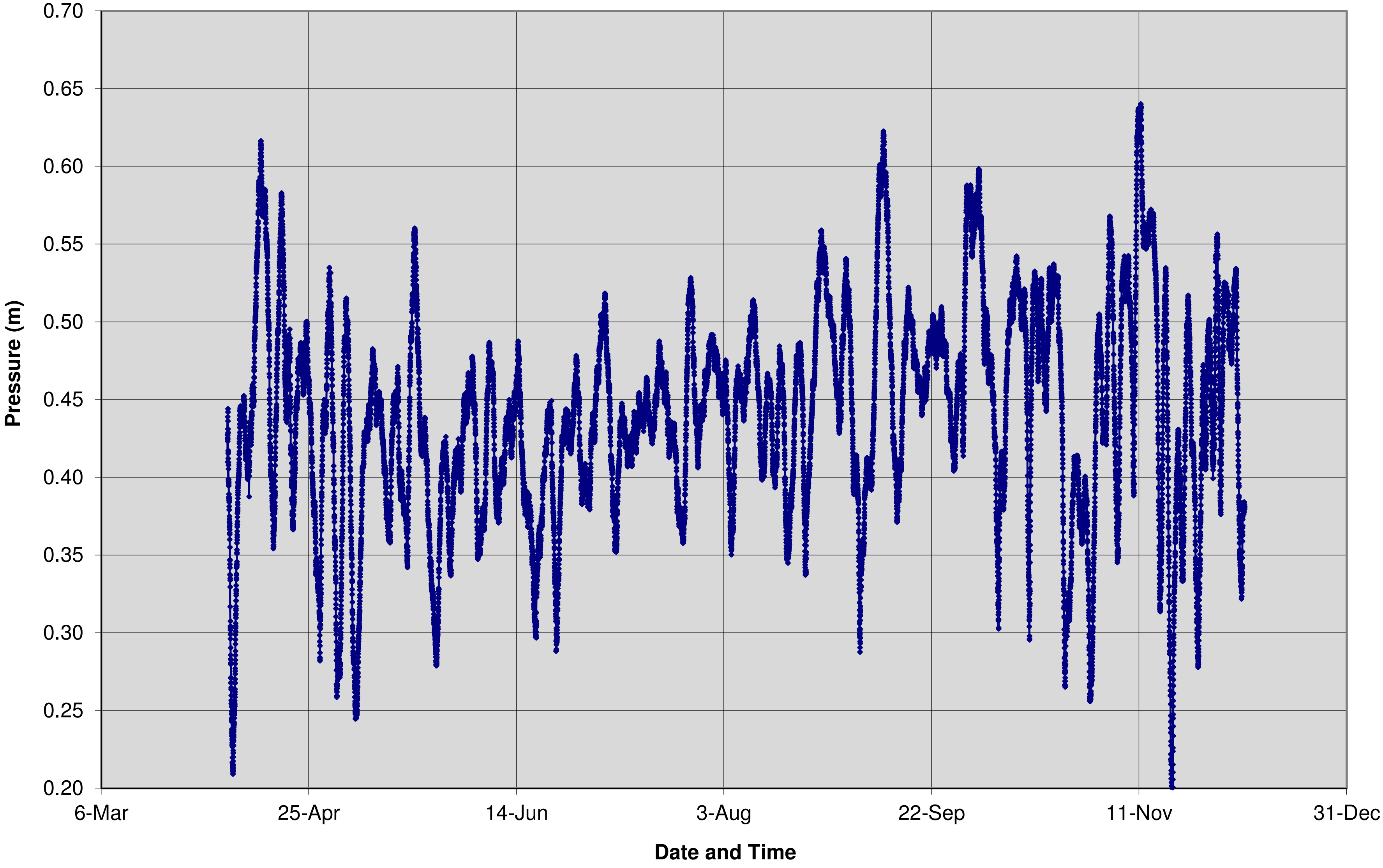


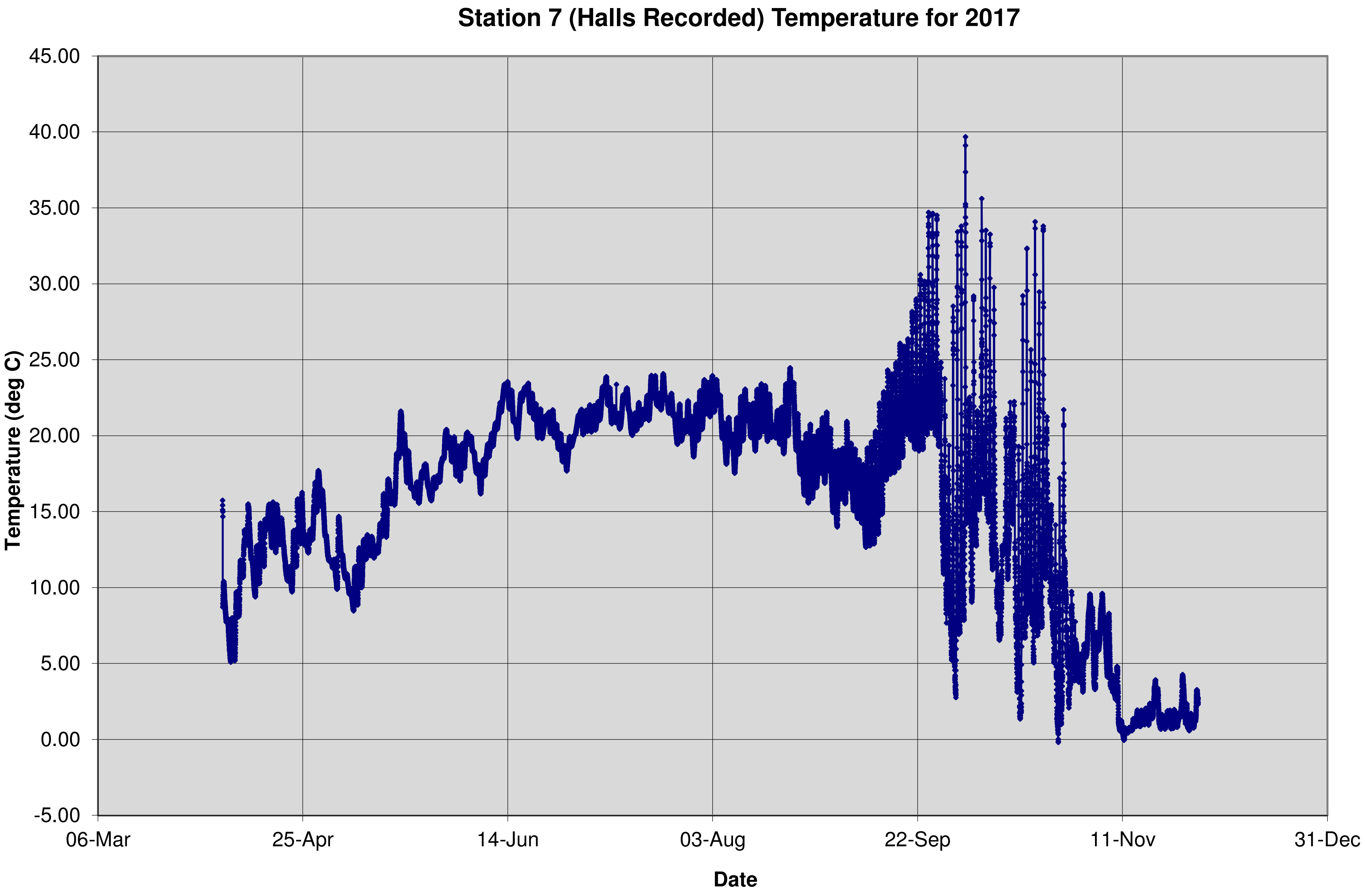

Rating Curve Hammersley 2016
Flow (cms)
Depth (m)
Observed Readings
Trial 3 (Steeper)
Trial 1 (n=0.03, 0.06)
Trial 2 (n=0.035, 0.07)
0.300
0.250
0.200
0.150
0.100
0.050
0.000
0.00
0.05
0.10
0.15
0.20
0.25
0.30
0.35
0.40
0.45

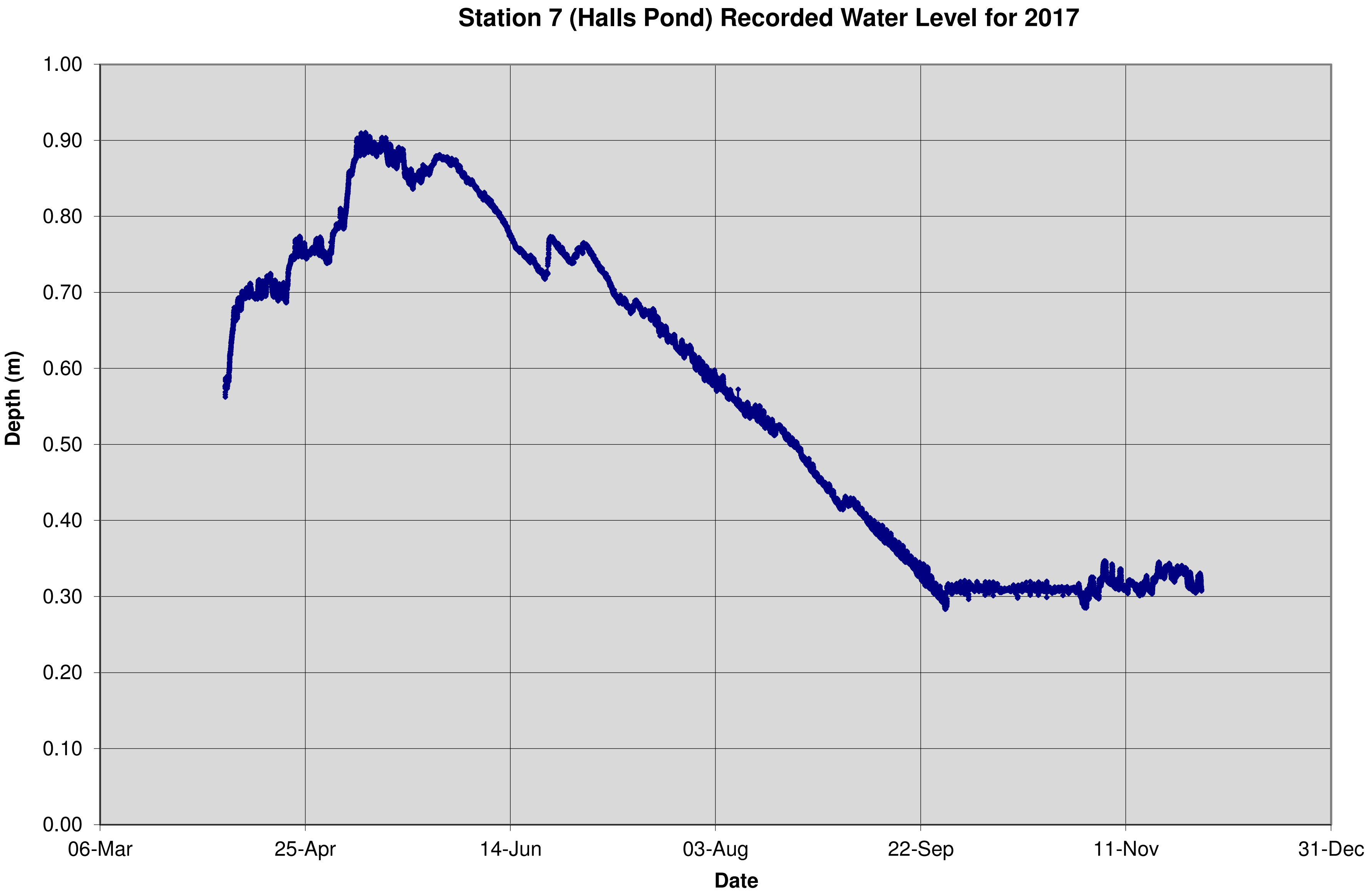

Hammersley Estimated Flows for 2016
Flow (m3/s)
0.12
0.10
0.08
0.06
0.04
0.02
0.00
09-Jul
29-Jul
18-Aug
07-Sep
27-Sep
17-Oct
06-Nov
26-Nov
16-Dec
05-Jan
Date
Aug 20 - 52mm, 1hr
Aug 25 - 24mm, 1hr
July 25 - 19.2mm, 0.75hrs
Sept 7- 33.6mm, 8.5hrs
Nov 2 - 4.2mm, 4hrs

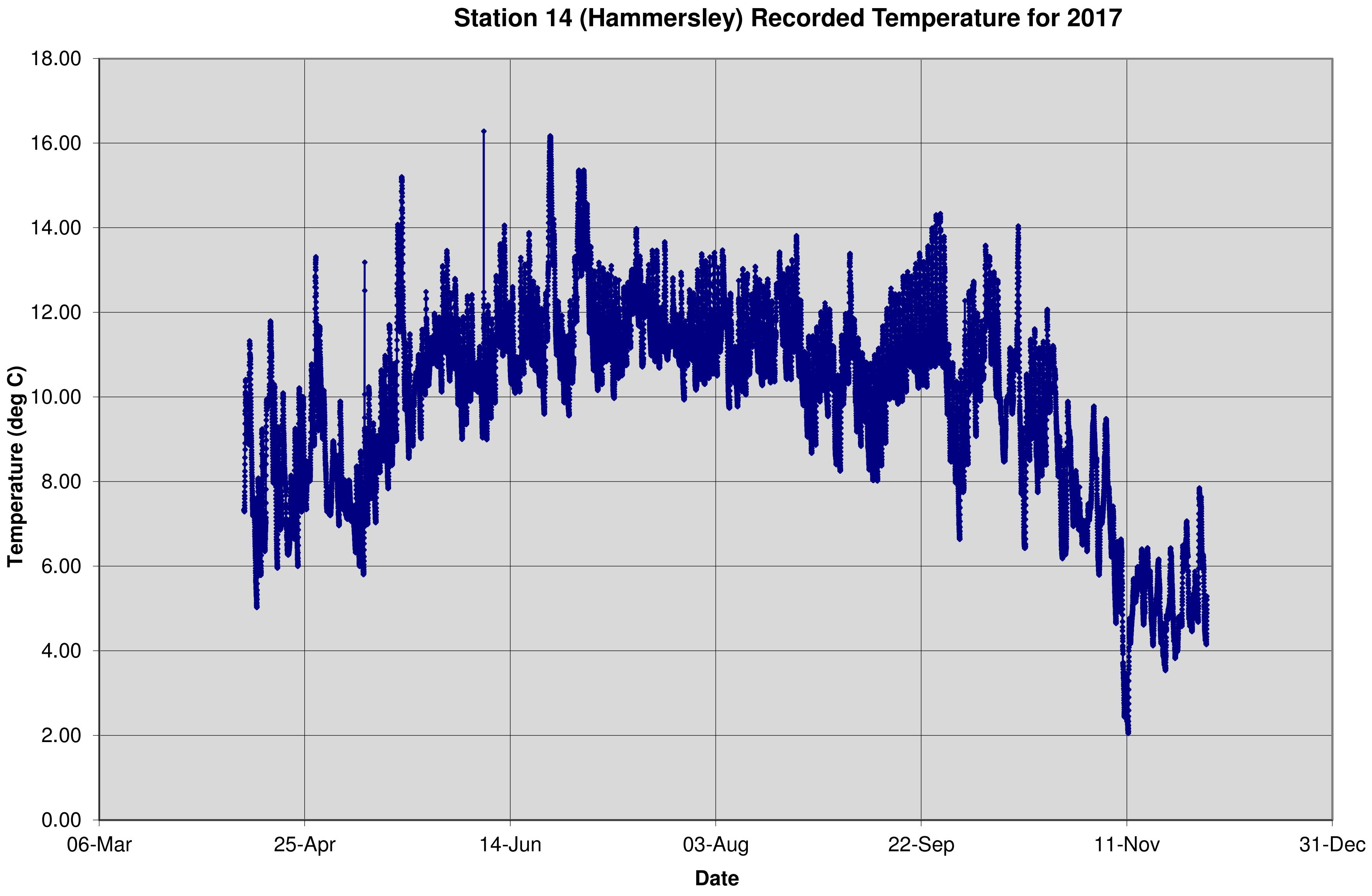

Cumulative Observed Rainfall for Rainfall Gauge 2017
(Maltby Road and Victoria Road)
Cumulative Rainfall (mm)
600
500
400
300
200
100
0
3/6/2017
4/25/2017
6/14/2017
8/3/2017
9/22/2017
11/11/2017
12/31/2017
Date

Barologger Recorded Pressure at Victoria/Maltby for 2017

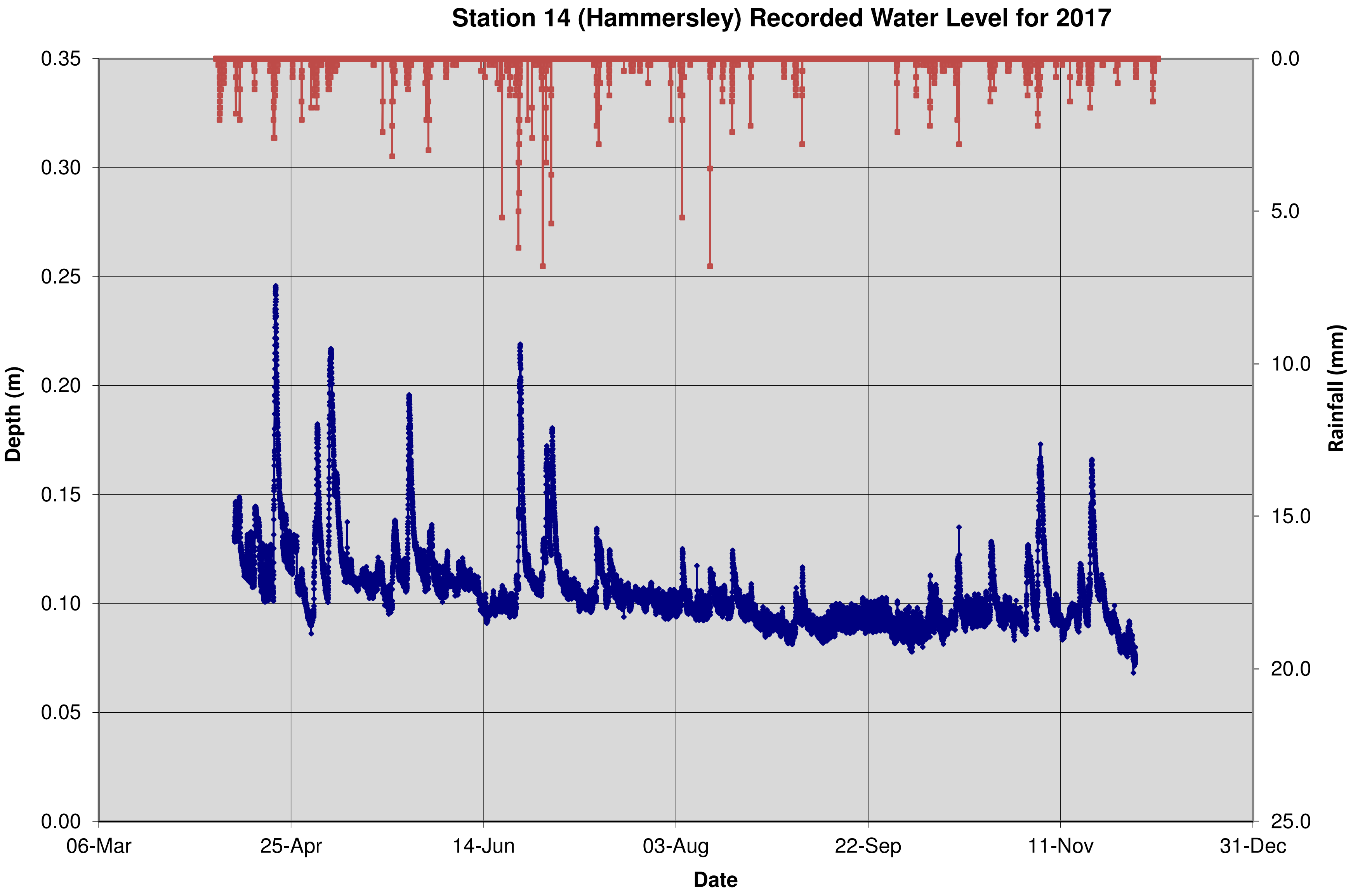


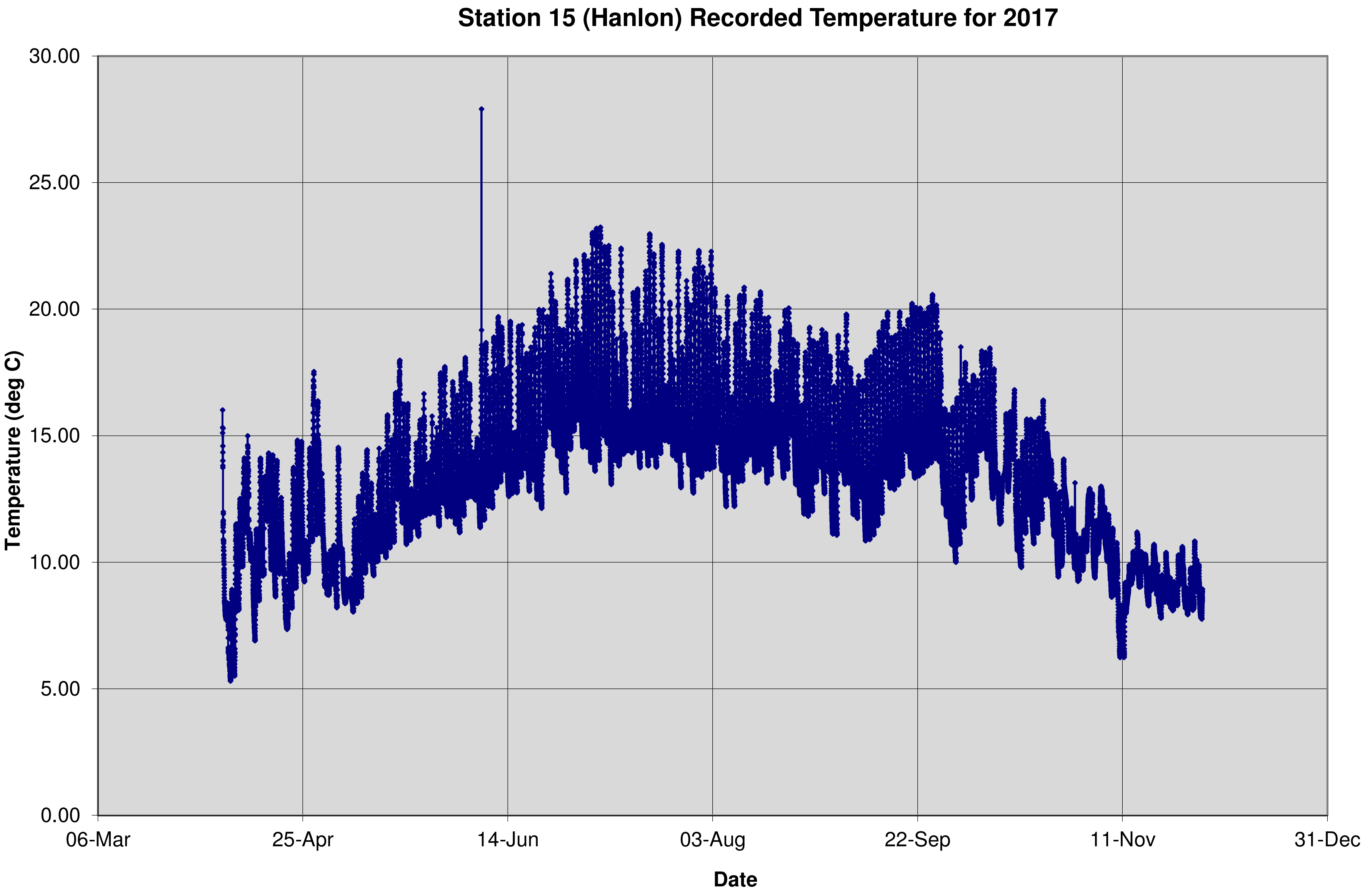
Station 7 (Halls Recorded) Temperature for 2017
Temperature (deg C)
45.00
40.00
35.00
30.00
25.00
20.00
15.00
10.00
5.00
0.00
-5.00
06-Mar
25-Apr
14-Jun
03-Aug
22-Sep
11-Nov
31-Dec
Date


Station 7 (Halls Pond) Recorded Water Level for 2017
Depth (m)
1.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
06-Mar
25-Apr
14-Jun
03-Aug
22-Sep
11-Nov
31-Dec
Date

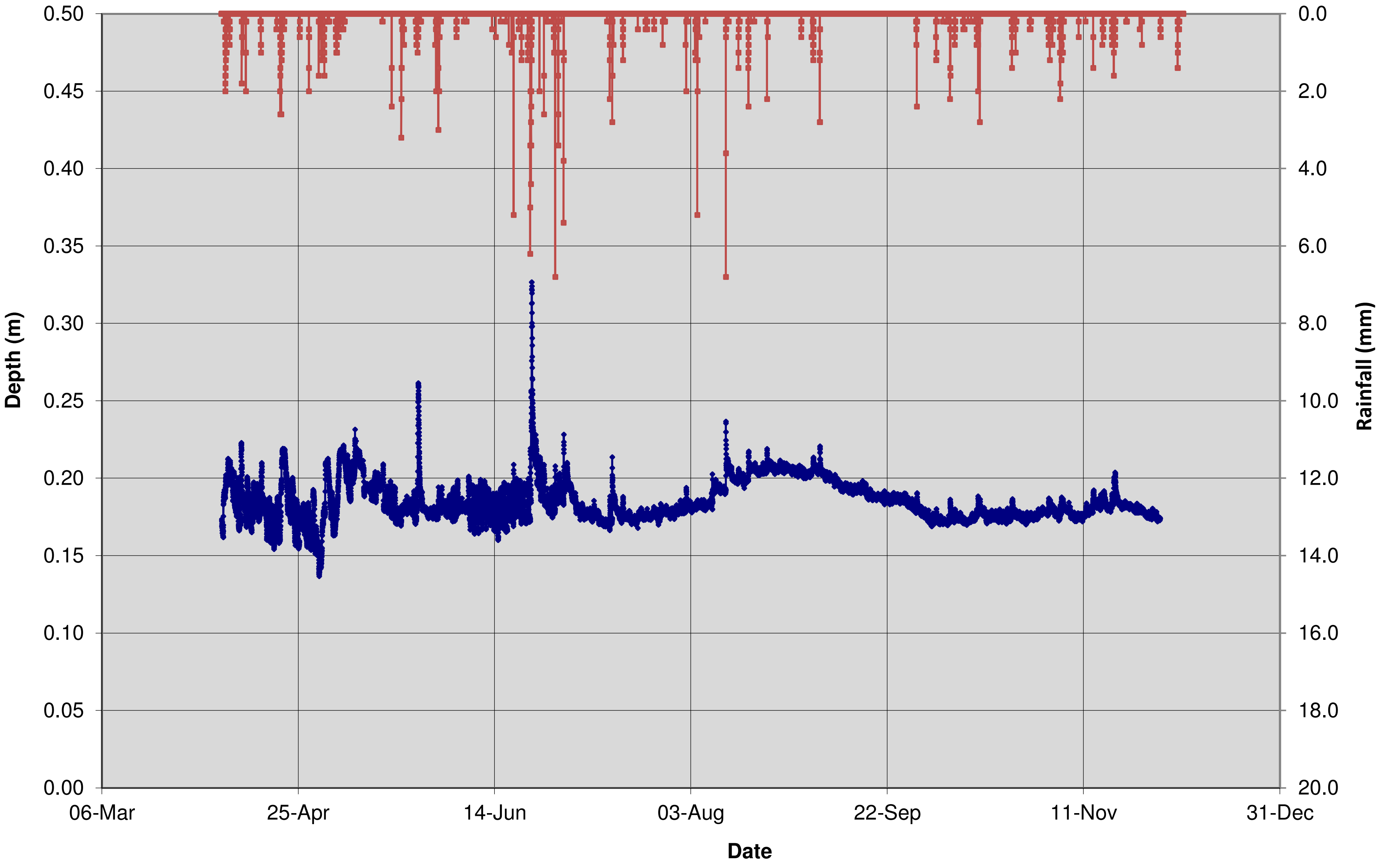


Station 14 (Hammersley) Recorded Temperature for 2017
Temperature (deg C)
18.00
16.00
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
06-Mar
25-Apr
14-Jun
03-Aug
22-Sep
11-Nov
31-Dec
Date

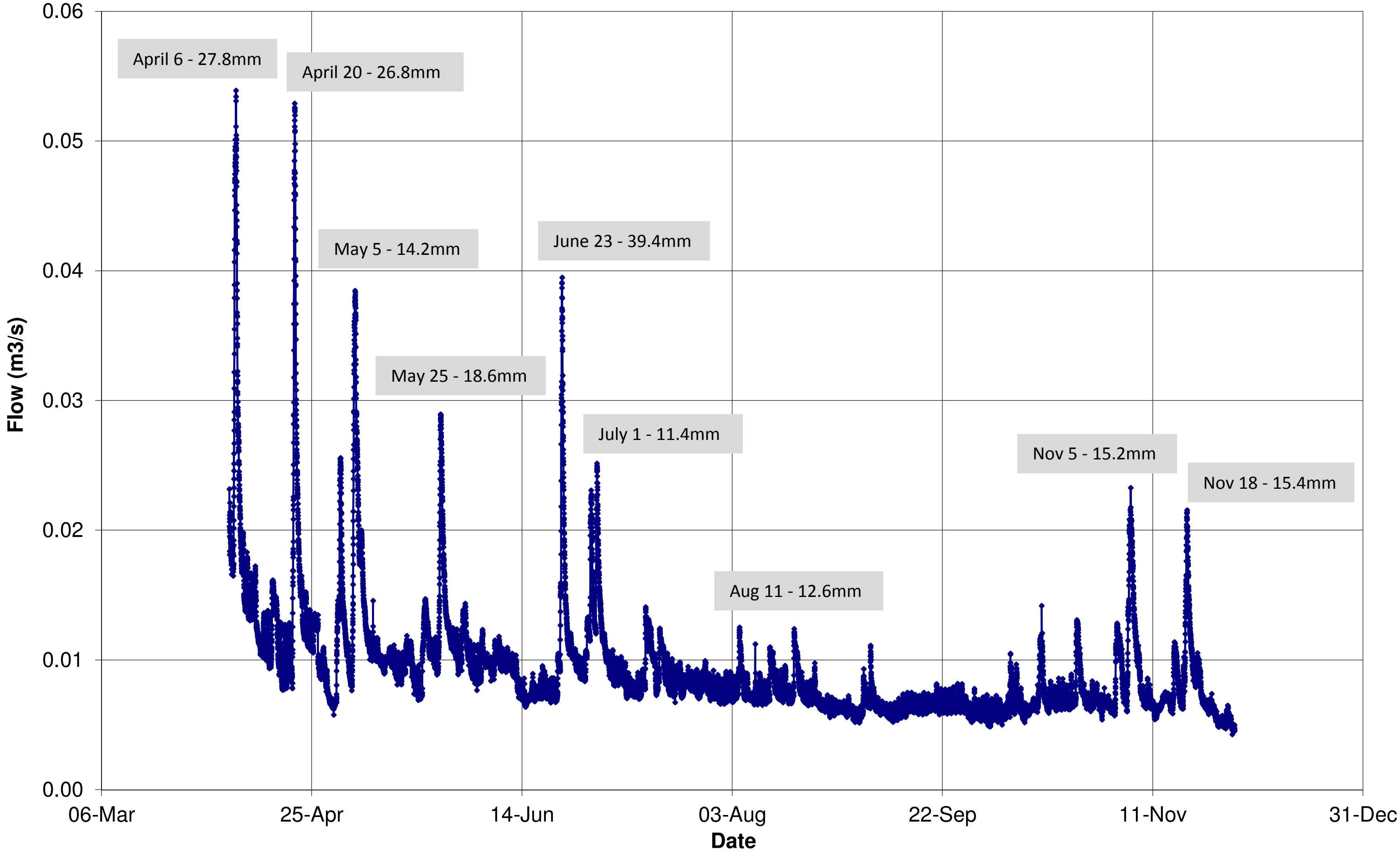

Station 14 (Hammersley) Recorded Water Level for 2017
Depth (m)
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
Rainfall (mm)
0.0
5.0
10.0
15.0
20.0
25.0
06-Mar
25-Apr
14-Jun
03-Aug
22-Sep
11-Nov
31-Dec
Date

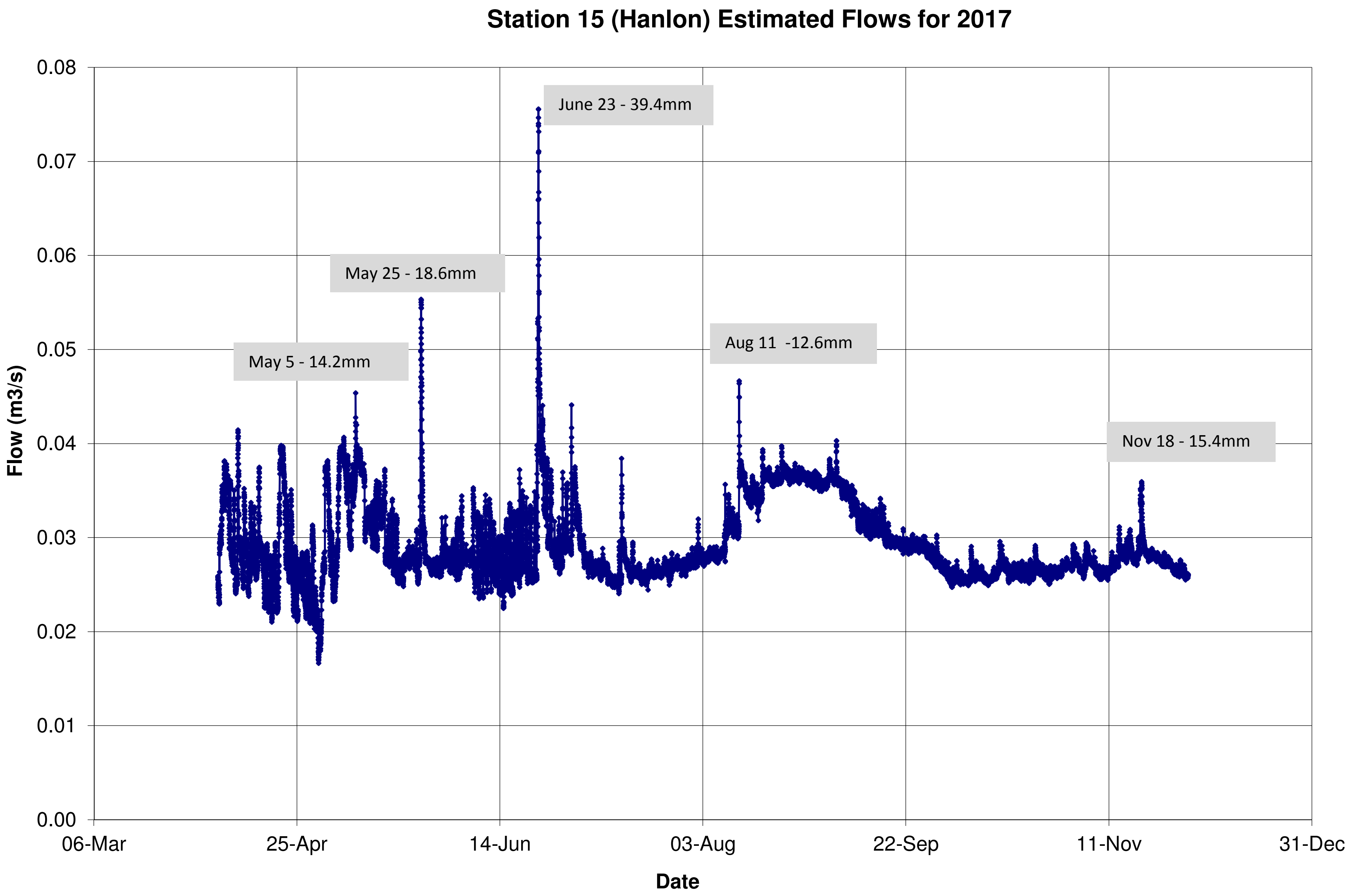

Station 15 (Hanlon) Recorded Temperature for 2017
Temperature (deg C)
30.00
25.00
20.00
15.00
10.00
5.00
0.00
06-Mar
25-Apr
14-Jun
03-Aug
22-Sep
11-Nov
31-Dec
Date

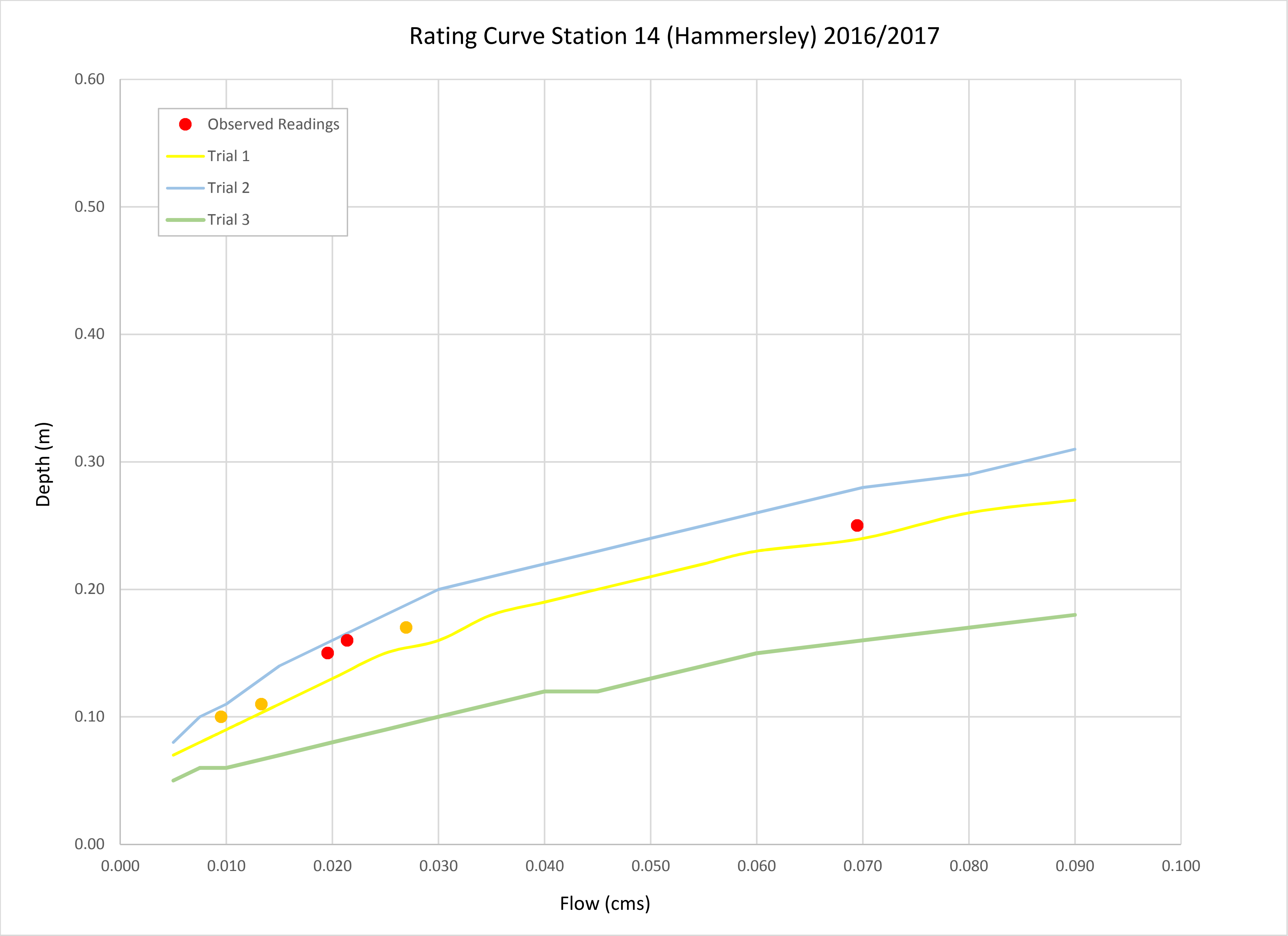
Station 15 (Hanlon) Recorded Water Level for 2017

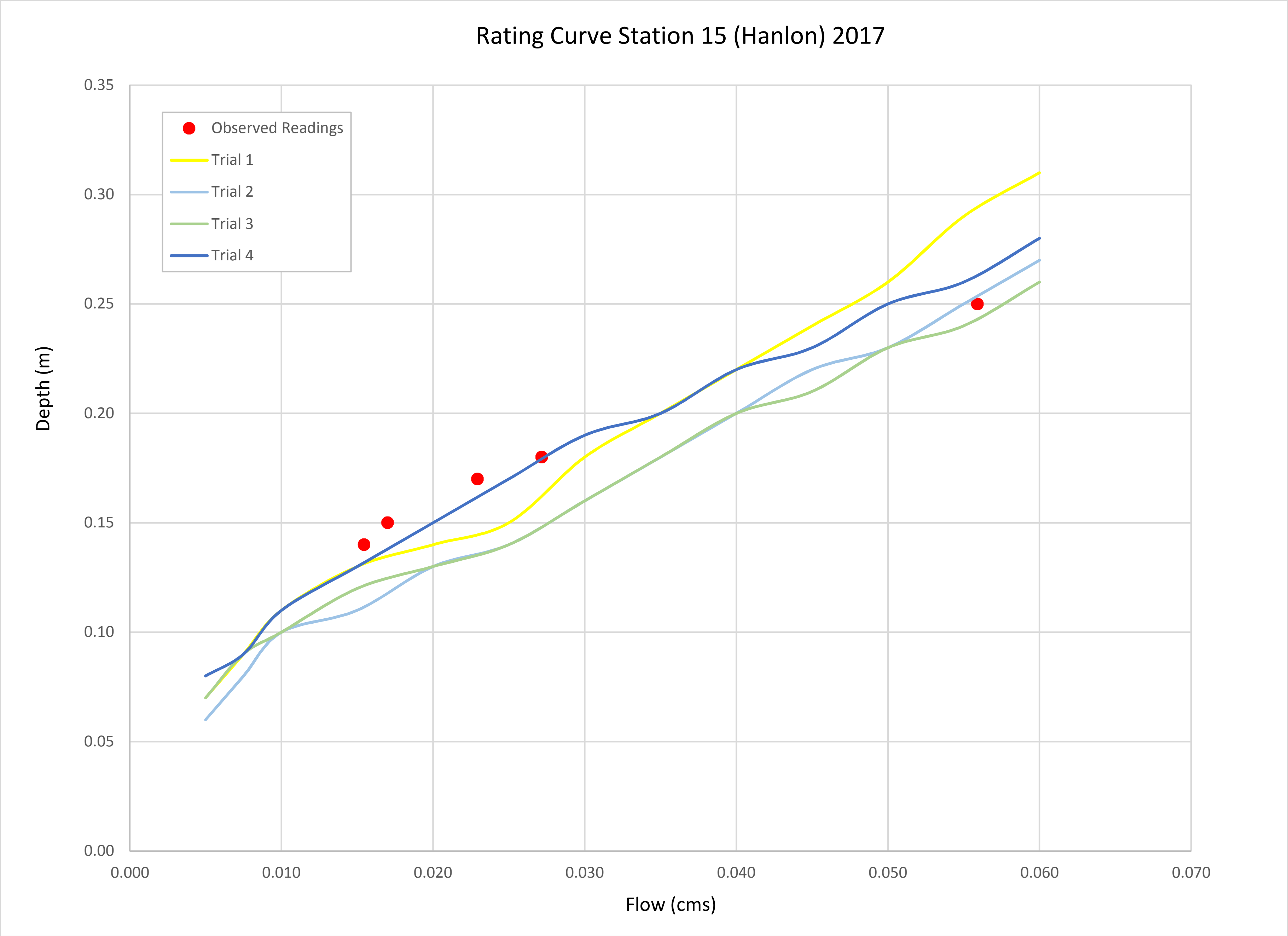


Station 14 (Hammersley) Estimated Flows for 2017

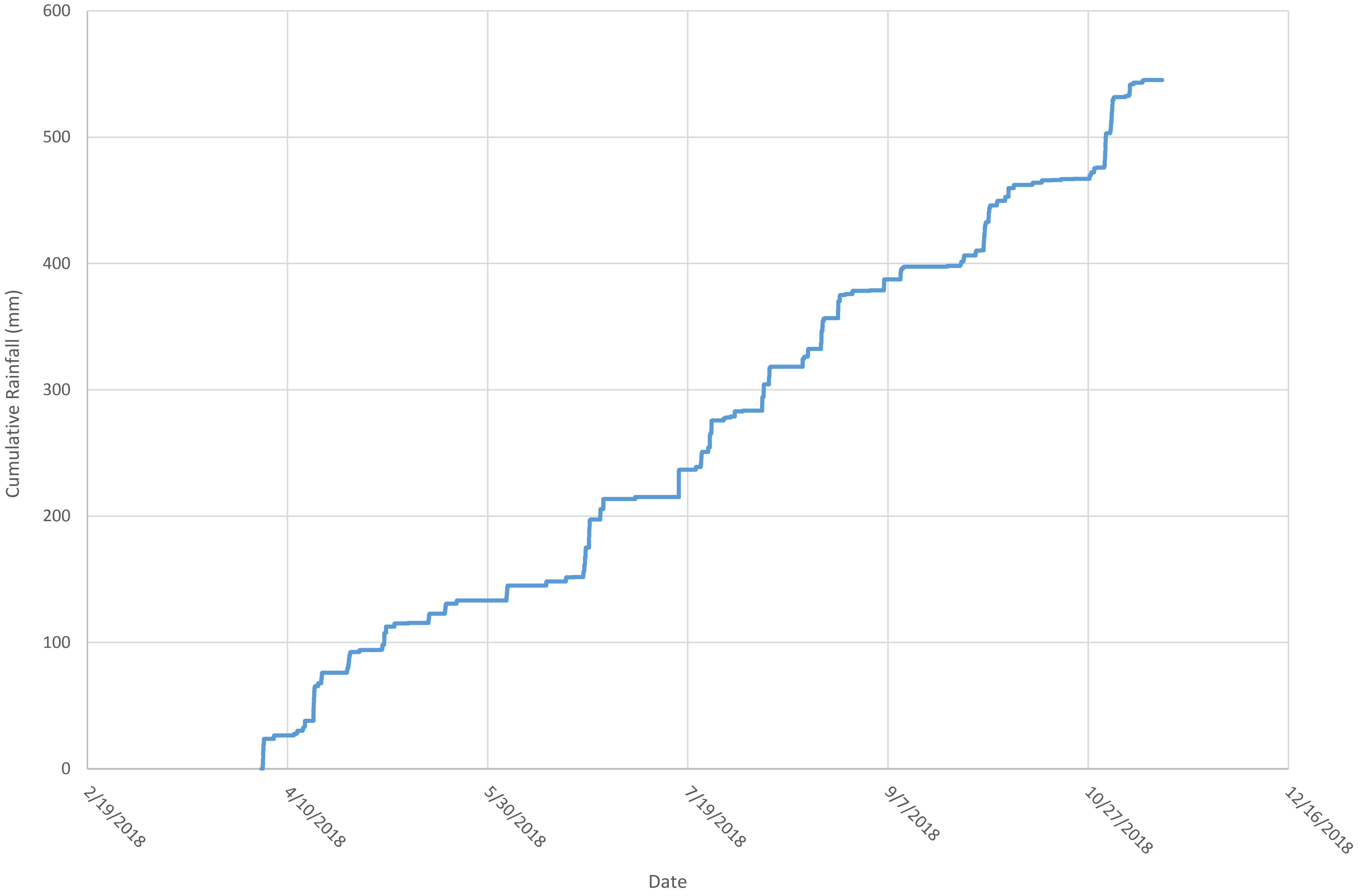


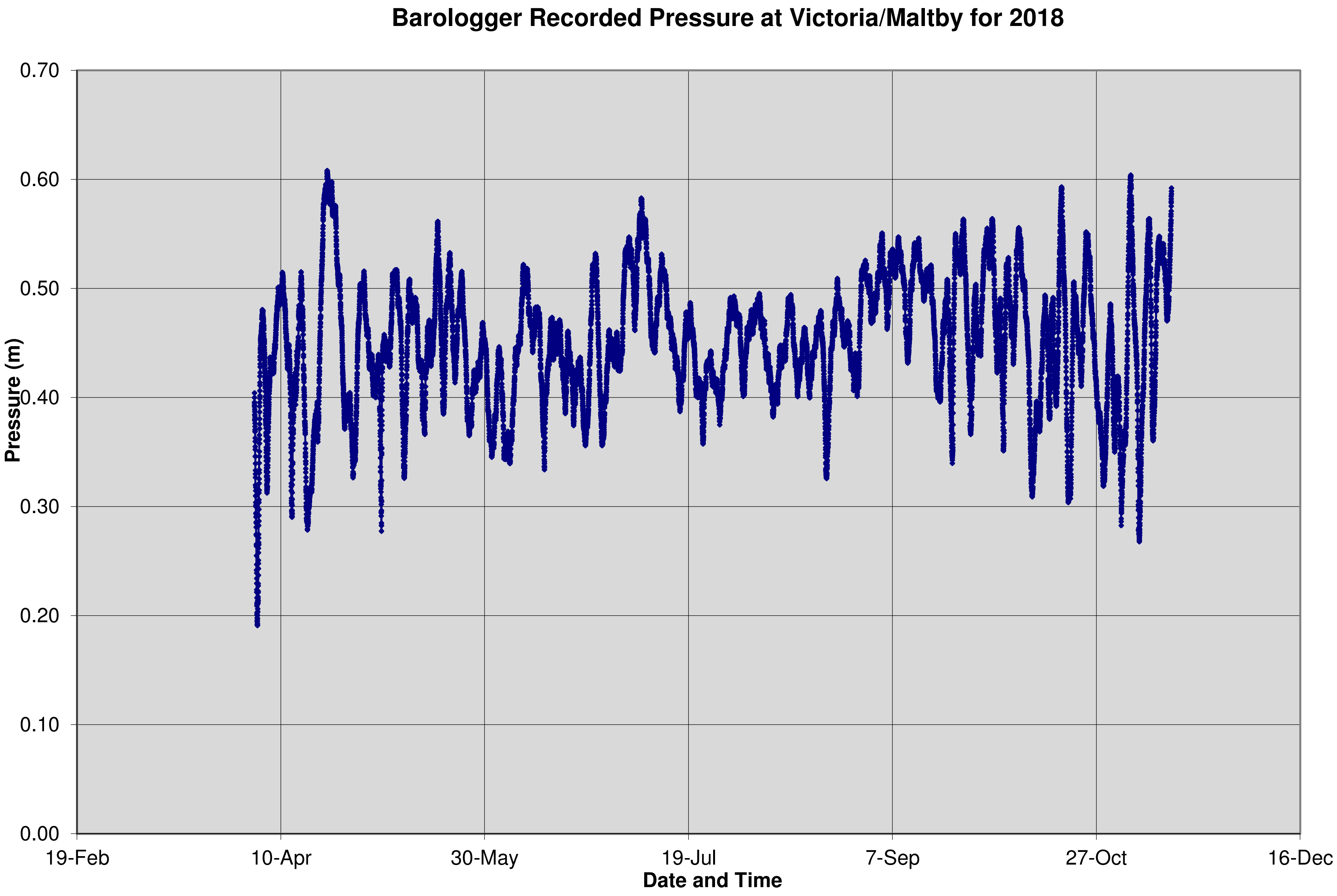

Station 15 (Hanlon) Estimated Flows for 2017
Flow (m3/s)
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0.00
06-Mar
25-Apr
14-Jun
03-Aug
22-Sep
11-Nov
31-Dec
Date
June 23 - 39.4mm
May 25 - 18.6mm
May 5 - 14.2mm
Aug 11 -12.6mm
Nov 18 - 15.4mm


Rating Curve Station 14 (Hammersley) 2016/2017
Observed Readings
Trial 1
Trial 2
Trial 3
Depth (m)
0.60
0.50
0.40
0.30
0.20
0.10
0.00
0.000
0.010
0.020
0.030
0.040
0.050
0.060
0.070
0.080
0.090
0.100
Flow (cms)

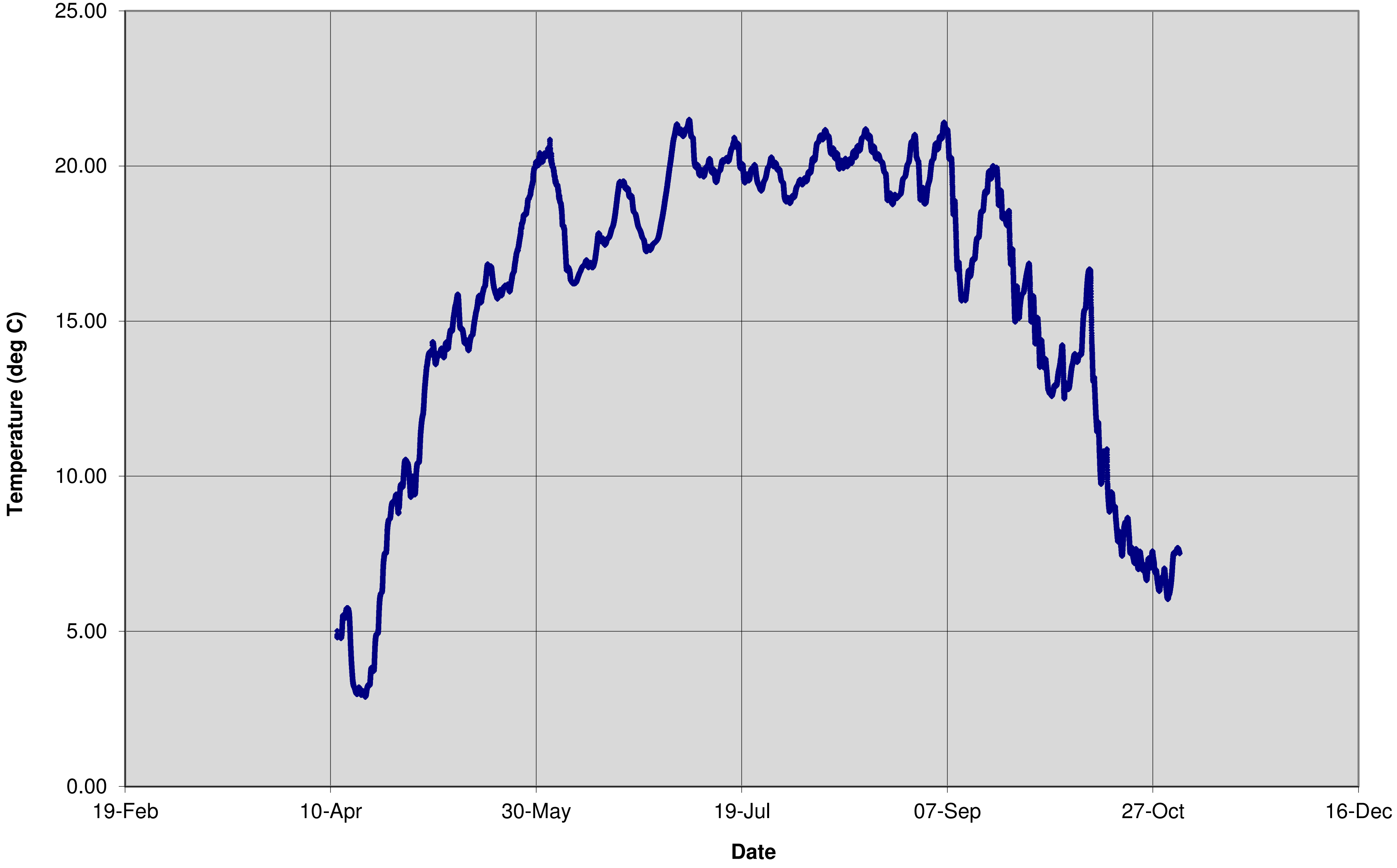

Rating Curve Station 15 (Hanlon) 2017
● Observed Readings
Trial 1
Trial 2
Trial 3
Trial 4
Depth (m)
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.000
0.010
0.020
0.030
0.040
0.050
0.060
0.070
Flow (cms)

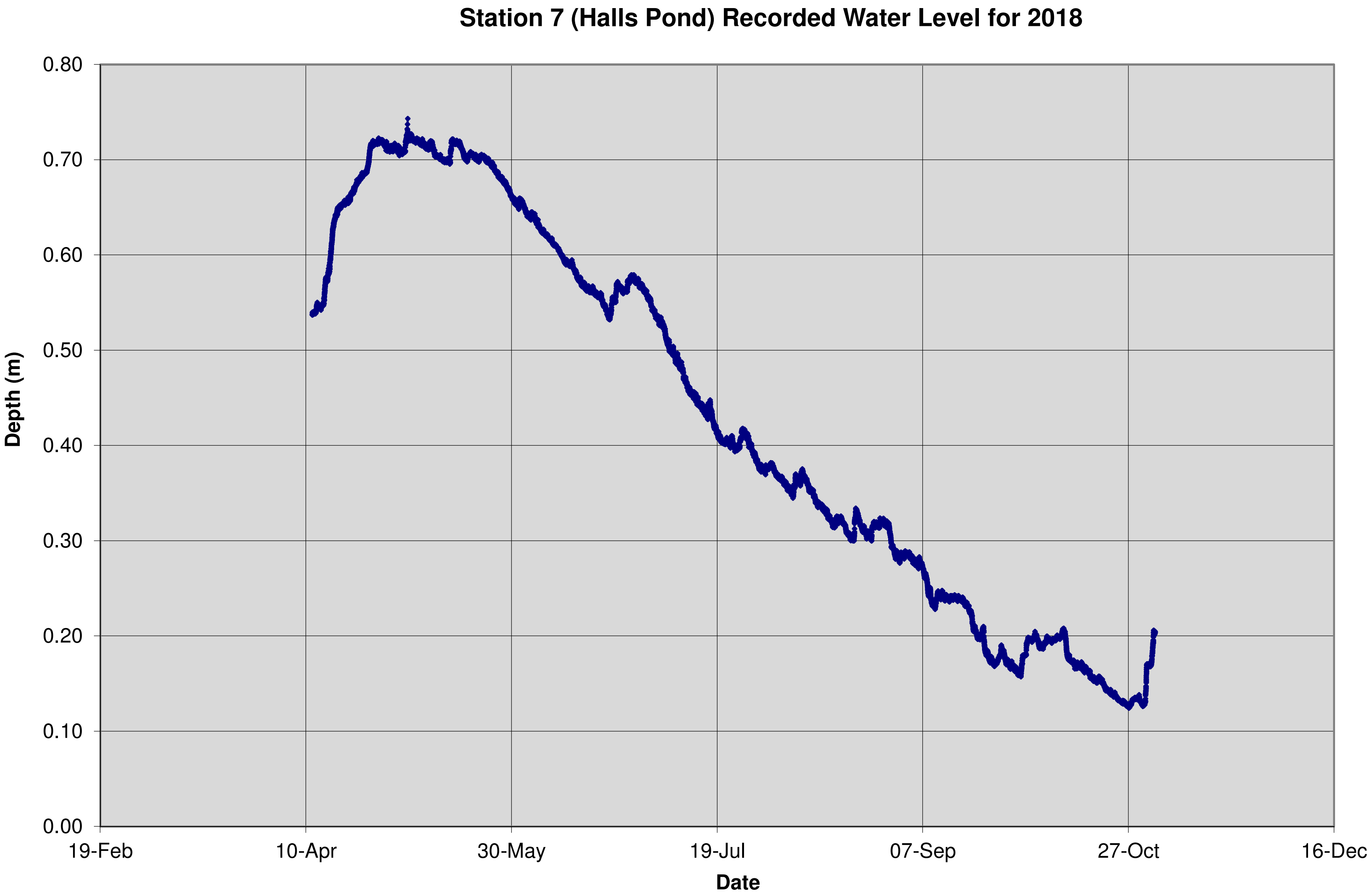
Cumulative Observed Rainfall for Rainfall Gauge 2018 (Maltby Road and Victoria Road)

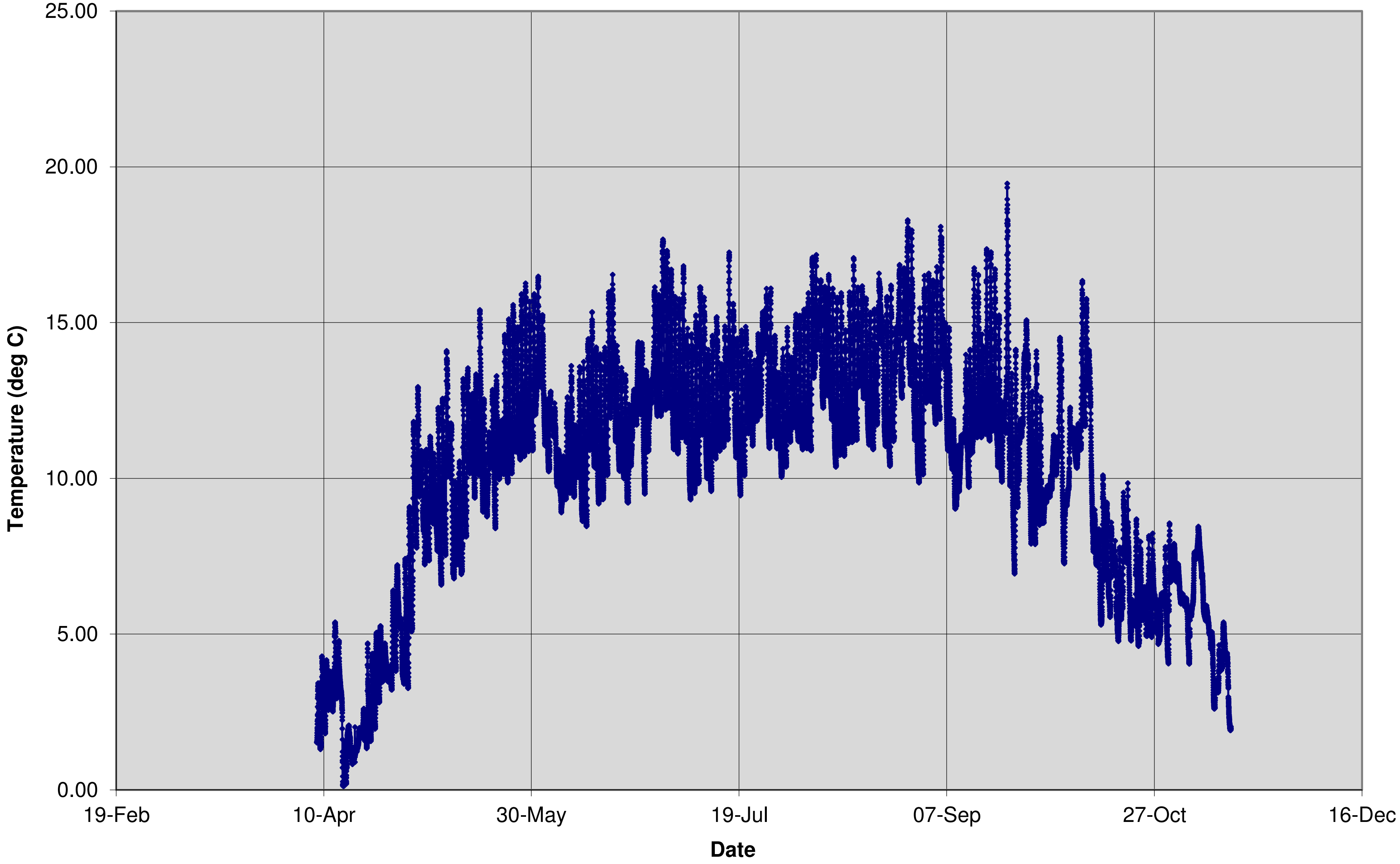



Barologger Recorded Pressure at Victoria/Maltby for 2018
Pressure (m)
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
19-Feb
10-Apr
30-May
19-Jul
7-Sep
27-Oct
16-Dec
Date and Time

Station 7 (Halls) Recorded Temperature for 2018

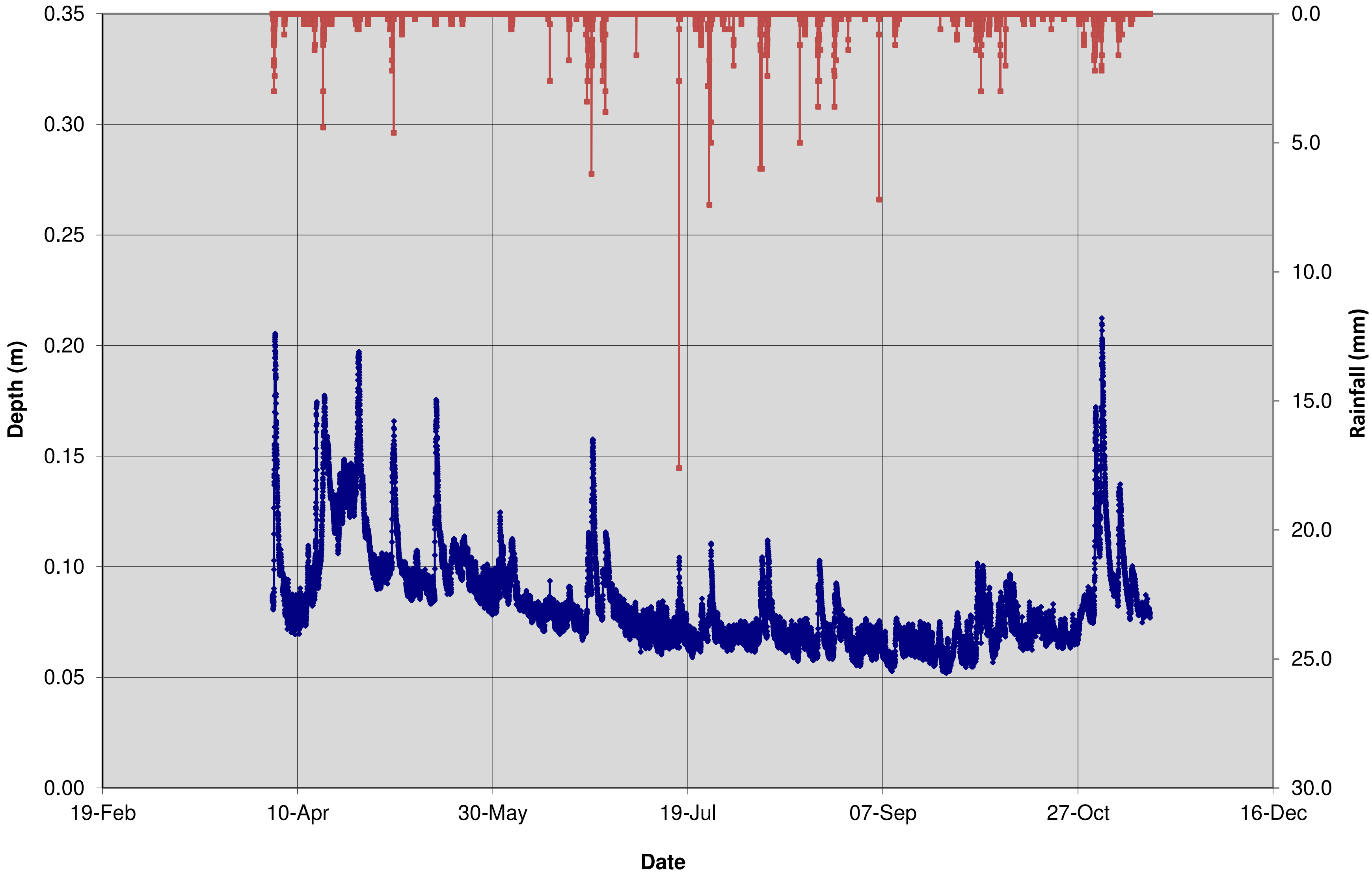


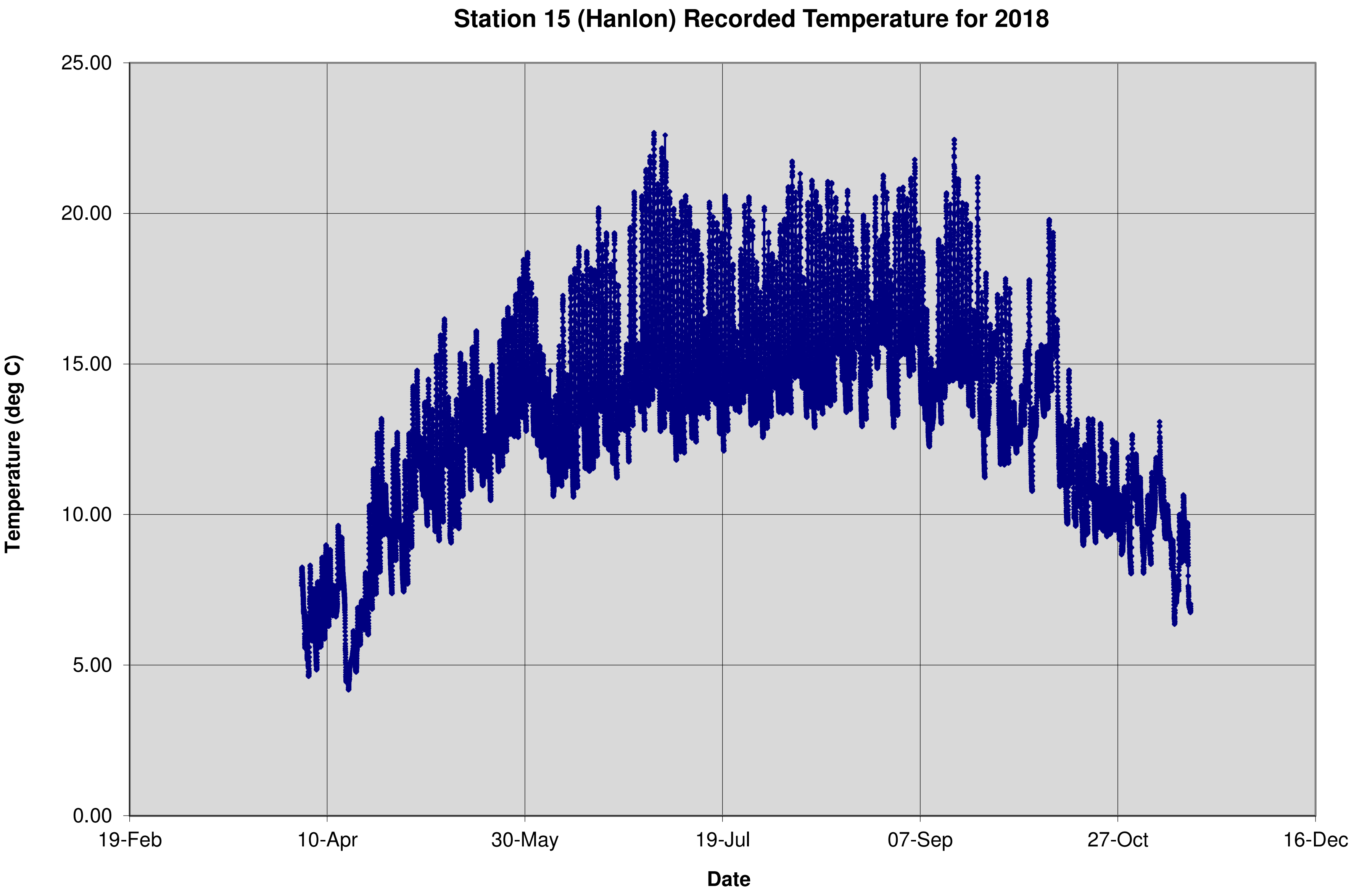

Station 7 (Halls Pond) Recorded Water Level for 2018
Depth (m)
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
19-Feb
10-Apr
30-May
19-Jul
07-Sep
27-Oct
16-Dec
Date



Station 14 (Hammersley) Recorded Temperature for 2018

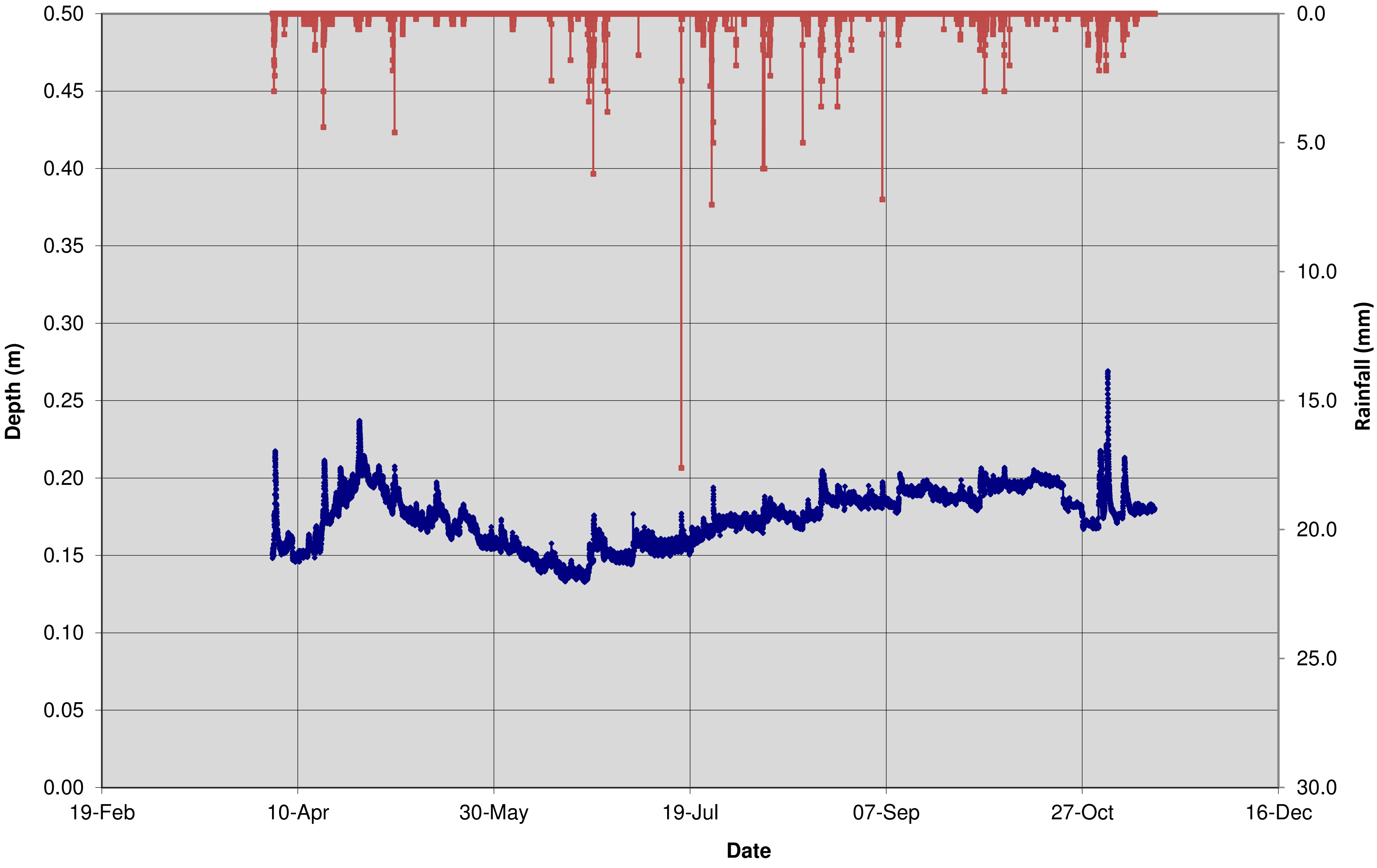
Station 14 (Hammersley) Recorded Water Level for 2018

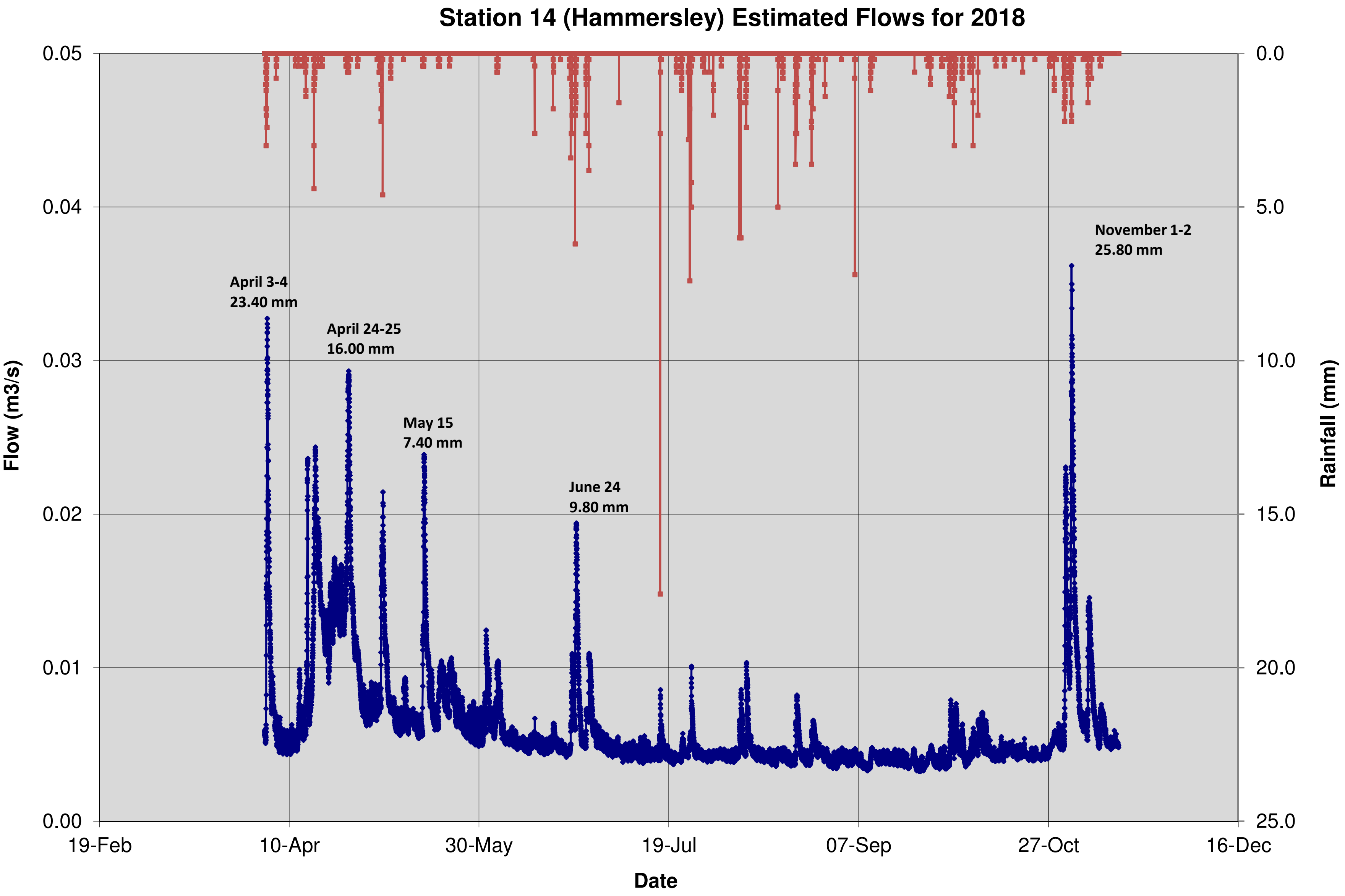


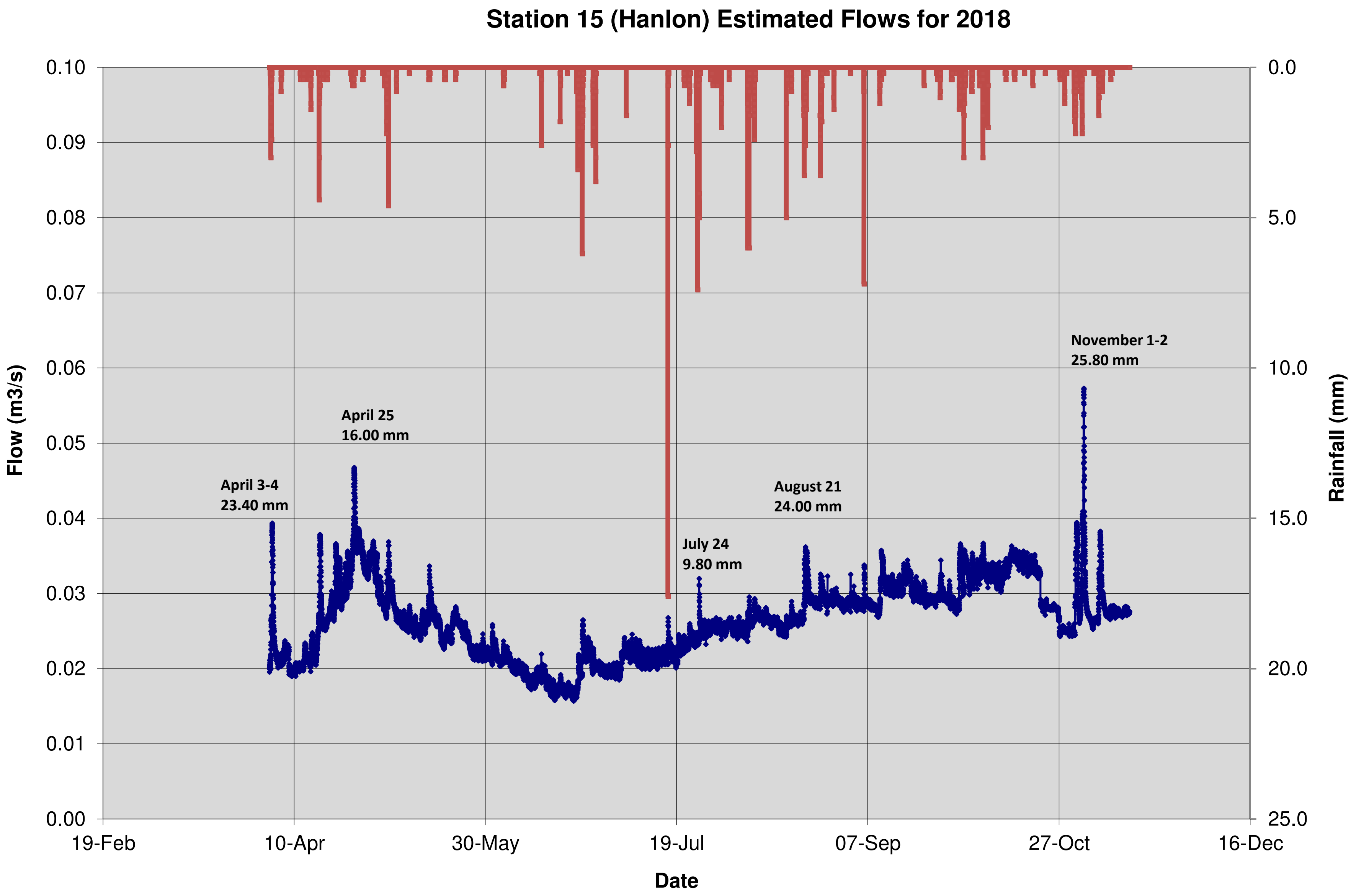


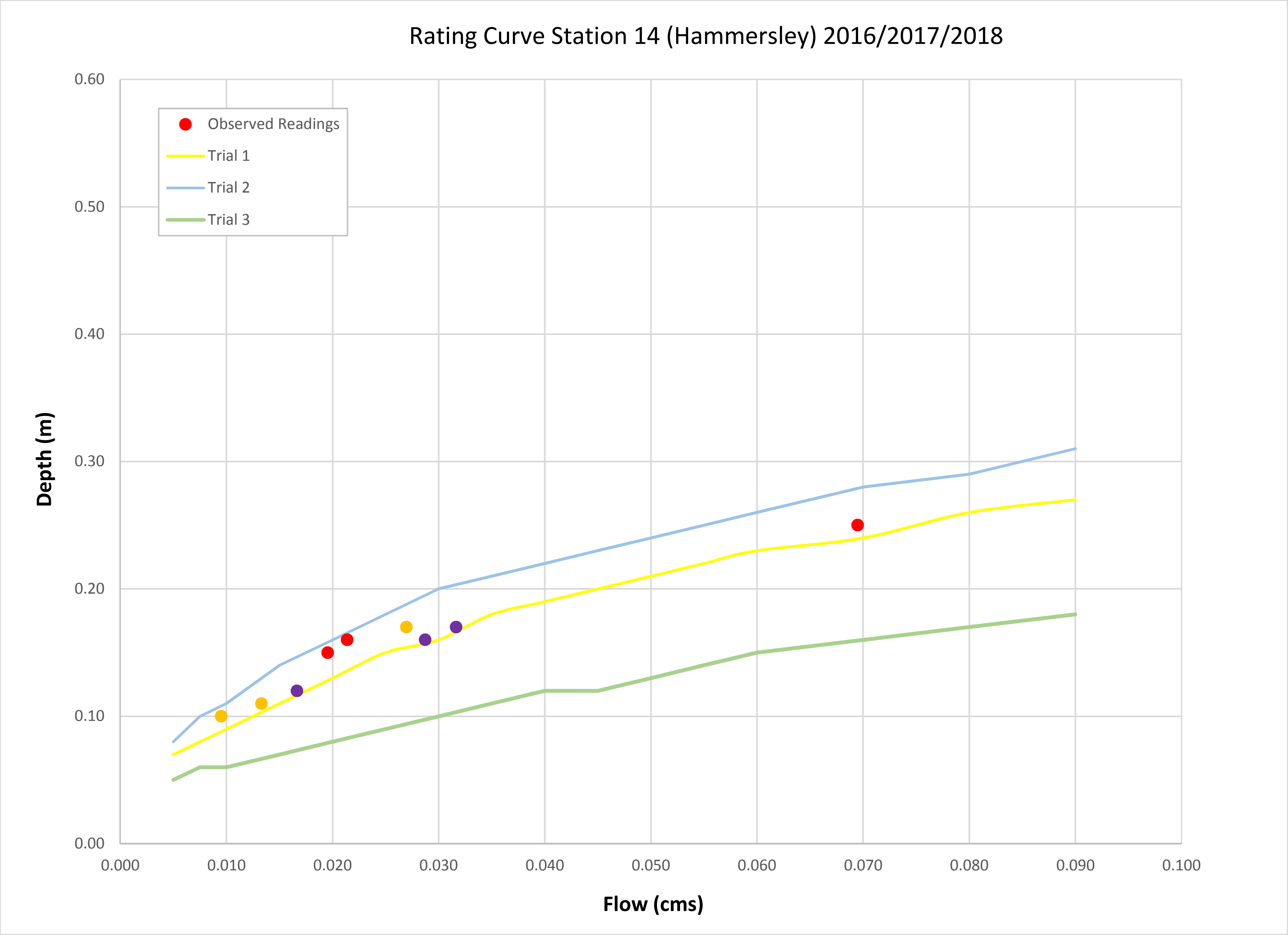
Station 15 (Hanlon) Recorded Temperature for 2018
Temperature (deg C)
25.00
20.00
15.00
10.00
5.00
0.00
19-Feb
10-Apr
30-May
19-Jul
07-Sep
27-Oct
16-Dec
Date

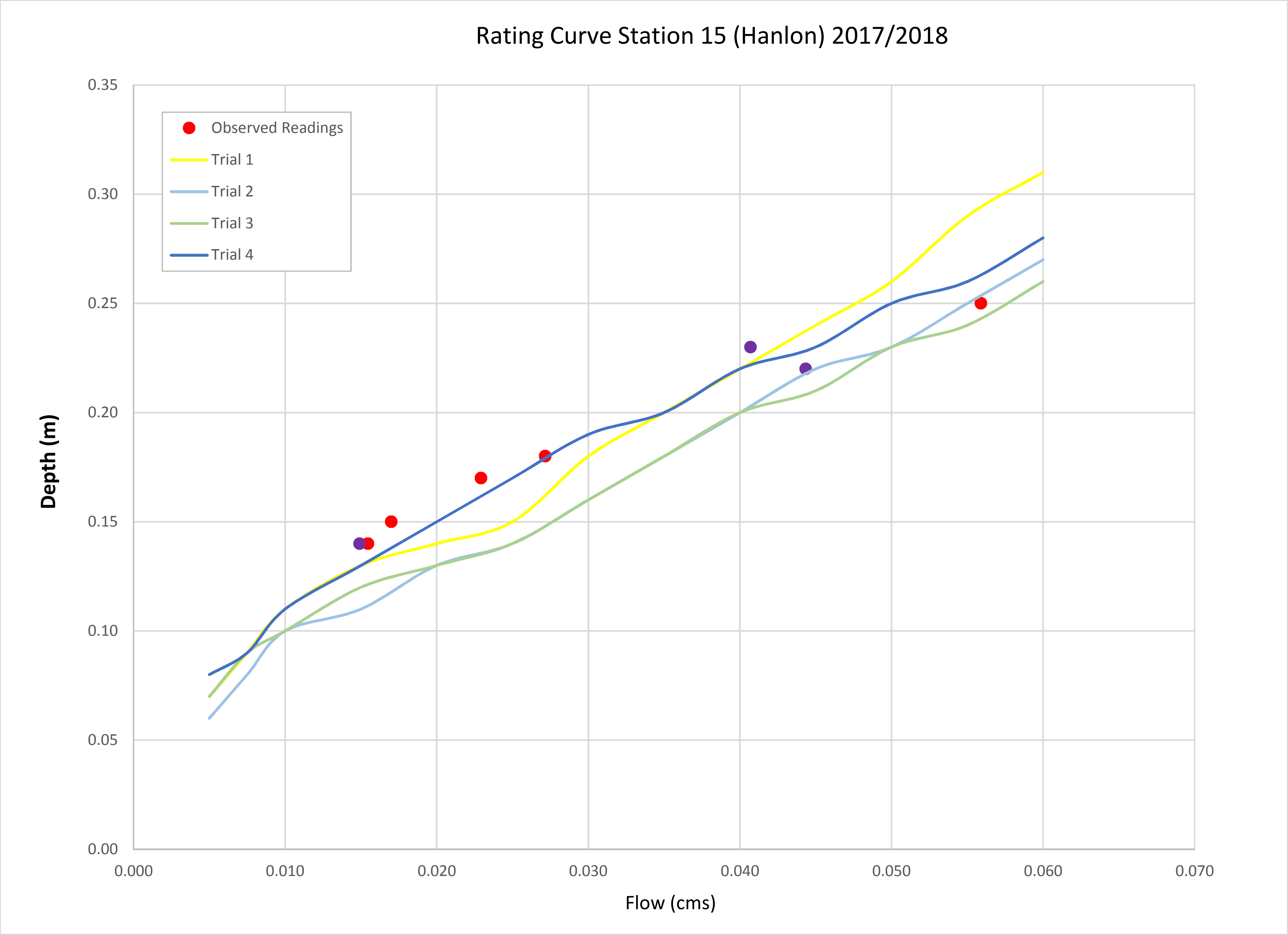
Station 15 (Hanlon) Recorded Water Level for 2018




Station 14 (Hammersley) Estimated Flows for 2018
Flow (m3/s)
0.05
0.04
0.03
0.02
0.01
0.00
Rainfall (mm)
0.0
5.0
10.0
15.0
20.0
25.0
19-Feb
10-Apr
30-May
19-Jul
07-Sep
27-Oct
16-Dec
Date
April 3-4
23.40 mm
April 24-25
16.00 mm
May 15
7.40 mm
June 24
9.80 mm
November 1-2
25.80 mm


Station 15 (Hanlon) Estimated Flows for 2018
Flow (m3/s)
Rainfall (mm)
Date
0.10
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0.00
0.0
5.0
10.0
15.0
20.0
25.0
19-Feb
10-Apr
30-May
19-Jul
07-Sep
27-Oct
16-Dec
April 3-4
23.40 mm
April 25
16.00 mm
July 24
9.80 mm
August 21
24.00 mm
November 1-2
25.80 mm


Rating Curve Station 14 (Hammersley) 2016/2017/2018
Observed Readings
Trial 1
Trial 2
Trial 3
Depth (m)
0.60
0.50
0.40
0.30
0.20
0.10
0.00
0.000
0.010
0.020
0.030
0.040
0.050
0.060
0.070
0.080
0.090
0.100
Flow (cms)

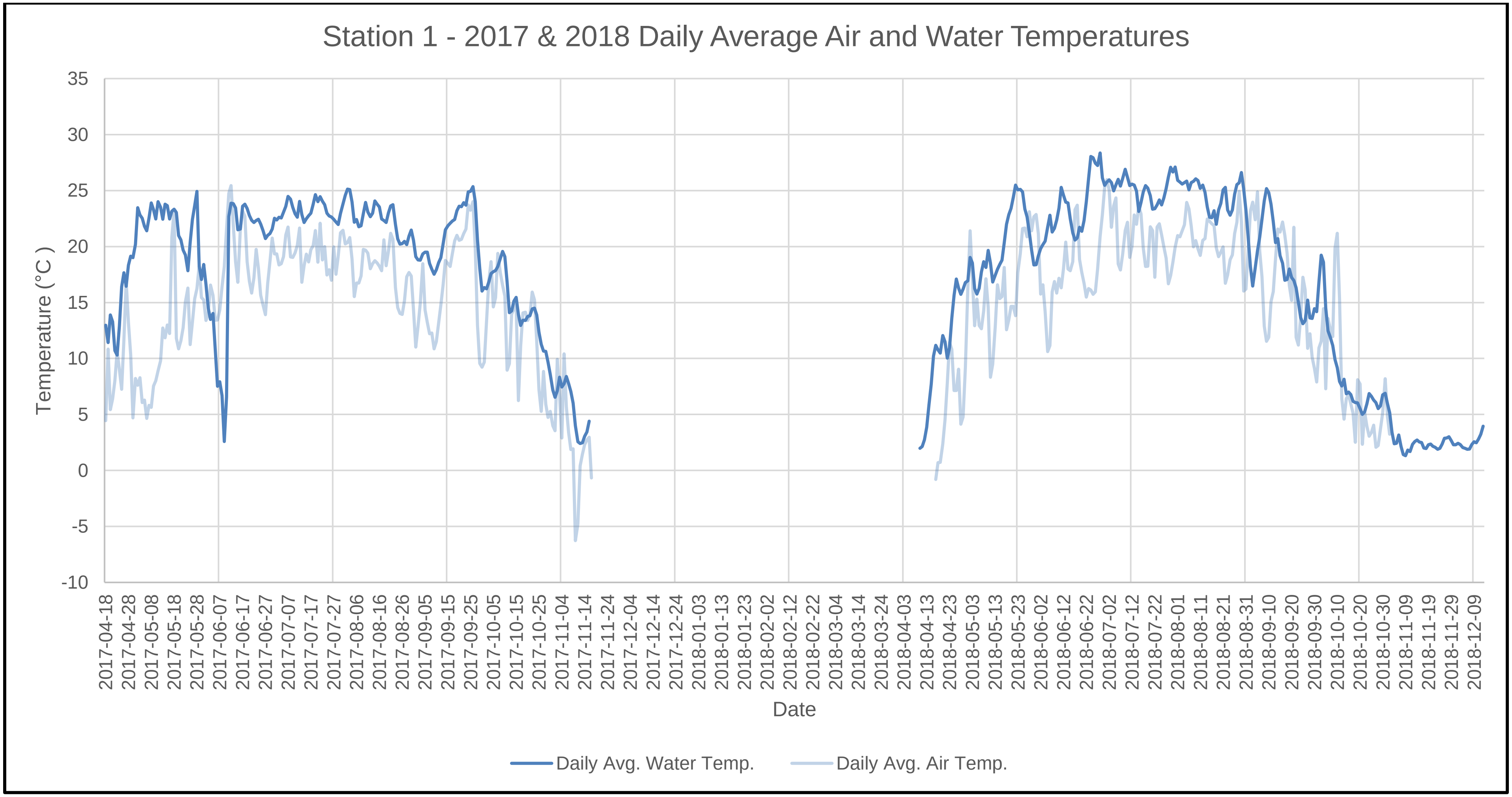

Rating Curve Station 15 (Hanlon) 2017/2018
Observed Readings
Trial 1
Trial 2
Trial 3
Trial 4
Depth (m)
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.000
0.010
0.020
0.030
0.040
0.050
0.060
0.070
Flow (cms)

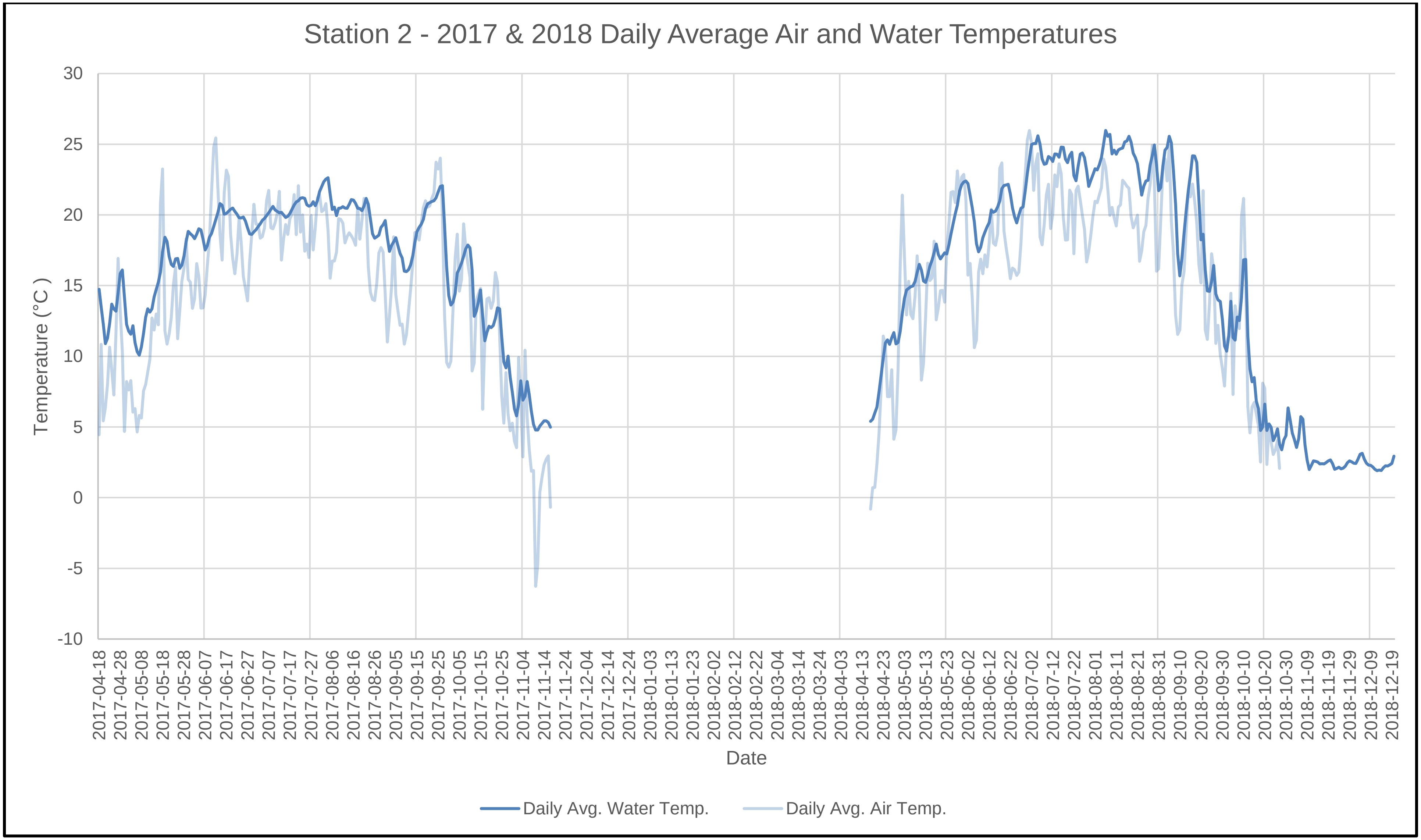
Appendix SW-1B

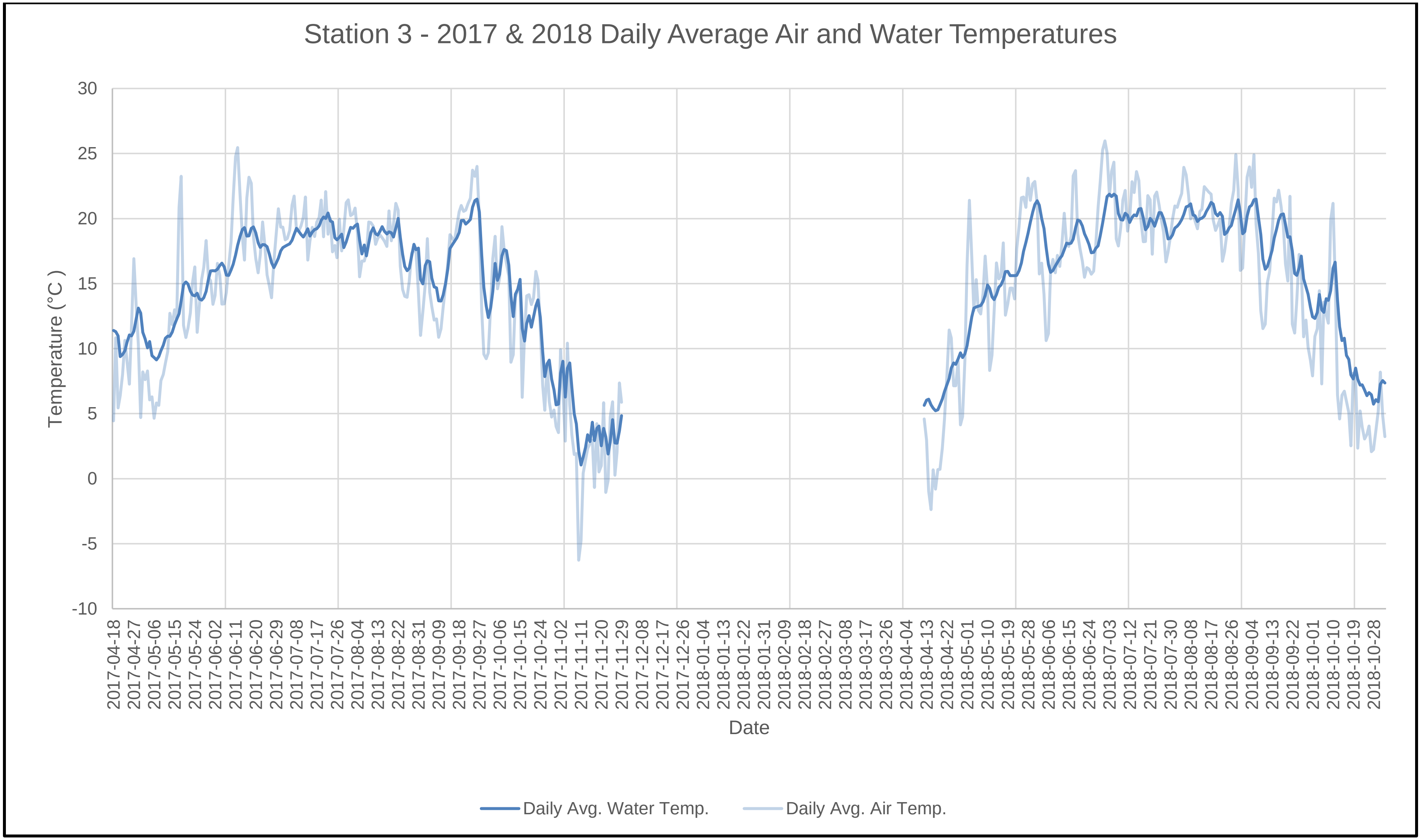
Wetland Water Temperature Graphs (2017 - 2018)

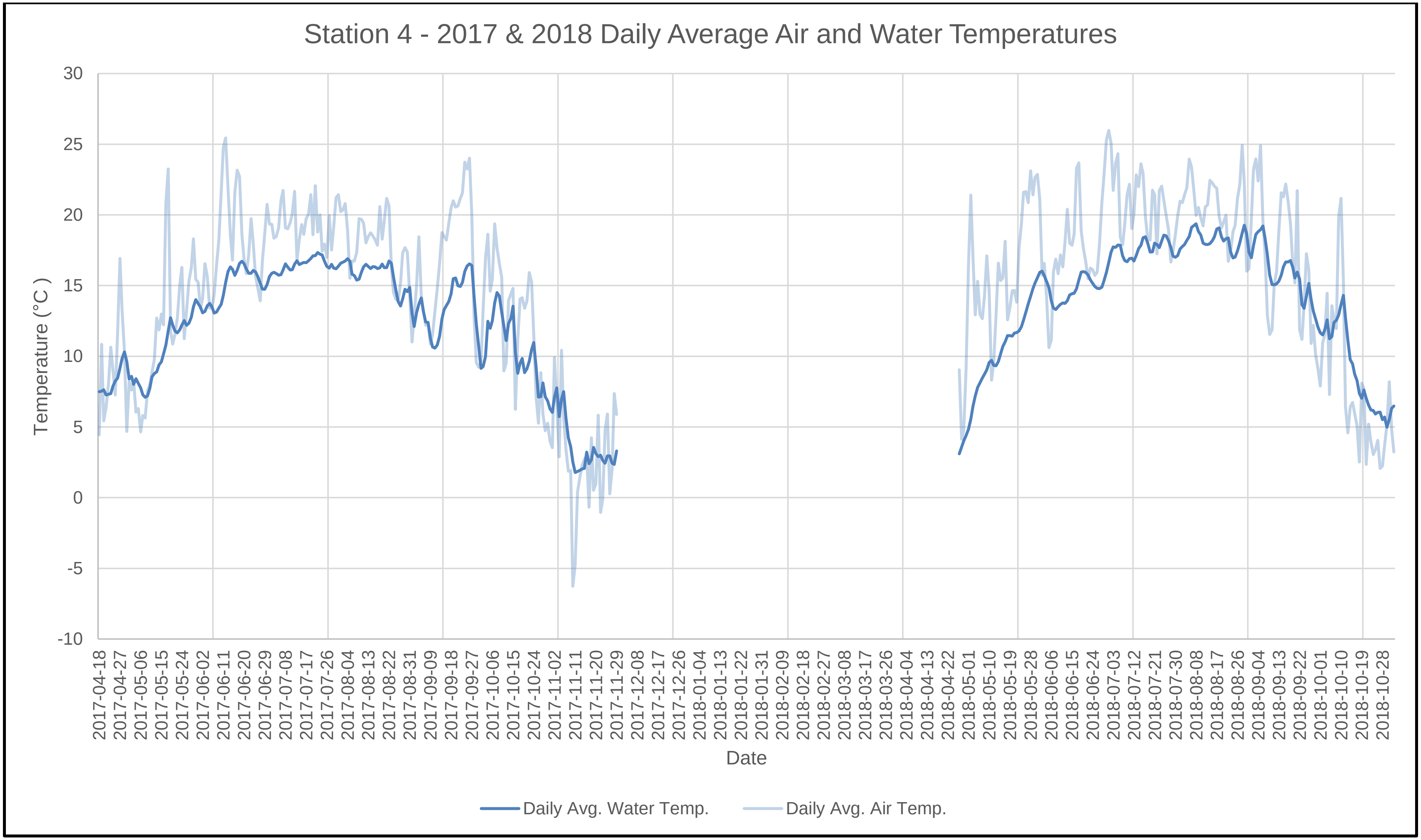
Appendix SW-1A

Appendix SW-1B: Wetland Water Temperature Results (2017 - 2018)

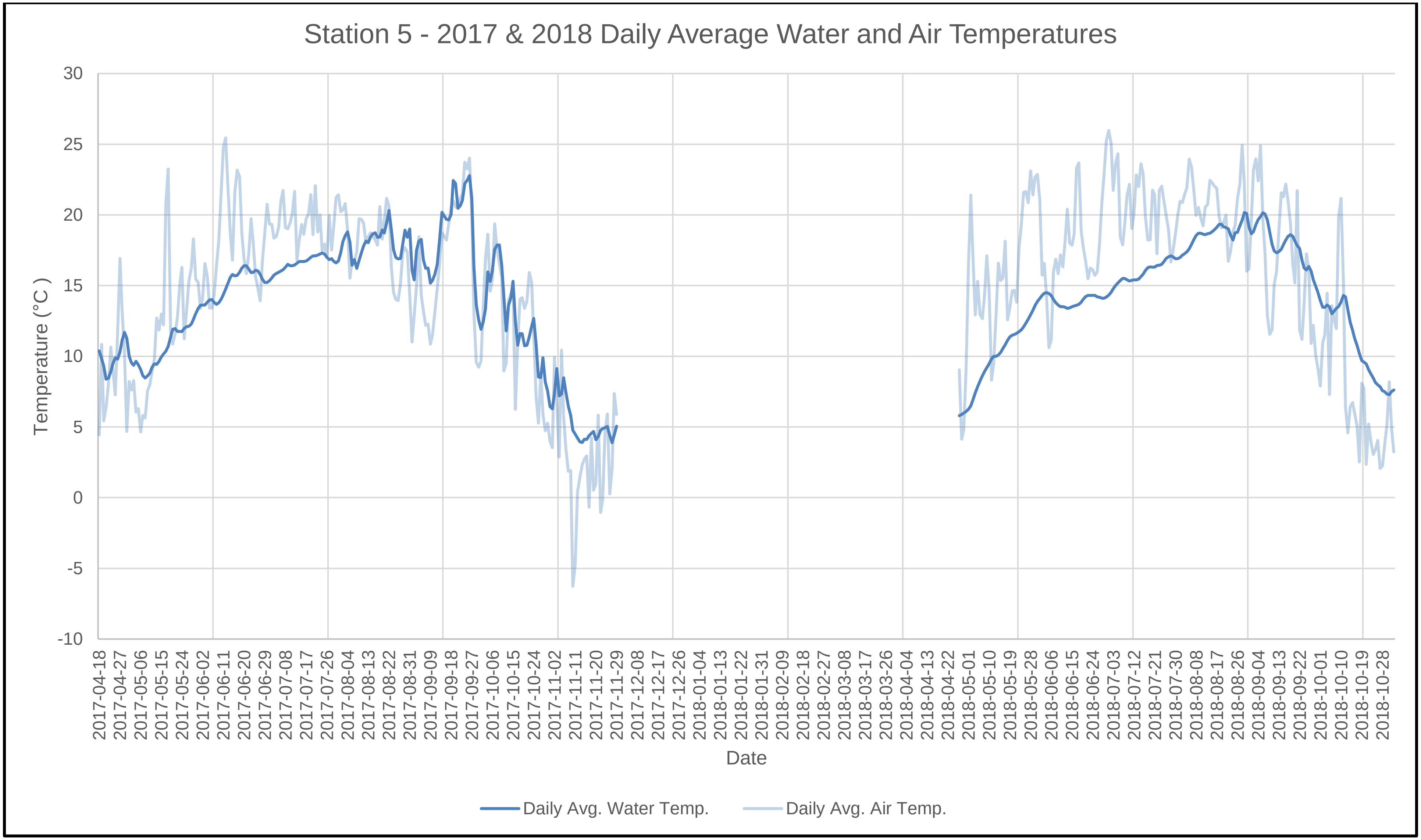


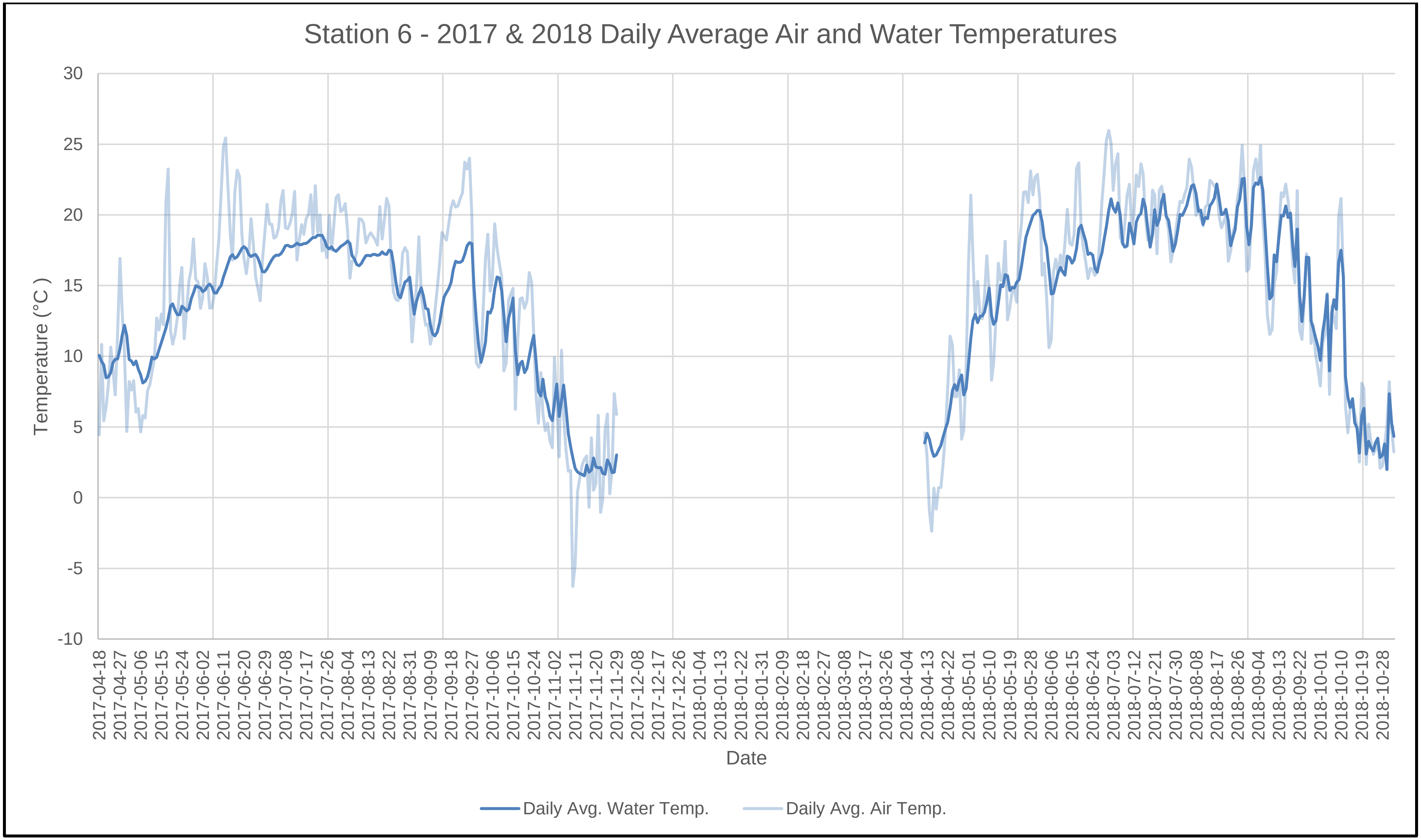

Station 2 - 2017 & 2018 Daily Average Air and Water Temperatures
Temperature (°C)
30
25
20
15
10
5
0
-5
-10
Date
2017-04-18
2017-04-28
2017-05-08
2017-05-18
2017-05-28
2017-06-07
2017-06-17
2017-06-27
2017-07-07
2017-07-17
2017-07-27
2017-08-06
2017-08-16
2017-08-26
2017-09-05
2017-09-15
2017-09-25
2017-10-05
2017-10-15
2017-10-25
2017-11-04
2017-11-14
2017-11-24
2017-12-04
2017-12-14
2017-12-24
2018-01-03
2018-01-13
2018-01-23
2018-02-02
2018-02-12
2018-02-22
2018-03-04
2018-03-14
2018-03-24
2018-04-03
2018-04-13
2018-04-23
2018-05-03
2018-05-13
2018-05-23
2018-06-02
2018-06-12
2018-06-22
2018-07-02
2018-07-12
2018-07-22
2018-08-01
2018-08-11
2018-08-21
2018-08-31
2018-09-10
2018-09-20
2018-09-30
2018-10-10
2018-10-20
2018-10-30
2018-11-09
2018-11-19
2018-11-29
2018-12-09
2018-12-19
Daily Avg. Water Temp.
Daily Avg. Air Temp.


Station 3 - 2017 & 2018 Daily Average Air and Water Temperatures
30
25
20
15
10
5
0
-5
-10
Temperature (°C)
2017-04-18
2017-04-27
2017-05-06
2017-05-15
2017-05-24
2017-06-02
2017-06-11
2017-06-20
2017-06-29
2017-07-08
2017-07-17
2017-07-26
2017-08-04
2017-08-13
2017-08-22
2017-08-31
2017-09-09
2017-09-18
2017-09-27
2017-10-06
2017-10-15
2017-10-24
2017-11-02
2017-11-11
2017-11-20
2017-11-29
2017-12-08
2017-12-17
2017-12-26
2018-01-04
2018-01-13
2018-01-22
2018-01-31
2018-02-09
2018-02-18
2018-02-27
2018-03-08
2018-03-17
2018-03-26
2018-04-04
2018-04-13
2018-04-22
2018-05-01
2018-05-10
2018-05-19
2018-05-28
2018-06-06
2018-06-15
2018-06-24
2018-07-03
2018-07-12
2018-07-21
2018-07-30
2018-08-08
2018-08-17
2018-08-26
2018-09-04
2018-09-13
2018-09-22
2018-10-01
2018-10-10
2018-10-19
2018-10-28
Date
Daily Avg. Water Temp.
Daily Avg. Air Temp.



Station 4 - 2017 & 2018 Daily Average Air and Water Temperatures


Station 5 - 2017 & 2018 Daily Average Water and Air Temperatures
Temperature (°C)
30
25
20
15
10
5
0
-5
-10
Date
2017-04-18
2017-04-27
2017-05-06
2017-05-15
2017-05-24
2017-06-02
2017-06-11
2017-06-20
2017-06-29
2017-07-08
2017-07-17
2017-07-26
2017-08-04
2017-08-13
2017-08-22
2017-08-31
2017-09-09
2017-09-18
2017-09-27
2017-10-06
2017-10-15
2017-10-24
2017-11-02
2017-11-11
2017-11-20
2017-11-29
2017-12-08
2017-12-17
2017-12-26
2018-01-04
2018-01-13
2018-01-22
2018-01-31
2018-02-09
2018-02-18
2018-02-27
2018-03-08
2018-03-17
2018-03-26
2018-04-04
2018-04-13
2018-04-22
2018-05-01
2018-05-10
2018-05-19
2018-05-28
2018-06-06
2018-06-15
2018-06-24
2018-07-03
2018-07-12
2018-07-21
2018-07-30
2018-08-08
2018-08-17
2018-08-26
2018-09-04
2018-09-13
2018-09-22
2018-10-01
2018-10-10
2018-10-19
2018-10-28
Daily Avg. Water Temp.
Daily Avg. Air Temp.


Station 6 - 2017 & 2018 Daily Average Air and Water Temperatures
Temperature (°C)
30
25
20
15
10
5
0
-5
-10
Date
2017-04-18
2017-04-27
2017-05-06
2017-05-15
2017-05-24
2017-06-02
2017-06-11
2017-06-20
2017-06-29
2017-07-08
2017-07-17
2017-07-26
2017-08-04
2017-08-13
2017-08-22
2017-08-31
2017-09-09
2017-09-18
2017-09-27
2017-10-06
2017-10-15
2017-10-24
2017-11-02
2017-11-11
2017-11-20
2017-11-29
2017-12-08
2017-12-17
2017-12-26
2018-01-04
2018-01-13
2018-01-22
2018-01-31
2018-02-09
2018-02-18
2018-02-27
2018-03-08
2018-03-17
2018-03-26
2018-04-04
2018-04-13
2018-04-22
2018-05-01
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2018-06-15
2018-06-24
2018-07-03
2018-07-12
2018-07-21
2018-07-30
2018-08-08
2018-08-17
2018-08-26
2018-09-04
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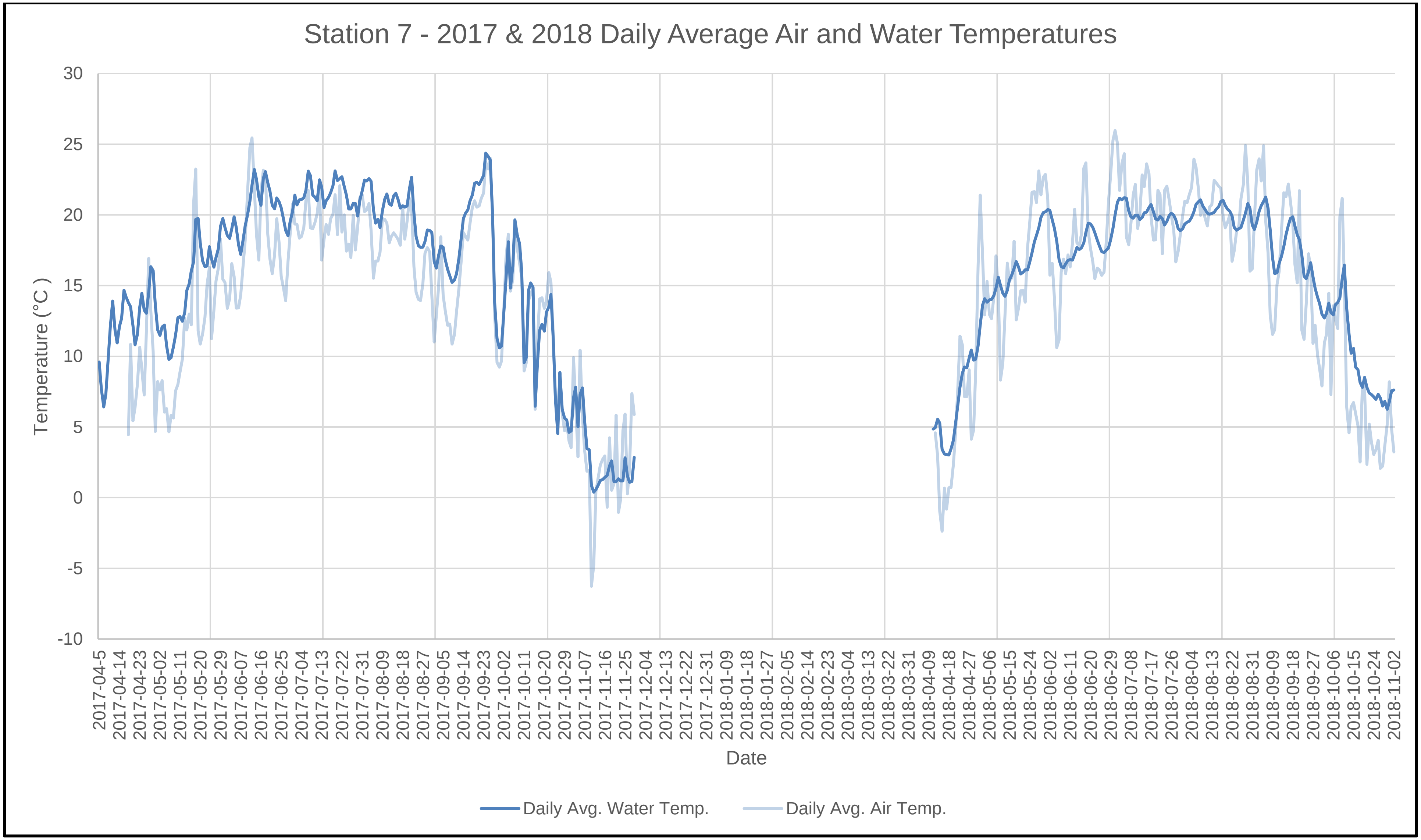
2018-10-01
2018-10-10
2018-10-19
2018-10-28
Daily Avg. Water Temp.
Daily Avg. Air Temp.


Station 7 - 2017 & 2018 Daily Average Air and Water Temperatures
Temperature (°C)
30
25
20
15
10
5
0
-5
-10
Date
2017-04-5
2017-04-14
2017-04-23
2017-05-02
2017-05-11
2017-05-20
2017-05-29
2017-06-07
2017-06-16
2017-06-25
2017-07-04
2017-07-13
2017-07-22
2017-07-31
2017-08-09
2017-08-18
2017-08-27
2017-09-05
2017-09-14
2017-09-23
2017-10-02
2017-10-11
2017-10-20
2017-10-29
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2017-11-16
2017-11-25
2017-12-04
2017-12-13
2017-12-22
2017-12-31
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2018-01-18
2018-01-27
2018-02-05
2018-02-14
2018-02-23
2018-03-04
2018-03-13
2018-03-22
2018-03-31
2018-04-09
2018-04-18
2018-04-27
2018-05-06
2018-05-15
2018-05-24
2018-06-02
2018-06-11
2018-06-20
2018-06-29
2018-07-08
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2018-08-04
2018-08-13
2018-08-22
2018-08-31
2018-09-09
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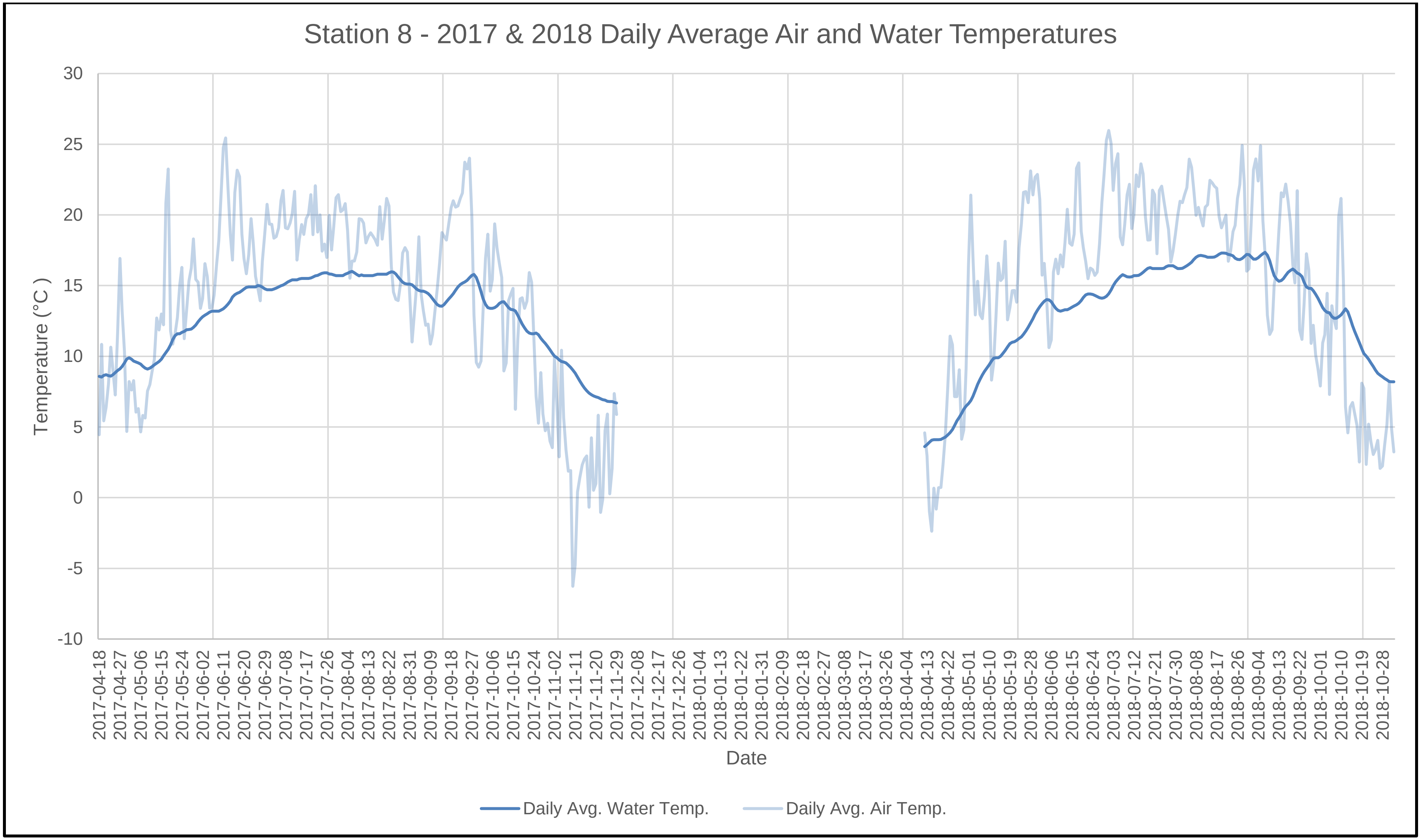
2018-10-15
2018-10-24
2018-11-02
Daily Avg. Water Temp.
Daily Avg. Air Temp.


Station 8 - 2017 & 2018 Daily Average Air and Water Temperatures
Temperature (°C)
30
25
20
15
10
5
0
-5
-10
Date
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2017-04-27
2017-05-06
2017-05-15
2017-05-24
2017-06-02
2017-06-11
2017-06-20
2017-06-29
2017-07-08
2017-07-17
2017-07-26
2017-08-04
2017-08-13
2017-08-22
2017-08-31
2017-09-09
2017-09-18
2017-09-27
2017-10-06
2017-10-15
2017-10-24
2017-11-02
2017-11-11
2017-11-20
2017-11-29
2017-12-08
2017-12-17
2017-12-26
2018-01-04
2018-01-13
2018-01-22
2018-01-31
2018-02-09
2018-02-18
2018-02-27
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2018-03-17
2018-03-26
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2018-05-28
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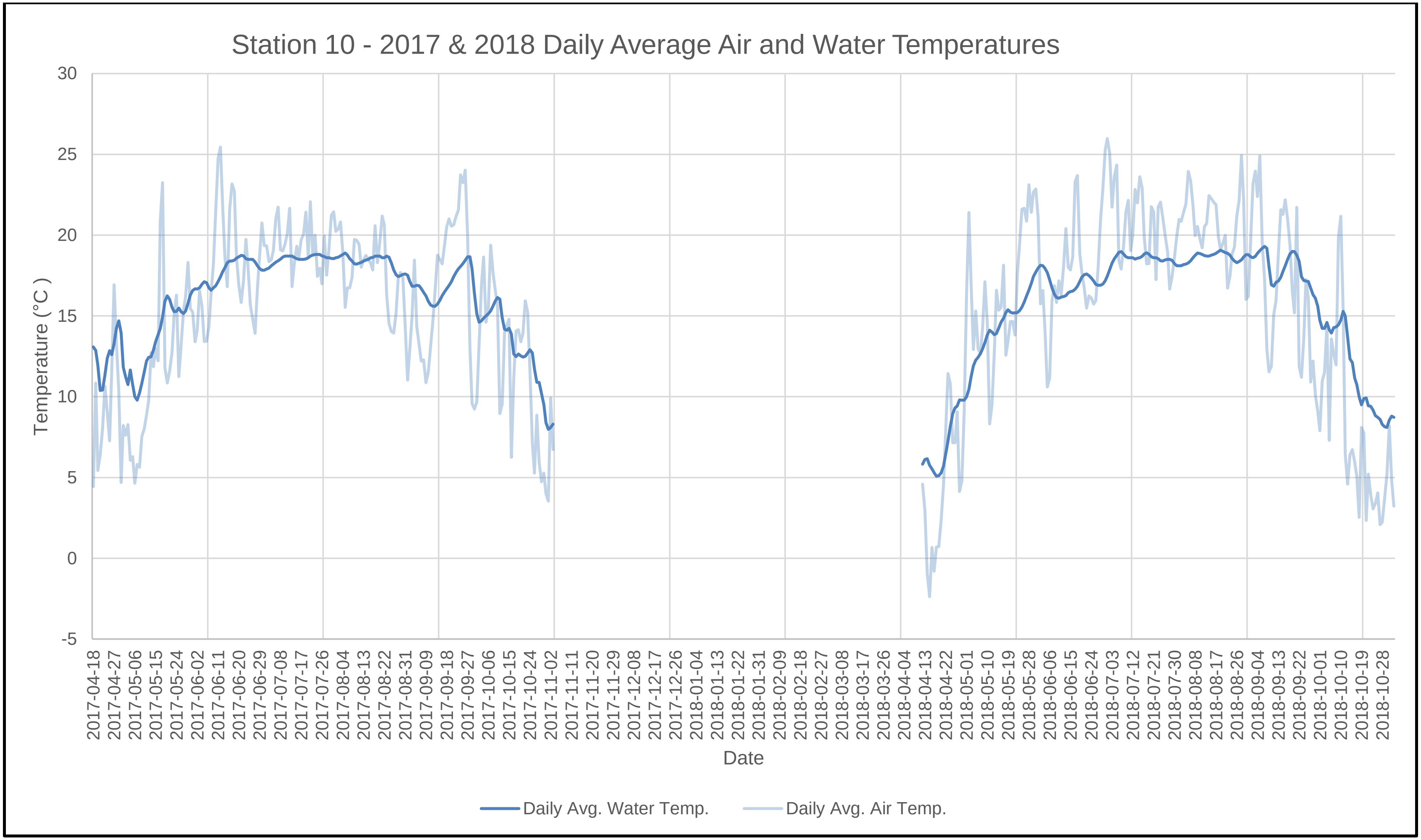
2018-06-15
2018-06-24
2018-07-03
2018-07-12
2018-07-21
2018-07-30
2018-08-08
2018-08-17
2018-08-26
2018-09-04
2018-09-13
2018-09-22
2018-10-01
2018-10-10
2018-10-19
2018-10-28
Daily Avg. Water Temp.
Daily Avg. Air Temp.


Station 10 - 2017 & 2018 Daily Average Air and Water Temperatures
Temperature (°C)
30
25
20
15
10
5
0
-5
Date
2017-04-18
2017-04-27
2017-05-06
2017-05-15
2017-05-24
2017-06-02
2017-06-11
2017-06-20
2017-06-29
2017-07-08
2017-07-17
2017-07-26
2017-08-04
2017-08-13
2017-08-22
2017-08-31
2017-09-09
2017-09-18
2017-09-27
2017-10-06
2017-10-15
2017-10-24
2017-11-02
2017-11-11
2017-11-20
2017-11-29
2017-12-08
2017-12-17
2017-12-26
2018-01-04
2018-01-13
2018-01-22
2018-01-31
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2018-03-08
2018-03-17
2018-03-26
2018-04-04
2018-04-13
2018-04-22
2018-05-01
2018-05-10
2018-05-19
2018-05-28
2018-06-06
2018-06-15
2018-06-24
2018-07-03
2018-07-12
2018-07-21
2018-07-30
2018-08-08
2018-08-17
2018-08-26
2018-09-04
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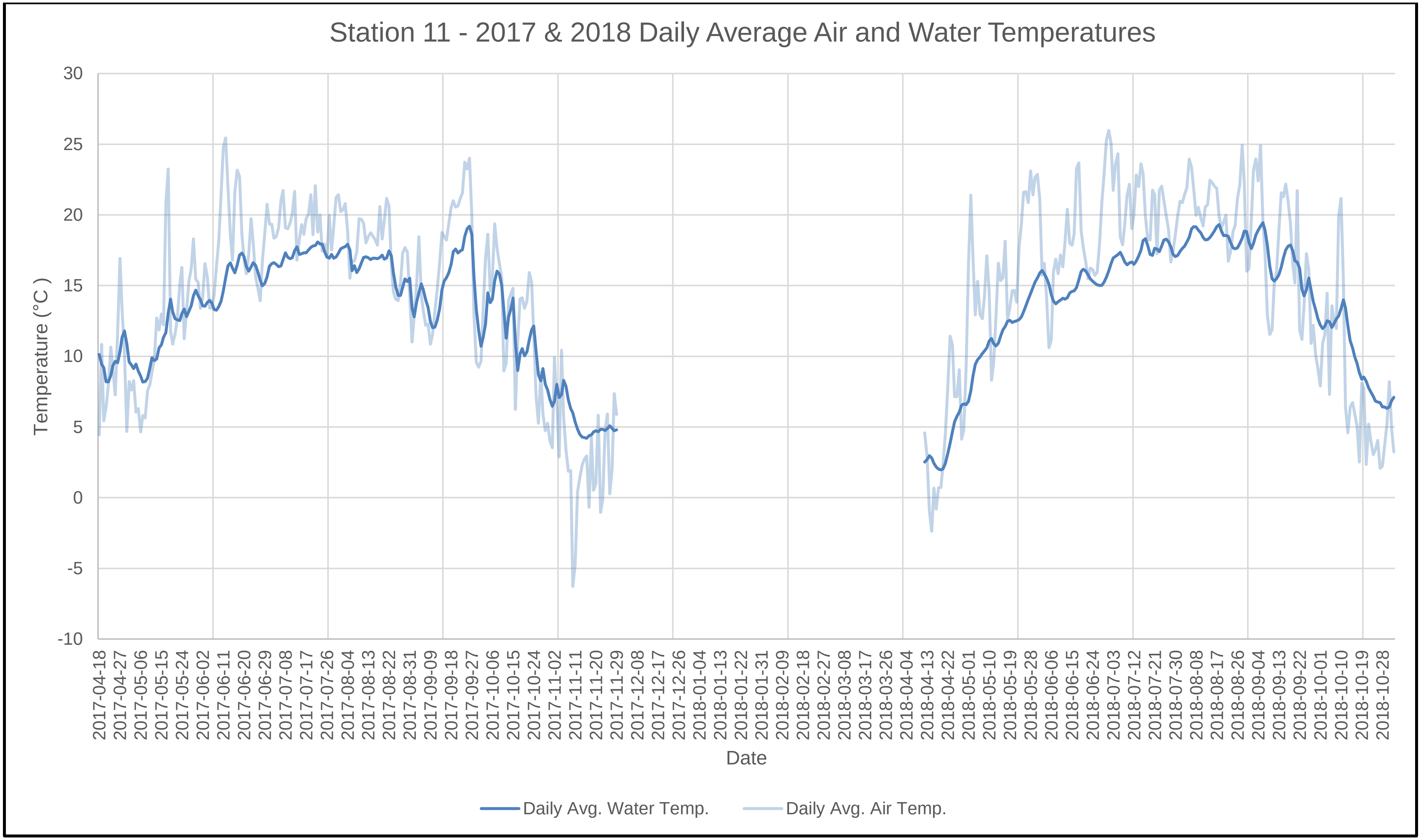
2018-09-22
2018-10-01
2018-10-10
2018-10-19
2018-10-28
Daily Avg. Water Temp.
Daily Avg. Air Temp.


Station 11 - 2017 & 2018 Daily Average Air and Water Temperatures
Temperature (°C)
30
25
20
15
10
5
0
-5
-10
2017-04-18
2017-04-27
2017-05-06
2017-05-15
2017-05-24
2017-06-02
2017-06-11
2017-06-20
2017-06-29
2017-07-08
2017-07-17
2017-07-26
2017-08-04
2017-08-13
2017-08-22
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2017-10-06
2017-10-15
2017-10-24
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2018-01-04
2018-01-13
2018-01-22
2018-01-31
2018-02-09
2018-02-18
2018-02-27
2018-03-08
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2018-04-13
2018-04-22
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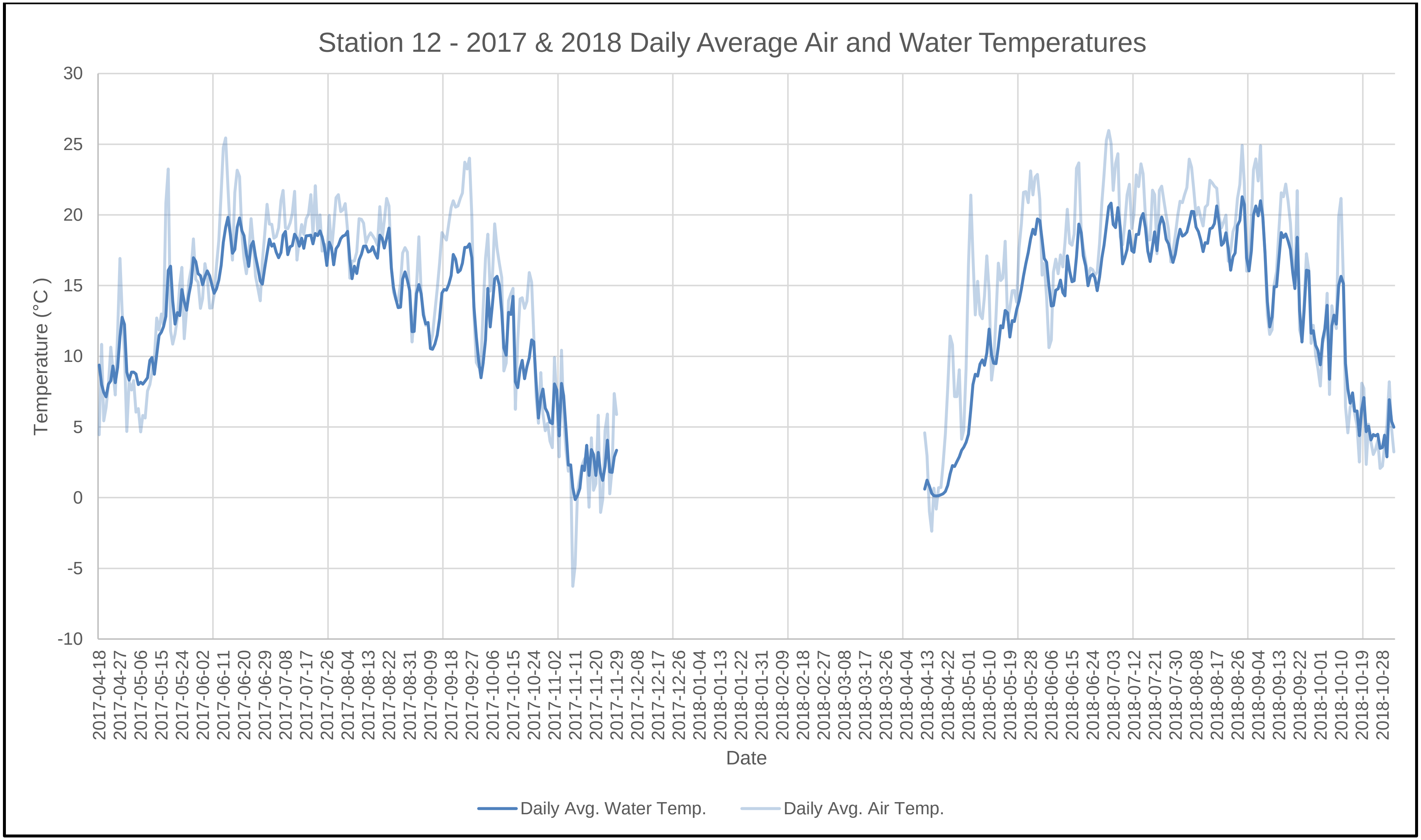
2018-06-15
2018-06-24
2018-07-03
2018-07-12
2018-07-21
2018-07-30
2018-08-08
2018-08-17
2018-08-26
2018-09-04
2018-09-13
2018-09-22
2018-10-01
2018-10-10
2018-10-19
2018-10-28
Date
Daily Avg. Water Temp.
Daily Avg. Air Temp.


Station 12 - 2017 & 2018 Daily Average Air and Water Temperatures
Temperature (°C)
30
25
20
15
10
5
0
-5
-10
2017-04-18
2017-04-27
2017-05-06
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2017-05-24
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2017-06-11
2017-06-20
2017-06-29
2017-07-08
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2017-08-13
2017-08-22
2017-08-31
2017-09-09
2017-09-18
2017-09-27
2017-10-06
2017-10-15
2017-10-24
2017-11-02
2017-11-11
2017-11-20
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2017-12-08
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2018-01-13
2018-01-22
2018-01-31
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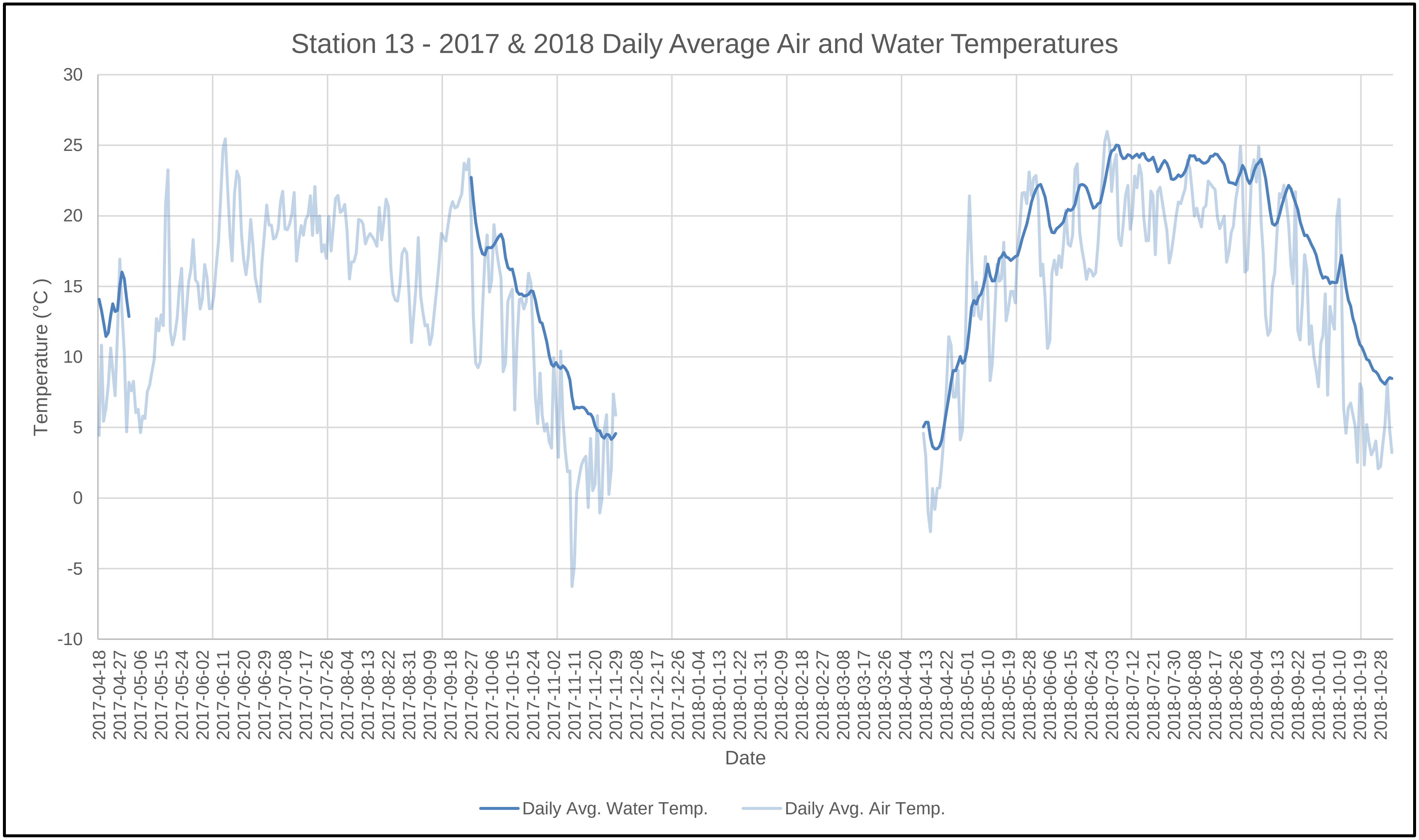
2018-02-27
2018-03-08
2018-03-17
2018-03-26
2018-04-04
2018-04-13
2018-04-22
2018-05-01
2018-05-10
2018-05-19
2018-05-28
2018-06-06
2018-06-15
2018-06-24
2018-07-03
2018-07-12
2018-07-21
2018-07-30
2018-08-08
2018-08-17
2018-08-26
2018-09-04
2018-09-13
2018-09-22
2018-10-01
2018-10-10
2018-10-19
2018-10-28
Date
Daily Avg. Water Temp.
Daily Avg. Air Temp.


Station 13 - 2017 & 2018 Daily Average Air and Water Temperatures
Temperature (°C)
30
25
20
15
10
5
0
-5
-10
Date
2017-04-18
2017-04-27
2017-05-06
2017-05-15
2017-05-24
2017-06-02
2017-06-11
2017-06-20
2017-06-29
2017-07-08
2017-07-17
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2017-08-22
2017-08-31
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2017-09-18
2017-09-27
2017-10-06
2017-10-15
2017-10-24
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2017-11-11
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2018-06-24
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2018-07-12
2018-07-21
2018-07-30
2018-08-08
2018-08-17
2018-08-26
2018-09-04
2018-09-13
2018-09-22
2018-10-01
2018-10-10
2018-10-19
2018-10-28
Daily Avg. Water Temp.
Daily Avg. Air Temp.

Appendix SW-1C

Wetland Water Quality Data
(2017 - 2018)

Station 7 WQ 2016 Summary 216002 - Clair/Maltby				4-Aug-2016 11:00	17-Aug-2016 11:40	22-Sep-2016 14:55	20-Oct-2016 13:55
Parameter	Lowest Detection Limit	Units	PWQO Surface Water Parameter Limits	8/4/2016 (11:00)	8/17/2016 (11:40)	9/22/2016 (14:55)	10/20/2016 (13:55)
Physical Tests (Water)							
Total Suspended Solids	2.0	mg/L		6.8	10.7	79.4	15.8
Total Dissolved Solids	20	mg/L		178	170	149	153
Anions and Nutrients (Water)							
Ammonia, Total (as N)	0.020	mg/L	0.02	0.028	<0.020	0.025	0.082
Bromide (Br)	0.10	mg/L		<0.10	<0.10	<0.10	<0.10
Chloride (Cl)	0.50	mg/L		9.92	10.1	12.3	12.7
Fluoride (F)	0.020	mg/L		0.042	0.043	0.067	0.044
Nitrate (as N)	0.020	mg/L		<0.020	<0.020	<0.020	<0.020
Nitrite (as N)	0.010	mg/L		<0.010	<0.010	<0.010	<0.010
Total Kjeldahl Nitrogen	0.15	mg/L		1.41	1.65	2.30	1.68
Orthophosphate-Dissolved (as P)	0.0030	mg/L		<0.0030	<0.0030	<0.0030	<0.0030
Phosphorus, Total	0.0030	mg/L	0.03	**0.0540**	**0.0742**	**0.173**	**0.0743**
Sulfate (SO4)	0.30	mg/L		<0.30	<0.30	<0.30	<0.30
Total Metals (Water)							
Aluminum (Al)-Total	0.010	mg/L	0.075	**0.027**	**0.027**	**0.263**	<0.010
Antimony (Sb)-Total	0.00010	mg/L	0.02	<0.00010	0.00012	<0.00010	0.00018
Arsenic (As)-Total	0.00010	mg/L	0.1	0.00064	0.00079	0.00062	0.00049
Barium (Ba)-Total	0.00020	mg/L		0.0502	0.0130	0.0123	0.0084
Beryllium (Be)-Total	0.00010	mg/L	0.011	<0.00010	<0.00010	<0.00010	<0.00010
Bismuth (Bi)-Total	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050
Boron (B)-Total	0.010	mg/L	0.2	0.013	0.014	0.015	0.011
Cadmium (Cd)-Total	0.000010	mg/L	0.0002	<0.000010	<0.000010	0.000022	<0.000010
Calcium (Ca)-Total	0.50	mg/L		32.7	30.9	24.4	30.6
Cesium (Cs)-Total	0.000010	mg/L		<0.000010	<0.000010	0.000026	<0.000010
Chromium (Cr)-Total	0.00050	mg/L		<0.00050	<0.00050	<0.00050	<0.00050
Cobalt (Co)-Total	0.00010	mg/L	0.0009	<0.00010	<0.00010	0.00015	<0.00010
Copper (Cu)-Total	0.0010	mg/L	0.005	<0.0010	<0.0010	<0.0010	<0.0010
Iron (Fe)-Total	0.050	mg/L	0.3	**0.371**	**0.457**	**0.491**	<0.050
Lead (Pb)-Total	0.00010	mg/L	0.001	0.00038	0.00053	**0.00207**	<0.00010
Magnesium (Mg)-Total	0.050	mg/L		8.72	7.55	7.65	6.98
Manganese (Mn)-Total	0.00050	mg/L		0.111	0.0780	0.0317	0.0150
Molybdenum (Mo)-Total	0.000050	mg/L	0.04	<0.000050	<0.000050	0.000069	<0.000050
Nickel (Ni)-Total	0.00050	mg/L	0.025	<0.00050	<0.00050	<0.00050	<0.00050
Potassium (K)-Total	0.050	mg/L		1.37	1.80	1.26	2.02
Rubidium (Rb)-Total	0.00020	mg/L		0.00045	0.00073	0.00088	0.00105
Selenium (Se)-Total	0.000050	mg/L	0.1	0.000062	0.000068	0.000082	<0.000050
Silicon (Si)-Total	0.050	mg/L		0.685	1.13	1.42	0.72
Silver (Ag)-Total	0.000050	mg/L	0.0001	<0.000050	<0.000050	<0.000050	<0.000050

Strontium (Sr)-Total	0.0010	mg/L		0.0650	0.0368	0.0340	0.0412
Sulfur (S)-Total	0.50	mg/L		0.52	<0.50	<0.50	<0.50
Tellurium (Te)-Total	0.00020	mg/L		<0.00020	<0.00020	<0.00020	<0.00020
Thallium (Tl)-Total	0.000010	mg/L	0.0003	<0.000010	<0.000010	<0.000010	<0.000010
Thorium (Th)-Total	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010
Tin (Sn)-Total	0.00010	mg/L		0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Total	0.00030	mg/L		0.00051	0.00078	0.00690	<0.00030
Tungsten (W)-Total	0.00010	mg/L	0.03	<0.00010	<0.00010	<0.00010	<0.00010
Uranium (U)-Total	0.000010	mg/L	0.005	<0.000010	<0.000010	0.000016	<0.000010
Vanadium (V)-Total	0.00050	mg/L	0.006	<0.00050	<0.00050	0.00083	<0.00050
Zinc (Zn)-Total	0.0030	mg/L	0.02	0.0043	0.0032	0.0100	<0.0030
Zirconium (Zr)-Total	0.00030	mg/L	0.004	<0.00030	<0.00030	<0.00030	<0.00030

Station 14 WQ 2016 Summary 216002- Clair/Maltby				4-Aug-2016 10:12	17-Aug-2016 10:55	22-Sep-2016 14:17	20-Oct-2016 13:55
Parameter	Lowest Detection Limit	Units	PWQO Surface Water Parameter Limits	8/4/2016 (10:12)	8/17/2016 (10:55)	9/22/2016 (14:17)	10/20/2016 (13:55)
Physical Tests (Water)							
Total Suspended Solids	2.0	mg/L		<2.0	2.5	<2.0	4.0
Total Dissolved Solids	20	mg/L		388	362	379	350
Anions and Nutrients (Water)							
Ammonia, Total (as N)	0.020	mg/L	0.02	<0.020	0.043	0.032	0.074
Bromide (Br)	0.10	mg/L		<0.10	<0.10	<0.10	<0.10
Chloride (Cl)	0.50	mg/L		38.0	33.5	36.7	33.6
Fluoride (F)	0.020	mg/L		0.050	0.051	0.064	0.042
Nitrate (as N)	0.020	mg/L		0.741	0.610	0.704	0.497
Nitrite (as N)	0.010	mg/L		<0.010	<0.010	<0.010	<0.010
Total Kjeldahl Nitrogen	0.15	mg/L		0.26	<0.15	0.21	0.31
Orthophosphate-Dissolved (as P)	0.0030	mg/L		0.0046	0.0097	0.0050	<0.0030
Phosphorus, Total	0.0030	mg/L	0.03	0.0056	0.0094	0.0069	0.0075
Sulfate (SO4)	0.30	mg/L		20.0	17.2	18.9	18.1
Total Metals (Water)							
Aluminum (Al)-Total	0.010	mg/L	0.075	<0.010	<0.010	<0.010	<0.010
Antimony (Sb)-Total	0.00010	mg/L	0.02	<0.00010	0.00011	<0.00010	0.00018
Arsenic (As)-Total	0.00010	mg/L	0.1	0.00017	0.00020	0.00017	0.00049
Barium (Ba)-Total	0.00020	mg/L		0.0609	0.0519	0.0586	0.00840
Beryllium (Be)-Total	0.00010	mg/L	0.011	<0.00010	<0.00010	<0.00010	<0.00010
Bismuth (Bi)-Total	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050
Boron (B)-Total	0.010	mg/L	0.2	0.010	0.011	0.011	0.011
Cadmium (Cd)-Total	0.000010	mg/L	0.0002	0.000050	0.000052	0.000042	<0.000010
Calcium (Ca)-Total	0.50	mg/L		83.0	74.8	80.2	30.6
Cesium (Cs)-Total	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010
Chromium (Cr)-Total	0.00050	mg/L		<0.00050	<0.00050	<0.00050	<0.00050
Cobalt (Co)-Total	0.00010	mg/L	0.0009	<0.00010	<0.00010	<0.00010	<0.00010
Copper (Cu)-Total	0.0010	mg/L	0.005	<0.0010	<0.0010	<0.0010	<0.0010
Iron (Fe)-Total	0.050	mg/L	0.3	<0.050	<0.050	<0.050	<0.050
Lead (Pb)-Total	0.00010	mg/L	0.001	<0.00010	<0.00010	<0.00010	<0.00010
Magnesium (Mg)-Total	0.050	mg/L		28.0	24.8	24.8	6.98
Manganese (Mn)-Total	0.00050	mg/L		0.0103	0.0145	0.0101	0.0150
Molybdenum (Mo)-Total	0.000050	mg/L	0.04	0.000432	0.000412	0.000419	<0.000050
Nickel (Ni)-Total	0.00050	mg/L	0.025	<0.00050	<0.00050	0.00053	<0.00050
Potassium (K)-Total	0.050	mg/L		1.24	1.11	1.15	2.02
Rubidium (Rb)-Total	0.00020	mg/L		0.00135	0.00122	0.00127	0.00105
Selenium (Se)-Total	0.000050	mg/L	0.1	0.000154	0.000160	0.000145	<0.000050
Silicon (Si)-Total	0.050	mg/L		5.24	4.89	4.84	0.716
Silver (Ag)-Total	0.000050	mg/L	0.0001	<0.000050	<0.000050	<0.000050	<0.000050

Strontium (Sr)-Total	0.0010	mg/L		0.107	0.107	0.109	0.0412
Sulfur (S)-Total	0.50	mg/L		7.40	6.42	6.59	<0.50
Tellurium (Te)-Total	0.00020	mg/L		<0.00020	<0.00020	<0.00020	<0.00020
Thallium (Tl)-Total	0.000010	mg/L	0.0003	0.000017	0.000013	0.000012	<0.000010
Thorium (Th)-Total	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010
Tin (Sn)-Total	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Total	0.00030	mg/L		<0.00030	<0.00030	<0.00030	<0.00030
Tungsten (W)-Total	0.00010	mg/L	0.03	<0.00010	<0.00010	<0.00010	<0.00010
Uranium (U)-Total	0.000010	mg/L	0.005	0.000577	0.000501	0.000538	<0.000010
Vanadium (V)-Total	0.00050	mg/L	0.006	<0.00050	<0.00050	<0.00050	<0.00050
Zinc (Zn)-Total	0.0030	mg/L	0.02	**0.0890**	**0.0760**	**0.0759**	<0.0030
Zirconium (Zr)-Total	0.00030	mg/L	0.004	<0.00030	<0.00030	<0.00030	<0.00030

Station 1 WQ 2017 Summary				STN 1	STN 1	STN 1	STN1	STN 1	STN1
216002 - Clair/ Maltby				1-May-2017	10-Aug-2017	3-Nov-2017	26-Apr-2018	24-Aug-2018	7-Nov-2018
				8:55	8:57	8:45	8:30	8:30	8:45
Parameter	Lowest Detection Limit	Units	PWQO Guideline Limit						
Physical Tests (Water)									
Total Suspended Solids	2.0	mg/L		15.4	56.7	14	17.0	126	10.8
Total Dissolved Solids	20	mg/L		189	148	163	167	147	145
Anions and Nutrients (Water)									
Ammonia, Total (as N)	0.020	mg/L		0.113	<0.020	0.036	0.059	0.581	<0.020
Bromide (Br)	0.10	mg/L		<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Chloride (Cl)	0.50	mg/L		6.2	5.78	5.73	5.52	6.16	5.95
Fluoride (F)	0.020	mg/L		0.031	0.047	0.026	0.033	0.052	0.042
Nitrate (as N)	0.020	mg/L		<0.020	<0.020	<0.020	<0.020	<0.020	0.038
Nitrite (as N)	0.010	mg/L		<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Total Kjeldahl Nitrogen	0.15	mg/L		1.59	1.85	1.79	1.96	7.8	1.12
Orthophosphate-Dissolved (as P)	0.0030	mg/L		0.0055	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
Phosphorus, Total	0.0030	mg/L	0.01 (U)	0.0902	0.131	0.0842	0.115	0.277	0.0468
Sulfate (SO4)	0.30	mg/L		3.81	1.95	2.51	2.50	0.87	2.07
Total Metals (Water)									
Aluminum (Al)-Total	0.010	mg/L	0.015 (U)	0.019	0.0647	0.0631	0.0490	0.414	0.0484
Antimony (Sb)-Total	0.00010	mg/L	0.02 (U)	0.00011	<0.00010	<0.00010	0.00010	0.00014	0.00012
Arsenic (As)-Total	0.00010	mg/L	0.005 (U)	0.00048	0.00069	0.00066	0.00048	0.00121	0.00071
Barium (Ba)-Total	0.00020	mg/L		0.0144	0.0161	0.0142	0.0102	0.0201	0.0202
Beryllium (Be)-Total	0.00010	mg/L	0.011 (U)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Bismuth (Bi)-Total	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron (B)-Total	0.010	mg/L	0.2 (U)	0.011	0.011	0.017	0.012	0.019	0.017
Cadmium (Cd)-Total	0.000010	mg/L	0.0001 (U)	<0.000010	0.000014	<0.000010	0.0000176	0.0000841	0.0000069
Calcium (Ca)-Total	0.50	mg/L		40.5	32.9	35.3	38.7	27.1	29.3
Cesium (Cs)-Total	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	0.000030	<0.000010
Chromium (Cr)-Total	0.00050	mg/L		<0.00050	<0.00050	0.00055	<0.00050	0.00118	<0.00050

Station 1 WQ 2017 Summary				STN 1	STN 1	STN 1	STN1	STN 1	STN1
216002 - Clair/ Maltby				1-May-2017	10-Aug-2017	3-Nov-2017	26-Apr-2018	24-Aug-2018	7-Nov-2018
				8:55	8:57	8:45	8:30	8:30	8:45
Cobalt (Co)-Total	0.00010	mg/L	0.0009 (U)	<0.00010	<0.00010	<0.00010	<0.00010	0.00031	<0.00010
Copper (Cu)-Total	0.0010	mg/L	0.001 (U)	<0.0010	<0.0010	<0.0010	<0.0010	0.0031	0.0013
Iron (Fe)-Total	0.050	mg/L	0.3 (U)	0.174	0.416	0.179	0.156	1.37	0.135
Lead (Pb)-Total	0.000050	mg/L	0.001 (U)	0.000114	0.000432	0.000417	0.000326	0.00240	0.000452
Lithium (Li)-Total	0.0010	mg/L		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Magnesium (Mg)-Total	0.050	mg/L		16.7	17.4	19.1	15.2	15.2	14.4
Manganese (Mn)-Total	0.00050	mg/L		0.104	0.23	0.0982	0.0808	0.302	0.0531
Molybdenum (Mo)-Total	0.000050	mg/L	0.04 (U)	0.000313	0.000199	0.000389	0.000277	0.000400	0.000509
Nickel (Ni)-Total	0.00050	mg/L	0.025 (U)	<0.00050	<0.00050	<0.00050	<0.00050	0.00114	<0.00050
Phosphorus (P)-Total	0.050	mg/L	0.01 (U)	0.093	0.149	0.112	0.130	0.327	0.074
Potassium (K)-Total	0.050	mg/L		3.86	4.29	5.23	4.55	5.73	5.82
Rubidium (Rb)-Total	0.00020	mg/L		0.00163	0.00213	0.00197	0.00181	0.00307	0.00231
Selenium (Se)-Total	0.000050	mg/L	0.1 (U)	0.000066	0.000056	0.000059	0.000079	0.000117	0.000056
Silicon (Si)-Total	0.10	mg/L		0.36	0.38	0.27	0.12	0.96	0.14
Silver (Ag)-Total	0.000050	mg/L	0.0001 (U)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Sodium (Na)-Total	0.50	mg/L		2.2	2.23	2.1	2.09	2.11	2.07
Strontium (Sr)-Total	0.0010	mg/L		0.0593	0.056	0.0567	0.0526	0.0518	0.0467
Sulfur (S)-Total	0.50	mg/L		1.61	0.72	1.18	1.28	0.89	0.82
Tellurium (Te)-Total	0.00020	mg/L		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Thallium (Tl)-Total	0.000010	mg/L	0.0003 (U)	<0.000010	<0.000010	<0.000010	0.000019	<0.000010	<0.000010
Thorium (Th)-Total	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Tin (Sn)-Total	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Total	0.00030	mg/L		0.0005	0.00189	<0.0030	0.00134	0.0122	0.00117
Tungsten (W)-Total	0.00010	mg/L	0.03 (U)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Uranium (U)-Total	0.000010	mg/L	0.005 (U)	0.00029	0.000128	0.000229	0.000265	0.000204	0.000241
Vanadium (V)-Total	0.00050	mg/L	0.006 (U)	<0.00050	0.00054	<0.00050	<0.00050	0.00209	0.00052
Zinc (Zn)-Total	0.0030	mg/L	0.02 (U)	<0.0030	0.0058	<0.0030	0.0050	0.0228	0.0776
Zirconium (Zr)-Total	0.00030	mg/L	0.004 (U)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030

Station 2 WQ 2017 Summary				STN 2	STN 2	STN 2	STN2	STN 2	STN2
216002 - Clair/ Maltby				1-May-2017	10-Aug-2017	3-Nov-2017	26-Apr-2018	24-Aug-2018	7-Nov-2018
				9:10	9:16		8:45	8:45	9:00
Parameter	Lowest Detection Limit	Units	PWQO Guideline Limit						
Physical Tests (Water)									
Total Suspended Solids	2.0	mg/L		<2.0	<2.0	7.7	6.4	88.6	5.4
Total Dissolved Solids	20	mg/L		156	135	108	115	180	164
Anions and Nutrients (Water)									
Ammonia, Total (as N)	0.020	mg/L		0.097	0.18	0.307	0.033	0.082	0.174
Bromide (Br)	0.10	mg/L		<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Chloride (Cl)	0.50	mg/L		2.31	1.41	1.42	1.83	2.71	5.08
Fluoride (F)	0.020	mg/L		0.033	0.026	<0.020	0.031	0.055	0.021
Nitrate (as N)	0.020	mg/L		<0.020	<0.020	0.037	<0.020	<0.020	0.035
Nitrite (as N)	0.010	mg/L		<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Total Kjeldahl Nitrogen	0.15	mg/L		0.52	0.69	0.72	0.38	1.35	0.97
Orthophosphate-Dissolved (as P)	0.0030	mg/L		<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
Phosphorus, Total	0.0030	mg/L	0.01 (U)	0.0139	0.015	0.0131	0.0124	0.0538	0.0573
Sulfate (SO4)	0.30	mg/L		1.72	0.91	1.7	0.57	<0.30	1.16
Total Metals (Water)									
Aluminum (Al)-Total	0.010	mg/L	0.015 (U)	<0.010	0.0074	0.0413	0.0195	0.550	0.0288
Antimony (Sb)-Total	0.00010	mg/L	0.02 (U)	0.00011	<0.00010	0.00013	<0.00010	0.00016	0.00013
Arsenic (As)-Total	0.00010	mg/L	0.005 (U)	0.00047	0.00074	0.00054	0.00032	0.00115	0.00072
Barium (Ba)-Total	0.00020	mg/L		0.0114	0.00734	0.00823	0.00796	0.0150	0.00842
Beryllium (Be)-Total	0.00010	mg/L	0.011 (U)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Bismuth (Bi)-Total	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron (B)-Total	0.010	mg/L	0.2 (U)	<0.010	<0.010	<0.010	<0.010	0.013	<0.010
Cadmium (Cd)-Total	0.000010	mg/L	0.0001 (U)	0.000011	<0.000010	<0.000010	0.0000054	0.0000542	0.0000155
Calcium (Ca)-Total	0.50	mg/L		35.9	29.6	28.6	27.6	39.9	37.1
Cesium (Cs)-Total	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	0.000048	<0.000010
Chromium (Cr)-Total	0.00050	mg/L		<0.00050	<0.00050	0.00056	<0.00050	0.00105	<0.00050

Station 2 WQ 2017 Summary				STN 2	STN 2	STN 2	STN2	STN 2	STN2
216002 - Clair/ Maltby				1-May-2017	10-Aug-2017	3-Nov-2017	26-Apr-2018	24-Aug-2018	7-Nov-2018
				9:10	9:16		8:45	8:45	9:00
Cobalt (Co)-Total	0.00010	mg/L	0.0009 (U)	<0.00010	<0.00010	<0.00010	<0.00010	0.00034	<0.00010
Copper (Cu)-Total	0.0010	mg/L	0.001 (U)	<0.0010	<0.0010	0.0019	<0.0010	0.0025	0.0010
Iron (Fe)-Total	0.050	mg/L	0.3 (U)	0.161	0.305	0.206	0.139	1.31	0.777
Lead (Pb)-Total	0.000050	mg/L	0.001 (U)	0.000117	0.000109	0.000477	0.000146	0.00374	0.000751
Lithium (Li)-Total	0.0010	mg/L		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Magnesium (Mg)-Total	0.050	mg/L		15.9	17.9	16.3	14.2	16.8	14.4
Manganese (Mn)-Total	0.00050	mg/L		0.0221	0.0375	0.0153	0.0378	0.0604	0.0921
Molybdenum (Mo)-Total	0.000050	mg/L	0.04 (U)	0.000185	0.000089	0.000315	0.000126	0.000157	0.000373
Nickel (Ni)-Total	0.00050	mg/L	0.025 (U)	<0.00050	<0.00050	<0.00050	<0.00050	0.00125	<0.00050
Phosphorus (P)-Total	0.050	mg/L	0.01 (U)	<0.050	<0.050	<0.050	<0.050	0.073	0.065
Potassium (K)-Total	0.050	mg/L		1.06	1.32	1.47	0.957	2.31	2.54
Rubidium (Rb)-Total	0.00020	mg/L		0.00102	0.00151	0.00107	0.00085	0.00253	0.00136
Selenium (Se)-Total	0.000050	mg/L	0.1 (U)	0.000054	0.000059	0.000067	0.000052	0.000105	0.000063
Silicon (Si)-Total	0.10	mg/L		0.12	0.6	0.11	0.13	2.72	1.76
Silver (Ag)-Total	0.000050	mg/L	0.0001 (U)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Sodium (Na)-Total	0.50	mg/L		1.34	1.53	1.6	1.26	1.53	1.26
Strontium (Sr)-Total	0.0010	mg/L		0.0472	0.0375	0.0359	0.0377	0.0526	0.0480
Sulfur (S)-Total	0.50	mg/L		0.67	<0.50	<0.50	<0.50	<0.50	0.54
Tellurium (Te)-Total	0.00020	mg/L		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Thallium (Tl)-Total	0.000010	mg/L	0.0003 (U)	<0.000010	<0.000010	<0.000010	<0.000010	0.000011	<0.000010
Thorium (Th)-Total	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Tin (Sn)-Total	0.00010	mg/L		<0.00010	<0.00010	<0.00010	0.00020	<0.00010	<0.00010
Titanium (Ti)-Total	0.00030	mg/L		<0.00030	<0.00030	<0.00080	0.00050	0.0152	0.00097
Tungsten (W)-Total	0.00010	mg/L	0.03 (U)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Uranium (U)-Total	0.000010	mg/L	0.005 (U)	0.000125	0.000028	0.000117	0.000079	0.000086	0.000163
Vanadium (V)-Total	0.00050	mg/L	0.006 (U)	<0.00050	<0.00050	<0.00050	<0.00050	0.00159	0.00083
Zinc (Zn)-Total	0.0030	mg/L	0.02 (U)	<0.0030	<0.0030	0.0377	<0.0030	0.0552	0.0640
Zirconium (Zr)-Total	0.00030	mg/L	0.004 (U)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030

Station 3 WQ 2017 Summary				STN 3	STN 3	STN 3	STN3	STN 3	STN3
216002 - Clair/ Maltby				1-May-2017	10-Aug-2017	3-Nov-2017	26-Apr-2018	24-Aug-2018	2-Nov-2018
				12:00	12:07	11:42	11:51	11:50	11:44
Parameter	Lowest Detection Limit	Units	PWQO Guideline Limit						
Physical Tests (Water)									
Total Suspended Solids	2.0	mg/L		2.2	38.3	55	3.1	9.5	6.3
Total Dissolved Solids	20	mg/L		435	416	386	407	422	237
Anions and Nutrients (Water)									
Ammonia, Total (as N)	0.020	mg/L		0.045	0.066	2.52	<0.020	0.296	0.225
Bromide (Br)	0.10	mg/L		<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Chloride (Cl)	0.50	mg/L		152	120	115	147	151	47.7
Fluoride (F)	0.020	mg/L		0.03	0.039	0.021	0.037	0.040	0.030
Nitrate (as N)	0.020	mg/L		<0.020	<0.020	0.054	<0.020	0.026	0.042
Nitrite (as N)	0.010	mg/L		<0.010	<0.010	0.013	<0.010	<0.010	<0.010
Total Kjeldahl Nitrogen	0.15	mg/L		0.78	1.2	4.22	0.48	1.13	0.96
Orthophosphate-Dissolved (as P)	0.0030	mg/L		<0.0030	0.0032	0.0128	<0.0030	<0.0030	<0.0030
Phosphorus, Total	0.0030	mg/L	0.01 (U)	0.0247	0.0651	0.242	0.0126	0.0217	0.103
Sulfate (SO4)	0.30	mg/L		5.54	1.87	8.72	5.04	0.68	7.55
Total Metals (Water)									
Aluminum (Al)-Total	0.010	mg/L	0.015 (U)	0.012	0.0074	0.0698	0.0153	0.0290	0.0289
Antimony (Sb)-Total	0.00010	mg/L	0.02 (U)	0.00013	<0.00010	0.00014	0.00014	<0.00010	0.00014
Arsenic (As)-Total	0.00010	mg/L	0.005 (U)	0.00035	0.0007	0.00076	0.00028	0.00054	0.00041
Barium (Ba)-Total	0.00020	mg/L		0.0138	0.0189	0.0254	0.0134	0.0159	0.0118
Beryllium (Be)-Total	0.00010	mg/L	0.011 (U)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Bismuth (Bi)-Total	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron (B)-Total	0.010	mg/L	0.2 (U)	<0.010	0.014	0.028	0.011	0.022	0.038
Cadmium (Cd)-Total	0.000010	mg/L	0.0001 (U)	<0.000010	<0.000010	0.000021	0.0000075	0.0000075	0.0000063
Calcium (Ca)-Total	0.50	mg/L		45.7	51.8	60.7	54.0	49.6	39.9
Cesium (Cs)-Total	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Chromium (Cr)-Total	0.00050	mg/L		<0.00050	<0.00050	0.00066	0.00051	0.00063	<0.00050

Station 3 WQ 2017 Summary				STN 3	STN 3	STN 3	STN3	STN 3	STN3
216002 - Clair/ Maltby				1-May-2017	10-Aug-2017	3-Nov-2017	26-Apr-2018	24-Aug-2018	2-Nov-2018
				12:00	12:07	11:42	11:51	11:50	11:44
Cobalt (Co)-Total	0.00010	mg/L	0.0009 (U)	<0.00010	<0.00010	0.00015	<0.00010	<0.00010	<0.00010
Copper (Cu)-Total	0.0010	mg/L	0.001 (U)	<0.0010	<0.0010	0.0014	<0.0010	<0.0010	<0.0010
Iron (Fe)-Total	0.050	mg/L	0.3 (U)	0.061	0.493	0.328	0.051	0.223	0.138
Lead (Pb)-Total	0.000050	mg/L	0.001 (U)	0.000103	0.000146	0.00097	0.000120	0.000307	0.000211
Lithium (Li)-Total	0.0010	mg/L		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Magnesium (Mg)-Total	0.050	mg/L		15.5	22.5	20.6	15.1	15.7	11.2
Manganese (Mn)-Total	0.00050	mg/L		0.0236	0.443	0.791	0.0670	0.0942	0.0766
Molybdenum (Mo)-Total	0.000050	mg/L	0.04 (U)	0.000251	0.000122	0.000432	0.000234	0.000157	0.000347
Nickel (Ni)-Total	0.00050	mg/L	0.025 (U)	<0.00050	<0.00050	<0.00050	0.00058	<0.00050	<0.00050
Phosphorus (P)-Total	0.050	mg/L	0.01 (U)	<0.050	0.072	0.276	<0.050	<0.050	0.134
Potassium (K)-Total	0.050	mg/L		0.883	1.12	4.27	1.66	1.01	1.90
Rubidium (Rb)-Total	0.00020	mg/L		0.00116	0.00183	0.00304	0.00147	0.00187	0.00169
Selenium (Se)-Total	0.000050	mg/L	0.1 (U)	0.00008	0.000092	0.000138	0.000065	0.000073	0.000061
Silicon (Si)-Total	0.10	mg/L		0.19	2.84	3.14	0.33	1.15	2.24
Silver (Ag)-Total	0.000050	mg/L	0.0001 (U)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.000061
Sodium (Na)-Total	0.50	mg/L		93.2	76.8	75.8	91.3	84.1	27.4
Strontium (Sr)-Total	0.0010	mg/L		0.0809	0.0815	0.0898	0.0815	0.0858	0.0520
Sulfur (S)-Total	0.50	mg/L		2.39	0.77	2.39	2.19	0.55	2.54
Tellurium (Te)-Total	0.00020	mg/L		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Thallium (Tl)-Total	0.000010	mg/L	0.0003 (U)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Thorium (Th)-Total	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Tin (Sn)-Total	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Total	0.00030	mg/L		0.00038	<0.00030	<0.0020	<0.00045	0.00085	0.00137
Tungsten (W)-Total	0.00010	mg/L	0.03 (U)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Uranium (U)-Total	0.000010	mg/L	0.005 (U)	0.000198	0.000091	0.000201	0.000176	0.000081	0.000136
Vanadium (V)-Total	0.00050	mg/L	0.006 (U)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc (Zn)-Total	0.0030	mg/L	0.02 (U)	<0.0030	<0.0030	0.0101	<0.0030	<0.0030	0.0040
Zirconium (Zr)-Total	0.00030	mg/L	0.004 (U)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030

Station 4 WQ 2017 Summary				STN 4	STN 4	STN4	STN4
216002 - Clair/ Maltby				1-May-2017	10-Aug-2017	26-Apr-2018	2-Nov-2018
				11:45	11:40	11:23	11:24
Parameter	Lowest Detection Limit	Units	PWQO Guideline Limit				
Physical Tests (Water)							
Total Suspended Solids	2.0	mg/L		<2.0	<2.0	<2.0	4.2
Total Dissolved Solids	20	mg/L		189	184	144	111
Anions and Nutrients (Water)							
Ammonia, Total (as N)	0.020	mg/L		0.101	0.052	0.116	0.427
Bromide (Br)	0.10	mg/L		<0.10	<0.10	<0.10	<0.10
Chloride (Cl)	0.50	mg/L		4.03	1.97	2.16	2.78
Fluoride (F)	0.020	mg/L		0.04	0.044	0.045	0.026
Nitrate (as N)	0.020	mg/L		0.03	<0.020	<0.020	1.25
Nitrite (as N)	0.010	mg/L		<0.010	<0.010	<0.010	<0.010
Total Kjeldahl Nitrogen	0.15	mg/L		1.08	1.53	0.43	1.42
Orthophosphate-Dissolved (as P)	0.0030	mg/L		0.0043	0.0105	<0.0030	<0.0030
Phosphorus, Total	0.0030	mg/L	0.01 (U)	0.0324	0.0295	0.0182	0.0522
Sulfate (SO4)	0.30	mg/L		5.94	1.29	4.15	15.3
Total Metals (Water)							
Aluminum (Al)-Total	0.010	mg/L	0.015 (U)	0.016	0.0085	0.0246	0.0531
Antimony (Sb)-Total	0.00010	mg/L	0.02 (U)	<0.00010	<0.00010	<0.00010	0.00021
Arsenic (As)-Total	0.00010	mg/L	0.005 (U)	0.00043	0.00047	0.00031	0.00057
Barium (Ba)-Total	0.00020	mg/L		0.0108	0.00887	0.00702	0.00599
Beryllium (Be)-Total	0.00010	mg/L	0.011 (U)	<0.00010	<0.00010	<0.00010	<0.00010
Bismuth (Bi)-Total	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050
Boron (B)-Total	0.010	mg/L	0.2 (U)	<0.010	0.019	<0.010	0.019
Cadmium (Cd)-Total	0.000010	mg/L	0.0001 (U)	<0.000010	<0.000010	0.0000133	0.0000261
Calcium (Ca)-Total	0.50	mg/L		42.9	39.3	33.0	12.9
Cesium (Cs)-Total	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010
Chromium (Cr)-Total	0.00050	mg/L		<0.00050	<0.00050	<0.00050	<0.00050

Station 4 WQ 2017 Summary				STN 4	STN 4	STN4	STN4
216002 - Clair/ Maltby				1-May-2017	10-Aug-2017	26-Apr-2018	2-Nov-2018
				11:45	11:40	11:23	11:24
Cobalt (Co)-Total	0.00010	mg/L	0.0009 (U)	<0.00010	<0.00010	<0.00010	<0.00010
Copper (Cu)-Total	0.0010	mg/L	0.001 (U)	<0.0010	<0.0010	<0.0010	0.0015
Iron (Fe)-Total	0.050	mg/L	0.3 (U)	0.121	0.155	0.105	0.375
Lead (Pb)-Total	0.000050	mg/L	0.001 (U)	0.000097	0.0001	0.000109	0.000369
Lithium (Li)-Total	0.0010	mg/L		<0.0010	<0.0010	<0.0010	<0.0010
Magnesium (Mg)-Total	0.050	mg/L		15.7	14.7	13.1	5.97
Manganese (Mn)-Total	0.00050	mg/L		0.0219	0.015	0.0165	0.0116
Molybdenum (Mo)-Total	0.000050	mg/L	0.04 (U)	0.000147	0.000081	0.000143	0.000372
Nickel (Ni)-Total	0.00050	mg/L	0.025 (U)	<0.00050	<0.00050	<0.00050	<0.00050
Phosphorus (P)-Total	0.050	mg/L	0.01 (U)	<0.050	<0.050	<0.050	0.052
Potassium (K)-Total	0.050	mg/L		0.881	0.246	0.640	2.14
Rubidium (Rb)-Total	0.00020	mg/L		0.00199	0.00053	0.00125	0.00328
Selenium (Se)-Total	0.000050	mg/L	0.1 (U)	0.000092	0.000102	0.000076	0.000079
Silicon (Si)-Total	0.10	mg/L		1.4	1.77	1.23	0.86
Silver (Ag)-Total	0.000050	mg/L	0.0001 (U)	<0.000050	<0.000050	<0.000050	0.000089
Sodium (Na)-Total	0.50	mg/L		2.33	1.87	1.61	0.812
Strontium (Sr)-Total	0.0010	mg/L		0.0456	0.0438	0.0321	0.0135
Sulfur (S)-Total	0.50	mg/L		2.56	0.82	1.75	5.10
Tellurium (Te)-Total	0.00020	mg/L		<0.00020	<0.00020	<0.00020	<0.00020
Thallium (Tl)-Total	0.000010	mg/L	0.0003 (U)	<0.000010	<0.000010	<0.000010	<0.000010
Thorium (Th)-Total	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010
Tin (Sn)-Total	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Total	0.00030	mg/L		<0.00060	<0.00030	<0.00085	0.00315
Tungsten (W)-Total	0.00010	mg/L	0.03 (U)	<0.00010	<0.00010	<0.00010	<0.00010
Uranium (U)-Total	0.000010	mg/L	0.005 (U)	0.000102	0.000033	0.000175	0.000019
Vanadium (V)-Total	0.00050	mg/L	0.006 (U)	<0.00050	<0.00050	<0.00050	0.00052
Zinc (Zn)-Total	0.0030	mg/L	0.02 (U)	<0.0030	<0.0030	0.0032	0.0161
Zirconium (Zr)-Total	0.00030	mg/L	0.004 (U)	<0.00030	<0.00030	<0.00030	<0.00030

Station 5 WQ 2017 Summary				STN 5	STN 5	STN 5	STN5	STN 5	STN5
216002 - Clair/ Maltby				1-May-2017	10-Aug-2017	3-Nov-2017	26-Apr-2018	24-Aug-2018	2-Nov-2018
				14:30	13:55	13:34	14:00	13:21	13:42
Parameter	Lowest Detection Limit	Units	PWQO Guideline Limit						
Physical Tests (Water)									
Total Suspended Solids	2.0	mg/L		<2.0	13.1	26.4	<2.0	51.6	25.0
Total Dissolved Solids	20	mg/L		257	218	271	205	262	307
Anions and Nutrients (Water)									
Ammonia, Total (as N)	0.020	mg/L		0.133	<0.020	1.65	0.040	0.837	0.442
Bromide (Br)	0.10	mg/L		<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Chloride (Cl)	0.50	mg/L		33.7	11.2	33.6	23.7	25.0	47.0
Fluoride (F)	0.020	mg/L		0.04	0.055	0.041	0.042	0.082	0.132
Nitrate (as N)	0.020	mg/L		<0.020	<0.020	0.029	0.048	<0.020	0.219
Nitrite (as N)	0.010	mg/L		<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Total Kjeldahl Nitrogen	0.15	mg/L		0.96	1.51	3.48	0.59	3.56	1.98
Orthophosphate-Dissolved (as P)	0.0030	mg/L		0.0103	<0.0030	0.0031	<0.0030	0.0109	0.0658
Phosphorus, Total	0.0030	mg/L	0.01 (U)	0.0248	0.038	0.0874	0.0237	0.231	0.0961
Sulfate (SO4)	0.30	mg/L		3.2	0.95	4.49	2.96	0.79	27.4
Total Metals (Water)									
Aluminum (Al)-Total	0.010	mg/L	0.015 (U)	<0.010	0.0199	0.0736	0.0110	0.0645	0.0333
Antimony (Sb)-Total	0.00010	mg/L	0.02 (U)	0.00011	<0.00010	0.0001	<0.00010	<0.00010	0.00032
Arsenic (As)-Total	0.00010	mg/L	0.005 (U)	0.00046	0.0006	0.00129	0.00036	0.00128	0.00132
Barium (Ba)-Total	0.00020	mg/L		0.00816	0.0144	0.0206	0.00920	0.0214	0.00873
Beryllium (Be)-Total	0.00010	mg/L	0.011 (U)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Bismuth (Bi)-Total	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron (B)-Total	0.010	mg/L	0.2 (U)	0.013	<0.010	<0.010	<0.010	0.017	<0.010
Cadmium (Cd)-Total	0.000010	mg/L	0.0001 (U)	0.000015	<0.000010	<0.000010	<0.0000050	0.0000080	0.0000118
Calcium (Ca)-Total	0.50	mg/L		53.9	56.2	70.5	51.6	55.0	57.2
Cesium (Cs)-Total	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010

Station 5 WQ 2017 Summary				STN 5	STN 5	STN 5	STN5	STN 5	STN5
216002 - Clair/ Maltby				1-May-2017	10-Aug-2017	3-Nov-2017	26-Apr-2018	24-Aug-2018	2-Nov-2018
				14:30	13:55	13:34	14:00	13:21	13:42
Chromium (Cr)-Total	0.00050	mg/L		<0.00050	<0.00050	0.00053	<0.00050	<0.00050	<0.00050
Cobalt (Co)-Total	0.00010	mg/L	0.0009 (U)	0.00011	<0.00010	0.00019	<0.00010	0.00016	0.00013
Copper (Cu)-Total	0.0010	mg/L	0.001 (U)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0029
Iron (Fe)-Total	0.050	mg/L	0.3 (U)	0.168	0.289	0.648	0.083	0.748	0.070
Lead (Pb)-Total	0.000050	mg/L	0.001 (U)	0.000121	0.000102	0.00045	0.000083	0.000411	0.000173
Lithium (Li)-Total	0.0010	mg/L		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Magnesium (Mg)-Total	0.050	mg/L		11	12.6	12.9	9.37	9.41	7.51
Manganese (Mn)-Total	0.00050	mg/L		0.0806	0.113	0.461	0.0549	0.244	0.0151
Molybdenum (Mo)-Total	0.000050	mg/L	0.04 (U)	0.000208	0.000067	0.000472	0.000215	0.000380	0.00136
Nickel (Ni)-Total	0.00050	mg/L	0.025 (U)	<0.00050	<0.00050	0.00051	<0.00050	<0.00050	0.00077
Phosphorus (P)-Total	0.050	mg/L	0.01 (U)	0.061	<0.050	0.146	<0.050	0.183	0.111
Potassium (K)-Total	0.050	mg/L		1.91	0.28	2.65	2.08	3.36	1.54
Rubidium (Rb)-Total	0.00020	mg/L		0.00146	0.00025	0.00163	0.00117	0.00253	0.00103
Selenium (Se)-Total	0.000050	mg/L	0.1 (U)	0.000082	0.000093	0.000152	0.000080	0.000132	0.000182
Silicon (Si)-Total	0.10	mg/L		0.51	0.6	3.58	0.84	2.48	1.18
Silver (Ag)-Total	0.000050	mg/L	0.0001 (U)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Sodium (Na)-Total	0.50	mg/L		19.3	10.5	17.6	14.9	17.5	17.4
Strontium (Sr)-Total	0.0010	mg/L		0.0817	0.0888	0.0904	0.0684	0.0841	0.0818
Sulfur (S)-Total	0.50	mg/L		1.44	0.68	0.94	1.42	0.78	9.68
Tellurium (Te)-Total	0.00020	mg/L		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Thallium (Tl)-Total	0.000010	mg/L	0.0003 (U)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Thorium (Th)-Total	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Tin (Sn)-Total	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Total	0.00030	mg/L		<0.00030	0.0005	0.00195	0.00033	0.00176	0.00111
Tungsten (W)-Total	0.00010	mg/L	0.03 (U)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Uranium (U)-Total	0.000010	mg/L	0.005 (U)	0.000197	0.000072	0.000404	0.000305	0.000220	0.000445
Vanadium (V)-Total	0.00050	mg/L	0.006 (U)	<0.00050	<0.00050	0.00082	<0.00050	0.00089	0.00076
Zinc (Zn)-Total	0.0030	mg/L	0.02 (U)	0.007	<0.0030	<0.0030	<0.0030	<0.0030	0.0090
Zirconium (Zr)-Total	0.00030	mg/L	0.004 (U)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030

Station 6 WQ 2017 Summary				STN 6	STN 6	STN 6	STN6	STN 6	STN6
216002 - Clair/ Maltby				1-May-2017	10-Aug-2017	3-Nov-2017	26-Apr-2018	24-Aug-2018	2-Nov-2018
				14:15	13:35	13:05	13:21	12:51	13:25
Parameter	Lowest Detection Limit	Units	PWQO Guideline Limit						
Physical Tests (Water)									
Total Suspended Solids	2.0	mg/L		<2.0	<2.0	277	2.1	66.5	8.6
Total Dissolved Solids	20	mg/L		205	235	175	111	218	59
Anions and Nutrients (Water)									
Ammonia, Total (as N)	0.020	mg/L		0.118	0.038	0.12	0.034	0.325	0.029
Bromide (Br)	0.10	mg/L		<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Chloride (Cl)	0.50	mg/L		9.8	11.6	16.3	7.16	3.90	3.42
Fluoride (F)	0.020	mg/L		0.05	0.036	0.023	0.033	0.059	<0.020
Nitrate (as N)	0.020	mg/L		<0.020	<0.020	0.089	<0.020	<0.020	0.046
Nitrite (as N)	0.010	mg/L		<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Total Kjeldahl Nitrogen	0.15	mg/L		0.76	0.68	1.17	1.03	2.22	0.70
Orthophosphate-Dissolved (as P)	0.0030	mg/L		<0.0030	<0.0030	0.0073	<0.0030	0.0091	<0.0030
Phosphorus, Total	0.0030	mg/L	0.01 (U)	0.0159	0.0163	0.0805	0.0233	0.183	0.0563
Sulfate (SO4)	0.30	mg/L		3.72	0.79	0.94	1.11	<0.30	1.50
Total Metals (Water)									
Aluminum (Al)-Total	0.010	mg/L	0.015 (U)	<0.010	0.0065	0.0091	0.0112	0.0125	0.0971
Antimony (Sb)-Total	0.00010	mg/L	0.02 (U)	0.00013	<0.00010	<0.00010	<0.00010	<0.00010	0.00018
Arsenic (As)-Total	0.00010	mg/L	0.005 (U)	0.00036	0.00046	0.00043	0.00027	0.00055	0.00026
Barium (Ba)-Total	0.00020	mg/L		0.0136	0.0141	0.00902	0.00486	0.0215	0.00449
Beryllium (Be)-Total	0.00010	mg/L	0.011 (U)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Bismuth (Bi)-Total	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron (B)-Total	0.010	mg/L	0.2 (U)	<0.010	<0.010	0.011	<0.010	0.034	0.012
Cadmium (Cd)-Total	0.000010	mg/L	0.0001 (U)	<0.000010	<0.000010	<0.000010	<0.0000050	<0.0000050	0.0000108
Calcium (Ca)-Total	0.50	mg/L		53.9	67.4	54.7	29.6	54.8	9.10
Cesium (Cs)-Total	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010

Station 6 WQ 2017 Summary				STN 6	STN 6	STN 6	STN6	STN 6	STN6
216002 - Clair/ Maltby				1-May-2017	10-Aug-2017	3-Nov-2017	26-Apr-2018	24-Aug-2018	2-Nov-2018
				14:15	13:35	13:05	13:21	12:51	13:25
Chromium (Cr)-Total	0.00050	mg/L		<0.00050	<0.00050	0.00169	0.00103	<0.00050	<0.00050
Cobalt (Co)-Total	0.00010	mg/L	0.0009 (U)	<0.00010	<0.00010	<0.00010	<0.00010	0.00018	<0.00010
Copper (Cu)-Total	0.0010	mg/L	0.001 (U)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Iron (Fe)-Total	0.050	mg/L	0.3 (U)	0.06	0.066	0.386	0.077	1.45	0.117
Lead (Pb)-Total	0.000050	mg/L	0.001 (U)	0.000081	0.000061	0.000135	0.000110	0.000167	0.000599
Lithium (Li)-Total	0.0010	mg/L		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Magnesium (Mg)-Total	0.050	mg/L		13.8	17.3	13.6	6.42	10.7	2.15
Manganese (Mn)-Total	0.00050	mg/L		0.00361	0.00643	0.192	0.0107	0.373	0.00883
Molybdenum (Mo)-Total	0.000050	mg/L	0.04 (U)	0.000219	<0.000050	<0.000050	0.000153	0.000065	0.000239
Nickel (Ni)-Total	0.00050	mg/L	0.025 (U)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00056
Phosphorus (P)-Total	0.050	mg/L	0.01 (U)	<0.050	<0.050	0.098	<0.050	0.265	0.059
Potassium (K)-Total	0.050	mg/L		0.807	0.131	7.31	1.71	0.526	3.24
Rubidium (Rb)-Total	0.00020	mg/L		0.00117	0.00026	0.00673	0.00166	0.00081	0.00274
Selenium (Se)-Total	0.000050	mg/L	0.1 (U)	0.000084	0.000079	<0.000050	<0.000050	0.000072	<0.000050
Silicon (Si)-Total	0.10	mg/L		0.13	0.56	4.38	<0.10	4.72	1.21
Silver (Ag)-Total	0.000050	mg/L	0.0001 (U)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Sodium (Na)-Total	0.50	mg/L		4.09	3.6	4.96	3.16	1.95	0.939
Strontium (Sr)-Total	0.0010	mg/L		0.0695	0.0826	0.0607	0.0291	0.0635	0.0107
Sulfur (S)-Total	0.50	mg/L		1.79	<0.50	<0.50	0.54	<0.50	<0.50
Tellurium (Te)-Total	0.00020	mg/L		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Thallium (Tl)-Total	0.000010	mg/L	0.0003 (U)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Thorium (Th)-Total	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Tin (Sn)-Total	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Total	0.00030	mg/L		<0.00030	<0.00030	<0.00030	0.00035	0.00055	0.00277
Tungsten (W)-Total	0.00010	mg/L	0.03 (U)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Uranium (U)-Total	0.000010	mg/L	0.005 (U)	0.00015	0.000049	0.000081	0.000024	<0.000010	<0.000010
Vanadium (V)-Total	0.00050	mg/L	0.006 (U)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc (Zn)-Total	0.0030	mg/L	0.02 (U)	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	0.0044
Zirconium (Zr)-Total	0.00030	mg/L	0.004 (U)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030

Station 7 WQ 2017 Summary				STN 7	STN 7	STN 7	STN7	STN 7	STN7
216002 - Clair/ Maltby				1-May-2017	10-Aug-2017	3-Nov-2017	26-Apr-2018	24-Aug-2018	2-Nov-2018
				13:45	12:40	12:45	12:39	12:30	13:08
Parameter	Lowest Detection Limit	Units	PWQO Guideline Limit						
Physical Tests (Water)									
Total Suspended Solids	2.0	mg/L		4.3	4.1	10	4.9	49.2	14.5
Total Dissolved Solids	20	mg/L		135	155	156	116	113	94
Anions and Nutrients (Water)									
Ammonia, Total (as N)	0.020	mg/L		0.077	0.066	0.053	0.079	0.423	0.457
Bromide (Br)	0.10	mg/L		<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Chloride (Cl)	0.50	mg/L		11.8	12.6	13.1	10.6	9.86	8.26
Fluoride (F)	0.020	mg/L		0.035	0.028	0.02	0.035	0.039	<0.020
Nitrate (as N)	0.020	mg/L		<0.020	<0.020	<0.020	<0.020	0.021	0.033
Nitrite (as N)	0.010	mg/L		<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Total Kjeldahl Nitrogen	0.15	mg/L		0.96	0.93	1.22	0.59	2.44	1.33
Orthophosphate-Dissolved (as P)	0.0030	mg/L		<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
Phosphorus, Total	0.0030	mg/L	0.01 (U)	0.0303	0.0321	0.062	0.0449	0.127	0.0825
Sulfate (SO4)	0.30	mg/L		1.41	<0.30	0.67	0.78	<0.30	0.43
Total Metals (Water)									
Aluminum (Al)-Total	0.010	mg/L	0.015 (U)	<0.010	<0.0050	0.0298	0.0202	0.118	0.0473
Antimony (Sb)-Total	0.00010	mg/L	0.02 (U)	0.00011	<0.00010	<0.00010	0.00010	<0.00010	<0.00010
Arsenic (As)-Total	0.00010	mg/L	0.005 (U)	0.00046	0.00047	0.00047	0.00040	0.00049	0.00039
Barium (Ba)-Total	0.00020	mg/L		0.00835	0.00673	0.00992	0.00747	0.0206	0.00679
Beryllium (Be)-Total	0.00010	mg/L	0.011 (U)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Bismuth (Bi)-Total	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron (B)-Total	0.010	mg/L	0.2 (U)	<0.010	0.01	<0.010	<0.010	0.011	<0.010
Cadmium (Cd)-Total	0.000010	mg/L	0.0001 (U)	<0.000010	<0.000010	<0.000010	<0.0000050	0.0000220	<0.0000050
Calcium (Ca)-Total	0.50	mg/L		26.7	33.7	37.2	24.5	25.0	17.3
Cesium (Cs)-Total	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	0.000013	<0.000010

Station 7 WQ 2017 Summary				STN 7	STN 7	STN 7	STN7	STN 7	STN7
216002 - Clair/ Maltby				1-May-2017	10-Aug-2017	3-Nov-2017	26-Apr-2018	24-Aug-2018	2-Nov-2018
				13:45	12:40	12:45	12:39	12:30	13:08
Chromium (Cr)-Total	0.00050	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	0.00064	<0.00050
Cobalt (Co)-Total	0.00010	mg/L	0.0009 (U)	<0.00010	<0.00010	<0.00010	<0.00010	0.00016	<0.00010
Copper (Cu)-Total	0.0010	mg/L	0.001 (U)	<0.0010	<0.0010	0.0013	<0.0010	<0.0010	<0.0010
Iron (Fe)-Total	0.050	mg/L	0.3 (U)	<0.050	0.081	0.084	0.070	1.36	0.263
Lead (Pb)-Total	0.000050	mg/L	0.001 (U)	0.000119	<0.000050	0.000307	0.000191	0.00113	0.000348
Lithium (Li)-Total	0.0010	mg/L		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Magnesium (Mg)-Total	0.050	mg/L		6.63	8.26	8.38	6.14	6.58	4.52
Manganese (Mn)-Total	0.00050	mg/L		0.0223	0.0192	0.0278	0.0233	0.0370	0.0151
Molybdenum (Mo)-Total	0.000050	mg/L	0.04 (U)	0.000221	<0.000050	0.000107	0.000192	<0.000050	0.000062
Nickel (Ni)-Total	0.00050	mg/L	0.025 (U)	<0.00050	<0.00050	<0.00050	<0.00050	0.00050	<0.00050
Phosphorus (P)-Total	0.050	mg/L	0.01 (U)	<0.050	<0.050	0.097	<0.050	0.108	0.092
Potassium (K)-Total	0.050	mg/L		1.86	0.801	2.36	2.22	0.605	1.97
Rubidium (Rb)-Total	0.00020	mg/L		0.00099	0.00054	0.00124	0.00101	0.00049	0.00134
Selenium (Se)-Total	0.000050	mg/L	0.1 (U)	0.000056	0.000052	0.000057	<0.000050	0.000060	<0.000050
Silicon (Si)-Total	0.10	mg/L		<0.10	0.35	0.26	<0.10	0.90	0.16
Silver (Ag)-Total	0.000050	mg/L	0.0001 (U)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.000055
Sodium (Na)-Total	0.50	mg/L		7.06	7.21	8.16	6.26	5.15	4.93
Strontium (Sr)-Total	0.0010	mg/L		0.0381	0.0436	0.0448	0.0283	0.0325	0.0233
Sulfur (S)-Total	0.50	mg/L		0.84	<0.50	<0.50	0.61	<0.50	<0.50
Tellurium (Te)-Total	0.00020	mg/L		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Thallium (Tl)-Total	0.000010	mg/L	0.0003 (U)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Thorium (Th)-Total	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Tin (Sn)-Total	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Total	0.00030	mg/L		<0.00030	<0.00030	0.00065	0.00043	0.00300	0.00150
Tungsten (W)-Total	0.00010	mg/L	0.03 (U)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Uranium (U)-Total	0.000010	mg/L	0.005 (U)	0.000029	<0.000010	0.000015	0.000028	0.000015	<0.000010
Vanadium (V)-Total	0.00050	mg/L	0.006 (U)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc (Zn)-Total	0.0030	mg/L	0.02 (U)	<0.0030	<0.0030	0.0038	<0.0030	0.0422	0.0059
Zirconium (Zr)-Total	0.00030	mg/L	0.004 (U)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030

Station 8 WQ 2017 Summary				STN 8	STN 8	STN 8	STN8	STN 8	STN8
216002 - Clair/ Maltby				1-May-2017	10-Aug-2017	3-Nov-2017	26-Apr-2018	24-Aug-2018	2-Nov-2018
				11:15	11:07	10:55	10:48	11:15	11:02
Parameter	Lowest Detection Limit	Units	PWQO Guideline Limit						
Physical Tests (Water)									
Total Suspended Solids	2.0	mg/L		2.2	19.2	4.6	<2.0	45.1	3.0
Total Dissolved Solids	20	mg/L		117	170	148	73	177	144
Anions and Nutrients (Water)									
Ammonia, Total (as N)	0.020	mg/L		0.07	0.038	0.118	0.035	0.230	0.343
Bromide (Br)	0.10	mg/L		<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Chloride (Cl)	0.50	mg/L		2.58	2.83	5.65	2.77	4.13	7.94
Fluoride (F)	0.020	mg/L		0.023	0.041	0.021	0.027	0.050	0.043
Nitrate (as N)	0.020	mg/L		<0.020	<0.020	<0.020	<0.020	<0.020	0.047
Nitrite (as N)	0.010	mg/L		<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Total Kjeldahl Nitrogen	0.15	mg/L		1	1.93	1	0.60	1.87	1.20
Orthophosphate-Dissolved (as P)	0.0030	mg/L		<0.0030	<0.0030	0.0054	<0.0030	<0.0030	0.0077
Phosphorus, Total	0.0030	mg/L	0.01 (U)	0.0321	0.0625	0.0252	0.0196	0.0689	0.0541
Sulfate (SO4)	0.30	mg/L		1.7	0.9	0.85	1.25	<0.30	7.83
Total Metals (Water)									
Aluminum (Al)-Total	0.010	mg/L	0.015 (U)	0.022	0.0052	0.018	0.0116	0.0219	0.0865
Antimony (Sb)-Total	0.00010	mg/L	0.02 (U)	0.00011	<0.00010	<0.00010	<0.00010	<0.00010	0.00030
Arsenic (As)-Total	0.00010	mg/L	0.005 (U)	0.00038	0.00042	0.00044	0.00025	0.00045	0.00046
Barium (Ba)-Total	0.00020	mg/L		0.00786	0.00679	0.00877	0.00239	0.0116	0.00846
Beryllium (Be)-Total	0.00010	mg/L	0.011 (U)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Bismuth (Bi)-Total	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron (B)-Total	0.010	mg/L	0.2 (U)	<0.010	0.014	<0.010	<0.010	0.019	0.021
Cadmium (Cd)-Total	0.000010	mg/L	0.0001 (U)	<0.000010	<0.000010	<0.000010	<0.0000050	<0.0000050	0.0000201
Calcium (Ca)-Total	0.50	mg/L		24	36.6	31.7	18.7	32.0	25.4
Cesium (Cs)-Total	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010

Station 8 WQ 2017 Summary				STN 8	STN 8	STN 8	STN8	STN 8	STN8
216002 - Clair/ Maltby				1-May-2017	10-Aug-2017	3-Nov-2017	26-Apr-2018	24-Aug-2018	2-Nov-2018
				11:15	11:07	10:55	10:48	11:15	11:02
Chromium (Cr)-Total	0.00050	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	0.00083	<0.00050
Cobalt (Co)-Total	0.00010	mg/L	0.0009 (U)	<0.00010	0.00011	0.00011	<0.00010	0.00015	0.00012
Copper (Cu)-Total	0.0010	mg/L	0.001 (U)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0012
Iron (Fe)-Total	0.050	mg/L	0.3 (U)	0.248	0.415	0.178	0.136	0.634	0.349
Lead (Pb)-Total	0.000050	mg/L	0.001 (U)	0.000235	0.000082	0.000162	0.000086	0.000268	0.000387
Lithium (Li)-Total	0.0010	mg/L		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Magnesium (Mg)-Total	0.050	mg/L		9.4	13.7	11.9	7.15	10.6	8.16
Manganese (Mn)-Total	0.00050	mg/L		0.0254	0.138	0.027	0.0231	0.191	0.0200
Molybdenum (Mo)-Total	0.000050	mg/L	0.04 (U)	0.000078	<0.000050	0.000105	0.000051	<0.000050	0.000282
Nickel (Ni)-Total	0.00050	mg/L	0.025 (U)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Phosphorus (P)-Total	0.050	mg/L	0.01 (U)	<0.050	0.061	<0.050	<0.050	0.097	<0.050
Potassium (K)-Total	0.050	mg/L		0.979	0.503	3.2	1.23	1.31	3.38
Rubidium (Rb)-Total	0.00020	mg/L		0.00136	0.00053	0.00263	0.00150	0.00151	0.00210
Selenium (Se)-Total	0.000050	mg/L	0.1 (U)	0.000075	0.000077	0.000074	0.000050	0.000070	0.000070
Silicon (Si)-Total	0.10	mg/L		0.3	1.76	1.29	0.21	3.89	1.54
Silver (Ag)-Total	0.000050	mg/L	0.0001 (U)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Sodium (Na)-Total	0.50	mg/L		1.86	1.95	3.47	1.53	2.08	2.74
Strontium (Sr)-Total	0.0010	mg/L		0.0275	0.0372	0.0361	0.0192	0.0369	0.0322
Sulfur (S)-Total	0.50	mg/L		1.08	0.53	0.55	0.67	<0.50	2.85
Tellurium (Te)-Total	0.00020	mg/L		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Thallium (Tl)-Total	0.000010	mg/L	0.0003 (U)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Thorium (Th)-Total	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Tin (Sn)-Total	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Total	0.00030	mg/L		0.00062	<0.00030	0.00057	<0.00030	0.00056	<0.0040
Tungsten (W)-Total	0.00010	mg/L	0.03 (U)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Uranium (U)-Total	0.000010	mg/L	0.005 (U)	0.000012	<0.000010	0.000018	<0.000010	0.000011	0.000064
Vanadium (V)-Total	0.00050	mg/L	0.006 (U)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00050
Zinc (Zn)-Total	0.0030	mg/L	0.02 (U)	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	0.0106
Zirconium (Zr)-Total	0.00030	mg/L	0.004 (U)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030

Station 10 WQ 2017 Summary				STN 10	STN 10	STN 10	STN 10	STN10	STN10
216002 - Clair/ Maltby				1-May-2017	10-Aug-2017	3-Nov-2017	26-Apr-2018	24-Aug-2018	2-Nov-2018
				10:00	10:10		9:10	10:18	10:21
Parameter	Lowest Detection Limit	Units	PWQO Guideline Limit						
Physical Tests (Water)									
Total Suspended Solids	2.0	mg/L		<2.0	<2.0	<2.0	2.5	3.5	2.4
Total Dissolved Solids	20	mg/L		153	175	164	136	187	180
Anions and Nutrients (Water)									
Ammonia, Total (as N)	0.020	mg/L		0.055	<0.020	0.08	0.046	<0.020	0.128
Bromide (Br)	0.10	mg/L		<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Chloride (Cl)	0.50	mg/L		1.5	1.65	2.35	2.02	1.89	2.17
Fluoride (F)	0.020	mg/L		0.038	0.032	0.024	0.032	0.052	0.052
Nitrate (as N)	0.020	mg/L		<0.020	<0.020	<0.020	<0.020	0.025	<0.020
Nitrite (as N)	0.010	mg/L		<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Total Kjeldahl Nitrogen	0.15	mg/L		0.66	0.73	0.65	0.64	0.90	1.30
Orthophosphate-Dissolved (as P)	0.0030	mg/L		<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
Phosphorus, Total	0.0030	mg/L	0.01 (U)	0.0117	0.0163	0.0065	0.0272	0.0304	0.0260
Sulfate (SO4)	0.30	mg/L		0.95	0.94	0.42	<0.30	<0.30	<0.30
Total Metals (Water)									
Aluminum (Al)-Total	0.010	mg/L	0.015 (U)	<0.010	<0.0050	0.0106	0.0113	0.0125	0.0094
Antimony (Sb)-Total	0.00010	mg/L	0.02 (U)	0.00012	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic (As)-Total	0.00010	mg/L	0.005 (U)	0.00056	0.00047	0.00038	0.00035	0.00042	0.00039
Barium (Ba)-Total	0.00020	mg/L		0.0157	0.0118	0.00656	0.00926	0.0112	0.00569
Beryllium (Be)-Total	0.00010	mg/L	0.011 (U)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Bismuth (Bi)-Total	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron (B)-Total	0.010	mg/L	0.2 (U)	<0.010	<0.010	<0.010	<0.010	0.014	<0.010
Cadmium (Cd)-Total	0.000010	mg/L	0.0001 (U)	<0.000010	<0.000010	<0.000010	<0.0000050	<0.0000050	<0.0000050
Calcium (Ca)-Total	0.50	mg/L		37.6	38.8	35.9	37.2	43.1	41.3
Cesium (Cs)-Total	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010

Station 10 WQ 2017 Summary				STN 10	STN 10	STN 10	STN 10	STN10	STN10
216002 - Clair/ Maltby				1-May-2017	10-Aug-2017	3-Nov-2017	26-Apr-2018	24-Aug-2018	2-Nov-2018
				10:00	10:10		9:10	10:18	10:21
Chromium (Cr)-Total	0.00050	mg/L		<0.00050	<0.00050	0.00051	<0.00050	<0.00050	<0.00050
Cobalt (Co)-Total	0.00010	mg/L	0.0009 (U)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper (Cu)-Total	0.0010	mg/L	0.001 (U)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Iron (Fe)-Total	0.050	mg/L	0.3 (U)	0.128	0.162	<0.050	0.124	0.323	0.127
Lead (Pb)-Total	0.000050	mg/L	0.001 (U)	0.000152	<0.000050	<0.000050	0.000150	0.000175	0.000107
Lithium (Li)-Total	0.0010	mg/L		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Magnesium (Mg)-Total	0.050	mg/L		12.7	19.8	20.5	10.1	14.5	12.0
Manganese (Mn)-Total	0.00050	mg/L		0.00899	0.0192	0.00123	0.0301	0.0389	0.0194
Molybdenum (Mo)-Total	0.000050	mg/L	0.04 (U)	0.000304	<0.000050	<0.000050	0.000126	<0.000050	0.000077
Nickel (Ni)-Total	0.00050	mg/L	0.025 (U)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Phosphorus (P)-Total	0.050	mg/L	0.01 (U)	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium (K)-Total	0.050	mg/L		0.455	0.61	1.28	1.34	0.902	0.742
Rubidium (Rb)-Total	0.00020	mg/L		0.00088	0.0011	0.00219	0.00154	0.00106	0.00094
Selenium (Se)-Total	0.000050	mg/L	0.1 (U)	<0.000050	0.000061	<0.000050	<0.000050	<0.000050	<0.000050
Silicon (Si)-Total	0.10	mg/L		0.15	0.56	0.16	<0.10	1.52	0.11
Silver (Ag)-Total	0.000050	mg/L	0.0001 (U)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Sodium (Na)-Total	0.50	mg/L		1.12	1.17	1.74	1.17	0.742	0.832
Strontium (Sr)-Total	0.0010	mg/L		0.0352	0.039	0.0349	0.0234	0.0357	0.0329
Sulfur (S)-Total	0.50	mg/L		0.55	<0.50	<0.50	<0.50	<0.50	<0.50
Tellurium (Te)-Total	0.00020	mg/L		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Thallium (Tl)-Total	0.000010	mg/L	0.0003 (U)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Thorium (Th)-Total	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Tin (Sn)-Total	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Total	0.00030	mg/L		0.00031	<0.00030	0.00036	0.00034	0.00104	<0.00060
Tungsten (W)-Total	0.00010	mg/L	0.03 (U)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Uranium (U)-Total	0.000010	mg/L	0.005 (U)	0.000204	0.000029	0.000095	0.000145	0.000049	0.000291
Vanadium (V)-Total	0.00050	mg/L	0.006 (U)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc (Zn)-Total	0.0030	mg/L	0.02 (U)	<0.0030	<0.0030	<0.0030	<0.0030	0.0036	<0.0030
Zirconium (Zr)-Total	0.00030	mg/L	0.004 (U)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030

Station 11 WQ 2017 Summary				STN 11	STN 11	STN 11	STN 11	STN11	STN11
216002 - Clair/ Maltby				1-May-2017	10-Aug-2017	3-Nov-2017	26-Apr-2018	24-Aug-2018	2-Nov-2018
				15:05	14:30	14:35	14:37	9:20	14:02
Parameter	Lowest Detection Limit	Units	PWQO Guideline Limit						
Physical Tests (Water)									
Total Suspended Solids	2.0	mg/L		<2.0	24.1	23.2	<2.0	88.0	7.9
Total Dissolved Solids	20	mg/L		393	1070	631	319	1170	276
Anions and Nutrients (Water)									
Ammonia, Total (as N)	0.020	mg/L		0.067	0.069	0.66	0.025	0.220	0.707
Bromide (Br)	0.10	mg/L		<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Chloride (Cl)	0.50	mg/L		96.9	351	179	86.1	405	64.5
Fluoride (F)	0.020	mg/L		0.042	0.062	0.03	0.052	0.067	0.032
Nitrate (as N)	0.020	mg/L		0.02	<0.020	0.048	<0.020	0.025	0.031
Nitrite (as N)	0.010	mg/L		<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Total Kjeldahl Nitrogen	0.15	mg/L		1.06	3.75	2.6	0.78	4.18	1.16
Orthophosphate-Dissolved (as P)	0.0030	mg/L		0.0072	0.0382	0.173	0.0077	0.068	0.0058
Phosphorus, Total	0.0030	mg/L	0.01 (U)	0.0311	0.189	0.362	0.0246	0.681	0.0632
Sulfate (SO4)	0.30	mg/L		3.59	1.25	17.3	6.02	1.94	10.5
Total Metals (Water)									
Aluminum (Al)-Total	0.010	mg/L	0.015 (U)	0.036	0.0283	0.0529	0.0407	0.110	0.0650
Antimony (Sb)-Total	0.00010	mg/L	0.02 (U)	0.00015	<0.00010	0.00021	<0.00010	0.00016	0.00019
Arsenic (As)-Total	0.00010	mg/L	0.005 (U)	0.00091	0.00135	0.00216	0.00066	0.00199	0.00087
Barium (Ba)-Total	0.00020	mg/L		0.0165	0.0616	0.029	0.0143	0.0547	0.0147
Beryllium (Be)-Total	0.00010	mg/L	0.011 (U)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Bismuth (Bi)-Total	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron (B)-Total	0.010	mg/L	0.2 (U)	0.01	<0.010	0.032	0.010	0.025	0.016
Cadmium (Cd)-Total	0.000010	mg/L	0.0001 (U)	0.000011	<0.000010	0.000025	0.0000148	0.0000350	0.0000408
Calcium (Ca)-Total	0.50	mg/L		53.6	120	72.6	47.9	111	35.8
Cesium (Cs)-Total	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	0.000016	0.000022

Station 11 WQ 2017 Summary				STN 11	STN 11	STN 11	STN 11	STN11	STN11
216002 - Clair/ Maltby				1-May-2017	10-Aug-2017	3-Nov-2017	26-Apr-2018	24-Aug-2018	2-Nov-2018
				15:05	14:30	14:35	14:37	9:20	14:02
Chromium (Cr)-Total	0.00050	mg/L		<0.00050	<0.00050	0.0006	<0.00050	0.00062	<0.00050
Cobalt (Co)-Total	0.00010	mg/L	0.0009 (U)	0.0001	0.00102	0.00045	<0.00010	0.00057	0.00013
Copper (Cu)-Total	0.0010	mg/L	0.001 (U)	<0.0010	<0.0010	0.001	<0.0010	0.0011	0.0014
Iron (Fe)-Total	0.050	mg/L	0.3 (U)	0.313	1.32	1.02	0.174	1.20	0.217
Lead (Pb)-Total	0.000050	mg/L	0.001 (U)	0.000224	0.000183	0.000408	0.000200	0.000939	0.000549
Lithium (Li)-Total	0.0010	mg/L		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Magnesium (Mg)-Total	0.050	mg/L		14.3	28.6	20.8	13.3	25.4	11.0
Manganese (Mn)-Total	0.00050	mg/L		0.0247	1.69	0.688	0.0157	0.817	0.116
Molybdenum (Mo)-Total	0.000050	mg/L	0.04 (U)	0.000259	0.000174	0.00053	0.000194	0.000475	0.000375
Nickel (Ni)-Total	0.00050	mg/L	0.025 (U)	0.00053	0.00072	0.0007	<0.00050	0.00086	<0.00050
Phosphorus (P)-Total	0.050	mg/L	0.01 (U)	<0.050	0.174	0.601	<0.050	0.495	0.078
Potassium (K)-Total	0.050	mg/L		1.47	0.906	3.51	1.49	2.11	2.04
Rubidium (Rb)-Total	0.00020	mg/L		0.00158	0.00112	0.00327	0.00162	0.00260	0.00347
Selenium (Se)-Total	0.000050	mg/L	0.1 (U)	0.000131	0.000176	0.000159	0.000102	0.000206	0.000092
Silicon (Si)-Total	0.10	mg/L		1.45	8.18	3.93	1.63	2.93	1.87
Silver (Ag)-Total	0.000050	mg/L	0.0001 (U)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.000096
Sodium (Na)-Total	0.50	mg/L		57.9	159	76	52.7	173	26.7
Strontium (Sr)-Total	0.0010	mg/L		0.0845	0.196	0.0885	0.0680	0.175	0.0493
Sulfur (S)-Total	0.50	mg/L		1.91	1.09	6.8	2.56	1.88	3.56
Tellurium (Te)-Total	0.00020	mg/L		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Thallium (Tl)-Total	0.000010	mg/L	0.0003 (U)	<0.000010	<0.000010	0.000013	<0.000010	<0.000010	0.000011
Thorium (Th)-Total	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Tin (Sn)-Total	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Total	0.00030	mg/L		0.00134	0.0009	0.00123	0.00117	0.00317	0.00340
Tungsten (W)-Total	0.00010	mg/L	0.03 (U)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Uranium (U)-Total	0.000010	mg/L	0.005 (U)	0.000096	0.000047	0.000025	0.000097	0.000112	0.000066
Vanadium (V)-Total	0.00050	mg/L	0.006 (U)	<0.00050	<0.00050	0.00055	<0.00050	0.00064	0.00052
Zinc (Zn)-Total	0.0030	mg/L	0.02 (U)	0.0038	0.004	0.0136	0.0053	0.0120	0.0153
Zirconium (Zr)-Total	0.00030	mg/L	0.004 (U)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030

Station 12 WQ 2017 Summary				STN 12	STN 12	STN12
216002 - Clair/ Maltby				1-May-2017	10-Aug-2017	26-Apr-2018
				15:50	14:52	15:58
Parameter	Lowest Detection Limit	Units	PWQO Guideline Limit			
Physical Tests (Water)						
Total Suspended Solids	2.0	mg/L		16.9	14.3	8.0
Total Dissolved Solids	20	mg/L		347	803	303
Anions and Nutrients (Water)						
Ammonia, Total (as N)	0.020	mg/L		0.035	<0.020	<0.020
Bromide (Br)	0.10	mg/L		0.13	1.34	0.14
Chloride (Cl)	0.50	mg/L		71.3	207	50.4
Fluoride (F)	0.020	mg/L		0.048	0.049	0.052
Nitrate (as N)	0.020	mg/L		0.059	<0.020	0.021
Nitrite (as N)	0.010	mg/L		<0.010	<0.010	<0.010
Total Kjeldahl Nitrogen	0.15	mg/L		0.85	0.61	0.31
Orthophosphate-Dissolved (as P)	0.0030	mg/L		0.0108	<0.0030	<0.0030
Phosphorus, Total	0.0030	mg/L	0.01 (U)	0.129	0.0216	0.0326
Sulfate (SO4)	0.30	mg/L		3.7	2.27	5.79
Total Metals (Water)						
Aluminum (Al)-Total	0.010	mg/L	0.015 (U)	2.61	0.0693	0.553
Antimony (Sb)-Total	0.00010	mg/L	0.02 (U)	0.00038	<0.00010	0.00023
Arsenic (As)-Total	0.00010	mg/L	0.005 (U)	0.00235	0.00084	0.00063
Barium (Ba)-Total	0.00020	mg/L		0.0398	0.0429	0.0216
Beryllium (Be)-Total	0.00010	mg/L	0.011 (U)	0.00013	<0.00010	<0.00010
Bismuth (Bi)-Total	0.000050	mg/L		<0.000050	<0.000050	<0.000050
Boron (B)-Total	0.010	mg/L	0.2 (U)	0.024	0.049	0.023
Cadmium (Cd)-Total	0.000010	mg/L	0.0001 (U)	0.00019	0.000018	0.0000427
Calcium (Ca)-Total	0.50	mg/L		77.6	132	63.6
Cesium (Cs)-Total	0.000010	mg/L		0.000225	<0.000010	0.000045
Chromium (Cr)-Total	0.00050	mg/L		0.00454	<0.00050	0.00103

Station 12 WQ 2017 Summary				STN 12	STN 12	STN12
216002 - Clair/ Maltby				1-May-2017	10-Aug-2017	26-Apr-2018
				15:50	14:52	15:58
Cobalt (Co)-Total	0.00010	mg/L	0.0009 (U)	0.00178	0.00105	0.00032
Copper (Cu)-Total	0.0010	mg/L	0.001 (U)	0.012	<0.0010	0.0032
Iron (Fe)-Total	0.050	mg/L	0.3 (U)	3.82	1	0.621
Lead (Pb)-Total	0.000050	mg/L	0.001 (U)	0.0204	0.000622	0.00337
Lithium (Li)-Total	0.0010	mg/L		0.0096	0.0389	0.0071
Magnesium (Mg)-Total	0.050	mg/L		15.3	14.6	10.5
Manganese (Mn)-Total	0.00050	mg/L		0.246	0.561	0.0839
Molybdenum (Mo)-Total	0.000050	mg/L	0.04 (U)	0.00122	0.000329	0.000741
Nickel (Ni)-Total	0.00050	mg/L	0.025 (U)	0.00418	0.00067	0.00102
Phosphorus (P)-Total	0.050	mg/L	0.01 (U)	0.201	0.084	<0.050
Potassium (K)-Total	0.050	mg/L		2.9	2.89	3.53
Rubidium (Rb)-Total	0.00020	mg/L		0.00453	0.00276	0.00146
Selenium (Se)-Total	0.000050	mg/L	0.1 (U)	0.000124	0.000053	0.000059
Silicon (Si)-Total	0.10	mg/L		8.98	1.56	4.45
Silver (Ag)-Total	0.000050	mg/L	0.0001 (U)	<0.000050	<0.000050	<0.000050
Sodium (Na)-Total	0.50	mg/L		40.2	54.1	27.8
Strontium (Sr)-Total	0.0010	mg/L		0.326	0.991	0.319
Sulfur (S)-Total	0.50	mg/L		1.63	1.05	2.30
Tellurium (Te)-Total	0.00020	mg/L		<0.00020	<0.00020	<0.00020
Thallium (Tl)-Total	0.000010	mg/L	0.0003 (U)	0.000041	0.000017	0.000012
Thorium (Th)-Total	0.00010	mg/L		0.00034	<0.00010	<0.00010
Tin (Sn)-Total	0.00010	mg/L		0.00028	<0.00010	<0.00010
Titanium (Ti)-Total	0.00030	mg/L		0.0833	0.00243	0.0172
Tungsten (W)-Total	0.00010	mg/L	0.03 (U)	<0.00010	<0.00010	<0.00010
Uranium (U)-Total	0.000010	mg/L	0.005 (U)	0.000381	0.000079	0.000284
Vanadium (V)-Total	0.00050	mg/L	0.006 (U)	0.00572	<0.00050	0.00129
Zinc (Zn)-Total	0.0030	mg/L	0.02 (U)	0.0838	0.0088	0.0184
Zirconium (Zr)-Total	0.00030	mg/L	0.004 (U)	0.00118	<0.00030	0.00057

Station 13 WQ 2017 Summary				STN 13	STN 13	STN 13	STN 13	STN13	STN13
216002 - Clair/ Maltby				1-May-2017	10-Aug-2017	3-Nov-2017	26-Apr-2018	24-Aug-2018	2-Nov-2018
				16:10	15:08	14:00	15:50	8:46	14:52
Parameter	Lowest Detection Limit	Units	PWQO Guideline Limit						
Physical Tests (Water)									
Total Suspended Solids	2.0	mg/L		4.5	6.8	15.6	3.5	19.2	9.1
Total Dissolved Solids	20	mg/L		440	392	399	419	419	421
Anions and Nutrients (Water)									
Ammonia, Total (as N)	0.020	mg/L		0.059	0.063	<0.020	0.041	0.088	0.056
Bromide (Br)	0.10	mg/L		<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Chloride (Cl)	0.50	mg/L		166	179	177	175	196	181
Fluoride (F)	0.020	mg/L		0.048	0.033	0.029	0.049	0.052	0.040
Nitrate (as N)	0.020	mg/L		<0.020	<0.020	<0.020	0.032	0.023	0.051
Nitrite (as N)	0.010	mg/L		<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Total Kjeldahl Nitrogen	0.15	mg/L		1.01	1.37	1.16	0.51	2.57	1.25
Orthophosphate-Dissolved (as P)	0.0030	mg/L		<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
Phosphorus, Total	0.0030	mg/L	0.01 (U)	0.0316	0.133	0.0363	0.0139	0.0718	0.0250
Sulfate (SO4)	0.30	mg/L		2.08	1.95	1.28	2.13	1.13	1.65
Total Metals (Water)									
Aluminum (Al)-Total	0.010	mg/L	0.015 (U)	0.021	0.0149	0.0327	0.0220	0.0287	0.0281
Antimony (Sb)-Total	0.00010	mg/L	0.02 (U)	0.00015	<0.00010	<0.00010	<0.00010	<0.00010	0.00012
Arsenic (As)-Total	0.00010	mg/L	0.005 (U)	0.00033	0.00055	0.00051	0.00031	0.00061	0.00056
Barium (Ba)-Total	0.00020	mg/L		0.017	0.0095	0.0199	0.0138	0.0425	0.0273
Beryllium (Be)-Total	0.00010	mg/L	0.011 (U)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Bismuth (Bi)-Total	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron (B)-Total	0.010	mg/L	0.2 (U)	0.013	0.018	0.018	0.012	0.017	0.015
Cadmium (Cd)-Total	0.000010	mg/L	0.0001 (U)	<0.000010	<0.000010	<0.000010	0.0000073	<0.0000050	0.0000054
Calcium (Ca)-Total	0.50	mg/L		44.9	27.2	46.7	46.3	25.7	26.6
Cesium (Cs)-Total	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010

Station 13 WQ 2017 Summary				STN 13	STN 13	STN 13	STN13	STN13	STN13
216002 - Clair/ Maltby				1-May-2017	10-Aug-2017	3-Nov-2017	26-Apr-2018	24-Aug-2018	2-Nov-2018
				16:10	15:08	14:00	15:50	8:46	14:52
Chromium (Cr)-Total	0.00050	mg/L		<0.00050	<0.00050	0.00069	<0.00050	<0.00050	<0.00050
Cobalt (Co)-Total	0.00010	mg/L	0.0009 (U)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper (Cu)-Total	0.0010	mg/L	0.001 (U)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Iron (Fe)-Total	0.050	mg/L	0.3 (U)	0.093	0.235	0.338	0.105	0.276	0.113
Lead (Pb)-Total	0.000050	mg/L	0.001 (U)	0.000365	0.00015	0.000557	0.000344	0.000315	0.000271
Lithium (Li)-Total	0.0010	mg/L		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Magnesium (Mg)-Total	0.050	mg/L		7.7	8.41	9.66	7.95	7.60	7.28
Manganese (Mn)-Total	0.00050	mg/L		0.0482	0.145	0.126	0.0223	0.107	0.0211
Molybdenum (Mo)-Total	0.000050	mg/L	0.04 (U)	0.000236	0.000245	0.000272	0.000189	0.000251	0.000292
Nickel (Ni)-Total	0.00050	mg/L	0.025 (U)	<0.00050	0.00097	<0.00050	<0.00050	<0.00050	<0.00050
Phosphorus (P)-Total	0.050	mg/L	0.01 (U)	<0.050	<0.050	0.055	<0.050	0.072	<0.050
Potassium (K)-Total	0.050	mg/L		2.15	2.19	2.42	2.30	2.50	2.43
Rubidium (Rb)-Total	0.00020	mg/L		0.00154	0.00192	0.00205	0.00144	0.00226	0.00214
Selenium (Se)-Total	0.000050	mg/L	0.1 (U)	<0.000050	0.000053	<0.000050	<0.000050	0.000053	<0.000050
Silicon (Si)-Total	0.10	mg/L		0.11	0.31	0.36	<0.10	0.57	0.53
Silver (Ag)-Total	0.000050	mg/L	0.0001 (U)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Sodium (Na)-Total	0.50	mg/L		104	115	110	109	110	114
Strontium (Sr)-Total	0.0010	mg/L		0.0923	0.0734	0.091	0.0913	0.0812	0.0739
Sulfur (S)-Total	0.50	mg/L		1.08	0.58	0.7	1.18	0.69	0.73
Tellurium (Te)-Total	0.00020	mg/L		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Thallium (Tl)-Total	0.000010	mg/L	0.0003 (U)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Thorium (Th)-Total	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Tin (Sn)-Total	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Total	0.00030	mg/L		0.00048	<0.00030	0.00079	<0.0005	0.00047	<0.00070
Tungsten (W)-Total	0.00010	mg/L	0.03 (U)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Uranium (U)-Total	0.000010	mg/L	0.005 (U)	0.000065	0.000026	0.000063	0.000053	0.000037	0.000066
Vanadium (V)-Total	0.00050	mg/L	0.006 (U)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc (Zn)-Total	0.0030	mg/L	0.02 (U)	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
Zirconium (Zr)-Total	0.00030	mg/L	0.004 (U)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030

Station 14 WQ 2017 Summary				STN 14	STN 14	STN 14	STN 14	STN 14	STN 14	STN 14	STN14	STN 14	STN 14	STN 14	STN14
216002 - Clair/ Maltby				28-Apr-2017	1-May-2017	10-Aug-2017	5-Sep-2017	3-Oct-2017	3-Nov-2017	26-Apr-2018	8-May-2018	8-Aug-2018	24-Aug-2018	26-Oct-2018	2-Nov-2018
				9:50	15:30	15:35	13:55	15:00	15:00	15:25	19:22	12:15	14:05	14:57	14:27
Parameter	Lowest Detection Limit	Units	PWQO Guideline Limit												
Physical Tests (Water)															
Total Suspended Solids	2.0	mg/L		<2.0	4.5	2.7	3.9	<2.0	<2.0	<2.0	<2.0	4.2	<2.0	<2.0	3.8
Total Dissolved Solids	20	mg/L		284	242	364	360	391	292	221	296	301	366	357	249
Anions and Nutrients (Water)															
Ammonia, Total (as N)	0.020	mg/L		<0.020	0.159	<0.020	0.194	0.067	0.036	0.052	0.042	0.086	0.030	<0.020	<0.020
Bromide (Br)	0.10	mg/L		<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Chloride (Cl)	0.50	mg/L		20.4	12.3	37.9	33.8	38.7	29.5	12.5	24.9	22.8	37.2	37.5	13.4
Fluoride (F)	0.020	mg/L		0.049	0.06	0.054	0.054	0.055	0.047	0.057	0.064	0.074	0.065	0.056	0.054
Nitrate (as N)	0.020	mg/L		0.298	0.153	0.678	0.551	0.689	0.431	0.203	0.477	0.378	0.850	0.845	0.175
Nitrite (as N)	0.010	mg/L		<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Total Kjeldahl Nitrogen	0.15	mg/L		0.33	0.38	0.17	0.22	<0.15	0.36	0.35	0.26	0.36	0.19	<0.15	0.68
Orthophosphate-Dissolved (as P)	0.0030	mg/L		0.0035	0.0033	0.006			0.0103	0.0049	0.0076	0.0281	0.0125	0.0037	0.0154
Phosphorus, Total	0.0030	mg/L	0.01 (U)	0.008	0.0103	0.0067	0.0105	0.0042	0.0389	0.0137	0.0130	0.0343	0.0118	<0.0030	0.0310
Sulfate (SO4)	0.30	mg/L		10.7	7.6	18.7	15.5	18.2	13.4	7.51	11.8	9.71	17.1	16.9	12.4
Total Metals (Water)															
Aluminum (Al)-Total	0.010	mg/L	0.015 (U)	<0.010	0.016	0.0101	0.0115	<0.0050	0.0098	0.0054	0.0060	0.0148	0.0077	<0.0050	0.0106
Antimony (Sb)-Total	0.00010	mg/L	0.02 (U)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic (As)-Total	0.00010	mg/L	0.005 (U)	0.00025	0.00029	0.00018	0.00028	0.00018	0.00027	0.00030	0.00028	0.00047	0.00022	0.00019	0.00042
Barium (Ba)-Total	0.00020	mg/L		0.0365	0.0267	0.0559	0.0532	0.0599	0.0444	0.0257	0.0401	0.0440	0.0519	0.0546	0.0221
Beryllium (Be)-Total	0.00010	mg/L	0.011 (U)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Bismuth (Bi)-Total	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron (B)-Total	0.010	mg/L	0.2 (U)	0.013	<0.010	0.01	0.01	<0.010	0.01	0.010	0.012	0.012	0.011	0.011	<0.010
Cadmium (Cd)-Total	0.000010	mg/L	0.0001 (U)	0.000028	0.000064	0.000075	0.000076	0.000057	0.000061	0.0000194	0.0000254	0.0000756	0.0000547	0.0000271	0.0000311
Calcium (Ca)-Total	0.50	mg/L		62.8	53.7	77.3	75.7	77.6	79.9	55.5	66.6	68.4	77.0	80.4	49.0
Cesium (Cs)-Total	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010

Station 14 WQ 2017 Summary				STN 14	STN 14	STN 14	STN 14	STN 14	STN 14	STN 14	STN14	STN 14	STN 14	STN 14	STN14
216002 - Clair/ Maltby				28-Apr-2017	1-May-2017	10-Aug-2017	5-Sep-2017	3-Oct-2017	3-Nov-2017	26-Apr-2018	8-May-2018	8-Aug-2018	24-Aug-2018	26-Oct-2018	2-Nov-2018
				9:50	15:30	15:35	13:55	15:00	15:00	15:25	19:22	12:15	14:05	14:57	14:27
Chromium (Cr)-Total	0.00050	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Cobalt (Co)-Total	0.00010	mg/L	0.0009 (U)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper (Cu)-Total	0.0010	mg/L	0.001 (U)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Iron (Fe)-Total	0.050	mg/L	0.3 (U)	<0.050	0.063	<0.050	0.056	<0.050	<0.050	0.035	0.021	0.116	0.033	<0.010	0.073
Lead (Pb)-Total	0.000050	mg/L	0.001 (U)	<0.000050	0.000166	0.000112	0.00013	<0.000050	0.000099	<0.000050	<0.000050	0.000186	0.000089	<0.000050	0.000101
Lithium (Li)-Total	0.0010	mg/L		<0.0010	<0.0010	<0.0010	<0.0010	0.0012	0.0011	0.0011	<0.0010	0.0011	0.0014	0.0016	<0.0010
Magnesium (Mg)-Total	0.050	mg/L		21.5	17.5	26.6	25.9	26.9	26.2	17.5	22.6	20.4	24.8	26.5	16.0
Manganese (Mn)-Total	0.00050	mg/L		0.00635	0.0173	0.0163	0.0501	0.0133	0.0219	0.0152	0.00680	0.0720	0.0202	0.00844	0.0260
Molybdenum (Mo)-Total	0.000050	mg/L	0.04 (U)	0.000342	0.00038	0.000414	0.000366	0.000396	0.000361	0.000302	0.000381	0.000362	0.000406	0.000388	0.000323
Nickel (Ni)-Total	0.00050	mg/L	0.025 (U)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00051	<0.00050	<0.00050	<0.00050	0.00063	<0.00050	<0.00050
Phosphorus (P)-Total	0.050	mg/L	0.01 (U)	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium (K)-Total	0.050	mg/L		0.894	0.638	1.18	1.1	1.19	1.16	0.944	1.13	1.15	1.17	1.28	1.62
Rubidium (Rb)-Total	0.00020	mg/L		0.00094	0.00071	0.00135	0.00126	0.00128	0.00126	0.00094	0.00118	0.00139	0.00133	0.00131	0.00152
Selenium (Se)-Total	0.000050	mg/L	0.1 (U)	0.000127	0.000118	0.000173	0.000157	0.000177	0.000149	0.000090	0.000101	0.000146	0.000187	0.000110	0.000098
Silicon (Si)-Total	0.10	mg/L		3.22	2.53	5.3	5.04	5.12	4.8	2.47	3.69	4.56	4.74	5.02	3.38
Silver (Ag)-Total	0.000050	mg/L	0.0001 (U)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Sodium (Na)-Total	0.50	mg/L		10.7	6.56	18.6	16.7	19.2	14.5	6.25	12.9	11.0	17.3	18.0	5.33
Strontium (Sr)-Total	0.0010	mg/L		0.0841	0.0712	0.106	0.103	0.111	0.0976	0.0689	0.0901	0.0954	0.110	0.106	0.0644
Sulfur (S)-Total	0.50	mg/L		4.37	3.03	7.03	5.67	6.77	5.32	2.97	4.42	3.64	6.04	6.22	4.05
Tellurium (Te)-Total	0.00020	mg/L		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Thallium (Tl)-Total	0.000010	mg/L	0.0003 (U)	<0.000010	<0.000010	0.000016	0.000015	0.000016	0.000013	<0.000010	0.000012	0.000018	0.000016	0.000015	<0.000010
Thorium (Th)-Total	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Tin (Sn)-Total	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Total	0.00030	mg/L		<0.00030	0.00054	0.00035	<0.00030	<0.00030	0.00039	<0.00030	<0.00030	<0.00050	<0.00030	<0.00030	0.00035
Tungsten (W)-Total	0.00010	mg/L	0.03 (U)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Uranium (U)-Total	0.000010	mg/L	0.005 (U)	0.00034	0.000233	0.000528	0.000445	0.000507	0.000352	0.000222	0.000353	0.000272	0.000489	0.000459	0.000160
Vanadium (V)-Total	0.00050	mg/L	0.006 (U)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc (Zn)-Total	0.0030	mg/L	0.02 (U)	0.0506	0.0471	0.0871	0.0823	0.0864	0.071	0.0270	0.0509	0.0710	0.0705	0.0733	0.0342
Zirconium (Zr)-Total	0.00030	mg/L	0.004 (U)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030

Station 15 WQ 2017 Summary				STN 15	STN 15	STN 15	STN 15	STN 15	STN 15	STN15	STN 15	STN 15	STN 15	STN 15	STN15
216002 - Clair/ Maltby				28-Apr-2017	1-May-2017	10-Aug-2017	5-Sep-2017	3-Oct-2017	3-Nov-2017	26-Apr-2018	8-May-2018	8-Aug-2018	24-Aug-2018	26-Oct-2018	2-Nov-2018
				10:30	15:35	16:00	14:20	16:00	15:25	16:30	19:45	11:40	14:40	15:25	15:18
Parameter	Lowest Detection Limit	Units	PWQO Guideline Limit												
Physical Tests (Water)															
Total Suspended Solids	2.0	mg/L		3.5	3.3	2.9	<2.0	<2.0	2.7	2.3	2.2	<2.0	<2.0	<2.0	3.5
Total Dissolved Solids	20	mg/L		272	613	626	654	664	661	610	687	586	575	631	462
Anions and Nutrients (Water)															
Ammonia, Total (as N)	0.020	mg/L		0.029	0.065	<0.020	0.212	0.116	0.194	0.134	0.031	0.083	0.169	0.057	0.178
Bromide (Br)	0.10	mg/L		<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Chloride (Cl)	0.50	mg/L		246	165	184	196	194	195	199	213	180	176	188	140
Fluoride (F)	0.020	mg/L		0.06	0.039	0.036	0.055	0.04	0.048	0.059	0.057	0.059	0.070	0.059	0.048
Nitrate (as N)	0.020	mg/L		2.73	2.03	2.35	2.53	2.65	2.77	2.44	2.62	2.26	2.42	2.70	1.35
Nitrite (as N)	0.010	mg/L		<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Total Kjeldahl Nitrogen	0.15	mg/L		0.49	0.6	0.61	0.41	0.21	0.51	0.46	0.37	0.36	0.47	0.35	0.65
Orthophosphate-Dissolved (as P)	0.0030	mg/L		<0.0030	<0.0030	0.0044			<0.0030	<0.0030	<0.0030	0.0062	<0.0030	<0.0030	0.0083
Phosphorus, Total	0.0030	mg/L	0.01 (U)	0.0106	0.0087	0.0065	0.0048	0.0044	0.0099	0.0089	0.0054	0.0101	0.0091	<0.0030	0.0326
Sulfate (SO4)	0.30	mg/L		20.9	14.7	18.3	17.8	17.9	19.6	20.1	20.9	17.2	18.6	21.6	14.6
Total Metals (Water)															
Aluminum (Al)-Total	0.010	mg/L	0.015 (U)	0.019	0.02	0.0065	0.0058	<0.0050	0.0238	0.0134	0.0073	0.0098	0.0068	0.0075	0.336
Antimony (Sb)-Total	0.00010	mg/L	0.02 (U)	0.00011	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00011	0.00018
Arsenic (As)-Total	0.00010	mg/L	0.005 (U)	0.00033	0.00029	0.00044	0.00041	0.0004	0.00042	0.00034	0.00036	0.00059	0.00058	0.00043	0.00057
Barium (Ba)-Total	0.00020	mg/L		0.0772	0.0752	0.0998	0.106	0.113	0.1	0.0816	0.0908	0.0922	0.0862	0.101	0.0574
Beryllium (Be)-Total	0.00010	mg/L	0.011 (U)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Bismuth (Bi)-Total	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron (B)-Total	0.010	mg/L	0.2 (U)	0.021	0.017	0.022	0.023	0.022	0.022	0.020	0.023	0.019	0.020	0.024	0.028
Cadmium (Cd)-Total	0.000010	mg/L	0.0001 (U)	0.000034	0.000029	0.000018	0.000016	0.000022	0.000029	0.0000274	0.0000268	0.0000150	0.0000147	0.0000129	0.0000264
Calcium (Ca)-Total	0.50	mg/L		97.4	81.5	89.9	95.3	101	105	85.2	93.1	84.2	84.0	96.1	56.4
Cesium (Cs)-Total	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.000032

Station 15 WQ 2017 Summary				STN 15	STN 15	STN 15	STN 15	STN 15	STN 15	STN15	STN 15	STN 15	STN 15	STN 15	STN15
216002 - Clair/ Maltby				28-Apr-2017	1-May-2017	10-Aug-2017	5-Sep-2017	3-Oct-2017	3-Nov-2017	26-Apr-2018	8-May-2018	8-Aug-2018	24-Aug-2018	26-Oct-2018	2-Nov-2018
				10:30	15:35	16:00	14:20	16:00	15:25	16:30	19:45	11:40	14:40	15:25	15:18
Chromium (Cr)-Total	0.00050	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00055	<0.00050	<0.00050	<0.00050	0.00057	<0.00050	0.00099
Cobalt (Co)-Total	0.00010	mg/L	0.0009 (U)	0.00013	0.00013	<0.00010	<0.00010	<0.00010	0.00016	0.00010	0.00012	0.00014	<0.00010	<0.00010	0.00017
Copper (Cu)-Total	0.0010	mg/L	0.001 (U)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0019
Iron (Fe)-Total	0.050	mg/L	0.3 (U)	0.143	0.149	0.139	0.128	0.113	0.184	0.109	0.127	0.276	0.228	0.111	0.481
Lead (Pb)-Total	0.000050	mg/L	0.001 (U)	0.000204	0.000175	0.000083	0.000116	0.000079	0.000217	0.000152	0.000114	0.000094	0.000089	0.000081	0.00145
Lithium (Li)-Total	0.0010	mg/L		0.0011	<0.0010	0.0015	0.0018	0.0018	0.0018	0.0018	0.0016	0.0014	0.0013	0.0022	0.0010
Magnesium (Mg)-Total	0.050	mg/L		27.3	24	28.7	29.7	28.9	31.7	24.3	27.1	25.2	24.4	29.0	16.1
Manganese (Mn)-Total	0.00050	mg/L		0.0417	0.0444	0.0179	0.0129	0.0279	0.0518	0.0306	0.0337	0.0615	0.0335	0.0205	0.0286
Molybdenum (Mo)-Total	0.000050	mg/L	0.04 (U)	0.000304	0.000294	0.000295	0.000295	0.000285	0.000295	0.000276	0.000269	0.000269	0.000304	0.000282	0.000317
Nickel (Ni)-Total	0.00050	mg/L	0.025 (U)	<0.00050	<0.00050	<0.00050	0.00051	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00052	<0.00050	0.00062
Phosphorus (P)-Total	0.050	mg/L	0.01 (U)	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium (K)-Total	0.050	mg/L		2.49	2.21	2.59	2.62	2.84	2.48	3.00	2.50	2.77	2.57	2.70	3.04
Rubidium (Rb)-Total	0.00020	mg/L		0.00066	0.00058	0.00077	0.00081	0.00079	0.00074	0.00066	0.00056	0.00073	0.00069	0.00077	0.00117
Selenium (Se)-Total	0.000050	mg/L	0.1 (U)	0.000214	0.000209	0.00016	0.00015	0.000136	0.000173	0.000200	0.000191	0.000144	0.000178	0.000158	0.000111
Silicon (Si)-Total	0.10	mg/L		2.91	3.08	4.29	4.13	4.78	4.9	2.77	2.94	4.41	4.16	4.77	3.38
Silver (Ag)-Total	0.000050	mg/L	0.0001 (U)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Sodium (Na)-Total	0.50	mg/L		139	110	94.1	94	91.2	95.4	107	116	88.2	84.7	95.3	64.7
Strontium (Sr)-Total	0.0010	mg/L		0.155	0.129	0.134	0.142	0.146	0.139	0.123	0.133	0.127	0.129	0.143	0.0897
Sulfur (S)-Total	0.50	mg/L		8.15	6.92	7.19	6.67	6.83	7.26	7.60	7.81	6.16	6.58	8.38	5.02
Tellurium (Te)-Total	0.00020	mg/L		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Thallium (Tl)-Total	0.000010	mg/L	0.0003 (U)	0.000012	<0.000010	0.000015	0.000014	0.000015	0.000014	0.000010	0.000014	0.000011	0.000013	0.000014	0.000010
Thorium (Th)-Total	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Tin (Sn)-Total	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Total	0.00030	mg/L		0.00068	0.00068	<0.00030	<0.00030	<0.00030	0.00074	0.00077	<0.00030	<0.00050	<0.00030	<0.00030	0.0104
Tungsten (W)-Total	0.00010	mg/L	0.03 (U)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Uranium (U)-Total	0.000010	mg/L	0.005 (U)	0.000456	0.000403	0.00038	0.00037	0.00036	0.000364	0.000421	0.000434	0.000322	0.000346	0.000362	0.000254
Vanadium (V)-Total	0.00050	mg/L	0.006 (U)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00083
Zinc (Zn)-Total	0.0030	mg/L	0.02 (U)	0.0085	0.0087	0.0053	0.0055	0.0058	0.0074	0.0058	0.0076	0.0054	0.0051	0.0057	0.0120
Zirconium (Zr)-Total	0.00030	mg/L	0.004 (U)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030

Appendix SW-1D

Wetland Water Pesticide Data (2017)

Parameter	Guideline Limit (PWQO)	Units	STN 3	STN 5	STN 7	STN 8	STN 11	STN 13
Organochlorine Pesticides (Water)								
Aldrin		ug/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
gamma-hexachlorocyclohexane	0.01 (U)	ug/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
a-chlordane		ug/L	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040
Chlordane (Total)	0.06 (U)	ug/L	<0.057	<0.057	<0.057	<0.057	<0.057	<0.057
g-chlordane		ug/L	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040
o,p-DDD		ug/L	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030
pp-DDD		ug/L	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030
Total DDD		ug/L	<0.042	<0.042	<0.042	<0.042	<0.042	<0.042
o,p-DDE		ug/L	<0.0080	<0.0080	<0.0080	<0.0080	<0.0080	<0.0080
pp-DDE		ug/L	<0.0080	<0.0080	<0.0080	<0.0080	<0.0080	<0.0080
Total DDE		ug/L	<0.011	<0.011	<0.011	<0.011	<0.011	<0.011
op-DDT		ug/L	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030
pp-DDT		ug/L	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030
Total DDT		ug/L	<0.042	<0.042	<0.042	<0.042	<0.042	<0.042
Dieldrin		ug/L	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Endosulfan I		ug/L	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030
Endosulfan II		ug/L	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030
Endosulfan (Total)	0.003 (U)	ug/L	<0.042	<0.042	<0.042	<0.042	<0.042	<0.042
Endrin	0.002 (U)	ug/L	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040
Heptachlor		ug/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Heptachlor Epoxide		ug/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Hexachlorobenzene	0.0065 (U)	ug/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Hexachlorobutadiene	0.009 (U)	ug/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Hexachloroethane		ug/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Methoxychlor	0.04 (U)	ug/L	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
2-Fluorobiphenyl		%	77.3	75	73.5	80.4	72.2	74.3
d14-Terphenyl		%	74	74	59.2	75.2	67.9	67.1

Detection Limit Exceeds Guideline

Appendix SW-2

Wetland Monitoring Stations Photo Log (2016 - 2018)

Appendix SW-2

Wetland Monitoring Stations Photo Log (2017 - 2018)

Photo 1.
Wetland Station 1 – May 1, 2017
(Photo provided by Matrix Solutions Inc.)

Photo 2.
Wetland Station 1 – August 10, 2017
(Photo provided by Matrix Solutions Inc.)

Photo 3.
Wetland Station 1 – August 24, 2018
(Photo provided by Matrix Solutions Inc.)

Photo 4.
Wetland Station 1 – November 2, 2018
(Photo provided by Matrix Solutions Inc.)

Photo 5.
Station 2 – May 1, 2017
(Photo provided by Matrix Solutions Inc.)

Photo 6.
Station 2 – May 1, 2017
(Photo provided by Matrix Solutions Inc.)

Photo 7.
Station 2 – August 10, 2017
(Photo provided by Matrix Solutions Inc.)

Photo 8.
Station 2 – August 10, 2017
(Photo provided by Matrix Solutions Inc.)

Photo 9.
Station 2 – August 24, 2018
(Photo provided by Matrix Solutions Inc.)

Photo 10.
Station 2 – November 2, 2018
(Photo provided by Matrix Solutions Inc.)

Photo 11.
Station 3 – April 18, 2017

Photo 12.
Station 3 – May 1, 2017

Photo 13.
Station 3 – August 10, 2017

Photo 14.
Station 3 – November 29, 2017

Photo 15.
Station 3 – April 11, 2018

Photo 16.
Station 3 – April 26, 2018

Photo 17.
Station 3 – August 8, 2018

Photo 18.
Station 3 – November 2, 2018

Photo 19.
Station 4 – April 18, 2017

Photo 20.
Station 4 – May 1, 2017

Photo 21.
Station 4 – August 10, 2017

Photo 22.
Station 4 – November 3, 2017

Photo 23.
Station 4 – April 11, 2018

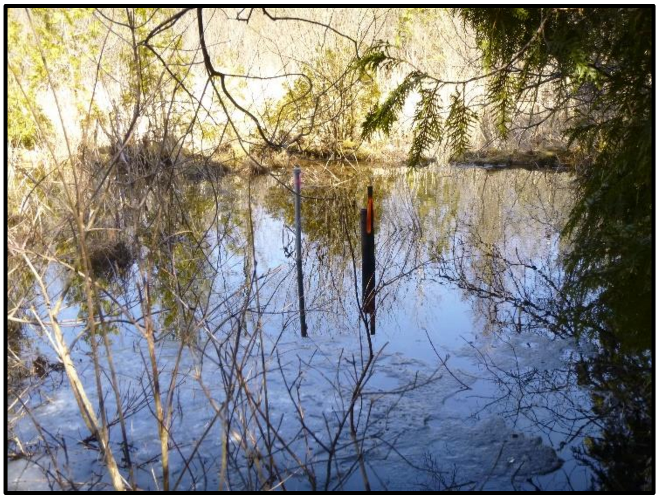


Photo 24.
Station 4 – April 26, 2018

Photo 25.
Station 4 – August 8, 2018

Photo 26.
Station 4 – November 2, 2018

Photo 27.
Station 5 – April 18, 2017

Photo 28.
Station 5 – May 1, 2017

Photo 29.
Station 5 – August 10, 2017

Photo 30.
Station 5 – November 29, 2017

Photo 31.
Station 5 – April 11, 2018

Photo 32.
Station 5 – April 26, 2018

Photo 33.
Station 5 – November 2, 2018

Photo 34.
Station 6 – April 18, 2017

Photo 35.
Station 6 – May 1, 2017

Photo 36.
Station 6 – August 10, 2017

Photo 37.
Station 6 – November 3, 2017

Photo 38.
Station 6 – April 11, 2018

Photo 39.
Station 6 – April 26, 2018

Photo 40.
Station 6 – August 24, 2018

Photo 41.
Station 6 – November 2, 2018

Photo 42.
Station 7 – April 18, 2017

Photo 43.
Station 7 – May 1, 2017

Photo 44.
Station 7 – August 10, 2017

Photo 45.
Station 7 – November 3, 2017

Photo 46.
Station 7 – April 11, 2018

Photo 47.
Station 7 – April 26, 2018

Photo 48.
Station 7 – August 24, 2018

Photo 49.
Station 7 – November 2, 2018

Photo 50.
Station 8 – April 18, 2017

Photo 51.
Station 8 – May 1, 2017

Photo 52.
Station 8 – August 10, 2017

Photo 53.
Station 8 – November 3, 2017

Photo 54.
Station 8 – April 11, 2018

Photo 55.
Station 8 – April 26, 2018

Photo 56.
Station 8 – August 24, 2018

Photo 57.
Station 8 – November 2, 2018

Photo 58.
Station 10 – April 18, 2017

Photo 59.
Station 10 – May 1, 2017

Photo 60.
Station 10 – August 10, 2017

Photo 61.
Station 10 – November 3, 2017

Photo 62.
Station 10 – April 11, 2018

Photo 63.
Station 10 – April 26, 2018

Photo 64.
Station 10 – August 24, 2018

Photo 65.
Station 10 – November 2, 2018

Photo 66.
Station 11 – April 18, 2017

Photo 67.
Station 11 – May 1, 2017

Photo 68.
Station 11 – August 10, 2017

Photo 69.
Station 11 – November 3, 2017

Photo 70.
Station 11 – April 11, 2018

Photo 71.
Station 11 – April 26, 2018

Photo 72.
Station 11 – August 24, 2018

Photo 73.
Station 11 – November 2, 2018

Photo 74.
Station 12 – April 18, 2017

Photo 75.
Station 12 – May 1, 2017

Photo 76.
Station 12 – August 10, 2017

Photo 77.
Station 12 – November 29, 2017

Photo 78.
Station 12 – April 11, 2018

Photo 79.
Station 12 – April 26, 2018

Photo 80.
Station 12 – August 24, 2018

Photo 81.
Station 12 – November 11, 2018

Photo 82.
Station 13 – April 18, 2017

Photo 83.
Station 13 – May 1, 2017

Photo 84.
Station 13 (New Location) – September 27, 2017

Photo 85.
Station 13 (New Location) – November 29, 2017

Photo 86.
Station 13 – April 11, 2018

Photo 87.
Station 13 – April 26, 2018

Photo 88.
Station 13 – August 24, 2018

Photo 89.
Station 13 – November 2, 2018

Photo 90.
Station 14 – April 28, 2017.

Photo 91.
Station 14 – May 1, 2017

Photo 92.
Station 14 – August 10, 2017

Photo 93.
Station 14 – November 3, 2017

Photo 94.
Station 14 – May 8, 2018

Photo 95.
Station 14 – April 26, 2018

Photo 96.
Station 14 – August 24, 2018

Photo 97.
Station 14 – October 26, 2018

Photo 98.
Station 15 – April 28, 2017.

Photo 99.
Station 15 – August 10, 2017

Photo 100.
Station 15 – September 5, 2017

Photo 101.
Station 15 – November 3, 2017

Photo 102.

Station 15 – May 8, 2018

Photo 103.

Station 15 – April 26, 2018

Photo 104.

Station 15 – August 24, 2018

Photo 105.

Station 15 – October 26, 2018

Appendix GW-1

Ground Water Tables

TABLE GW1.1

Monitoring Well Summary

City of Guelph

Clair - Maltby Master Environmental Servicing Plan (MESP) and Secondary Plan (SP)

Monitoring Well	UTM NAD83 Zone 17N		Elevation^1 (masl)													Depth (mbgs)													Hydraulic Conductivity (m/s)	Method	Stratigraphy of Screened Interval
	Northing	Easting	Ground Surface	Top of Casing	Oct. 2016 Ground Water	Dec. 2016 Ground Water	Jan. 2017 Ground Water	April 2017 Ground Water	July 2017 Ground Water	Oct. 2017 Ground Water	Feb. 2018 Ground Water	April 2018 Ground Water	May 2018 Ground Water	June 2018 Ground Water	Dec. 2018 Ground Water	Top of Screen	Base of Screen	Oct. 2016 Ground To Water	Dec. 2016 Ground To Water	Jan. 2017 Ground To Water	April 2017 Ground To Water	July 2017 Ground To Water	Oct. 2017 Ground To Water	Feb. 2018 Ground To Water	April 2018 Ground To Water	May 2018 Ground To Water	June 2018 Ground To Water	Dec. 2018 Ground To Water			
MW01-D	4817765	566644	337.27	337.85	331.52	331.26	331.26	332.94	332.93	331.95	331.40	332.29	332.78	---	332.38	18.8	20.3	5.75	6.01	5.25	4.33	4.34	5.32	5.87	4.98	4.49	---	4.89	5.8E-07	BR	Clayey Silt (Till)
MW01-S	4817763	566642	337.20	337.71	331.72	331.51	331.51	333.22	333.15	332.28	331.56	332.36	332.93	---	332.52	11.9	13.4	5.48	5.69	4.95	3.98	4.05	4.92	5.64	4.84	4.27	---	4.68	2.1E-04	BR	Sand, Gravel
MW02-D	4817419	566681	335.29	336.11	331.32	331.12	331.12	332.89	332.79	331.74	331.34	332.34	332.78	---	332.38	19.2	20.7	3.98	4.17	3.37	2.41	2.51	3.55	3.95	2.95	2.51	---	2.91	1.5E-03	SG	Gravely Sand
MW02-S	4817425	566682	335.40	336.36	332.00	331.80	331.80	333.60	334.19	332.53	332.08	332.93	333.35	---	332.80	6.7	8.2	3.40	3.60	2.85	1.80	1.21	2.87	3.32	2.47	2.05	---	2.60	2.1E-03	SG	Sandy Gravel
MW03-D	4816950	568080	350.05	350.80	330.89	330.58	330.58	331.31	332.40	331.60	330.77	---	331.26	---	330.81	32.6	34.1	19.17	19.48	19.55	18.75	17.66	18.45	19.28	---	18.79	---	19.24	2.8E-04	BR	Sand, Gravel
MW03-S	4816949	568083	349.95	350.70	331.17	330.80	330.80	331.45	332.57	331.81	330.96	---	331.41	---	331.03	21.6	23.2	18.78	19.15	19.27	18.50	17.38	18.14	18.99	---	18.54	---	18.92	NA	SG	Sand
MW04-D	4816485	566169	349.60	350.47	334.60	334.43	334.43	336.18	336.04	334.94	334.79	---	335.66	---	334.98	26.8	28.3	15.00	15.17	14.71	13.42	13.56	14.66	14.81	---	13.94	---	14.62	2.2E-06	BR	Sandy Silt
MW04-S	4816488	566171	349.63	350.54	336.01	335.80	335.80	337.45	337.69	336.60	336.12	---	337.08	---	336.26	19.4	20.9	13.63	13.83	13.58	12.19	11.95	13.03	13.51	---	12.55	---	13.37	8.2E-08	KGS	Silt (Till)
MW05-D	4816337	567001	340.17	341.10	334.66	334.46	334.46	335.88	335.93	335.18	334.75	---	335.59	---	334.89	22.6	24.1	5.51	5.71	5.32	4.29	4.24	4.99	5.42	---	4.58	---	5.28	2.5E-04	KGS	Sand, Gravel
MW05-S	4816335	566999	340.16	341.11	335.07	334.86	334.86	336.32	336.31	335.56	335.18	---	336.05	---	335.30	15.2	16.8	5.09	5.31	4.86	3.84	3.85	4.60	4.98	---	4.11	---	4.86	5.4E-04	KGS	Sand, Gravel
MW06-D	4816250	567400	352.38	353.20	334.40	334.14	334.14	335.31	335.58	334.94	334.31	---	335.05	---	334.38	35.1	36.6	17.98	18.24	18.09	17.07	16.80	17.44	18.07	---	17.33	---	18.00	7.6E-06	KGS	Silty Sand
MW06-S	4816247	567401	352.41	353.34	334.71	334.42	334.42	335.40	335.79	335.23	334.52	---	335.11	---	334.56	21.4	22.9	17.69	17.99	17.98	17.00	16.61	17.18	17.89	---	17.30	---	17.85	5.4E-06	KGS	Silt and Sand
MW07-D	4815512	565479	347.04	347.89	329.61	329.31	329.31	330.25	330.82	330.12	329.51	---	330.13	---	329.46	33.1	34.6	17.43	17.73	17.60	16.79	16.22	16.92	17.53	---	16.91	---	17.58	4.8E-04	BR	Sand, Gravel
MW08-D	4815489	566248	338.48	339.45	330.90	330.57	330.57	331.66	332.42	331.60	330.74	---	331.41	---	330.68	17.7	19.2	7.58	7.91	7.96	6.82	6.06	6.88	7.74	---	7.07	---	7.80	2.3E-04	KGS	Sand, Gravel
MW08-S	4815494	566250	338.48	339.40	334.08	333.81	333.81	335.26	334.72	334.22	334.42	---	335.02	---	333.93	6.1	7.6	4.40	4.67	4.09	3.22	3.76	4.26	4.06	---	3.46	---	4.55	6.6E-04	KGS	Sand, Gravel
MW09-D	4815295	566970	350.51	351.15	331.14	330.81	330.81	331.77	332.77	331.92	330.97	---	---	331.89	330.89	32.0	33.5	19.37	19.69	19.77	18.74	17.74	18.59	19.54	---	---	18.62	19.62	7.2E-06	BR	Sandy Silt
MW09-S	4815292	566972	350.46	350.98	331.02	330.74	330.74	331.58	332.61	331.74	330.85	---	331.43	---	330.80	21.6	23.2	19.44	19.72	19.82	18.88	17.85	18.72	19.61	---	19.03	---	19.66	2.2E-04	KGS	Sand, Gravel
MW1-11*	4816210	565410	346.40	347.32	329.85	329.62	329.62	330.71	330.88	---	329.70	---	330.42	---	---	15.3^{AB}	18.3^{AB}	16.55	16.77	16.46	15.69	15.52	---	16.70	---	15.98	---	---	--	--	--
MW2-11*	4816026	565434	343.36	344.37	329.91	329.67	329.67	330.64	330.98	---	329.74	---	330.38	---	---	12.0^{AB}	15.0^{AB}	13.45	13.69	13.47	12.72	12.38	---	13.62	---	12.98	---	---	--	--	--
MW3-11*	4815829	565622	349.03	349.90	331.41	331.48	331.48	331.47	331.48	---	331.41	---	331.46	---	---	11.6^{AB}	17.8^{AB}	17.62	17.56	17.55	17.56	17.55	---	17.62	---	17.57	---	---	--	---	--

Notes:

^{1} - elevations are geodetic

^{AB} - As reported by Aquifer Beach Ltd. (2012)

* - Pre-existing monitoring well at 132 Clair Road

masl - metres above sea level

NA - not available

BR - Bouwer and Rice method (1976)

KGS - Hyder et al method (1994)

SG - Springer-Gelhar (1991)

🟨 - Indicates an upward flow gradient at the well

Notes:

Water levels were recorded on the following dates:

October 19, 20, 21, 2016
December 13, 2016
January 26, 2017
April 19, 2017
July 17, 2017
October 4, 5, 10, 2017
February 8, 9, 2018
April 17, 2018
May 9, 10, 11, 2018
June 8, 2018
December 18 and 19, 2018

TABLE GW1.2

Mini Piezometer Summary

City of Guelph

Clair - Maltby Master Environmental Servicing Plan (MESP) and Secondary Plan (SP)

Monitoring Well	UTM NAD83 Zone 17N		Elevation[1] (masl)																						Depth (mbgs)
					Oct. 2016		Dec. 2016		Jan. 2017		April 2017		July 2017		Nov. 2017		Feb. 2018		April 2018		May 2018		Dec. 2018		Ground Surface to Screen Base
	Northing	Easting	Ground Surface	Top of Casing	Surface Water	Ground Water	Surface Water	Ground Water	Surface Water	Ground Water	Surface Water	Ground Water	Surface Water	Ground Water	Surface Water	Ground Water	Surface Water	Ground Water	Surface Water	Ground Water	Surface Water	Ground Water	Surface Water	Ground Water	
MP01-D	4816236	565484	341.95	342.86	dry	340.64	dry	340.77	342.11	341.30	342.47	342.10	342.37	342.07	341.91	341.16	---	---	342.44	341.93	342.46	342.18	342.05	341.34	1.99
MP01-S	4816236	565484	341.95	342.78	dry	dry	dry	dry	342.12	341.83	342.48	342.26	342.38	341.94	341.94	341.31	---	---	342.45	342.29	342.48	342.26	342.05	341.85	1.15
MP02	4816113	565844	345.90	347.16	dry	dry	dry	dry	346.18	345.58	346.78	346.21	346.94	346.43	346.30	345.84	---	---	346.66	346.14	346.84	346.36	346.20	345.82	1.04
MP03	4816332	566274	347.42	348.28	dry	347.09	dry	347.23	347.55	347.52	348.08	348.08	347.74	347.74	347.27	347.27	frozen	frozen	frozen	348.00	348.05	348.05	347.74	347.72	1.44
MP04	4816622	566419	339.30	340.33	dry	339.09	dry	339.25	339.67	339.66	339.74	339.74	339.69	339.68	339.38	339.38	frozen	frozen	frozen	339.73	339.74	339.73	339.62	frozen	1.27
MP05	4815925	566681	337.70	338.36	dry	337.49	dry	337.64	338.13	338.13	338.16	338.16	338.09	338.09	337.72	337.72	frozen	frozen	frozen	338.16	338.13	338.14	338.01	337.94	1.64
MP06	4816131	566973	337.39	338.24	dry	337.00	dry	337.02	337.73	337.69	337.94	337.93	337.90	337.89	337.48	337.42	frozen	frozen	frozen	337.88	337.93	337.92	dry	337.37	1.45
MP07-D	4816369	567115	337.26	338.37	dry	336.45	dry	336.75	337.43	336.82	337.89	337.49	337.86	337.83	337.42	frozen	frozen	frozen	frozen	337.66	337.87	337.77	337.39	frozen	2.42
MP07-S	4816369	567115	337.29	338.22	dry	336.97	dry	336.96	337.38	337.32	337.87	337.81	337.85	337.81	337.39	337.31	frozen	frozen	frozen	337.67	337.88	337.84	337.40	337.17	1.37
MP08	4816745	566739	337.40	338.72	337.38	337.28	337.40	337.29	337.68	337.67	337.86	337.86	337.84	337.82	337.57	337.56	frozen	frozen	337.81	337.77	337.87	337.85	337.65	frozen	0.98
MP09-D	4817378	566708	333.14	334.00	dry	331.63	dry	331.92	332.99	332.26	333.68	332.46	333.54	333.02	dry	332.89	frozen	332.75	333.32	332.63	333.41	333.04	dry	332.98	2.04
MP09-S	4817379	566707	333.14	334.30	dry	332.47	dry	332.45	332.99	332.33	333.74	332.73	333.59	333.07	dry	332.88	frozen	332.71	333.37	333.17	333.45	333.16	dry	333.04	1.14
MP10	4815366	565340	330.11	331.58	NA	NA	dry	329.95	330.13	330.10	330.46	330.46	331.07	331.07	330.43	330.42	frozen	frozen	330.37	330.37	330.46	330.46	330.17	330.06	0.97
MP11	4814531	566385	333.03	334.04	dry	332.98	333.19	333.16	333.33	333.33	333.33	333.34	333.29	333.31	333.19	333.16	frozen	frozen	333.43	333.36	333.38	333.40	frozen	333.29	1.29
MP12	4816079	567796	334.34	335.61	NA	NA	dry	334.16	334.38	334.33	334.58	334.58	334.59	334.60	334.41	334.31	dry	frozen	334.64	334.58	334.66	334.67	dry	frozen	1.47
MP13-D	4816631	568562	334.03	335.21	dry	333.29	333.99	333.38	334.30	333.99	334.57	334.27	334.43	333.99	destroyed	destroyed	destroyed	destroyed	destroyed	destroyed	destroyed	destroyed	destroyed	destroyed	2.17
MP13-S	4816631	568563	334.07	335.04	dry	333.51	333.99	333.74	334.28	333.83	334.56	334.18	334.42	334.42	destroyed	destroyed	destroyed	destroyed	destroyed	destroyed	destroyed	destroyed	destroyed	destroyed	1.16
MP14	4815633	568626	326.80	327.54	326.90	326.56	326.90	326.85	326.96	327.11	326.92	327.04	326.93	326.81	326.93	326.74	326.94	frozen	---	---	326.91	327.02	326.91	326.94	0.86

Notes:

--- - not available

[1] - elevations are geodetic

masl - metres above sea level

NA - not available

🟨 - Indicates an upward flow gradient in the GW system

🟩 - Indicates groundwater elevation above surface water elevation

Notes:

Water levels were recorded on the following dates:

October 20 and 21, 2016
December 13, 2016
January 26, 2017
April 18, 2017
July 17, 2017
November 17, 2017
February 8, 2018
April 17, 2018
May 9, 2018
December 18 and 19, 2018

Matrix Solutions Inc.

TABLE GW1.3

Groundwater Quality Results - Field Parameters

City of Guelph
Clair - Maltby Master Environmental Servicing Plan (MESP) and Secondary Plan (SP)

Monitoring Well	Sample Date	MSI Sample Number	Field Temp °C	Field pH	Field EC^{25} µS/cm	Field DO% % Saturation	Field Turbidity NTU
MW01-D	20-Oct-16	23089161020003	10.4	7.2	439	71.3	269.2
MW01-D	19-Apr-17	23089170419003	9.6	8.6	590	28.2	280.8
MW01-D	04-Oct-17	23089171004003	13.8	7.1	602	37.1	---
MW01-D	10-May-18	23089180510004	11.2	8.1	644	45.9	>1100
MW01-D	18-Dec-18	23089181218008	9.5	8.0	445	60.3	>1100
MW01-S	20-Oct-16	23089161020004	11.4	7.5	975	70.1	224.1
MW01-S	19-Apr-17	23089170419004	8.9	8.0	938	60.9	23.3
MW01-S	04-Oct-17	23089171004004	12.5	6.8	932	62.9	---
MW01-S	10-May-18	23089180510003	9.8	7.6	700	106.0	15.6
MW01-S	18-Dec-18	23089181218007	9.6	7.5	599	80.4	16.2
MW02-D	20-Oct-16	23089161020002	10.5	7.3	753	15.4	136.7
MW02-D	19-Apr-17	23089170419002	9.0	7.8	742	14.6	11.3
MW02-D	04-Oct-17	23089171004001	10.8	3.7	724	25.8	4.6
MW02-D	10-May-18	23089180510002	9.2	7.5	725	81.2	0.0
MW02-D	18-Dec-18	23089181218006	9.2	7.3	531	32.0	13.6
MW02-S	20-Oct-16	23089161020001	12.4	7.0	880	19.1	122.6
MW02-S	19-Apr-17	23089170419001	8.8	7.4	804	23.0	28.9
MW02-S	04-Oct-17	23089171004002	13.0	6.1	740	28.7	133.2
MW02-S	10-May-18	23089180510001	9.2	7.3	732	90.8	28.8
MW02-S	18-Dec-18	23089181218005	11.1	7.2	576	42.0	16.4
MW03-D	20-Oct-16	23089161020005	8.4	8.1	547	22.0	449.7
MW03-D	19-Apr-17	23089170419006	8.9	8.1	558	18.6	160.3
MW03-D	10-Oct-17	23089171010003	8.8	7.0	534	51.9	23.9
MW03-D	10-May-18	23089180510006	9.8	8.1	544	54.8	288.3
MW03-D	18-Dec-18	23089181218001	7.6	7.3	447	74.6	471.7
MW03-S	20-Oct-16	23089161020006	8.8	7.7	676	54.2	---
MW03-S	19-Apr-17	23089170419005	9.0	7.9	666	58.0	962.3
MW03-S	10-Oct-17	23089171010002	11.2	6.7	712	69.2	>1100
MW03-S	10-May-18	23089180510005	9.0	7.7	636	79.4	>1100
MW03-S	18-Dec-18	23089181218002	6.7	7.9	373	48.0	---
MW04-D	20-Oct-16	23089161020008	8.7	8.2	504	23.1	---
MW04-D	19-Apr-17	23089170419008	8.7	8.6	540	30.3	85.3
MW04-D	04-Oct-17	23089171004006	11.2	6.7	489	22.0	395.1
MW04-D	09-May-18	23089180509002	---	7.9	479	30.2	>1100
MW04-D	18-Dec-18	23089181218010	8.1	8.0	336	32.5	235.7

TABLE GW1.3

Groundwater Quality Results - Field Parameters

City of Guelph
Clair - Maltby Master Environmental Servicing Plan (MESP) and Secondary Plan (SP)

Monitoring Well	Sample Date	MSI Sample Number	Field Temp °C	Field pH	Field EC^{25} µS/cm	Field DO% % Saturation	Field Turbidity NTU
MW04-S	20-Oct-16	23089161020007	9.3	8.3	598	45.6	---
MW04-S	19-Apr-17	23089170419007	10.7	8.4	567	47.2	>1100
MW04-S	04-Oct-17	23089171004005	11.9	6.6	570	83.0	>1000
MW04-S	09-May-18	23089180509001	12.3	7.9	585	87.7	>1100
MW04-S	18-Dec-18	23089181218009	7.5	8.2	419	118.7	754.4
MW05-D	19-Oct-16	23089161019007	9.9	7.4	683	15.1	856.7
MW05-D	19-Apr-17	23089170419010	9.8	8.3	690	14.8	>1100
MW05-D	05-Oct-17	23089171005001	12.3	6.2	678	18.3	>1100
MW05-D	09-May-18	23089180509004	---	7.7	669	90.3	>1100
MW05-D	20-Dec-18	23089181220016	9.0	7.4	490	25.1	1066.0
MW05-S	19-Oct-16	23089161019006	9.8	7.3	790	22.2	478.0
MW05-S	19-Apr-17	23089170419009	9.8	7.6	673	13.9	30.0
MW05-S	05-Oct-17	23089171005002	12.3	6.5	646	21.0	32.4
MW05-S	09-May-18	23089180509003	---	7.7	653	63.8	36.3
MW05-S	20-Dec-18	23089181220015	8.7	7.6	456	30.7	23.8
MW06-D	19-Oct-16	23089161019004	10.4	8.1	474	25.3	185.8
MW06-D	19-Apr-17	23089170419012	9.4	8.3	444	26.3	66.9
MW06-D	05-Oct-17	23089171005003	11.2	7.1	431	33.0	37.9
MW06-D	09-May-18	23089180509006	12.2	7.9	434	35.2	132.5
MW06-D	20-Dec-18	23089181220014	8.5	7.8	302	---	72.1
MW06-S	19-Oct-16	23089161019005	10.8	8.2	616	33.3	973.5
MW06-S	19-Apr-17	23089170419011	10.5	8.1	616	18.3	>1100
MW06-S	04-Oct-17	23089171004009	12.1	6.6	628	43.2	1097.0
MW06-S	09-May-18	23089180509005	---	8.0	622	64.2	>1100
MW06-S	20-Dec-18	23089181220013	8.4	6.8	454	68.7	370.3
MW07-D	19-Oct-16	23089161019001	10.1	7.4	709	42.7	428.0
MW07-D	19-Apr-17	23089170419015	9.5	7.9	686	34.7	86.8
MW07-D	10-Oct-17	23089171010001	10.0	6.5	683	30.2	200.0
MW07-D	10-May-18	23089180510010	10.1	9.6	667	41.5	179.2
MW07-D	20-Dec-18	23089181220017	8.1	7.9	450	59.7	161.6
MW08-D	19-Oct-16	23089161019002	10.3	7.0	1188	35.0	>1100
MW08-D	19-Apr-17	23089170419014	9.8	7.8	1119	23.9	811.9
MW08-D	05-Oct-17	23089171005004	9.9	7.1	1179	48.8	262.6
MW08-D	10-May-18	23089180510008	8.9	7.7	1143	25.0	36.5
MW08-D	18-Dec-18	23089181218012	7.3	7.6	792	50.3	123.9

TABLE GW1.3

Groundwater Quality Results - Field Parameters

City of Guelph

Clair - Maltby Master Environmental Servicing Plan (MESP) and Secondary Plan (SP)

Monitoring Well	Sample Date	MSI Sample Number	Field Temp °C	Field pH	Field EC^{25} µS/cm	Field DO% % Saturation	Field Turbidity NTU
MW08-S	19-Oct-16	23089161019003	11.9	7.3	597	22.6	727.8
MW08-S	19-Apr-17	23089170419013	9.8	7.7	669	11.8	>1100
MW08-S	05-Oct-17	23089171005005	10.8	7.0	653	29.4	903.7
MW08-S	10-May-18	23089180510007	9.2	7.5	742	24.8	3584.0
MW08-S	18-Dec-18	23089181218011	8.0	7.6	440	51.3	272.3
MW09-D	21-Oct-16	23089161021001	8.5	8.4	486	30.0	---
MW09-D	19-Apr-17	23089170419017	8.6	8.3	485	40.0	686.9
MW09-D	04-Oct-17	23089171004008	11.7	6.3	467	40.5	139.7
MW09-D	10-May-18	could not open	---	---	---	---	---
MW09-D	08-Jun-18	23089180608001	11.2	7.8	462	91.8	252.5
MW09-D	18-Dec-18	23089181218004	7.4	7.8	318	46.5	138.0
MW09-S	21-Oct-16	23089161021002	8.4	7.8	635	69.1	---
MW09-S	19-Apr-17	23089170419016	9.5	8.1	680	53.6	>1100
MW09-S	04-Oct-17	23089171004007	11.4	6.5	626	81.1	>1100
MW09-S	10-May-18	23089180510009	10.0	8.0	643	95.5	>1100
MW09-S	18-Dec-18	23089181218003	7.5	7.8	445	121.3	951.2

Notes:

--- - not analyzed

^{25} - field EC corrected to 25°C

NTU - nephelometric turbidity units

TABLE GW1.4

Groundwater Quality Results - Routine Parameters

City of Guelph
Clair - Maltby Master Environmental Servicing Plan (MESP) and Secondary Plan (SP)

Monitoring Well	Sample Date	MSI Sample Number	Lab pH	Lab EC µS/cm	Temp at lab °C	Ca mg/L	Mg mg/L	Na mg/L	K mg/L	Fe mg/L	Mn mg/L	Cl mg/L	SO_4 mg/L	NO_2-N mg/L	NO_3-N mg/L	TKN mg/L	Alkalinity-T mg/L	HCO_3 mg/L	Hardness-T mg/L	TDS mg/L
MW01-D	20-Oct-16	23089161020003	7.96	411	5.3	20.7	19.3	33.7	0.798	<0.010	0.0157	13.2	23.4	<0.050	<0.10	0.67	188	188	***131***	246
MW01-D	19-Apr-17	23089170419003	8.17	586	2.4	34.2	29.2	34.4	0.849	0.018	0.0133	40.8	37.5	<0.010	<0.020	1.9	246	246	***206***	304
MW01-D	04-Oct-17	23089171004003	8.21	590	3.3	38.6	32.4	35.6	0.888	0.031	0.0314	42.2	38.8	<0.010	<0.020	<0.15	236	236	***230***	348
MW01-D	10-May-18	23089180510004	8.20	589	8.4	39.6	30.6	35.7	0.81	0.025	0.0093	48.5	41.4	<0.010	<0.020	<1.5	233	233	***225***	373
MW01-D	18-Dec-18	23089181218008	7.85	561	7.5	42.1	33.3	36.4	0.91	0.081	0.0108	43.6	37.6	<0.010	0.056	<1.5	***690***	690	***242***	347
MW01-S	20-Oct-16	23089161020004	7.20	947	5.3	87.8	29	49	1.65	<0.010	0.00157	106	49.3	<0.010	2.12	0.43	291	291	***339***	***550***
MW01-S	19-Apr-17	23089170419004	7.89	938	2.4	96.0	28.5	48.2	1.57	<0.010	<0.00050	98.5	50.4	<0.010	2.2	0.38	285	285	***357***	497
MW01-S	04-Oct-17	23089171004004	8.04	935	3.3	95.2	29.9	50	1.85	<0.010	0.0006	101	52.2	<0.010	1.73	<0.15	299	299	***361***	***542***
MW01-S	10-May-18	23089180510003	7.97	613	8.4	84.3	25.7	22.1	1.12	<0.010	<0.00050	38.5	15.5	<0.010	3.09	0.3	300	300	***316***	406
MW01-S	18-Dec-18	23089181218007	7.65	742	7.5	90.5	31.6	32.7	1.2	<0.010	<0.00050	62.6	14.8	<0.010	3.17	0.45	312	312	***356***	435
MW02-D	20-Oct-16	23089161020002	7.15	723	5.3	97.0	26.7	8.9	1.01	***0.452***	***0.157***	18.4	34.9	<0.010	<0.020	0.44	354	354	***352***	416
MW02-D	19-Apr-17	23089170419002	7.80	741	2.4	100	28.1	6.04	0.855	***1.04***	***0.109***	16.2	31.9	<0.010	<0.020	0.4	364	364	***366***	397
MW02-D	04-Oct-17	23089171004001	8.00	720	3.3	103	30.2	6.55	0.871	***1.82***	***0.092***	16.3	35	<0.010	<0.020	0.26	378	378	***382***	440
MW02-D	10-May-18	23089180510002	7.89	666	8.4	102	28.6	6.23	0.713	***2***	***0.148***	16.8	29.8	<0.010	<0.020	0.34	358	358	***373***	420
MW02-D	18-Dec-18	23089181218006	7.18	652	7.5	103	27.9	10.9	0.642	***1.97***	***0.289***	20.7	24.1	<0.010	<0.020	0.28	342	342	***371***	409
MW02-S	20-Oct-16	23089161020001	6.85	862	5.3	98.3	25.1	32.8	0.868	***1.27***	***0.459***	61.3	20.2	<0.010	<0.020	0.48	375	375	***349***	495
MW02-S	19-Apr-17	23089170419001	7.64	803	2.4	113	28.3	12.2	0.539	***1.66***	***0.482***	21	21.9	<0.010	<0.020	0.42	397	397	***399***	421
MW02-S	04-Oct-17	23089171004002	7.81	737	3.3	98.8	24.4	21.4	0.633	***1.39***	***0.465***	29.4	7.54	<0.010	<0.020	0.35	377	377	***347***	396
MW02-S	10-May-18	23089180510001	7.66	668	8.4	103	25.6	9.26	0.428	***1.68***	***0.492***	18.6	18.1	<0.010	0.035	0.33	380	380	***364***	399
MW02-S	18-Dec-18	23089181218005	7.06	682	7.5	100	24.6	21.7	0.608	***1.68***	***0.471***	31.8	14.7	<0.010	<0.020	0.38	341	341	***351***	414
MW03-D	20-Oct-16	23089161020005	7.54	517	5.3	57.9	25.4	4.38	0.986	0.222	0.0174	12.6	27.7	<0.010	<0.020	0.23	248	248	***249***	293
MW03-D	19-Apr-17	23089170419006	8.03	547	2.4	64.0	25.9	4.22	1.01	0.209	0.014	13.4	28.6	<0.010	<0.020	0.25	258	258	***267***	301
MW03-D	10-Oct-17	23089171010003	8.09	536	4.7	65.7	27.2	4.48	1.03	0.227	0.0134	12.9	27.2	<0.010	<0.020	<0.15	250	250	***276***	287
MW03-D	10-May-18	23089180510006	8.16	450	8.4	65.9	26.3	4.26	0.895	0.198	0.0131	15.1	26.7	<0.010	<0.020	<0.15	260	260	***273***	326
MW03-D	18-Dec-18	23089181218001	7.65	596	7.5	81.7	28.3	7.89	1.35	0.012	0.00451	13.2	18.7	0.017	1.3	0.55	360	360	***321***	340
MW03-S	20-Oct-16	23089161020006	7.38	680	5.3	80.5	28	13.7	1.62	<0.010	0.013	28.6	20.4	<0.010	1.65	<1.5	317	317	***316***	385
MW03-S	19-Apr-17	23089170419005	7.94	697	2.4	87.2	28.3	12.1	1.57	<0.010	0.00384	24.2	19.8	<0.010	1.6	<1.5	321	321	***334***	377
MW03-S	10-Oct-17	23089171010002	8.10	711	4.7	88.9	29.6	15.2	1.55	<0.010	0.00663	31.6	20.6	<0.010	1.83	0.21	308	308	***344***	406
MW03-S	10-May-18	23089180510005	7.97	507	8.4	84.9	27.3	7.59	1.07	<0.010	0.00211	12.4	19.2	<0.010	1.32	<0.15	316	316	***324***	357
MW03-S	18-Dec-18	23089181218002	7.63	485	7.5	66.4	27	4.56	1.01	0.26	0.0131	14.6	28.3	<0.010	<0.020	<0.15	244	244	***277***	292
MW04-D	20-Oct-16	23089161020008	7.76	484	5.3	41.9	26.6	13.5	1.48	0.288	0.0135	9.95	25.7	<0.010	<0.020	0.18	239	239	***214***	278
MW04-D	19-Apr-17	23089170419008	8.13	518	2.4	50.4	23.3	16.4	1.28	0.056	0.0156	7.3	20.9	<0.010	<0.020	<0.15	264	264	***222***	269
MW04-D	04-Oct-17	23089171004006	8.08	490	3.3	50.7	26.5	13.9	1.24	0.249	0.0135	7.39	20.8	<0.010	<0.020	<1.5	261	261	***236***	244
MW04-D	09-May-18	23089180509002	8.11	474	20.4	51.5	27.6	11	1.17	***0.335***	0.019	6.67	19.2	<0.010	0.032	0.44	230	230	***242***	264
MW04-D	18-Dec-18	23089181218010	7.84	424	7.5	49.8	27.1	10.4	1.22	***0.362***	0.0121	7.69	20.1	<0.010	<0.020	0.19	***730***	730	***236***	263
Ontario Drinking Water Quality Standards*			$6.5\text{-}8.5^{OG,+}$	NS	NS	NS	NS	$200^{AO,Na,+}$	NS	$0.3^{AO,+}$	$0.05^{AO,+}$	$250^{AO,+}$	$500^{AO,SO4,+}$	1^{MAC}	10^{MAC}	NS	$30\text{-}500^{OG,+}$	NS	$80\text{-}100^{OG,+}$	$500^{AO,+}$

TABLE GW1.4

Groundwater Quality Results - Routine Parameters

City of Guelph
Clair - Maltby Master Environmental Servicing Plan (MESP) and Secondary Plan (SP)

Monitoring Well	Sample Date	MSI Sample Number	Lab pH	Lab EC µS/cm	Temp at lab °C	Ca mg/L	Mg mg/L	Na mg/L	K mg/L	Fe mg/L	Mn mg/L	Cl mg/L	SO_4 mg/L	NO_2-N mg/L	NO_3 -N mg/L	TKN mg/L	Alkalinity-T mg/L	HCO_3 mg/L	Hardness-T mg/L	TDS mg/L
MW04-S	20-Oct-16	23089161020007	7.66	568	5.3	53.2	25.4	18.5	2.8	<0.010	***0.0575***	26.8	48.8	0.028	<0.020	5	227	227	***237***	323
MW04-S	19-Apr-17	23089170419007	8.07	560	2.4	63.1	24.8	11	1.51	<0.010	0.0181	23.4	45.6	<0.010	0.149	<1.5	233	233	***260***	336
MW04-S	04-Oct-17	23089171004005	8.11	557	3.3	64.5	27.2	8.63	1.34	<0.010	0.0257	23.3	45.2	<0.010	0.039	1.7	249	249	***273***	352
MW04-S	09-May-18	23089180509001	8.04	582	20.4	69.6	28.7	11	1.74	0.015	0.0347	24.1	45.7	<0.010	0.029	0.56	234	234	***292***	393
MW04-S	18-Dec-18	23089181218009	7.68	545	7.5	66.9	29.2	11.3	1.44	<0.010	0.014	23.8	43.3	<0.010	0.077	0.88	***670***	670	***287***	361
MW05-D	19-Oct-16	23089161019007	7.17	663	8.7	94.3	27	4.71	0.837	***2.25***	***0.0829***	11.9	36	<0.010	<0.020	4.1	366	366	***347***	396
MW05-D	19-Apr-17	23089170419010	7.87	689	2.4	89	25.8	3.98	0.745	***2.91***	***0.08***	11.6	34.3	<0.010	<0.020	<1.5	354	354	***328***	448
MW05-D	05-Oct-17	23089171005001	8.00	674	3.3	96.3	26.7	4.04	0.776	***2.76***	***0.0828***	11.7	36.9	<0.010	<0.020	1.39	336	336	***350***	402
MW05-D	09-May-18	23089180509004	7.89	671	20.4	95.3	27.1	4.09	0.759	***2.98***	***0.0826***	12.1	36.5	<0.010	<0.020	1.23	320	320	***350***	401
MW05-D	20-Dec-18	23089181220016	7.80	613	7.5	96.1	27.8	4.18	0.783	***2.97***	***0.0845***	12.2	34.5	<0.010	<0.020	1.18	***540***	540	***354***	437
MW05-S	19-Oct-16	23089161019006	7.17	750	8.7	105	35.8	5.53	1.63	***0.346***	***0.159***	10	89.4	0.056	0.429	0.62	327	327	***410***	430
MW05-S	19-Apr-17	23089170419009	7.85	674	2.4	89.7	29.1	3.66	1.28	***0.733***	***0.0976***	10.8	39.4	<0.010	<0.020	0.25	307	307	***344***	422
MW05-S	05-Oct-17	23089171005002	8.08	644	3.3	85.7	29.8	5.27	1.4	0.288	***0.0972***	10.2	48	0.012	0.384	0.22	309	309	***337***	364
MW05-S	09-May-18	23089180509003	7.97	654	20.4	88.2	29.9	4.87	1.17	***0.726***	***0.0865***	13.5	45	<0.010	0.047	0.28	304	304	***343***	386
MW05-S	20-Dec-18	23089181220015	7.67	587	7.5	86.2	30.4	4.44	1.25	***0.317***	***0.0949***	12.4	51.4	<0.010	0.031	0.27	280	280	***340***	361
MW06-D	19-Oct-16	23089161019004	7.64	460	8.7	50.9	20.8	15.1	1.28	0.067	0.0154	4.32	24.7	<0.010	<0.020	0.19	229	229	***213***	259
MW06-D	19-Apr-17	23089170419012	8.12	436	2.4	51.8	20.2	6.2	1.05	0.089	0.0137	3.55	15.3	<0.010	<0.020	<0.15	224	224	***213***	260
MW06-D	05-Oct-17	23089171005003	8.17	431	3.3	54	20.2	5.81	1.14	0.07	0.0163	3.34	16.6	<0.010	0.046	<0.15	221	221	***218***	235
MW06-D	09-May-18	23089180509006	8.07	418	20.4	52.7	20.6	4.67	0.9	0.091	0.0119	3.62	15.7	<0.010	<0.020	<0.15	206	206	***216***	234
MW06-D	20-Dec-18	23089181220014	7.85	388	7.5	53.2	20.4	4.46	0.962	0.081	0.0138	3.51	16.3	<0.010	<0.020	<0.15	211	211	***217***	238
MW06-S	19-Oct-16	23089161019005	7.53	602	8.7	69.2	29.7	13	2.2	0.012	0.0453	9.21	55.6	<0.010	<0.020	0.28	282	282	***295***	351
MW06-S	19-Apr-17	23089170419011	8.08	616	2.4	99.5	39.5	5.2	1.78	***0.79***	***0.121***	8.23	70.5	<0.010	<0.020	<1.5	316	316	***411***	404
MW06-S	04-Oct-17	23089171004009	8.01	625	3.3	73.3	31	10.6	1.45	***0.589***	0.0452	11.4	76.4	<0.010	<0.020	<0.15	271	271	***311***	400
MW06-S	09-May-18	23089180509005	8.05	616	20.4	76.9	30.6	7.43	1.19	***0.51***	0.038	10	76.3	<0.010	<0.020	<0.15	243	243	***318***	379
MW06-S	20-Dec-18	23089181220013	7.64	583	7.5	76.6	32	14.8	1.54	***0.887***	***0.0584***	12.9	82.2	<0.010	0.081	<1.5	350	350	***323***	393
MW07-D	19-Oct-16	23089161019001	7.44	696	8.7	79.3	30.7	17.1	1.55	0.024	***0.0787***	39.6	47.4	0.028	0.318	<0.15	276	276	***325***	386
MW07-D	19-Apr-17	23089170419015	7.99	682	2.4	77.7	27.9	13.2	1.4	0.021	***0.0654***	32.4	42.1	0.012	0.125	<0.15	281	281	***309***	413
MW07-D	10-Oct-17	23089171010001	8.12	701	4.7	76.4	29	18	1.65	0.028	***0.0696***	40.4	41.2	<0.010	0.578	0.19	285	285	***310***	416
MW07-D	10-May-18	23089180510010	8.12	556	8.4	77.8	27.9	13.7	1.27	0.017	***0.0527***	35.1	39.8	0.015	0.436	<0.15	288	288	***309***	405
MW07-D	20-Dec-18	23089181220017	7.64	594	7.5	75.8	29.6	13.1	1.38	0.048	***0.0638***	28.5	36.9	<0.010	0.174	<0.15	273	273	***311***	376
MW08-D	19-Oct-16	23089161019002	7.23	1180	8.7	105	30.5	88.3	3.18	<0.010	0.0434	189	32	<0.050	1.49	0.51	336	336	***388***	***639***
MW08-D	19-Apr-17	23089170419014	7.88	1180	2.4	100	28.8	85.2	3.37	<0.010	0.0191	167	29.5	0.015	1.51	<1.5	354	354	***369***	***718***
MW08-D	05-Oct-17	23089171005004	8.09	1180	3.3	101	29.3	88.6	3.42	<0.010	0.021	170	29.9	0.014	1.31	<0.15	321	321	***374***	***663***
MW08-D	10-May-18	23089180510008	8.06	1060	8.4	101	27.6	81.8	3.22	<0.010	0.0181	167	29.7	0.023	1.44	<0.15	308	308	***366***	***630***
MW08-D	18-Dec-18	23089181218012	7.53	1060	7.5	101	28.5	92.4	3.33	<0.010	0.0134	170	27.9	0.021	1.21	0.42	307	307	***370***	***643***
Ontario Drinking Water Quality Standards*			**6.5-8.5$^{OG,+}$**	**NS**	**NS**	**NS**	**NS**	**200$^{AO,Na,+}$**	**NS**	**0.3$^{AO,+}$**	**0.05$^{AO,+}$**	**250$^{AO,+}$**	**500$^{AO,SO4,+}$**	**1^{MAC}**	**10^{MAC}**	**NS**	**30-500$^{OG,+}$**	**NS**	**80-100$^{OG,+}$**	**500$^{AO,+}$**

TABLE GW1.4

Groundwater Quality Results - Routine Parameters

City of Guelph

Clair - Maltby Master Environmental Servicing Plan (MESP) and Secondary Plan (SP)

Monitoring Well	Sample Date	MSI Sample Number	Lab pH	Lab EC µS/cm	Temp at lab °C	Ca mg/L	Mg mg/L	Na mg/L	K mg/L	Fe mg/L	Mn mg/L	Cl mg/L	SO_4 mg/L	NO_2-N mg/L	NO_3-N mg/L	TKN mg/L	Alkalinity-T mg/L	HCO_3 mg/L	Hardness-T mg/L	TDS mg/L
MW08-S	19-Oct-16	23089161019003	7.25	569	8.7	77.7	22.8	4.17	1.29	<0.010	0.00707	14.4	4.79	<0.010	1.04	0.76	288	288	***288***	295
MW08-S	19-Apr-17	23089170419013	7.78	664	2.4	92	24.2	3.74	0.87	<0.010	0.0013	13.5	5.89	<0.010	1.81	<1.5	354	354	***329***	385
MW08-S	05-Oct-17	23089171005005	7.93	656	3.3	95.1	24.6	3.25	0.744	<0.010	0.00133	15.9	4.95	<0.010	4.19	0.15	321	321	***339***	352
MW08-S	10-May-18	23089180510007	7.89	575	8.4	111	27.7	4.45	0.807	<0.010	0.00099	18.3	11.1	<0.010	3.03	0.21	368	368	***391***	435
MW08-S	18-Dec-18	23089181218011	7.79	560	7.5	90.3	24.6	3.92	0.877	<0.010	0.00197	19.6	6.18	<0.010	4.31	0.39	310	310	***327***	353
MW09-D	21-Oct-16	23089161021001	7.56	445	12	54.4	22.3	12.1	1.08	0.024	0.0367	2.79	7.88	<0.010	<0.020	0.48	237	237	***228***	272
MW09-D	19-Apr-17	23089170419017	8.12	469	2.4	53.9	20.8	10.1	0.997	0.06	***0.0551***	3.06	4.98	<0.010	<0.020	0.84	294	294	***220***	312
MW09-D	04-Oct-17	23089171004008	7.98	466	3.3	59.8	21.8	7.31	0.99	0.084	***0.0581***	2.56	4.55	<0.010	<0.020	0.29	264	264	***239***	386
MW09-D	08-Jun-18	23089180608001	8.01	446	9.8	59.6	23.5	7.18	1.04	0.119	0.0492	3.32	8.04	<0.010	<0.020	0.55	245	245	***246***	278
MW09-D	18-Dec-18	23089181218004	7.71	412	7.5	56.9	22.2	8.05	1.05	0.163	0.0464	3.34	5.07	<0.010	<0.020	0.36	257	257	***234***	259
MW09-S	21-Oct-16	23089161021002	7.28	583	12	89.3	23.4	4.69	3.34	<0.010	0.00469	14.1	16.9	<0.010	7	1.91	260	260	***319***	346
MW09-S	19-Apr-17	23089170419016	7.96	659	2.4	89.1	23.5	5.71	3.63	<0.010	0.00068	19.9	15.0	<0.010	7.17	1.6	338	338	***319***	430
MW09-S	04-Oct-17	23089171004007	7.88	620	3.3	87.2	23.9	5.41	4.35	0.109	0.00058	14.7	17.0	<0.010	7.09	<1.5	283	283	***316***	376
MW09-S	10-May-18	23089180510009	8.05	501	8.4	85.8	23	4.05	3.41	<0.010	<0.00050	16.0	15.1	<0.010	7.81	0.25	340	343	***309***	388
MW09-S	18-Dec-18	23089181218003	7.48	571	7.5	87.9	24.6	4.47	3.95	<0.010	<0.00050	15.6	15.0	0.011	8.07	<0.15	410	410	***321***	413
Ontario Drinking Water Quality Standards*			**6.5-8.5$^{OG,+}$**	**NS**	**NS**	**NS**	**NS**	**200$^{AO,Na,+}$**	**NS**	**0.3$^{AO,+}$**	**0.05$^{AO,+}$**	**250$^{AO,+}$**	**500$^{AO,SO4,+}$**	**1^{MAC}**	**10^{MAC}**	**NS**	**30-500$^{OG,+}$**	**NS**	**80-100$^{OG,+}$**	**500$^{AO,+}$**

Notes:

--- - not analyzed

NS - not specified

^{25} - field EC corrected to 25°C

^{AO} - aesthetic objective

^{OG} - operational guidelines

^{MAC} - maximum acceptable concentration

^{SO4} - when sulphate levels exceed 500 mg/L, water may have a laxative effect on some people

^{Na} - the local Medical Officer or Health should be notified when sodium concentrations exceeds 20 mg/L so that this information may be communicated to local physicians for their use with patients on sodium restricted diets

* - Ontario Regulation 169/03 Ontario Drinking Water Quality Standards (Government of Ontario 2006) - Latest ammendment as of Jan, 2018

$^{+}$ - *Technical Support Document for Ontario Drinking Water Quality Standards, Objectives and Guidelines* (MOE 2006)

Italics - values do not meet applicable guidelines

TABLE GW1.5a

Groundwater Quality Results - Dissolved Metals

City of Guelph
Clair - Maltby Master Environmental Servicing Plan (MESP) and Secondary Plan (SP)

Monitoring Well	Sample Date	MSI Sample Number	Al mg/L	Sb mg/L	As mg/L	Ba mg/L	Be mg/L	Bi mg/L	B mg/L	Cd mg/L	Cs mg/L	Cr mg/L	Co mg/L	Cu mg/L	Pb mg/L	Li mg/L	Mo mg/L	Ni mg/L	P mg/L
MW01-D	20-Oct-16	23089161020003	0.007	0.00024	0.00763	0.0345	<0.00010	<0.000050	0.078	<0.000010	<0.000010	<0.00050	0.00022	0.00059	<0.000050	0.002	0.00453	0.00152	<0.050
MW01-D	19-Apr-17	23089170419003	<0.0050	0.00015	***0.0127***	0.049	<0.00010	<0.000050	0.072	<0.000010	<0.000010	<0.00050	0.00042	0.00069	<0.000050	0.002	0.00312	0.00245	<0.050
MW01-D	04-Oct-17	23089171004003	<0.0050	0.00017	0.00876	0.044	<0.00010	<0.000050	0.065	0.000011	<0.000010	<0.00050	0.00072	0.00104	<0.000050	0.005	0.00293	0.00291	<0.050
MW01-D	10-May-18	23089180510004	<0.0050	<0.00010	0.00873	0.0448	<0.00010	<0.000050	0.066	<0.0000050	<0.000010	<0.00050	0.00012	<0.00020	<0.000050	0.004	0.00264	0.00066	<0.050
MW01-D	18-Dec-18	23089181218008	0.0054	<0.00010	0.00737	0.0477	<0.00010	<0.000050	0.055	<0.0000050	<0.000010	<0.00050	<0.00010	0.0004	0.000692	0.004	0.00201	0.00107	<0.050
MW01-S	20-Oct-16	23089161020004	<0.0050	<0.00010	0.00012	0.0573	<0.00010	<0.000050	0.021	0.000195	<0.000010	<0.00050	<0.00010	0.00129	0.00018	0.002	0.000284	0.00082	<0.050
MW01-S	19-Apr-17	23089170419004	<0.0050	<0.00010	0.00011	0.056	<0.00010	<0.000050	0.019	0.000183	<0.000010	<0.00050	<0.00010	0.00143	0.00026	0.002	0.000425	0.00069	<0.050
MW01-S	04-Oct-17	23089171004004	<0.0050	<0.00010	0.00014	0.0609	<0.00010	<0.000050	0.021	0.000192	<0.000010	<0.00050	<0.00010	0.00191	0.000214	0.003	0.000578	0.00157	<0.050
MW01-S	10-May-18	23089180510003	<0.0050	<0.00010	0.00012	0.0412	<0.00010	<0.000050	0.016	0.000165	<0.000010	<0.00050	<0.00010	0.00161	0.000266	0.001	0.000302	0.00055	<0.050
MW01-S	18-Dec-18	23089181218007	<0.0050	<0.00010	0.00011	0.048	<0.00010	<0.000050	0.016	0.000212	<0.000010	<0.00050	<0.00010	0.00111	0.000359	0.001	0.000201	0.00081	<0.050
MW02-D	20-Oct-16	23089161020002	<0.0050	0.00046	***0.0104***	0.0901	<0.00010	<0.000050	0.015	<0.000010	<0.000010	<0.00050	0.00137	0.00056	0.000163	0.002	0.00136	0.00619	<0.050
MW02-D	19-Apr-17	23089170419002	<0.0050	<0.00010	0.0049	0.0885	<0.00010	<0.000050	<0.010	<0.000010	<0.000010	<0.00050	0.00059	<0.00020	0.000281	0.002	0.000484	0.003	<0.050
MW02-D	04-Oct-17	23089171004001	<0.0050	<0.00010	0.00358	0.0906	<0.00010	<0.000050	<0.010	<0.000010	<0.000010	<0.00050	0.00028	0.0004	0.000126	0.003	0.000396	0.00154	<0.050
MW02-D	10-May-18	23089180510002	<0.0050	<0.00010	0.00604	0.0781	<0.00010	<0.000050	0.011	<0.0000050	<0.000010	<0.00050	0.00024	<0.00020	0.000461	0.002	0.000429	0.00129	<0.050
MW02-D	18-Dec-18	23089181218006	<0.0050	<0.00010	***0.0157***	0.0622	<0.00010	<0.000050	0.015	<0.0000050	<0.000010	<0.00050	0.00035	0.00034	0.000696	0.002	0.000699	0.00214	<0.050
MW02-S	20-Oct-16	23089161020001	0.0064	0.00049	***0.023***	0.0647	<0.00010	<0.000050	0.028	<0.000010	<0.000010	<0.00050	0.003	0.00056	0.000266	0.001	0.00192	0.0126	<0.050
MW02-S	19-Apr-17	23089170419001	0.0052	0.00013	***0.0315***	0.0482	<0.00010	<0.000050	0.019	<0.000010	<0.000010	<0.00050	0.00182	0.00023	0.000066	0.002	0.000828	0.00841	<0.050
MW02-S	04-Oct-17	23089171004002	0.0093	0.00011	***0.0197***	0.0471	<0.00010	<0.000050	0.02	<0.000010	<0.000010	<0.00050	0.00101	0.00063	0.000066	0.002	0.000821	0.00491	<0.050
MW02-S	10-May-18	23089180510001	0.0071	0.00012	***0.0294***	0.042	<0.00010	<0.000050	0.016	<0.0000050	<0.000010	<0.00050	0.00116	<0.00020	0.000172	0.002	0.000649	0.00593	<0.050
MW02-S	18-Dec-18	23089181218005	0.0076	0.00011	***0.0229***	0.0499	<0.00010	<0.000050	0.02	<0.0000050	<0.000010	<0.00050	0.00069	0.00049	0.000085	0.002	0.000872	0.00403	<0.050
MW03-D	20-Oct-16	23089161020005	<0.0050	<0.00010	0.00238	0.0806	<0.00010	<0.000050	<0.010	<0.000010	<0.000010	<0.00050	0.00013	0.00032	<0.000050	0.002	0.000905	<0.00050	<0.050
MW03-D	19-Apr-17	23089170419006	<0.0050	<0.00010	0.00244	0.0778	<0.00010	<0.000050	<0.010	<0.000010	<0.000010	<0.00050	<0.00010	0.00082	<0.000050	0.003	0.000864	<0.00050	<0.050
MW03-D	10-Oct-17	23089171010003	<0.0050	<0.00010	0.00233	0.0787	<0.00010	<0.000050	<0.010	<0.000010	<0.000010	<0.00050	<0.00010	0.00042	<0.000050	0.003	0.000809	<0.00050	<0.050
MW03-D	10-May-18	23089180510006	<0.0050	<0.00010	0.00196	0.0824	<0.00010	<0.000050	<0.010	<0.0000050	<0.000010	<0.00050	<0.00010	0.00029	<0.000050	0.003	0.000699	<0.00050	<0.050
MW03-D	18-Dec-18	23089181218001	<0.0050	<0.00010	0.00017	0.0807	<0.00010	<0.000050	<0.010	0.0000158	<0.000010	<0.00050	<0.00010	0.00033	0.000091	0.001	0.000248	0.0015	<0.050
MW03-S	20-Oct-16	23089161020006	<0.0050	<0.00010	0.00019	0.0832	<0.00010	<0.000050	0.011	0.000064	<0.000010	<0.00050	<0.00010	0.00081	0.000158	<0.0010	0.000447	0.00083	<0.050
MW03-S	19-Apr-17	23089170419005	<0.0050	<0.00010	0.00024	0.087	<0.00010	<0.000050	0.011	0.000051	<0.000010	<0.00050	<0.00010	0.00052	0.000086	<0.0010	0.000289	0.0005	<0.050
MW03-S	10-Oct-17	23089171010002	<0.0050	<0.00010	0.0003	0.094	<0.00010	<0.000050	0.01	0.00006	0.00001	<0.00050	<0.00010	0.00126	0.00009	<0.0010	0.000247	0.00077	<0.050
MW03-S	10-May-18	23089180510005	<0.0050	<0.00010	0.00021	0.0815	<0.00010	<0.000050	0.01	0.0000485	<0.000010	<0.00050	<0.00010	0.00044	0.000116	0.001	0.00022	<0.00050	<0.050
MW03-S	18-Dec-18	23089181218002	<0.0050	<0.00010	0.00207	0.0804	<0.00010	<0.000050	<0.010	<0.0000050	<0.000010	<0.00050	<0.00010	0.00098	<0.000050	0.003	0.000776	<0.00050	<0.050
Ontario Drinking Water Quality Standards*			**$0.1^{OG,+}$**	**0.006^{MAC}**	**0.01^{MAC}**	**1^{MAC}**	**NS**	**NS**	**5^{MAC}**	**0.005^{MAC}**	**NS**	**0.05^{MAC}**	**NS**	**$1^{AO,+}$**	**$0.01^{MAC,Pb}$**	**NS**	**NS**	**NS**	**NS**

TABLE GW1.5a

Groundwater Quality Results - Dissolved Metals

City of Guelph

Clair - Maltby Master Environmental Servicing Plan (MESP) and Secondary Plan (SP)

Monitoring Well	Sample Date	MSI Sample Number	Rb mg/L	Se mg/L	Si mg/L	Ag mg/L	Sr mg/L	S mg/L	Te mg/L	Tl mg/L	Th mg/L	Sn mg/L	Ti mg/L	W mg/L	U mg/L	V mg/L	Zn mg/L	Zr mg/L
MW01-D	20-Oct-16	23089161020003	0.00082	<0.000050	4.6	<0.000050	0.314	7.99	<0.00020	<0.000010	<0.00010	0.00014	<0.00030	<0.00010	0.00232	0.001	0.0042	<0.00030
MW01-D	19-Apr-17	23089170419003	0.00073	<0.000050	5.63	<0.000050	0.483	12.1	<0.00020	<0.000010	<0.00010	<0.00010	<0.00030	<0.00010	0.00123	0.00086	0.0032	<0.00030
MW01-D	04-Oct-17	23089171004003	0.00045	<0.000050	6.23	<0.000050	0.461	14.2	<0.00020	<0.000010	<0.00010	0.00013	<0.00030	<0.00010	0.000498	<0.00050	0.0074	<0.00030
MW01-D	10-May-18	23089180510004	0.00045	0.000065	5.74	<0.000050	0.527	12.6	<0.00020	<0.000010	<0.00010	<0.00010	<0.00030	<0.00010	0.000415	0.00068	<0.0010	<0.00030
MW01-D	18-Dec-18	23089181218008	0.00045	0.00007	6.27	<0.000050	0.498	12.8	<0.00020	<0.000010	<0.00010	<0.00010	<0.00030	<0.00010	0.000344	<0.00050	0.0029	<0.00030
MW01-S	20-Oct-16	23089161020004	0.0026	0.000229	4	<0.000050	0.326	16.5	<0.00020	0.000021	<0.00010	<0.00010	<0.00030	<0.00010	0.000809	<0.00050	0.111	<0.00030
MW01-S	19-Apr-17	23089170419004	0.00221	0.000324	3.79	<0.000050	0.385	18.3	<0.00020	0.00002	<0.00010	<0.00010	<0.00030	<0.00010	0.000961	<0.00050	0.097	<0.00030
MW01-S	04-Oct-17	23089171004004	0.00275	0.000192	4.45	<0.000050	0.411	19.8	<0.00020	0.000023	<0.00010	<0.00010	<0.00030	<0.00010	0.000941	<0.00050	0.103	<0.00030
MW01-S	10-May-18	23089180510003	0.0017	0.000309	3.31	<0.000050	0.25	5.02	<0.00020	0.00002	<0.00010	<0.00010	<0.00030	<0.00010	0.000583	<0.00050	0.0979	<0.00030
MW01-S	18-Dec-18	23089181218007	0.00169	0.000343	3.72	<0.000050	0.143	5.29	<0.00020	0.000017	<0.00010	<0.00010	<0.00030	<0.00010	0.000425	<0.00050	0.132	<0.00030
MW02-D	20-Oct-16	23089161020002	0.00129	<0.000050	5.6	<0.000050	0.142	11.2	<0.00020	<0.000010	<0.00010	<0.00010	<0.00030	<0.00010	0.00489	<0.00050	0.0404	<0.00030
MW02-D	19-Apr-17	23089170419002	0.0011	<0.000050	7.59	<0.000050	0.133	11.3	<0.00020	<0.000010	<0.00010	<0.00010	<0.00030	<0.00010	0.000766	<0.00050	0.0354	<0.00030
MW02-D	04-Oct-17	23089171004001	0.0011	<0.000050	8.38	<0.000050	0.122	12.7	<0.00020	<0.000010	<0.00010	<0.00010	<0.00030	<0.00010	0.000309	<0.00050	0.0183	<0.00030
MW02-D	10-May-18	23089180510002	0.00099	<0.000050	6.96	<0.000050	0.133	9.71	<0.00020	<0.000010	<0.00010	<0.00010	<0.00030	<0.00010	0.000715	<0.00050	0.0423	<0.00030
MW02-D	18-Dec-18	23089181218006	0.001	<0.000050	5.88	<0.000050	0.135	7.86	<0.00020	<0.000010	<0.00010	<0.00010	<0.00030	<0.00010	0.00144	<0.00050	0.0604	0.00039
MW02-S	20-Oct-16	23089161020001	0.00182	0.000151	3.84	<0.000050	0.144	6.4	<0.00020	<0.000010	<0.00010	<0.00010	<0.00040	<0.00010	0.00961	0.00128	0.183	0.00053
MW02-S	19-Apr-17	23089170419001	0.00084	0.000112	3.75	<0.000050	0.148	8.23	<0.00020	<0.000010	<0.00010	<0.00010	<0.00030	<0.00010	0.00506	0.00085	0.0772	0.00054
MW02-S	04-Oct-17	23089171004002	0.00126	0.000096	4.18	<0.000050	0.117	4.24	<0.00020	<0.000010	<0.00010	<0.00010	0.00042	<0.00010	0.00242	0.00141	0.0574	0.00052
MW02-S	10-May-18	23089180510001	0.00079	0.000069	3.51	<0.000050	0.133	5.9	<0.00020	<0.000010	<0.00010	<0.00010	0.00032	<0.00010	0.0036	0.00085	0.0969	0.00045
MW02-S	18-Dec-18	23089181218005	0.00105	0.000063	4.06	<0.000050	0.155	5.34	<0.00020	<0.000010	<0.00010	<0.00010	<0.00030	<0.00010	0.00229	0.00111	0.0531	0.00056
MW03-D	20-Oct-16	23089161020005	0.00056	<0.000050	6.41	<0.000050	0.109	8.95	<0.00020	<0.000010	<0.00010	0.00012	<0.00030	<0.00010	0.00149	<0.00050	0.0053	<0.00030
MW03-D	19-Apr-17	23089170419006	0.00054	0.00009	7.24	<0.000050	0.115	9.98	<0.00020	<0.000010	<0.00010	0.00017	<0.00030	<0.00010	0.000915	<0.00050	0.0087	<0.00030
MW03-D	10-Oct-17	23089171010003	0.0005	<0.000050	6.78	<0.000050	0.111	9.11	<0.00020	<0.000010	<0.00010	<0.00010	<0.00030	<0.00010	0.000646	<0.00050	0.0072	<0.00030
MW03-D	10-May-18	23089180510006	0.0005	<0.000050	6.77	<0.000050	0.116	8.43	<0.00020	<0.000010	<0.00010	<0.00010	<0.00030	<0.00010	0.000541	<0.00050	0.0011	<0.00030
MW03-D	18-Dec-18	23089181218001	0.00427	0.00031	5.44	<0.000050	0.0968	6.08	<0.00020	<0.000010	<0.00010	<0.00010	<0.00030	<0.00010	0.000423	<0.00050	0.0164	<0.00030
MW03-S	20-Oct-16	23089161020006	0.00205	0.000258	5.02	<0.000050	0.11	6.67	<0.00020	0.000024	<0.00010	<0.00010	<0.00030	<0.00010	0.00102	<0.00050	0.0648	<0.00030
MW03-S	19-Apr-17	23089170419005	0.00327	0.000309	5.44	<0.000050	0.099	7.06	<0.00020	0.000021	<0.00010	<0.00010	<0.00030	<0.00010	0.000608	<0.00050	0.0239	<0.00030
MW03-S	10-Oct-17	23089171010002	0.00416	0.000261	5.34	<0.000050	0.102	6.96	<0.00020	0.000035	<0.00010	<0.00010	<0.00030	<0.00010	0.000484	<0.00050	0.0485	<0.00030
MW03-S	10-May-18	23089180510005	0.00324	0.000273	5.3	<0.000050	0.099	6.06	<0.00020	0.000018	<0.00010	<0.00010	<0.00030	<0.00010	0.00043	<0.00050	0.022	<0.00030
MW03-S	18-Dec-18	23089181218002	0.00054	<0.000050	7	<0.000050	0.113	9.36	<0.00020	<0.000010	<0.00010	0.00012	<0.00030	<0.00010	0.000496	<0.00050	0.0036	<0.00030
Ontario Drinking Water Quality Standards^{+}			**NS**	**0.05^{MAC}**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**0.02^{MAC}**	**NS**	**$5^{AO,+}$**	**NS**

Notes:

--- - not analyzed

NS - not specified

^{AO} - aesthetic objective

^{OG} - operational guidelines

^{MAC} - maximum acceptable concentration

^{Pb} - standard applies to water at the point of consumption. Since lead is a component in some plumbing systems, first flush water may contain higher concentrations of lead than water that has been flushed for five minutes.

* - Ontario Regulation 169/03 Ontario Drinking Water Quality Standards (Government of Ontario 2006) - Latest ammendment as of Jan, 2018

$^{+}$ - *Technical Support Document for Ontario Drinking Water Quality Standards, Objectives and Guidelines* (MOE 2006)

Italics - values do not meet applicable guidelines

TABLE GW1.5b

Groundwater Quality Results - Dissolved Metals

City of Guelph
Clair - Maltby Master Environmental Servicing Plan (MESP) and Secondary Plan (SP)

Monitoring Well	Sample Date	MSI Sample Number	Al mg/L	Sb mg/L	As mg/L	Ba mg/L	Be mg/L	Bi mg/L	B mg/L	Cd mg/L	Cs mg/L	Cr mg/L	Co mg/L	Cu mg/L	Pb mg/L	Li mg/L	Mo mg/L	Ni mg/L	P mg/L
MW04-D	20-Oct-16	23089161020008	<0.0050	<0.00010	0.00812	0.0637	<0.00010	<0.000050	0.015	<0.000010	<0.000010	<0.00050	<0.00010	0.00033	<0.000050	0.003	0.00315	<0.00050	<0.050
MW04-D	19-Apr-17	23089170419008	<0.0050	<0.00010	0.00758	0.0538	<0.00010	<0.000050	0.016	<0.000010	<0.000010	<0.00050	0.00013	0.00023	<0.000050	0.003	0.00213	0.00052	<0.050
MW04-D	04-Oct-17	23089171004006	<0.0050	<0.00010	0.01	0.0575	<0.00010	<0.000050	0.016	<0.000010	<0.000010	<0.00050	<0.00010	<0.00020	<0.000050	0.006	0.00142	<0.00050	<0.050
MW04-D	09-May-18	23089180509002	0.0541	<0.00010	0.00994	0.0628	<0.00010	<0.000050	0.015	<0.0000050	<0.000010	<0.00050	<0.00010	0.00023	0.000353	0.006	0.00128	<0.00050	<0.050
MW04-D	18-Dec-18	23089181218010	<0.0050	<0.00010	***0.0104***	0.063	<0.00010	<0.000050	0.014	<0.0000050	<0.000010	<0.00050	<0.00010	<0.00020	<0.000050	0.006	0.00124	<0.00050	<0.050
MW04-S	20-Oct-16	23089161020007	<0.0050	0.0004	0.0003	0.0793	<0.00010	<0.000050	0.018	<0.000010	<0.000010	<0.00050	0.00023	0.00037	<0.000050	<0.0010	0.0066	0.00647	<0.050
MW04-S	19-Apr-17	23089170419007	<0.0050	0.00027	0.00227	0.0615	<0.00010	<0.000050	0.013	<0.000010	<0.000010	<0.00050	<0.00010	0.00038	<0.000050	0.002	0.00418	0.00091	<0.050
MW04-S	04-Oct-17	23089171004005	<0.0050	<0.00010	0.00272	0.0612	<0.00010	<0.000050	<0.010	<0.000010	<0.000010	<0.00050	0.00014	0.00057	<0.000050	0.004	0.00182	0.0006	<0.050
MW04-S	09-May-18	23089180509001	0.0199	0.00019	0.00126	0.0698	<0.00010	<0.000050	0.012	<0.0000050	<0.000010	<0.00050	0.00022	0.00251	0.000106	0.004	0.00198	0.00231	<0.050
MW04-S	18-Dec-18	23089181218009	<0.0050	0.00013	0.00315	0.0596	<0.00010	<0.000050	0.011	0.0000056	<0.000010	<0.00050	0.00012	0.0014	0.000056	0.004	0.00225	0.00073	<0.050
MW05-D	19-Oct-16	23089161019007	<0.0050	<0.00010	0.0008	0.145	<0.00010	<0.000050	<0.010	<0.000010	0.000011	<0.00050	0.00011	<0.00020	<0.000050	0.002	0.000176	0.0009	<0.050
MW05-D	19-Apr-17	23089170419010	<0.0050	<0.00010	0.00029	0.118	<0.00010	<0.000050	<0.010	<0.000010	<0.000010	<0.00050	<0.00010	0.00025	<0.000050	0.002	0.000089	<0.00050	<0.050
MW05-D	05-Oct-17	23089171005001	<0.0050	<0.00010	0.00025	0.124	<0.00010	<0.000050	<0.010	<0.000010	<0.000010	<0.00050	<0.00010	<0.00020	<0.000050	0.003	0.000177	<0.00050	<0.050
MW05-D	09-May-18	23089180509004	<0.0050	<0.00010	0.00016	0.12	<0.00010	<0.000050	<0.010	<0.0000050	<0.000010	<0.00050	<0.00010	<0.00020	<0.000050	0.002	0.000165	<0.00050	<0.050
MW05-D	20-Dec-18	23089181220016	<0.0050	<0.00010	0.00015	0.117	<0.00010	<0.000050	<0.010	<0.0000050	<0.000010	<0.00050	<0.00010	0.00074	<0.000050	0.002	0.000153	<0.00050	<0.050
MW05-S	19-Oct-16	23089161019006	<0.0050	0.00041	0.00333	0.126	<0.00010	<0.000050	<0.010	0.000019	<0.000010	<0.00050	0.00092	0.00046	0.000154	0.004	0.0235	0.00372	<0.050
MW05-S	19-Apr-17	23089170419009	<0.0050	<0.00010	0.00553	0.127	<0.00010	<0.000050	<0.010	<0.000010	<0.000010	<0.00050	0.00018	0.00025	0.000141	0.003	0.0044	0.00109	<0.050
MW05-S	05-Oct-17	23089171005002	<0.0050	<0.00010	0.00304	0.122	<0.00010	<0.000050	<0.010	0.00001	<0.000010	0.00274	0.00028	<0.00020	0.000071	0.005	0.00492	0.00131	<0.050
MW05-S	09-May-18	23089180509003	<0.0050	<0.00010	0.00338	0.127	<0.00010	<0.000050	<0.010	<0.0000050	<0.000010	<0.00050	0.0001	<0.00020	0.000075	0.003	0.0011	0.00066	<0.050
MW05-S	20-Dec-18	23089181220015	<0.0050	<0.00010	0.00208	0.121	<0.00010	<0.000050	<0.010	<0.0000050	<0.000010	<0.00050	0.00015	<0.00020	0.000057	0.003	0.00105	0.00072	<0.050
MW06-D	19-Oct-16	23089161019004	<0.0050	<0.00010	0.00166	0.121	<0.00010	<0.000050	0.012	<0.000010	<0.000010	<0.00050	0.00013	0.00037	<0.000050	0.003	0.0023	<0.00050	<0.050
MW06-D	19-Apr-17	23089170419012	<0.0050	<0.00010	0.0015	0.112	<0.00010	<0.000050	<0.010	<0.000010	<0.000010	<0.00050	<0.00010	<0.00020	<0.000050	0.002	0.000896	<0.00050	<0.050
MW06-D	05-Oct-17	23089171005003	<0.0050	<0.00010	0.00129	0.111	<0.00010	<0.000050	<0.010	<0.000010	<0.000010	<0.00050	<0.00010	0.00041	<0.000050	0.003	0.000828	<0.00050	<0.050
MW06-D	09-May-18	23089180509006	<0.0050	<0.00010	0.00116	0.111	<0.00010	<0.000050	<0.010	<0.0000050	<0.000010	<0.00050	<0.00010	<0.00020	<0.000050	0.002	0.000573	<0.00050	<0.050
MW06-D	20-Dec-18	23089181220014	<0.0050	<0.00010	0.00119	0.103	<0.00010	<0.000050	<0.010	0.0000061	<0.000010	<0.00050	<0.00010	0.00045	0.00117	0.002	0.000618	0.00112	<0.050
MW06-S	19-Oct-16	23089161019005	<0.0050	0.0003	0.00104	0.124	<0.00010	<0.000050	0.014	<0.000010	<0.000010	<0.00050	0.0002	0.00046	<0.000050	0.002	0.00323	<0.00050	<0.050
MW06-S	19-Apr-17	23089170419011	***0.627***	<0.0010	0.0015	0.129	<0.0010	<0.00050	<0.10	<0.00010	0.00011	<0.0050	<0.0010	<0.0020	0.00511	<0.010	0.00181	<0.0050	<0.50
MW06-S	04-Oct-17	23089171004009	<0.0050	<0.00010	0.00165	0.121	<0.00010	<0.000050	<0.010	<0.000010	<0.000010	0.00131	0.00011	0.00029	<0.000050	0.003	0.00251	0.00067	<0.050
MW06-S	09-May-18	23089180509005	<0.0050	<0.00010	0.00168	0.118	<0.00010	<0.000050	<0.010	<0.0000050	<0.000010	<0.00050	<0.00010	0.00022	<0.000050	0.003	0.00191	<0.00050	<0.050
MW06-S	20-Dec-18	23089181220013	***0.165***	<0.00010	0.00196	0.112	<0.00010	<0.000050	<0.010	0.0000131	0.000017	<0.00050	0.00018	0.00118	0.00155	0.003	0.00219	0.00068	<0.050
Ontario Drinking Water Quality Standards*			**$0.1^{OG,+}$**	**0.006^{MAC}**	**0.01^{MAC}**	**1^{MAC}**	**NS**	**NS**	**5^{MAC}**	**0.005^{MAC}**	**NS**	**0.05^{MAC}**	**NS**	**$1^{AO,+}$**	**$0.01^{MAC,Pb}$**	**NS**	**NS**	**NS**	**NS**

TABLE GW1.5b

Groundwater Quality Results - Dissolved Metals

City of Guelph
Clair - Maltby Master Environmental Servicing Plan (MESP) and Secondary Plan (SP)

Monitoring Well	Sample Date	MSI Sample Number	Rb mg/L	Se mg/L	Si mg/L	Ag mg/L	Sr mg/L	S mg/L	Te mg/L	Tl mg/L	Th mg/L	Sn mg/L	Ti mg/L	W mg/L	U mg/L	V mg/L	Zn mg/L	Zr mg/L
MW04-D	20-Oct-16	23089161020008	0.00062	<0.000050	8.69	<0.000050	0.158	8.32	<0.00020	<0.000010	<0.00010	0.00013	<0.00030	<0.00010	0.00112	<0.00050	0.0272	<0.00030
MW04-D	19-Apr-17	23089170419008	0.00089	0.000252	9.28	<0.000050	0.145	7.48	<0.00020	<0.000010	<0.00010	0.00029	<0.00030	<0.00010	0.00109	0.00071	0.0038	<0.00030
MW04-D	04-Oct-17	23089171004006	0.00052	0.000073	10.9	<0.000050	0.149	7.58	<0.00020	<0.000010	<0.00010	<0.00010	<0.00030	<0.00010	0.000633	<0.00050	<0.0010	<0.00030
MW04-D	09-May-18	23089180509002	0.00057	0.000106	10.5	<0.000050	0.164	6.3	<0.00020	<0.000010	<0.00010	<0.00010	0.00273	<0.00010	0.000433	<0.00050	0.0014	<0.00030
MW04-D	18-Dec-18	23089181218010	0.00037	0.000113	9.89	<0.000050	0.167	6.51	<0.00020	<0.000010	<0.00010	<0.00010	<0.00030	<0.00010	0.00034	<0.00050	<0.0010	<0.00030
MW04-S	20-Oct-16	23089161020007	0.00208	0.000206	5.85	<0.000050	0.256	15.5	<0.00020	0.000014	<0.00010	0.0007	<0.00030	<0.00010	0.00248	<0.00050	0.0039	<0.00030
MW04-S	19-Apr-17	23089170419007	0.00089	0.000063	8.05	<0.000050	0.145	15.1	<0.00020	<0.000010	<0.00010	0.00036	<0.00030	<0.00010	0.00241	0.0006	0.0017	<0.00030
MW04-S	04-Oct-17	23089171004005	0.00079	<0.000050	9.81	<0.000050	0.135	15.9	<0.00020	0.000013	<0.00010	<0.00010	<0.00030	<0.00010	0.00165	0.00067	0.0025	<0.00030
MW04-S	09-May-18	23089180509001	0.00127	<0.000050	9.19	<0.000050	0.165	15.4	<0.00020	0.000012	<0.00010	0.00086	<0.00050	<0.00010	0.00172	0.00068	0.0054	<0.00030
MW04-S	18-Dec-18	23089181218009	0.00059	<0.000050	9.32	<0.000050	0.145	14.6	<0.00020	0.00001	<0.00010	0.00015	<0.00030	<0.00010	0.00111	<0.00050	0.006	<0.00030
MW05-D	19-Oct-16	23089161019007	0.00075	<0.000050	9.08	<0.000050	0.135	11.6	<0.00020	<0.000010	<0.00010	<0.00010	0.00038	<0.00010	0.000113	0.00062	0.0019	0.00051
MW05-D	19-Apr-17	23089170419010	0.00046	0.000168	9.2	<0.000050	0.138	12.1	<0.00020	<0.000010	<0.00010	<0.00010	0.00032	<0.00010	0.000034	0.00054	0.0049	0.00067
MW05-D	05-Oct-17	23089171005001	0.00054	0.000064	10.2	<0.000050	0.127	13.5	<0.00020	<0.000010	<0.00010	<0.00010	<0.00030	<0.00010	0.000042	0.00062	<0.0010	0.00059
MW05-D	09-May-18	23089180509004	0.00056	<0.000050	9.11	<0.000050	0.135	12.3	<0.00020	<0.000010	<0.00010	<0.00010	0.00035	<0.00010	0.000047	0.00054	<0.0010	0.00055
MW05-D	20-Dec-18	23089181220016	0.00055	0.00009	8.95	<0.000050	0.139	11.8	<0.00020	<0.000010	<0.00010	<0.00010	<0.00030	<0.00010	0.000031	0.00051	0.0023	0.0006
MW05-S	19-Oct-16	23089161019006	0.0024	0.000167	4.01	<0.000050	0.143	31	<0.00020	0.00002	<0.00010	<0.00010	<0.00030	<0.00010	***0.024***	<0.00050	0.0276	<0.00030
MW05-S	19-Apr-17	23089170419009	0.00065	<0.000050	5.06	<0.000050	0.126	17.2	<0.00020	<0.000010	<0.00010	<0.00010	<0.00030	<0.00010	0.00825	<0.00050	0.0099	<0.00030
MW05-S	05-Oct-17	23089171005002	0.00081	<0.000050	5.02	<0.000050	0.107	18.1	<0.00020	<0.000010	<0.00010	<0.00010	<0.00030	<0.00010	0.00511	<0.00050	0.0106	<0.00030
MW05-S	09-May-18	23089180509003	0.00052	<0.000050	5.61	<0.000050	0.119	15.4	<0.00020	<0.000010	<0.00010	<0.00010	<0.00030	<0.00010	0.00282	<0.00050	0.0116	<0.00030
MW05-S	20-Dec-18	23089181220015	0.00058	<0.000050	5.63	<0.000050	0.118	17.5	<0.00020	<0.000010	<0.00010	<0.00010	<0.00030	<0.00010	0.00276	<0.00050	0.017	<0.00030
MW06-D	19-Oct-16	23089161019004	0.00075	<0.000050	6.43	<0.000050	0.123	8.63	<0.00020	<0.000010	<0.00010	0.00016	<0.00030	<0.00010	0.00202	<0.00050	0.0038	<0.00030
MW06-D	19-Apr-17	23089170419012	0.0005	0.000272	7.31	<0.000050	0.126	5.5	<0.00020	<0.000010	<0.00010	<0.00010	<0.00030	<0.00010	0.000905	<0.00050	0.002	<0.00030
MW06-D	05-Oct-17	23089171005003	0.00075	<0.000050	7.72	<0.000050	0.112	6.15	<0.00020	<0.000010	<0.00010	0.00011	<0.00030	<0.00010	0.000595	<0.00050	0.0317	<0.00030
MW06-D	09-May-18	23089180509006	0.0004	<0.000050	7.49	<0.000050	0.101	5.28	<0.00020	<0.000010	<0.00010	<0.00010	<0.00030	<0.00010	0.00031	<0.00050	0.001	<0.00030
MW06-D	20-Dec-18	23089181220014	0.00047	<0.000050	7.72	<0.000050	0.0969	5.46	<0.00020	<0.000010	<0.00010	<0.00010	<0.00030	0.00014	0.000185	<0.00050	0.0061	<0.00030
MW06-S	19-Oct-16	23089161019005	0.00159	0.000053	4.2	<0.000050	0.256	18.1	<0.00020	<0.000010	<0.00010	0.00061	<0.00030	<0.00010	0.00545	<0.00050	0.0509	<0.00030
MW06-S	19-Apr-17	23089170419011	0.0027	<0.00050	7.54	<0.00050	0.177	24.4	<0.0020	<0.00010	<0.0010	<0.0010	<0.030	<0.0010	0.00376	<0.0050	0.013	<0.0030
MW06-S	04-Oct-17	23089171004009	0.00095	<0.000050	6.39	<0.000050	0.137	28.7	<0.00020	<0.000010	<0.00010	<0.00010	<0.00030	<0.00010	0.00241	<0.00050	0.0028	<0.00030
MW06-S	09-May-18	23089180509005	0.00086	<0.000050	6.34	<0.000050	0.133	25.6	<0.00020	<0.000010	<0.00010	<0.00010	<0.00030	<0.00010	0.00172	<0.00050	0.0012	<0.00030
MW06-S	20-Dec-18	23089181220013	0.00117	<0.000050	6.86	<0.000050	0.141	27.8	<0.00020	<0.000010	<0.00010	0.00035	<0.0060	<0.00010	0.00154	<0.00050	0.0073	<0.00030
Ontario Drinking Water Quality Standards^{+}			**NS**	**0.05^{MAC}**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**0.02^{MAC}**	**NS**	**5$^{AO,+}$**	**NS**

Notes:

--- - not analyzed
NS - not specified
^{AO} - aesthetic objective
^{OG} - operational guidelines
^{MAC} - maximum acceptable concentration
^{Pb} - standard applies to water at the point of consumption. Since lead is a component in some plumbing systems, first flush water may contain higher concentrations of lead than water that has been flushed for five minutes.
* - Ontario Regulation 169/03 Ontario Drinking Water Quality Standards (Government of Ontario 2006) - Latest ammendment as of Jan, 2018
$^{+}$ - *Technical Support Document for Ontario Drinking Water Quality Standards, Objectives and Guidelines* (MOE 2006)
Italics - values do not meet applicable guidelines

TABLE GW1.5c

Groundwater Quality Results - Dissolved Metals

City of Guelph

Clair - Maltby Master Environmental Servicing Plan (MESP) and Secondary Plan (SP)

Monitoring Well	Sample Date	MSI Sample Number	Al mg/L	Sb mg/L	As mg/L	Ba mg/L	Be mg/L	Bi mg/L	B mg/L	Cd mg/L	Cs mg/L	Cr mg/L	Co mg/L	Cu mg/L	Pb mg/L	Li mg/L	Mo mg/L	Ni mg/L	P mg/L
MW07-D	19-Oct-16	23089161019001	<0.0050	0.00017	0.00037	0.127	<0.00010	<0.000050	<0.010	0.000015	<0.000010	<0.00050	0.00062	0.00103	0.000155	0.003	0.00118	0.00174	<0.050
MW07-D	19-Apr-17	23089170419015	<0.0050	<0.00010	0.00036	0.115	<0.00010	<0.000050	<0.010	<0.000010	<0.000010	<0.00050	0.00028	0.00024	0.000098	0.003	0.000928	0.00127	<0.050
MW07-D	10-Oct-17	23089171010001	<0.0050	0.00018	0.00045	0.122	<0.00010	<0.000050	<0.010	0.000039	<0.000010	<0.00050	0.00037	0.0184	0.000758	0.003	0.000794	0.00211	<0.050
MW07-D	10-May-18	23089180510010	0.0065	<0.00010	0.00034	0.119	<0.00010	<0.000050	<0.010	0.000023	<0.000010	<0.00050	0.00021	0.00181	0.000185	0.004	0.000824	0.00122	<0.050
MW07-D	20-Dec-18	23089181220017	<0.0050	<0.00010	0.00037	0.109	<0.00010	<0.000050	<0.010	0.0000102	<0.000010	<0.00050	0.00024	0.00105	0.000111	0.003	0.000805	0.00116	<0.050
MW08-D	19-Oct-16	23089161019002	<0.0050	0.00012	<0.00010	0.144	<0.00010	<0.000050	0.013	0.000067	<0.000010	<0.00050	0.00085	0.00201	0.000614	0.003	0.000662	0.0031	<0.050
MW08-D	19-Apr-17	23089170419014	<0.0050	<0.00010	0.0001	0.121	<0.00010	<0.000050	0.014	0.000073	<0.000010	<0.00050	0.00044	0.0014	0.000425	0.003	0.000684	0.00224	<0.050
MW08-D	05-Oct-17	23089171005004	<0.0050	<0.00010	<0.00010	0.144	<0.00010	<0.000050	0.013	0.000084	<0.000010	<0.00050	0.00047	0.00111	0.000347	0.004	0.000605	0.00236	<0.050
MW08-D	10-May-18	23089180510008	<0.0050	<0.00010	0.00011	0.138	<0.00010	<0.000050	0.014	0.000101	<0.000010	<0.00050	0.00038	0.00129	0.00029	0.003	0.000638	0.00219	<0.050
MW08-D	18-Dec-18	23089181218012	<0.0050	<0.00010	0.0001	0.126	<0.00010	<0.000050	0.014	0.0000601	<0.000010	<0.00050	0.00026	0.00087	0.000175	0.003	0.000527	0.00196	<0.050
MW08-S	19-Oct-16	23089161019003	<0.0050	0.00036	0.00028	0.0167	<0.00010	<0.000050	0.011	0.000043	<0.000010	<0.00050	0.00018	0.00158	0.000051	<0.0010	0.000655	0.00945	<0.050
MW08-S	19-Apr-17	23089170419013	<0.0050	<0.00010	0.00019	0.0136	<0.00010	<0.000050	0.01	0.000056	<0.000010	<0.00050	<0.00010	0.00061	0.000051	<0.0010	<0.000050	<0.00050	<0.050
MW08-S	05-Oct-17	23089171005005	<0.0050	<0.00010	0.00019	0.013	<0.00010	<0.000050	<0.010	0.000046	<0.000010	<0.00050	<0.00010	0.00074	<0.000050	0.001	<0.000050	<0.00050	<0.050
MW08-S	10-May-18	23089180510007	<0.0050	<0.00010	0.00018	0.0136	<0.00010	<0.000050	0.011	0.0000586	<0.000010	<0.00050	<0.00010	0.0008	0.000074	0.001	0.000074	<0.00050	<0.050
MW08-S	18-Dec-18	23089181218011	<0.0050	<0.00010	0.0002	0.0129	<0.00010	<0.000050	<0.010	0.0000461	<0.000010	<0.00050	<0.00010	0.00134	0.000072	<0.0010	0.000088	<0.00050	<0.050
MW09-D	21-Oct-16	23089161021001	<0.0050	0.00013	0.0039	0.0908	<0.00010	<0.000050	0.017	0.000019	<0.000010	<0.00050	0.00023	0.00054	0.000113	0.003	0.00634	0.00068	<0.050
MW09-D	19-Apr-17	23089170419017	<0.0050	<0.00010	0.00448	0.0898	<0.00010	<0.000050	0.014	<0.000010	<0.000010	<0.00050	0.00023	0.00026	<0.000050	0.002	0.00269	0.00068	<0.050
MW09-D	04-Oct-17	23089171004008	<0.0050	<0.00010	0.00443	0.0954	<0.00010	<0.000050	0.013	0.000016	<0.000010	<0.00050	0.00037	0.00096	<0.000050	0.004	0.00153	0.00067	<0.050
MW09-D	08-Jun-18	23089180608001	<0.0050	<0.00010	0.00523	0.0959	<0.00010	<0.000050	0.012	0.0000156	<0.000010	<0.00050	0.00049	0.00121	<0.000050	0.003	0.00137	0.00067	<0.050
MW09-D	18-Dec-18	23089181218004	<0.0050	<0.00010	0.00534	0.096	<0.00010	<0.000050	0.011	<0.0000050	<0.000010	<0.00050	0.00047	0.00111	0.000059	0.002	0.00141	0.00064	<0.050
MW09-S	21-Oct-16	23089161021002	<0.0050	<0.00010	0.00012	0.0869	<0.00010	<0.000050	0.012	0.000036	<0.000010	<0.00050	<0.00010	0.00112	0.00006	<0.0010	0.000203	<0.00050	<0.050
MW09-S	19-Apr-17	23089170419016	<0.0050	<0.00010	<0.00010	0.0876	<0.00010	<0.000050	0.013	0.000049	<0.000010	<0.00050	<0.00010	0.00103	0.000082	0.001	0.000194	<0.00050	<0.050
MW09-S	04-Oct-17	23089171004007	<0.0050	<0.00010	0.00011	0.0944	<0.00010	<0.000050	0.013	0.000043	<0.000010	<0.00050	<0.00010	0.00136	0.000069	0.002	0.000192	<0.00050	<0.050
MW09-S	10-May-18	23089180510009	<0.0050	<0.00010	0.00011	0.0857	<0.00010	<0.000050	0.012	0.0000443	<0.000010	<0.00050	<0.00010	0.00188	0.000118	0.001	0.000179	<0.00050	<0.050
MW09-S	18-Dec-18	23089181218003	<0.0050	<0.00010	0.0001	0.0904	<0.00010	<0.000050	0.012	0.0000467	<0.000010	<0.00050	<0.00010	0.00127	0.000075	0.001	0.000163	<0.00050	<0.050
Ontario Drinking Water Quality Standards*			**$0.1^{OG,+}$**	**0.006^{MAC}**	**0.01^{MAC}**	**1^{MAC}**	**NS**	**NS**	**5^{MAC}**	**0.005^{MAC}**	**NS**	**0.05^{MAC}**	**NS**	**$1^{AO,+}$**	**$0.01^{MAC,Pb}$**	**NS**	**NS**	**NS**	**NS**

TABLE GW1.5c

Groundwater Quality Results - Dissolved Metals

City of Guelph
Clair - Maltby Master Environmental Servicing Plan (MESP) and Secondary Plan (SP)

Monitoring Well	Sample Date	MSI Sample Number	Rb mg/L	Se mg/L	Si mg/L	Ag mg/L	Sr mg/L	S mg/L	Te mg/L	Tl mg/L	Th mg/L	Sn mg/L	Ti mg/L	W mg/L	U mg/L	V mg/L	Zn mg/L	Zr mg/L
MW07-D	19-Oct-16	23089161019001	0.00127	0.000098	6.12	<0.000050	0.114	15.5	<0.00020	0.000018	<0.00010	0.00055	<0.00030	<0.00010	0.00148	<0.00050	0.0149	<0.00030
MW07-D	19-Apr-17	23089170419015	0.00109	0.000058	6.96	<0.000050	0.115	14.7	<0.00020	0.000019	<0.00010	<0.00010	<0.00030	<0.00010	0.00095	<0.00050	0.0107	<0.00030
MW07-D	10-Oct-17	23089171010001	0.00122	0.000055	6.21	<0.000050	0.112	13.6	<0.00020	0.000016	<0.00010	0.00054	<0.00030	<0.00010	0.000807	<0.00050	0.0543	<0.00030
MW07-D	10-May-18	23089180510010	0.00116	0.000083	6.1	<0.000050	0.12	12.8	<0.00020	0.000016	<0.00010	<0.00010	<0.00030	<0.00010	0.000858	<0.00050	0.0243	<0.00030
MW07-D	20-Dec-18	23089181220017	0.00097	<0.000050	6.34	<0.000050	0.115	12.3	<0.00020	0.000014	<0.00010	<0.00010	<0.00030	<0.00010	0.000784	<0.00050	0.022	<0.00030
MW08-D	19-Oct-16	23089161019002	0.00225	0.000251	5.51	<0.000050	0.18	10.9	<0.00020	0.000048	<0.00010	<0.00010	<0.00030	<0.00010	0.000649	<0.00050	0.192	<0.00030
MW08-D	19-Apr-17	23089170419014	0.00149	0.000276	5.43	<0.000050	0.164	10.9	<0.00020	0.000032	<0.00010	<0.00010	<0.00030	<0.00010	0.000549	<0.00050	0.151	<0.00030
MW08-D	05-Oct-17	23089171005004	0.00233	0.000249	5.69	<0.000050	0.152	11.5	<0.00020	0.000051	<0.00010	<0.00010	<0.00030	<0.00010	0.000491	<0.00050	0.198	<0.00030
MW08-D	10-May-18	23089180510008	0.00241	0.000311	5.17	<0.000050	0.168	9.81	<0.00020	0.000057	<0.00010	<0.00010	<0.00030	<0.00010	0.000503	<0.00050	0.212	<0.00030
MW08-D	18-Dec-18	23089181218012	0.00171	0.000261	5.29	<0.000050	0.16	9.89	<0.00020	0.000034	<0.00010	<0.00010	<0.00030	<0.00010	0.000462	<0.00050	0.15	<0.00030
MW08-S	19-Oct-16	23089161019003	0.00069	0.000132	3.66	<0.000050	0.115	1.48	<0.00020	<0.000010	<0.00010	0.00123	<0.00030	<0.00010	0.000231	<0.00050	0.0101	<0.00030
MW08-S	19-Apr-17	23089170419013	0.00032	0.000105	4.18	<0.000050	0.11	2.17	<0.00020	<0.000010	<0.00010	<0.00010	<0.00030	<0.00010	0.000181	<0.00050	0.0075	<0.00030
MW08-S	05-Oct-17	23089171005005	0.00031	0.000059	4.33	<0.000050	0.0997	1.96	<0.00020	<0.000010	<0.00010	<0.00010	<0.00030	<0.00010	0.000143	<0.00050	0.0082	<0.00030
MW08-S	10-May-18	23089180510007	0.00032	0.000083	4.18	<0.000050	0.135	3.43	<0.00020	<0.000010	<0.00010	<0.00010	<0.00030	<0.00010	0.0002	<0.00050	0.0082	<0.00030
MW08-S	18-Dec-18	23089181218011	0.00031	0.00012	3.8	<0.000050	0.105	2.15	<0.00020	<0.000010	<0.00010	0.0001	<0.00030	<0.00010	0.000172	<0.00050	0.0078	<0.00030
MW09-D	21-Oct-16	23089161021001	0.00167	<0.000050	7.26	<0.000050	0.166	2.24	<0.00020	0.00002	<0.00010	0.00027	<0.00030	<0.00010	0.00104	<0.00050	0.0146	<0.00030
MW09-D	19-Apr-17	23089170419017	0.00123	<0.000050	7.31	<0.000050	0.148	1.85	<0.00020	0.000019	<0.00010	<0.00010	<0.00030	<0.00010	0.000792	<0.00050	0.0087	<0.00030
MW09-D	04-Oct-17	23089171004008	0.00078	<0.000050	8.2	<0.000050	0.137	1.96	<0.00020	0.000017	<0.00010	<0.00010	<0.00030	<0.00010	0.000429	<0.00050	0.0167	<0.00030
MW09-D	08-Jun-18	23089180608001	0.00065	<0.000050	8.28	<0.000050	0.139	1.82	<0.00020	0.000013	<0.00010	0.00025	<0.00030	<0.00010	0.000346	<0.00050	0.0099	<0.00030
MW09-D	18-Dec-18	23089181218004	0.00065	<0.000050	7.94	<0.000050	0.146	1.68	<0.00020	<0.000010	<0.00010	0.00021	<0.00030	<0.00010	0.000364	<0.00050	0.0079	<0.00030
MW09-S	21-Oct-16	23089161021002	0.00047	0.000314	4.43	<0.000050	0.0948	5.6	<0.00020	<0.000010	<0.00010	0.00027	<0.00030	<0.00010	0.000262	<0.00050	0.0604	<0.00030
MW09-S	19-Apr-17	23089170419016	0.0006	0.000325	4.36	<0.000050	0.105	5.32	<0.00020	<0.000010	<0.00010	0.00013	<0.00030	<0.00010	0.000294	<0.00050	0.0214	<0.00030
MW09-S	04-Oct-17	23089171004007	0.00057	0.000366	4.45	<0.000050	0.0906	5.92	<0.00020	<0.000010	<0.00010	<0.00010	<0.00030	<0.00010	0.000268	<0.00050	0.0249	<0.00030
MW09-S	10-May-18	23089180510009	0.00053	0.00034	4.1	<0.000050	0.102	4.85	<0.00020	<0.000010	<0.00010	0.00011	<0.00030	<0.00010	0.000282	<0.00050	0.0245	<0.00030
MW09-S	18-Dec-18	23089181218003	0.0005	0.000299	4.29	<0.000050	0.0999	5.07	<0.00020	<0.000010	<0.00010	0.00014	<0.00030	<0.00010	0.000255	<0.00050	0.0251	<0.00030
Ontario Drinking Water Quality Standards^{+}			**NS**	**0.05^{MAC}**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**0.02^{MAC}**	**NS**	**$5^{AO,+}$**	**NS**

Notes:

--- - not analyzed
NS - not specified
^{AO} - aesthetic objective
^{OG} - operational guidelines
^{MAC} - maximum acceptable concentration
^{Pb} - standard applies to water at the point of consumption. Since lead is a component in some plumbing systems, first flush water may contain higher concentrations of lead than water that has been flushed for five minutes.
* - Ontario Regulation 169/03 Ontario Drinking Water Quality Standards (Government of Ontario 2006) - Latest ammendment as of Jan, 2018
$^{+}$ - *Technical Support Document for Ontario Drinking Water Quality Standards, Objectives and Guidelines* (MOE 2006)
Italics - values do not meet applicable guidelines

TABLE GW1.6

Surface Water Base Flow Results

City of Guelph

Clair - Maltby Master Environmental Servicing Plan (MESP) and Secondary Plan (SP)

Spot Flow Location	Upstream or Side of the Crossing	Subwatershed			Spot Flows															
			UTM NAD83 Zone 17N		Summer 2016				Fall 2016				Spring 2017				Summer 2017			
			Northing	Easting	Flow (L/s)	SW Temp °C	Date	Method	Flow (L/s)	SW Temp °C	Date	Method	Flow (L/s)	SW Temp °C	Date	Method	Flow (L/s)	SW Temp °C	Date	Method
HC-HR1	US	Hanlon Creek	4817074	562217	63.3	18.1	Aug 31	FT	59.9	6.3	Nov 10	FT	175.3	8.3	May 11	FT	64.5	16.4	Aug 16	FT
HC-HR2	DS	Hanlon Creek	4816810	562558	0.0	---	Aug 31	V	0.0	---	Nov 10	V	1.0	---	May 11	V	0.0	---	Aug 16	V
HC-HR3	---	Hanlon Creek	4816866	562652	2.1	---	Sept 1	L	2.6	10.2	Nov 10	FT	5.7	11.9	May 11	FT	3.0	---	Aug 16	V
HC-T1	US	Hanlon Creek	4816367	562118	14.0	16.5	Sept 1	FT	11.6	6.3	Nov 10	FT	85.2	10.3	May 11	FT	11.5	18.7	Aug 16	FT
LSR-D2	---	Lower Speed River	4814794	562355	0.0	---	Sept 1	V	0.0	---	Nov 10	V	5.0	---	May 11	V	0.0	---	Aug 16	V
LSR-L1	DS	Lower Speed River	4815033	561481	0.0	---	Aug 31	V	0.0	---	Nov 10	V	25.0	9.8	May 11	FT	0.0	---	Aug 16	V
LSR-P1	DS	Lower Speed River	4815726	560821	0.1	---	Sept 1	B	0.1	---	Nov 10	B	35.0	---	May 11	B	9.1	22.0	Aug 16	FT
LSR-P2	DS	Lower Speed River	4816066	560757	0.0	---	Sept 1	V	0.0	---	Nov 10	V	0.7	---	May 11	B	0.0	---	Aug 16	V
LSR-P3	DS	Lower Speed River	4816551	560703	0.1	---	Sept 1	V	0.3	---	Nov 10	B	20.0	---	May 11	V	1.0	---	Aug 16	L
MC-C71	US	Mill Creek	4812339	566992	0.0	---	Aug 31	V	0.0	---	Nov 9	V	0.5	---	May 10	V	0.0	---	Aug 16	V
MC-C72	US	Mill Creek	4812723	566606	0.0	---	Aug 31	V	0.8	---	Nov 9	L	10.0	---	May 10	V	0.0	---	Aug 16	V
MC-G1	US	Mill Creek	4813575	569960	36.9	15.2	Aug 30	FT	43.4	7.6	Nov 9	FT	168.9	9.5	May 10	FT	38.6	13.9	Aug 16	FT
MC-GN1	US	Mill Creek	4814253	568042	1.9	21.5	Aug 30	FT	4.7	8.3	Nov 9	FT	3.0	---	May 10	B	2.0	---	Aug 16	V
MC-GN2	DS	Mill Creek	4814342	567968	1.9	---	Aug 30	B	2.4	---	Nov 9	B	5.0	---	May 10	B	3.0	---	Aug 16	B
MC-GN3	DS	Mill Creek	4813648	568576	73.8	16.9	Aug 31	FT	58.2	8.4	Nov 9	FT	209.2	12.8	May 10	FT	74.2	16.2	Aug 16	FT
MC-GN4	DS	Mill Creek	4813263	569173	105.7	23.9	Aug 31	FT	111.4	8.7	Nov 9	FT	411.1	13.1	May 10	FT	108.8	23.5	Aug 16	FT
MC-M2		Mill Creek	4818016	569639	---	---	---	---	0.0	---	Nov 10	V	3.0	---	May 11	V	0.0	---	Aug 16	V
MC-M3	US	Mill Creek	4814352	566152	0.0	---	Aug 31	V	0.0	---	Nov 9	V	0.0	---	May 10	V	0.0	---	Aug 16	V
MC-SR1	DS	Mill Creek	4811552	567674	174.3	21.9	Aug 31	FT	187.2	8.1	Nov 9	FT	676.3	10.8	May 11	FT	208.0	18.3	Aug 16	FT
MC-V1	DS	Mill Creek	4813756	571458	16.5	16.4	Aug 30	FT	12.0	7.4	Nov 9	FT	62.8	10.1	May 10	FT	15.3	15.0	Aug 16	FT
MC-V2	DS	Mill Creek	4815732	569467	11.2	20.9	Aug 30	FT	5.8	8.0	Nov 9	FT	179.3	9.9	May 11	FT	25.0	18.1	Aug 16	FT
MC-W2	DS	Mill Creek	4817137	571205	8.3	---	Aug 30	FT	5.6	6.3	Nov 10	FT	102.2	10.7	May 11	FT	10.2	14.4	Aug 16	FT
MC-WL3	DS	Mill Creek	4813824	568493	76.9	17.9	Aug 30	FT	65.8	8.0	Nov 9	FT	206.5	12.8	May 10	FT	84.7	15.7	Aug 16	FT
MC-WL4	DS	Mill Creek	4813565	568249	8.4	18.8	Aug 31	FT	13.5	8.1	Nov 9	FT	28.2	13.0	May 10	FT	14.3	14.8	Aug 16	FT
TC-C1	---	Torrance Creek	4820979	565613	---	---	---	---	0.0	---	Nov 10	V	0.3	---	May 10	B	0.0	---	Aug 16	V
TC-V1	---	Torrance Creek	4820265	564884	---	---	---	---	4.0	3.4	Nov 10	FT	39.3	10.2	May 10	FT	8.0	---	Aug 16	V
TC-V2	---	Torrance Creek	4820648	564494	---	---	---	---	0.0	---	Nov 10	V	1.3	9.9	May 10	FT	0.0	---	Aug 16	V

Spot Flow Location	Upstream or Side of the Crossing	Subwatershed			Spot Flows															
			UTM NAD83 Zone 17N		Fall 2017				Spring 2018				Summer 2018				Fall 2018			
			Northing	Easting	Flow (L/s)	SW Temp °C	Date	Method	Flow (L/s)	SW Temp °C	Date	Method	Flow (L/s)	SW Temp °C	Date	Method	Flow (L/s)	SW Temp °C	Date	Method
HC-HR1	US	Hanlon Creek	4817074	562217	57.8	5.9	Nov 29	FT	57.4	14.1	Jun 8	FT	32.0	14.6	Sep 19	FT	82.0	3.3	Dec 12	FT
HC-HR2	DS	Hanlon Creek	4816810	562558	0.0	---	Nov 29	V	0.0	--	Jun 8	V	0.0	---	Sep 19	V	0.0	---	Dec 12	V
HC-HR3	---	Hanlon Creek	4816866	562652	2.3	7.2	Nov 29	FT	1.4	--	Jun 8	L	0.2	---	Sep 19	L	3.0	6.0	Dec 12	V
HC-T1	US	Hanlon Creek	4816367	562118	24.6	4.6	Nov 29	FT	15.1	13.1	Jun 8	FT	3.0	14.5	Sep 19	FT	5.0	3.0	Dec 12	FT
LSR-D2	---	Lower Speed River	4814794	562355	0.0	---	Nov 29	V	0.0	--	Jun 8	V	0.0	---	Sep 18	V	0.0	---	Dec 12	V
LSR-L1	DS	Lower Speed River	4815033	561481	0.0	---	Nov 29	V	0.0	--	Jun 8	V	0.0	---	Sep 18	V	0.0	---	Dec 12	V
LSR-P1	DS	Lower Speed River	4815726	560821	0.6	---	Nov 29	L	3.1	--	Jun 8	B	0.0	---	Sep 19	V	1.0	---	Dec 12	B
LSR-P2	DS	Lower Speed River	4816066	560757	0.0	---	Nov 29	V	0.0	--	Jun 8	V	0.0	---	Sep 19	V	0.0	---	Dec 12	V
LSR-P3	DS	Lower Speed River	4816551	560703	0.4	---	Nov 29	B	1.2	--	Jun 8	B	0.3	---	Sep 19	B	1.8	---	Dec 12	B
MC-C71	US	Mill Creek	4812339	566992	0.0	---	Nov 29	V	0.0	--	Jun 7	V	0.0	---	Sep 18	V	1.0	---	Dec 12	V
MC-C72	US	Mill Creek	4812723	566606	0.0	---	Nov 29	V	5.8	--	Jun 7	L	0.0	---	Sep 18	V	5.0	---	Dec 12	V
MC-G1	US	Mill Creek	4813575	569960	49.8	4.8	Nov 29	FT	33.2	11.4	Jun 7	FT	13.5	13.7	Sep 18	FT	41.3	2.0	Dec 12	FT
MC-GN1	US	Mill Creek	4814253	568042	1.5	---	Nov 29	V	<1	17.7	Jun 7	V	5.0	---	Sep 18	L	3.3	---	Dec 12	V
MC-GN2	DS	Mill Creek	4814342	567968	3.5	---	Nov 29	B	2.0	--	Jun 7	B	2.0	---	Sep 18	B	3.0	---	Dec 12	B
MC-GN3	DS	Mill Creek	4813648	568576	69.0	5.0	Nov 29	FT	72.8	13.8	Jun 7	FT	57.2	17.1	Sep 18	FT	73.1	2.8	Dec 12	FT
MC-GN4	DS	Mill Creek	4813263	569173	131.7	3.6	Nov 29	FT	93.5	16.7	Jun 7	FT	51.5	23.4	Sep 18	FT	132.2	1.8	Dec 12	FT
MC-M2		Mill Creek	4818016	569639	0.0	---	Nov 29	V	0.0	--	Jun 7	V	0.0	---	Sep 18	V	0.0	---	Dec 12	V
MC-M3	US	Mill Creek	4814352	566152	0.0	---	Nov 29	V	0.0	--	Jun 7	V	0.0	---	Sep 18	V	0.0	---	Dec 12	V
MC-SR1	DS	Mill Creek	4811552	567674	212.0	4.2	Nov 29	FT	227.1	16.8	Jun 7	FT	101.0	20.1	Sep 18	FT	243.5	1.5	Dec 12	FT
MC-V1	DS	Mill Creek	4813756	571458	15.4	4.1	Nov 29	FT	---	---	---	---	---	---	---	---	---	---	Dec 12	---
MC-V2	DS	Mill Creek	4815732	569467	21.1	4.0	Nov 29	FT	21.5	13.4	Jun 7	FT	4.1	19.0	Sep 18	FT	15.5	1.2	Dec 12	FT
MC-W2	DS	Mill Creek	4817137	571205	5.9	7.1	Nov 29	FT	10.3	13.0	Jun 7	FT	5.2	15.3	Sep 18	FT	7.1	5.6	Dec 12	FT
MC-WL3	DS	Mill Creek	4813824	568493	75.2	5.1	Nov 29	FT	79.4	14.0	Jun 7	FT	38.1	18.0	Sep 18	FT	77.6	2.7	Dec 12	FT
MC-WL4	DS	Mill Creek	4813565	568249	12.7	4.2	Nov 29	FT	10.3	15.6	Jun 7	FT	2.2	18.3	Sep 18	FT	14.8	2.3	Dec 12	FT
TC-C1	---	Torrance Creek	4820979	565613	0.0	---	Nov 29	V	0.0	--	Jun 7	V	0.0	---	Sep 18	V	0.0	---	Dec 12	V
TC-V1	---	Torrance Creek	4820265	564884	8.0	---	Nov 29	L	7.0	12.8	Jun 7	FT	2.6	17.0	Sep 18	FT	11.6	0.5	Dec 12	FT
TC-V2	---	Torrance Creek	4820648	564494	0.0	---	Nov 29	V	0.0	--	Jun 7	V	0.0	---	Sep 18	V	0.0	---	Dec 12	V

Notes:

--- - not recorded
FT - Son-Tek FlowTracker
L - Measured leaf velocity and multiplied by simplified cross-sectional area to estimate discharge
B - Discharge collected in a bucket over a measured amount of time
V - Visual estimate

Appendix GW-2

Geophysical Logs

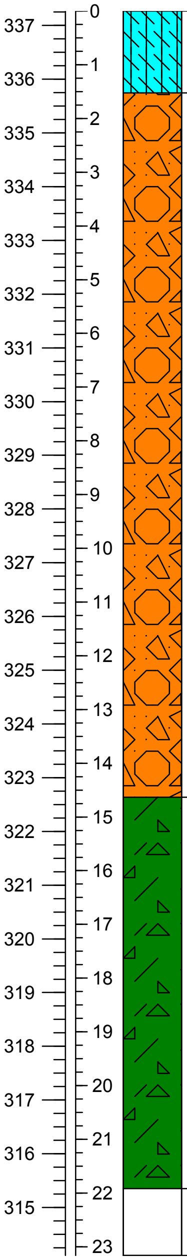
DRILLING LOG | Clair - Maltby Subwatershed Study | MW1-D

Client: **City of Guelph**
Project Area: **Clair - Maltby**
Project No.(MSI): **23089**
Field Staff: **J. Melchin**
Driller: **Highland Water Well Drilling Inc**

Date: **August 18, 2016**
Ground Elevation: **337.27 m asl**
Total Depth: **21.64 m**
Drill Rig: **Foremost DR-12**
Boring Diameter: **152 mm**

Screen Type: **52.5 mm PVC Sched. 40**
Screened Interval: **18.75 - 20.27 m**
Slot Size: **0.01"**
Casing Diameter: **52.5 mm**
Sand Pack: **17.37 - 21.09 m**

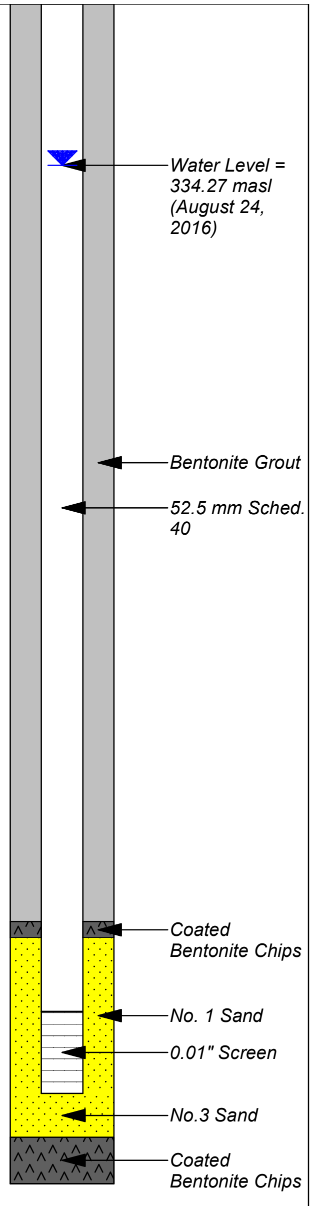
Stick Up: **0.51 m**
Northing: **4817765.42**
Easting: **566643.99**
Datum/Zone: **NAD83 17T**



Stratigraphic Description	Depth (m bgs)/ Elev. (m asl)
CLAYEY SILT, trace fine to coarse sand, brown, dry	0 / 337.27
SANDY GRAVEL, coarse sand, fine to very coarse gravel, brown, poorly sorted, angular to subrounded, dry **@ 9.75 m bgs: drill producing water**	1.52 / 335.75
CLAYEY SILT, some fine to coarse sand, trace fine gravel, grey (TILL)	14.63 / 322.64
PROBABLE BEDROCK **END OF BOREHOLE @ 21.95 m bgs**	21.95 / 315.32

Sample ID	Sample Type	Blow Counts (N Value)	% Recovery
5	CS	NA	NA
10	CS	NA	NA
15	CS	NA	NA
20	CS	NA	NA
25	CS	NA	NA
30	CS	NA	NA
35	CS	NA	NA
40	CS	NA	NA
45	CS	NA	NA
50	CS	NA	NA
55	CS	NA	NA
60	CS	NA	NA
65	CS	NA	NA
70	CS	NA	NA

Completion Details



NOTES: m asl = metres above sea level
m bgs = metres below ground surface
CS = cyclone sample

Matrix Solutions Inc.

DRILLING LOG

Clair - Maltby Subwatershed Study

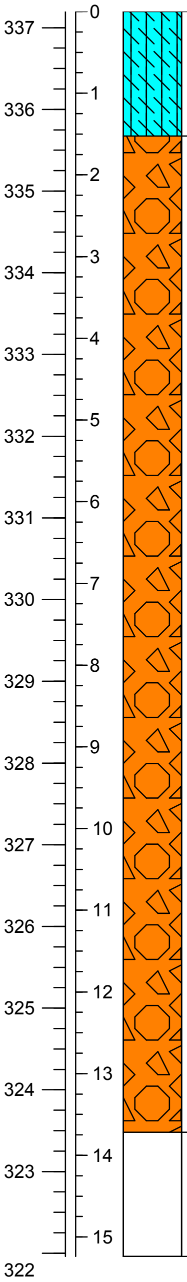
MW1-S

Client: **City of Guelph**
Project Area: **Clair - Maltby**
Project No.(MSI): **23089**
Field Staff: **J. Melchin**
Driller: **Highland Water Well Drilling Inc**

Date: **August 19, 2016**
Ground Elevation: **337.20 masl**
Total Depth: **13.72 m**
Drill Rig: **Foremost DR-12**
Boring Diameter: **152 mm**

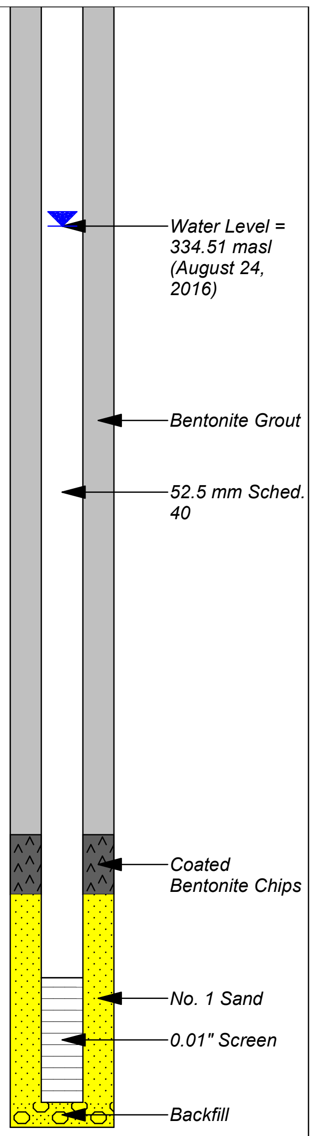
Screen Type: **52.5 mm PVC Sched. 40**
Screened Interval: **11.89 - 13.41 m**
Slot Size: **0.01"**
Casing Diameter: **52.5 mm**
Sand Pack: **10.87 - 13.41 m**

Stick Up: **0.42 m**
Northing: **4817762.85**
Easting: **566641.90**
Datum/Zone: **NAD83 17T**



Stratigraphic Description	Depth (m bgs)/ Elev. (m asl)	Sample ID	Sample Type	Blow Counts (N Value)	% Recovery
CLAYEY SILT, trace fine to coarse sand, brown, dry	0 / 337.20				
SANDY GRAVEL, coarse sand, fine to very coarse gravel, brown, poorly sorted, angular to subrounded, dry	1.52 / 335.67	5	CS	NA	NA
		10	CS	NA	NA
		15	CS	NA	NA
		20	CS	NA	NA
		25	CS	NA	NA
@ 9.14 m bgs: drill producing water					
		30	CS	NA	NA
		35	CS	NA	NA
		40	CS	NA	NA
	13.72 / 323.48	45	CS	NA	NA
END OF BOREHOLE @ 13.72 m bgs					

Completion Details



NOTES: **0.00 to 7.62 m bgs logged from MW1-D**
m asl = metres above sea level
m bgs = metres below ground surface
CS = cyclone sample

Matrix Solutions Inc.

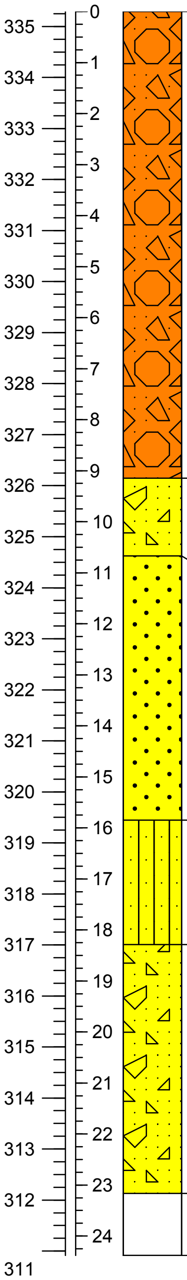
DRILLING LOG | Clair - Maltby Subwatershed Study | MW2-D

Client: **City of Guelph**
Project Area: **Clair - Maltby**
Project No.(MSI): **23089**
Field Staff: **S. Miller/J. Melchin**
Driller: **Highland Water Well Drilling Inc**

Date: **August 3, 2016**
Ground Elevation: **335.29 masl**
Total Depth: **23.16 m**
Drill Rig: **Foremost DR-12**
Boring Diameter: **152 mm**

Screen Type: **52.5 mm PVC Sched. 40**
Screened Interval: **19.20 - 20.73 m**
Slot Size: **0.01"**
Casing Diameter: **52.5 mm**
Sand Pack: **17.37 - 23.16 m**

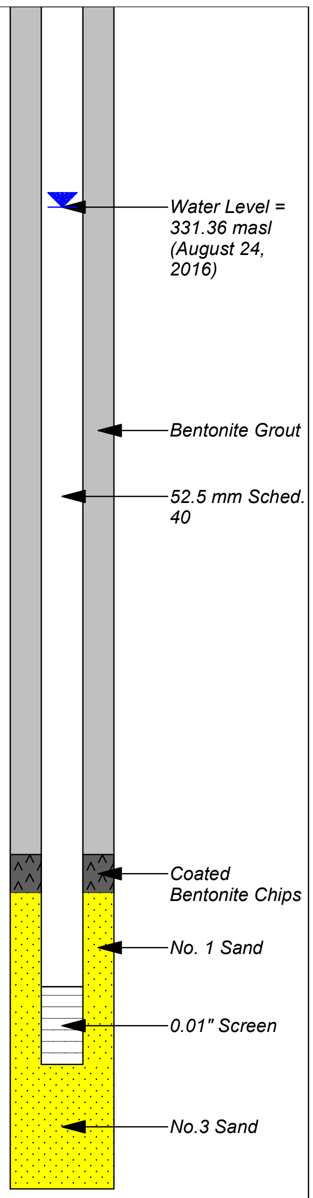
Stick Up: **0.83 m**
Northing: **4817418.83**
Easting: **566680.83**
Datum/Zone: **NAD83 17T**



Stratigraphic Description	Depth (m bgs)/ Elev. (m asl)
SANDY GRAVEL, fine to coarse sand, medium to fine gravel fining downwards, brown, poorly sorted, angular to subrounded, dry **@4.57 m bgs: moist** **@ 6.10 m bgs: drill producing water**	0 / 335.29
GRAVELLY SAND, fine to coarse sand, fine to medium gravel, grey, poorly sorted, angular to sub rounded, saturated	9.14 / 326.15
fine to very fine SAND, fining downwards, grey, well sorted, saturated	10.67 / 324.63
SILTY fine SAND, grey, moderately well sorted, saturated	15.85 / 319.44
GRAVELY SAND, medium to coarse sand, fine to medium gravel, poorly sorted, subangular to subrounded, saturated	18.29 / 317.01
END OF BOREHOLE @ 23.16 m bgs	23.16 / 312.13

Sample ID	Sample Type	Blow Counts (N Value)	% Recovery
5	CS	NA	NA
10	CS	NA	NA
15	CS	NA	NA
20	CS	NA	NA
25	CS	NA	NA
30	CS	NA	NA
35	CS	NA	NA
40	CS	NA	NA
45	CS	NA	NA
50	CS	NA	NA
55	CS	NA	NA
60	CS	NA	NA
65	CS	NA	NA
70	CS	NA	NA
75	CS	NA	NA

Completion Details



NOTES:
m asl = metres above sea level
m bgs = metres below ground surface
CS = cyclone sample

Matrix Solutions Inc.

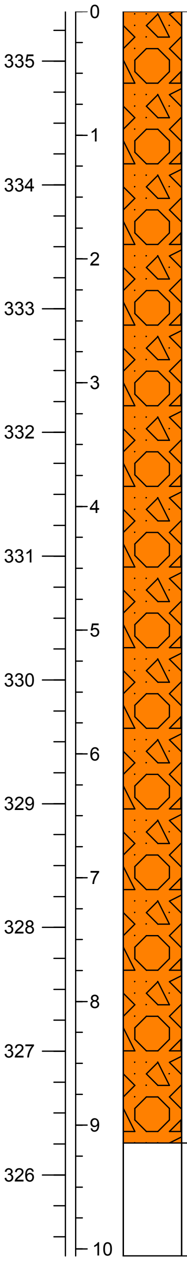
DRILLING LOG | Clair - Maltby Subwatershed Study | MW2-S

Client: **City of Guelph**
Project Area: **Clair - Maltby**
Project No.(MSI): **23089**
Field Staff: **S. Miller/J. Melchin**
Driller: **Highland Water Well Drilling Inc**

Date: **August 4, 2016**
Ground Elevation: **335.40 masl**
Total Depth: **9.14 m**
Drill Rig: **Foremost DR-12**
Boring Diameter: **152 mm**

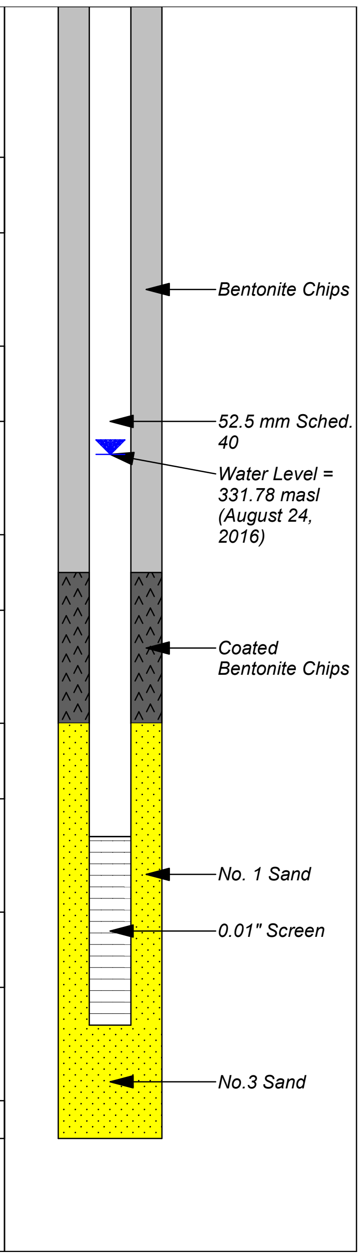
Screen Type: **52.5 mm PVC Sched. 40**
Screened Interval: **6.71 - 8.23 m**
Slot Size: **0.01"**
Casing Diameter: **52.5 mm**
Sand Pack: **5.79 - 9.14 m**

Stick Up: **0.91 m**
Northing: **4817425.33**
Easting: **566681.67**
Datum/Zone: **NAD83 17T**



Stratigraphic Description	Depth (m bgs)/ Elev. (m asl)	Sample ID	Sample Type	Blow Counts (N Value)	% Recovery
SANDY GRAVEL, fine to coarse sand, medium to fine gravel fining downwards, brown, poorly sorted, angular to subrounded, dry	0 / 335.40				
		5	CS	NA	NA
		10	CS	NA	NA
@ 4.57 m bgs: moist		15	CS	NA	NA
@ 6.10 m bgs: drill producing water		20	CS	NA	NA
		25	CS	NA	NA
	9.14 / 326.26	30	CS	NA	NA
END OF BOREHOLE @ 9.14 m bgs					

Completion Details



NOTES: **0.00 to 6.10 m bgs logged from MW2-D**
m asl = metres above sea level
m bgs = metres below ground surface
CS = cyclone sample

Matrix Solutions Inc.

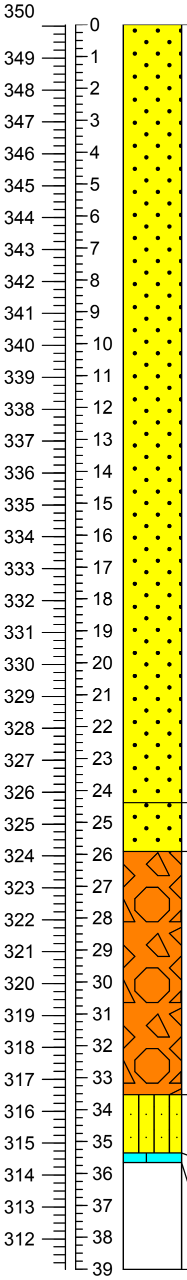
DRILLING LOG | Clair - Maltby Subwatershed Study | MW3-D

Client: **City of Guelph**
Project Area: **Clair - Maltby**
Project No.(MSI): **23089**
Field Staff: **S. Miller**
Driller: **Highland Water Well Drilling Inc**

Date: **July 25, 2016**
Ground Elevation: **350.05 masl**
Total Depth: **35.66 m**
Drill Rig: **Foremost DR-12**
Boring Diameter: **152 mm**

Screen Type: **52.5 mm PVC Sched. 40**
Screened Interval: **32.61 - 34.14 m**
Slot Size: **0.01"**
Casing Diameter: **52.5 mm**
Sand Pack: **30.78 - 35.05 m**

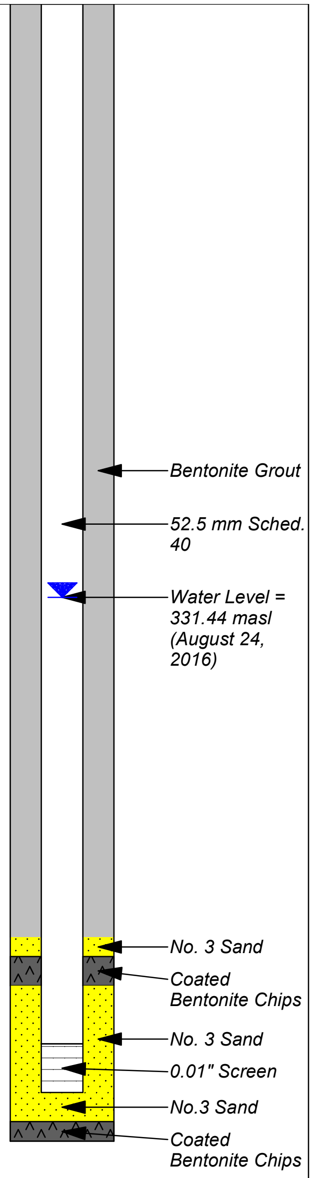
Stick Up: **0.70 m**
Northing: **4816950.32**
Easting: **568080.23**
Datum/Zone: **NAD83 17T**



Stratigraphic Description	Depth (m bgs)/ Elev. (m asl)
fine to medium SAND, some fine to coarse gravel, brown, poorly sorted, subangular to subrounded gravel, dry	0 / 350.05
@18.90 m bgs: moist	
medium SAND, brown, well sorted, wet, loose	24.38 / 325.67
fine to coarse GRAVEL, some coarse sand, poorly sorted, angular to subrounded, wet	25.91 / 324.14
SILTY fine to coarse SAND, trace fine to coarse gravel, grey, poorly sorted, wet	33.53 / 316.52
PROBABLE BEDROCK	35.36 / 314.70
END OF BOREHOLE @ 35.66 m bgs	35.66 / 314.39

Sample ID	Sample Type	Blow Counts (N Value)	% Recovery
5	CS	NA	NA
10	CS	NA	NA
15	CS	NA	NA
20	CS	NA	NA
25	CS	NA	NA
30	CS	NA	NA
35	CS	NA	NA
40	CS	NA	NA
45	CS	NA	NA
50	CS	NA	NA
55	CS	NA	NA
60	CS	NA	NA
65	CS	NA	NA
70	CS	NA	NA
75	CS	NA	NA
80	CS	NA	NA
85	CS	NA	NA
90	CS	NA	NA
95	CS	NA	NA
100	CS	NA	NA
105	CS	NA	NA
110	CS	NA	NA
115	CS	NA	NA

Completion Details



NOTES:
m asl = metres above sea level
m bgs = metres below ground surface
CS = cyclone sample

Matrix Solutions Inc.

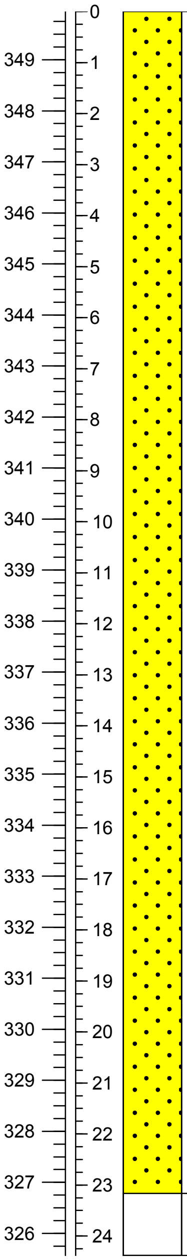
DRILLING LOG | Clair - Maltby Subwatershed Study | MW3-S

Client: **City of Guelph**
Project Area: **Clair - Maltby**
Project No.(MSI): **23089**
Field Staff: **S. Miller**
Driller: **Highland Water Well Drilling Inc**

Date: **July 26, 2016**
Ground Elevation: **349.95 masl**
Total Depth: **23.16 m**
Drill Rig: **Foremost DR-12**
Boring Diameter: **152 mm**

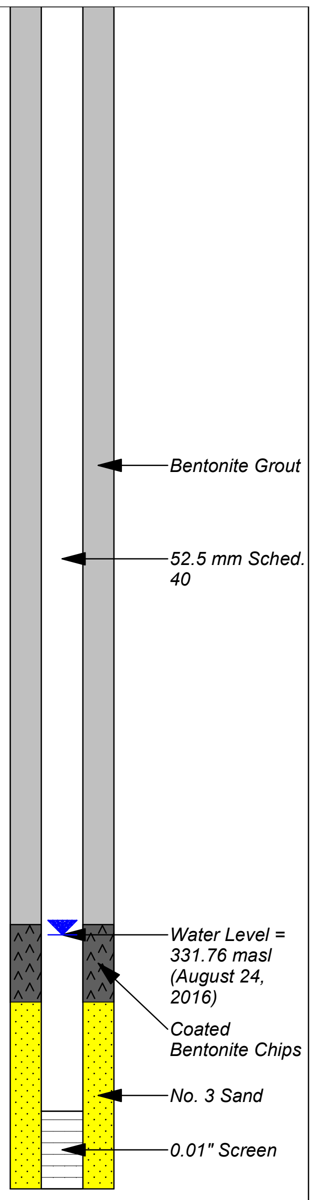
Screen Type: **52.5 mm PVC Sched. 40**
Screened Interval: **21.64 - 23.16 m**
Slot Size: **0.01"**
Casing Diameter: **52.5 mm**
Sand Pack: **19.51 - 23.16 m**

Stick Up: **0.68 m**
Northing: **4816948.56**
Easting: **568083.16**
Datum/Zone: **NAD83 17T**



Stratigraphic Description	Depth (m bgs)/ Elev. (m asl)	Sample ID	Sample Type	Blow Counts (N Value)	% Recovery
fine to medium SAND, some fine to coarse gravel, brown, poorly sorted, subangular to subrounded gravel, dry	0 / 349.95				
		5	CS	NA	NA
		10	CS	NA	NA
		15	CS	NA	NA
		20	CS	NA	NA
		25	CS	NA	NA
		30	CS	NA	NA
		35	CS	NA	NA
		40	CS	NA	NA
		45	CS	NA	NA
		50	CS	NA	NA
		55	CS	NA	NA
@18.90 m bgs: moist		60	CS	NA	NA
		65	CS	NA	NA
		70	CS	NA	NA
	23.16 / 326.78	75	CS	NA	NA
END OF BOREHOLE @ 23.16 m bgs					

Completion Details



NOTES:
0.00 to 19.81 m bgs logged from MW3-D
m asl = metres above sea level
m bgs = metres below ground surface
CS = cyclone sample

Matrix Solutions Inc.

DRILLING LOG

Clair - Maltby Subwatershed Study

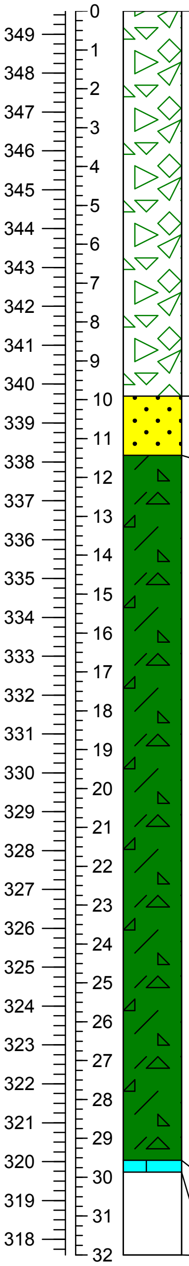
MW4-D

Client: **City of Guelph**
Project Area: **Clair - Maltby**
Project No.(MSI): **23089**
Field Staff: **D. Martin**
Driller: **Highland Water Well Drilling Inc**

Date: **August 22, 2016**
Ground Elevation: **349.60 masl**
Total Depth: **29.87 m**
Drill Rig: **Foremost DR-12**
Boring Diameter: **152 mm**

Screen Type: **52.5 mm PVC Sched. 40**
Screened Interval: **26.82 - 28.35 m**
Slot Size: **0.01"**
Casing Diameter: **52.5 mm**
Sand Pack: **26.00 - 29.08 m**

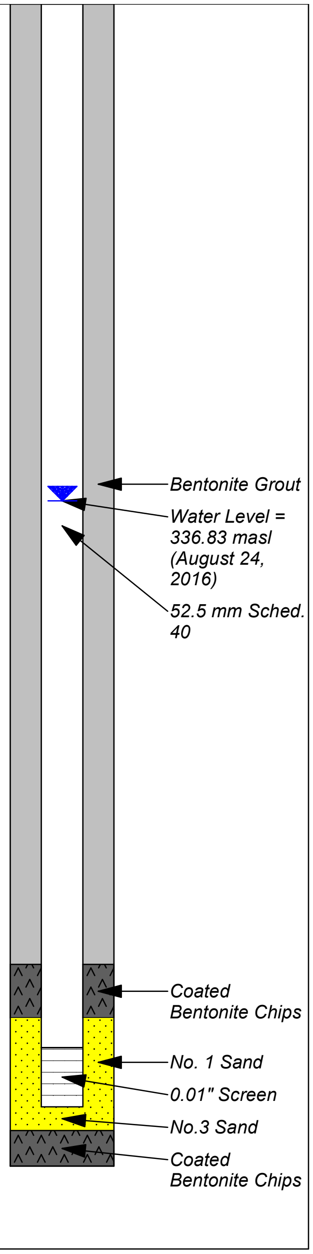
Stick Up: **0.76 m**
Northing: **4816485.40**
Easting: **566169.17**
Datum/Zone: **NAD83 17T**



Stratigraphic Description	Depth (m bgs)/ Elev. (m asl)
SILTY fine to coarse SAND, some fine to medium gravel, grey, poorly sorted, angular, damp (TILL) **@6.10 m bgs: cleaner SILTY SAND lense, trace fine gravel**	0 / 349.60
fine to coarse SAND, some fine gravel, trace silt, grey, poorly sorted, subrounded, damp	9.91 / 339.69
fine to course SANDY SILT to SILTY SAND, occasional layers of fine to medium gravel, grey, very poorly sorted, angular (possible TILL) **@13.72 m bgs: saturated** **@ 16.76 m bgs: lense of increased SILT content** **@ 22.86 m bgs: layer of fine GRAVELY coarse SAND, trace silt, poorly sorted** **@ 27.43 m bgs: layer of fine GRAVELY coarse SAND, trace silt, poorly sorted** **@ 28.96 m bgs: layer of fine GRAVELY coarse SAND, trace silt, poorly sorted**	11.43 / 338.17
PROBABLE BEDROCK	29.57 / 320.03
END OF BOREHOLE @ 29.87 m bgs	29.87 / 319.73

Sample ID	Sample Type	Blow Counts (N Value)	% Recovery
5	CS	NA	NA
10	CS	NA	NA
15	CS	NA	NA
20	CS	NA	NA
25	CS	NA	NA
30	CS	NA	NA
35	CS	NA	NA
40	CS	NA	NA
45	CS	NA	NA
50	CS	NA	NA
55	CS	NA	NA
60	CS	NA	NA
65	CS	NA	NA
70	CS	NA	NA
75	CS	NA	NA
80	CS	NA	NA
85	CS	NA	NA
90	CS	NA	NA
95	CS	NA	NA
97	CS	NA	NA

Completion Details



NOTES: **m asl = metres above sea level**
m bgs = metres below ground surface
CS = cyclone sample

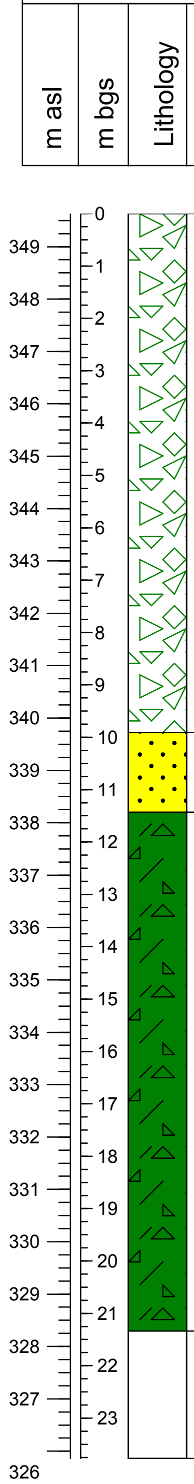
Matrix Solutions Inc.

DRILLING LOG

Clair - Maltby Subwatershed Study

MW4-S

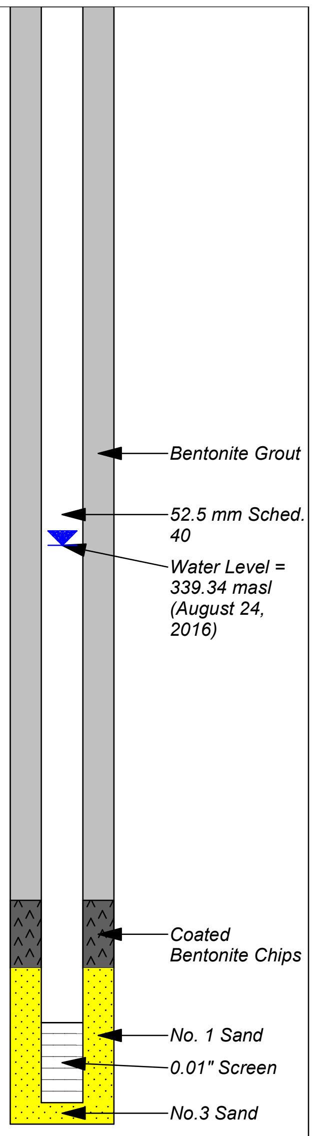
Client: **City of Guelph**	Date: **August 22 - 23, 2016**	Screen Type: **52.5 mm PVC Sched. 40**	Stick Up: **0.81 m**
Project Area: **Clair - Maltby**	Ground Elevation: **349.63 masl**	Screened Interval: **19.40 - 20.93 m**	Northing: **4816488.20**
Project No.(MSI): **23089**	Total Depth: **21.34 m**	Slot Size: **0.01"**	Easting: **566170.83**
Field Staff: **D. Martin**	Drill Rig: **Foremost DR-12**	Casing Diameter: **52.5 mm**	Datum/Zone: **NAD83 17T**
Driller: **Highland Water Well Drilling Inc**	Boring Diameter: **152 mm**	Sand Pack: **18.36 - 21.34 m**	



Stratigraphic Description	Depth (m bgs)/ Elev. (m asl)
SILTY fine to coarse SAND, some fine to medium gravel, grey, poorly sorted, angular, damp (TILL) **@6.10 m bgs: cleaner SILTY SAND lense, trace fine gravel**	0 / 349.63
fine to coarse SAND, some fine gravel, trace silt, grey, poorly sorted, subrounded, damp	9.91 / 339.73
fine to course SANDY SILT to SILTY SAND, occasional layers of fine to medium gravel, grey, very poorly sorted, angular, damp (possible TILL) **@13.72 m bgs: saturated** **@ 16.76 m bgs: lense of increased SILT content**	11.43 / 338.20
END OF BOREHOLE @ 21.34 m bgs	21.34 / 328.30

Sample ID	Sample Type	Blow Counts (N Value)	% Recovery
5	CS	NA	NA
10	CS	NA	NA
15	CS	NA	NA
20	CS	NA	NA
25	CS	NA	NA
30	CS	NA	NA
35	CS	NA	NA
40	CS	NA	NA
45	CS	NA	NA
50	CS	NA	NA
55	CS	NA	NA
60	CS	NA	NA
65	CS	NA	NA
70	CS	NA	NA

Completion Details



NOTES: **0.00 to 16.76 m bgs logged from MW4-D**
m asl = metres above sea level
m bgs = metres below ground surface
CS = cyclone sample

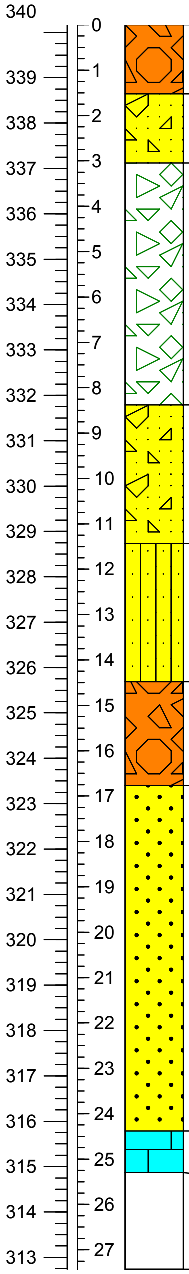
Matrix Solutions Inc.

DRILLING LOG

Clair - Maltby Subwatershed Study

MW5-D

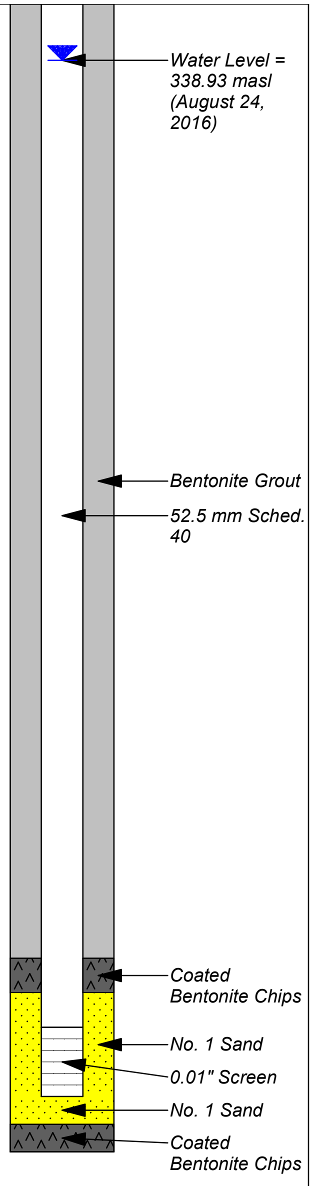
Client: **City of Guelph**	Date: **August 10 - 11, 2016**	Screen Type: **52.5 mm PVC Sched. 40**	Stick Up: **0.71 m**
Project Area: **Clair - Maltby**	Ground Elevation: **340.17 masl**	Screened Interval: **22.56 - 24.08 m**	Northing: **4816336.75**
Project No.(MSI): **23089**	Total Depth: **25.30 m**	Slot Size: **0.01"**	Easting: **567001.03**
Field Staff: **D. Martin**	Drill Rig: **Foremost DR-12**	Casing Diameter: **52.5 mm**	Datum/Zone: **NAD83 17T**
Driller: **Highland Water Well Drilling Inc**	Boring Diameter: **152 mm**	Sand Pack: **21.79 - 24.69 m**	



Stratigraphic Description	Depth (m bgs)/ Elev. (m asl)
fine clean GRAVEL, well sorted, angular to sub rounded, dry	0 / 340.17
medium to coarse SAND and fine to medium GRAVEL, brown, moderately well sorted, well rounded, dry	1.52 / 338.64
SILTY GRAVELY fine to coarse SAND, fine gravel, brown, poorly sorted, angular to subangular, saturated (TILL)	3.05 / 337.12
coarse SAND and fine GRAVEL, brown, moderately well sorted, well rounded, saturated	8.38 / 331.79
SILTY very coarse SAND, some fine gravel, grey, poorly sorted, angular, saturated	11.43 / 328.74
fine to very coarse GRAVEL up to COBBLES, some coarse sand, poorly sorted, subrounded	14.48 / 325.69
coarse SAND fining downwards to fine SAND, grey, well sorted, sub rounded, saturated **@22.86 m bgs: very trace SILT**	16.76 / 323.40
PROBABLE BEDROCK	24.38 / 315.78
END OF BOREHOLE @ 25.30 m bgs	25.30 / 314.87

Sample ID	Sample Type	Blow Counts (N Value)	% Recovery
5	CS	NA	NA
10	CS	NA	NA
15	CS	NA	NA
20	CS	NA	NA
25	CS	NA	NA
30	CS	NA	NA
35	CS	NA	NA
40	CS	NA	NA
45	CS	NA	NA
50	CS	NA	NA
55	CS	NA	NA
60	CS	NA	NA
65	CS	NA	NA
70	CS	NA	NA
75	CS	NA	NA
80	CS	NA	NA
83	CS	NA	NA

Completion Details



NOTES: m asl = metres above sea level
m bgs = metres below surface
CS = cyclone sample

Matrix Solutions Inc.

DRILLING LOG

Clair - Maltby Subwatershed Study

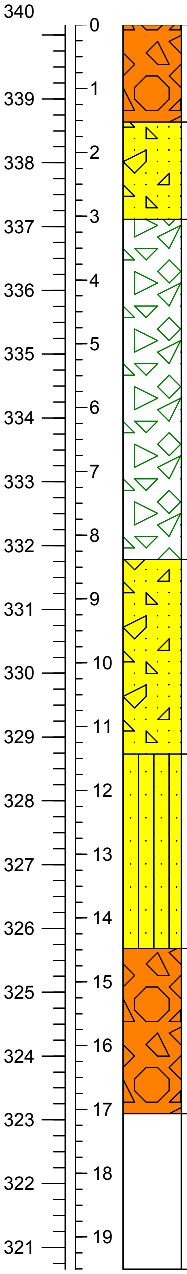
MW5-S

Client: **City of Guelph**
Project Area: **Clair - Maltby**
Project No.(MSI): **23089**
Field Staff: **D. Martin**
Driller: **Highland Water Well Drilling Inc**

Date: **August 11, 2016**
Ground Elevation: **340.16 masl**
Total Depth: **17.07 m**
Drill Rig: **Foremost DR-12**
Boring Diameter: **152 mm**

Screen Type: **52.5 mm PVC Sched. 40**
Screened Interval: **15.24 - 16.76 m**
Slot Size: **0.01"**
Casing Diameter: **52.5 mm**
Sand Pack: **13.72 - 16.76 m**

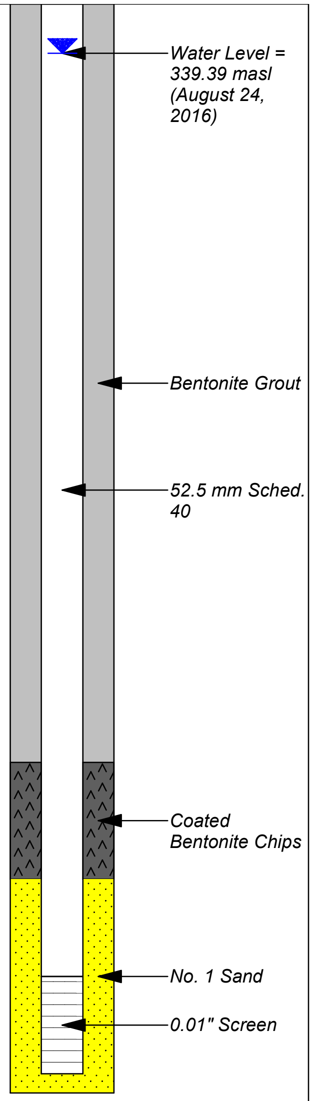
Stick Up: **0.76 m**
Northing: **4816334.91**
Easting: **566998.56**
Datum/Zone: **NAD83 17T**



Stratigraphic Description	Depth (m bgs)/ Elev. (m asl)
fine GRAVEL, well sorted, angular to sub rounded, dry	0 / 340.16
medium to coarse SAND and fine to medium GRAVEL, brown, moderately well sorted, well rounded, dry	1.52 / 338.64
SILTY GRAVELY fine to coarse SAND, fine gravel, brown, poorly sorted, angular to subangular, saturated (TILL)	3.05 / 337.12
coarse SAND and fine GRAVEL, brown, moderately well sorted, well rounded, saturated	8.38 / 331.78
SILTY very coarse SAND, some fine gravel, grey, poorly sorted, angular, saturated	11.43 / 328.73
fine to very coarse GRAVEL up to COBBLES, some coarse sand, fine to very coarse gravel, poorly sorted, subrounded	14.48 / 325.69
END OF BOREHOLE @ 17.07 m bgs	17.07 / 323.09

Sample ID	Sample Type	Blow Counts (N Value)	% Recovery
5	CS	NA	NA
10	CS	NA	NA
15	CS	NA	NA
20	CS	NA	NA
25	CS	NA	NA
30	CS	NA	NA
35	CS	NA	NA
40	CS	NA	NA
45	CS	NA	NA
50	CS	NA	NA
55	CS	NA	NA

Completion Details



NOTES: **0.00 to 10.67 m bgs logged from MW5-D**
m asl = metres above sea level
m bgs = metres below ground surface
CS = cyclone sample

Matrix Solutions Inc.

DRILLING LOG

Clair - Maltby Subwatershed Study

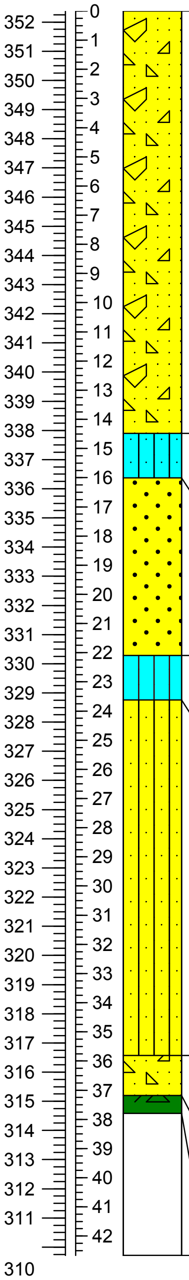
MW6-D

Client: **City of Guelph**
Project Area: **Clair - Maltby**
Project No.(MSI): **23089**
Field Staff: **D. Martin**
Driller: **Highland Water Well Drilling Inc**

Date: **August 15, 2016**
Ground Elevation: **352.38 masl**
Total Depth: **38.10 m**
Drill Rig: **Foremost DR-12**
Boring Diameter: **152 mm**

Screen Type: **52.5 mm PVC Sched. 40**
Screened Interval: **35.05 - 36.58 m**
Slot Size: **0.01"**
Casing Diameter: **52.5 mm**
Sand Pack: **34.32 - 36.88 m**

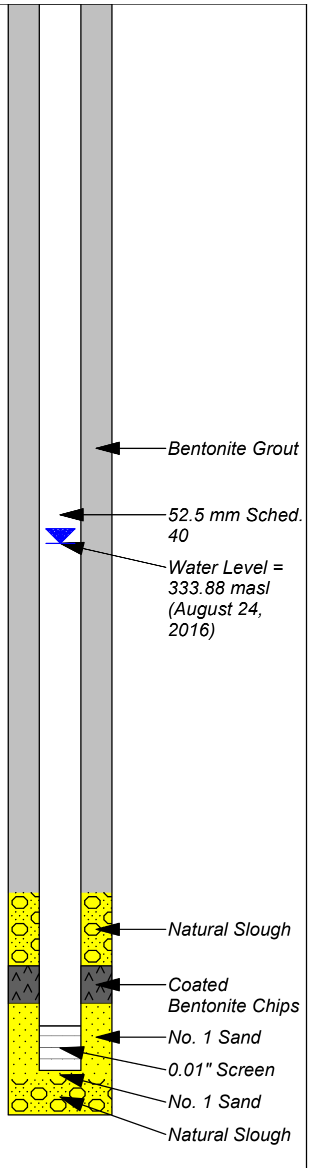
Stick Up: **0.79 m**
Northing: **4816249.90**
Easting: **567400.42**
Datum/Zone: **NAD83 17T**



Stratigraphic Description	Depth (m bgs)/ Elev. (m asl)
GRAVELY SAND, fine to coarse sand, fine to medium gravel, brown, poorly sorted, subangular to subrounded, dry to damp **@ 9.91 to 12.95 m bgs: GRAVEL, some fine to coarse SAND**	0 / 352.38
fine to very coarse SANDY SILT to SILTY SAND, brown, poorly sorted, angular to subangular, damp	14.48 / 337.90
fine to medium SAND coarsening downwards to a GRAVELY SAND, angular to subrounded, damp @18.29 m bgs: saturated	16.00 / 336.38
SILT, trace clay, trace coarse sand, grey, poorly sorted, saturated	22.10 / 330.28
SILTY fine to medium SAND, fining downwards, brown, poorly sorted, saturated, very loose	23.62 / 328.76
GRAVELY SAND (fine to medium gravel, fine to coarse sand), trace silt, grey, poorly sorted, saturated	35.81 / 316.57
SILTY CLAY, some fine GRAVEL, grey, poorly sorted, angular to subangular, saturated (TILL)	37.19 / 315.19
END OF BOREHOLE @ 37.80 m bgs	37.80 / 314.58

Sample ID	Sample Type	Blow Counts (N Value)	% Recovery
5	CS		
10	CS		
15	CS		
20	CS		
25	CS		
30	CS		
35	CS		
40	CS		
45	CS		
50	CS		
55	CS		
60	CS		
65	CS		
70	CS		
75	CS		
80	CS		
85	CS		
90	CS		
95	CS		
100	CS		
105	CS		
110	CS		
115	CS		
120	CS		
124	CS		

Completion Details



NOTES: **m asl = metres above sea level**
m bgs = metres below ground surface
CS = cyclone sample

Matrix Solutions Inc.

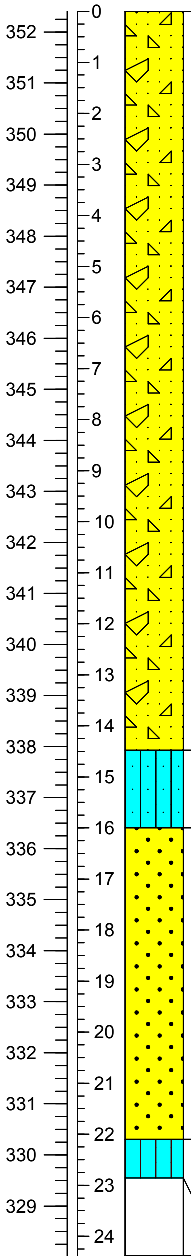
DRILLING LOG | Clair - Maltby Subwatershed Study | MW6-S

Client: **City of Guelph**
Project Area: **Clair - Maltby**
Project No.(MSI): **23089**
Field Staff: **D. Martin**
Driller: **Highland Water Well Drilling Inc**

Date: **August 16-17, 2016**
Ground Elevation: **352.41 masl**
Total Depth: **23.17 m**
Drill Rig: **Foremost DR-12**
Boring Diameter: **152 mm**

Screen Type: **52.5 mm PVC Sched. 40**
Screened Interval: **21.39 - 22.91 m**
Slot Size: **0.01"**
Casing Diameter: **52.5 mm**
Sand Pack: **20.27 - 23.16 m**

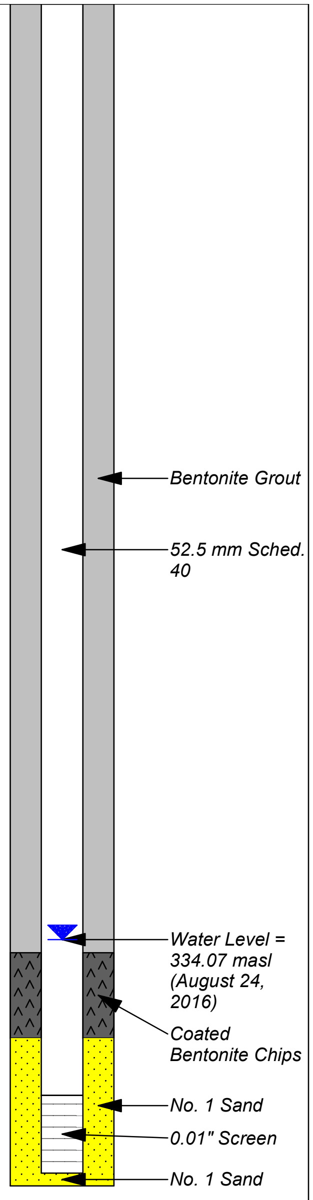
Stick Up: **0.79 m**
Northing: **4816246.66**
Easting: **567401.07**
Datum/Zone: **NAD83 17T**



Depth (m bgs)/ Elev. (m asl)	Stratigraphic Description
0 / 352.41	**GRAVELY SAND, fine to coarse sand, fine to medium gravel, brown, poorly sorted, subangular to subrounded, dry to damp** **@ 9.91 to 12.95 m bgs: GRAVEL, some fine to coarse SAND**
14.48 / 337.93	**fine to very coarse SANDY SILT to SILTY SAND, brown, poorly sorted, angular to subangular, damp**
16.00 / 336.40	**fine to medium SAND coarsening downwards to a poorly sorted GRAVELY SAND, angular to subrounded, damp** **@18.29 m bgs: saturated**
22.10 / 330.31	**SILT, trace clay, trace coarse sand, grey, poorly sorted, saturated**
22.86 / 329.55	**END OF BOREHOLE @ 22.86 m bgs**

Sample ID	Sample Type	Blow Counts (N Value)	% Recovery
5	CS		
10	CS		
15	CS		
20	CS		
25	CS		
30	CS		
35	CS		
40	CS		
45	CS		
50	CS		
55	CS		
60	CS		
65	CS		
70	CS		
75	CS		

Completion Details



NOTES: **0.00 to 15.24 m bgs logged from MW6-D**
m asl = metres above sea level
m bgs = metres below ground surface
CS = cyclone sample

Matrix Solutions Inc.

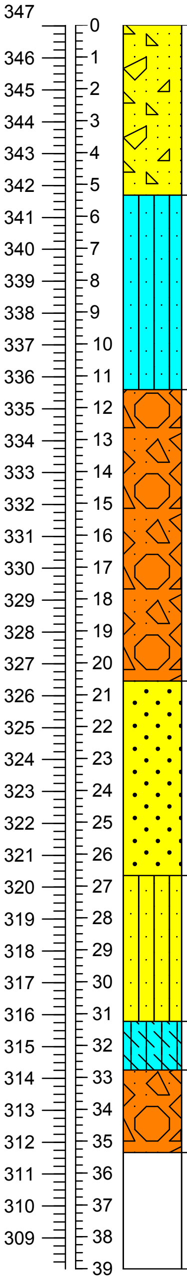
DRILLING LOG | Clair - Maltby Subwatershed Study | MW7-D

Client: **City of Guelph**
Project Area: **Clair - Maltby**
Project No.(MSI): **23089**
Field Staff: **D. Martin**
Driller: **Highland Water Well Drilling Inc**

Date: **August 23, 2016**
Ground Elevation: **347.04 masl**
Total Depth: **35.46 m**
Drill Rig: **Foremost DR-12**
Boring Diameter: **152 mm**

Screen Type: **52.5 mm PVC Sched. 40**
Screened Interval: **33.07 - 34.59 m**
Slot Size: **0.01"**
Casing Diameter: **52.5 mm**
Sand Pack: **32.16 - 34.82 m**

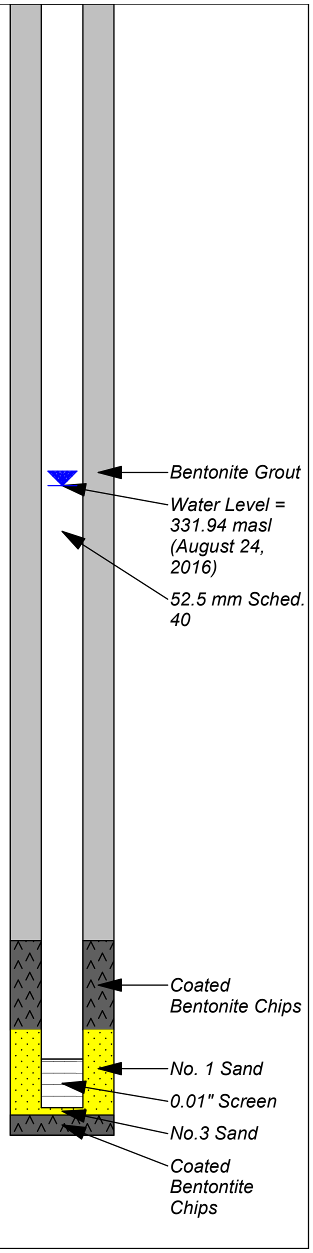
Stick Up: **0.76 m**
Northing: **4815512.35**
Easting: **565478.72**
Datum/Zone: **NAD83 17T**



Stratigraphic Description	Depth (m bgs)/ Elev. (m asl)
GRAVELY SAND (fine to medium gravel, medium to coarse sand), brown, poorly sorted, subrounded, dry	0 / 347.04
SILT, trace clay coarsening downwards to SANDY SILT, trace fine gravel, brown, angular, dry	5.33 / 341.70
SANDY GRAVEL, medium to coarse sand, fine to medium gravel, brown, poorly sorted, angular to subangular, moist	11.43 / 335.61
medium to coarse SAND fining downwards, grey, well sorted, saturated	20.57 / 326.46
SANDY SILT to SILTY SAND fining downwards to SILT, grey, well sorted, saturated	26.67 / 320.37
CLAYEY SILT, grey, moderately well sorted, saturated	31.24 / 315.79
SANDY GRAVEL, fine gravel, fine to coarse sand, grey, poorly sorted, angular to subangular, saturated	32.77 / 314.27
END OF BOREHOLE @ 35.36 m bgs	35.36 / 311.68

Sample ID	Sample Type	Blow Counts (N Value)	% Recovery
5	CS		
10	CS		
15	CS		
20	CS		
25	CS		
30	CS		
35	CS		
40	CS		
45	CS		
50	CS		
55	CS		
60	CS		
65	CS		
70	CS		
75	CS		
80	CS		
85	CS		
90	CS		
95	CS		
100	CS		
105	CS		
110	CS		
115	CS		

Completion Details



NOTES:
m asl = metres above sea level
m bgs = metres below ground surface
CS = cyclone sample

Matrix Solutions Inc.

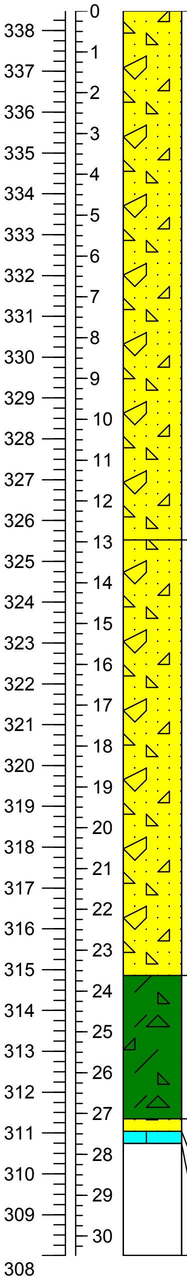
DRILLING LOG | Clair - Maltby Subwatershed Study | MW8-D

Client: **City of Guelph**
Project Area: **Clair - Maltby**
Project No.(MSI): **23089**
Field Staff: **D. Martin/J. Melchin**
Driller: **Highland Water Well Drilling Inc.**

Date: **August 9, 2016**
Ground Elevation: **338.48 masl**
Total Depth: **27.74 m**
Drill Rig: **Foremost DR-12**
Boring Diameter: **152 mm**

Screen Type: **52.5 mm PVC Sched. 40**
Screened Interval: **17.68 - 19.20 m**
Slot Size: **0.01"**
Casing Diameter: **52.5 mm**
Sand Pack: **16.15 - 19.81 m**

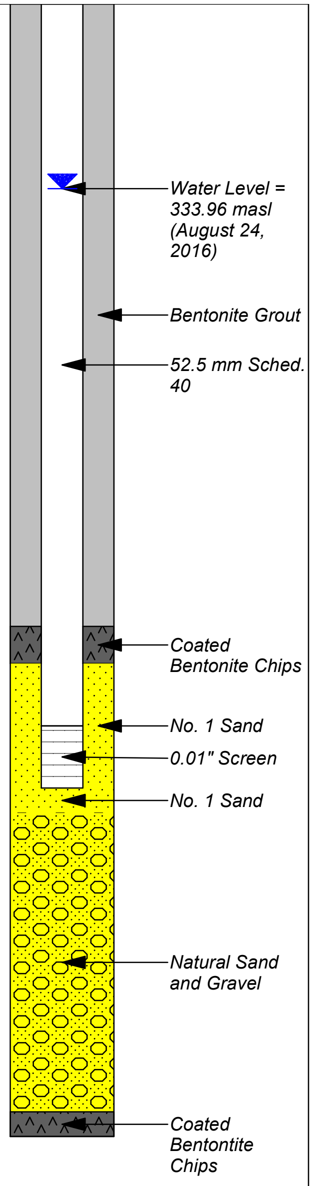
Stick Up: **0.87 m**
Northing: **4815489.34**
Easting: **566248.11**
Datum/Zone: **NAD83 17T**



Stratigraphic Description	Depth (m bgs)/ Elev. (m asl)
fine to coarse SAND and fine to medium GRAVEL, trace silt, brown, poorly sorted, angular to sub-rounded, damp to moist **@4.57 m bgs: saturated**	0 / 338.48
very coarse SAND and fine GRAVEL, slight coarsening downwards to medium coarse gravel, grey, moderately well sorted, saturated	12.95 / 325.52
SILTY CLAY, some fine to coarse sand, some fine to medium gravel, grey, very poorly sorted, angular, saturated (TILL)	23.62 / 314.86
SAND and fine GRAVEL, poorly sorted, subrounded	27.13 / 311.35
PROBABLE BEDROCK	27.43 / 311.05
END OF BOREHOLE @ 27.74 m bgs	27.74 / 310.74

Sample ID	Sample Type	Blow Counts (N Value)	% Recovery
5	CS		
10	CS		
15	CS		
20	CS		
25	CS		
30	CS		
35	CS		
40	CS		
45	CS		
50	CS		
55	CS		
60	CS		
65	CS		
70	CS		
75	CS		
80	CS		
85	CS		
90	CS		

Completion Details



NOTES: **m asl = metres above sea level**
m bgs = metres below ground surface
CS = cyclone sample

Matrix Solutions Inc.

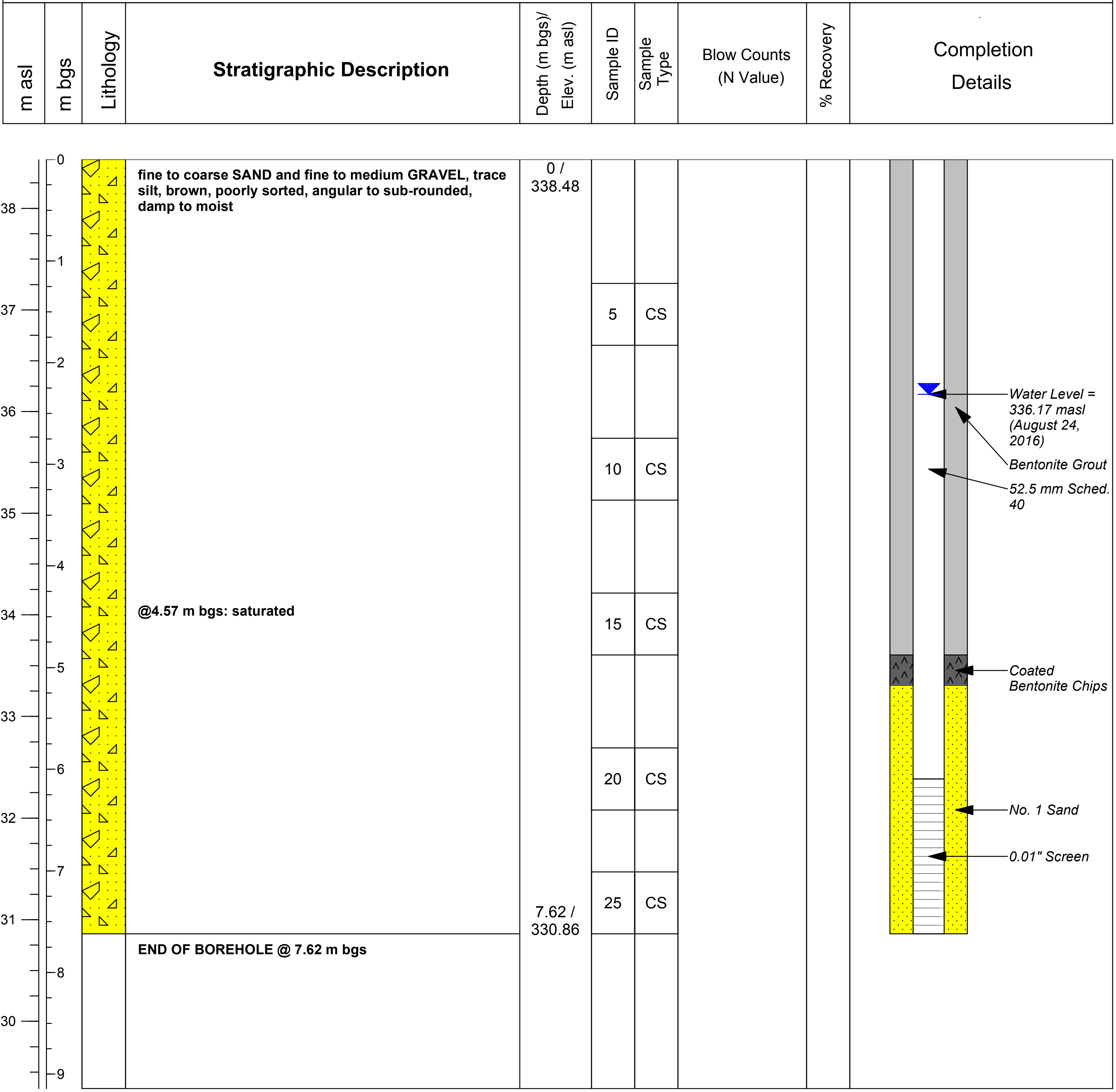
DRILLING LOG	Clair - Maltby Subwatershed Study	MW8-S

Client: **City of Guelph**
Project Area: **Clair - Maltby**
Project No.(MSI): **23089**
Field Staff: **D. Martin**
Driller: **Highland Water Well Drilling Inc**

Date: **August 10, 2016**
Ground Elevation: **338.48 masl**
Total Depth: **7.62 m**
Drill Rig: **Foremost DR-12**
Boring Diameter: **152 mm**

Screen Type: **52.5 mm PVC Sched. 40**
Screened Interval: **6.10 - 7.62 m**
Slot Size: **0.01"**
Casing Diameter: **52.5 mm**
Sand Pack: **5.18 - 7.62 m**

Stick Up: **0.84 m**
Northing: **4815493.95**
Easting: **566250.11**
Datum/Zone: **NAD83 17T**



Stratigraphic Description	Depth (m bgs)/ Elev. (m asl)	Sample ID	Sample Type	Blow Counts (N Value)	% Recovery	Completion Details
fine to coarse SAND and fine to medium GRAVEL, trace silt, brown, poorly sorted, angular to sub-rounded, damp to moist	0 / 338.48					
		5	CS			
		10	CS			
@4.57 m bgs: saturated		15	CS			
		20	CS			
	7.62 / 330.86	25	CS			
END OF BOREHOLE @ 7.62 m bgs						

NOTES: **0.00 to 6.10 m bgs logged from MW8-D**
m asl = metres above sea level
m bgs = metres below ground surface
CS = cyclone sample

Matrix Solutions Inc.

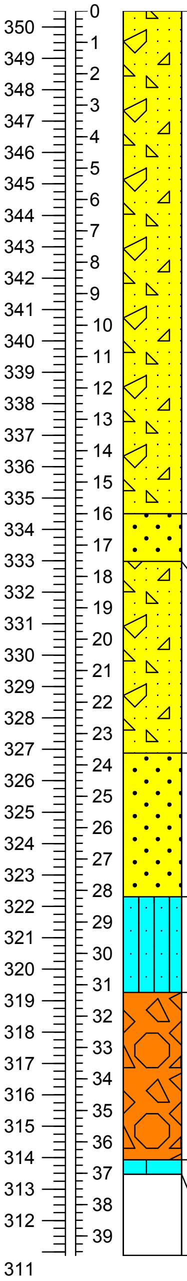
DRILLING LOG | Clair - Maltby Subwatershed Study | MW9-D

Client: **City of Guelph**
Project Area: **Clair - Maltby**
Project No.(MSI): **23089**
Field Staff: **S. Miller/J. Melchin**
Driller: **Highland Water Well Drilling Inc**

Date: **August 4, 2016**
Ground Elevation: **350.51 masl**
Total Depth: **37.03 m**
Drill Rig: **Foremost DR-12**
Boring Diameter: **152 mm**

Screen Type: **52.5 mm PVC Sched. 40**
Screened Interval: **32.00 - 33.53 m**
Slot Size: **0.01"**
Casing Diameter: **52.5 mm**
Sand Pack: **29.26 - 36.58 m**

Stick Up: **0.55 m**
Northing: **4815294.75**
Easting: **566970.16**
Datum/Zone: **NAD83 17T**



Stratigraphic Description	Depth (m bgs)/ Elev. (m asl)
GRAVELY SAND (fine gravel, medium to coarse sand) coarsening with depth, brown, moderately well sorted, subrounded to rounded, dry **@1.52 m bgs: some silt, trace clay** **@ 15.24 m bgs: trace silt**	0 / 350.51
fine to medium SAND, brown, moderately well sorted, dry	16.00 / 334.50
medium to coarse SAND and fine GRAVEL, brown, moderately well sorted, subrounded to rounded, saturated	17.53 / 332.98
medium to very coarse SAND, trace fine gravel, fining slightly with depth, brown, subrounded, saturated	23.62 / 326.88
very fine SANDY SILT, fining downwards to silt, grey, well sorted, saturated	28.19 / 322.31
fine to medium GRAVEL, trace to some coarse sand, grey, subangular to subrounded, saturated	31.24 / 319.26
PROBABLE BEDROCK	36.58 / 313.93
END OF BOREHOLE @ 37.03 m bgs	37.03 / 313.47

Sample ID	Sample Type	Blow Counts (N Value)	% Recovery
5	CS		
10	CS		
15	CS		
20	CS		
25	CS		
30	CS		
35	CS		
40	CS		
45	CS		
50	CS		
55	CS		
60	CS		
65	CS		
70	CS		
75	CS		
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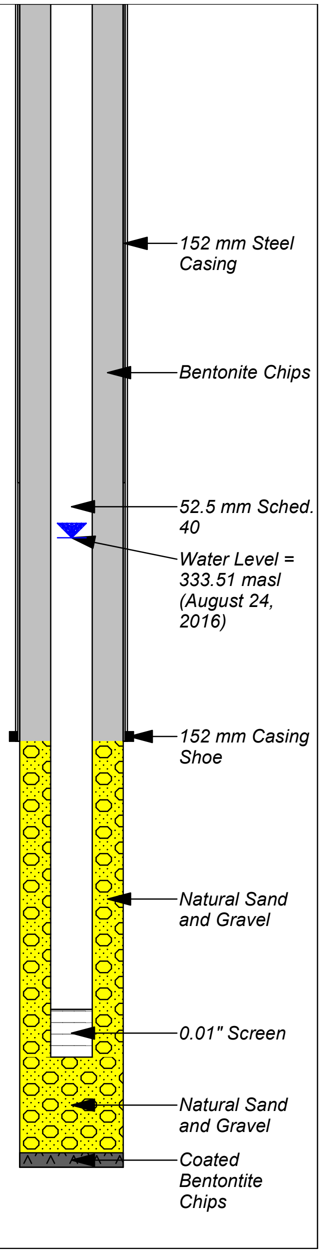
90	CS		
95	CS		
100	CS		
105	CS		
110	CS		
115	CS		
120	CS		

Completion Details



NOTES:
m asl = metres above sea level
m bgs = metres below ground surface
CS = cyclone sample

Matrix Solutions Inc.

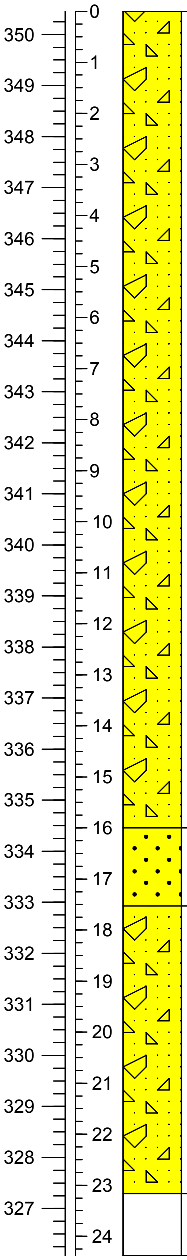
DRILLING LOG	Clair - Maltby Subwatershed Study	MW9-S

Client: **City of Guelph**
Project Area: **Clair - Maltby**
Project No.(MSI): **23089**
Field Staff: **S.Miller/J. Melchin**
Driller: **Highland Water Well Drilling Inc**

Date: **August 8, 2016**
Ground Elevation: **350.46 masl**
Total Depth: **23.16 m**
Drill Rig: **Foremost DR-12**
Boring Diameter: **152 mm**

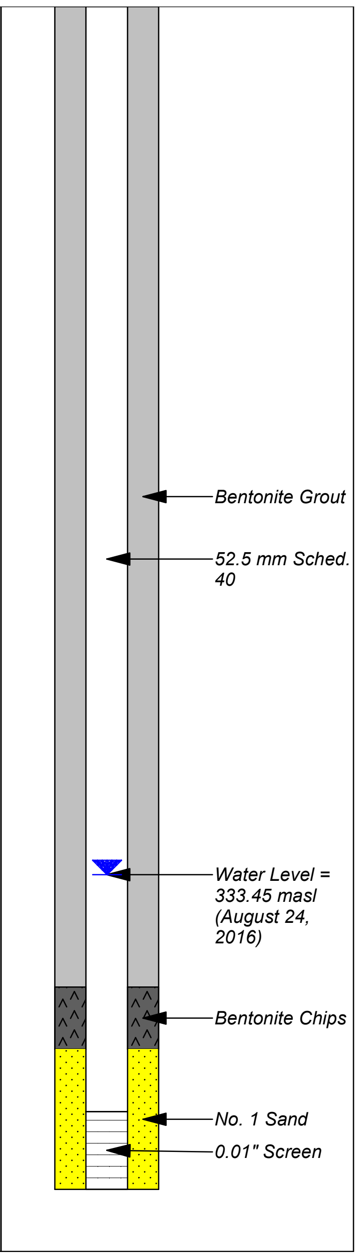
Screen Type: **52.5 mm PVC Sched. 40**
Screened Interval: **21.64 - 23.16 m**
Slot Size: **0.01"**
Casing Diameter: **52.5 mm**
Sand Pack: **20.42 - 23.16 m**

Stick Up: **0.46 m**
Northing: **4815292.49**
Easting: **566972.15**
Datum/Zone: **NAD83 17T**



Stratigraphic Description	Depth (m bgs)/ Elev. (m asl)	Sample ID	Sample Type	Blow Counts (N Value)	% Recovery
GRAVELY SAND, fine gravel, medium to coarse sand coarsening with depth, brown, subrounded to rounded, dry **@1.52 m bgs: some silt, trace clay**	0 / 350.46				
		5	CS		
		10	CS		
		15	CS		
		20	CS		
		25	CS		
		30	CS		
		35	CS		
		40	CS		
		45	CS		
@ 15.24 m bgs: trace silt		50	CS		
fine to medium SAND, brown, moderately well sorted, dry	16.00 / 334.45	55	CS		
medium to coarse SAND and fine GRAVEL, brown, subrounded to rounded, saturated	17.53 / 332.93	60	CS		
		65	CS		
		70	CS		
		75	CS		
END OF BOREHOLE @ 23.16 m bgs	23.16 / 327.29				

Completion Details



NOTES:	**0.00 to 18.29 m bgs logged from MW9-D** **m asl = metres above sea level** **m bgs = metres below ground surface** **CS = cyclone sample**

Matrix Solutions Inc.

Aquafor Beech Limited
920 Princess St.
Kingston, Ontario
K7L 1H1

Log of Borehole: MW-1

Project No.: 65188

Project: Neumann Property EIS

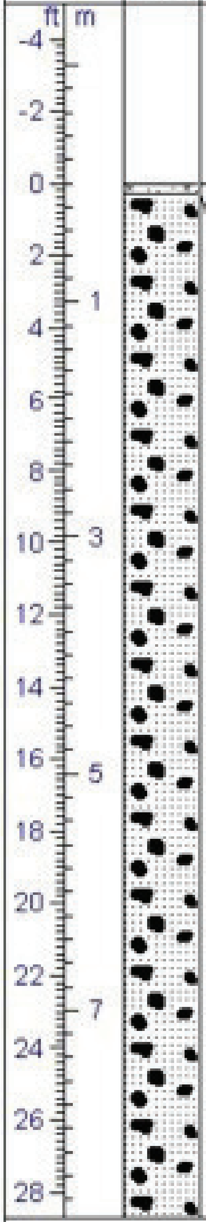
Client: Neumann Group

Enclosure: 1

Location: Guelph, ON

Project Manager: Barry Gorman

SUBSURFACE PROFILE

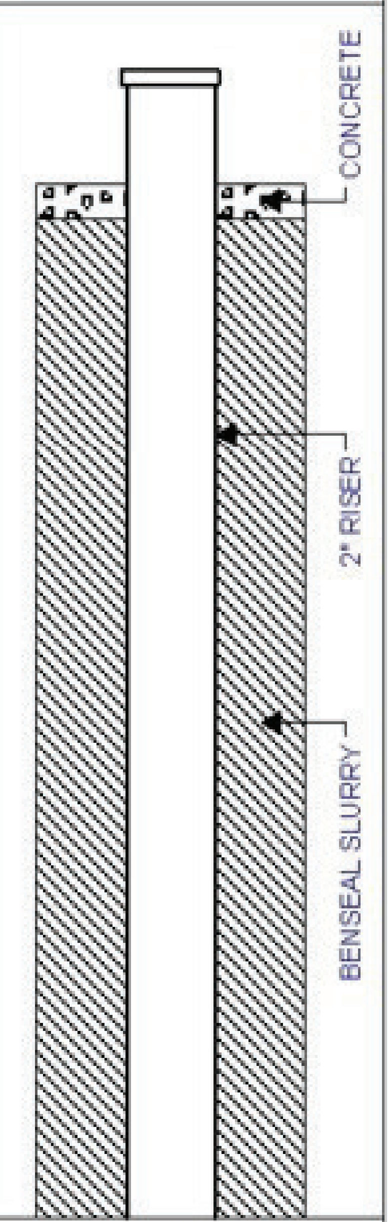


Description	Depth/Elev.
Ground Surface	346.2 0.0
Topsoil brown silty sand loam	
Silty sand ,gravel, trace clay	
grinding on boulder - moisture 7% Sand 49%, silt 41%, clay 11% light brown, cobbles, dry	
Sand 45%, silt 48%, clay 7%	
moist, cobbles - moisture 8.4%	
coarse sand with cobbles	

SAMPLE

Number	Type	'N' Blows/ft.
1		16
2		10
3		30
4		23
5		36
6		35
7		33

Well Completion Details



Drilled By: Aardvark Drilling Inc.

Hole Size: 210 mm

Drill Method: Hollow-stem auger

Datum:

Drill Date: Nov. 14, 2011

Sheet: 1 of 2

Aquafor Beech Limited
920 Princess St.
Kingston, Ontario
K7L 1H1

Log of Borehole: MW-1

Project No.: 65188

Project: Neumann Property EIS

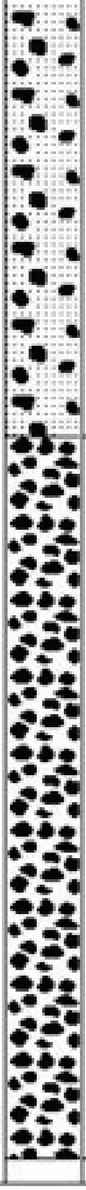
Client: Neumann Group

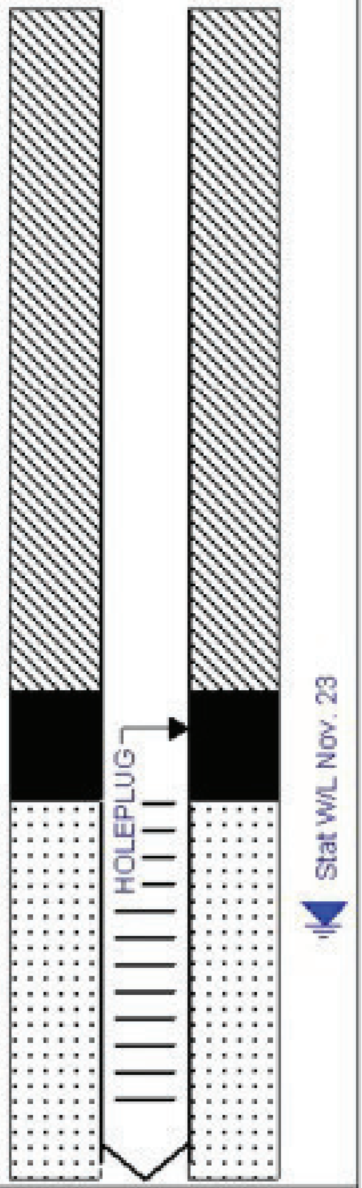
Enclosure: 1

Location: Guelph, ON

Project Manager: Barry Gorman

SUBSURFACE PROFILE			SAMPLE		
Depth	Description	Depth/Elev.	Number	Type	'N' Blows/ft.
30	Sand 50%, silt41%, clay 9%		8	‖	64
32 (10 m)	moisture 7.3%				
36	reddish tint		9	‖	28
40 (12 m)	*Gravel and sand*	306.2 40.0	10	‖	24
42	Gravel 57%, sand 26%, silt and clay 17%, moisture 4%				
46 (14 m)			11	‖	78
50	Gravel 55%, sand 30%, silt and clay 15%		12	‖	86
52 (16 m)	some Precambrian pebbles - moisture 3.4%				
56	wet		13	‖	65
60 (18 m)		286.2 60.0			





Drilled By: Aardvark Drilling Inc.

Drill Method: Hollow-stem auger

Drill Date: Nov. 14, 2011

Hole Size: 210 mm

Datum:

Sheet: 2 of 2

Aquafor Beech Limited
920 Princess St.
Kingston, Ontario
K7L 1H1

Log of Borehole: MW-2

Project No.: 65188

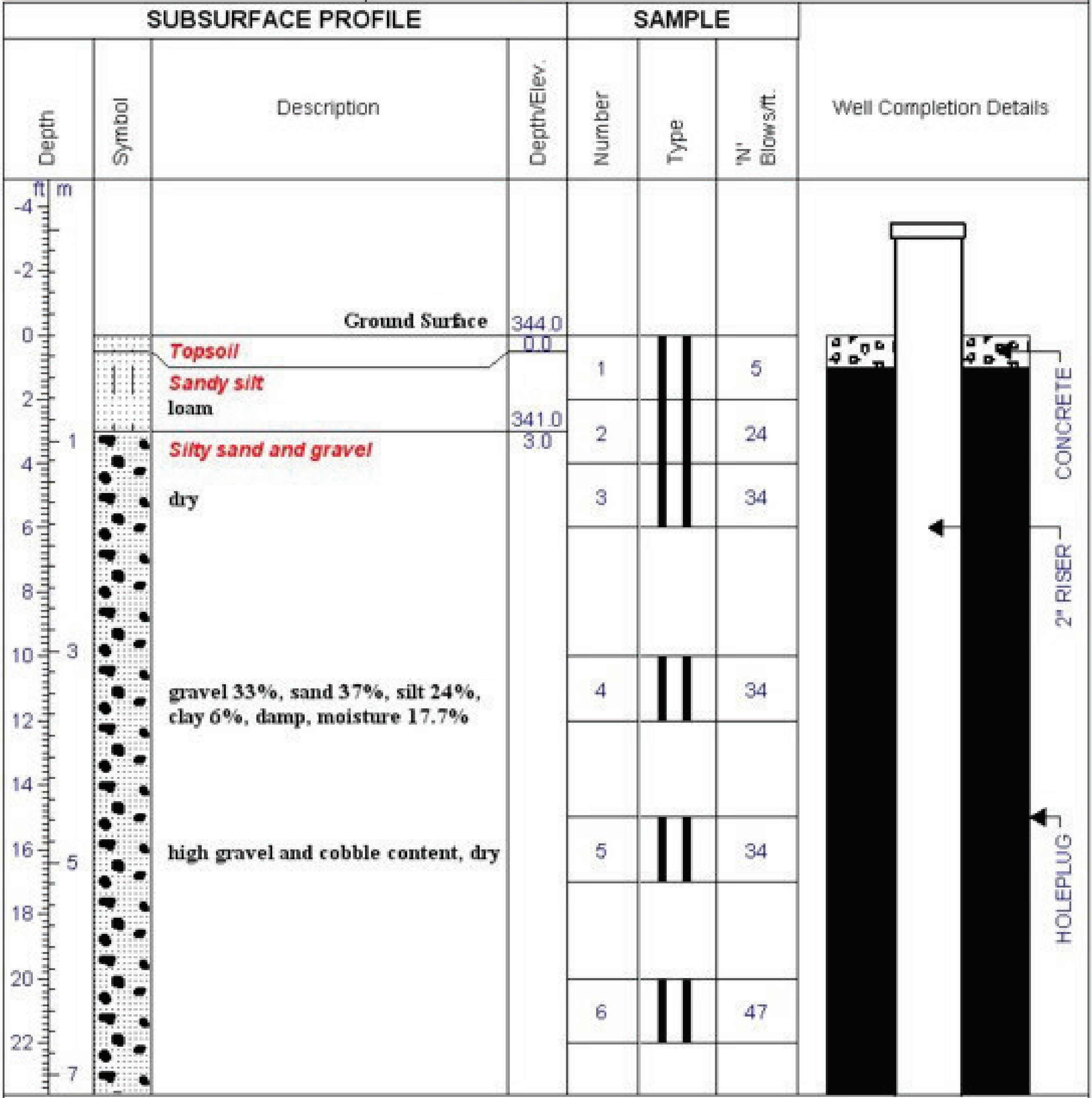
Project: Neumann Property EIS

Client: Neumann Group

Enclosure: 2

Location: Guelph, ON

Project Manager: Barry Gorman



Description	Depth/Elev.
Ground Surface	344.0 0.0
Topsoil	
Sandy silt loam	
Silty sand and gravel dry gravel 33%, sand 37%, silt 24%, clay 6%, damp, moisture 17.7% high gravel and cobble content, dry	341.0 3.0

Number	'N' Blows/ft.
1	5
2	24
3	34
4	34
5	34
6	47

Drilled By: Aardvark Drilling Inc.

Hole Size: 210 mm

Drill Method: Hollow-stem auger

Datum:

Drill Date: Nov. 23-24, 2011

Sheet: 1 of 2

Aquafor Beech Limited
920 Princess St.
Kingston, Ontario
K7L 1H1

Log of Borehole: MW-2

Project No.: 65188

Project: Neumann Property EIS

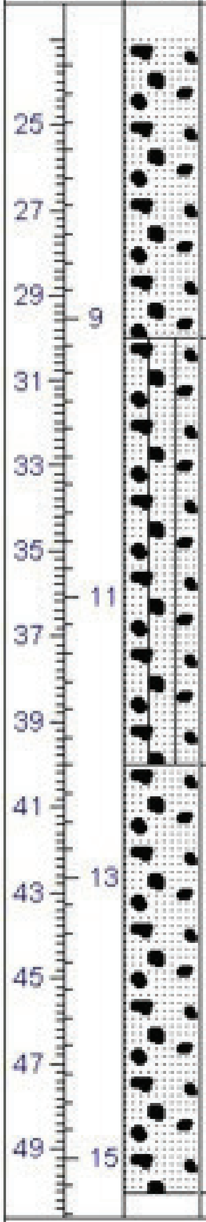
Client: Neumann Group

Enclosure: 2

Location: Guelph, ON

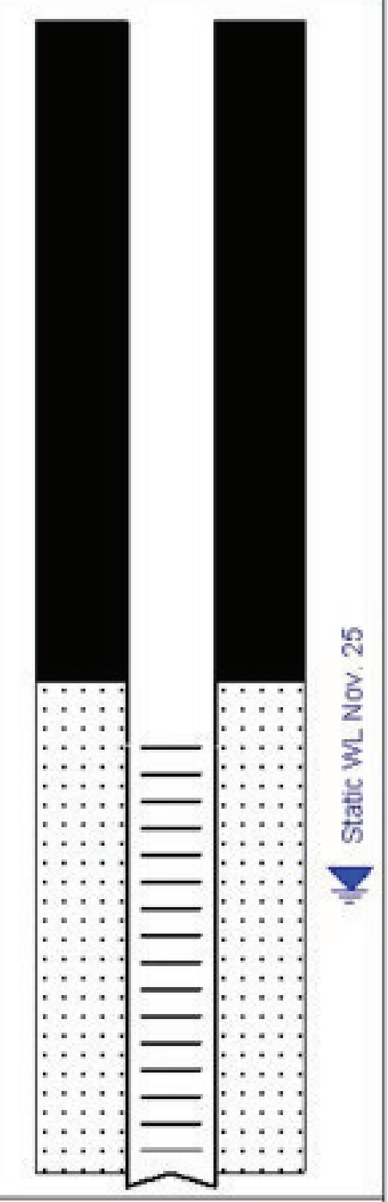
Project Manager: Barry Gorman

SUBSURFACE PROFILE



Description	Depth/Elev.	Number	Type	'N' Blows/ft.
damp	314.0	7	‖	48
Silt with gravel gravel 16%, sand 16%m silt 24%, clay 6%, moisture 6.7%	30.0	8	‖	61
cobbles	304.0	9	‖	100+
Sand and gravel sand and gravel, dry	40.0	10	‖	69
coarse grey sand 45-46, wet		11	‖	72
grinding on cobbles	294.0			
	50.0			

Well Completion Details



Drilled By: Aardvark Drilling Inc.

Drill Method: Hollow-stem auger

Drill Date: Nov. 23-24, 2011

Hole Size: 210 mm

Datum:

Sheet: 2 of 2

Aquafor Beech Limited
920 Princess St
Kingston, Ontario
K7L 1H1

Log of Borehole: MW-3

Project No.: 65188

Project: Neumann Property EIS

Client: Neumann Group

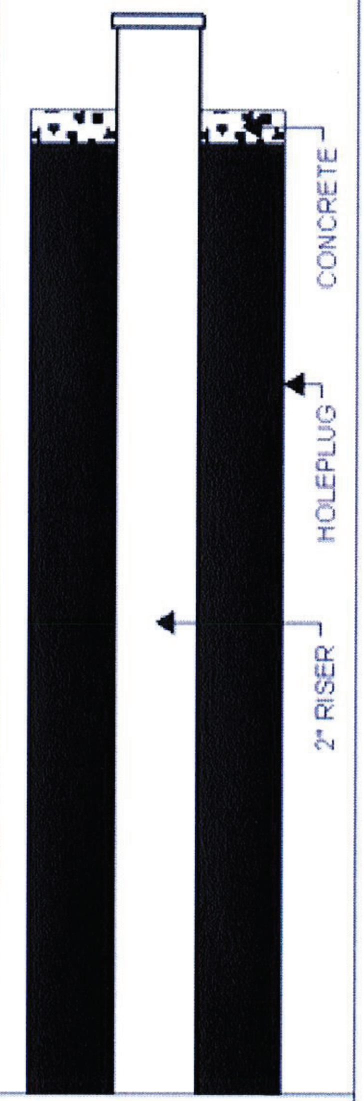
Enclosure: 3

Location: Guelph, ON

Project Manager: Barry Gorman

SUBSURFACE PROFILE				SAMPLE		
Depth ft m	Symbol	Description	Depth/Elev	Number	Type	'N' Blows/ft.
0		Ground Surface	349.0 0.0			
		Topsoil		1		3
2		*Coarse Sand with silt*				
4				2		5
6		light brown		3		5
10		grinding on cobbles	337.0	4		15
12		*Silt and clay with gravel*	12.0			
14		gravel 7%, sand 8%, silt 50%, clay 35%, moisture 8.0%				
16		grinding on boulder		5		63
20			329.0			
20		*Gravel with silt and clay* still dry grinding on boulders and cobbles	20.0	6		100+

Well Completion Details



Drilled By: Aardvark Drilling Inc.

Drill Method: Hollow-stem auger

Drill Date: Nov. 24, 2011

Hole Size: 210 mm

Datum:

Sheet: 1 of 2

Aquafor Beech Limited
920 Princess St
Kingston, Ontario
K7L 1H1

Log of Borehole: MW-3

Project No.: 65188

Project: Neumann Property EIS

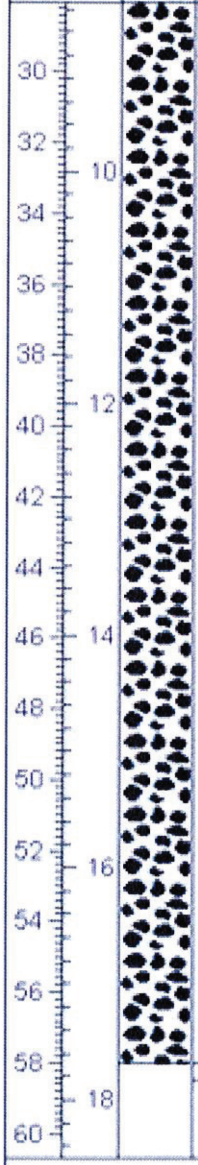
Client: Neumann Group

Location: Guelph, ON

Enclosure: 3

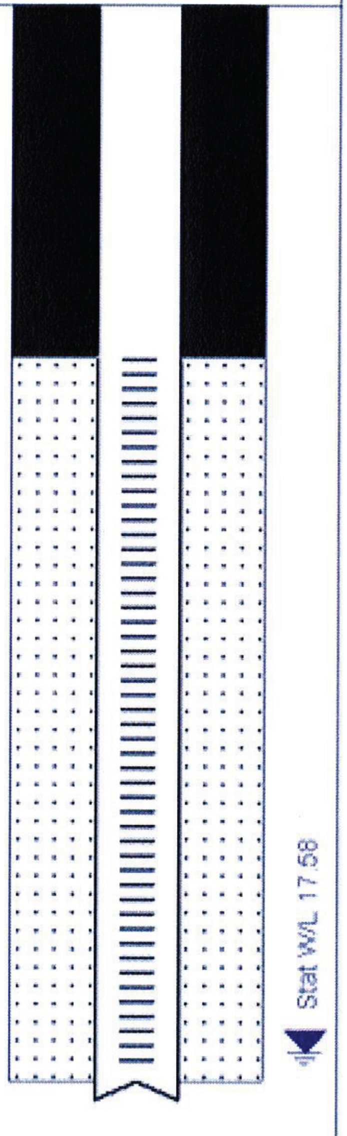
Project Manager: Barry Gorman

SUBSURFACE PROFILE



Description	Depth/Elev	Number	Type	'N' Blows/ft.
brown, still dry		7	‖	40
cobbles and boulders				
		8	‖	56
gravel 40%, sand 31%, silt 16%, clay 13%, moisture 3%				
red & grey shale fragments, wet				
same, still wet		9	‖	82
cobbles, spoon wet		10	‖	100+
gravel 43%, sand 11%, silt 22%, clay 24%, moisture 6.3%				
boulders and cobbles to TD		11	‖	100+
	290.5 58.5			

Well Completion Details



Drilled By: Aardvark Drilling Inc.

Drill Method: Hollow-stem auger

Drill Date: Nov 24, 2011

Hole Size: 210 mm

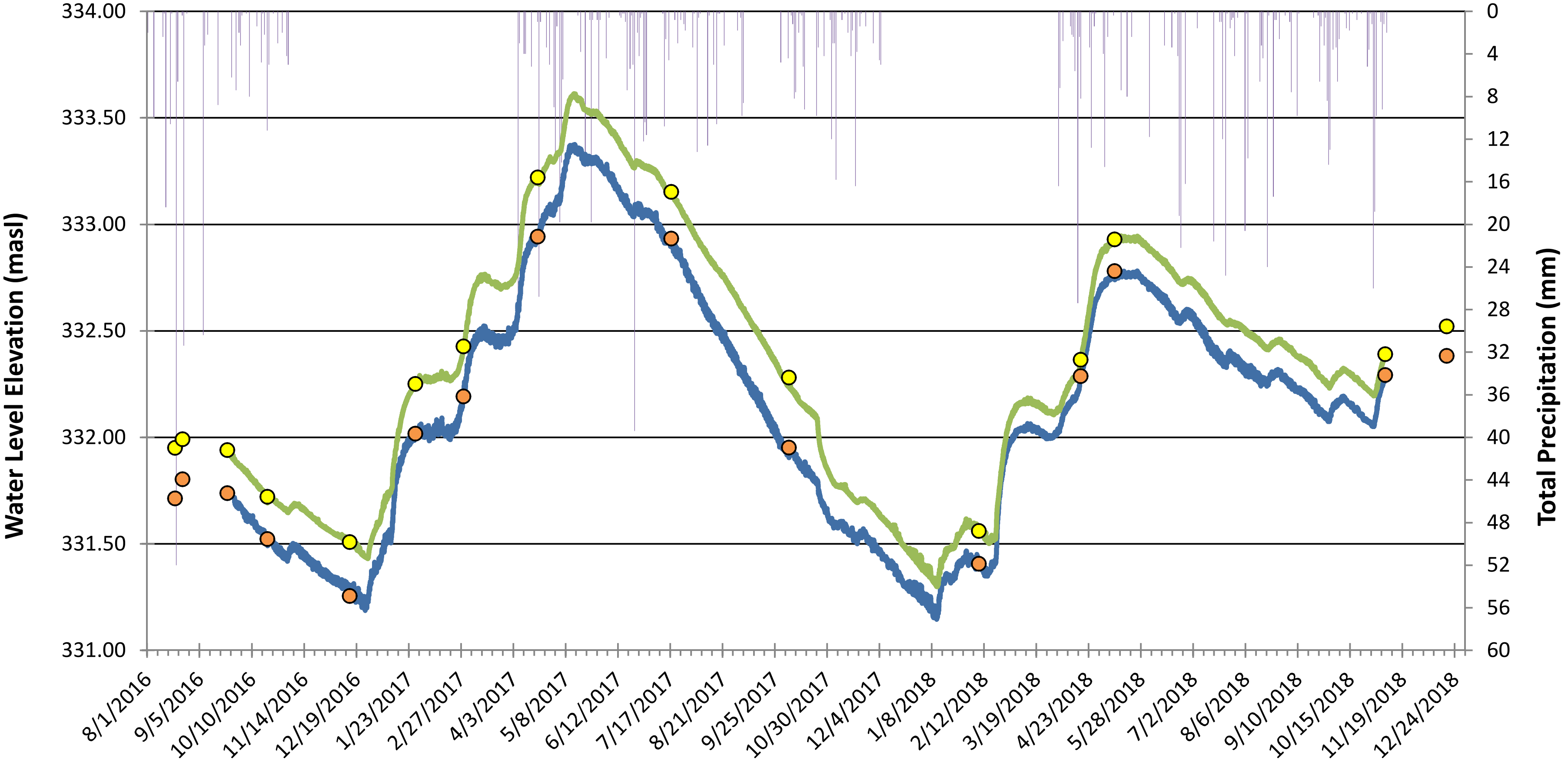
Datum:

Sheet: 2 of 2

Appendix GW-3

Monitoring Well Hydrographs

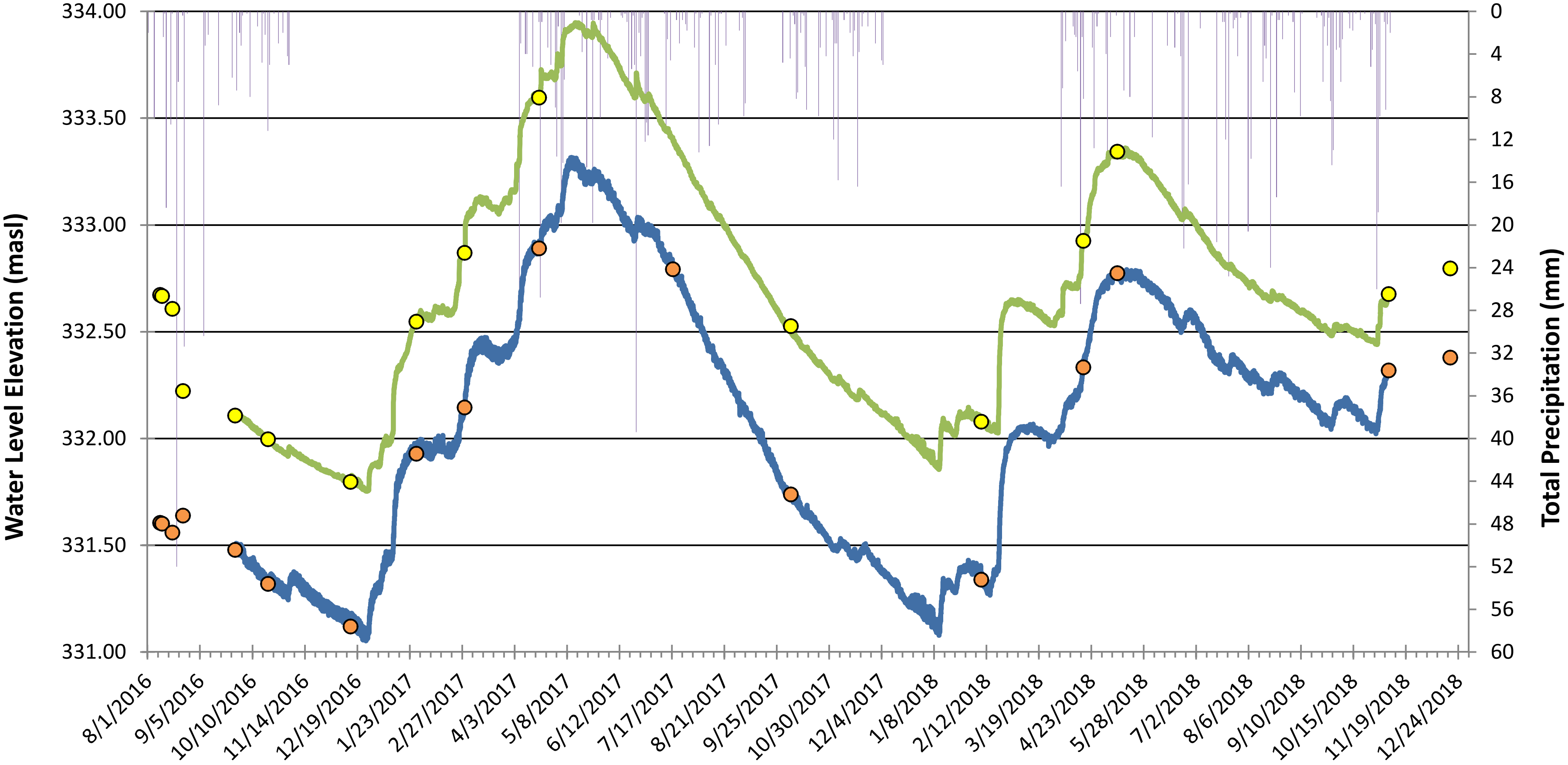
Clair-Maltby Secondary Plan
Long Term Groundwater Level Monitoring
MW1-D & MW1-S



Well ID	Ground Surface Elevation (masl)	Top of Casing Elevation (masl)	Elevation of Top of Screen (masl)	Elevation of Bottom of Screen (masl)
MW01-S	337.20	337.71	325.31	323.79
MW01-D	337.27	337.85	318.52	317.00

Precipitation - AFW: Data set from rain gauge installed by AMEC Foster-Wheeler at 500 Maltby Rd. E.

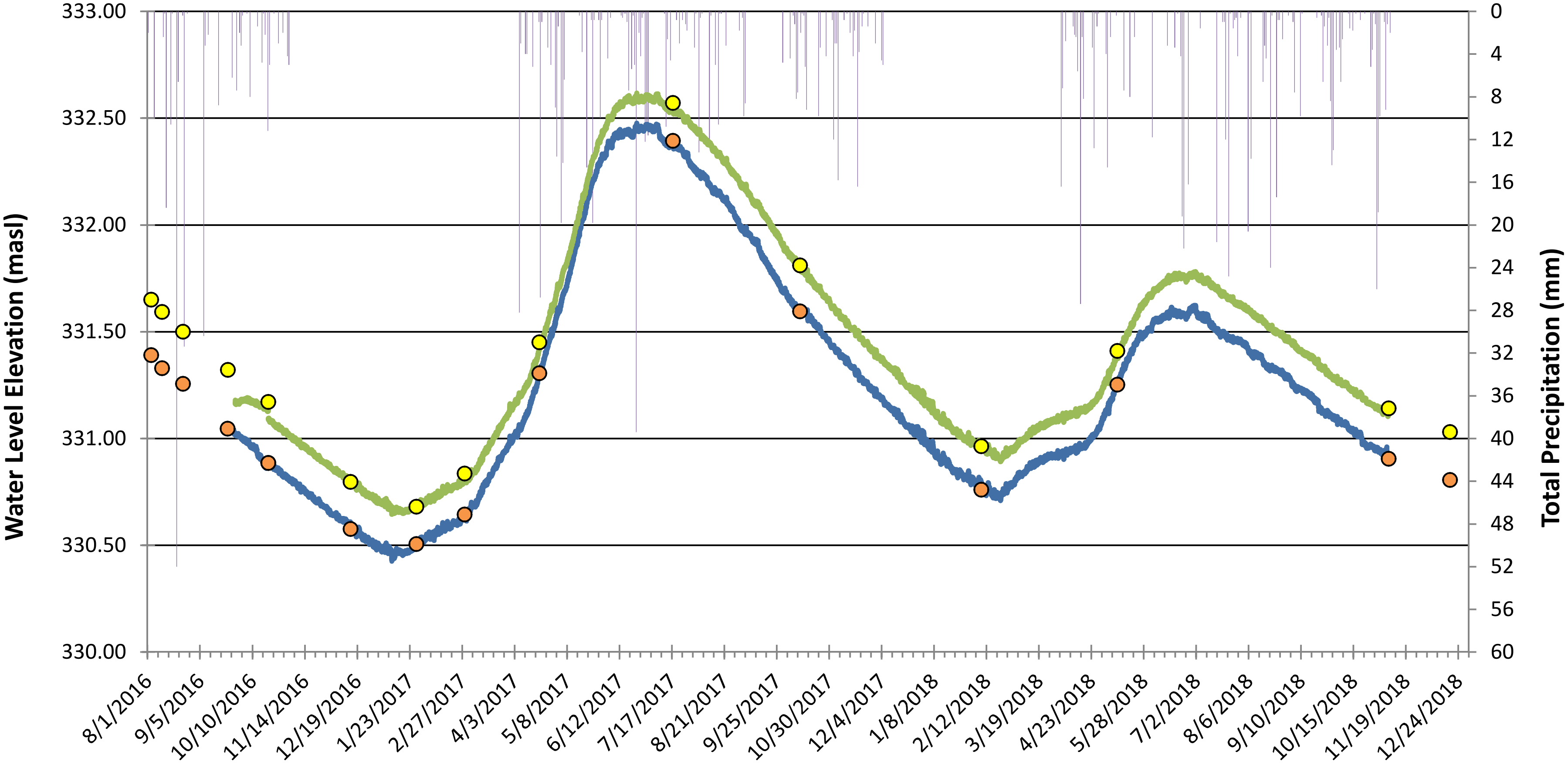
Clair-Maltby Secondary Plan
Long Term Groundwater Level Monitoring
MW2-D & MW2-S



Well ID	Ground Surface Elevation (masl)	Top of Casing Elevation (masl)	Elevation of Top of Screen (masl)	Elevation of Bottom of Screen (masl)
MW02-S	335.40	336.36	328.69	327.17
MW02-D	335.29	336.11	316.09	314.56

Precipitation - AFW: Data set from rain gauge installed by AMEC Foster-Wheeler at 500 Maltby Rd. E.

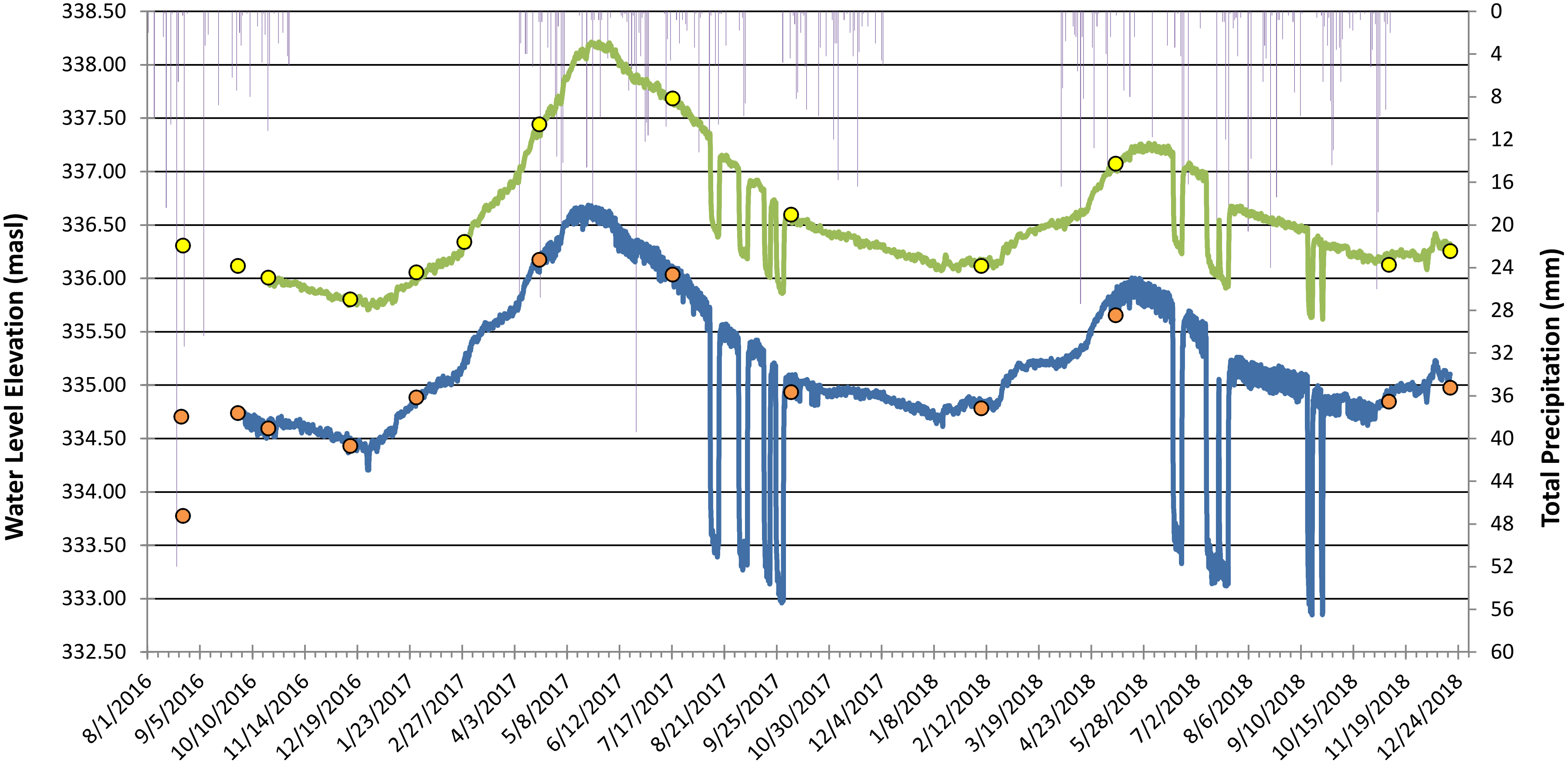
Clair-Maltby Secondary Plan
Long Term Groundwater Level Monitoring
MW3-D & MW3-S



Well ID	Ground Surface Elevation (masl)	Top of Casing Elevation (masl)	Elevation of Top of Screen (masl)	Elevation of Bottom of Screen (masl)
MW03-S	349.95	350.70	328.31	326.79
MW03-D	350.05	350.80	317.44	315.91

Precipitation - AFW: Data set from rain gauge installed by AMEC Foster-Wheeler at 500 Maltby Rd. E.

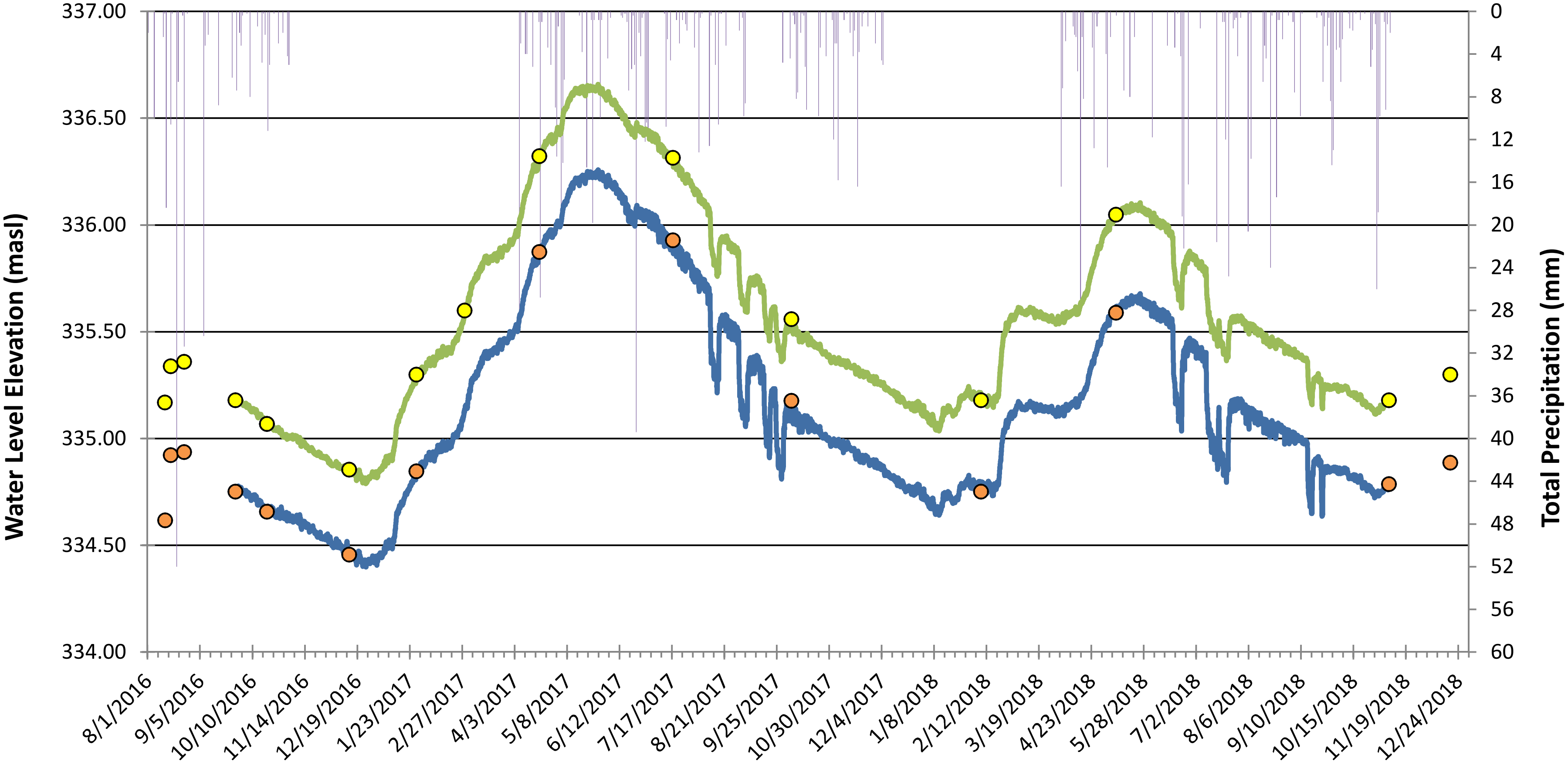
Clair-Maltby Secondary Plan
Long Term Groundwater Level Monitoring
MW4-D & MW4-S



Well ID	Ground Surface Elevation (masl)	Top of Casing Elevation (masl)	Elevation of Top of Screen (masl)	Elevation of Bottom of Screen (masl)
MW04-S	349.63	350.54	330.23	328.70
MW04-D	349.60	350.47	322.78	321.25

Precipitation - AFW: Data set from rain gauge installed by AMEC Foster-Wheeler at 500 Maltby Rd. E.

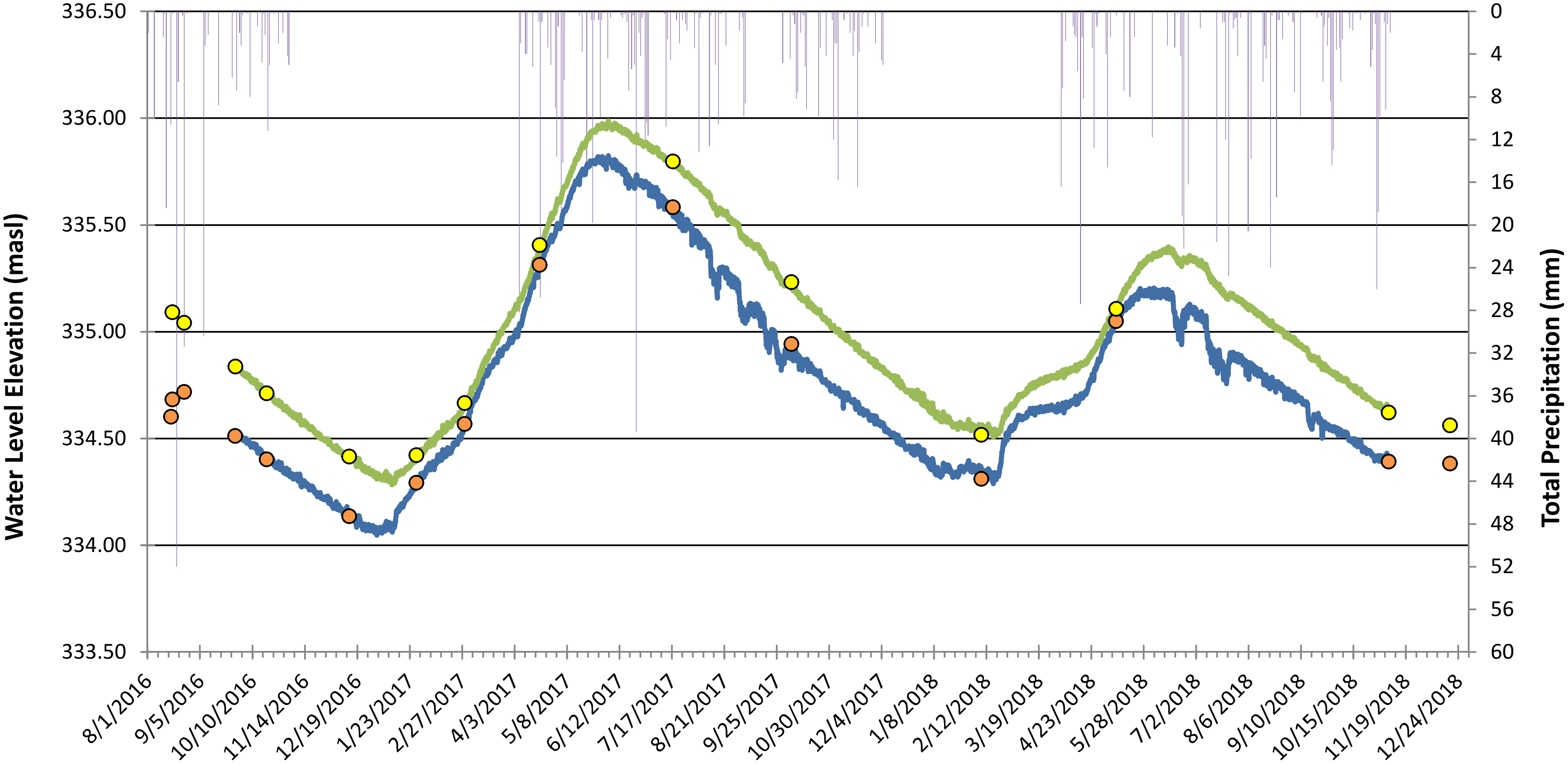
Clair-Maltby Secondary Plan
Long Term Groundwater Level Monitoring
MW5-D & MW5-S



Well ID	Ground Surface Elevation (masl)	Top of Casing Elevation (masl)	Elevation of Top of Screen (masl)	Elevation of Bottom of Screen (masl)
MW05-S	340.16	341.11	324.92	323.40
MW05-D	340.17	341.10	317.61	316.09

Precipitation - AFW: Data set from rain gauge installed by AMEC Foster-Wheeler at 500 Maltby Rd. E.

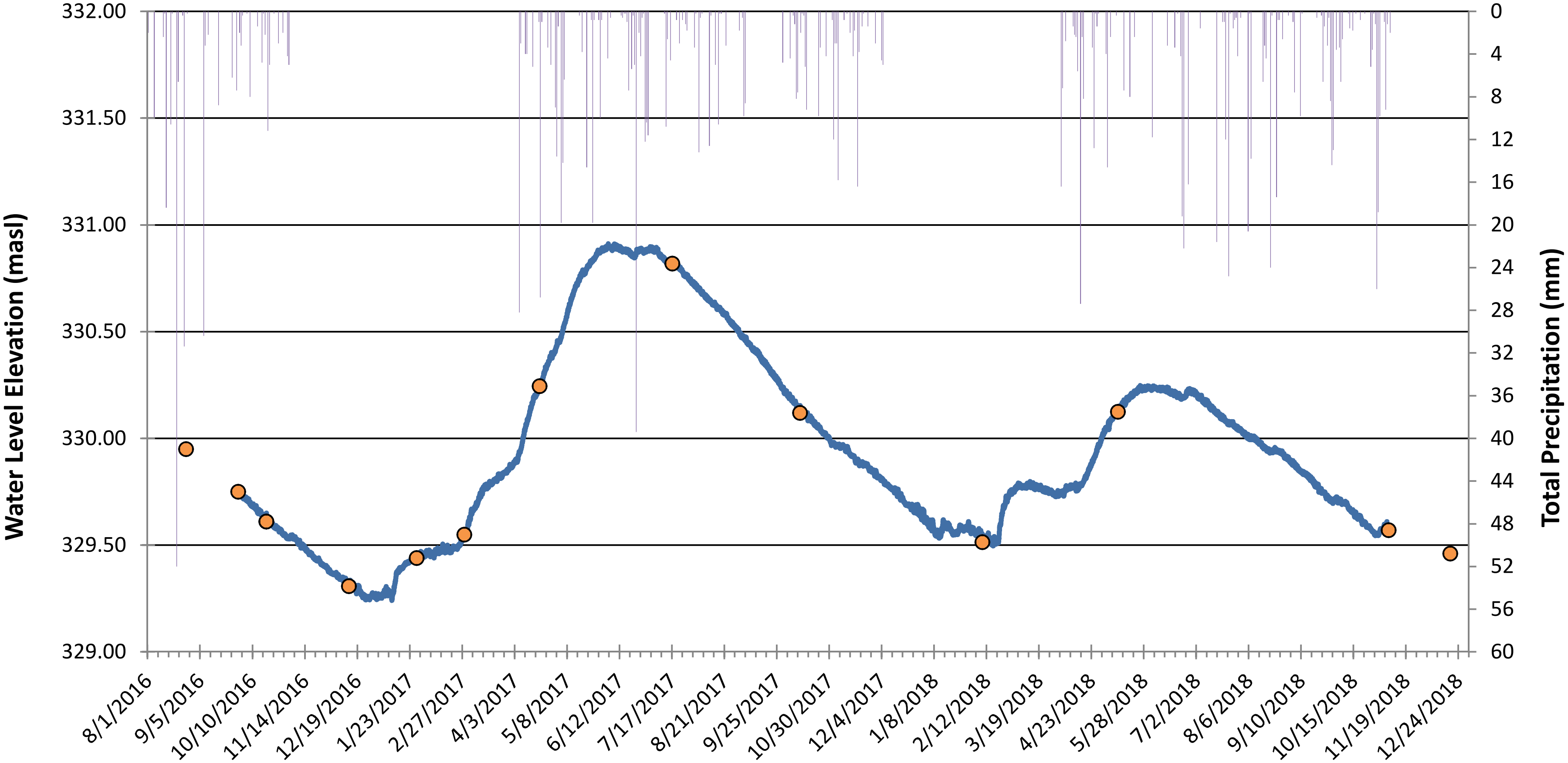
Clair-Maltby Secondary Plan
Long Term Groundwater Level Monitoring
MW6-D & MW6-S



Well ID	Ground Surface Elevation (masl)	Top of Casing Elevation (masl)	Elevation of Top of Screen (masl)	Elevation of Bottom of Screen (masl)
MW06-S	352.41	353.34	331.02	329.50
MW06-D	352.38	353.20	317.33	315.80

Precipitation - AFW: Data set from rain gauge installed by AMEC Foster-Wheeler at 500 Maltby Rd. E.

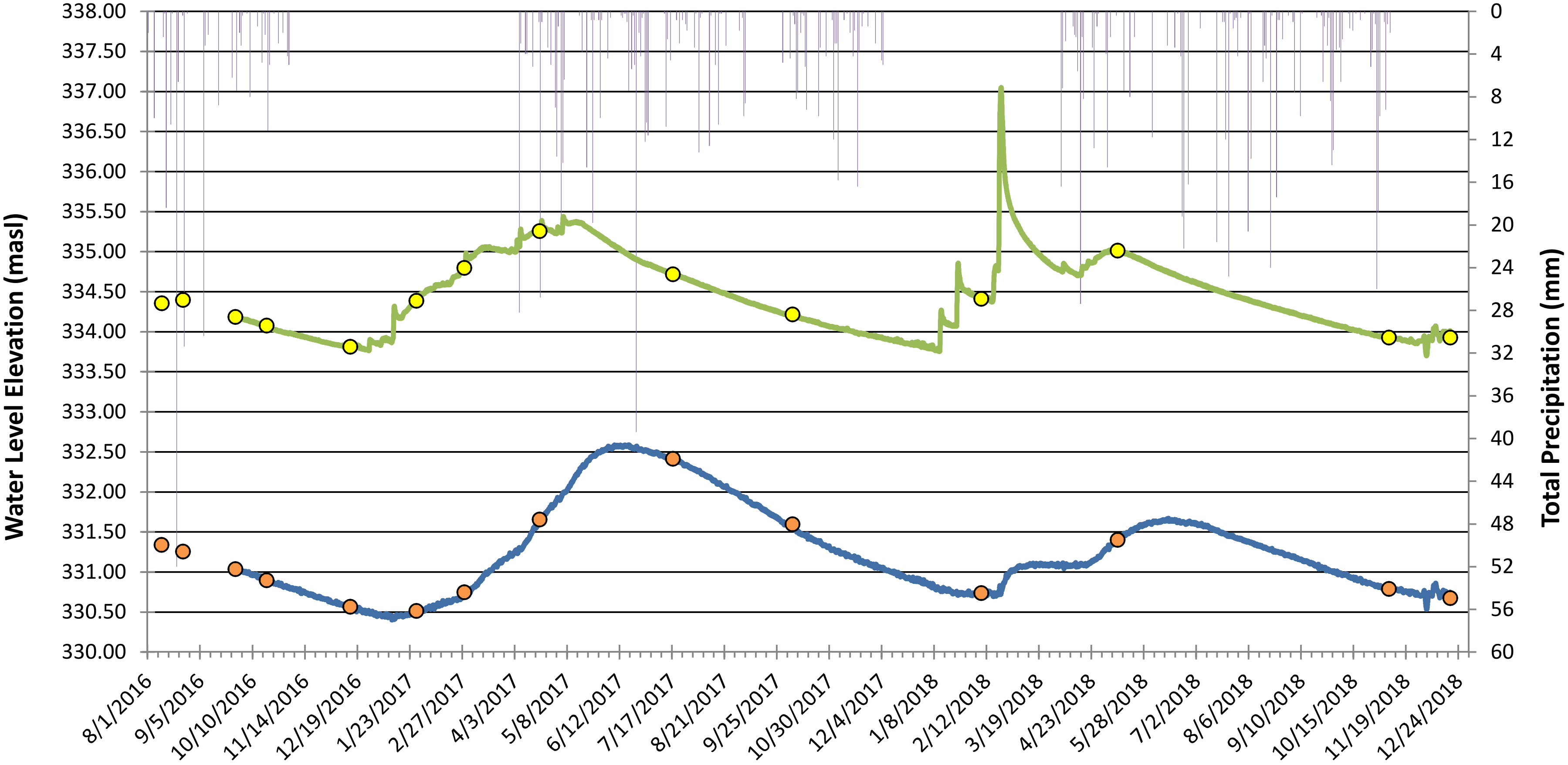
Clair-Maltby Secondary Plan
Long Term Groundwater Level Monitoring
MW7-D



Well ID	Ground Surface Elevation (masl)	Top of Casing Elevation (masl)	Elevation of Top of Screen (masl)	Elevation of Bottom of Screen (masl)
MW07-D	347.04	347.89	313.97	312.45

Precipitation - AFW: Data set from rain gauge installed by AMEC Foster-Wheeler at 500 Maltby Rd. E.

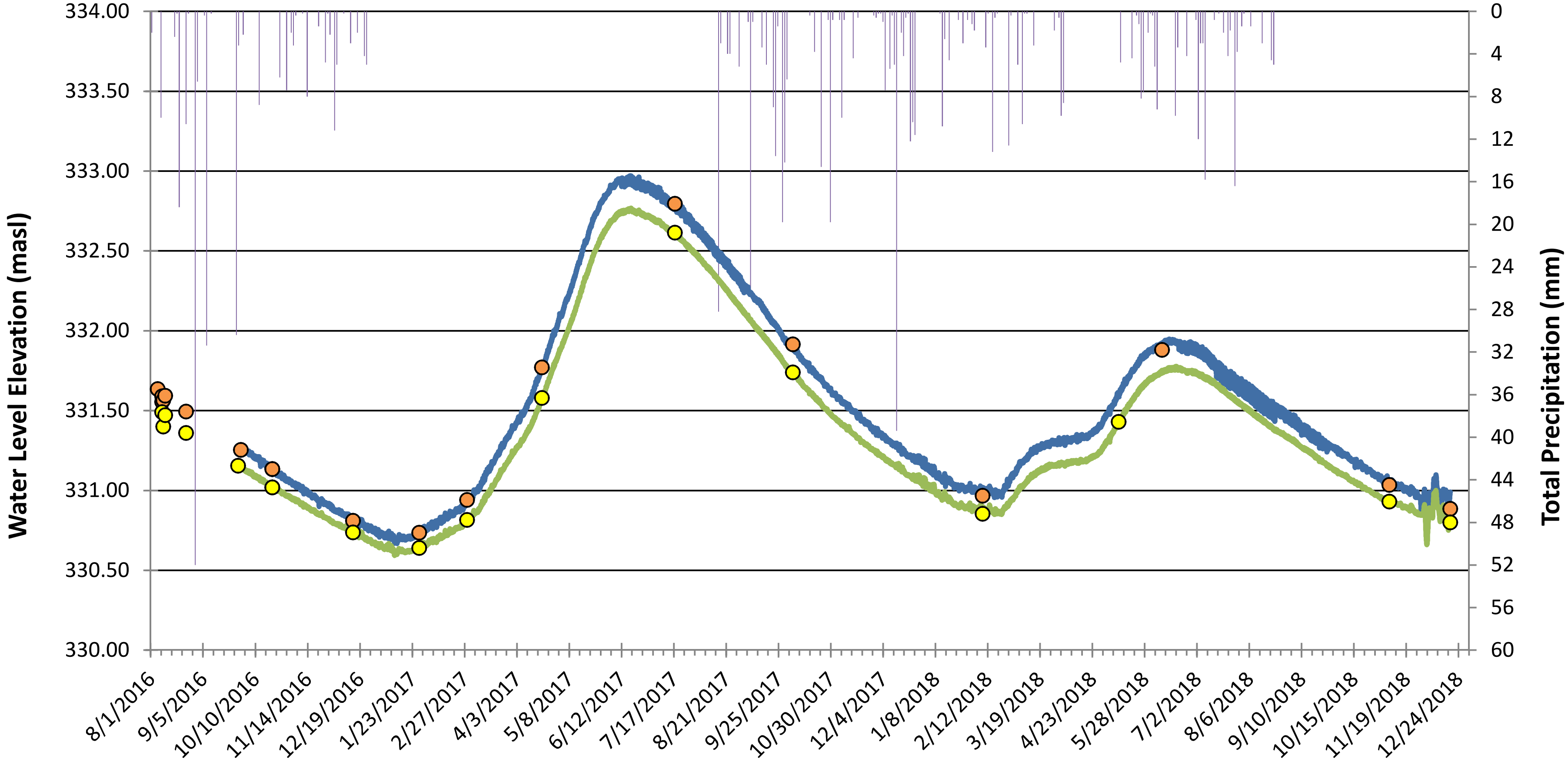
Clair-Maltby Secondary Plan
Long Term Groundwater Level Monitoring
MW8-D & MW8-S



Well ID	Ground Surface Elevation (masl)	Top of Casing Elevation (masl)	Elevation of Top of Screen (masl)	Elevation of Bottom of Screen (masl)
MW08-S	338.48	339.40	332.38	330.86
MW08-D	338.48	339.45	320.80	319.28

Precipitation - AFW: Data set from rain gauge installed by AMEC Foster-Wheeler at 500 Maltby Rd. E

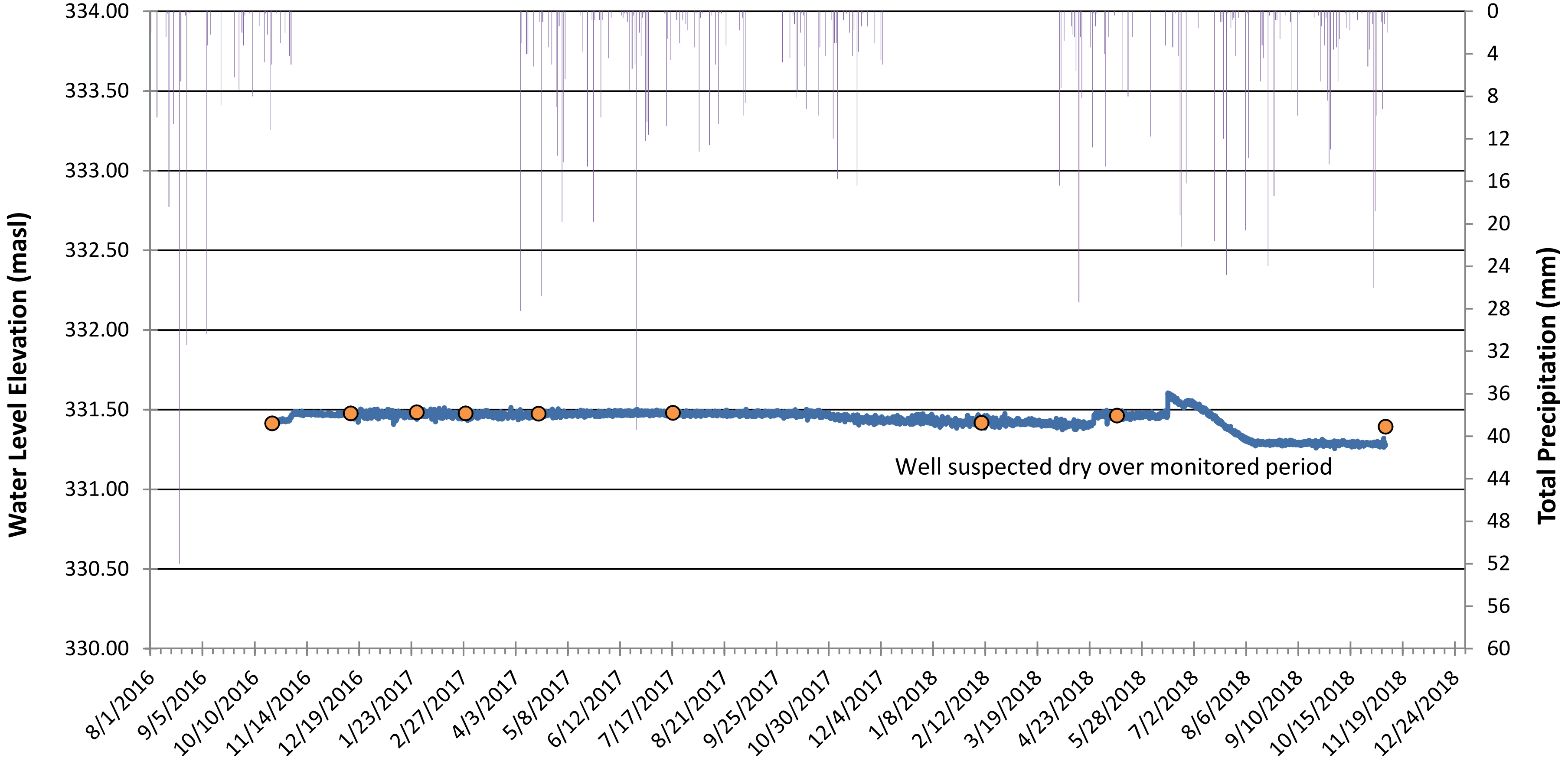
Clair-Maltby Secondary Plan
Long Term Groundwater Level Monitoring
MW9-D & MW9-S



Well ID	Ground Surface Elevation (masl)	Top of Casing Elevation (masl)	Elevation of Top of Screen (masl)	Elevation of Bottom of Screen (masl)
MW09-S	350.46	350.98	328.82	327.30
MW09-D	350.51	351.15	318.51	316.98

Precipitation - AFW: Data set from rain gauge installed by AMEC Foster-Wheeler at 500 Maltby Rd. E

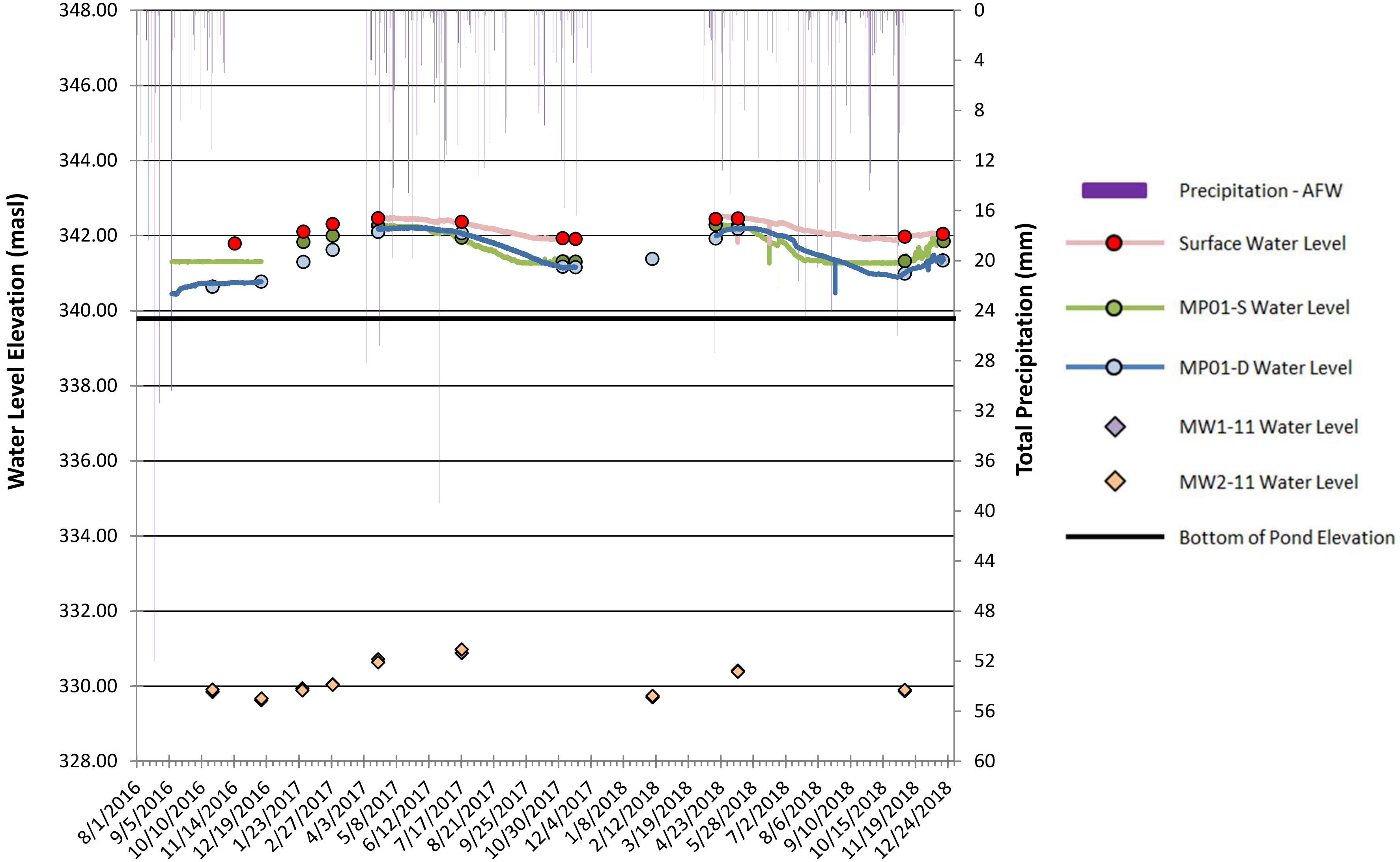
Clair-Maltby Secondary Plan
Long Term Groundwater Level Monitoring
MW3-11



Well ID	Ground Surface Elevation (masl)	Top of Casing Elevation (masl)	Elevation of Top of Screen (masl)	Elevation of Bottom of Screen (masl)
MW3-11	349.03	349.90	337.43	331.43

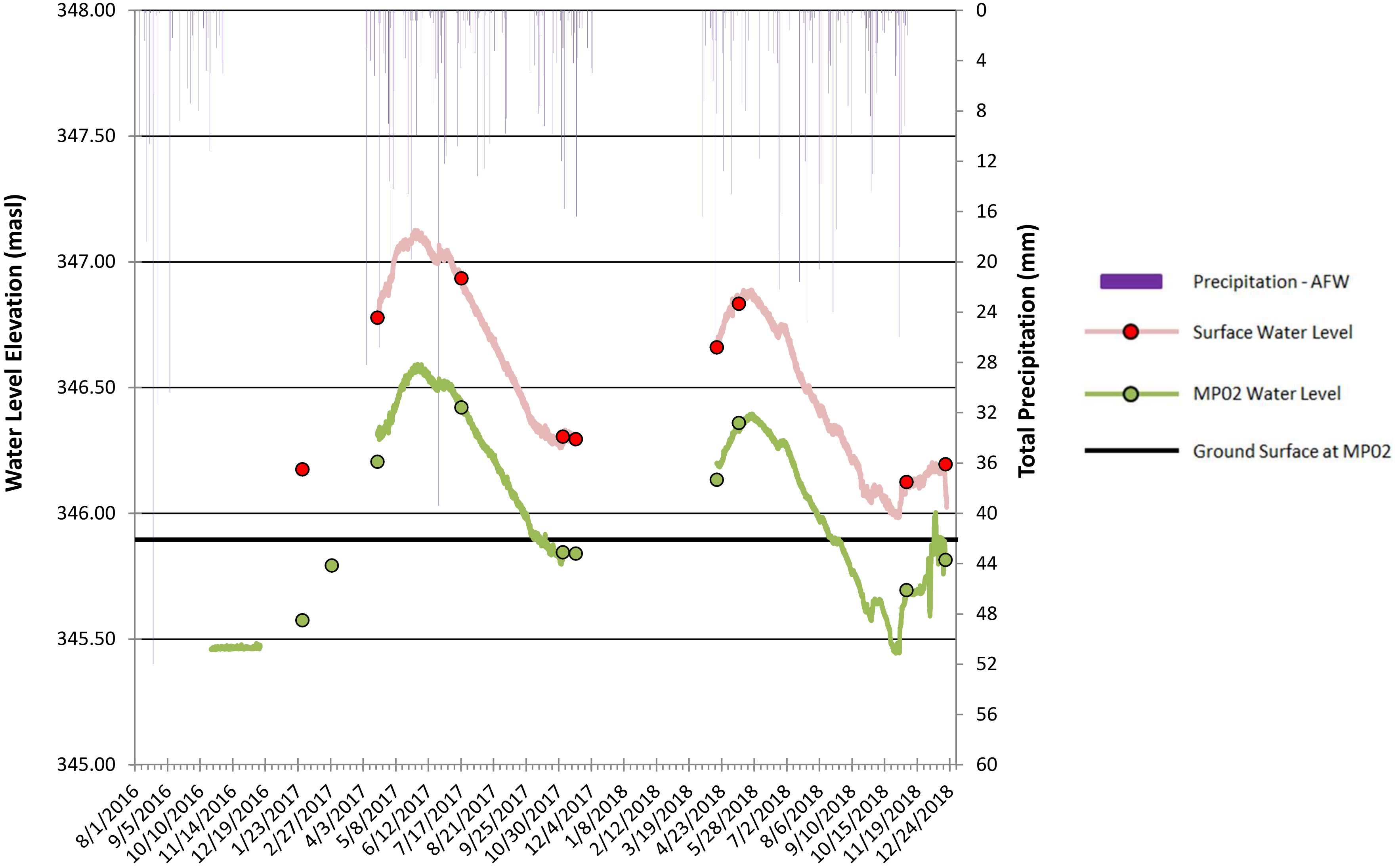
Precipitation - AFW: Data set from rain gauge installed by AMEC Foster-Wheeler at 500 Maltby Rd. E

Clair-Maltby Secondary Plan
Long Term Water Level Monitoring
Station 1 (Neumann's Pond 1)



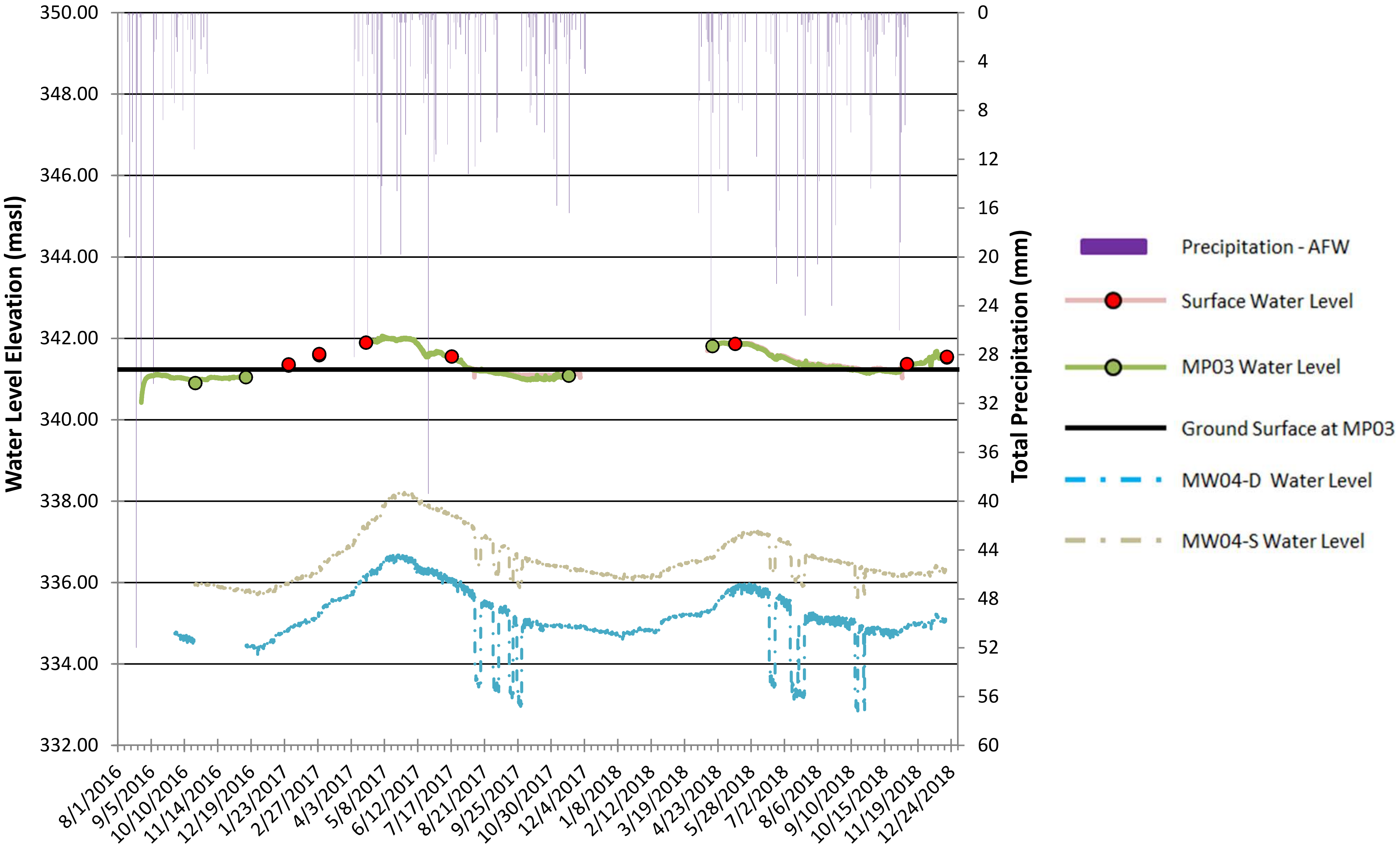
Precipitation - AFW: Data set from rain gauge installed by AMEC Foster-Wheeler at 500 Maltby Rd. E.

Clair-Maltby Secondary Plan
Long Term Water Level Monitoring
Station 2 (Neumann's Pond 2)



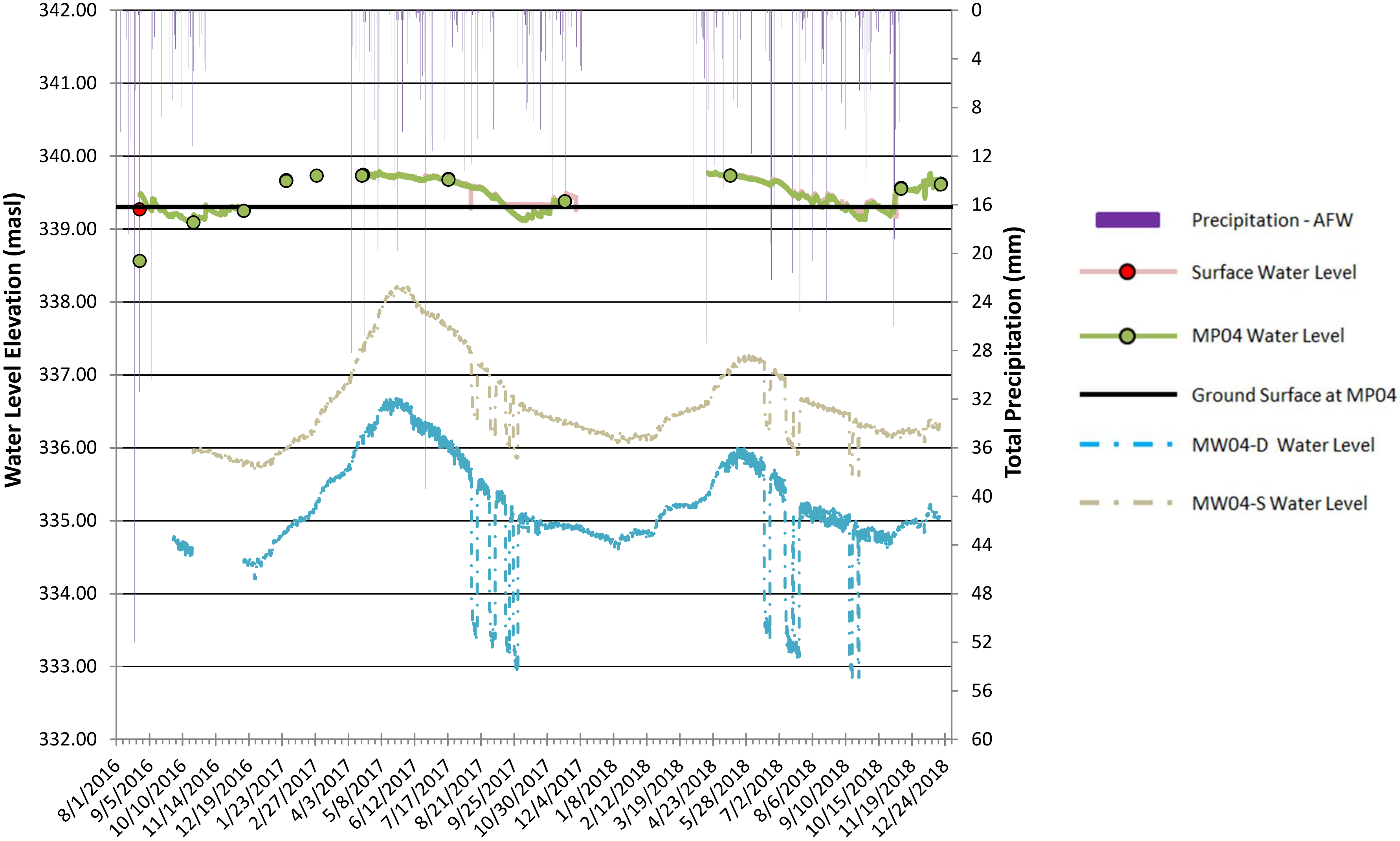
Precipitation - AFW: Data set from rain gauge installed by AMEC Foster-Wheeler at 500 Maltby Rd. E.

Clair-Maltby Secondary Plan
Long Term Water Level Monitoring
Station 3



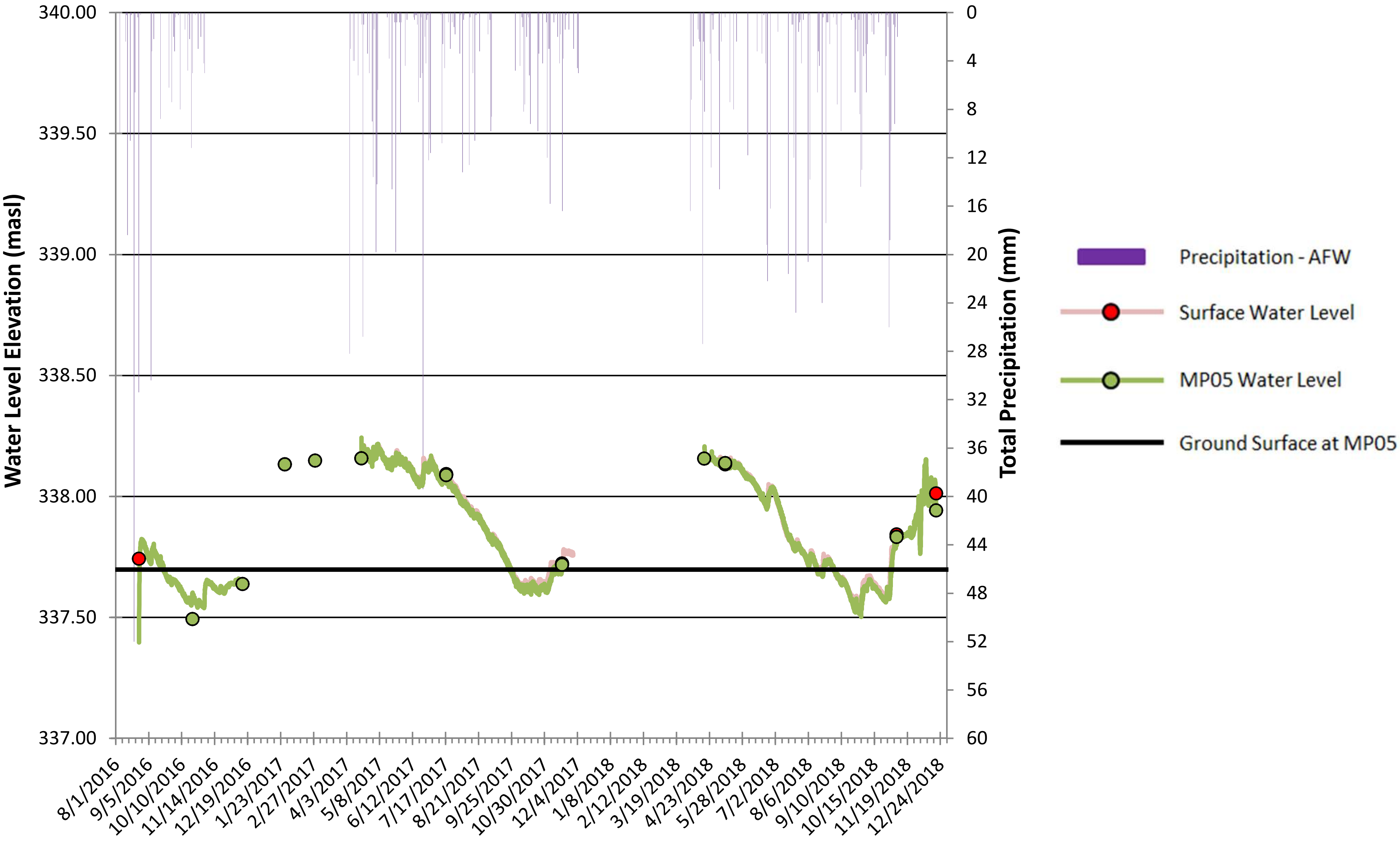
Precipitation - AFW: Data set from rain gauge installed by AMEC Foster-Wheeler at 500 Maltby Rd. E.

Clair-Maltby Secondary Plan
Long Term Water Level Monitoring
Station 4



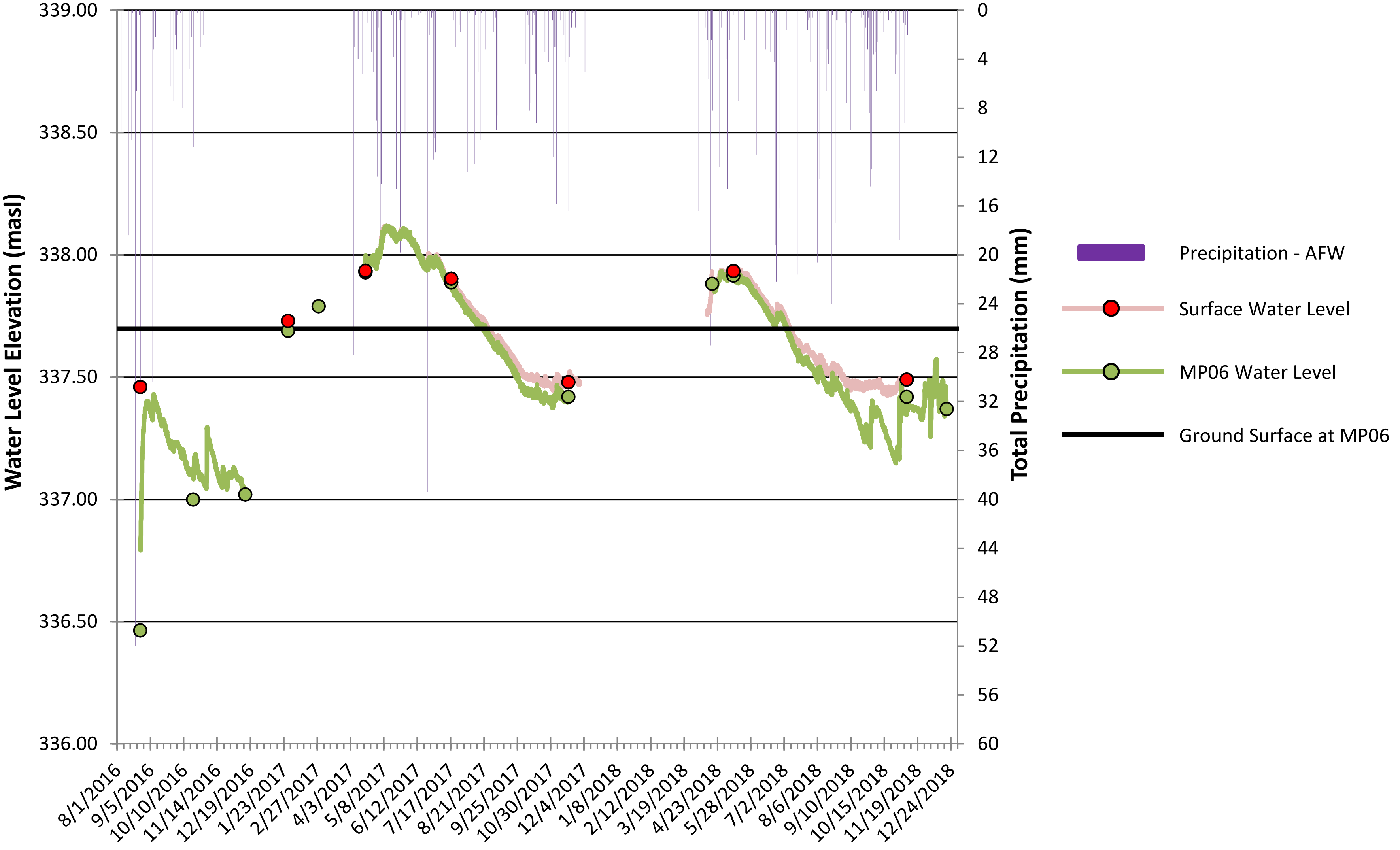
Precipitation - AFW: Data set from rain gauge installed by AMEC Foster-Wheeler at 500 Maltby Rd. E.

Clair-Maltby Secondary Plan
Long Term Water Level Monitoring
Station 5



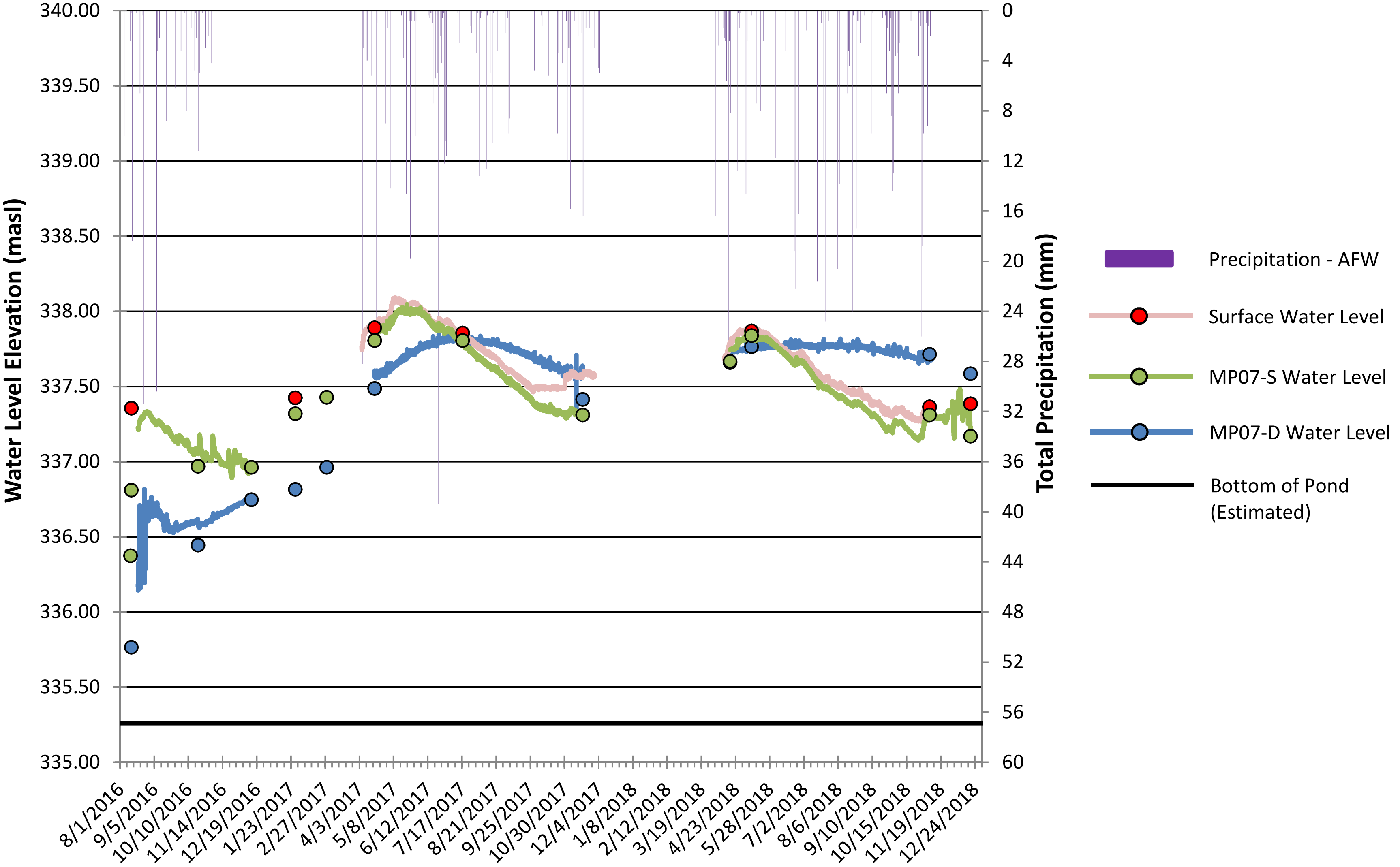
Precipitation - AFW: Data set from rain gauge installed by AMEC Foster-Wheeler at 500 Maltby Rd. E.

Clair-Maltby Secondary Plan
Long Term Water Level Monitoring
Station 6



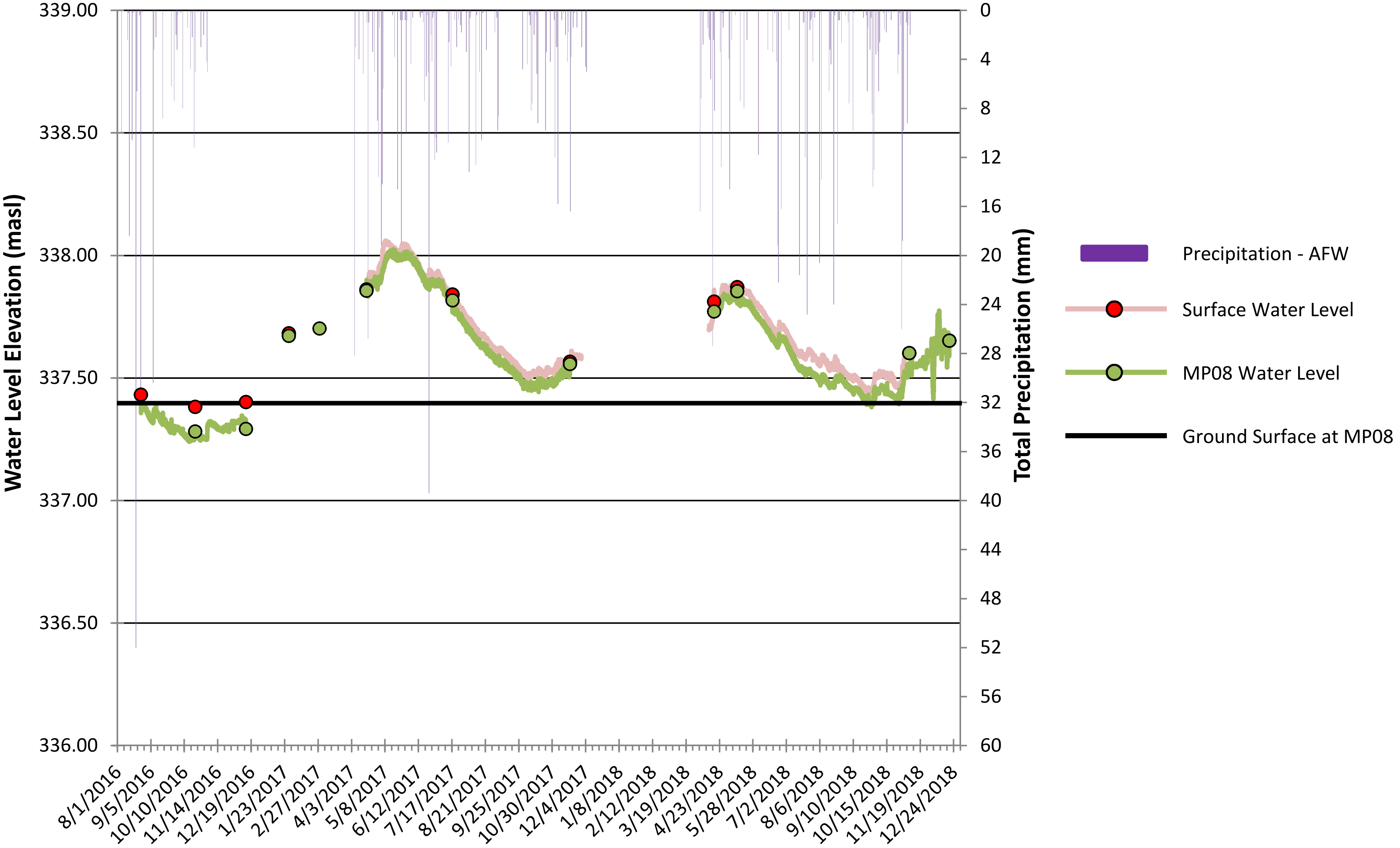
Precipitation - AFW: Data set from rain gauge installed by AMEC Foster-Wheeler at 500 Maltby Rd. E.

Clair-Maltby Secondary Plan
Long Term Water Level Monitoring
Station 7



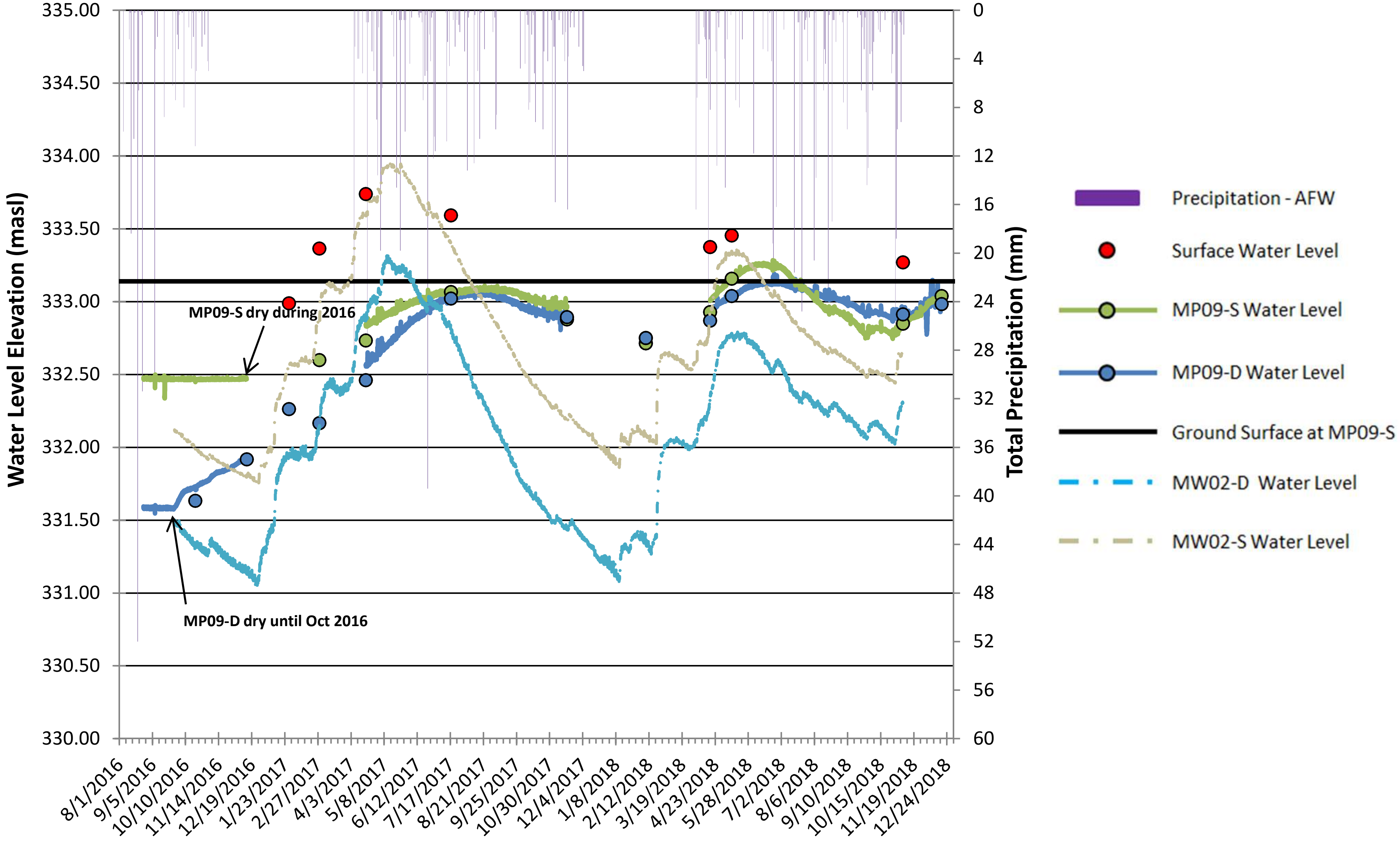
Precipitation - AFW: Data set from rain gauge installed by AMEC Foster-Wheeler at 500 Maltby Rd. E.

Clair-Maltby Secondary Plan
Long Term Water Level Monitoring
Station 8



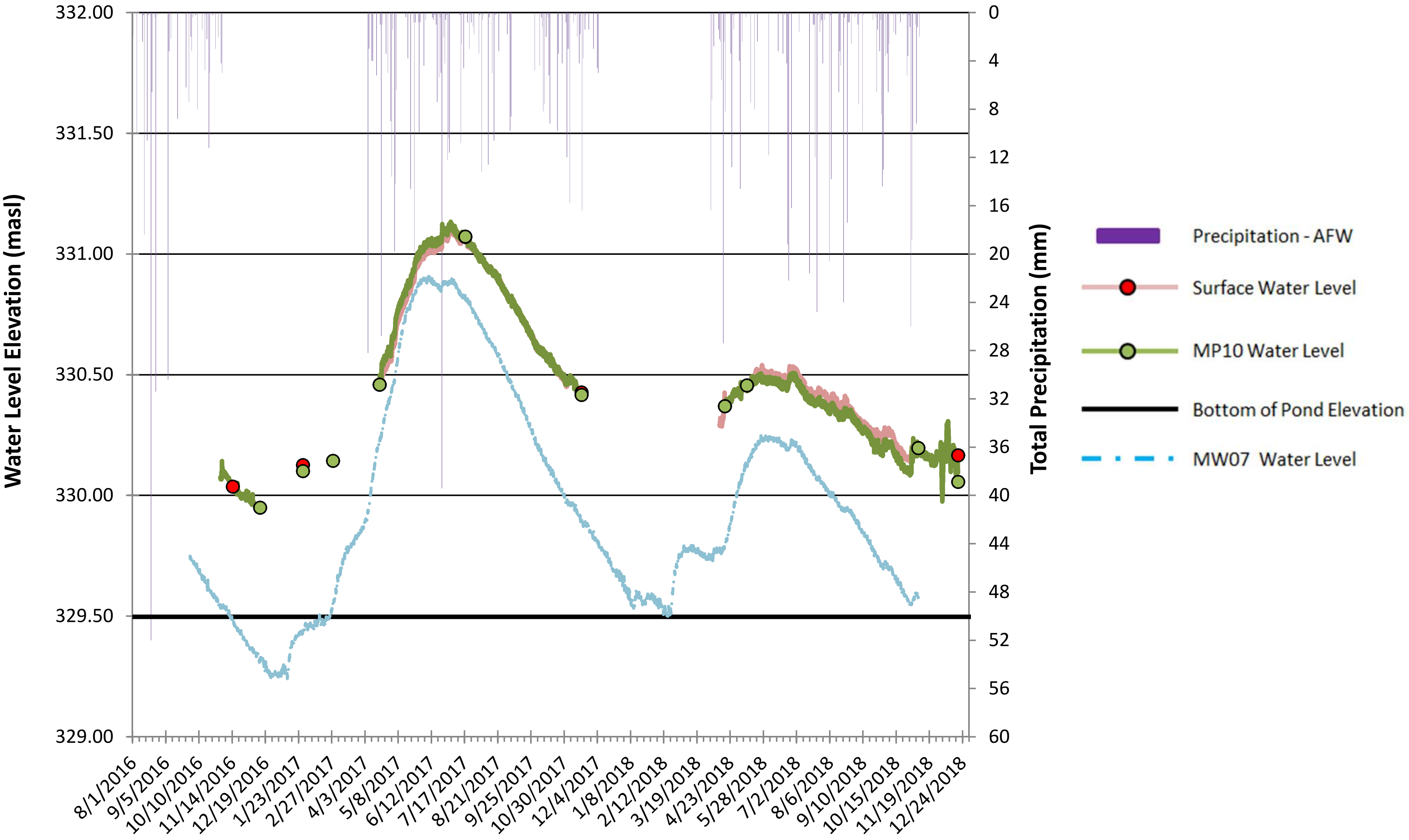
Precipitation - AFW: Data set from rain gauge installed by AMEC Foster-Wheeler at 500 Maltby Rd. E.

Clair-Maltby Secondary Plan
Long Term Water Level Monitoring
Station 9



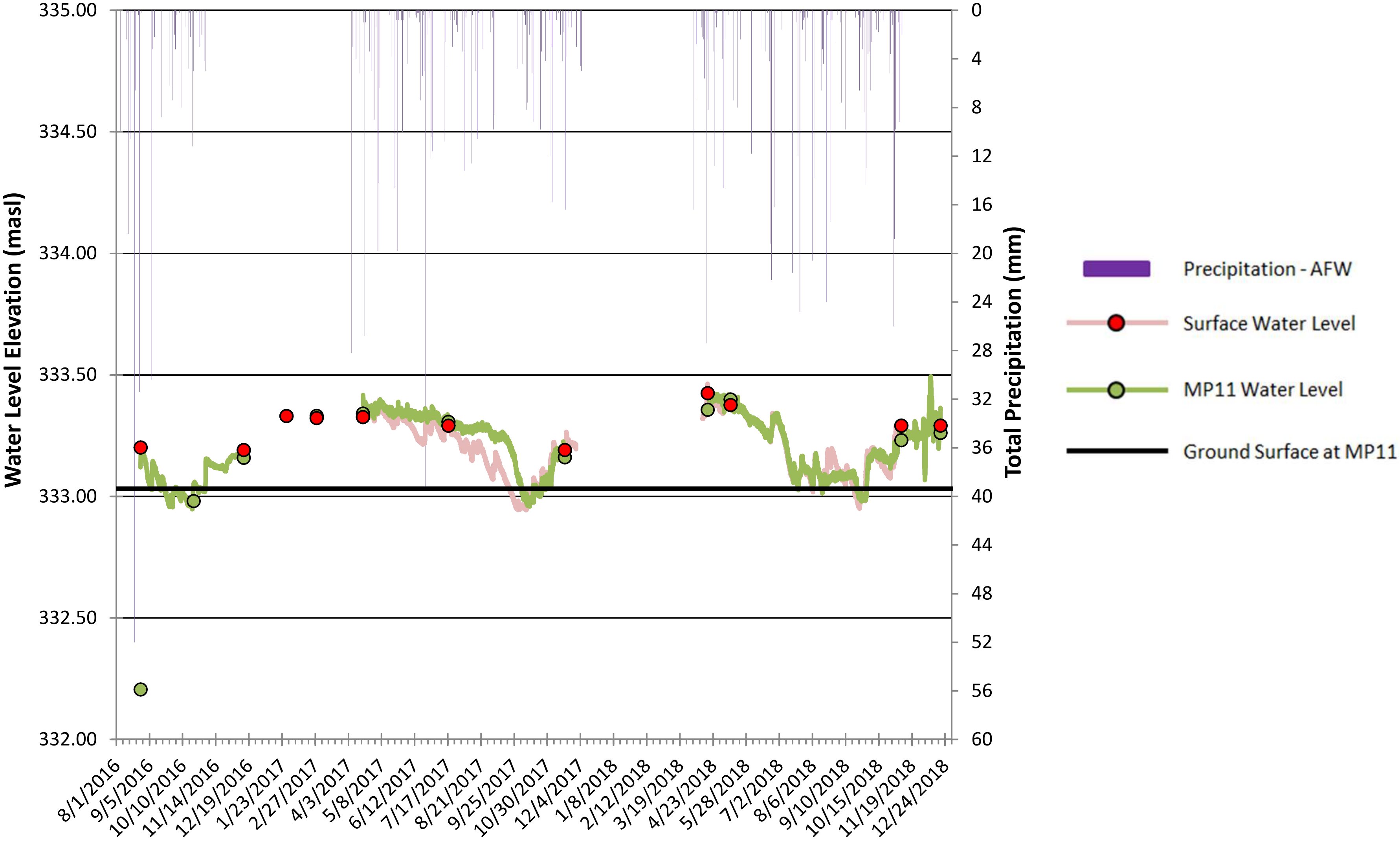
Precipitation - AFW: Data set from rain gauge installed by AMEC Foster-Wheeler at 500 Maltby Rd. E.

Clair-Maltby Secondary Plan
Long Term Water Level Monitoring
Station 10



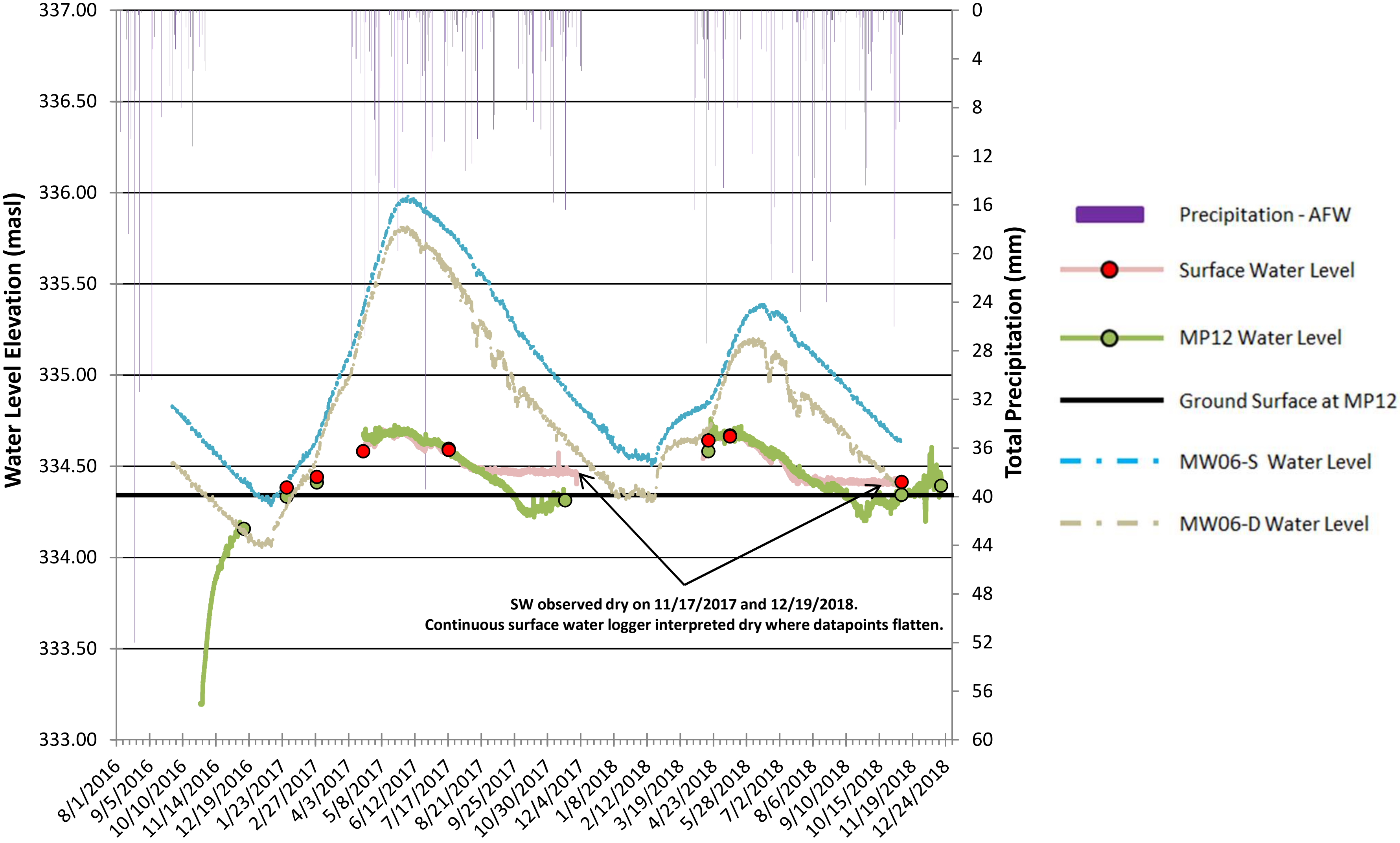
Precipitation - AFW: Data set from rain gauge installed by AMEC Foster-Wheeler at 500 Maltby Rd. E.

Clair-Maltby Secondary Plan
Long Term Water Level Monitoring
Station 11



Precipitation - AFW: Data set from rain gauge installed by AMEC Foster-Wheeler at 500 Maltby Rd. E.

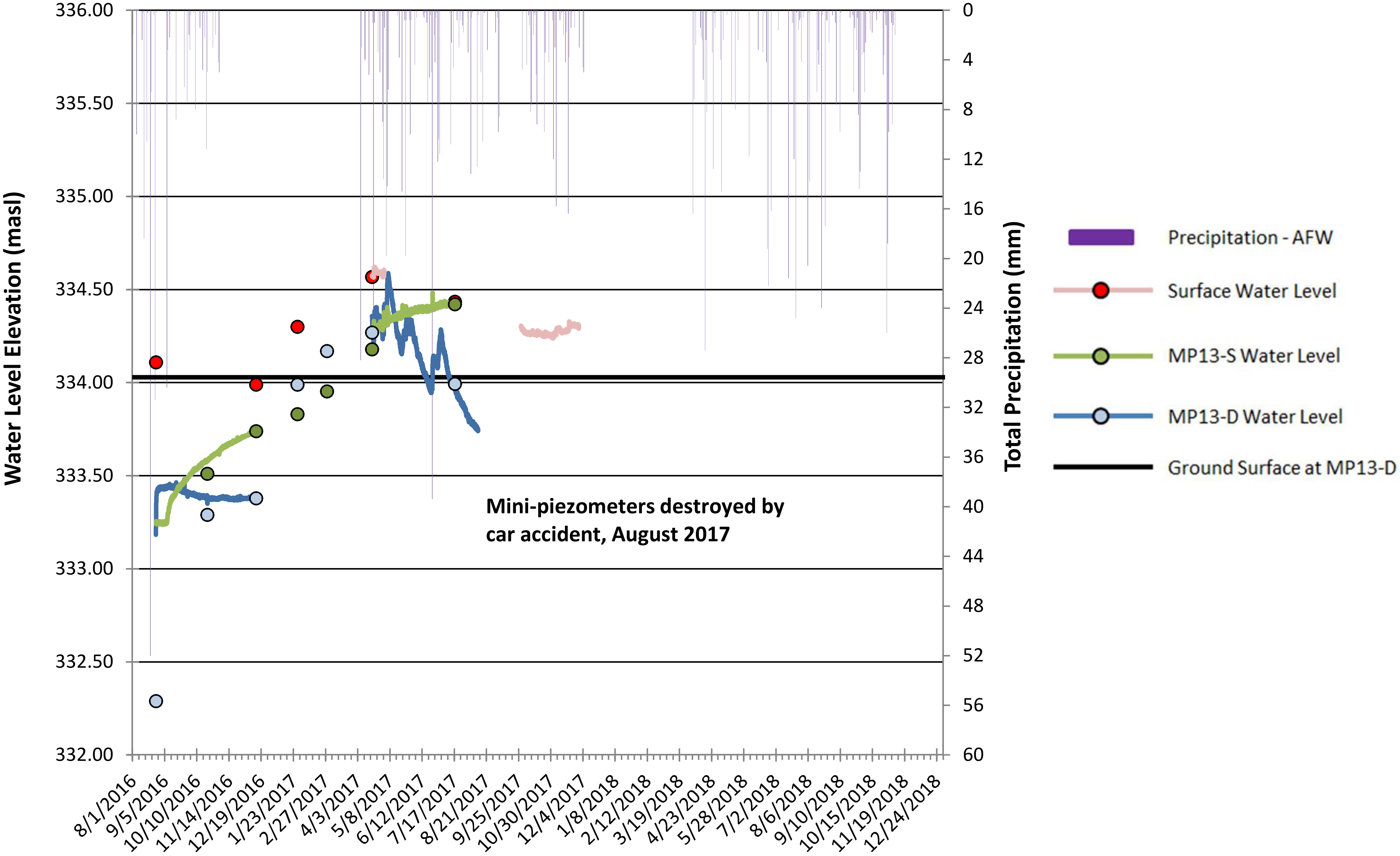
Clair-Maltby Secondary Plan
Long Term Water Level Monitoring
Station 12



SW observed dry on 11/17/2017 and 12/19/2018.
Continuous surface water logger interpreted dry where datapoints flatten.

Precipitation - AFW: Data set from rain gauge installed by AMEC Foster-Wheeler at 500 Maltby Rd. E.

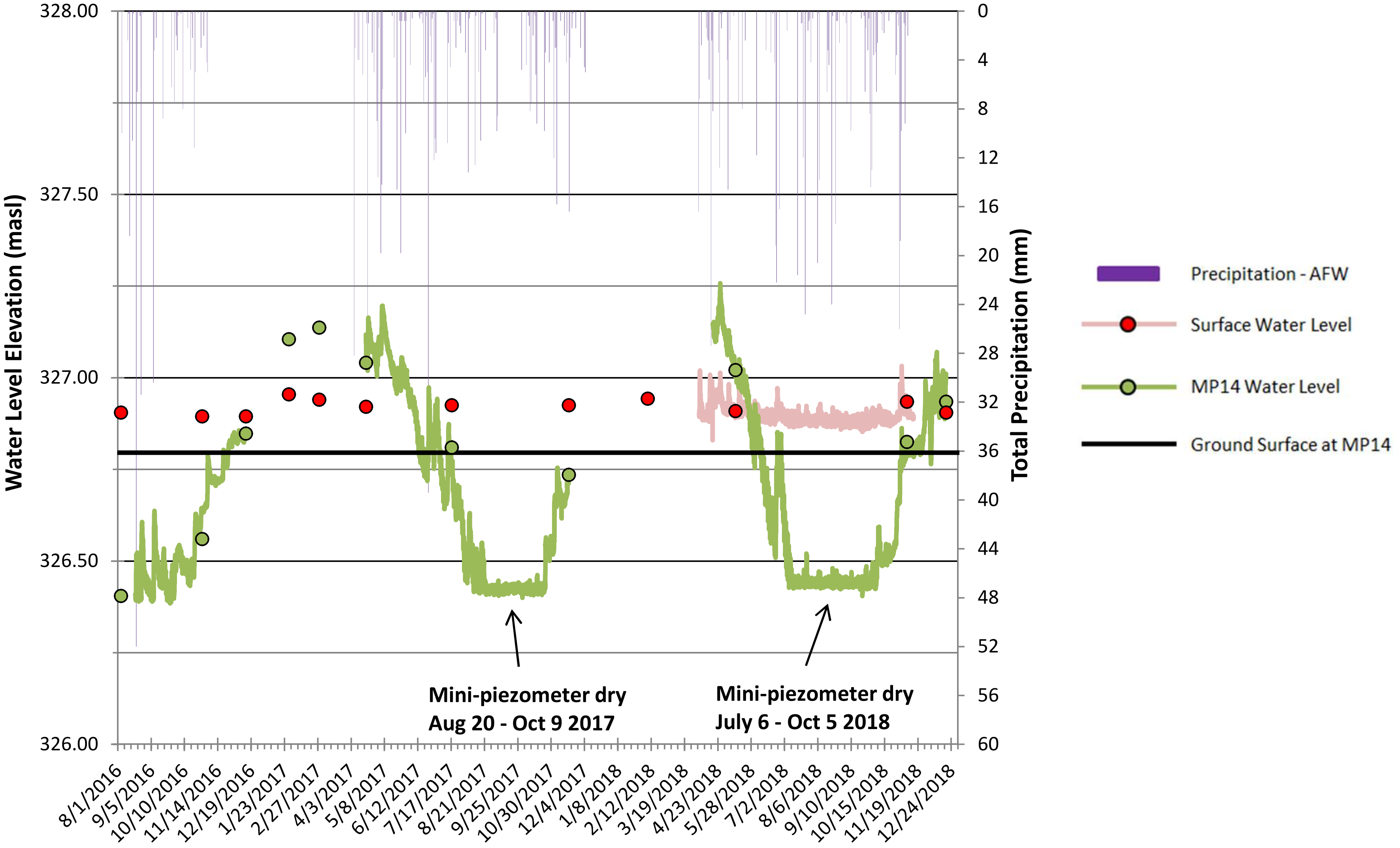
Clair-Maltby Secondary Plan
Long Term Water Level Monitoring
Station 13 (Halligan's Pond)



Mini-piezometers destroyed by car accident, August 2017

Precipitation - AFW: Data set from rain gauge installed by AMEC Foster-Wheeler at 500 Maltby Rd. E.

Clair-Maltby Secondary Plan
Long Term Water Level Monitoring
Station 14

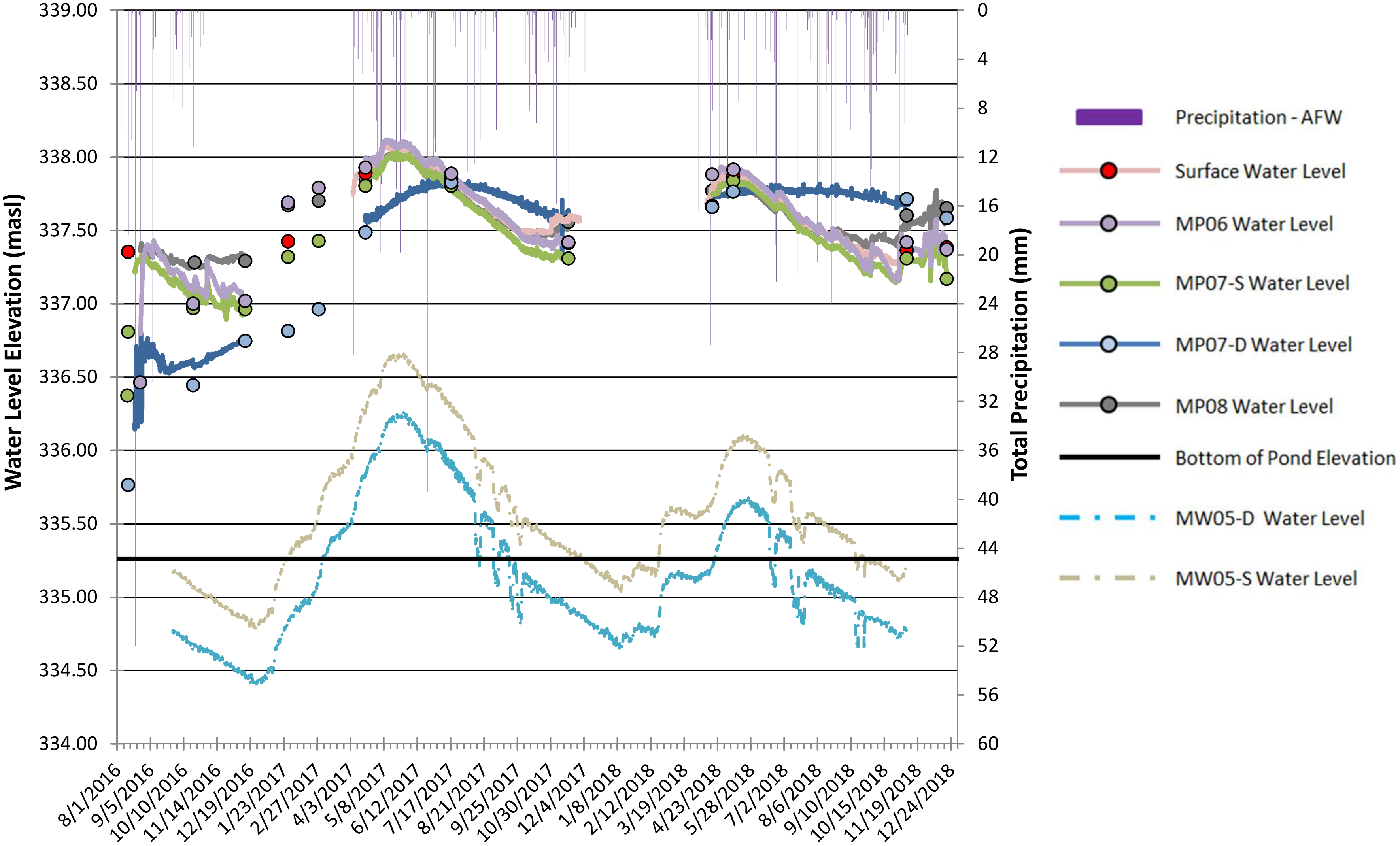


Mini-piezometer dry
Aug 20 - Oct 9 2017

Mini-piezometer dry
July 6 - Oct 5 2018

Precipitation - AFW: Data set from rain gauge installed by AMEC Foster-Wheeler at 500 Maltby Rd. E.

Clair-Maltby Secondary Plan
Long Term Water Level Monitoring
Hall's Pond (Stations Combined)



Precipitation - AFW: Data set from rain gauge installed by AMEC Foster-Wheeler at 500 Maltby Rd. E.

Appendix GW-4

Laboratory Certificates of Analysis

MATRIX SOLUTIONS INC.
ATTN: Scott Miller
31 Beacon Point Court
Breslau ON N0B 1M0

Date Received: 19-OCT-16
Report Date: 27-OCT-16 09:12 (MT)
Version: FINAL

Client Phone: 519-772-3777

Certificate of Analysis

Lab Work Order #: L1845890
Project P.O. #: CLAIRE-MALTBY
Job Reference: 23089-528
C of C Numbers: 81837
Legal Site Desc:

Gayle Braun

Gayle Braun
Senior Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1845890-1	L1845890-2	L1845890-3	L1845890-4	L1845890-5
	Description	WATER	WATER	WATER	WATER	WATER
	Sampled Date	19-OCT-16	19-OCT-16	19-OCT-16	19-OCT-16	19-OCT-16
	Sampled Time	10:30	12:30	12:50	15:30	15:55
	Client ID	23089161019001 MW7	23089161019002 MW8D	23089161019003 MW8S	23089161019004 MW6D	23089161019005 MW6S
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (umhos/cm)	696	1180	569	460	602
	pH (pH units)	7.44	7.23	7.25	7.64	7.53
	Total Dissolved Solids (mg/L)	386 DLDS	639 DLDS	295 DLDS	259 DLDS	351 DLDS
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	276	336	288	229	282
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<10	<10	<10	<10	<10
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<10	<10	<10	<10	<10
	Alkalinity, Total (as CaCO3) (mg/L)	276	336	288	229	282
	Chloride (Cl) (mg/L)	39.6	189 DLDS	14.4	4.32	9.21
	Computed Conductivity (uS/cm)	630	1060	493	416	561
	Conductivity % Difference (%)	-9.8	-10.7	-14.3	-10.0	-7.1
	Hardness (as CaCO3) (mg/L)	325	388	288	213	295
	Ion Balance (%)	109	101	112	112	108
	Langelier Index	0.3	0.3	0.2	0.3	0.4
	Nitrate (as N) (mg/L)	0.318	1.49 DLDS	1.04	<0.020	<0.020
	Nitrite (as N) (mg/L)	0.028	<0.050 DLDS	<0.010	<0.010	<0.010
	Total Kjeldahl Nitrogen (mg/L)	<0.15	0.51	0.76	0.19	0.28
	Saturation pH (pH)	7.11	6.95	7.08	7.35	7.16
	TDS (Calculated) (mg/L)	383	656	303	254	348
	Sulfate (SO4) (mg/L)	47.4	32.0 DLDS	4.79	24.7	55.6
	Anion Sum (me/L)	6.67	11.6	5.31	4.40	6.05
	Cation Sum (me/L)	7.27	11.7	5.96	4.94	6.52
	Cation - Anion Balance (%)	4.3	0.3	5.8	5.7	3.8
Dissolved Metals	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Aluminum (Al)-Dissolved (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
	Antimony (Sb)-Dissolved (mg/L)	0.00017	0.00012	0.00036	<0.00010	0.00030
	Arsenic (As)-Dissolved (mg/L)	0.00037	<0.00010	0.00028	0.00166	0.00104
	Barium (Ba)-Dissolved (mg/L)	0.127	0.144	0.0167	0.121	0.124
	Beryllium (Be)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Dissolved (mg/L)	<0.010	0.013	0.011	0.012	0.014
	Cadmium (Cd)-Dissolved (mg/L)	0.000015	0.000067	0.000043	<0.000010	<0.000010
	Calcium (Ca)-Dissolved (mg/L)	79.3	105	77.7	50.9	69.2
	Cesium (Cs)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Chromium (Cr)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Cobalt (Co)-Dissolved (mg/L)	0.00062	0.00085	0.00018	0.00013	0.00020
	Copper (Cu)-Dissolved (mg/L)	0.00103	0.00201	0.00158	0.00037	0.00046
	Iron (Fe)-Dissolved (mg/L)	0.024	<0.010	<0.010	0.067	0.012

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1845890-6	L1845890-7			
	Description	WATER	WATER			
	Sampled Date	19-OCT-16	19-OCT-16			
	Sampled Time	17:15	17:30			
	Client ID	23089161019006 MW5S	23089161019007 MW5D			
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (umhos/cm)	750	663			
	pH (pH units)	7.17	7.17			
	Total Dissolved Solids (mg/L)	DLDS 430	DLDS 396			
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	327	366			
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<10	<10			
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<10	<10			
	Alkalinity, Total (as CaCO3) (mg/L)	327	366			
	Chloride (Cl) (mg/L)	10.0	11.9			
	Computed Conductivity (uS/cm)	712	617			
	Conductivity % Difference (%)	-5.3	-7.2			
	Hardness (as CaCO3) (mg/L)	410	347			
	Ion Balance (%)	112	101			
	Langelier Index	0.2	0.3			
	Nitrate (as N) (mg/L)	0.429	<0.020			
	Nitrite (as N) (mg/L)	0.056	<0.010			
	Total Kjeldahl Nitrogen (mg/L)	0.62	DLM 4.1			
	Saturation pH (pH)	6.94	6.92			
	TDS (Calculated) (mg/L)	446	394			
	Sulfate (SO4) (mg/L)	89.4	36.0			
	Anion Sum (me/L)	7.54	7.09			
	Cation Sum (me/L)	8.48	7.16			
	Cation - Anion Balance (%)	5.9	0.4			
Dissolved Metals	Dissolved Metals Filtration Location	FIELD	FIELD			
	Aluminum (Al)-Dissolved (mg/L)	<0.0050	<0.0050			
	Antimony (Sb)-Dissolved (mg/L)	0.00041	<0.00010			
	Arsenic (As)-Dissolved (mg/L)	0.00333	0.00080			
	Barium (Ba)-Dissolved (mg/L)	0.126	0.145			
	Beryllium (Be)-Dissolved (mg/L)	<0.00010	<0.00010			
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050			
	Boron (B)-Dissolved (mg/L)	<0.010	<0.010			
	Cadmium (Cd)-Dissolved (mg/L)	0.000019	<0.000010			
	Calcium (Ca)-Dissolved (mg/L)	105	94.3			
	Cesium (Cs)-Dissolved (mg/L)	<0.000010	0.000011			
	Chromium (Cr)-Dissolved (mg/L)	<0.00050	<0.00050			
	Cobalt (Co)-Dissolved (mg/L)	0.00092	0.00011			
	Copper (Cu)-Dissolved (mg/L)	0.00046	<0.00020			
	Iron (Fe)-Dissolved (mg/L)	0.346	2.25			

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

	Sample ID	L1845890-1	L1845890-2	L1845890-3	L1845890-4	L1845890-5
	Description	WATER	WATER	WATER	WATER	WATER
	Sampled Date	19-OCT-16	19-OCT-16	19-OCT-16	19-OCT-16	19-OCT-16
	Sampled Time	10:30	12:30	12:50	15:30	15:55
	Client ID	23089161019001 MW7	23089161019002 MW8D	23089161019003 MW8S	23089161019004 MW6D	23089161019005 MW6S
Grouping	**Analyte**					
WATER						
Dissolved Metals	Lead (Pb)-Dissolved (mg/L)	0.000155	0.000614	0.000051	<0.000050	<0.000050
	Lithium (Li)-Dissolved (mg/L)	0.0032	0.0034	<0.0010	0.0027	0.0017
	Magnesium (Mg)-Dissolved (mg/L)	30.7	30.5	22.8	20.8	29.7
	Manganese (Mn)-Dissolved (mg/L)	0.0787	0.0434	0.00707	0.0154	0.0453
	Molybdenum (Mo)-Dissolved (mg/L)	0.00118	0.000662	0.000655	0.00230	0.00323
	Nickel (Ni)-Dissolved (mg/L)	0.00174	0.00310	0.00945	<0.00050	<0.00050
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Dissolved (mg/L)	1.55	3.18	1.29	1.28	2.20
	Rubidium (Rb)-Dissolved (mg/L)	0.00127	0.00225	0.00069	0.00075	0.00159
	Selenium (Se)-Dissolved (mg/L)	0.000098	0.000251	0.000132	<0.000050	0.000053
	Silicon (Si)-Dissolved (mg/L)	6.12	5.51	3.66	6.43	4.20
	Silver (Ag)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Sodium (Na)-Dissolved (mg/L)	17.1	88.3	4.17	15.1	13.0
	Strontium (Sr)-Dissolved (mg/L)	0.114	0.180	0.115	0.123	0.256
	Sulfur (S)-Dissolved (mg/L)	15.5	10.9	1.48	8.63	18.1
	Tellurium (Te)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	Thallium (Tl)-Dissolved (mg/L)	0.000018	0.000048	<0.000010	<0.000010	<0.000010
	Thorium (Th)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Tin (Sn)-Dissolved (mg/L)	0.00055	<0.00010	0.00123	0.00016	0.00061
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
	Tungsten (W)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Uranium (U)-Dissolved (mg/L)	0.00148	0.000649	0.000231	0.00202	0.00545
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Dissolved (mg/L)	0.0149	0.192	0.0101	0.0038	0.0509
	Zirconium (Zr)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1845890-6	L1845890-7			
	Description	WATER	WATER			
	Sampled Date	19-OCT-16	19-OCT-16			
	Sampled Time	17:15	17:30			
	Client ID	23089161019006 MW5S	23089161019007 MW5D			
Grouping	**Analyte**					
WATER						
Dissolved Metals	Lead (Pb)-Dissolved (mg/L)	0.000154	<0.000050			
	Lithium (Li)-Dissolved (mg/L)	0.0043	0.0018			
	Magnesium (Mg)-Dissolved (mg/L)	35.8	27.0			
	Manganese (Mn)-Dissolved (mg/L)	0.159	0.0829			
	Molybdenum (Mo)-Dissolved (mg/L)	0.0235	0.000176			
	Nickel (Ni)-Dissolved (mg/L)	0.00372	0.00090			
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050			
	Potassium (K)-Dissolved (mg/L)	1.63	0.837			
	Rubidium (Rb)-Dissolved (mg/L)	0.00240	0.00075			
	Selenium (Se)-Dissolved (mg/L)	0.000167	<0.000050			
	Silicon (Si)-Dissolved (mg/L)	4.01	9.08			
	Silver (Ag)-Dissolved (mg/L)	<0.000050	<0.000050			
	Sodium (Na)-Dissolved (mg/L)	5.53	4.71			
	Strontium (Sr)-Dissolved (mg/L)	0.143	0.135			
	Sulfur (S)-Dissolved (mg/L)	31.0	11.6			
	Tellurium (Te)-Dissolved (mg/L)	<0.00020	<0.00020			
	Thallium (Tl)-Dissolved (mg/L)	0.000020	<0.000010			
	Thorium (Th)-Dissolved (mg/L)	<0.00010	<0.00010			
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010			
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	0.00038			
	Tungsten (W)-Dissolved (mg/L)	<0.00010	<0.00010			
	Uranium (U)-Dissolved (mg/L)	0.0240	0.000113			
	Vanadium (V)-Dissolved (mg/L)	<0.00050	0.00062			
	Zinc (Zn)-Dissolved (mg/L)	0.0276	0.0019			
	Zirconium (Zr)-Dissolved (mg/L)	<0.00030	0.00051			

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L1845890-1, -2, -3, -4, -5, -6, -7
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L1845890-1, -2, -3, -4, -5, -6, -7
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L1845890-1, -2, -3, -4, -5, -6, -7
Matrix Spike	Manganese (Mn)-Dissolved	MS-B	L1845890-1, -2, -3, -4, -5, -6, -7
Matrix Spike	Silicon (Si)-Dissolved	MS-B	L1845890-1, -2, -3, -4, -5, -6, -7
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L1845890-1, -2, -3, -4, -5, -6, -7
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L1845890-1, -2, -3, -4, -5, -6, -7
Matrix Spike	Sulfur (S)-Dissolved	MS-B	L1845890-1, -2, -3, -4, -5, -6, -7
Matrix Spike	Uranium (U)-Dissolved	MS-B	L1845890-1, -2, -3, -4, -5, -6, -7
Matrix Spike	Sulfate (SO4)	MS-B	L1845890-1, -2, -3, -4, -5, -6, -7

Qualifiers for Individual Parameters Listed:

Qualifier	Description
DLDS	Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-SPEC-WT	Water	Speciated Alkalinity	EPA 310.2
CL-IC-WT	Water	Chloride by IC	EPA 300.1 (mod)

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

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

EC-WT	Water	Conductivity	APHA 2510 B

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

IONBALANCE-OP03-WT	Water	Detailed Ion Balance Calculation	APHA 1030E, 2330B, 2510A
MET-D-CCMS-WT	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B/6020A (mod)

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

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

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

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

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

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

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

PH-ALK-WT	Water	pH	APHA 4500 H-Electrode

Water samples are analyzed directly by a calibrated pH meter.

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

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

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

A well-mixed sample is filtered though glass fibres filter. A known volume of the filtrate is evaporated and dried at 105–5°C overnight and then 180–10°C for 1hr.

TKN-WT	Water	Total Kjeldahl Nitrogen	APHA 4500-N

Sample is digested to convert the TKN to ammonium sulphate. The ammonia ions are heated to produce a colour complex. The absorbance measured by the instrument is proportional to the concentration of ammonium sulphate in the sample and is reported as TKN.

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

Reference Information

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

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

Chain of Custody Numbers:

81837

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

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

Quality Control Report

Workorder: L1845890 Report Date: 27-OCT-16

Client: MATRIX SOLUTIONS INC.
31 Beacon Point Court
Breslau ON N0B 1M0

Contact: Scott Miller

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
ALK-SPEC-WT	**Water**							
Batch R3576806								
WG2415367-3 CRM		**WT-ALK-CRM**						
Alkalinity, Total (as CaCO3)			102.8		%		80-120	20-OCT-16
WG2415367-2 LCS								
Alkalinity, Total (as CaCO3)			102.5		%		85-115	20-OCT-16
WG2415367-1 MB								
Alkalinity, Total (as CaCO3)			<10		mg/L		10	20-OCT-16
CL-IC-WT	**Water**							
Batch R3579307								
WG2415943-12 LCS								
Chloride (Cl)			100.7		%		70-130	23-OCT-16
WG2415943-7 LCS								
Chloride (Cl)			101.0		%		70-130	23-OCT-16
WG2415943-11 MB								
Chloride (Cl)			<0.50		mg/L		0.5	23-OCT-16
WG2415943-6 MB								
Chloride (Cl)			<0.50		mg/L		0.5	23-OCT-16
EC-WT	**Water**							
Batch R3575583								
WG2414036-14 LCS								
Conductivity			102.1		%		90-110	20-OCT-16
WG2414036-13 MB								
Conductivity			<3.0		umhos/cm		3	20-OCT-16
MET-D-CCMS-WT	**Water**							
Batch R3576471								
WG2415171-2 LCS								
Aluminum (Al)-Dissolved			97.1		%		80-120	20-OCT-16
Antimony (Sb)-Dissolved			97.4		%		80-120	20-OCT-16
Arsenic (As)-Dissolved			96.9		%		80-120	20-OCT-16
Barium (Ba)-Dissolved			101.5		%		80-120	20-OCT-16
Beryllium (Be)-Dissolved			95.4		%		80-120	20-OCT-16
Bismuth (Bi)-Dissolved			101.0		%		80-120	20-OCT-16
Boron (B)-Dissolved			93.5		%		80-120	20-OCT-16
Cadmium (Cd)-Dissolved			95.4		%		80-120	20-OCT-16
Calcium (Ca)-Dissolved			97.3		%		80-120	20-OCT-16
Cesium (Cs)-Dissolved			97.2		%		80-120	20-OCT-16
Chromium (Cr)-Dissolved			95.8		%		80-120	20-OCT-16
Cobalt (Co)-Dissolved			96.3		%		80-120	20-OCT-16

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-WT	**Water**							
Batch R3576471								
WG2415171-2 LCS								
Copper (Cu)-Dissolved			96.5		%		80-120	20-OCT-16
Iron (Fe)-Dissolved			93.5		%		80-120	20-OCT-16
Lead (Pb)-Dissolved			97.6		%		80-120	20-OCT-16
Lithium (Li)-Dissolved			93.9		%		80-120	20-OCT-16
Magnesium (Mg)-Dissolved			96.9		%		80-120	20-OCT-16
Manganese (Mn)-Dissolved			97.5		%		80-120	20-OCT-16
Molybdenum (Mo)-Dissolved			94.4		%		80-120	20-OCT-16
Nickel (Ni)-Dissolved			96.2		%		80-120	20-OCT-16
Phosphorus (P)-Dissolved			92.5		%		80-120	20-OCT-16
Potassium (K)-Dissolved			97.0		%		80-120	20-OCT-16
Rubidium (Rb)-Dissolved			101.7		%		80-120	20-OCT-16
Selenium (Se)-Dissolved			95.6		%		80-120	21-OCT-16
Silicon (Si)-Dissolved			101.3		%		80-120	20-OCT-16
Silver (Ag)-Dissolved			100.8		%		80-120	21-OCT-16
Sodium (Na)-Dissolved			97.5		%		80-120	20-OCT-16
Strontium (Sr)-Dissolved			99.8		%		80-120	20-OCT-16
Sulfur (S)-Dissolved			96.0		%		80-120	20-OCT-16
Tellurium (Te)-Dissolved			96.3		%		80-120	20-OCT-16
Thallium (Tl)-Dissolved			96.0		%		80-120	20-OCT-16
Thorium (Th)-Dissolved			94.6		%		80-120	20-OCT-16
Tin (Sn)-Dissolved			94.1		%		80-120	20-OCT-16
Titanium (Ti)-Dissolved			95.9		%		80-120	20-OCT-16
Tungsten (W)-Dissolved			97.5		%		80-120	20-OCT-16
Uranium (U)-Dissolved			99.2		%		80-120	20-OCT-16
Vanadium (V)-Dissolved			97.5		%		80-120	20-OCT-16
Zinc (Zn)-Dissolved			91.7		%		80-120	20-OCT-16
Zirconium (Zr)-Dissolved			91.4		%		80-120	20-OCT-16
WG2415171-1 MB								
Aluminum (Al)-Dissolved			<0.0050		mg/L		0.005	20-OCT-16
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	20-OCT-16
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	20-OCT-16
Barium (Ba)-Dissolved			<0.00010		mg/L		0.0001	20-OCT-16
Beryllium (Be)-Dissolved			<0.00010		mg/L		0.0001	20-OCT-16
Bismuth (Bi)-Dissolved			<0.000050		mg/L		0.00005	20-OCT-16

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-WT	**Water**							
Batch R3576471								
WG2415171-1 MB								
Boron (B)-Dissolved			<0.010		mg/L		0.01	20-OCT-16
Cadmium (Cd)-Dissolved			<0.000010		mg/L		0.00001	20-OCT-16
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	20-OCT-16
Cesium (Cs)-Dissolved			<0.000010		mg/L		0.00001	20-OCT-16
Chromium (Cr)-Dissolved			<0.00050		mg/L		0.0005	20-OCT-16
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	20-OCT-16
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	20-OCT-16
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	20-OCT-16
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	20-OCT-16
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	20-OCT-16
Magnesium (Mg)-Dissolved			<0.050		mg/L		0.05	20-OCT-16
Manganese (Mn)-Dissolved			<0.00050		mg/L		0.0005	20-OCT-16
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	20-OCT-16
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	20-OCT-16
Phosphorus (P)-Dissolved			<0.050		mg/L		0.05	20-OCT-16
Potassium (K)-Dissolved			<0.050		mg/L		0.05	20-OCT-16
Rubidium (Rb)-Dissolved			<0.00020		mg/L		0.0002	20-OCT-16
Selenium (Se)-Dissolved			<0.000050		mg/L		0.00005	21-OCT-16
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	20-OCT-16
Silver (Ag)-Dissolved			<0.000050		mg/L		0.00005	21-OCT-16
Sodium (Na)-Dissolved			<0.50		mg/L		0.5	20-OCT-16
Strontium (Sr)-Dissolved			<0.0010		mg/L		0.001	20-OCT-16
Sulfur (S)-Dissolved			<0.50		mg/L		0.5	20-OCT-16
Tellurium (Te)-Dissolved			<0.00020		mg/L		0.0002	20-OCT-16
Thallium (Tl)-Dissolved			<0.000010		mg/L		0.00001	20-OCT-16
Thorium (Th)-Dissolved			<0.00010		mg/L		0.0001	20-OCT-16
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	20-OCT-16
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	20-OCT-16
Tungsten (W)-Dissolved			<0.00010		mg/L		0.0001	20-OCT-16
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	20-OCT-16
Vanadium (V)-Dissolved			<0.00050		mg/L		0.0005	20-OCT-16
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	20-OCT-16
Zirconium (Zr)-Dissolved			<0.00030		mg/L		0.0003	20-OCT-16
NO2-IC-WT	**Water**							

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NO2-IC-WT	**Water**							
Batch R3579307								
WG2415943-12 LCS								
Nitrite (as N)			103.5		%		70-130	23-OCT-16
WG2415943-7 LCS								
Nitrite (as N)			104.0		%		70-130	23-OCT-16
WG2415943-11 MB								
Nitrite (as N)			<0.010		mg/L		0.01	23-OCT-16
WG2415943-6 MB								
Nitrite (as N)			<0.010		mg/L		0.01	23-OCT-16
NO3-IC-WT	**Water**							
Batch R3579307								
WG2415943-12 LCS								
Nitrate (as N)			100.2		%		70-130	23-OCT-16
WG2415943-7 LCS								
Nitrate (as N)			100.5		%		70-130	23-OCT-16
WG2415943-11 MB								
Nitrate (as N)			<0.020		mg/L		0.02	23-OCT-16
WG2415943-6 MB								
Nitrate (as N)			<0.020		mg/L		0.02	23-OCT-16
PH-ALK-WT	**Water**							
Batch R3575575								
WG2414537-10 LCS								
pH			6.97		pH units		6.9-7.1	20-OCT-16
SO4-IC-N-WT	**Water**							
Batch R3579307								
WG2415943-12 LCS								
Sulfate (SO4)			100.8		%		90-110	23-OCT-16
WG2415943-7 LCS								
Sulfate (SO4)			100.6		%		90-110	23-OCT-16
WG2415943-11 MB								
Sulfate (SO4)			<0.30		mg/L		0.3	23-OCT-16
WG2415943-6 MB								
Sulfate (SO4)			<0.30		mg/L		0.3	23-OCT-16
SOLIDS-TDS-WT	**Water**							
Batch R3580302								
WG2418394-2 LCS								
Total Dissolved Solids			95.4		%		85-115	25-OCT-16
WG2418394-1 MB								

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
SOLIDS-TDS-WT	**Water**							
Batch R3580302								
WG2418394-1 MB								
Total Dissolved Solids			<10		mg/L		10	25-OCT-16
TKN-WT	**Water**							
Batch R3577223								
WG2415564-2 LCS								
Total Kjeldahl Nitrogen			98.3		%		75-125	21-OCT-16
WG2415564-1 MB								
Total Kjeldahl Nitrogen			<0.15		mg/L		0.15	21-OCT-16

Quality Control Report

Legend:

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

Hold Time Exceedances:

All test results reported with this submission were conducted within ALS recommended hold times.

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

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

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

L1845890 ESmith e8 19-Oct-16 19D

Matrix Solutions Inc.
ENVIRONMENT & ENGINEERING

COC # M 81837

Page: 1 of 1

Lab Submitted to : ALS Waterloo
Lab Agreement no : Q 58595
Lab Job ID:

Invoice to: Require Report: Y ✓ N___

Company Name: MATRIX SOLUTIONS
Contact Name: Scott Miller
Address: 31 Beacon Point Court
Breslau ON PC:
Phone / Fax#: Ph: Fax:

Copy of Report to:
Matrix Solutions - Data Management
Suite 200, 150 - 13th Avenue SW
Calgary, Alberta, Canada
T2R 0V2
Ph: 403-237-0606 Fax: 403-263-2493
Fax draft copy of invoice to Matrix Solutions Inc.

Matrix Project # : 23089-528
Matrix Proj. Name: Claire-Maltby
Location:
Sampler's Name(s): S. Miller

AFE #:

REGULATORY REQUIREMENTS: (check)
☐ Alberta Tier 1
☐ SPIGEC
☐ Freshwater Aquatic Life (Low Level Metals)
☐ Canadian Drinking Water
☐ BC Regs
☐ Other: 149006.02.03

SERVICE REQUESTED:
☐ RUSH (Please ensure you contact the lab) Due Date:
☒ REGULAR Turnaround

REPORT DISTRIBUTION: always send to data_management@matrix-solutions.com
☐ Additional Emails smiller@matrix-solutions.com

	Sample Number (14 digits only) yr-mth-day	Sample Point Name	Depth (cm)	Sample Type	Date/Time Sampled	Quantity # of Jars	Quantity # of Bags	Analysis Required: Q58595	Lab Sample Number
1	23089161019001	MW7	–	Water	Oct 19 10:30	3	–	X	1
2	002	MW8D	–	↓	12:30	3	–	X	2
3	003	MW8S	–		12:50	3	–	X	3
4	004	MW6D	–		15:30	3	–	X	4
5	005	MW6S	–		15:55	3	–	X	5
6	006	MW5S	–		17:15	3	–	X	6
7	23089161019 007	MW5D	–	↓	Oct 19 17:30	3	–	X	7
8									
9									
10									
11									
12									
13									
14									
15									

L1845890-COFC

*For metals in water samples indicate if you want Total (T), Dissolved (D) or Extractable (E) as part of "Analysis Required"

Preserved/Filtered

Relinquished by: Scott Miller Date/Time: Oct 19/16 19:30
Signature:
Received by: EVS Date/Time: Oct/19/2016 19:35
Signature:

COMMENTS/SPECIAL INSTRUCTIONS
Call Scott with any questions 403 589 1599
See Quote Q58595 / Metals are dissolved & field filtered

TEMP on arrival: 8.7 ecs.

MATRIX SOLUTIONS INC.
ATTN: Scott Miller
31 Beacon Point Court
Breslau ON N0B 1M0

Date Received:	20-OCT-16
Report Date:	28-OCT-16 14:49 (MT)
Version:	FINAL

Client Phone: 519-772-3777

Certificate of Analysis

Lab Work Order #:	L1846629
Project P.O. #:	NOT SUBMITTED
Job Reference:	23089-528 CLAIRE-MALTBY
C of C Numbers:	
Legal Site Desc:	

Gayle Braun

Gayle Braun
Senior Account Manager

[This report shall not be reproduced except in full without the written authority of the Laboratory.]

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L1846629-1	L1846629-2	L1846629-3	L1846629-4	L1846629-5
	Sample ID	L1846629-1	L1846629-2	L1846629-3	L1846629-4	L1846629-5
	Description	WATER	WATER	WATER	WATER	WATER
	Sampled Date	20-OCT-16	20-OCT-16	20-OCT-16	20-OCT-16	20-OCT-16
	Sampled Time	11:30	11:40	12:05	12:15	14:30
	Client ID	23089161020001-MW25	23089161020002-MW2D	23089161020003-MW1D	23089161020004-MW1S	23089161020005-MW3D
WATER						
Physical Tests	Conductivity (umhos/cm)	862	723	411	947	517
	pH (pH units)	6.85	7.15	7.96	7.20	7.54
	Total Dissolved Solids (mg/L)	495 DLDS	416 DLDS	246 DLDS	550 DLDS	293 DLDS
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	375	354	188	291	248
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<10	<10	<10	<10	<10
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<10	<10	<10	<10	<10
	Alkalinity, Total (as CaCO3) (mg/L)	375	354	188	291	248
	Chloride (Cl) (mg/L)	61.3	18.4	13.2 DLDS	106	12.6
	Computed Conductivity (uS/cm)	732	631	365	822	457
	Conductivity % Difference (%)	-16.3	-13.5	-11.8	-14.2	-12.2
	Hardness (as CaCO3) (mg/L)	349	352	131	339	249
	Ion Balance (%)	101	106	104	100	103
	Langelier Index	0.0	0.2	0.2	0.1	0.3
	Nitrate (as N) (mg/L)	<0.020	<0.020	<0.10 DLDS	2.12	<0.020
	Nitrite (as N) (mg/L)	<0.010	<0.010	<0.050 DLDS	<0.010	<0.010
	Total Kjeldahl Nitrogen (mg/L)	0.48	0.44	0.67	0.43	0.23
	Saturation pH (pH)	6.90	6.92	7.81	7.07	7.27
	TDS (Calculated) (mg/L)	464	399	223	507	278
	Sulfate (SO4) (mg/L)	20.2	34.9	23.4 DLDS	49.3	27.7
	Anion Sum (me/L)	8.30	7.05	3.96	8.95	5.02
	Cation Sum (me/L)	8.42	7.45	4.10	8.95	5.19
	Cation - Anion Balance (%)	0.7	2.7	1.7	0.0	1.7
Dissolved Metals	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Aluminum (Al)-Dissolved (mg/L)	0.0064	<0.0050	0.0070	<0.0050	<0.0050
	Antimony (Sb)-Dissolved (mg/L)	0.00049	0.00046	0.00024	<0.00010	<0.00010
	Arsenic (As)-Dissolved (mg/L)	0.0230	0.0104	0.00763	0.00012	0.00238
	Barium (Ba)-Dissolved (mg/L)	0.0647	0.0901	0.0345	0.0573	0.0806
	Beryllium (Be)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Dissolved (mg/L)	0.028	0.015	0.078	0.021	<0.010
	Cadmium (Cd)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	0.000195	<0.000010
	Calcium (Ca)-Dissolved (mg/L)	98.3	97.0	20.7	87.8	57.9
	Cesium (Cs)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Chromium (Cr)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Cobalt (Co)-Dissolved (mg/L)	0.00300	0.00137	0.00022	<0.00010	0.00013
	Copper (Cu)-Dissolved (mg/L)	0.00056	0.00056	0.00059	0.00129	0.00032
	Iron (Fe)-Dissolved (mg/L)	1.27	0.452	<0.010	<0.010	0.222

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1846629-6	L1846629-7	L1846629-8		
	Description	WATER	WATER	WATER		
	Sampled Date	20-OCT-16	20-OCT-16	20-OCT-16		
	Sampled Time	14:45	16:45	16:55		
	Client ID	23089161020006-MW3S	23089161020007-MW4S	23089161020008-MW4D		
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (umhos/cm)	680	568	484		
	pH (pH units)	7.38	7.66	7.76		
	Total Dissolved Solids (mg/L)	385 DLDS	323 DLDS	278 DLDS		
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	317	227	239		
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<10	<10	<10		
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<10	<10	<10		
	Alkalinity, Total (as CaCO3) (mg/L)	317	227	239		
	Chloride (Cl) (mg/L)	28.6	26.8	9.95		
	Computed Conductivity (uS/cm)	595	513	430		
	Conductivity % Difference (%)	-13.4	-10.2	-11.8		
	Hardness (as CaCO3) (mg/L)	316	237	214		
	Ion Balance (%)	106	102	103		
	Langelier Index	0.3	0.3	0.3		
	Nitrate (as N) (mg/L)	1.65	<0.020	<0.020		
	Nitrite (as N) (mg/L)	<0.010	0.028	<0.010		
	Total Kjeldahl Nitrogen (mg/L)	<1.5 DLM	5.0 DLM	0.18		
	Saturation pH (pH)	7.04	7.35	7.42		
	TDS (Calculated) (mg/L)	370	312	263		
	Sulfate (SO4) (mg/L)	20.4	48.8	25.7		
	Anion Sum (me/L)	6.56	5.51	4.76		
	Cation Sum (me/L)	6.96	5.62	4.91		
	Cation - Anion Balance (%)	3.0	1.0	1.6		
Dissolved Metals	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD		
	Aluminum (Al)-Dissolved (mg/L)	<0.0050	<0.0050	<0.0050		
	Antimony (Sb)-Dissolved (mg/L)	<0.00010	0.00040	<0.00010		
	Arsenic (As)-Dissolved (mg/L)	0.00019	0.00030	0.00812		
	Barium (Ba)-Dissolved (mg/L)	0.0832	0.0793	0.0637		
	Beryllium (Be)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010		
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050		
	Boron (B)-Dissolved (mg/L)	0.011	0.018	0.015		
	Cadmium (Cd)-Dissolved (mg/L)	0.000064	<0.000010	<0.000010		
	Calcium (Ca)-Dissolved (mg/L)	80.5	53.2	41.9		
	Cesium (Cs)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010		
	Chromium (Cr)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050		
	Cobalt (Co)-Dissolved (mg/L)	<0.00010	0.00023	<0.00010		
	Copper (Cu)-Dissolved (mg/L)	0.00081	0.00037	0.00033		
	Iron (Fe)-Dissolved (mg/L)	<0.010	<0.010	0.288		

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1846629-1	L1846629-2	L1846629-3	L1846629-4	L1846629-5
	Description	WATER	WATER	WATER	WATER	WATER
	Sampled Date	20-OCT-16	20-OCT-16	20-OCT-16	20-OCT-16	20-OCT-16
	Sampled Time	11:30	11:40	12:05	12:15	14:30
	Client ID	23089161020001-MW25	23089161020002-MW2D	23089161020003-MW1D	23089161020004-MW1S	23089161020005-MW3D
Grouping	**Analyte**					
WATER						
Dissolved Metals	Lead (Pb)-Dissolved (mg/L)	0.000266	0.000163	<0.000050	0.000180	<0.000050
	Lithium (Li)-Dissolved (mg/L)	0.0014	0.0017	0.0016	0.0016	0.0023
	Magnesium (Mg)-Dissolved (mg/L)	25.1	26.7	19.3	29.0	25.4
	Manganese (Mn)-Dissolved (mg/L)	0.459	0.157	0.0157	0.00157	0.0174
	Molybdenum (Mo)-Dissolved (mg/L)	0.00192	0.00136	0.00453	0.000284	0.000905
	Nickel (Ni)-Dissolved (mg/L)	0.0126	0.00619	0.00152	0.00082	<0.00050
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Dissolved (mg/L)	0.868	1.01	0.798	1.65	0.986
	Rubidium (Rb)-Dissolved (mg/L)	0.00182	0.00129	0.00082	0.00260	0.00056
	Selenium (Se)-Dissolved (mg/L)	0.000151	<0.000050	<0.000050	0.000229	<0.000050
	Silicon (Si)-Dissolved (mg/L)	3.84	5.60	4.60	4.00	6.41
	Silver (Ag)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Sodium (Na)-Dissolved (mg/L)	32.8	8.90	33.7	49.0	4.38
	Strontium (Sr)-Dissolved (mg/L)	0.144	0.142	0.314	0.326	0.109
	Sulfur (S)-Dissolved (mg/L)	6.40	11.2	7.99	16.5	8.95
	Tellurium (Te)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	0.000021	<0.000010
	Thorium (Th)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	0.00014	<0.00010	0.00012
	Titanium (Ti)-Dissolved (mg/L)	DLUI <0.00040	<0.00030	<0.00030	<0.00030	<0.00030
	Tungsten (W)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Uranium (U)-Dissolved (mg/L)	0.00961	0.00489	0.00232	0.000809	0.00149
	Vanadium (V)-Dissolved (mg/L)	0.00128	<0.00050	0.00100	<0.00050	<0.00050
	Zinc (Zn)-Dissolved (mg/L)	0.183	0.0404	0.0042	0.111	0.0053
	Zirconium (Zr)-Dissolved (mg/L)	0.00053	<0.00030	<0.00030	<0.00030	<0.00030

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1846629-6	L1846629-7	L1846629-8		
	Description	WATER	WATER	WATER		
	Sampled Date	20-OCT-16	20-OCT-16	20-OCT-16		
	Sampled Time	14:45	16:45	16:55		
	Client ID	23089161020006-MW3S	23089161020007-MW4S	23089161020008-MW4D		
Grouping	**Analyte**					
WATER						
Dissolved Metals	Lead (Pb)-Dissolved (mg/L)	0.000158	<0.000050	<0.000050		
	Lithium (Li)-Dissolved (mg/L)	<0.0010	<0.0010	0.0029		
	Magnesium (Mg)-Dissolved (mg/L)	28.0	25.4	26.6		
	Manganese (Mn)-Dissolved (mg/L)	0.0130	0.0575	0.0135		
	Molybdenum (Mo)-Dissolved (mg/L)	0.000447	0.00660	0.00315		
	Nickel (Ni)-Dissolved (mg/L)	0.00083	0.00647	<0.00050		
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050		
	Potassium (K)-Dissolved (mg/L)	1.62	2.80	1.48		
	Rubidium (Rb)-Dissolved (mg/L)	0.00205	0.00208	0.00062		
	Selenium (Se)-Dissolved (mg/L)	0.000258	0.000206	<0.000050		
	Silicon (Si)-Dissolved (mg/L)	5.02	5.85	8.69		
	Silver (Ag)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050		
	Sodium (Na)-Dissolved (mg/L)	13.7	18.5	13.5		
	Strontium (Sr)-Dissolved (mg/L)	0.110	0.256	0.158		
	Sulfur (S)-Dissolved (mg/L)	6.67	15.5	8.32		
	Tellurium (Te)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020		
	Thallium (Tl)-Dissolved (mg/L)	0.000024	0.000014	<0.000010		
	Thorium (Th)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010		
	Tin (Sn)-Dissolved (mg/L)	<0.00010	0.00070	0.00013		
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030		
	Tungsten (W)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010		
	Uranium (U)-Dissolved (mg/L)	0.00102	0.00248	0.00112		
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050		
	Zinc (Zn)-Dissolved (mg/L)	0.0648	0.0039	0.0272		
	Zirconium (Zr)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030		

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L1846629-1, -2, -3, -4, -5, -6, -7, -8
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L1846629-1, -2, -3, -4, -5, -6, -7, -8
Matrix Spike	Iron (Fe)-Dissolved	MS-B	L1846629-1, -2, -3, -4, -5, -6, -7, -8
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L1846629-1, -2, -3, -4, -5, -6, -7, -8
Matrix Spike	Manganese (Mn)-Dissolved	MS-B	L1846629-1, -2, -3, -4, -5, -6, -7, -8
Matrix Spike	Silicon (Si)-Dissolved	MS-B	L1846629-1, -2, -3, -4, -5, -6, -7, -8
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L1846629-1, -2, -3, -4, -5, -6, -7, -8
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L1846629-1, -2, -3, -4, -5, -6, -7, -8
Matrix Spike	Sulfur (S)-Dissolved	MS-B	L1846629-1, -2, -3, -4, -5, -6, -7, -8
Matrix Spike	Uranium (U)-Dissolved	MS-B	L1846629-1, -2, -3, -4, -5, -6, -7, -8

Qualifiers for Individual Parameters Listed:

Qualifier	Description
DLDS	Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).
DLUI	Detection Limit Raised: Unknown Interference generated an apparent false positive test result.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-SPEC-WT	Water	Speciated Alkalinity	EPA 310.2
CL-IC-WT	Water	Chloride by IC	EPA 300.1 (mod)

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

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

EC-WT	Water	Conductivity	APHA 2510 B

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

IONBALANCE-OP03-WT	Water	Detailed Ion Balance Calculation	APHA 1030E, 2330B, 2510A
MET-D-CCMS-WT	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B/6020A (mod)

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

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

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

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

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

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

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

PH-ALK-WT	Water	pH	APHA 4500 H-Electrode

Water samples are analyzed directly by a calibrated pH meter.

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

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

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

A well-mixed sample is filtered though glass fibres filter. A known volume of the filtrate is evaporated and dried at 105–5°C overnight and then 180–10°C for 1hr.

TKN-WT	Water	Total Kjeldahl Nitrogen	APHA 4500-N

Sample is digested to convert the TKN to ammonium sulphate. The ammonia ions are heated to produce a colour complex. The absorbance measured by the instrument is proportional to the concentration of ammonium sulphate in the sample and is reported as TKN.

Reference Information

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

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

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

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

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

Quality Control Report

Workorder: L1846629 Report Date: 28-OCT-16

Client: MATRIX SOLUTIONS INC.
31 Beacon Point Court
Breslau ON N0B 1M0
Contact: Scott Miller

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
ALK-SPEC-WT	**Water**							
Batch R3577280								
WG2416369-3 CRM		**WT-ALK-CRM**						
Alkalinity, Total (as CaCO3)			98.9		%		80-120	21-OCT-16
WG2416369-4 DUP		**L1846629-1**						
Alkalinity, Total (as CaCO3)		375	373		mg/L	0.5	20	21-OCT-16
WG2416369-2 LCS								
Alkalinity, Total (as CaCO3)			100.2		%		85-115	21-OCT-16
WG2416369-1 MB								
Alkalinity, Total (as CaCO3)			<10		mg/L		10	21-OCT-16
CL-IC-WT	**Water**							
Batch R3580587								
WG2418167-9 DUP		**L1846629-2**						
Chloride (Cl)		18.4	18.4		mg/L	0.2	25	25-OCT-16
WG2418167-7 LCS								
Chloride (Cl)			100.9		%		70-130	25-OCT-16
WG2418167-6 MB								
Chloride (Cl)			<0.50		mg/L		0.5	25-OCT-16
WG2418167-10 MS		**L1846629-2**						
Chloride (Cl)			101.4		%		70-130	25-OCT-16
EC-WT	**Water**							
Batch R3577079								
WG2416125-8 DUP		**L1846629-1**						
Conductivity		862	866		umhos/cm	0.1	10	22-OCT-16
WG2416125-2 LCS								
Conductivity			99.5		%		90-110	22-OCT-16
WG2416125-6 LCS								
Conductivity			100.0		%		90-110	22-OCT-16
WG2416125-1 MB								
Conductivity			<3.0		umhos/cm		3	22-OCT-16
WG2416125-5 MB								
Conductivity			<3.0		umhos/cm		3	22-OCT-16
Batch R3582038								
WG2420644-4 DUP		**L1846629-3**						
Conductivity		411	416		umhos/cm	0.0	10	28-OCT-16
WG2420644-2 LCS								
Conductivity			99.9		%		90-110	28-OCT-16
WG2420644-1 MB								
Conductivity			<3.0		umhos/cm		3	28-OCT-16
MET-D-CCMS-WT	**Water**							

Quality Control Report

Workorder: L1846629 Report Date: 28-OCT-16

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-WT	**Water**							
Batch R3578737								
WG2416020-2 LCS								
Aluminum (Al)-Dissolved			91.6		%		80-120	21-OCT-16
Antimony (Sb)-Dissolved			100.8		%		80-120	21-OCT-16
Arsenic (As)-Dissolved			93.6		%		80-120	21-OCT-16
Barium (Ba)-Dissolved			93.9		%		80-120	21-OCT-16
Beryllium (Be)-Dissolved			85.4		%		80-120	21-OCT-16
Bismuth (Bi)-Dissolved			98.1		%		80-120	21-OCT-16
Boron (B)-Dissolved			88.0		%		80-120	21-OCT-16
Cadmium (Cd)-Dissolved			95.5		%		80-120	21-OCT-16
Calcium (Ca)-Dissolved			89.8		%		80-120	21-OCT-16
Cesium (Cs)-Dissolved			97.0		%		80-120	21-OCT-16
Chromium (Cr)-Dissolved			93.0		%		80-120	21-OCT-16
Cobalt (Co)-Dissolved			93.4		%		80-120	21-OCT-16
Copper (Cu)-Dissolved			95.1		%		80-120	21-OCT-16
Iron (Fe)-Dissolved			93.7		%		80-120	21-OCT-16
Lead (Pb)-Dissolved			97.0		%		80-120	21-OCT-16
Lithium (Li)-Dissolved			85.6		%		80-120	21-OCT-16
Magnesium (Mg)-Dissolved			93.1		%		80-120	21-OCT-16
Manganese (Mn)-Dissolved			92.8		%		80-120	21-OCT-16
Molybdenum (Mo)-Dissolved			92.4		%		80-120	21-OCT-16
Nickel (Ni)-Dissolved			94.4		%		80-120	21-OCT-16
Phosphorus (P)-Dissolved			96.3		%		80-120	21-OCT-16
Potassium (K)-Dissolved			93.3		%		80-120	21-OCT-16
Rubidium (Rb)-Dissolved			93.1		%		80-120	21-OCT-16
Selenium (Se)-Dissolved			96.8		%		80-120	21-OCT-16
Silicon (Si)-Dissolved			97.2		%		80-120	21-OCT-16
Silver (Ag)-Dissolved			93.1		%		80-120	21-OCT-16
Sodium (Na)-Dissolved			93.3		%		80-120	21-OCT-16
Strontium (Sr)-Dissolved			96.6		%		80-120	21-OCT-16
Sulfur (S)-Dissolved			91.4		%		80-120	21-OCT-16
Tellurium (Te)-Dissolved			92.1		%		80-120	21-OCT-16
Thallium (Tl)-Dissolved			95.0		%		80-120	21-OCT-16
Thorium (Th)-Dissolved			94.2		%		80-120	21-OCT-16
Tin (Sn)-Dissolved			95.4		%		80-120	21-OCT-16
Titanium (Ti)-Dissolved			88.9		%		80-120	21-OCT-16

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-WT	**Water**							
Batch R3578737								
WG2416020-2 LCS								
Tungsten (W)-Dissolved			96.0		%		80-120	21-OCT-16
Uranium (U)-Dissolved			100.5		%		80-120	21-OCT-16
Vanadium (V)-Dissolved			94.2		%		80-120	21-OCT-16
Zinc (Zn)-Dissolved			91.6		%		80-120	21-OCT-16
Zirconium (Zr)-Dissolved			88.4		%		80-120	21-OCT-16
WG2416020-1 MB								
Aluminum (Al)-Dissolved			<0.0050		mg/L		0.005	21-OCT-16
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	21-OCT-16
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	21-OCT-16
Barium (Ba)-Dissolved			<0.00010		mg/L		0.0001	21-OCT-16
Beryllium (Be)-Dissolved			<0.00010		mg/L		0.0001	21-OCT-16
Bismuth (Bi)-Dissolved			<0.000050		mg/L		0.00005	21-OCT-16
Boron (B)-Dissolved			<0.010		mg/L		0.01	21-OCT-16
Cadmium (Cd)-Dissolved			<0.000010		mg/L		0.00001	21-OCT-16
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	21-OCT-16
Cesium (Cs)-Dissolved			<0.000010		mg/L		0.00001	21-OCT-16
Chromium (Cr)-Dissolved			<0.00050		mg/L		0.0005	21-OCT-16
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	21-OCT-16
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	21-OCT-16
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	21-OCT-16
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	21-OCT-16
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	21-OCT-16
Magnesium (Mg)-Dissolved			<0.050		mg/L		0.05	21-OCT-16
Manganese (Mn)-Dissolved			<0.00050		mg/L		0.0005	21-OCT-16
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	21-OCT-16
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	21-OCT-16
Phosphorus (P)-Dissolved			<0.050		mg/L		0.05	21-OCT-16
Potassium (K)-Dissolved			<0.050		mg/L		0.05	21-OCT-16
Rubidium (Rb)-Dissolved			<0.00020		mg/L		0.0002	21-OCT-16
Selenium (Se)-Dissolved			<0.000050		mg/L		0.00005	21-OCT-16
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	21-OCT-16
Silver (Ag)-Dissolved			<0.000050		mg/L		0.00005	21-OCT-16
Sodium (Na)-Dissolved			<0.50		mg/L		0.5	21-OCT-16
Strontium (Sr)-Dissolved			<0.0010		mg/L		0.001	21-OCT-16

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-WT	**Water**							
Batch R3578737								
WG2416020-1 MB								
Sulfur (S)-Dissolved			<0.50		mg/L		0.5	21-OCT-16
Tellurium (Te)-Dissolved			<0.00020		mg/L		0.0002	21-OCT-16
Thallium (Tl)-Dissolved			<0.000010		mg/L		0.00001	21-OCT-16
Thorium (Th)-Dissolved			<0.00010		mg/L		0.0001	21-OCT-16
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	21-OCT-16
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	21-OCT-16
Tungsten (W)-Dissolved			<0.00010		mg/L		0.0001	21-OCT-16
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	21-OCT-16
Vanadium (V)-Dissolved			<0.00050		mg/L		0.0005	21-OCT-16
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	21-OCT-16
Zirconium (Zr)-Dissolved			<0.00030		mg/L		0.0003	21-OCT-16
NO2-IC-WT	**Water**							
Batch R3580587								
WG2418167-9 DUP		**L1846629-2**						
Nitrite (as N)		<0.010	<0.010	RPD-NA	mg/L	N/A	25	25-OCT-16
WG2418167-7 LCS								
Nitrite (as N)			104.0		%		70-130	25-OCT-16
WG2418167-6 MB								
Nitrite (as N)			<0.010		mg/L		0.01	25-OCT-16
WG2418167-10 MS		**L1846629-2**						
Nitrite (as N)			101.0		%		70-130	25-OCT-16
NO3-IC-WT	**Water**							
Batch R3580587								
WG2418167-9 DUP		**L1846629-2**						
Nitrate (as N)		<0.020	<0.020	RPD-NA	mg/L	N/A	25	25-OCT-16
WG2418167-7 LCS								
Nitrate (as N)			99.9		%		70-130	25-OCT-16
WG2418167-6 MB								
Nitrate (as N)			<0.020		mg/L		0.02	25-OCT-16
WG2418167-10 MS		**L1846629-2**						
Nitrate (as N)			100.1		%		70-130	25-OCT-16
PH-ALK-WT	**Water**							
Batch R3576742								
WG2415568-10 LCS								
pH			6.99		pH units		6.9-7.1	21-OCT-16

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
SO4-IC-N-WT	**Water**							
Batch R3580587								
WG2418167-9 DUP		**L1846629-2**						
Sulfate (SO4)		34.9	34.9		mg/L	0.1	20	25-OCT-16
WG2418167-7 LCS								
Sulfate (SO4)			100.8		%		90-110	25-OCT-16
WG2418167-6 MB								
Sulfate (SO4)			<0.30		mg/L		0.3	25-OCT-16
WG2418167-10 MS		**L1846629-2**						
Sulfate (SO4)			98.3		%		75-125	25-OCT-16
SOLIDS-TDS-WT	**Water**							
Batch R3580302								
WG2418394-2 LCS								
Total Dissolved Solids			95.4		%		85-115	25-OCT-16
WG2418394-1 MB								
Total Dissolved Solids			<10		mg/L		10	25-OCT-16
TKN-WT	**Water**							
Batch R3579625								
WG2417137-3 DUP		**L1846629-2**						
Total Kjeldahl Nitrogen		0.44	0.39		mg/L	10	20	25-OCT-16
WG2417133-2 LCS								
Total Kjeldahl Nitrogen			93.5		%		75-125	25-OCT-16
WG2417137-2 LCS								
Total Kjeldahl Nitrogen			97.8		%		75-125	25-OCT-16
WG2417133-1 MB								
Total Kjeldahl Nitrogen			<0.15		mg/L		0.15	25-OCT-16
WG2417137-1 MB								
Total Kjeldahl Nitrogen			<0.15		mg/L		0.15	25-OCT-16
WG2417137-4 MS		**L1846629-2**						
Total Kjeldahl Nitrogen			112.8		%		70-130	25-OCT-16
Batch R3580613								
WG2417995-2 LCS								
Total Kjeldahl Nitrogen			112.2		%		75-125	26-OCT-16
WG2417995-1 MB								
Total Kjeldahl Nitrogen			<0.15		mg/L		0.15	26-OCT-16

Legend:

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

Sample Parameter Qualifier Definitions:

Qualifier	Description
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Hold Time Exceedances:

All test results reported with this submission were conducted within ALS recommended hold times.

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

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

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

Matrix Solutions Inc.
ENVIRONMENT & ENGINEERING

COC # M 81838

Page: 1 **of** 1

Lab Submitted to : ALS Waterloo
Lab Agreement no : Q58595
Lab Job ID:

Invoice to: Require Report:Y✓ N__
Company Name: MATRIX SOLUTIONS
Contact Name: Scott Miller
Address: 31 Beacon Pt Court
PC:
Phone / Fax#: Ph: Fax:
AFE #: 149006.02.03

Copy of Report to:
Matrix Solutions - Data Management
Suite 200, 150 - 13th Avenue SW
Calgary, Alberta, Canada
T2R 0V2
Ph: 403-237-0606 Fax: 403-263-2493
Fax draft copy of invoice to Matrix Solutions Inc.

Matrix Project # : 23089-528
Matrix Proj. Name: Claire-Maltby
Location:
Sampler's Name(s): S. Miller

REGULATORY REQUIREMENTS: (check)
- ☐ Alberta Tier 1
- ☐ SPIGEC
- ☐ Freshwater Aquatic Life (Low Level Metals)
- ☐ Canadian Drinking Water
- ☐ BC Regs
- ☐ Other:

SERVICE REQUESTED:
- ☐ **RUSH** (Please ensure you contact the lab) **Due Date:**
- ☑ REGULAR Turnaround

REPORT DISTRIBUTION: always send to data_management@matrix-solutions.com
- ☑ Additional Emails smiller@matrix-solutions.com

Analysis Required

	Sample Number (14 digits only) yr-mth-day	Sample Point Name	Depth (cm)	Sample Type	Date/Time Sampled	Quantity # of Jars	Quantity # of Bags	Q58595													Lab Sample Number
1	23089161020001	MW25	—	Water	oct 20 11:30	3	—	X													1
2	↓ 002	MW2D	—	↓	↓ 11:40	3	—	X													2
3	003	MW1D	—		12:05	3	—	X													3
4	004	MW15	—		12:15	3	—	X													4
5	005	MW30	—		14:30	3	—	X													5
6	006	MW35	—		14:45	3	—	X													6
7	007	MW45	—		16:45	3	—	X													7
8	23089161020008	MW4D	—	Water	oct 20 16:55	3	—	X													8
9																					
10																					
11																					
12																					
13																					
14																					
15																					

L1846629-COFC

*For metals in water samples indicate if you want Total (T), Dissolved (D) or Extractable (E) as part of "Analysis Required" Preserved/Filtered

Relinquished by: Scott Miller **Date/Time:** Oct 20/16 18:30
Signature:
Received by: 5.3 **Date/Time:** Oct 20/16 @18:30
Signature: Amanda Farkas

COMMENTS/SPECIAL INSTRUCTIONS CALL Scott With Questions 403 589-1599
Metals were field filtered. See Q58595

MATRIX SOLUTIONS INC.
ATTN: Scott Miller
31 Beacon Point Court
Breslau ON N0B 1M0

Date Received:	21-OCT-16
Report Date:	01-NOV-16 08:17 (MT)
Version:	FINAL

Client Phone: 519-772-3777

Certificate of Analysis

Lab Work Order #:	L1847231
Project P.O. #:	CLAIRE-MALTBY
Job Reference:	23089-528
C of C Numbers:	81839
Legal Site Desc:	

Gayle Braun

Gayle Braun
Senior Account Manager

[This report shall not be reproduced except in full without the written authority of the Laboratory.]

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1847231-1	L1847231-2
	Description	WATER	WATER
	Sampled Date	21-OCT-16	21-OCT-16
	Sampled Time	11:30	11:45
	Client ID	23089161021001 MW9D	23089161021002 MW95
Grouping	**Analyte**		
WATER			
Physical Tests	Conductivity (umhos/cm)	445	583
	pH (pH units)	7.56	7.28
	Total Dissolved Solids (mg/L)	DLDS 272	DLDS 346
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	237	260
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<10	<10
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<10	<10
	Alkalinity, Total (as CaCO3) (mg/L)	237	260
	Chloride (Cl) (mg/L)	2.79	14.1
	Computed Conductivity (uS/cm)	404	547
	Conductivity % Difference (%)	-9.6	-6.4
	Hardness (as CaCO3) (mg/L)	228	319
	Ion Balance (%)	123	121
	Langelier Index	0.3	0.2
	Nitrate (as N) (mg/L)	<0.020	7.00
	Nitrite (as N) (mg/L)	<0.010	<0.010
	Total Kjeldahl Nitrogen (mg/L)	0.48	1.91
	Saturation pH (pH)	7.30	7.08
	TDS (Calculated) (mg/L)	243	339
	Sulfate (SO4) (mg/L)	7.88	16.9
	Anion Sum (me/L)	4.15	5.51
	Cation Sum (me/L)	5.11	6.67
	Cation - Anion Balance (%)	10.4	9.5
Dissolved Metals	Dissolved Metals Filtration Location	FIELD	FIELD
	Aluminum (Al)-Dissolved (mg/L)	<0.0050	<0.0050
	Antimony (Sb)-Dissolved (mg/L)	0.00013	<0.00010
	Arsenic (As)-Dissolved (mg/L)	0.00390	0.00012
	Barium (Ba)-Dissolved (mg/L)	0.0908	0.0869
	Beryllium (Be)-Dissolved (mg/L)	<0.00010	<0.00010
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050
	Boron (B)-Dissolved (mg/L)	0.017	0.012
	Cadmium (Cd)-Dissolved (mg/L)	0.000019	0.000036
	Calcium (Ca)-Dissolved (mg/L)	54.4	89.3
	Cesium (Cs)-Dissolved (mg/L)	<0.000010	<0.000010
	Chromium (Cr)-Dissolved (mg/L)	<0.00050	<0.00050
	Cobalt (Co)-Dissolved (mg/L)	0.00023	<0.00010
	Copper (Cu)-Dissolved (mg/L)	0.00054	0.00112
	Iron (Fe)-Dissolved (mg/L)	0.024	<0.010

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1847231-1	L1847231-2			
	Description	WATER	WATER			
	Sampled Date	21-OCT-16	21-OCT-16			
	Sampled Time	11:30	11:45			
	Client ID	23089161021001 MW9D	23089161021002 MW95			
Grouping	**Analyte**					
WATER						
Dissolved Metals	Lead (Pb)-Dissolved (mg/L)	0.000113	0.000060			
	Lithium (Li)-Dissolved (mg/L)	0.0027	<0.0010			
	Magnesium (Mg)-Dissolved (mg/L)	22.3	23.4			
	Manganese (Mn)-Dissolved (mg/L)	0.0367	0.00469			
	Molybdenum (Mo)-Dissolved (mg/L)	0.00634	0.000203			
	Nickel (Ni)-Dissolved (mg/L)	0.00068	<0.00050			
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050			
	Potassium (K)-Dissolved (mg/L)	1.08	3.34			
	Rubidium (Rb)-Dissolved (mg/L)	0.00167	0.00047			
	Selenium (Se)-Dissolved (mg/L)	<0.000050	0.000314			
	Silicon (Si)-Dissolved (mg/L)	7.26	4.43			
	Silver (Ag)-Dissolved (mg/L)	<0.000050	<0.000050			
	Sodium (Na)-Dissolved (mg/L)	12.1	4.69			
	Strontium (Sr)-Dissolved (mg/L)	0.166	0.0948			
	Sulfur (S)-Dissolved (mg/L)	2.24	5.60			
	Tellurium (Te)-Dissolved (mg/L)	<0.00020	<0.00020			
	Thallium (Tl)-Dissolved (mg/L)	0.000020	<0.000010			
	Thorium (Th)-Dissolved (mg/L)	<0.00010	<0.00010			
	Tin (Sn)-Dissolved (mg/L)	0.00027	0.00027			
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030			
	Tungsten (W)-Dissolved (mg/L)	<0.00010	<0.00010			
	Uranium (U)-Dissolved (mg/L)	0.00104	0.000262			
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050			
	Zinc (Zn)-Dissolved (mg/L)	0.0146	0.0604			
	Zirconium (Zr)-Dissolved (mg/L)	<0.00030	<0.00030			

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

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L1847231-1, -2
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L1847231-1, -2
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L1847231-1, -2
Matrix Spike	Potassium (K)-Dissolved	MS-B	L1847231-1, -2
Matrix Spike	Silicon (Si)-Dissolved	MS-B	L1847231-1, -2
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L1847231-1, -2
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L1847231-1, -2
Matrix Spike	Sulfur (S)-Dissolved	MS-B	L1847231-1, -2
Matrix Spike	Uranium (U)-Dissolved	MS-B	L1847231-1, -2

Qualifiers for Individual Parameters Listed:

Qualifier	Description
DLDS	Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-SPEC-WT	Water	Speciated Alkalinity	EPA 310.2
CL-IC-WT	Water	Chloride by IC	EPA 300.1 (mod)

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

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

EC-WT	Water	Conductivity	APHA 2510 B

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

IONBALANCE-OP03-WT	Water	Detailed Ion Balance Calculation	APHA 1030E, 2330B, 2510A
MET-D-CCMS-WT	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B/6020A (mod)

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

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

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

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

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

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

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

PH-ALK-WT	Water	pH	APHA 4500 H-Electrode

Water samples are analyzed directly by a calibrated pH meter.

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

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

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

A well-mixed sample is filtered though glass fibres filter. A known volume of the filtrate is evaporated and dried at 105–5°C overnight and then 180–10°C for 1hr.

TKN-WT	Water	Total Kjeldahl Nitrogen	APHA 4500-N

Sample is digested to convert the TKN to ammonium sulphate. The ammonia ions are heated to produce a colour complex. The absorbance measured by the instrument is proportional to the concentration of ammonium sulphate in the sample and is reported as TKN.

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

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

Laboratory Definition Code	Laboratory Location

Reference Information

WT	ALS ENVIRONMENTAL - WATERLOO, ONTARIO, CANADA

Chain of Custody Numbers:

81839

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Quality Control Report

Workorder: L1847231 Report Date: 01-NOV-16

Client: MATRIX SOLUTIONS INC.
31 Beacon Point Court
Breslau ON N0B 1M0
Contact: Scott Miller

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
ALK-SPEC-WT	**Water**							
Batch R3579263								
WG2417846-3 CRM		**WT-ALK-CRM**						
Alkalinity, Total (as CaCO3)			96.8		%		80-120	24-OCT-16
WG2417846-2 LCS								
Alkalinity, Total (as CaCO3)			104.4		%		85-115	24-OCT-16
WG2417846-1 MB								
Alkalinity, Total (as CaCO3)			<10		mg/L		10	24-OCT-16
CL-IC-WT	**Water**							
Batch R3581637								
WG2420201-12 LCS								
Chloride (Cl)			100.5		%		70-130	27-OCT-16
WG2420201-11 MB								
Chloride (Cl)			<0.50		mg/L		0.5	27-OCT-16
EC-WT	**Water**							
Batch R3579021								
WG2416673-2 LCS								
Conductivity			97.8		%		90-110	22-OCT-16
WG2416673-1 MB								
Conductivity			<3.0		umhos/cm		3	22-OCT-16
MET-D-CCMS-WT	**Water**							
Batch R3579149								
WG2417038-2 LCS								
Aluminum (Al)-Dissolved			104.3		%		80-120	25-OCT-16
Antimony (Sb)-Dissolved			98.1		%		80-120	25-OCT-16
Arsenic (As)-Dissolved			95.9		%		80-120	25-OCT-16
Barium (Ba)-Dissolved			97.3		%		80-120	25-OCT-16
Beryllium (Be)-Dissolved			101.8		%		80-120	25-OCT-16
Bismuth (Bi)-Dissolved			98.7		%		80-120	25-OCT-16
Boron (B)-Dissolved			100.6		%		80-120	25-OCT-16
Cadmium (Cd)-Dissolved			93.1		%		80-120	25-OCT-16
Calcium (Ca)-Dissolved			99.9		%		80-120	25-OCT-16
Cesium (Cs)-Dissolved			98.7		%		80-120	25-OCT-16
Chromium (Cr)-Dissolved			94.2		%		80-120	25-OCT-16
Cobalt (Co)-Dissolved			93.6		%		80-120	25-OCT-16
Copper (Cu)-Dissolved			91.7		%		80-120	25-OCT-16
Iron (Fe)-Dissolved			84.7		%		80-120	25-OCT-16
Lead (Pb)-Dissolved			95.2		%		80-120	25-OCT-16

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-WT	**Water**							
Batch R3579149								
WG2417038-2 LCS								
Lithium (Li)-Dissolved			106.8		%		80-120	25-OCT-16
Magnesium (Mg)-Dissolved			99.0		%		80-120	25-OCT-16
Manganese (Mn)-Dissolved			96.8		%		80-120	25-OCT-16
Molybdenum (Mo)-Dissolved			93.4		%		80-120	25-OCT-16
Nickel (Ni)-Dissolved			93.1		%		80-120	25-OCT-16
Phosphorus (P)-Dissolved			101.3		%		80-120	25-OCT-16
Potassium (K)-Dissolved			95.6		%		80-120	25-OCT-16
Rubidium (Rb)-Dissolved			99.8		%		80-120	25-OCT-16
Selenium (Se)-Dissolved			87.2		%		80-120	25-OCT-16
Silicon (Si)-Dissolved			106.1		%		80-120	25-OCT-16
Silver (Ag)-Dissolved			94.1		%		80-120	25-OCT-16
Sodium (Na)-Dissolved			96.8		%		80-120	25-OCT-16
Strontium (Sr)-Dissolved			98.7		%		80-120	25-OCT-16
Sulfur (S)-Dissolved			100.4		%		80-120	25-OCT-16
Tellurium (Te)-Dissolved			94.0		%		80-120	25-OCT-16
Thallium (Tl)-Dissolved			96.7		%		80-120	25-OCT-16
Thorium (Th)-Dissolved			92.1		%		80-120	25-OCT-16
Tin (Sn)-Dissolved			95.0		%		80-120	25-OCT-16
Titanium (Ti)-Dissolved			94.7		%		80-120	25-OCT-16
Tungsten (W)-Dissolved			93.5		%		80-120	25-OCT-16
Uranium (U)-Dissolved			93.2		%		80-120	25-OCT-16
Vanadium (V)-Dissolved			96.7		%		80-120	25-OCT-16
Zinc (Zn)-Dissolved			89.5		%		80-120	25-OCT-16
Zirconium (Zr)-Dissolved			93.7		%		80-120	25-OCT-16
WG2417038-1 MB								
Aluminum (Al)-Dissolved			<0.0050		mg/L		0.005	25-OCT-16
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	25-OCT-16
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	25-OCT-16
Barium (Ba)-Dissolved			<0.00010		mg/L		0.0001	25-OCT-16
Beryllium (Be)-Dissolved			<0.00010		mg/L		0.0001	25-OCT-16
Bismuth (Bi)-Dissolved			<0.000050		mg/L		0.00005	25-OCT-16
Boron (B)-Dissolved			<0.010		mg/L		0.01	25-OCT-16
Cadmium (Cd)-Dissolved			<0.000010		mg/L		0.00001	25-OCT-16
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	25-OCT-16

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-WT	**Water**							
Batch R3579149								
WG2417038-1 MB								
Cesium (Cs)-Dissolved			<0.000010		mg/L		0.00001	25-OCT-16
Chromium (Cr)-Dissolved			<0.00050		mg/L		0.0005	25-OCT-16
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	25-OCT-16
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	25-OCT-16
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	25-OCT-16
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	25-OCT-16
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	25-OCT-16
Magnesium (Mg)-Dissolved			<0.050		mg/L		0.05	25-OCT-16
Manganese (Mn)-Dissolved			<0.00050		mg/L		0.0005	25-OCT-16
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	25-OCT-16
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	25-OCT-16
Phosphorus (P)-Dissolved			<0.050		mg/L		0.05	25-OCT-16
Potassium (K)-Dissolved			<0.050		mg/L		0.05	25-OCT-16
Rubidium (Rb)-Dissolved			<0.00020		mg/L		0.0002	25-OCT-16
Selenium (Se)-Dissolved			<0.000050		mg/L		0.00005	25-OCT-16
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	25-OCT-16
Silver (Ag)-Dissolved			<0.000050		mg/L		0.00005	25-OCT-16
Sodium (Na)-Dissolved			<0.50		mg/L		0.5	25-OCT-16
Strontium (Sr)-Dissolved			<0.0010		mg/L		0.001	25-OCT-16
Sulfur (S)-Dissolved			<0.50		mg/L		0.5	25-OCT-16
Tellurium (Te)-Dissolved			<0.00020		mg/L		0.0002	25-OCT-16
Thallium (Tl)-Dissolved			<0.000010		mg/L		0.00001	25-OCT-16
Thorium (Th)-Dissolved			<0.00010		mg/L		0.0001	25-OCT-16
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	25-OCT-16
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	25-OCT-16
Tungsten (W)-Dissolved			<0.00010		mg/L		0.0001	25-OCT-16
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	25-OCT-16
Vanadium (V)-Dissolved			<0.00050		mg/L		0.0005	25-OCT-16
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	25-OCT-16
Zirconium (Zr)-Dissolved			<0.00030		mg/L		0.0003	25-OCT-16
NO2-IC-WT	**Water**							

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NO2-IC-WT	**Water**							
Batch R3581637								
WG2420201-12 LCS								
Nitrite (as N)			102.9		%		70-130	27-OCT-16
WG2420201-11 MB								
Nitrite (as N)			<0.010		mg/L		0.01	27-OCT-16
NO3-IC-WT	**Water**							
Batch R3581637								
WG2420201-12 LCS								
Nitrate (as N)			100.3		%		70-130	27-OCT-16
WG2420201-11 MB								
Nitrate (as N)			<0.020		mg/L		0.02	27-OCT-16
PH-ALK-WT	**Water**							
Batch R3577157								
WG2416472-9 DUP		**L1847231-2**						
pH		7.28	7.32	J	pH units	0.04	0.2	22-OCT-16
WG2416472-4 LCS								
pH			6.96		pH units		6.9-7.1	22-OCT-16
WG2416472-7 LCS								
pH			6.94		pH units		6.9-7.1	22-OCT-16
SO4-IC-N-WT	**Water**							
Batch R3581637								
WG2420201-12 LCS								
Sulfate (SO4)			100.3		%		90-110	27-OCT-16
WG2420201-11 MB								
Sulfate (SO4)			<0.30		mg/L		0.3	27-OCT-16
SOLIDS-TDS-WT	**Water**							
Batch R3583278								
WG2419582-3 DUP		**L1847231-1**						
Total Dissolved Solids		272	270		mg/L	0.9	20	26-OCT-16
WG2419582-2 LCS								
Total Dissolved Solids			96.4		%		85-115	26-OCT-16
WG2419582-1 MB								
Total Dissolved Solids			<10		mg/L		10	26-OCT-16
TKN-WT	**Water**							
Batch R3584321								
WG2418960-2 LCS								
Total Kjeldahl Nitrogen			91.0		%		75-125	31-OCT-16
WG2418960-1 MB								

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
TKN-WT	**Water**							
Batch R3584321								
WG2418960-1 MB								
Total Kjeldahl Nitrogen			<0.15		mg/L		0.15	31-OCT-16

Quality Control Report

Legend:

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

Sample Parameter Qualifier Definitions:

Qualifier	Description
J	Duplicate results and limits are expressed in terms of absolute difference.

Hold Time Exceedances:

All test results reported with this submission were conducted within ALS recommended hold times.

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

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

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

L1847231 ESmith ES 21-Oct-16 21E

Matrix Solutions Inc.
ENVIRONMENT & ENGINEERING

COC # M81839

Page: 1 of 1

Lab Submitted to : ALS Waterloo
Lab Agreement no : ~~[illegible]~~ Q58595
Lab Job ID:

Invoice to: Require Report:Y___ N___
Company Name: MATRIX SOLUTIONS
Contact Name: 31 Beacon Point Court
Address: Breslau, ON
PC:
Phone / Fax#: Ph: Fax:
AFE #: 149006.02.03

Copy of Report to:
Matrix Solutions - Data Management
Suite 200, 150 - 13th Avenue SW
Calgary, Alberta, Canada
T2R 0V2
Ph: 403-237-0606 Fax: 403-263-2493
Fax draft copy of invoice to Matrix Solutions Inc.

Matrix Project # : 23089 - 528
Matrix Proj. Name: Claire - Maltby
Location:
Sampler's Name(s): S. Miller

REGULATORY REQUIREMENTS: (check)
☐ Alberta Tier 1
☐ SPIGEC
☐ Freshwater Aquatic Life (Low Level Metals)
☐ Canadian Drinking Water
☐ BC Regs
☐ Other:

SERVICE REQUESTED:
☐ RUSH (Please ensure you contact the lab) Due Date:
☒ REGULAR Turnaround

REPORT DISTRIBUTION: always send to data_management@matrix-solutions.com
☒ Additional Emails Smiller@matrix-solutions.com

	Sample Number (14 digits only) yr-mth-day	Sample Point Name	Depth (cm)	Sample Type	Date/Time Sampled	Quantity # of Jars	Quantity # of Bags	Analysis Required: Q58595													Lab Sample Number
1	23089161021001	MW9D		Water	Oct 21 11:30	3	—	X													1
2	23089161021002	MW95		Water	Oct 21 11:45	3	—	X													2
3																					
4																					
5																					
6																					
7																					
8																					
9																					
10																					
11																					
12																					
13																					
14																					
15																					
*For metals in water samples indicate if you want Total (T), Dissolved (D) or Extractable (E) as part of "Analysis Required"							Preserved/Filtered	/	/	/	/	/	/	/	/	/	/	/	/	/	

L1847231-COFC

Relinquished by: Date/Time: Oct 21 18:15
Signature: Scott Miller
Received by: EXS
Signature:
Date/Time: Oct/20/2016 18:20

COMMENTS/SPECIAL INSTRUCTIONS
CALL Scott With Questions 403 589 1599
Metals are Dissolved and were Field Filtered.
temp: 12.0°C
ES.

MATRIX SOLUTIONS INC.
ATTN: Scott Miller
31 Beacon Point Court
Breslau ON N0B 1M0

Date Received: 20-APR-17
Report Date: 27-APR-17 14:14 (MT)
Version: FINAL

Client Phone: 519-772-3777

Certificate of Analysis

Lab Work Order #: L1915040

Project P.O. #: NOT SUBMITTED
Job Reference: 23089 - CLAIR MALTBY CEIS
C of C Numbers: 81841, 81842
Legal Site Desc:

Gayle Braun

Gayle Braun
Senior Account Manager

	Sample ID	L1915040-1	L1915040-2	L1915040-3	L1915040-4	L1915040-5
	Description	WATER	WATER	WATER	WATER	WATER
	Sampled Date	19-APR-17	19-APR-17	19-APR-17	19-APR-17	19-APR-17
	Sampled Time	09:50	09:55	10:40	10:45	11:25
	Client ID	23089170419001 MW02-S	23089170419002 MW02-D	23089170419003 MW01-D	23089170419004 MW01-S	23089170419005 MW03-S
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (umhos/cm)	803	741	586	938	697
	pH (pH units)	7.64	7.80	8.17	7.89	7.94
	Total Dissolved Solids (mg/L)	DLDS 421	DLDS 397	DLDS 304	DLDS 497	DLDS 377
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	397	364	246	285	321
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<10	<10	<10	<10	<10
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<10	<10	<10	<10	<10
	Alkalinity, Total (as CaCO3) (mg/L)	397	364	246	285	321
	Chloride (Cl) (mg/L)	21.0	16.2	40.8	98.5	24.2
	Computed Conductivity (uS/cm)	688	638	531	823	604
	Conductivity % Difference (%)	-15.4	-14.9	-9.8	-13.0	-14.3
	Hardness (as CaCO3) (mg/L)	399	366	206	357	334
	Ion Balance (%)	112	107	93.5	107	111
	Langelier Index	0.8	0.9	0.7	0.9	0.9
	Nitrate (as N) (mg/L)	<0.020	<0.020	<0.020	2.20	1.60
	Nitrite (as N) (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Total Kjeldahl Nitrogen (mg/L)	0.42	0.40	1.9	0.38	<1.5
	Saturation pH (pH)	6.82	6.90	7.51	7.04	7.01
	TDS (Calculated) (mg/L)	435	401	324	504	373
	Sulfate (SO4) (mg/L)	21.9	31.9	37.5	50.4	19.8
	Anion Sum (me/L)	7.58	7.12	6.02	8.70	6.52
	Cation Sum (me/L)	8.52	7.59	5.63	9.27	7.25
	Cation - Anion Balance (%)	5.8	3.2	-3.3	3.2	5.3
Dissolved Metals	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Aluminum (Al)-Dissolved (mg/L)	0.0052	<0.0050	<0.0050	<0.0050	<0.0050
	Antimony (Sb)-Dissolved (mg/L)	0.00013	<0.00010	0.00015	<0.00010	<0.00010
	Arsenic (As)-Dissolved (mg/L)	0.0315	0.00490	0.0127	0.00011	0.00024
	Barium (Ba)-Dissolved (mg/L)	0.0482	0.0885	0.0490	0.0560	0.0870
	Beryllium (Be)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Dissolved (mg/L)	0.019	<0.010	0.072	0.019	0.011
	Cadmium (Cd)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	0.000183	0.000051
	Calcium (Ca)-Dissolved (mg/L)	113	100	34.2	96.0	87.2
	Cesium (Cs)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Chromium (Cr)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Cobalt (Co)-Dissolved (mg/L)	0.00182	0.00059	0.00042	<0.00010	<0.00010
	Copper (Cu)-Dissolved (mg/L)	0.00023	<0.00020	0.00069	0.00143	0.00052

	Sample ID	L1915040-6	L1915040-7	L1915040-8	L1915040-9	L1915040-10
	Description	WATER	WATER	WATER	WATER	WATER
	Sampled Date	19-APR-17	19-APR-17	19-APR-17	19-APR-17	19-APR-17
	Sampled Time	12:15	12:54	13:20	14:30	14:35
	Client ID	23089170419006 MW03-D	23089170419007 MW04-S	23089170419008 MW04-D	23089170419009 MW05-S	23089170419010 MW05-D
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (umhos/cm)	547	560	518	674	689
	pH (pH units)	8.03	8.07	8.13	7.85	7.87
	Total Dissolved Solids (mg/L)	DLDS 301	DLDS 336	DLDS 269	DLDS 422	DLDS 448
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	258	233	264	307	354
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<10	<10	<10	<10	<10
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<10	<10	<10	<10	<10
	Alkalinity, Total (as CaCO3) (mg/L)	258	233	264	307	354
	Chloride (Cl) (mg/L)	13.4	23.4	7.30	10.8	11.6
	Computed Conductivity (uS/cm)	483	515	449	585	594
	Conductivity % Difference (%)	-12.5	-8.3	-14.3	-14.2	-14.8
	Hardness (as CaCO3) (mg/L)	267	260	222	344	328
	Ion Balance (%)	106	104	103	114	98.0
	Langelier Index	0.8	0.8	0.8	0.8	0.9
	Nitrate (as N) (mg/L)	<0.020	0.149	<0.020	<0.020	<0.020
	Nitrite (as N) (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Total Kjeldahl Nitrogen (mg/L)	0.25	DLM <1.5	<0.15	0.25	DLM <1.5
	Saturation pH (pH)	7.21	7.27	7.30	7.01	6.95
	TDS (Calculated) (mg/L)	292	310	278	358	378
	Sulfate (SO4) (mg/L)	28.6	45.6	20.9	39.4	34.3
	Anion Sum (me/L)	5.24	5.48	5.02	6.19	6.89
	Cation Sum (me/L)	5.54	5.71	5.17	7.07	6.76
	Cation - Anion Balance (%)	2.7	2.1	1.5	6.6	-1.0
Dissolved Metals	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Aluminum (Al)-Dissolved (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
	Antimony (Sb)-Dissolved (mg/L)	<0.00010	0.00027	<0.00010	<0.00010	<0.00010
	Arsenic (As)-Dissolved (mg/L)	0.00244	0.00227	0.00758	0.00553	0.00029
	Barium (Ba)-Dissolved (mg/L)	0.0778	0.0615	0.0538	0.127	0.118
	Beryllium (Be)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Dissolved (mg/L)	<0.010	0.013	0.016	<0.010	<0.010
	Cadmium (Cd)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Calcium (Ca)-Dissolved (mg/L)	64.0	63.1	50.4	89.7	89.0
	Cesium (Cs)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Chromium (Cr)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010	0.00013	0.00018	<0.00010
	Copper (Cu)-Dissolved (mg/L)	0.00082	0.00038	0.00023	0.00025	0.00025

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1915040-11	L1915040-12	L1915040-13	L1915040-14	L1915040-15
	Description	WATER	WATER	WATER	WATER	WATER
	Sampled Date	19-APR-17	19-APR-17	19-APR-17	19-APR-17	19-APR-17
	Sampled Time	15:36	15:50	16:55	17:05	18:30
	Client ID	23089170419011 MW06-S	23089170419012 MW06-D	23089170419013 MW08-S	23089170419014 MW08-D	23089170419015 MW07
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (umhos/cm)	616	436	664	1180	682
	pH (pH units)	8.08	8.12	7.78	7.88	7.99
	Total Dissolved Solids (mg/L)	404	260 DLDS	385 DLDS	718 DLDS	413 DLDS
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	316	224	354	354	281
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<10	<10	<10	<10	<10
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<10	<10	<10	<10	<10
	Alkalinity, Total (as CaCO3) (mg/L)	316	224	354	354	281
	Chloride (Cl) (mg/L)	8.23	3.55	13.5	167	32.4
	Computed Conductivity (uS/cm)	681	387	569	1010	597
	Conductivity % Difference (%)	10.1	-11.9	-15.4	-15.6	-13.4
	Hardness (as CaCO3) (mg/L)	411	213	329	369	309
	Ion Balance (%)	122	110	105	99.1	105
	Langelier Index	1.1	0.8	0.8	0.9	0.9
	Nitrate (as N) (mg/L)	<0.020	<0.020	1.81	1.51	0.125
	Nitrite (as N) (mg/L)	<0.010	<0.010	<0.010	0.015	0.012
	Total Kjeldahl Nitrogen (mg/L)	<1.5 DLM	<0.15	<1.5 DLM	<1.5 DLM	<0.15
	Saturation pH (pH)	6.97	7.35	6.94	6.94	7.11
	TDS (Calculated) (mg/L)	414	233	360	633	364
	Sulfate (SO4) (mg/L)	70.5	15.3	5.89	29.5	42.1
	Anion Sum (me/L)	6.94	4.14	6.46	11.3	6.45
	Cation Sum (me/L)	8.49	4.54	6.77	11.2	6.78
	Cation - Anion Balance (%)	10.1	4.6	2.3	-0.5	2.5
Dissolved Metals	Dissolved Metals Filtration Location	LAB FIELD	FIELD	FIELD	FIELD	FIELD
	Aluminum (Al)-Dissolved (mg/L)	0.627 DLM	<0.0050	<0.0050	<0.0050	<0.0050
	Antimony (Sb)-Dissolved (mg/L)	<0.0010 DLM	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)-Dissolved (mg/L)	0.0015 DLM	0.00150	0.00019	0.00010	0.00036
	Barium (Ba)-Dissolved (mg/L)	0.129 DLM	0.112	0.0136	0.121	0.115
	Beryllium (Be)-Dissolved (mg/L)	<0.0010 DLM	<0.00010	<0.00010	<0.00010	<0.00010
	Bismuth (Bi)-Dissolved (mg/L)	<0.00050 DLM	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Dissolved (mg/L)	<0.10 DLM	<0.010	0.010	0.014	<0.010
	Cadmium (Cd)-Dissolved (mg/L)	<0.00010 DLM	<0.000010	0.000056	0.000073	<0.000010
	Calcium (Ca)-Dissolved (mg/L)	99.5 DLM	51.8	92.0	100	77.7
	Cesium (Cs)-Dissolved (mg/L)	0.00011 DLM	<0.000010	<0.000010	<0.000010	<0.000010
	Chromium (Cr)-Dissolved (mg/L)	<0.0050 DLM	<0.00050	<0.00050	<0.00050	<0.00050
	Cobalt (Co)-Dissolved (mg/L)	<0.0010 DLM	<0.00010	<0.00010	0.00044	0.00028
	Copper (Cu)-Dissolved (mg/L)	<0.0020 DLM	<0.00020	0.00061	0.00140	0.00024

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

	Sample ID	L1915040-16	L1915040-17
	Description	WATER	WATER
	Sampled Date	19-APR-17	19-APR-17
	Sampled Time	19:30	19:50
	Client ID	23089170419016 MW09-S	23089170419017 MW09-D
Grouping	**Analyte**		
WATER			
Physical Tests	Conductivity (umhos/cm)	659	469
	pH (pH units)	7.96	8.12
	Total Dissolved Solids (mg/L)	430 DLDS	312 DLDS
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	338	294
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<10	<10
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<10	<10
	Alkalinity, Total (as CaCO3) (mg/L)	338	294
	Chloride (Cl) (mg/L)	19.9	3.06
	Computed Conductivity (uS/cm)	604	427
	Conductivity % Difference (%)	-8.9	-9.4
	Hardness (as CaCO3) (mg/L)	319	220
	Ion Balance (%)	96.3	96.1
	Langelier Index	1.0	0.9
	Nitrate (as N) (mg/L)	7.17	<0.020
	Nitrite (as N) (mg/L)	<0.010	<0.010
	Total Kjeldahl Nitrogen (mg/L)	1.6 DLM	0.84
	Saturation pH (pH)	6.97	7.22
	TDS (Calculated) (mg/L)	391	270
	Sulfate (SO4) (mg/L)	15.0	4.98
	Anion Sum (me/L)	6.97	5.07
	Cation Sum (me/L)	6.72	4.87
	Cation - Anion Balance (%)	-1.9	-2.0
Dissolved Metals	Dissolved Metals Filtration Location	FIELD	FIELD
	Aluminum (Al)-Dissolved (mg/L)	<0.0050	<0.0050
	Antimony (Sb)-Dissolved (mg/L)	<0.00010	<0.00010
	Arsenic (As)-Dissolved (mg/L)	<0.00010	0.00448
	Barium (Ba)-Dissolved (mg/L)	0.0876	0.0898
	Beryllium (Be)-Dissolved (mg/L)	<0.00010	<0.00010
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050
	Boron (B)-Dissolved (mg/L)	0.013	0.014
	Cadmium (Cd)-Dissolved (mg/L)	0.000049	<0.000010
	Calcium (Ca)-Dissolved (mg/L)	89.1	53.9
	Cesium (Cs)-Dissolved (mg/L)	<0.000010	<0.000010
	Chromium (Cr)-Dissolved (mg/L)	<0.00050	<0.00050
	Cobalt (Co)-Dissolved (mg/L)	<0.00010	0.00023
	Copper (Cu)-Dissolved (mg/L)	0.00103	0.00026

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

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	Sample ID	L1915040-1	L1915040-2	L1915040-3	L1915040-4	L1915040-5
	Description	WATER	WATER	WATER	WATER	WATER
	Sampled Date	19-APR-17	19-APR-17	19-APR-17	19-APR-17	19-APR-17
	Sampled Time	09:50	09:55	10:40	10:45	11:25
	Client ID	23089170419001 MW02-S	23089170419002 MW02-D	23089170419003 MW01-D	23089170419004 MW01-S	23089170419005 MW03-S
Grouping	**Analyte**					
WATER						
Dissolved Metals	Iron (Fe)-Dissolved (mg/L)	1.66	1.04	0.018	<0.010	<0.010
	Lead (Pb)-Dissolved (mg/L)	0.000066	0.000281	<0.000050	0.000260	0.000086
	Lithium (Li)-Dissolved (mg/L)	0.0017	0.0016	0.0024	0.0018	<0.0010
	Magnesium (Mg)-Dissolved (mg/L)	28.3	28.1	29.2	28.5	28.3
	Manganese (Mn)-Dissolved (mg/L)	0.482	0.109	0.0133	<0.00050	0.00384
	Molybdenum (Mo)-Dissolved (mg/L)	0.000828	0.000484	0.00312	0.000425	0.000289
	Nickel (Ni)-Dissolved (mg/L)	0.00841	0.00300	0.00245	0.00069	0.00050
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Dissolved (mg/L)	0.539	0.855	0.849	1.57	1.57
	Rubidium (Rb)-Dissolved (mg/L)	0.00084	0.00110	0.00073	0.00221	0.00327
	Selenium (Se)-Dissolved (mg/L)	0.000112	<0.000050	<0.000050	0.000324	0.000309
	Silicon (Si)-Dissolved (mg/L)	3.75	7.59	5.63	3.79	5.44
	Silver (Ag)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Sodium (Na)-Dissolved (mg/L)	12.2	6.04	34.4	48.2	12.1
	Strontium (Sr)-Dissolved (mg/L)	0.148	0.133	0.483	0.385	0.0990
	Sulfur (S)-Dissolved (mg/L)	8.23	11.3	12.1	18.3	7.06
	Tellurium (Te)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	0.000020	0.000021
	Thorium (Th)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
	Tungsten (W)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Uranium (U)-Dissolved (mg/L)	0.00506	0.000766	0.00123	0.000961	0.000608
	Vanadium (V)-Dissolved (mg/L)	0.00085	<0.00050	0.00086	<0.00050	<0.00050
	Zinc (Zn)-Dissolved (mg/L)	0.0772	0.0354	0.0032	0.0970	0.0239
	Zirconium (Zr)-Dissolved (mg/L)	0.00054	<0.00030	<0.00030	<0.00030	<0.00030

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	Sample ID	L1915040-6	L1915040-7	L1915040-8	L1915040-9	L1915040-10
	Description	WATER	WATER	WATER	WATER	WATER
	Sampled Date	19-APR-17	19-APR-17	19-APR-17	19-APR-17	19-APR-17
	Sampled Time	12:15	12:54	13:20	14:30	14:35
	Client ID	23089170419006 MW03-D	23089170419007 MW04-S	23089170419008 MW04-D	23089170419009 MW05-S	23089170419010 MW05-D
Grouping	**Analyte**					
WATER						
Dissolved Metals	Iron (Fe)-Dissolved (mg/L)	0.209	<0.010	0.056	0.733	2.91
	Lead (Pb)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	0.000141	<0.000050
	Lithium (Li)-Dissolved (mg/L)	0.0027	0.0021	0.0030	0.0028	0.0016
	Magnesium (Mg)-Dissolved (mg/L)	25.9	24.8	23.3	29.1	25.8
	Manganese (Mn)-Dissolved (mg/L)	0.0140	0.0181	0.0156	0.0976	0.0800
	Molybdenum (Mo)-Dissolved (mg/L)	0.000864	0.00418	0.00213	0.00440	0.000089
	Nickel (Ni)-Dissolved (mg/L)	<0.00050	0.00091	0.00052	0.00109	<0.00050
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Dissolved (mg/L)	1.01	1.51	1.28	1.28	0.745
	Rubidium (Rb)-Dissolved (mg/L)	0.00054	0.00089	0.00089	0.00065	0.00046
	Selenium (Se)-Dissolved (mg/L)	0.000090	0.000063	0.000252	<0.000050	0.000168
	Silicon (Si)-Dissolved (mg/L)	7.24	8.05	9.28	5.06	9.20
	Silver (Ag)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Sodium (Na)-Dissolved (mg/L)	4.22	11.0	16.4	3.66	3.98
	Strontium (Sr)-Dissolved (mg/L)	0.115	0.145	0.145	0.126	0.138
	Sulfur (S)-Dissolved (mg/L)	9.98	15.1	7.48	17.2	12.1
	Tellurium (Te)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Thorium (Th)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Tin (Sn)-Dissolved (mg/L)	0.00017	0.00036	0.00029	<0.00010	<0.00010
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	0.00032
	Tungsten (W)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Uranium (U)-Dissolved (mg/L)	0.000915	0.00241	0.00109	0.00825	0.000034
	Vanadium (V)-Dissolved (mg/L)	<0.00050	0.00060	0.00071	<0.00050	0.00054
	Zinc (Zn)-Dissolved (mg/L)	0.0087	0.0017	0.0038	0.0099	0.0049
	Zirconium (Zr)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	0.00067

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

	Sample ID	L1915040-11	L1915040-12	L1915040-13	L1915040-14	L1915040-15
	Description	WATER	WATER	WATER	WATER	WATER
	Sampled Date	19-APR-17	19-APR-17	19-APR-17	19-APR-17	19-APR-17
	Sampled Time	15:36	15:50	16:55	17:05	18:30
	Client ID	23089170419011 MW06-S	23089170419012 MW06-D	23089170419013 MW08-S	23089170419014 MW08-D	23089170419015 MW07
Grouping	**Analyte**					
WATER						
Dissolved Metals	Iron (Fe)-Dissolved (mg/L)	0.79 DLM	0.089	<0.010	<0.010	0.021
	Lead (Pb)-Dissolved (mg/L)	0.00511 DLM	<0.000050	0.000051	0.000425	0.000098
	Lithium (Li)-Dissolved (mg/L)	<0.010 DLM	0.0021	<0.0010	0.0028	0.0033
	Magnesium (Mg)-Dissolved (mg/L)	39.5 DLM	20.2	24.2	28.8	27.9
	Manganese (Mn)-Dissolved (mg/L)	0.121 DLM	0.0137	0.00130	0.0191	0.0654
	Molybdenum (Mo)-Dissolved (mg/L)	0.00181 DLM	0.000896	<0.000050	0.000684	0.000928
	Nickel (Ni)-Dissolved (mg/L)	<0.0050 DLM	<0.00050	<0.00050	0.00224	0.00127
	Phosphorus (P)-Dissolved (mg/L)	<0.50 DLM	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Dissolved (mg/L)	1.78 DLM	1.05	0.870	3.37	1.40
	Rubidium (Rb)-Dissolved (mg/L)	0.0027 DLM	0.00050	0.00032	0.00149	0.00109
	Selenium (Se)-Dissolved (mg/L)	<0.00050 DLM	0.000272	0.000105	0.000276	0.000058
	Silicon (Si)-Dissolved (mg/L)	7.54 DLM	7.31	4.18	5.43	6.96
	Silver (Ag)-Dissolved (mg/L)	<0.00050 DLM	<0.000050	<0.000050	<0.000050	<0.000050
	Sodium (Na)-Dissolved (mg/L)	5.2 DLM	6.20	3.74	85.2	13.2
	Strontium (Sr)-Dissolved (mg/L)	0.177 DLM	0.126	0.110	0.164	0.115
	Sulfur (S)-Dissolved (mg/L)	24.4 DLM	5.50	2.17	10.9	14.7
	Tellurium (Te)-Dissolved (mg/L)	<0.0020 DLM	<0.00020	<0.00020	<0.00020	<0.00020
	Thallium (Tl)-Dissolved (mg/L)	<0.00010 DLM	<0.000010	<0.000010	0.000032	0.000019
	Thorium (Th)-Dissolved (mg/L)	<0.0010 DLM	<0.00010	<0.00010	<0.00010	<0.00010
	Tin (Sn)-Dissolved (mg/L)	<0.0010 DLM	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Dissolved (mg/L)	<0.030 DLUI	<0.00030	<0.00030	<0.00030	<0.00030
	Tungsten (W)-Dissolved (mg/L)	<0.0010 DLM	<0.00010	<0.00010	<0.00010	<0.00010
	Uranium (U)-Dissolved (mg/L)	0.00376 DLM	0.000905	0.000181	0.000549	0.000950
	Vanadium (V)-Dissolved (mg/L)	<0.0050 DLM	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Dissolved (mg/L)	0.013 DLM	0.0020	0.0075	0.151	0.0107
	Zirconium (Zr)-Dissolved (mg/L)	<0.0030 DLM	<0.00030	<0.00030	<0.00030	<0.00030

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	Sample ID	L1915040-16	L1915040-17			
	Description	WATER	WATER			
	Sampled Date	19-APR-17	19-APR-17			
	Sampled Time	19:30	19:50			
	Client ID	23089170419016 MW09-S	23089170419017 MW09-D			
Grouping	**Analyte**					
WATER						
Dissolved Metals	Iron (Fe)-Dissolved (mg/L)	<0.010	0.060			
	Lead (Pb)-Dissolved (mg/L)	0.000082	<0.000050			
	Lithium (Li)-Dissolved (mg/L)	0.0013	0.0023			
	Magnesium (Mg)-Dissolved (mg/L)	23.5	20.8			
	Manganese (Mn)-Dissolved (mg/L)	0.00068	0.0551			
	Molybdenum (Mo)-Dissolved (mg/L)	0.000194	0.00269			
	Nickel (Ni)-Dissolved (mg/L)	<0.00050	0.00068			
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050			
	Potassium (K)-Dissolved (mg/L)	3.63	0.997			
	Rubidium (Rb)-Dissolved (mg/L)	0.00060	0.00123			
	Selenium (Se)-Dissolved (mg/L)	0.000325	<0.000050			
	Silicon (Si)-Dissolved (mg/L)	4.36	7.31			
	Silver (Ag)-Dissolved (mg/L)	<0.000050	<0.000050			
	Sodium (Na)-Dissolved (mg/L)	5.71	10.1			
	Strontium (Sr)-Dissolved (mg/L)	0.105	0.148			
	Sulfur (S)-Dissolved (mg/L)	5.32	1.85			
	Tellurium (Te)-Dissolved (mg/L)	<0.00020	<0.00020			
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	0.000019			
	Thorium (Th)-Dissolved (mg/L)	<0.00010	<0.00010			
	Tin (Sn)-Dissolved (mg/L)	0.00013	<0.00010			
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030			
	Tungsten (W)-Dissolved (mg/L)	<0.00010	<0.00010			
	Uranium (U)-Dissolved (mg/L)	0.000294	0.000792			
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050			
	Zinc (Zn)-Dissolved (mg/L)	0.0214	0.0087			
	Zirconium (Zr)-Dissolved (mg/L)	<0.00030	<0.00030			

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

Reference Information

Additional Comments for Sample Listed:

Samplenum	Matrix	Report Remarks	Sample Comments
L1915040-11	Water	Note: DLM - Sample diluted due to presence of precipitate in field filtered dissolved metals bottle.	

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	Chloride (Cl)	MS-B	L1915040-1, -10, -11, -12, -13, -14, -15, -16, -17, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Copper (Cu)-Dissolved	MS-B	L1915040-1, -10, -12, -13, -14, -15, -16, -17, -2, -3, -4, -5, -6, -7, -8, -9

Qualifiers for Individual Parameters Listed:

Qualifier	Description
DLDS	Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).
DLUI	Detection Limit Raised: Unknown Interference generated an apparent false positive test result.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-SPEC-WT	Water	Speciated Alkalinity	EPA 310.2

This analysis is carried out using procedures adapted from EPA Method 310.2 "Alkalinity". Total Alkalinity is determined using the methyl orange colourimetric method.

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

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

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

EC-WT	Water	Conductivity	APHA 2510 B

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

IONBALANCE-OP03-WT	Water	Detailed Ion Balance Calculation	APHA 1030E, 2330B, 2510A
MET-D-CCMS-WT	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B/6020A (mod)

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

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

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

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

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

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

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

PH-ALK-WT	Water	pH	APHA 4500 H-Electrode

Water samples are analyzed directly by a calibrated pH meter.

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

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

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

A well-mixed sample is filtered though glass fibres filter. A known volume of the filtrate is evaporated and dried at 105–5°C overnight and then 180–10°C for 1hr.

TKN-WT	Water	Total Kjeldahl Nitrogen	APHA 4500-N

Sample is digested to convert the TKN to ammonium sulphate. The ammonia ions are heated to produce a colour complex. The absorbance measured by the instrument is proportional to the concentration of ammonium sulphate in the sample and is reported as TKN.

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

Reference Information

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

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

Chain of Custody Numbers:

81841 81842

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

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

ALS Environmental

Quality Control Report

Workorder: L1915040 Report Date: 27-APR-17

Client: MATRIX SOLUTIONS INC.
31 Beacon Point Court
Breslau ON N0B 1M0
Contact: Scott Miller

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
ALK-SPEC-WT	**Water**							
Batch R3708449								
WG2516437-3 CRM		**WT-ALK-CRM**						
Alkalinity, Total (as CaCO3)			103.8		%		80-120	25-APR-17
WG2516437-7 CRM		**WT-ALK-CRM**						
Alkalinity, Total (as CaCO3)			106.0		%		80-120	25-APR-17
WG2516437-2 LCS								
Alkalinity, Total (as CaCO3)			99.7		%		85-115	25-APR-17
WG2516437-6 LCS								
Alkalinity, Total (as CaCO3)			101.5		%		85-115	25-APR-17
WG2516437-1 MB								
Alkalinity, Total (as CaCO3)			<10		mg/L		10	25-APR-17
WG2516437-5 MB								
Alkalinity, Total (as CaCO3)			<10		mg/L		10	25-APR-17
CL-IC-N-WT	**Water**							
Batch R3707808								
WG2515789-12 LCS								
Chloride (Cl)			104.7		%		90-110	24-APR-17
WG2515789-7 LCS								
Chloride (Cl)			104.0		%		90-110	24-APR-17
WG2515789-11 MB								
Chloride (Cl)			<0.50		mg/L		0.5	24-APR-17
WG2515789-6 MB								
Chloride (Cl)			<0.50		mg/L		0.5	24-APR-17
EC-WT	**Water**							
Batch R3704104								
WG2514681-24 DUP		**L1915040-1**						
Conductivity		803	799		umhos/cm	0.4	10	21-APR-17
WG2514681-21 LCS								
Conductivity			105.0		%		90-110	21-APR-17
WG2514681-22 MB								
Conductivity			<3.0		umhos/cm		3	21-APR-17
MET-D-CCMS-WT	**Water**							
Batch R3704331								
WG2514539-2 LCS								
Aluminum (Al)-Dissolved			97.1		%		80-120	21-APR-17
Antimony (Sb)-Dissolved			97.5		%		80-120	21-APR-17
Arsenic (As)-Dissolved			97.8		%		80-120	21-APR-17
Barium (Ba)-Dissolved			101.9		%		80-120	21-APR-17

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-WT	**Water**							
Batch R3704331								
WG2514539-2 LCS								
Beryllium (Be)-Dissolved			93.1		%		80-120	21-APR-17
Bismuth (Bi)-Dissolved			100.3		%		80-120	21-APR-17
Boron (B)-Dissolved			94.1		%		80-120	21-APR-17
Cadmium (Cd)-Dissolved			102.4		%		80-120	21-APR-17
Calcium (Ca)-Dissolved			96.4		%		80-120	21-APR-17
Cesium (Cs)-Dissolved			101.7		%		80-120	21-APR-17
Chromium (Cr)-Dissolved			95.1		%		80-120	21-APR-17
Cobalt (Co)-Dissolved			96.9		%		80-120	21-APR-17
Copper (Cu)-Dissolved			95.4		%		80-120	21-APR-17
Iron (Fe)-Dissolved			97.8		%		80-120	21-APR-17
Lead (Pb)-Dissolved			101.4		%		80-120	21-APR-17
Lithium (Li)-Dissolved			91.8		%		80-120	21-APR-17
Magnesium (Mg)-Dissolved			97.6		%		80-120	21-APR-17
Manganese (Mn)-Dissolved			97.2		%		80-120	21-APR-17
Molybdenum (Mo)-Dissolved			96.6		%		80-120	21-APR-17
Nickel (Ni)-Dissolved			96.6		%		80-120	21-APR-17
Phosphorus (P)-Dissolved			83.9		%		80-120	21-APR-17
Potassium (K)-Dissolved			96.3		%		80-120	21-APR-17
Rubidium (Rb)-Dissolved			97.9		%		80-120	21-APR-17
Selenium (Se)-Dissolved			98.3		%		80-120	21-APR-17
Silicon (Si)-Dissolved			102.6		%		80-120	21-APR-17
Silver (Ag)-Dissolved			103.4		%		80-120	21-APR-17
Sodium (Na)-Dissolved			96.5		%		80-120	21-APR-17
Strontium (Sr)-Dissolved			99.6		%		80-120	21-APR-17
Sulfur (S)-Dissolved			93.1		%		80-120	21-APR-17
Tellurium (Te)-Dissolved			100.3		%		80-120	21-APR-17
Thallium (Tl)-Dissolved			95.7		%		80-120	21-APR-17
Thorium (Th)-Dissolved			100.4		%		80-120	21-APR-17
Tin (Sn)-Dissolved			97.1		%		80-120	21-APR-17
Titanium (Ti)-Dissolved			94.2		%		80-120	21-APR-17
Tungsten (W)-Dissolved			100.2		%		80-120	21-APR-17
Uranium (U)-Dissolved			103.7		%		80-120	21-APR-17
Vanadium (V)-Dissolved			98.3		%		80-120	21-APR-17
Zinc (Zn)-Dissolved			91.5		%		80-120	21-APR-17

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-WT	**Water**							
Batch R3704331								
WG2514539-2 LCS								
Zirconium (Zr)-Dissolved			99.8		%		80-120	21-APR-17
WG2514539-1 MB								
Aluminum (Al)-Dissolved			<0.0050		mg/L		0.005	21-APR-17
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	21-APR-17
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	21-APR-17
Barium (Ba)-Dissolved			<0.00010		mg/L		0.0001	21-APR-17
Beryllium (Be)-Dissolved			<0.00010		mg/L		0.0001	21-APR-17
Bismuth (Bi)-Dissolved			<0.000050		mg/L		0.00005	21-APR-17
Boron (B)-Dissolved			<0.010		mg/L		0.01	21-APR-17
Cadmium (Cd)-Dissolved			<0.000010		mg/L		0.00001	21-APR-17
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	21-APR-17
Cesium (Cs)-Dissolved			<0.000010		mg/L		0.00001	21-APR-17
Chromium (Cr)-Dissolved			<0.00050		mg/L		0.0005	21-APR-17
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	21-APR-17
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	21-APR-17
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	21-APR-17
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	21-APR-17
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	21-APR-17
Magnesium (Mg)-Dissolved			<0.050		mg/L		0.05	21-APR-17
Manganese (Mn)-Dissolved			<0.00050		mg/L		0.0005	21-APR-17
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	21-APR-17
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	21-APR-17
Phosphorus (P)-Dissolved			<0.050		mg/L		0.05	21-APR-17
Potassium (K)-Dissolved			<0.050		mg/L		0.05	21-APR-17
Rubidium (Rb)-Dissolved			<0.00020		mg/L		0.0002	21-APR-17
Selenium (Se)-Dissolved			<0.000050		mg/L		0.00005	21-APR-17
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	21-APR-17
Silver (Ag)-Dissolved			<0.000050		mg/L		0.00005	21-APR-17
Sodium (Na)-Dissolved			<0.50		mg/L		0.5	21-APR-17
Strontium (Sr)-Dissolved			<0.0010		mg/L		0.001	21-APR-17
Sulfur (S)-Dissolved			<0.50		mg/L		0.5	21-APR-17
Tellurium (Te)-Dissolved			<0.00020		mg/L		0.0002	21-APR-17
Thallium (Tl)-Dissolved			<0.000010		mg/L		0.00001	21-APR-17
Thorium (Th)-Dissolved			<0.00010		mg/L		0.0001	21-APR-17

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-WT	**Water**							
Batch R3704331								
WG2514539-1 MB								
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	21-APR-17
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	21-APR-17
Tungsten (W)-Dissolved			<0.00010		mg/L		0.0001	21-APR-17
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	21-APR-17
Vanadium (V)-Dissolved			<0.00050		mg/L		0.0005	21-APR-17
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	21-APR-17
Zirconium (Zr)-Dissolved			<0.00030		mg/L		0.0003	21-APR-17
Batch R3707090								
WG2516000-2 LCS								
Aluminum (Al)-Dissolved			101.7		%		80-120	24-APR-17
Antimony (Sb)-Dissolved			100.2		%		80-120	24-APR-17
Arsenic (As)-Dissolved			99.1		%		80-120	24-APR-17
Barium (Ba)-Dissolved			102.3		%		80-120	24-APR-17
Beryllium (Be)-Dissolved			93.4		%		80-120	24-APR-17
Bismuth (Bi)-Dissolved			100.2		%		80-120	24-APR-17
Boron (B)-Dissolved			92.3		%		80-120	24-APR-17
Cadmium (Cd)-Dissolved			99.3		%		80-120	24-APR-17
Calcium (Ca)-Dissolved			95.0		%		80-120	24-APR-17
Cesium (Cs)-Dissolved			104.3		%		80-120	24-APR-17
Chromium (Cr)-Dissolved			99.3		%		80-120	24-APR-17
Cobalt (Co)-Dissolved			98.4		%		80-120	24-APR-17
Copper (Cu)-Dissolved			96.3		%		80-120	24-APR-17
Iron (Fe)-Dissolved			99.9		%		80-120	24-APR-17
Lead (Pb)-Dissolved			100.6		%		80-120	24-APR-17
Lithium (Li)-Dissolved			90.4		%		80-120	24-APR-17
Magnesium (Mg)-Dissolved			98.8		%		80-120	24-APR-17
Manganese (Mn)-Dissolved			98.1		%		80-120	24-APR-17
Molybdenum (Mo)-Dissolved			91.6		%		80-120	24-APR-17
Nickel (Ni)-Dissolved			98.9		%		80-120	24-APR-17
Phosphorus (P)-Dissolved			106.3		%		80-120	24-APR-17
Potassium (K)-Dissolved			99.2		%		80-120	24-APR-17
Rubidium (Rb)-Dissolved			101.0		%		80-120	24-APR-17
Selenium (Se)-Dissolved			99.3		%		80-120	24-APR-17
Silicon (Si)-Dissolved			109.7		%		80-120	24-APR-17

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-WT	**Water**							
Batch R3707090								
WG2516000-2 LCS								
Silver (Ag)-Dissolved			98.6		%		80-120	24-APR-17
Sodium (Na)-Dissolved			102.1		%		80-120	24-APR-17
Strontium (Sr)-Dissolved			90.0		%		80-120	24-APR-17
Sulfur (S)-Dissolved			99.8		%		80-120	24-APR-17
Tellurium (Te)-Dissolved			99.0		%		80-120	24-APR-17
Thallium (Tl)-Dissolved			96.9		%		80-120	24-APR-17
Thorium (Th)-Dissolved			100.6		%		80-120	24-APR-17
Tin (Sn)-Dissolved			99.0		%		80-120	24-APR-17
Titanium (Ti)-Dissolved			95.3		%		80-120	24-APR-17
Tungsten (W)-Dissolved			101.9		%		80-120	24-APR-17
Uranium (U)-Dissolved			105.1		%		80-120	24-APR-17
Vanadium (V)-Dissolved			101.3		%		80-120	24-APR-17
Zinc (Zn)-Dissolved			95.8		%		80-120	24-APR-17
Zirconium (Zr)-Dissolved			94.9		%		80-120	24-APR-17
WG2516000-1 MB								
Aluminum (Al)-Dissolved			<0.0050		mg/L		0.005	24-APR-17
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	24-APR-17
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	24-APR-17
Barium (Ba)-Dissolved			<0.00010		mg/L		0.0001	24-APR-17
Beryllium (Be)-Dissolved			<0.00010		mg/L		0.0001	24-APR-17
Bismuth (Bi)-Dissolved			<0.000050		mg/L		0.00005	24-APR-17
Boron (B)-Dissolved			<0.010		mg/L		0.01	24-APR-17
Cadmium (Cd)-Dissolved			<0.000010		mg/L		0.00001	24-APR-17
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	24-APR-17
Cesium (Cs)-Dissolved			<0.000010		mg/L		0.00001	24-APR-17
Chromium (Cr)-Dissolved			<0.00050		mg/L		0.0005	24-APR-17
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	24-APR-17
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	24-APR-17
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	24-APR-17
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	24-APR-17
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	24-APR-17
Magnesium (Mg)-Dissolved			<0.050		mg/L		0.05	24-APR-17
Manganese (Mn)-Dissolved			<0.00050		mg/L		0.0005	24-APR-17
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	24-APR-17

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-WT	**Water**							
Batch R3707090								
WG2516000-1 MB								
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	24-APR-17
Phosphorus (P)-Dissolved			<0.050		mg/L		0.05	24-APR-17
Potassium (K)-Dissolved			<0.050		mg/L		0.05	24-APR-17
Rubidium (Rb)-Dissolved			<0.00020		mg/L		0.0002	24-APR-17
Selenium (Se)-Dissolved			<0.000050		mg/L		0.00005	24-APR-17
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	24-APR-17
Silver (Ag)-Dissolved			<0.000050		mg/L		0.00005	24-APR-17
Sodium (Na)-Dissolved			<0.50		mg/L		0.5	24-APR-17
Strontium (Sr)-Dissolved			<0.0010		mg/L		0.001	24-APR-17
Sulfur (S)-Dissolved			<0.50		mg/L		0.5	24-APR-17
Tellurium (Te)-Dissolved			<0.00020		mg/L		0.0002	24-APR-17
Thallium (Tl)-Dissolved			<0.000010		mg/L		0.00001	24-APR-17
Thorium (Th)-Dissolved			<0.00010		mg/L		0.0001	24-APR-17
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	24-APR-17
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	24-APR-17
Tungsten (W)-Dissolved			<0.00010		mg/L		0.0001	24-APR-17
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	24-APR-17
Vanadium (V)-Dissolved			<0.00050		mg/L		0.0005	24-APR-17
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	24-APR-17
Zirconium (Zr)-Dissolved			<0.00030		mg/L		0.0003	24-APR-17
NO2-IC-WT	**Water**							
Batch R3707808								
WG2515789-12 LCS								
Nitrite (as N)			105.3		%		70-130	24-APR-17
WG2515789-7 LCS								
Nitrite (as N)			105.2		%		70-130	24-APR-17
WG2515789-11 MB								
Nitrite (as N)			<0.010		mg/L		0.01	24-APR-17
WG2515789-6 MB								
Nitrite (as N)			<0.010		mg/L		0.01	24-APR-17
NO3-IC-WT	**Water**							
Batch R3707808								
WG2515789-12 LCS								
Nitrate (as N)			102.8		%		70-130	24-APR-17
WG2515789-7 LCS								

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NO3-IC-WT	**Water**							
Batch R3707808								
WG2515789-7 LCS								
Nitrate (as N)			102.9		%		70-130	24-APR-17
WG2515789-11 MB								
Nitrate (as N)			<0.020		mg/L		0.02	24-APR-17
WG2515789-6 MB								
Nitrate (as N)			<0.020		mg/L		0.02	24-APR-17
PH-ALK-WT	**Water**							
Batch R3704104								
WG2514681-24 DUP		**L1915040-1**						
pH		7.64	7.59	J	pH units	0.03	0.2	21-APR-17
WG2514681-21 LCS								
pH			6.99		pH units		6.9-7.1	21-APR-17
SO4-IC-N-WT	**Water**							
Batch R3707808								
WG2515789-12 LCS								
Sulfate (SO4)			104.9		%		90-110	24-APR-17
WG2515789-7 LCS								
Sulfate (SO4)			104.1		%		90-110	24-APR-17
WG2515789-11 MB								
Sulfate (SO4)			<0.30		mg/L		0.3	24-APR-17
WG2515789-6 MB								
Sulfate (SO4)			<0.30		mg/L		0.3	24-APR-17
SOLIDS-TDS-WT	**Water**							
Batch R3705867								
WG2514834-2 LCS								
Total Dissolved Solids			99.5		%		85-115	21-APR-17
WG2514834-1 MB								
Total Dissolved Solids			<10		mg/L		10	21-APR-17
Batch R3708455								
WG2516324-3 DUP		**L1915040-9**						
Total Dissolved Solids		422	411		mg/L	2.5	20	25-APR-17
WG2516324-2 LCS								
Total Dissolved Solids			98.3		%		85-115	25-APR-17
WG2516324-1 MB								
Total Dissolved Solids			<10		mg/L		10	25-APR-17
TKN-WT	**Water**							

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
TKN-WT	**Water**							
Batch R3708045								
WG2516286-2 LCS								
Total Kjeldahl Nitrogen			106.8		%		75-125	25-APR-17
WG2516286-1 MB								
Total Kjeldahl Nitrogen			<0.15		mg/L		0.15	25-APR-17
Batch R3708706								
WG2516550-3 DUP		**L1915040-9**						
Total Kjeldahl Nitrogen		0.25	0.26		mg/L	4.8	20	26-APR-17
WG2516550-2 LCS								
Total Kjeldahl Nitrogen			90.7		%		75-125	26-APR-17
WG2516550-1 MB								
Total Kjeldahl Nitrogen			<0.15		mg/L		0.15	26-APR-17
WG2516550-4 MS		**L1915040-9**						
Total Kjeldahl Nitrogen			92.9		%		70-130	26-APR-17

Legend:

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

Sample Parameter Qualifier Definitions:

Qualifier	Description
J	Duplicate results and limits are expressed in terms of absolute difference.

Hold Time Exceedances:

All test results reported with this submission were conducted within ALS recommended hold times.

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

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

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

Matrix Solutions Inc.
ENVIRONMENT & ENGINEERING

COC # M 81841

Page: 1 of 2

Lab Submitted to : ALS Waterloo
Lab Agreement no : Q58595
Lab Job ID:

Invoice to: Require Report: Y X N___
Company Name: MATRIX SOLUTIONS INC
Contact Name: Scott Miller
Address:
PC:
Phone / Fax#: Ph: Fax:

Copy of Report to:
Matrix Solutions - Data Management
Suite 200, 150 - 13th Avenue SW
Calgary, Alberta, Canada
T2R 0V2
Ph: 403-237-0606 Fax: 403-263-2493
Fax draft copy of invoice to Matrix Solutions Inc.

Matrix Project # : 23089
Matrix Proj. Name: Clair Maltby CEIS
Location:
Sampler's Name(s): SM / DM

AFE #: 147164

REGULATORY REQUIREMENTS: (check)
☐ Alberta Tier 1
☐ SPIGEC
☐ Freshwater Aquatic Life (Low Level Metals)
☐ Canadian Drinking Water
☐ BC Regs
☒ Other: ODWQS

SERVICE REQUESTED:
☐ RUSH (Please ensure you contact the lab) Due Date:
☒ REGULAR Turnaround

REPORT DISTRIBUTION: always send to data_management@matrix-solutions.com
☒ Additional Emails smiller@matrix-solutions.com

Analysis Required

	Sample Number (14 digits only) yr-mth-day	Sample Point Name	Depth (cm)	Sample Type	Date/Time Sampled	Quantity # of Jars	Quantity # of Bags	Q58595	Lab Sample Number
1	23089170419001	MW02-S		WATER	04/19/17 9:50	3		X	1
2	23089170419002	MW02-D			04/19/17 9:55	3		X	2
3	23089170419003	MW01-D			04/19/17 10:40	3		X	3
4	23089170419004	MW01-S			04/19/17 10:45	3		X	4
5	23089170419005	MW03-S			04/19/17 11:25	3		X	5
6	23089170419006	MW03-D			04/19/17 12:15	3		X	6
7	23089170419007	MW04-S			04/19/17 12:54	3		X	7
8	23089170419008	MW04-D			04/19/17 13:20	3		X	8
9	23089170419009	MW05-S			04/19/17 14:30	3		X	9
10	23089170419010	MW05-D			04/19/17 14:35	3		X	10
11	23089170419011	MW06-S			04/19/17 15:36	3		X	11
12	23089170419012	MW06-D			04/19/17 15:50	3		X	12
13	23089170419013	MW08-~~D~~S			04/19/17 16:55	3		X	13
14	23089170419014	MW08-D		↓	04/19/17 17:05	3		X	14
15	23089170419015	MW07		WATER	04/19/17 18:30	3		X	15

L1915040-COFC

L1915040
on
20/4/17
April 20C

*For metals in water samples indicate if you want Total (T), Dissolved (D) or Extractable (E) as part of "Analysis Required"

Preserved/Filtered

Relinquished by: Scott Miller
Date/Time: April 20/17 9:40
Signature:
Received by: RH
Signature: 20APR 17 e 840
Date/Time: e 24 / 1.4°C

COMMENTS/SPECIAL INSTRUCTIONS

Matrix Solutions Inc.
ENVIRONMENT & ENGINEERING

COC # M 81842

Page: 2 of 2

Lab Submitted to : ALS Waterloo
Lab Agreement no : Q58595
Lab Job ID:

Invoice to: Require Report: Y X N___
Company Name: MATRIX SOLUTIONS
Contact Name:
Address:
PC:
Phone / Fax#: Ph: Fax:

Copy of Report to:
Matrix Solutions - Data Management
Suite 200, 150 - 13th Avenue SW
Calgary, Alberta, Canada
T2R 0V2
Ph: 403-237-0606 Fax: 403-263-2493
Fax draft copy of invoice to Matrix Solutions Inc.

Matrix Project # : 23089
Matrix Proj. Name: Clair Maltby CEIS
Location:
Sampler's Name(s): SM/DM

AFE #: 147164

REGULATORY REQUIREMENTS: (check)
- ☐ Alberta Tier 1
- ☐ SPIGEC
- ☐ Freshwater Aquatic Life (Low Level Metals)
- ☐ Canadian Drinking Water
- ☐ BC Regs
- ☒ Other: ODWQS

SERVICE REQUESTED:
- ☐ RUSH (Please ensure you contact the lab) Due Date:
- ☒ REGULAR Turnaround

REPORT DISTRIBUTION: always send to data_management@matrix-solutions.com
- ☒ Additional Emails smiller@matrix-solutions.com

Analysis Required

	Sample Number (14 digits only) yr-mth-day	Sample Point Name	Depth (cm)	Sample Type	Date/Time Sampled	Quantity # of Jars	Quantity # of Bags	Q58595													Lab Sample Number
1	23089170419016	MW09-S	|	WATER	04/19/17 19:30	3		X													16
2	23089170419017	MW09-D	|	WATER	04/19/17 19:50	3		X													17
3																					
4																					
5																					
6																					
7																					
8																					
9																					
10		L1915040																			
11		ok																			
12		20/4/17																			
13		April 20C																			
14																					
15																					

L1915040-COFC

*For metals in water samples indicate if you want Total (T), Dissolved (D) or Extractable (E) as part of "Analysis Required"

Preserved/Filtered

Relinquished by: Scott Miller
Date/Time: April 20/17 9:40
Signature:

Received by: 20Apr17C 940
Signature:
Date/Time: e 2.4 / 1.4.

COMMENTS/SPECIAL INSTRUCTIONS

MATRIX SOLUTIONS INC.
ATTN: Scott Miller
31 Beacon Point Court
Breslau ON N0B 1M0

Date Received:	05-OCT-17
Report Date:	13-OCT-17 14:02 (MT)
Version:	FINAL

Client Phone: 519-772-3777

Certificate of Analysis

Lab Work Order #: L2003176

Project P.O. #:	NOT SUBMITTED
Job Reference:	23089 - CLAIR MALTBY CEIS
C of C Numbers:	M81843
Legal Site Desc:	

Gayle Braun

Gayle Braun
Senior Account Manager

	Sample ID	L2003176-1	L2003176-2	L2003176-3	L2003176-4	L2003176-5
	Description	WATER	WATER	WATER	WATER	WATER
	Sampled Date	04-OCT-17	04-OCT-17	04-OCT-17	04-OCT-17	04-OCT-17
	Sampled Time	10:20	10:30	11:30	11:45	13:20
	Client ID	2308917004001 MW02-D	2308917004002 MW02-S	2308917004003 MW01-D	2308917004004 MW01-S	2308917004005 MW04-S
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (umhos/cm)	720	737	590	935	557
	pH (pH units)	8.00	7.81	8.21	8.04	8.11
	Total Dissolved Solids (mg/L)	440 DLDS	396 DLDS	348 DLDS	542 DLDS	352 DLM
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	378	377	236	299	249
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<10	<10	<10	<10	<10
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<10	<10	<10	<10	<10
	Alkalinity, Total (as CaCO3) (mg/L)	378	377	236	299	249
	Bromide (Br) (mg/L)	<0.10	<0.10	<0.10	<0.10	<0.10
	Chloride (Cl) (mg/L)	16.3	29.4	42.2	101	23.3
	Computed Conductivity (uS/cm)	665	648	552	843	530
	Conductivity % Difference (%)	-7.9	-12.8	-6.6	-10.4	-5.0
	Fluoride (F) (mg/L)	0.045	0.077	0.136	0.084	0.086
	Hardness (as CaCO3) (mg/L)	382	347	230	361	273
	Ion Balance (%)	107	109	104	104	102
	Langelier Index	1.1	0.9	0.7	1.0	0.9
	Nitrate (as N) (mg/L)	<0.020	<0.020	<0.020	1.73	0.039
	Nitrite (as N) (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Total Kjeldahl Nitrogen (mg/L)	0.26	0.35	<0.15	<0.15	1.7 DLM
	Saturation pH (pH)	6.87	6.89	7.48	7.02	7.23
	TDS (Calculated) (mg/L)	419	408	330	518	320
	Sulfate (SO4) (mg/L)	35.0	7.54	38.8	52.2	45.2
	Anion Sum (me/L)	7.45	7.20	5.94	9.03	5.74
	Cation Sum (me/L)	7.94	7.89	6.16	9.43	5.86
	Cation - Anion Balance (%)	3.2	4.5	1.8	2.2	1.1
Dissolved Metals	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Aluminum (Al)-Dissolved (mg/L)	<0.0050	0.0093	<0.0050	<0.0050	<0.0050
	Antimony (Sb)-Dissolved (mg/L)	<0.00010	0.00011	0.00017	<0.00010	<0.00010
	Arsenic (As)-Dissolved (mg/L)	0.00358	0.0197	0.00876	0.00014	0.00272
	Barium (Ba)-Dissolved (mg/L)	0.0906	0.0471	0.0440	0.0609	0.0612
	Beryllium (Be)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Dissolved (mg/L)	<0.010	0.020	0.065	0.021	<0.010
	Cadmium (Cd)-Dissolved (mg/L)	<0.000010	<0.000010	0.000011	0.000192	<0.000010
	Calcium (Ca)-Dissolved (mg/L)	103	98.8	38.6	95.2	64.5
	Cesium (Cs)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Chromium (Cr)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Cobalt (Co)-Dissolved (mg/L)	0.00028	0.00101	0.00072	<0.00010	0.00014

	Sample ID	L2003176-6	L2003176-7	L2003176-8	L2003176-9	L2003176-10
	Description	WATER	WATER	WATER	WATER	WATER
	Sampled Date	04-OCT-17	04-OCT-17	04-OCT-17	04-OCT-17	05-OCT-17
	Sampled Time	13:45	14:50	16:00	17:20	11:50
	Client ID	2308917004006 MW04-D	2308917004007 MW02-D	2308917004008 MW09-D	2308917004009 MW06-S	2308917005001 MW05-D
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (umhos/cm)	490	620	466	625	674
	pH (pH units)	8.08	7.88	7.98	8.01	8.00
	Total Dissolved Solids (mg/L)	244 DLM	376 DLDS	278 DLDS	400 DLDS	402 DLDS
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	261	283	264	271	336
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<10	<10	<10	<10	<10
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<10	<10	<10	<10	<10
	Alkalinity, Total (as CaCO3) (mg/L)	261	283	264	271	336
	Bromide (Br) (mg/L)	<0.10	<0.10	<0.10	<0.10	<0.10
	Chloride (Cl) (mg/L)	7.39	14.7	2.56	11.4	11.7
	Computed Conductivity (uS/cm)	455	563	419	595	607
	Conductivity % Difference (%)	-7.5	-9.6	-10.5	-5.0	-10.5
	Fluoride (F) (mg/L)	0.170	0.027	0.076	0.066	0.057
	Hardness (as CaCO3) (mg/L)	236	316	239	311	350
	Ion Balance (%)	107	112	113	105	108
	Langelier Index	0.8	0.8	0.8	0.9	1.1
	Nitrate (as N) (mg/L)	<0.020	7.09	<0.020	<0.020	<0.020
	Nitrite (as N) (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Total Kjeldahl Nitrogen (mg/L)	<1.5 DLM	<1.5 DLM	0.29	<0.15	1.39
	Saturation pH (pH)	7.30	7.05	7.22	7.15	6.95
	TDS (Calculated) (mg/L)	277	353	256	367	378
	Sulfate (SO4) (mg/L)	20.8	17.0	4.55	76.4	36.9
	Anion Sum (me/L)	4.98	5.94	4.54	6.40	6.67
	Cation Sum (me/L)	5.35	6.67	5.13	6.71	7.20
	Cation - Anion Balance (%)	3.6	5.7	6.0	2.4	3.8
Dissolved Metals	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Aluminum (Al)-Dissolved (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
	Antimony (Sb)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)-Dissolved (mg/L)	0.0100	0.00011	0.00443	0.00165	0.00025
	Barium (Ba)-Dissolved (mg/L)	0.0575	0.0944	0.0954	0.121	0.124
	Beryllium (Be)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Dissolved (mg/L)	0.016	0.013	0.013	<0.010	<0.010
	Cadmium (Cd)-Dissolved (mg/L)	<0.000010	0.000043	0.000016	<0.000010	<0.000010
	Calcium (Ca)-Dissolved (mg/L)	50.7	87.2	59.8	73.3	96.3
	Cesium (Cs)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Chromium (Cr)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	0.00131	<0.00050
	Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010	0.00037	0.00011	<0.00010

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2003176-11	L2003176-12	L2003176-13	L2003176-14	
	Description	WATER	WATER	WATER	WATER	
	Sampled Date	05-OCT-17	05-OCT-17	05-OCT-17	05-OCT-17	
	Sampled Time	12:20	12:45	13:42	13:53	
	Client ID	2308917005002 MW05-S	2308917005003 MW06-D	2308917005004 MW08-D	2308917005005 MW08-S	
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (umhos/cm)	644	431	1180	656	
	pH (pH units)	8.08	8.17	8.09	7.93	
	Total Dissolved Solids (mg/L)	DLDS 364	DLDS 235	DLDS 663	DLDS 352	
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	309	221	321	321	
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<10	<10	<10	<10	
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<10	<10	<10	<10	
	Alkalinity, Total (as CaCO3) (mg/L)	309	221	321	321	
	Bromide (Br) (mg/L)	<0.10	<0.10	0.19	<0.10	
	Chloride (Cl) (mg/L)	10.2	3.34	170	15.9	
	Computed Conductivity (uS/cm)	595	392	1010	572	
	Conductivity % Difference (%)	-8.0	-9.4	-15.3	-13.8	
	Fluoride (F) (mg/L)	0.057	0.053	0.043	0.045	
	Hardness (as CaCO3) (mg/L)	337	218	374	339	
	Ion Balance (%)	109	112	105	112	
	Langelier Index	1.0	0.8	1.1	1.0	
	Nitrate (as N) (mg/L)	0.384	0.046	1.31	4.19	
	Nitrite (as N) (mg/L)	0.012	<0.010	0.014	<0.010	
	Total Kjeldahl Nitrogen (mg/L)	0.22	<0.15	<0.15	TKNI 0.15	
	Saturation pH (pH)	7.03	7.34	6.98	6.96	
	TDS (Calculated) (mg/L)	367	234	621	356	
	Sulfate (SO4) (mg/L)	48.0	16.6	29.9	4.95	
	Anion Sum (me/L)	6.44	4.13	10.8	6.17	
	Cation Sum (me/L)	6.99	4.64	11.4	6.94	
	Cation - Anion Balance (%)	4.1	5.8	2.6	5.9	
Dissolved Metals	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	
	Aluminum (Al)-Dissolved (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	
	Antimony (Sb)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	
	Arsenic (As)-Dissolved (mg/L)	0.00304	0.00129	<0.00010	0.00019	
	Barium (Ba)-Dissolved (mg/L)	0.122	0.111	0.144	0.0130	
	Beryllium (Be)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	
	Boron (B)-Dissolved (mg/L)	<0.010	<0.010	0.013	<0.010	
	Cadmium (Cd)-Dissolved (mg/L)	0.000010	<0.000010	0.000084	0.000046	
	Calcium (Ca)-Dissolved (mg/L)	85.7	54.0	101	95.1	
	Cesium (Cs)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	
	Chromium (Cr)-Dissolved (mg/L)	0.00274	<0.00050	<0.00050	<0.00050	
	Cobalt (Co)-Dissolved (mg/L)	0.00028	<0.00010	0.00047	<0.00010	

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2003176-1	L2003176-2	L2003176-3	L2003176-4	L2003176-5
	Description	WATER	WATER	WATER	WATER	WATER
	Sampled Date	04-OCT-17	04-OCT-17	04-OCT-17	04-OCT-17	04-OCT-17
	Sampled Time	10:20	10:30	11:30	11:45	13:20
	Client ID	2308917004001 MW02-D	2308917004002 MW02-S	2308917004003 MW01-D	2308917004004 MW01-S	2308917004005 MW04-S
Grouping	**Analyte**					
WATER						
Dissolved Metals	Copper (Cu)-Dissolved (mg/L)	0.00040	0.00063	0.00104	0.00191	0.00057
	Iron (Fe)-Dissolved (mg/L)	1.82	1.39	0.031	<0.010	<0.010
	Lead (Pb)-Dissolved (mg/L)	0.000126	0.000066	<0.000050	0.000214	<0.000050
	Lithium (Li)-Dissolved (mg/L)	0.0026	0.0024	0.0048	0.0031	0.0040
	Magnesium (Mg)-Dissolved (mg/L)	30.2	24.4	32.4	29.9	27.2
	Manganese (Mn)-Dissolved (mg/L)	0.0920	0.465	0.0314	0.00060	0.0257
	Molybdenum (Mo)-Dissolved (mg/L)	0.000396	0.000821	0.00293	0.000578	0.00182
	Nickel (Ni)-Dissolved (mg/L)	0.00154	0.00491	0.00291	0.00157	0.00060
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Dissolved (mg/L)	0.871	0.633	0.888	1.85	1.34
	Rubidium (Rb)-Dissolved (mg/L)	0.00110	0.00126	0.00045	0.00275	0.00079
	Selenium (Se)-Dissolved (mg/L)	<0.000050	0.000096	<0.000050	0.000192	<0.000050
	Silicon (Si)-Dissolved (mg/L)	8.38	4.18	6.23	4.45	9.81
	Silver (Ag)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Sodium (Na)-Dissolved (mg/L)	6.55	21.4	35.6	50.0	8.63
	Strontium (Sr)-Dissolved (mg/L)	0.122	0.117	0.461	0.411	0.135
	Sulfur (S)-Dissolved (mg/L)	12.7	4.24	14.2	19.8	15.9
	Tellurium (Te)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	0.000023	0.000013
	Thorium (Th)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	0.00013	<0.00010	<0.00010
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	0.00042	<0.00030	<0.00030	<0.00030
	Tungsten (W)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Uranium (U)-Dissolved (mg/L)	0.000309	0.00242	0.000498	0.000941	0.00165
	Vanadium (V)-Dissolved (mg/L)	<0.00050	0.00141	<0.00050	<0.00050	0.00067
	Zinc (Zn)-Dissolved (mg/L)	0.0183	0.0574	0.0074	0.103	0.0025
	Zirconium (Zr)-Dissolved (mg/L)	<0.00030	0.00052	<0.00030	<0.00030	<0.00030

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2003176-6	L2003176-7	L2003176-8	L2003176-9	L2003176-10
	Description	WATER	WATER	WATER	WATER	WATER
	Sampled Date	04-OCT-17	04-OCT-17	04-OCT-17	04-OCT-17	05-OCT-17
	Sampled Time	13:45	14:50	16:00	17:20	11:50
	Client ID	2308917004006 MW04-D	2308917004007 MW02-D	2308917004008 MW09-D	2308917004009 MW06-S	2308917005001 MW05-D
Grouping	**Analyte**					
WATER						
Dissolved Metals	Copper (Cu)-Dissolved (mg/L)	<0.00020	0.00136	0.00096	0.00029	<0.00020
	Iron (Fe)-Dissolved (mg/L)	0.249	0.109	0.084	0.589	2.76
	Lead (Pb)-Dissolved (mg/L)	<0.000050	0.000069	<0.000050	<0.000050	<0.000050
	Lithium (Li)-Dissolved (mg/L)	0.0061	0.0022	0.0035	0.0029	0.0025
	Magnesium (Mg)-Dissolved (mg/L)	26.5	23.9	21.8	31.0	26.7
	Manganese (Mn)-Dissolved (mg/L)	0.0135	0.00058	0.0581	0.0452	0.0828
	Molybdenum (Mo)-Dissolved (mg/L)	0.00142	0.000192	0.00153	0.00251	0.000177
	Nickel (Ni)-Dissolved (mg/L)	<0.00050	<0.00050	0.00067	0.00067	<0.00050
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Dissolved (mg/L)	1.24	4.35	0.990	1.45	0.776
	Rubidium (Rb)-Dissolved (mg/L)	0.00052	0.00057	0.00078	0.00095	0.00054
	Selenium (Se)-Dissolved (mg/L)	0.000073	0.000366	<0.000050	<0.000050	0.000064
	Silicon (Si)-Dissolved (mg/L)	10.9	4.45	8.20	6.39	10.2
	Silver (Ag)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Sodium (Na)-Dissolved (mg/L)	13.9	5.41	7.31	10.6	4.04
	Strontium (Sr)-Dissolved (mg/L)	0.149	0.0906	0.137	0.137	0.127
	Sulfur (S)-Dissolved (mg/L)	7.58	5.92	1.96	28.7	13.5
	Tellurium (Te)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	0.000017	<0.000010	<0.000010
	Thorium (Th)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
	Tungsten (W)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Uranium (U)-Dissolved (mg/L)	0.000633	0.000268	0.000429	0.00241	0.000042
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	0.00062
	Zinc (Zn)-Dissolved (mg/L)	<0.0010	0.0249	0.0167	0.0028	<0.0010
	Zirconium (Zr)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	0.00059

	Sample ID	L2003176-11	L2003176-12	L2003176-13	L2003176-14
	Description	WATER	WATER	WATER	WATER
	Sampled Date	05-OCT-17	05-OCT-17	05-OCT-17	05-OCT-17
	Sampled Time	12:20	12:45	13:42	13:53
	Client ID	2308917005002 MW05-S	2308917005003 MW06-D	2308917005004 MW08-D	2308917005005 MW08-S
Grouping	**Analyte**				
WATER					
Dissolved Metals	Copper (Cu)-Dissolved (mg/L)	<0.00020	0.00041	0.00111	0.00074
	Iron (Fe)-Dissolved (mg/L)	0.288	0.070	<0.010	<0.010
	Lead (Pb)-Dissolved (mg/L)	0.000071	<0.000050	0.000347	<0.000050
	Lithium (Li)-Dissolved (mg/L)	0.0048	0.0029	0.0036	0.0012
	Magnesium (Mg)-Dissolved (mg/L)	29.8	20.2	29.3	24.6
	Manganese (Mn)-Dissolved (mg/L)	0.0972	0.0163	0.0210	0.00133
	Molybdenum (Mo)-Dissolved (mg/L)	0.00492	0.000828	0.000605	<0.000050
	Nickel (Ni)-Dissolved (mg/L)	0.00131	<0.00050	0.00236	<0.00050
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Dissolved (mg/L)	1.40	1.14	3.42	0.744
	Rubidium (Rb)-Dissolved (mg/L)	0.00081	0.00075	0.00233	0.00031
	Selenium (Se)-Dissolved (mg/L)	<0.000050	<0.000050	0.000249	0.000059
	Silicon (Si)-Dissolved (mg/L)	5.02	7.72	5.69	4.33
	Silver (Ag)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050
	Sodium (Na)-Dissolved (mg/L)	5.27	5.81	88.6	3.25
	Strontium (Sr)-Dissolved (mg/L)	0.107	0.112	0.152	0.0997
	Sulfur (S)-Dissolved (mg/L)	18.1	6.15	11.5	1.96
	Tellurium (Te)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	0.000051	<0.000010
	Thorium (Th)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010
	Tin (Sn)-Dissolved (mg/L)	<0.00010	0.00011	<0.00010	<0.00010
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030
	Tungsten (W)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010
	Uranium (U)-Dissolved (mg/L)	0.00511	0.000595	0.000491	0.000143
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Dissolved (mg/L)	0.0106	0.0317	0.198	0.0082
	Zirconium (Zr)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030

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

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L2003176-1, -10, -11, -12, -13, -14, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2003176-1, -10, -11, -12, -13, -14, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Iron (Fe)-Dissolved	MS-B	L2003176-1, -10, -11, -12, -13, -14, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2003176-1, -10, -11, -12, -13, -14, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Manganese (Mn)-Dissolved	MS-B	L2003176-1, -10, -11, -12, -13, -14, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Silicon (Si)-Dissolved	MS-B	L2003176-1, -10, -11, -12, -13, -14, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L2003176-1, -10, -11, -12, -13, -14, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2003176-1, -10, -11, -12, -13, -14, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Uranium (U)-Dissolved	MS-B	L2003176-1, -10, -11, -12, -13, -14, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Zinc (Zn)-Dissolved	MS-B	L2003176-1, -10, -11, -12, -13, -14, -2, -3, -4, -5, -6, -7, -8, -9

Qualifiers for Individual Parameters Listed:

Qualifier	Description
DLDS	Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
TKNI	TKN result may be biased low due to Nitrate interference. Nitrate-N is > 10x TKN.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-AUTO-WT	Water	Automated Speciated Alkalinity	EPA 310.2

This analysis is carried out using procedures adapted from EPA Method 310.2 "Alkalinity". Total Alkalinity is determined using the methyl orange colourimetric method.

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-SPECIATED-WT	Water	pH Measurement for Spec. Alk	APHA 4500 H-Electrode

Water samples are analyzed directly by a calibrated pH meter.

ALS Test Code	Matrix	Test Description	Method Reference**
BR-IC-N-WT	Water	Bromide in Water by IC	EPA 300.1 (mod)

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

ALS Test Code	Matrix	Test Description	Method Reference**
CL-IC-N-WT	Water	Chloride by IC	EPA 300.1 (mod)

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

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

ALS Test Code	Matrix	Test Description	Method Reference**
EC-WT	Water	Conductivity	APHA 2510 B

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

ALS Test Code	Matrix	Test Description	Method Reference**
F-IC-N-WT	Water	Fluoride in Water by IC	EPA 300.1 (mod)

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

ALS Test Code	Matrix	Test Description	Method Reference**
IONBALANCE-OP03-WT	Water	Detailed Ion Balance Calculation	APHA 1030E, 2330B, 2510A
MET-D-CCMS-WT	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B/6020A (mod)

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

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

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

Reference Information

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

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

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

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

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

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

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

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

TKN-WT	Water	Total Kjeldahl Nitrogen	APHA 4500-N

Sample is digested to convert the TKN to ammonium sulphate. The ammonia ions are heated to produce a colour complex. The absorbance measured by the instrument is proportional to the concentration of ammonium sulphate in the sample and is reported as TKN.

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

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

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

Chain of Custody Numbers:

M81843

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

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

Quality Control Report

Workorder: L2003176 Report Date: 13-OCT-17

Client: MATRIX SOLUTIONS INC.
31 Beacon Point Court
Breslau ON N0B 1M0
Contact: Scott Miller

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
ALK-AUTO-WT	**Water**							
Batch R3852508								
WG2636421-7 CRM		**WT-ALK-CRM**						
Alkalinity, Total (as CaCO3)			107.4		%		80-120	11-OCT-17
WG2636421-6 LCS								
Alkalinity, Total (as CaCO3)			107.0		%		85-115	11-OCT-17
WG2636421-5 MB								
Alkalinity, Total (as CaCO3)			<10		mg/L		10	11-OCT-17
ALK-SPECIATED-WT	**Water**							
Batch R3850309								
WG2634088-28 DUP		**L2003176-8**						
pH		7.98	7.99	J	pH units	0.03	0.2	06-OCT-17
WG2634088-32 DUP		**L2003176-10**						
pH		8.00	8.02	J	pH units	0.01	0.2	06-OCT-17
BR-IC-N-WT	**Water**							
Batch R3851990								
WG2635493-4 DUP		**L2003176-2**						
Bromide (Br)		<0.10	<0.10	RPD-NA	mg/L	N/A	20	10-OCT-17
WG2635493-8 DUP		**L2003176-12**						
Bromide (Br)		<0.10	<0.10	RPD-NA	mg/L	N/A	20	10-OCT-17
WG2635493-2 LCS								
Bromide (Br)			102.8		%		85-115	10-OCT-17
WG2635493-7 LCS								
Bromide (Br)			100.7		%		85-115	10-OCT-17
WG2635493-1 MB								
Bromide (Br)			<0.10		mg/L		0.1	10-OCT-17
WG2635493-6 MB								
Bromide (Br)			<0.10		mg/L		0.1	10-OCT-17
WG2635493-5 MS		**L2003176-2**						
Bromide (Br)			84.1		%		75-125	10-OCT-17
WG2635493-9 MS		**L2003176-12**						
Bromide (Br)			88.2		%		75-125	10-OCT-17
CL-IC-N-WT	**Water**							
Batch R3851990								
WG2635493-4 DUP		**L2003176-2**						
Chloride (Cl)		29.4	29.5		mg/L	0.3	20	10-OCT-17
WG2635493-8 DUP		**L2003176-12**						
Chloride (Cl)		3.34	3.35		mg/L	0.4	20	10-OCT-17
WG2635493-2 LCS								
Chloride (Cl)			101.0		%		90-110	10-OCT-17

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
CL-IC-N-WT	**Water**							
Batch R3851990								
WG2635493-7 LCS								
Chloride (Cl)			101.3		%		90-110	10-OCT-17
WG2635493-1 MB								
Chloride (Cl)			<0.50		mg/L		0.5	10-OCT-17
WG2635493-6 MB								
Chloride (Cl)			<0.50		mg/L		0.5	10-OCT-17
WG2635493-5 MS		**L2003176-2**						
Chloride (Cl)			107.9		%		75-125	10-OCT-17
WG2635493-9 MS		**L2003176-12**						
Chloride (Cl)			98.5		%		75-125	10-OCT-17
EC-WT	**Water**							
Batch R3850309								
WG2634088-28 DUP		**L2003176-8**						
Conductivity		466	466		umhos/cm	0.0	10	06-OCT-17
WG2634088-32 DUP		**L2003176-10**						
Conductivity		674	670		umhos/cm	0.1	10	06-OCT-17
WG2634088-18 LCS								
Conductivity			101.9		%		90-110	06-OCT-17
WG2634088-22 LCS								
Conductivity			102.1		%		90-110	06-OCT-17
WG2634088-26 LCS								
Conductivity			102.6		%		90-110	06-OCT-17
WG2634088-30 LCS								
Conductivity			102.3		%		90-110	06-OCT-17
WG2634088-17 MB								
Conductivity			<3.0		umhos/cm		3	06-OCT-17
WG2634088-21 MB								
Conductivity			<3.0		umhos/cm		3	06-OCT-17
WG2634088-25 MB								
Conductivity			<3.0		umhos/cm		3	06-OCT-17
WG2634088-29 MB								
Conductivity			<3.0		umhos/cm		3	06-OCT-17
F-IC-N-WT	**Water**							
Batch R3851990								
WG2635493-4 DUP		**L2003176-2**						
Fluoride (F)		0.077	0.077		mg/L	0.5	20	10-OCT-17
WG2635493-8 DUP		**L2003176-12**						
Fluoride (F)		0.053	0.054		mg/L	0.2	20	10-OCT-17

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
F-IC-N-WT	**Water**							
Batch R3851990								
WG2635493-2	**LCS**							
Fluoride (F)			102.4		%		90-110	10-OCT-17
WG2635493-7	**LCS**							
Fluoride (F)			104.6		%		90-110	10-OCT-17
WG2635493-1	**MB**							
Fluoride (F)			<0.020		mg/L		0.02	10-OCT-17
WG2635493-6	**MB**							
Fluoride (F)			<0.020		mg/L		0.02	10-OCT-17
WG2635493-5	**MS**	**L2003176-2**						
Fluoride (F)			101.7		%		75-125	10-OCT-17
WG2635493-9	**MS**	**L2003176-12**						
Fluoride (F)			98.3		%		75-125	10-OCT-17
MET-D-CCMS-WT	**Water**							
Batch R3850907								
WG2633658-2	**LCS**							
Aluminum (Al)-Dissolved			97.9		%		80-120	06-OCT-17
Antimony (Sb)-Dissolved			94.8		%		80-120	06-OCT-17
Arsenic (As)-Dissolved			99.8		%		80-120	06-OCT-17
Barium (Ba)-Dissolved			102.7		%		80-120	06-OCT-17
Beryllium (Be)-Dissolved			93.9		%		80-120	06-OCT-17
Bismuth (Bi)-Dissolved			98.5		%		80-120	06-OCT-17
Boron (B)-Dissolved			92.4		%		80-120	06-OCT-17
Cadmium (Cd)-Dissolved			97.7		%		80-120	06-OCT-17
Calcium (Ca)-Dissolved			96.9		%		80-120	06-OCT-17
Cesium (Cs)-Dissolved			103.7		%		80-120	06-OCT-17
Chromium (Cr)-Dissolved			99.5		%		80-120	06-OCT-17
Cobalt (Co)-Dissolved			98.6		%		80-120	06-OCT-17
Copper (Cu)-Dissolved			98.0		%		80-120	06-OCT-17
Iron (Fe)-Dissolved			96.6		%		80-120	06-OCT-17
Lead (Pb)-Dissolved			97.3		%		80-120	06-OCT-17
Lithium (Li)-Dissolved			91.2		%		80-120	06-OCT-17
Magnesium (Mg)-Dissolved			99.0		%		80-120	06-OCT-17
Manganese (Mn)-Dissolved			100.4		%		80-120	06-OCT-17
Molybdenum (Mo)-Dissolved			97.6		%		80-120	06-OCT-17
Nickel (Ni)-Dissolved			99.4		%		80-120	06-OCT-17
Phosphorus (P)-Dissolved			100.9		%		80-120	06-OCT-17

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-WT	**Water**							
Batch R3850907								
WG2633658-2 LCS								
Potassium (K)-Dissolved			92.9		%		80-120	06-OCT-17
Rubidium (Rb)-Dissolved			99.1		%		80-120	06-OCT-17
Selenium (Se)-Dissolved			96.0		%		80-120	06-OCT-17
Silicon (Si)-Dissolved			100.6		%		60-140	06-OCT-17
Silver (Ag)-Dissolved			103.0		%		80-120	06-OCT-17
Sodium (Na)-Dissolved			99.9		%		80-120	06-OCT-17
Strontium (Sr)-Dissolved			95.0		%		80-120	06-OCT-17
Sulfur (S)-Dissolved			86.4		%		80-120	06-OCT-17
Tellurium (Te)-Dissolved			93.0		%		80-120	06-OCT-17
Thallium (Tl)-Dissolved			95.1		%		80-120	06-OCT-17
Thorium (Th)-Dissolved			95.6		%		80-120	06-OCT-17
Tin (Sn)-Dissolved			99.0		%		80-120	06-OCT-17
Titanium (Ti)-Dissolved			97.3		%		80-120	06-OCT-17
Tungsten (W)-Dissolved			99.1		%		80-120	06-OCT-17
Uranium (U)-Dissolved			98.0		%		80-120	06-OCT-17
Vanadium (V)-Dissolved			99.98		%		80-120	06-OCT-17
Zinc (Zn)-Dissolved			94.4		%		80-120	06-OCT-17
Zirconium (Zr)-Dissolved			96.0		%		80-120	06-OCT-17
WG2633658-1 MB								
Aluminum (Al)-Dissolved			<0.0050		mg/L		0.005	06-OCT-17
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	06-OCT-17
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	06-OCT-17
Barium (Ba)-Dissolved			<0.00010		mg/L		0.0001	06-OCT-17
Beryllium (Be)-Dissolved			<0.00010		mg/L		0.0001	06-OCT-17
Bismuth (Bi)-Dissolved			<0.000050		mg/L		0.00005	06-OCT-17
Boron (B)-Dissolved			<0.010		mg/L		0.01	06-OCT-17
Cadmium (Cd)-Dissolved			<0.000010		mg/L		0.00001	06-OCT-17
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	06-OCT-17
Cesium (Cs)-Dissolved			<0.000010		mg/L		0.00001	06-OCT-17
Chromium (Cr)-Dissolved			<0.00050		mg/L		0.0005	06-OCT-17
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	06-OCT-17
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	06-OCT-17
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	06-OCT-17
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	06-OCT-17

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-WT	**Water**							
Batch R3850907								
WG2633658-1 MB								
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	06-OCT-17
Magnesium (Mg)-Dissolved			<0.050		mg/L		0.05	06-OCT-17
Manganese (Mn)-Dissolved			<0.00050		mg/L		0.0005	06-OCT-17
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	06-OCT-17
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	06-OCT-17
Phosphorus (P)-Dissolved			<0.050		mg/L		0.05	06-OCT-17
Potassium (K)-Dissolved			<0.050		mg/L		0.05	06-OCT-17
Rubidium (Rb)-Dissolved			<0.00020		mg/L		0.0002	06-OCT-17
Selenium (Se)-Dissolved			<0.000050		mg/L		0.00005	06-OCT-17
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	06-OCT-17
Silver (Ag)-Dissolved			<0.000050		mg/L		0.00005	06-OCT-17
Sodium (Na)-Dissolved			<0.50		mg/L		0.5	06-OCT-17
Strontium (Sr)-Dissolved			<0.0010		mg/L		0.001	06-OCT-17
Sulfur (S)-Dissolved			<0.50		mg/L		0.5	06-OCT-17
Tellurium (Te)-Dissolved			<0.00020		mg/L		0.0002	06-OCT-17
Thallium (Tl)-Dissolved			<0.000010		mg/L		0.00001	06-OCT-17
Thorium (Th)-Dissolved			<0.00010		mg/L		0.0001	06-OCT-17
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	06-OCT-17
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	06-OCT-17
Tungsten (W)-Dissolved			<0.00010		mg/L		0.0001	06-OCT-17
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	06-OCT-17
Vanadium (V)-Dissolved			<0.00050		mg/L		0.0005	06-OCT-17
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	06-OCT-17
Zirconium (Zr)-Dissolved			<0.00030		mg/L		0.0003	06-OCT-17
NO2-IC-WT	**Water**							
Batch R3851990								
WG2635493-4 DUP		**L2003176-2**						
Nitrite (as N)		<0.010	<0.010	RPD-NA	mg/L	N/A	25	10-OCT-17
WG2635493-8 DUP		**L2003176-12**						
Nitrite (as N)		<0.010	<0.010	RPD-NA	mg/L	N/A	25	10-OCT-17
WG2635493-2 LCS								
Nitrite (as N)			101.2		%		70-130	10-OCT-17
WG2635493-7 LCS								
Nitrite (as N)			99.99		%		70-130	10-OCT-17
WG2635493-1 MB								

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NO2-IC-WT	**Water**							
Batch R3851990								
WG2635493-1 MB								
Nitrite (as N)			<0.010		mg/L		0.01	10-OCT-17
WG2635493-6 MB								
Nitrite (as N)			<0.010		mg/L		0.01	10-OCT-17
WG2635493-5 MS		**L2003176-2**						
Nitrite (as N)			100.5		%		70-130	10-OCT-17
WG2635493-9 MS		**L2003176-12**						
Nitrite (as N)			98.1		%		70-130	10-OCT-17
NO3-IC-WT	**Water**							
Batch R3851990								
WG2635493-4 DUP		**L2003176-2**						
Nitrate (as N)		<0.020	<0.020	RPD-NA	mg/L	N/A	25	10-OCT-17
WG2635493-8 DUP		**L2003176-12**						
Nitrate (as N)		0.046	0.048		mg/L	4.0	25	10-OCT-17
WG2635493-2 LCS								
Nitrate (as N)			101.1		%		70-130	10-OCT-17
WG2635493-7 LCS								
Nitrate (as N)			100.5		%		70-130	10-OCT-17
WG2635493-1 MB								
Nitrate (as N)			<0.020		mg/L		0.02	10-OCT-17
WG2635493-6 MB								
Nitrate (as N)			<0.020		mg/L		0.02	10-OCT-17
WG2635493-5 MS		**L2003176-2**						
Nitrate (as N)			98.7		%		70-130	10-OCT-17
WG2635493-9 MS		**L2003176-12**						
Nitrate (as N)			97.4		%		70-130	10-OCT-17
SO4-IC-N-WT	**Water**							
Batch R3851990								
WG2635493-4 DUP		**L2003176-2**						
Sulfate (SO4)		7.54	7.60		mg/L	0.7	20	10-OCT-17
WG2635493-8 DUP		**L2003176-12**						
Sulfate (SO4)		16.6	16.3		mg/L	1.6	20	10-OCT-17
WG2635493-2 LCS								
Sulfate (SO4)			101.4		%		90-110	10-OCT-17
WG2635493-7 LCS								
Sulfate (SO4)			101.6		%		90-110	10-OCT-17
WG2635493-1 MB								
Sulfate (SO4)			<0.30		mg/L		0.3	10-OCT-17

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
SO4-IC-N-WT	**Water**							
Batch R3851990								
WG2635493-6 MB								
Sulfate (SO4)			<0.30		mg/L		0.3	10-OCT-17
WG2635493-5 MS		**L2003176-2**						
Sulfate (SO4)			104.8		%		75-125	10-OCT-17
WG2635493-9 MS		**L2003176-12**						
Sulfate (SO4)			97.4		%		75-125	10-OCT-17
SOLIDS-TDS-WT	**Water**							
Batch R3849767								
WG2634902-2 LCS								
Total Dissolved Solids			99.2		%		85-115	08-OCT-17
WG2634902-1 MB								
Total Dissolved Solids			<10		mg/L		10	08-OCT-17
Batch R3851648								
WG2635084-2 LCS								
Total Dissolved Solids			99.7		%		85-115	09-OCT-17
WG2635084-1 MB								
Total Dissolved Solids			<10		mg/L		10	09-OCT-17
TKN-WT	**Water**							
Batch R3851316								
WG2635198-2 LCS								
Total Kjeldahl Nitrogen			96.4		%		75-125	10-OCT-17
WG2635198-1 MB								
Total Kjeldahl Nitrogen			<0.15		mg/L		0.15	10-OCT-17
Batch R3852943								
WG2636240-3 DUP		**L2003176-5**						
Total Kjeldahl Nitrogen		1.7	1.7		mg/L	2.0	20	12-OCT-17
WG2636240-2 LCS								
Total Kjeldahl Nitrogen			95.0		%		75-125	12-OCT-17
WG2636240-1 MB								
Total Kjeldahl Nitrogen			<0.15		mg/L		0.15	12-OCT-17
WG2636240-4 MS		**L2003176-5**						
Total Kjeldahl Nitrogen			98.4		%		70-130	12-OCT-17

Legend:

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

Sample Parameter Qualifier Definitions:

Qualifier	Description
J	Duplicate results and limits are expressed in terms of absolute difference.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Hold Time Exceedances:

All test results reported with this submission were conducted within ALS recommended hold times.

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

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

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

L2003176

Matrix Solutions Inc.
ENVIRONMENT & ENGINEERING

COC # M 81843

Page: 1 of 1
Lab Submitted to : ALS Waterloo
Lab Agreement no : Q58595
Lab Job ID:

Invoice to: Require Report:Y___ N___
Company Name: Matrix Solutions Inc.
Contact Name: Scott Miller
Address:
PC:
Phone / Fax#: Ph: Fax:
AFE #: ~~2300~~ 147164

Copy of Report to:
Matrix Solutions - Data Management
Suite 200, 150 - 13th Avenue SW
Calgary, Alberta, Canada
T2R 0V2
Ph: 403-237-0606 Fax: 403-263-2493
Fax draft copy of invoice to Matrix Solutions Inc.

Matrix Project #: 23089
Matrix Proj. Name: Clair Maltby CEIS
Location:
Sampler's Name(s): ~~SM~~ SM

REGULATORY REQUIREMENTS: (check)
☐ Alberta Tier 1
☐ SPIGEC
☐ Freshwater Aquatic Life (Low Level Metals)
☐ Canadian Drinking Water
☐ BC Regs
☒ Other: ODWQS

SERVICE REQUESTED:
☐ **RUSH** (Please ensure you contact the lab) **Due Date:**
☒ REGULAR Turnaround
REPORT DISTRIBUTION: always send to data_management@matrix-solutions.com
☐ Additional Emails Smiller@matrix-solutions.com

Analysis Required

	Sample Number (14 digits only) yr-mth-day	Sample Point Name	Depth (cm)	Sample Type	Date/Time Sampled	Quantity # of Jars	Quantity # of Bags	Q58595													Lab Sample Number
1	23089171004001	MW02-D	—	H2O	Oct 4/17 10:20	3	—	X													1
2	23089171004002	MW02-S	—	H2O	Oct 4/17 10:30	3	—	X													2
3	23089171004003	MW01-D	—	H2O	Oct 4/17 11:30	3	—	X													3
4	23089171004004	MW01-S	—	H2O	Oct 4/17 11:45	3	—	X													4
5	23089171004005	MW04-S	—	H2O	Oct 4/17 13:20	3	—	X													5
6	23089171004006	MW04-D	—	H2O	Oct 4/17 13:45	3	—	X													6
7	23089171004007	MW09-S	—	H2O	Oct 4/17 14:50	3	—	X													7
8	23089171004008	MW09-D	—	H2O	Oct 4/17 16:00	3	—	X													8
9	23089171004009	MW06-S	—	H2O	Oct 4/17 17:20	3	—	X													9
10	23089171005001	MW05-D	—	H2O	Oct 5/17 11:50	3	—	X													10
11	23089171005002	MW05-S	—	H2O	Oct 5/17 12:00	3	—	X													11
12	23089171005003	MW06-D	—	H2O	Oct 5/17 12:45	3	—	X													12
13	23089171005004	MW08-D	—	H2O	Oct 5/17 13:42	3	—	X													13
14	23089171005005	MW08-S	—	H2O	Oct 5/17 13:53	3	—	X													14
15																					
*For metals in water samples indicate if you want Total (T), Dissolved (D) or Extractable (E) as part of "Analysis Required"							Preserved/Filtered	▨													

L2003176-COFC

Relinquished by: Scott Miller Date/Time: Oct 5/17 17:15
Signature:
Received by: RW Date/Time: OCT-05-2017 17:15 3.3C
Signature:

COMMENTS/SPECIAL INSTRUCTIONS Dissolved metals were all field filtered. Please see Q58595 for specific Analyses.

MATRIX SOLUTIONS INC.
ATTN: Scott Miller
31 Beacon Point Court
Breslau ON N0B 1M0

Date Received:	11-OCT-17
Report Date:	18-OCT-17 11:59 (MT)
Version:	FINAL

Client Phone: 519-772-3777

Certificate of Analysis

Lab Work Order #: L2004753

Project P.O. #:	23089
Job Reference:	23089 - CLAIR MALTOY CEIS
C of C Numbers:	81854
Legal Site Desc:	

Gayle Braun

Gayle Braun
Senior Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2004753-1	L2004753-2	L2004753-3
	Description	WATER	WATER	WATER
	Sampled Date	10-OCT-17	10-OCT-17	10-OCT-17
	Sampled Time	14:45	15:45	16:57
	Client ID	23089171010001	23089171010002	23089171010003
Grouping	**Analyte**			
WATER				
Physical Tests	Conductivity (umhos/cm)	701	711	536
	pH (pH units)	8.12	8.10	8.09
	Total Dissolved Solids (mg/L)	416 DLDS	406 DLDS	287 DLDS
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	285	308	250
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<10	<10	<10
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<10	<10	<10
	Alkalinity, Total (as CaCO3) (mg/L)	285	308	250
	Bromide (Br) (mg/L)	<0.10	<0.10	<0.10
	Chloride (Cl) (mg/L)	40.4	31.6	12.9
	Computed Conductivity (uS/cm)	624	625	484
	Conductivity % Difference (%)	-11.6	-12.9	-10.2
	Fluoride (F) (mg/L)	0.049	0.046	0.070
	Hardness (as CaCO3) (mg/L)	310	344	276
	Ion Balance (%)	104	116	113
	Langelier Index	1.0	1.1	0.9
	Nitrate (as N) (mg/L)	0.578	1.83	<0.020
	Nitrite (as N) (mg/L)	<0.010	<0.010	<0.010
	Total Kjeldahl Nitrogen (mg/L)	0.19	0.21	<0.15
	Saturation pH (pH)	7.11	7.02	7.22
	TDS (Calculated) (mg/L)	380	380	288
	Sulfate (SO4) (mg/L)	41.2	20.6	27.2
	Anion Sum (me/L)	6.78	6.56	5.08
	Cation Sum (me/L)	7.03	7.57	5.74
	Cation - Anion Balance (%)	1.8	7.2	6.1
Dissolved Metals	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD
	Aluminum (Al)-Dissolved (mg/L)	<0.0050	<0.0050	<0.0050
	Antimony (Sb)-Dissolved (mg/L)	0.00018	<0.00010	<0.00010
	Arsenic (As)-Dissolved (mg/L)	0.00045	0.00030	0.00233
	Barium (Ba)-Dissolved (mg/L)	0.122	0.0940	0.0787
	Beryllium (Be)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050
	Boron (B)-Dissolved (mg/L)	<0.010	0.010	<0.010
	Cadmium (Cd)-Dissolved (mg/L)	0.000039	0.000060	<0.000010
	Calcium (Ca)-Dissolved (mg/L)	76.4	88.9	65.7
	Cesium (Cs)-Dissolved (mg/L)	<0.000010	0.000010	<0.000010
	Chromium (Cr)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050
	Cobalt (Co)-Dissolved (mg/L)	0.00037	<0.00010	<0.00010

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2004753-1	L2004753-2	L2004753-3		
	Description	WATER	WATER	WATER		
	Sampled Date	10-OCT-17	10-OCT-17	10-OCT-17		
	Sampled Time	14:45	15:45	16:57		
	Client ID	23089171010001	23089171010002	23089171010003		
Grouping	**Analyte**					
WATER						
Dissolved Metals	Copper (Cu)-Dissolved (mg/L)	0.0184	0.00126	0.00042		
	Iron (Fe)-Dissolved (mg/L)	0.028	<0.010	0.227		
	Lead (Pb)-Dissolved (mg/L)	0.000758	0.000090	<0.000050		
	Lithium (Li)-Dissolved (mg/L)	0.0029	<0.0010	0.0025		
	Magnesium (Mg)-Dissolved (mg/L)	29.0	29.6	27.2		
	Manganese (Mn)-Dissolved (mg/L)	0.0696	0.00663	0.0134		
	Molybdenum (Mo)-Dissolved (mg/L)	0.000794	0.000247	0.000809		
	Nickel (Ni)-Dissolved (mg/L)	0.00211	0.00077	<0.00050		
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050		
	Potassium (K)-Dissolved (mg/L)	1.65	1.55	1.03		
	Rubidium (Rb)-Dissolved (mg/L)	0.00122	0.00416	0.00050		
	Selenium (Se)-Dissolved (mg/L)	0.000055	0.000261	<0.000050		
	Silicon (Si)-Dissolved (mg/L)	6.21	5.34	6.78		
	Silver (Ag)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050		
	Sodium (Na)-Dissolved (mg/L)	18.0	15.2	4.48		
	Strontium (Sr)-Dissolved (mg/L)	0.112	0.102	0.111		
	Sulfur (S)-Dissolved (mg/L)	13.6	6.96	9.11		
	Tellurium (Te)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020		
	Thallium (Tl)-Dissolved (mg/L)	0.000016	0.000035	<0.000010		
	Thorium (Th)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010		
	Tin (Sn)-Dissolved (mg/L)	0.00054	<0.00010	<0.00010		
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030		
	Tungsten (W)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010		
	Uranium (U)-Dissolved (mg/L)	0.000807	0.000484	0.000646		
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050		
	Zinc (Zn)-Dissolved (mg/L)	0.0543	0.0485	0.0072		
	Zirconium (Zr)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030		

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L2004753-1, -2, -3
Matrix Spike	Boron (B)-Dissolved	MS-B	L2004753-1, -2, -3
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2004753-1, -2, -3
Matrix Spike	Lithium (Li)-Dissolved	MS-B	L2004753-1, -2, -3
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2004753-1, -2, -3
Matrix Spike	Manganese (Mn)-Dissolved	MS-B	L2004753-1, -2, -3
Matrix Spike	Potassium (K)-Dissolved	MS-B	L2004753-1, -2, -3
Matrix Spike	Silicon (Si)-Dissolved	MS-B	L2004753-1, -2, -3
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L2004753-1, -2, -3
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2004753-1, -2, -3
Matrix Spike	Sulfur (S)-Dissolved	MS-B	L2004753-1, -2, -3
Matrix Spike	Uranium (U)-Dissolved	MS-B	L2004753-1, -2, -3

Qualifiers for Individual Parameters Listed:

Qualifier	Description
DLDS	Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-AUTO-WT	Water	Automated Speciated Alkalinity	EPA 310.2

This analysis is carried out using procedures adapted from EPA Method 310.2 "Alkalinity". Total Alkalinity is determined using the methyl orange colourimetric method.

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-SPECIATED-WT	Water	pH Measurement for Spec. Alk	APHA 4500 H-Electrode

Water samples are analyzed directly by a calibrated pH meter.

ALS Test Code	Matrix	Test Description	Method Reference**
BR-IC-N-WT	Water	Bromide in Water by IC	EPA 300.1 (mod)

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

ALS Test Code	Matrix	Test Description	Method Reference**
CL-IC-N-WT	Water	Chloride by IC	EPA 300.1 (mod)

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

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

ALS Test Code	Matrix	Test Description	Method Reference**
EC-WT	Water	Conductivity	APHA 2510 B

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

ALS Test Code	Matrix	Test Description	Method Reference**
F-IC-N-WT	Water	Fluoride in Water by IC	EPA 300.1 (mod)

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

ALS Test Code	Matrix	Test Description	Method Reference**
IONBALANCE-OP03-WT	Water	Detailed Ion Balance Calculation	APHA 1030E, 2330B, 2510A
MET-D-CCMS-WT	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B/6020A (mod)

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

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

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

ALS Test Code	Matrix	Test Description	Method Reference**
NO2-IC-WT	Water	Nitrite in Water by IC	EPA 300.1 (mod)

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

ALS Test Code	Matrix	Test Description	Method Reference**
NO3-IC-WT	Water	Nitrate in Water by IC	EPA 300.1 (mod)

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

ALS Test Code	Matrix	Test Description	Method Reference**
SO4-IC-N-WT	Water	Sulfate in Water by IC	EPA 300.1 (mod)

Reference Information

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

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

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

TKN-WT	Water	Total Kjeldahl Nitrogen	APHA 4500-N

Sample is digested to convert the TKN to ammonium sulphate. The ammonia ions are heated to produce a colour complex. The absorbance measured by the instrument is proportional to the concentration of ammonium sulphate in the sample and is reported as TKN.

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

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

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

Chain of Custody Numbers:

81854

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

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

Quality Control Report

Workorder: L2004753 Report Date: 18-OCT-17

Client: MATRIX SOLUTIONS INC.
31 Beacon Point Court
Breslau ON N0B 1M0
Contact: Scott Miller

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
ALK-AUTO-WT	**Water**							
Batch R3857326								
WG2640384-3 CRM		**WT-ALK-CRM**						
Alkalinity, Total (as CaCO3)			101.2		%		80-120	16-OCT-17
WG2640384-2 LCS								
Alkalinity, Total (as CaCO3)			102.9		%		85-115	16-OCT-17
WG2640384-1 MB								
Alkalinity, Total (as CaCO3)			<10		mg/L		10	16-OCT-17
Batch R3858293								
WG2641806-3 CRM		**WT-ALK-CRM**						
Alkalinity, Total (as CaCO3)			95.8		%		80-120	17-OCT-17
WG2641806-4 DUP		**L2004753-2**						
Alkalinity, Total (as CaCO3)		308	296		mg/L	3.8	20	17-OCT-17
WG2641806-2 LCS								
Alkalinity, Total (as CaCO3)			99.3		%		85-115	17-OCT-17
WG2641806-1 MB								
Alkalinity, Total (as CaCO3)			<10		mg/L		10	17-OCT-17
ALK-SPECIATED-WT	**Water**							
Batch R3852519								
WG2636416-14 LCS								
pH			7.00		pH units		6.9-7.1	11-OCT-17
BR-IC-N-WT	**Water**							
Batch R3853963								
WG2637481-9 DUP		**L2004753-2**						
Bromide (Br)		<0.10	<0.10	RPD-NA	mg/L	N/A	20	12-OCT-17
WG2637481-7 LCS								
Bromide (Br)			101.7		%		85-115	12-OCT-17
WG2637481-6 MB								
Bromide (Br)			<0.10		mg/L		0.1	12-OCT-17
WG2637481-10 MS		**L2004753-2**						
Bromide (Br)			100.2		%		75-125	12-OCT-17
CL-IC-N-WT	**Water**							
Batch R3853963								
WG2637481-9 DUP		**L2004753-2**						
Chloride (Cl)		31.6	31.6		mg/L	0.0	20	12-OCT-17
WG2637481-7 LCS								
Chloride (Cl)			100.8		%		90-110	12-OCT-17
WG2637481-6 MB								
Chloride (Cl)			<0.50		mg/L		0.5	12-OCT-17

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
CL-IC-N-WT	**Water**							
Batch R3853963								
WG2637481-10 MS		**L2004753-2**						
Chloride (Cl)			99.4		%		75-125	12-OCT-17
EC-WT	**Water**							
Batch R3852519								
WG2636416-14 LCS								
Conductivity			101.8		%		90-110	11-OCT-17
WG2636416-13 MB								
Conductivity			<3.0		umhos/cm		3	11-OCT-17
F-IC-N-WT	**Water**							
Batch R3853963								
WG2637481-9 DUP		**L2004753-2**						
Fluoride (F)		0.046	0.044		mg/L	4.0	20	12-OCT-17
WG2637481-7 LCS								
Fluoride (F)			100.9		%		90-110	12-OCT-17
WG2637481-6 MB								
Fluoride (F)			<0.020		mg/L		0.02	12-OCT-17
WG2637481-10 MS		**L2004753-2**						
Fluoride (F)			95.1		%		75-125	12-OCT-17
MET-D-CCMS-WT	**Water**							
Batch R3852586								
WG2637230-2 LCS								
Aluminum (Al)-Dissolved			97.1		%		80-120	12-OCT-17
Antimony (Sb)-Dissolved			107.4		%		80-120	12-OCT-17
Arsenic (As)-Dissolved			100.9		%		80-120	12-OCT-17
Barium (Ba)-Dissolved			104.0		%		80-120	12-OCT-17
Beryllium (Be)-Dissolved			95.3		%		80-120	12-OCT-17
Bismuth (Bi)-Dissolved			97.4		%		80-120	12-OCT-17
Boron (B)-Dissolved			89.5		%		80-120	12-OCT-17
Cadmium (Cd)-Dissolved			100.6		%		80-120	12-OCT-17
Calcium (Ca)-Dissolved			99.3		%		80-120	12-OCT-17
Cesium (Cs)-Dissolved			105.0		%		80-120	12-OCT-17
Chromium (Cr)-Dissolved			99.8		%		80-120	12-OCT-17
Cobalt (Co)-Dissolved			99.99		%		80-120	12-OCT-17
Copper (Cu)-Dissolved			97.1		%		80-120	12-OCT-17
Iron (Fe)-Dissolved			97.7		%		80-120	12-OCT-17

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-WT	**Water**							
Batch R3852586								
WG2637230-2 LCS								
Lead (Pb)-Dissolved			99.6		%		80-120	12-OCT-17
Lithium (Li)-Dissolved			106.0		%		80-120	12-OCT-17
Magnesium (Mg)-Dissolved			99.7		%		80-120	12-OCT-17
Manganese (Mn)-Dissolved			102.5		%		80-120	12-OCT-17
Molybdenum (Mo)-Dissolved			101.6		%		80-120	12-OCT-17
Nickel (Ni)-Dissolved			99.1		%		80-120	12-OCT-17
Phosphorus (P)-Dissolved			103.3		%		80-120	12-OCT-17
Potassium (K)-Dissolved			103.0		%		80-120	12-OCT-17
Rubidium (Rb)-Dissolved			103.4		%		80-120	12-OCT-17
Selenium (Se)-Dissolved			98.1		%		80-120	12-OCT-17
Silicon (Si)-Dissolved			99.3		%		60-140	12-OCT-17
Silver (Ag)-Dissolved			104.4		%		80-120	12-OCT-17
Sodium (Na)-Dissolved			101.3		%		80-120	12-OCT-17
Strontium (Sr)-Dissolved			99.5		%		80-120	12-OCT-17
Sulfur (S)-Dissolved			92.9		%		80-120	12-OCT-17
Tellurium (Te)-Dissolved			99.4		%		80-120	12-OCT-17
Thallium (Tl)-Dissolved			98.0		%		80-120	12-OCT-17
Thorium (Th)-Dissolved			98.7		%		80-120	12-OCT-17
Tin (Sn)-Dissolved			102.2		%		80-120	12-OCT-17
Titanium (Ti)-Dissolved			93.6		%		80-120	12-OCT-17
Tungsten (W)-Dissolved			101.7		%		80-120	12-OCT-17
Uranium (U)-Dissolved			101.8		%		80-120	12-OCT-17
Vanadium (V)-Dissolved			100.1		%		80-120	12-OCT-17
Zinc (Zn)-Dissolved			93.7		%		80-120	12-OCT-17
Zirconium (Zr)-Dissolved			100.4		%		80-120	12-OCT-17
WG2637230-1 MB								
Aluminum (Al)-Dissolved			<0.0050		mg/L		0.005	12-OCT-17
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	12-OCT-17
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	12-OCT-17
Barium (Ba)-Dissolved			<0.00010		mg/L		0.0001	12-OCT-17
Beryllium (Be)-Dissolved			<0.00010		mg/L		0.0001	12-OCT-17
Bismuth (Bi)-Dissolved			<0.000050		mg/L		0.00005	12-OCT-17
Boron (B)-Dissolved			<0.010		mg/L		0.01	12-OCT-17
Cadmium (Cd)-Dissolved			<0.000010		mg/L		0.00001	12-OCT-17

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-WT	**Water**							
Batch R3852586								
WG2637230-1 MB								
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	12-OCT-17
Cesium (Cs)-Dissolved			<0.000010		mg/L		0.00001	12-OCT-17
Chromium (Cr)-Dissolved			<0.00050		mg/L		0.0005	12-OCT-17
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	12-OCT-17
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	12-OCT-17
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	12-OCT-17
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	12-OCT-17
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	12-OCT-17
Magnesium (Mg)-Dissolved			<0.050		mg/L		0.05	12-OCT-17
Manganese (Mn)-Dissolved			<0.00050		mg/L		0.0005	12-OCT-17
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	12-OCT-17
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	12-OCT-17
Phosphorus (P)-Dissolved			<0.050		mg/L		0.05	12-OCT-17
Potassium (K)-Dissolved			<0.050		mg/L		0.05	12-OCT-17
Rubidium (Rb)-Dissolved			<0.00020		mg/L		0.0002	12-OCT-17
Selenium (Se)-Dissolved			<0.000050		mg/L		0.00005	12-OCT-17
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	12-OCT-17
Silver (Ag)-Dissolved			<0.000050		mg/L		0.00005	12-OCT-17
Sodium (Na)-Dissolved			<0.50		mg/L		0.5	12-OCT-17
Strontium (Sr)-Dissolved			<0.0010		mg/L		0.001	12-OCT-17
Sulfur (S)-Dissolved			<0.50		mg/L		0.5	12-OCT-17
Tellurium (Te)-Dissolved			<0.00020		mg/L		0.0002	12-OCT-17
Thallium (Tl)-Dissolved			<0.000010		mg/L		0.00001	12-OCT-17
Thorium (Th)-Dissolved			<0.00010		mg/L		0.0001	12-OCT-17
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	12-OCT-17
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	12-OCT-17
Tungsten (W)-Dissolved			<0.00010		mg/L		0.0001	12-OCT-17
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	12-OCT-17
Vanadium (V)-Dissolved			<0.00050		mg/L		0.0005	12-OCT-17
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	12-OCT-17
Zirconium (Zr)-Dissolved			<0.00030		mg/L		0.0003	12-OCT-17
NO2-IC-WT	**Water**							

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NO2-IC-WT	**Water**							
Batch R3853963								
WG2637481-9 DUP		**L2004753-2**						
Nitrite (as N)		<0.010	<0.010	RPD-NA	mg/L	N/A	25	12-OCT-17
WG2637481-7 LCS								
Nitrite (as N)			99.5		%		70-130	12-OCT-17
WG2637481-6 MB								
Nitrite (as N)			<0.010		mg/L		0.01	12-OCT-17
WG2637481-10 MS		**L2004753-2**						
Nitrite (as N)			100.9		%		70-130	12-OCT-17
NO3-IC-WT	**Water**							
Batch R3853963								
WG2637481-9 DUP		**L2004753-2**						
Nitrate (as N)		1.83	1.81		mg/L	1.0	25	12-OCT-17
WG2637481-7 LCS								
Nitrate (as N)			100.2		%		70-130	12-OCT-17
WG2637481-6 MB								
Nitrate (as N)			<0.020		mg/L		0.02	12-OCT-17
WG2637481-10 MS		**L2004753-2**						
Nitrate (as N)			99.4		%		70-130	12-OCT-17
SO4-IC-N-WT	**Water**							
Batch R3853963								
WG2637481-9 DUP		**L2004753-2**						
Sulfate (SO4)		20.6	20.6		mg/L	0.3	20	12-OCT-17
WG2637481-7 LCS								
Sulfate (SO4)			100.9		%		90-110	12-OCT-17
WG2637481-6 MB								
Sulfate (SO4)			<0.30		mg/L		0.3	12-OCT-17
WG2637481-10 MS		**L2004753-2**						
Sulfate (SO4)			100.2		%		75-125	12-OCT-17
SOLIDS-TDS-WT	**Water**							
Batch R3852662								
WG2635778-2 LCS								
Total Dissolved Solids			95.9		%		85-115	11-OCT-17
WG2635778-1 MB								
Total Dissolved Solids			<10		mg/L		10	11-OCT-17
TKN-WT	**Water**							

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
TKN-WT	**Water**							
Batch R3856787								
WG2640062-10 LCS								
Total Kjeldahl Nitrogen			90.6		%		75-125	16-OCT-17
WG2640062-9 MB								
Total Kjeldahl Nitrogen			<0.15		mg/L		0.15	16-OCT-17

Legend:

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

Sample Parameter Qualifier Definitions:

Qualifier	Description
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Hold Time Exceedances:

All test results reported with this submission were conducted within ALS recommended hold times.

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

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

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

Matrix Solutions Inc.
ENVIRONMENT & ENGINEERING

COC # M 81854

Page: 1 of 1

Lab Submitted to : ALS Waterloo
Lab Agreement no : Q58595
Lab Job ID:

Invoice to: Require Report: Y ✓ N

Company Name: MATRIX SOLUTIONS
Contact Name: Scott Miller
Address:
PC:
Phone / Fax#: Ph: Fax:
AFE #: 147164

Copy of Report to:

Matrix Solutions - Data Management
Suite 200, 150 - 13th Avenue SW
Calgary, Alberta, Canada
T2R 0V2
Ph: 403-237-0606 Fax: 403-263-2493
Fax draft copy of invoice to Matrix Solutions Inc.

Matrix Project # : 23089
Matrix Proj. Name: Clair Maltby CEIS
Location:
Sampler's Name(s): S.M / D.A.

REGULATORY REQUIREMENTS: (check)

☐ Alberta Tier 1
☐ SPIGEC
☐ Freshwater Aquatic Life (Low Level Metals)
☐ Canadian Drinking Water
☐ BC Regs
☒ Other: ODWQS

SERVICE REQUESTED:

☐ RUSH (Please ensure you contact the lab) Due Date:
☒ REGULAR Turnaround

REPORT DISTRIBUTION: always send to data_management@matrix-solutions.com

☒ Additional Emails SMiller@matrix-solutions.com

	Sample Number (14 digits only) yr-mth-day	Sample Point Name	Depth (cm)	Sample Type	Date/Time Sampled	Quantity # of Jars	Quantity # of Bags	Analysis Required: Q58595													Lab Sample Number
1	23089171010001	MW-07	—	WATER	Oct 10/17 14:45	3	—	X													
2	23089171010002	MW-03-S	—	WATER	Oct 10/17 15:45	3	—	X													
3	23089171010003	MW03-D	—	WATER	Oct 10/17 16:57	3	—	X													
4																					
5																					
6																					
7																					
8	L2004753																				
9																					
10																					
11																					
12																					
13																					
14																					
15																					

L2004753-COFC

*For metals in water samples indicate if you want Total (T), Dissolved (D) or Extractable (E) as part of "Analysis Required"

Preserved/Filtered

Relinquished by: Scott Miller
Signature:
Date/Time: Oct 11/17 9:10

Received by:
Signature: T: 4.7°C
Date/Time: 11-Oct-17 9:10

COMMENTS/SPECIAL INSTRUCTIONS Dissolved metals were field filtered. Please see Q58595 for specific Analyses

MATRIX SOLUTIONS INC.
ATTN: DUSTIN MARTIN
31 Beacon Point Court
Breslau ON N0B 1M0

Date Received: 09-MAY-18
Report Date: 15-MAY-18 12:41 (MT)
Version: FINAL

Client Phone: 519-772-3777

Certificate of Analysis

Lab Work Order #: L2091912
Project P.O. #: CLAIR MALTBY LEIS
Job Reference: 23089
C of C Numbers: m81832
Legal Site Desc:

Gayle Braun

Gayle Braun
Senior Account Manager

ANALYTICAL GUIDELINE REPORT

L2091912-1 23089180509001 MW04S
Sampled By: CLIENT on 09-MAY-18 @ 16:30
Matrix: WATER

Sample Details Grouping	Analyte	Result	Qualifier	D.L.	Units	Analyzed	Guideline Limits #1	Guideline Limits #2
Physical Tests								
	Conductivity	582		3.0	umhos/cm	10-MAY-18		
	pH	8.04		0.10	pH units	10-MAY-18		6.5-8.5
	Total Dissolved Solids	393		20	mg/L	11-MAY-18		500
Anions and Nutrients								
	Alkalinity, Bicarbonate (as CaCO3)	234		10	mg/L	11-MAY-18		
	Alkalinity, Carbonate (as CaCO3)	<10		10	mg/L	11-MAY-18		
	Alkalinity, Hydroxide (as CaCO3)	<10		10	mg/L	11-MAY-18		
	Alkalinity, Total (as CaCO3)	234		10	mg/L	11-MAY-18		30-500
	Bromide (Br)	<0.10		0.10	mg/L	12-MAY-18		
	Chloride (Cl)	24.1		0.50	mg/L	12-MAY-18		250
	Computed Conductivity	543			uS/cm	15-MAY-18		
	Conductivity % Difference	-6.8			%	15-MAY-18		
	Fluoride (F)	0.118		0.020	mg/L	12-MAY-18	1.5	
	Hardness (as CaCO3)	292			mg/L	15-MAY-18		*80-100
	Ion Balance	115			%	15-MAY-18		
	Langelier Index	0.8			No Unit	15-MAY-18		
	Nitrate (as N)	0.029		0.020	mg/L	12-MAY-18	10	
	Nitrite (as N)	<0.010		0.010	mg/L	12-MAY-18	1	
	Total Kjeldahl Nitrogen	0.56		0.15	mg/L	11-MAY-18		
	Saturation pH	7.23			pH	15-MAY-18		
	TDS (Calculated)	322			mg/L	15-MAY-18		
	Sulfate (SO4)	45.7		0.30	mg/L	12-MAY-18		500
	Anion Sum	5.52			me/L	15-MAY-18		
	Cation Sum	6.35			me/L	15-MAY-18		
	Cation - Anion Balance	7.0			%	15-MAY-18		
Dissolved Metals								
	Dissolved Metals Filtration Location	FIELD			No Unit	10-MAY-18		
	Aluminum (Al)-Dissolved	0.0199		0.0050	mg/L	10-MAY-18		0.1
	Antimony (Sb)-Dissolved	0.00019		0.00010	mg/L	10-MAY-18	0.006	
	Arsenic (As)-Dissolved	0.00126		0.00010	mg/L	10-MAY-18	0.0100	
	Barium (Ba)-Dissolved	0.0698		0.00010	mg/L	10-MAY-18	1	
	Beryllium (Be)-Dissolved	<0.00010		0.00010	mg/L	10-MAY-18		
	Bismuth (Bi)-Dissolved	<0.000050		0.000050	mg/L	10-MAY-18		
	Boron (B)-Dissolved	0.012		0.010	mg/L	10-MAY-18	5	
	Cadmium (Cd)-Dissolved	<0.0000050		0.0000050	mg/L	10-MAY-18	0.005	
	Calcium (Ca)-Dissolved	69.6		0.050	mg/L	10-MAY-18		
	Cesium (Cs)-Dissolved	<0.000010		0.000010	mg/L	10-MAY-18		
	Chromium (Cr)-Dissolved	<0.00050		0.00050	mg/L	10-MAY-18	0.05	
	Cobalt (Co)-Dissolved	0.00022		0.00010	mg/L	10-MAY-18		
	Copper (Cu)-Dissolved	0.00251		0.00020	mg/L	10-MAY-18		1
	Iron (Fe)-Dissolved	0.015		0.010	mg/L	10-MAY-18		0.3
	Lead (Pb)-Dissolved	0.000106		0.000050	mg/L	10-MAY-18	0.01	
	Lithium (Li)-Dissolved	0.0038		0.0010	mg/L	10-MAY-18		
	Magnesium (Mg)-Dissolved	28.7		0.0050	mg/L	10-MAY-18		
	Manganese (Mn)-Dissolved	0.0347		0.00050	mg/L	10-MAY-18		0.05
	Molybdenum (Mo)-Dissolved	0.00198		0.000050	mg/L	10-MAY-18		

** Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
* Analytical result for this parameter exceeds Guideline Limit listed on this report. Guideline Limits applied:

Ontario Drinking Water Regulation (ODWQS) JAN.1,2018 = [Suite] - ON-DW-STANDARD+GUIDELINES

#1: Schedule 1 (Microbiological) and 2 (Chemical) Standards (JAN,2018) **#2: Ontario DW Aesthetic and Operational Guidelines**

ANALYTICAL GUIDELINE REPORT

Sample Details Grouping	Analyte	Result	Qualifier	D.L.	Units	Analyzed	Guideline Limits	
L2091912-1	23089180509001 MW04S							
Sampled By:	CLIENT on 09-MAY-18 @ 16:30							
Matrix:	WATER						#1	#2
Dissolved Metals								
	Nickel (Ni)-Dissolved	0.00231		0.00050	mg/L	10-MAY-18		
	Phosphorus (P)-Dissolved	<0.050		0.050	mg/L	10-MAY-18		
	Potassium (K)-Dissolved	1.74		0.050	mg/L	10-MAY-18		
	Rubidium (Rb)-Dissolved	0.00127		0.00020	mg/L	10-MAY-18		
	Selenium (Se)-Dissolved	<0.000050		0.000050	mg/L	10-MAY-18	0.05	
	Silicon (Si)-Dissolved	9.19		0.050	mg/L	10-MAY-18		
	Silver (Ag)-Dissolved	<0.000050		0.000050	mg/L	10-MAY-18		
	Sodium (Na)-Dissolved	11.0		0.050	mg/L	10-MAY-18	20	200
	Strontium (Sr)-Dissolved	0.165		0.0010	mg/L	10-MAY-18		
	Sulfur (S)-Dissolved	15.4		0.50	mg/L	10-MAY-18		
	Tellurium (Te)-Dissolved	<0.00020		0.00020	mg/L	10-MAY-18		
	Thallium (Tl)-Dissolved	0.000012		0.000010	mg/L	10-MAY-18		
	Thorium (Th)-Dissolved	<0.00010		0.00010	mg/L	10-MAY-18		
	Tin (Sn)-Dissolved	0.00086		0.00010	mg/L	10-MAY-18		
	Titanium (Ti)-Dissolved	<0.00050	DLUI	0.00050	mg/L	10-MAY-18		
	Tungsten (W)-Dissolved	<0.00010		0.00010	mg/L	10-MAY-18		
	Uranium (U)-Dissolved	0.00172		0.000010	mg/L	10-MAY-18	0.02	
	Vanadium (V)-Dissolved	0.00068		0.00050	mg/L	10-MAY-18		
	Zinc (Zn)-Dissolved	0.0054		0.0010	mg/L	10-MAY-18		5
	Zirconium (Zr)-Dissolved	<0.00030		0.00030	mg/L	10-MAY-18		
L2091912-2	23089180509002 MW04D							
Sampled By:	CLIENT on 09-MAY-18 @ 09:15							
Matrix:	WATER						#1	#2
Physical Tests								
	Conductivity	474		3.0	umhos/cm	10-MAY-18		
	pH	8.11		0.10	pH units	10-MAY-18		6.5-8.5
	Total Dissolved Solids	264		20	mg/L	11-MAY-18		500
Anions and Nutrients								
	Alkalinity, Bicarbonate (as CaCO3)	230		10	mg/L	11-MAY-18		
	Alkalinity, Carbonate (as CaCO3)	<10		10	mg/L	11-MAY-18		
	Alkalinity, Hydroxide (as CaCO3)	<10		10	mg/L	11-MAY-18		
	Alkalinity, Total (as CaCO3)	230		10	mg/L	11-MAY-18		30-500
	Bromide (Br)	<0.10		0.10	mg/L	12-MAY-18		
	Chloride (Cl)	6.67		0.50	mg/L	12-MAY-18		250
	Computed Conductivity	434			uS/cm	15-MAY-18		
	Conductivity % Difference	-8.9			%	15-MAY-18		
	Fluoride (F)	0.199		0.020	mg/L	12-MAY-18	1.5	
	Hardness (as CaCO3)	242			mg/L	15-MAY-18		*80-100
	Ion Balance	121			%	15-MAY-18		
	Langelier Index	0.8			No Unit	15-MAY-18		
	Nitrate (as N)	0.032		0.020	mg/L	12-MAY-18	10	
	Nitrite (as N)	<0.010		0.010	mg/L	12-MAY-18	1	
	Total Kjeldahl Nitrogen	0.44		0.15	mg/L	14-MAY-18		
	Saturation pH	7.35			pH	15-MAY-18		
	TDS (Calculated)	256			mg/L	15-MAY-18		
	Sulfate (SO4)	19.2		0.30	mg/L	12-MAY-18		500

** Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
* Analytical result for this parameter exceeds Guideline Limit listed on this report. Guideline Limits applied:

Ontario Drinking Water Regulation (ODWQS) JAN.1,2018 = [Suite] - ON-DW-STANDARD+GUIDELINES

#1: Schedule 1 (Microbiological) and 2 (Chemical) Standards (JAN,2018) **#2: Ontario DW Aesthetic and Operational Guidelines**

Sample Details Grouping	Analyte	Result	Qualifier	D.L.	Units	Analyzed	Guideline Limits #1	Guideline Limits #2
L2091912-2	23089180509002 MW04D							
Sampled By:	CLIENT on 09-MAY-18 @ 09:15							
Matrix:	WATER							
Anions and Nutrients								
	Anion Sum	4.42			me/L	15-MAY-18		
	Cation Sum	5.35			me/L	15-MAY-18		
	Cation - Anion Balance	9.5			%	15-MAY-18		
Dissolved Metals								
	Dissolved Metals Filtration Location	FIELD			No Unit	10-MAY-18		
	Aluminum (Al)-Dissolved	0.0541		0.0050	mg/L	10-MAY-18		0.1
	Antimony (Sb)-Dissolved	<0.00010		0.00010	mg/L	10-MAY-18	0.006	
	Arsenic (As)-Dissolved	0.00994		0.00010	mg/L	10-MAY-18	0.0100	
	Barium (Ba)-Dissolved	0.0628		0.00010	mg/L	10-MAY-18	1	
	Beryllium (Be)-Dissolved	<0.00010		0.00010	mg/L	10-MAY-18		
	Bismuth (Bi)-Dissolved	<0.000050		0.000050	mg/L	10-MAY-18		
	Boron (B)-Dissolved	0.015		0.010	mg/L	10-MAY-18	5	
	Cadmium (Cd)-Dissolved	<0.0000050		0.0000050	mg/L	10-MAY-18	0.005	
	Calcium (Ca)-Dissolved	51.5		0.050	mg/L	10-MAY-18		
	Cesium (Cs)-Dissolved	<0.000010		0.000010	mg/L	10-MAY-18		
	Chromium (Cr)-Dissolved	<0.00050		0.00050	mg/L	10-MAY-18	0.05	
	Cobalt (Co)-Dissolved	<0.00010		0.00010	mg/L	10-MAY-18		
	Copper (Cu)-Dissolved	0.00023		0.00020	mg/L	10-MAY-18		1
	Iron (Fe)-Dissolved	0.335		0.010	mg/L	10-MAY-18		*0.3
	Lead (Pb)-Dissolved	0.000353		0.000050	mg/L	10-MAY-18	0.01	
	Lithium (Li)-Dissolved	0.0058		0.0010	mg/L	10-MAY-18		
	Magnesium (Mg)-Dissolved	27.6		0.0050	mg/L	10-MAY-18		
	Manganese (Mn)-Dissolved	0.0190		0.00050	mg/L	10-MAY-18		0.05
	Molybdenum (Mo)-Dissolved	0.00128		0.000050	mg/L	10-MAY-18		
	Nickel (Ni)-Dissolved	<0.00050		0.00050	mg/L	10-MAY-18		
	Phosphorus (P)-Dissolved	<0.050		0.050	mg/L	10-MAY-18		
	Potassium (K)-Dissolved	1.17		0.050	mg/L	10-MAY-18		
	Rubidium (Rb)-Dissolved	0.00057		0.00020	mg/L	10-MAY-18		
	Selenium (Se)-Dissolved	0.000106		0.000050	mg/L	11-MAY-18	0.05	
	Silicon (Si)-Dissolved	10.5		0.050	mg/L	10-MAY-18		
	Silver (Ag)-Dissolved	<0.000050		0.000050	mg/L	10-MAY-18		
	Sodium (Na)-Dissolved	11.0		0.050	mg/L	10-MAY-18	20	200
	Strontium (Sr)-Dissolved	0.164		0.0010	mg/L	10-MAY-18		
	Sulfur (S)-Dissolved	6.30		0.50	mg/L	10-MAY-18		
	Tellurium (Te)-Dissolved	<0.00020		0.00020	mg/L	10-MAY-18		
	Thallium (Tl)-Dissolved	<0.000010		0.000010	mg/L	10-MAY-18		
	Thorium (Th)-Dissolved	<0.00010		0.00010	mg/L	10-MAY-18		
	Tin (Sn)-Dissolved	<0.00010		0.00010	mg/L	10-MAY-18		
	Titanium (Ti)-Dissolved	0.00273		0.00030	mg/L	10-MAY-18		
	Tungsten (W)-Dissolved	<0.00010		0.00010	mg/L	10-MAY-18		
	Uranium (U)-Dissolved	0.000433		0.000010	mg/L	10-MAY-18	0.02	
	Vanadium (V)-Dissolved	<0.00050		0.00050	mg/L	10-MAY-18		
	Zinc (Zn)-Dissolved	0.0014		0.0010	mg/L	10-MAY-18		5
	Zirconium (Zr)-Dissolved	<0.00030		0.00030	mg/L	10-MAY-18		

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Ontario Drinking Water Regulation (ODWQS) JAN.1,2018 = [Suite] - ON-DW-STANDARD+GUIDELINES

#1: Schedule 1 (Microbiological) and 2 (Chemical) Standards (JAN,2018) **#2: Ontario DW Aesthetic and Operational Guidelines**

ANALYTICAL GUIDELINE REPORT

23089

Sample Details Grouping	Analyte	Result	Qualifier	D.L.	Units	Analyzed	Guideline Limits #1	Guideline Limits #2
L2091912-3	23089180509003 MW05S							
Sampled By:	CLIENT on 09-MAY-18 @ 12:00							
Matrix:	WATER							
Physical Tests								
	Conductivity	654		3.0	umhos/cm	10-MAY-18		
	pH	7.97		0.10	pH units	10-MAY-18		6.5-8.5
	Total Dissolved Solids	386		20	mg/L	11-MAY-18		500
Anions and Nutrients								
	Alkalinity, Bicarbonate (as CaCO3)	304		10	mg/L	11-MAY-18		
	Alkalinity, Carbonate (as CaCO3)	<10		10	mg/L	11-MAY-18		
	Alkalinity, Hydroxide (as CaCO3)	<10		10	mg/L	11-MAY-18		
	Alkalinity, Total (as CaCO3)	304		10	mg/L	11-MAY-18		30-500
	Bromide (Br)	<0.10		0.10	mg/L	12-MAY-18		
	Chloride (Cl)	13.5		0.50	mg/L	12-MAY-18		250
	Computed Conductivity	597			uS/cm	15-MAY-18		
	Conductivity % Difference	-9.1			%	15-MAY-18		
	Fluoride (F)	0.057		0.020	mg/L	12-MAY-18	1.5	
	Hardness (as CaCO3)	343			mg/L	15-MAY-18		*80-100
	Ion Balance	112			%	15-MAY-18		
	Langelier Index	0.9			No Unit	15-MAY-18		
	Nitrate (as N)	0.047		0.020	mg/L	12-MAY-18	10	
	Nitrite (as N)	<0.010		0.010	mg/L	12-MAY-18	1	
	Total Kjeldahl Nitrogen	0.28		0.15	mg/L	14-MAY-18		
	Saturation pH	7.03			pH	15-MAY-18		
	TDS (Calculated)	366			mg/L	15-MAY-18		
	Sulfate (SO4)	45.0		0.30	mg/L	12-MAY-18		500
	Anion Sum	6.36			me/L	15-MAY-18		
	Cation Sum	7.11			me/L	15-MAY-18		
	Cation - Anion Balance	5.5			%	15-MAY-18		
Dissolved Metals								
	Dissolved Metals Filtration Location	FIELD			No Unit	10-MAY-18		
	Aluminum (Al)-Dissolved	<0.0050		0.0050	mg/L	10-MAY-18		0.1
	Antimony (Sb)-Dissolved	<0.00010		0.00010	mg/L	10-MAY-18	0.006	
	Arsenic (As)-Dissolved	0.00338		0.00010	mg/L	10-MAY-18	0.0100	
	Barium (Ba)-Dissolved	0.127		0.00010	mg/L	10-MAY-18	1	
	Beryllium (Be)-Dissolved	<0.00010		0.00010	mg/L	10-MAY-18		
	Bismuth (Bi)-Dissolved	<0.000050		0.000050	mg/L	10-MAY-18		
	Boron (B)-Dissolved	<0.010		0.010	mg/L	10-MAY-18	5	
	Cadmium (Cd)-Dissolved	<0.0000050		0.0000050	mg/L	10-MAY-18	0.005	
	Calcium (Ca)-Dissolved	88.2		0.050	mg/L	10-MAY-18		
	Cesium (Cs)-Dissolved	<0.000010		0.000010	mg/L	10-MAY-18		
	Chromium (Cr)-Dissolved	<0.00050		0.00050	mg/L	10-MAY-18	0.05	
	Cobalt (Co)-Dissolved	0.00010		0.00010	mg/L	10-MAY-18		
	Copper (Cu)-Dissolved	<0.00020		0.00020	mg/L	10-MAY-18		1
	Iron (Fe)-Dissolved	0.726		0.010	mg/L	10-MAY-18		*0.3
	Lead (Pb)-Dissolved	0.000075		0.000050	mg/L	10-MAY-18	0.01	
	Lithium (Li)-Dissolved	0.0033		0.0010	mg/L	10-MAY-18		
	Magnesium (Mg)-Dissolved	29.9		0.0050	mg/L	10-MAY-18		
	Manganese (Mn)-Dissolved	0.0865		0.00050	mg/L	10-MAY-18		*0.05
	Molybdenum (Mo)-Dissolved	0.00110		0.000050	mg/L	10-MAY-18		

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Ontario Drinking Water Regulation (ODWQS) JAN.1,2018 = [Suite] - ON-DW-STANDARD+GUIDELINES

#1: Schedule 1 (Microbiological) and 2 (Chemical) Standards (JAN,2018) **#2: Ontario DW Aesthetic and Operational Guidelines**

ANALYTICAL GUIDELINE REPORT

23089

Sample Details Grouping	Analyte	Result	Qualifier	D.L.	Units	Analyzed	Guideline Limits			
L2091912-3	23089180509003 MW05S									
Sampled By:	CLIENT on 09-MAY-18 @ 12:00									
Matrix:	WATER						#1	#2		
Dissolved Metals										
	Nickel (Ni)-Dissolved	0.00066		0.00050	mg/L	10-MAY-18				
	Phosphorus (P)-Dissolved	<0.050		0.050	mg/L	10-MAY-18				
	Potassium (K)-Dissolved	1.17		0.050	mg/L	10-MAY-18				
	Rubidium (Rb)-Dissolved	0.00052		0.00020	mg/L	10-MAY-18				
	Selenium (Se)-Dissolved	<0.000050		0.000050	mg/L	10-MAY-18	0.05			
	Silicon (Si)-Dissolved	5.61		0.050	mg/L	10-MAY-18				
	Silver (Ag)-Dissolved	<0.000050		0.000050	mg/L	10-MAY-18				
	Sodium (Na)-Dissolved	4.87		0.050	mg/L	10-MAY-18	20	200		
	Strontium (Sr)-Dissolved	0.119		0.0010	mg/L	10-MAY-18				
	Sulfur (S)-Dissolved	15.4		0.50	mg/L	10-MAY-18				
	Tellurium (Te)-Dissolved	<0.00020		0.00020	mg/L	10-MAY-18				
	Thallium (Tl)-Dissolved	<0.000010		0.000010	mg/L	10-MAY-18				
	Thorium (Th)-Dissolved	<0.00010		0.00010	mg/L	10-MAY-18				
	Tin (Sn)-Dissolved	<0.00010		0.00010	mg/L	10-MAY-18				
	Titanium (Ti)-Dissolved	<0.00030		0.00030	mg/L	10-MAY-18				
	Tungsten (W)-Dissolved	<0.00010		0.00010	mg/L	10-MAY-18				
	Uranium (U)-Dissolved	0.00282		0.000010	mg/L	10-MAY-18	0.02			
	Vanadium (V)-Dissolved	<0.00050		0.00050	mg/L	10-MAY-18				
	Zinc (Zn)-Dissolved	0.0116		0.0010	mg/L	10-MAY-18		5		
	Zirconium (Zr)-Dissolved	<0.00030		0.00030	mg/L	10-MAY-18				
L2091912-4	23089180509004 MW05D									
Sampled By:	CLIENT on 09-MAY-18 @ 11:40									
Matrix:	WATER						#1	#2		
Physical Tests										
	Conductivity	671		3.0	umhos/cm	10-MAY-18				
	pH	7.89		0.10	pH units	10-MAY-18		6.5-8.5		
	Total Dissolved Solids	401		20	mg/L	11-MAY-18		500		
Anions and Nutrients										
	Alkalinity, Bicarbonate (as CaCO3)	320		10	mg/L	11-MAY-18				
	Alkalinity, Carbonate (as CaCO3)	<10		10	mg/L	11-MAY-18				
	Alkalinity, Hydroxide (as CaCO3)	<10		10	mg/L	11-MAY-18				
	Alkalinity, Total (as CaCO3)	320		10	mg/L	11-MAY-18		30-500		
	Bromide (Br)	<0.10		0.10	mg/L	12-MAY-18				
	Chloride (Cl)	12.1		0.50	mg/L	12-MAY-18		250		
	Computed Conductivity	596			uS/cm	15-MAY-18				
	Conductivity % Difference	-11.8			%	15-MAY-18				
	Fluoride (F)	0.075		0.020	mg/L	12-MAY-18	1.5			
	Hardness (as CaCO3)	350			mg/L	15-MAY-18		*80-100		
	Ion Balance	112			%	15-MAY-18				
	Langelier Index	0.9			No Unit	15-MAY-18				
	Nitrate (as N)	<0.020		0.020	mg/L	12-MAY-18	10			
	Nitrite (as N)	<0.010		0.010	mg/L	12-MAY-18	1			
	Total Kjeldahl Nitrogen	1.23		0.15	mg/L	14-MAY-18				
	Saturation pH	6.97			pH	15-MAY-18				
	TDS (Calculated)	368			mg/L	15-MAY-18				
	Sulfate (SO4)	36.5		0.30	mg/L	12-MAY-18		500		

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Ontario Drinking Water Regulation (ODWQS) JAN.1,2018 = [Suite] - ON-DW-STANDARD+GUIDELINES

#1: Schedule 1 (Microbiological) and 2 (Chemical) Standards (JAN,2018) **#2: Ontario DW Aesthetic and Operational Guidelines**

Sample Details Grouping	Analyte	Result	Qualifier	D.L.	Units	Analyzed	Guideline Limits #1	Guideline Limits #2
L2091912-4	23089180509004 MW05D							
Sampled By:	CLIENT on 09-MAY-18 @ 11:40							
Matrix:	WATER							
Anions and Nutrients								
	Anion Sum	6.39			me/L	15-MAY-18		
	Cation Sum	7.18			me/L	15-MAY-18		
	Cation - Anion Balance	5.9			%	15-MAY-18		
Dissolved Metals								
	Dissolved Metals Filtration Location	FIELD			No Unit	10-MAY-18		
	Aluminum (Al)-Dissolved	<0.0050		0.0050	mg/L	10-MAY-18		0.1
	Antimony (Sb)-Dissolved	<0.00010		0.00010	mg/L	10-MAY-18	0.006	
	Arsenic (As)-Dissolved	0.00016		0.00010	mg/L	10-MAY-18	0.0100	
	Barium (Ba)-Dissolved	0.120		0.00010	mg/L	10-MAY-18	1	
	Beryllium (Be)-Dissolved	<0.00010		0.00010	mg/L	10-MAY-18		
	Bismuth (Bi)-Dissolved	<0.000050		0.000050	mg/L	10-MAY-18		
	Boron (B)-Dissolved	<0.010		0.010	mg/L	10-MAY-18	5	
	Cadmium (Cd)-Dissolved	<0.0000050		0.0000050	mg/L	10-MAY-18	0.005	
	Calcium (Ca)-Dissolved	95.3		0.050	mg/L	10-MAY-18		
	Cesium (Cs)-Dissolved	<0.000010		0.000010	mg/L	10-MAY-18		
	Chromium (Cr)-Dissolved	<0.00050		0.00050	mg/L	10-MAY-18	0.05	
	Cobalt (Co)-Dissolved	<0.00010		0.00010	mg/L	10-MAY-18		
	Copper (Cu)-Dissolved	<0.00020		0.00020	mg/L	10-MAY-18		1
	Iron (Fe)-Dissolved	2.98		0.010	mg/L	10-MAY-18		*0.3
	Lead (Pb)-Dissolved	<0.000050		0.000050	mg/L	10-MAY-18	0.01	
	Lithium (Li)-Dissolved	0.0019		0.0010	mg/L	10-MAY-18		
	Magnesium (Mg)-Dissolved	27.1		0.0050	mg/L	10-MAY-18		
	Manganese (Mn)-Dissolved	0.0826		0.00050	mg/L	10-MAY-18		*0.05
	Molybdenum (Mo)-Dissolved	0.000165		0.000050	mg/L	10-MAY-18		
	Nickel (Ni)-Dissolved	<0.00050		0.00050	mg/L	10-MAY-18		
	Phosphorus (P)-Dissolved	<0.050		0.050	mg/L	10-MAY-18		
	Potassium (K)-Dissolved	0.759		0.050	mg/L	10-MAY-18		
	Rubidium (Rb)-Dissolved	0.00056		0.00020	mg/L	10-MAY-18		
	Selenium (Se)-Dissolved	<0.000050		0.000050	mg/L	10-MAY-18	0.05	
	Silicon (Si)-Dissolved	9.11		0.050	mg/L	10-MAY-18		
	Silver (Ag)-Dissolved	<0.000050		0.000050	mg/L	10-MAY-18		
	Sodium (Na)-Dissolved	4.09		0.050	mg/L	10-MAY-18	20	200
	Strontium (Sr)-Dissolved	0.135		0.0010	mg/L	10-MAY-18		
	Sulfur (S)-Dissolved	12.3		0.50	mg/L	10-MAY-18		
	Tellurium (Te)-Dissolved	<0.00020		0.00020	mg/L	10-MAY-18		
	Thallium (Tl)-Dissolved	<0.000010		0.000010	mg/L	10-MAY-18		
	Thorium (Th)-Dissolved	<0.00010		0.00010	mg/L	10-MAY-18		
	Tin (Sn)-Dissolved	<0.00010		0.00010	mg/L	10-MAY-18		
	Titanium (Ti)-Dissolved	0.00035		0.00030	mg/L	10-MAY-18		
	Tungsten (W)-Dissolved	<0.00010		0.00010	mg/L	10-MAY-18		
	Uranium (U)-Dissolved	0.000047		0.000010	mg/L	10-MAY-18	0.02	
	Vanadium (V)-Dissolved	0.00054		0.00050	mg/L	10-MAY-18		
	Zinc (Zn)-Dissolved	<0.0010		0.0010	mg/L	10-MAY-18		5
	Zirconium (Zr)-Dissolved	0.00055		0.00030	mg/L	10-MAY-18		

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* Analytical result for this parameter exceeds Guideline Limit listed on this report. Guideline Limits applied:

Ontario Drinking Water Regulation (ODWQS) JAN.1,2018 = [Suite] - ON-DW-STANDARD+GUIDELINES

#1: Schedule 1 (Microbiological) and 2 (Chemical) Standards (JAN,2018) **#2: Ontario DW Aesthetic and Operational Guidelines**

ANALYTICAL GUIDELINE REPORT

Sample Details Grouping	Analyte	Result	Qualifier	D.L.	Units	Analyzed	Guideline Limits #1	Guideline Limits #2
L2091912-5	23089180509005 MW06S							
Sampled By:	CLIENT on 09-MAY-18 @ 13:25							
Matrix:	WATER							
Physical Tests								
	Conductivity	616		3.0	umhos/cm	10-MAY-18		
	pH	8.05		0.10	pH units	10-MAY-18		6.5-8.5
	Total Dissolved Solids	379		20	mg/L	11-MAY-18		500
Anions and Nutrients								
	Alkalinity, Bicarbonate (as CaCO3)	243		10	mg/L	11-MAY-18		
	Alkalinity, Carbonate (as CaCO3)	<10		10	mg/L	11-MAY-18		
	Alkalinity, Hydroxide (as CaCO3)	<10		10	mg/L	11-MAY-18		
	Alkalinity, Total (as CaCO3)	243		10	mg/L	11-MAY-18		30-500
	Bromide (Br)	<0.10		0.10	mg/L	12-MAY-18		
	Chloride (Cl)	10.0		0.50	mg/L	12-MAY-18		250
	Computed Conductivity	578			uS/cm	15-MAY-18		
	Conductivity % Difference	-6.3			%	15-MAY-18		
	Fluoride (F)	0.076		0.020	mg/L	12-MAY-18	1.5	
	Hardness (as CaCO3)	318			mg/L	15-MAY-18		*80-100
	Ion Balance	114			%	15-MAY-18		
	Langelier Index	0.9			No Unit	15-MAY-18		
	Nitrate (as N)	<0.020		0.020	mg/L	12-MAY-18	10	
	Nitrite (as N)	<0.010		0.010	mg/L	12-MAY-18	1	
	Total Kjeldahl Nitrogen	<0.15		0.15	mg/L	14-MAY-18		
	Saturation pH	7.18			pH	15-MAY-18		
	TDS (Calculated)	348			mg/L	15-MAY-18		
	Sulfate (SO4)	76.3		0.30	mg/L	12-MAY-18		500
	Anion Sum	5.90			me/L	15-MAY-18		
	Cation Sum	6.71			me/L	15-MAY-18		
	Cation - Anion Balance	6.4			%	15-MAY-18		
Dissolved Metals								
	Dissolved Metals Filtration Location	FIELD			No Unit	10-MAY-18		
	Aluminum (Al)-Dissolved	<0.0050		0.0050	mg/L	10-MAY-18		0.1
	Antimony (Sb)-Dissolved	<0.00010		0.00010	mg/L	10-MAY-18	0.006	
	Arsenic (As)-Dissolved	0.00168		0.00010	mg/L	10-MAY-18	0.0100	
	Barium (Ba)-Dissolved	0.118		0.00010	mg/L	10-MAY-18	1	
	Beryllium (Be)-Dissolved	<0.00010		0.00010	mg/L	10-MAY-18		
	Bismuth (Bi)-Dissolved	<0.000050		0.000050	mg/L	10-MAY-18		
	Boron (B)-Dissolved	<0.010		0.010	mg/L	10-MAY-18	5	
	Cadmium (Cd)-Dissolved	<0.0000050		0.0000050	mg/L	10-MAY-18	0.005	
	Calcium (Ca)-Dissolved	76.9		0.050	mg/L	10-MAY-18		
	Cesium (Cs)-Dissolved	<0.000010		0.000010	mg/L	10-MAY-18		
	Chromium (Cr)-Dissolved	<0.00050		0.00050	mg/L	10-MAY-18	0.05	
	Cobalt (Co)-Dissolved	<0.00010		0.00010	mg/L	10-MAY-18		
	Copper (Cu)-Dissolved	0.00022		0.00020	mg/L	10-MAY-18		1
	Iron (Fe)-Dissolved	0.510		0.010	mg/L	10-MAY-18		*0.3
	Lead (Pb)-Dissolved	<0.000050		0.000050	mg/L	10-MAY-18	0.01	
	Lithium (Li)-Dissolved	0.0029		0.0010	mg/L	10-MAY-18		
	Magnesium (Mg)-Dissolved	30.6		0.0050	mg/L	10-MAY-18		
	Manganese (Mn)-Dissolved	0.0380		0.00050	mg/L	10-MAY-18		0.05
	Molybdenum (Mo)-Dissolved	0.00191		0.000050	mg/L	10-MAY-18		

** Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.

* Analytical result for this parameter exceeds Guideline Limit listed on this report. Guideline Limits applied:

Ontario Drinking Water Regulation (ODWQS) JAN.1,2018 = [Suite] - ON-DW-STANDARD+GUIDELINES

#1: Schedule 1 (Microbiological) and 2 (Chemical) Standards (JAN,2018) **#2: Ontario DW Aesthetic and Operational Guidelines**

ANALYTICAL GUIDELINE REPORT

23089

Sample Details Grouping	Analyte	Result	Qualifier	D.L.	Units	Analyzed	Guideline Limits #1	#2		
L2091912-5	23089180509005 MW06S									
Sampled By:	CLIENT on 09-MAY-18 @ 13:25									
Matrix:	WATER						#1	#2		
Dissolved Metals										
	Nickel (Ni)-Dissolved	<0.00050		0.00050	mg/L	10-MAY-18				
	Phosphorus (P)-Dissolved	<0.050		0.050	mg/L	10-MAY-18				
	Potassium (K)-Dissolved	1.19		0.050	mg/L	10-MAY-18				
	Rubidium (Rb)-Dissolved	0.00086		0.00020	mg/L	10-MAY-18				
	Selenium (Se)-Dissolved	<0.000050		0.000050	mg/L	10-MAY-18	0.05			
	Silicon (Si)-Dissolved	6.34		0.050	mg/L	10-MAY-18				
	Silver (Ag)-Dissolved	<0.000050		0.000050	mg/L	10-MAY-18				
	Sodium (Na)-Dissolved	7.43		0.050	mg/L	10-MAY-18	20	200		
	Strontium (Sr)-Dissolved	0.133		0.0010	mg/L	10-MAY-18				
	Sulfur (S)-Dissolved	25.6		0.50	mg/L	10-MAY-18				
	Tellurium (Te)-Dissolved	<0.00020		0.00020	mg/L	10-MAY-18				
	Thallium (Tl)-Dissolved	<0.000010		0.000010	mg/L	10-MAY-18				
	Thorium (Th)-Dissolved	<0.00010		0.00010	mg/L	10-MAY-18				
	Tin (Sn)-Dissolved	<0.00010		0.00010	mg/L	10-MAY-18				
	Titanium (Ti)-Dissolved	<0.00030		0.00030	mg/L	10-MAY-18				
	Tungsten (W)-Dissolved	<0.00010		0.00010	mg/L	10-MAY-18				
	Uranium (U)-Dissolved	0.00172		0.000010	mg/L	10-MAY-18	0.02			
	Vanadium (V)-Dissolved	<0.00050		0.00050	mg/L	10-MAY-18				
	Zinc (Zn)-Dissolved	0.0012		0.0010	mg/L	10-MAY-18		5		
	Zirconium (Zr)-Dissolved	<0.00030		0.00030	mg/L	10-MAY-18				
L2091912-6	23089180509006 MW06D									
Sampled By:	CLIENT on 09-MAY-18 @ 14:55									
Matrix:	WATER						#1	#2		
Physical Tests										
	Conductivity	418		3.0	umhos/cm	10-MAY-18				
	pH	8.07		0.10	pH units	10-MAY-18		6.5-8.5		
	Total Dissolved Solids	234		20	mg/L	11-MAY-18		500		
Anions and Nutrients										
	Alkalinity, Bicarbonate (as CaCO3)	206		10	mg/L	11-MAY-18				
	Alkalinity, Carbonate (as CaCO3)	<10		10	mg/L	11-MAY-18				
	Alkalinity, Hydroxide (as CaCO3)	<10		10	mg/L	11-MAY-18				
	Alkalinity, Total (as CaCO3)	206		10	mg/L	11-MAY-18		30-500		
	Bromide (Br)	<0.10		0.10	mg/L	12-MAY-18				
	Chloride (Cl)	3.62		0.50	mg/L	12-MAY-18		250		
	Computed Conductivity	377			uS/cm	15-MAY-18				
	Conductivity % Difference	-10.2			%	15-MAY-18				
	Fluoride (F)	0.061		0.020	mg/L	12-MAY-18	1.5			
	Hardness (as CaCO3)	216			mg/L	15-MAY-18		*80-100		
	Ion Balance	118			%	15-MAY-18				
	Langelier Index	0.7			No Unit	15-MAY-18				
	Nitrate (as N)	<0.020		0.020	mg/L	12-MAY-18	10			
	Nitrite (as N)	<0.010		0.010	mg/L	12-MAY-18	1			
	Total Kjeldahl Nitrogen	<0.15		0.15	mg/L	14-MAY-18				
	Saturation pH	7.37			pH	15-MAY-18				
	TDS (Calculated)	222			mg/L	15-MAY-18				
	Sulfate (SO4)	15.7		0.30	mg/L	12-MAY-18		500		

** Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
* Analytical result for this parameter exceeds Guideline Limit listed on this report. Guideline Limits applied:

Ontario Drinking Water Regulation (ODWQS) JAN.1,2018 = [Suite] - ON-DW-STANDARD+GUIDELINES

#1: Schedule 1 (Microbiological) and 2 (Chemical) Standards (JAN,2018) **#2: Ontario DW Aesthetic and Operational Guidelines**

ANALYTICAL GUIDELINE REPORT

L2091912-6 23089180509006 MW06D
Sampled By: CLIENT on 09-MAY-18 @ 14:55
Matrix: WATER

Sample Details Grouping	Analyte	Result	Qualifier	D.L.	Units	Analyzed	Guideline Limits #1	Guideline Limits #2		
Anions and Nutrients										
	Anion Sum	3.85			me/L	15-MAY-18				
	Cation Sum	4.55			me/L	15-MAY-18				
	Cation - Anion Balance	8.4			%	15-MAY-18				
Dissolved Metals										
	Dissolved Metals Filtration Location	FIELD			No Unit	10-MAY-18				
	Aluminum (Al)-Dissolved	<0.0050		0.0050	mg/L	10-MAY-18		0.1		
	Antimony (Sb)-Dissolved	<0.00010		0.00010	mg/L	10-MAY-18	0.006			
	Arsenic (As)-Dissolved	0.00116		0.00010	mg/L	10-MAY-18	0.0100			
	Barium (Ba)-Dissolved	0.111		0.00010	mg/L	10-MAY-18	1			
	Beryllium (Be)-Dissolved	<0.00010		0.00010	mg/L	10-MAY-18				
	Bismuth (Bi)-Dissolved	<0.000050		0.000050	mg/L	10-MAY-18				
	Boron (B)-Dissolved	<0.010		0.010	mg/L	10-MAY-18	5			
	Cadmium (Cd)-Dissolved	<0.0000050		0.0000050	mg/L	10-MAY-18	0.005			
	Calcium (Ca)-Dissolved	52.7		0.050	mg/L	10-MAY-18				
	Cesium (Cs)-Dissolved	<0.000010		0.000010	mg/L	10-MAY-18				
	Chromium (Cr)-Dissolved	<0.00050		0.00050	mg/L	10-MAY-18	0.05			
	Cobalt (Co)-Dissolved	<0.00010		0.00010	mg/L	10-MAY-18				
	Copper (Cu)-Dissolved	<0.00020		0.00020	mg/L	10-MAY-18		1		
	Iron (Fe)-Dissolved	0.091		0.010	mg/L	10-MAY-18		0.3		
	Lead (Pb)-Dissolved	<0.000050		0.000050	mg/L	10-MAY-18	0.01			
	Lithium (Li)-Dissolved	0.0023		0.0010	mg/L	10-MAY-18				
	Magnesium (Mg)-Dissolved	20.6		0.0050	mg/L	10-MAY-18				
	Manganese (Mn)-Dissolved	0.0119		0.00050	mg/L	10-MAY-18		0.05		
	Molybdenum (Mo)-Dissolved	0.000573		0.000050	mg/L	10-MAY-18				
	Nickel (Ni)-Dissolved	<0.00050		0.00050	mg/L	10-MAY-18				
	Phosphorus (P)-Dissolved	<0.050		0.050	mg/L	10-MAY-18				
	Potassium (K)-Dissolved	0.900		0.050	mg/L	10-MAY-18				
	Rubidium (Rb)-Dissolved	0.00040		0.00020	mg/L	10-MAY-18				
	Selenium (Se)-Dissolved	<0.000050		0.000050	mg/L	10-MAY-18	0.05			
	Silicon (Si)-Dissolved	7.49		0.050	mg/L	10-MAY-18				
	Silver (Ag)-Dissolved	<0.000050		0.000050	mg/L	10-MAY-18				
	Sodium (Na)-Dissolved	4.67		0.050	mg/L	10-MAY-18	20	200		
	Strontium (Sr)-Dissolved	0.101		0.0010	mg/L	10-MAY-18				
	Sulfur (S)-Dissolved	5.28		0.50	mg/L	10-MAY-18				
	Tellurium (Te)-Dissolved	<0.00020		0.00020	mg/L	10-MAY-18				
	Thallium (Tl)-Dissolved	<0.000010		0.000010	mg/L	10-MAY-18				
	Thorium (Th)-Dissolved	<0.00010		0.00010	mg/L	10-MAY-18				
	Tin (Sn)-Dissolved	<0.00010		0.00010	mg/L	10-MAY-18				
	Titanium (Ti)-Dissolved	<0.00030		0.00030	mg/L	10-MAY-18				
	Tungsten (W)-Dissolved	<0.00010		0.00010	mg/L	10-MAY-18				
	Uranium (U)-Dissolved	0.000310		0.000010	mg/L	10-MAY-18	0.02			
	Vanadium (V)-Dissolved	<0.00050		0.00050	mg/L	10-MAY-18				
	Zinc (Zn)-Dissolved	0.0010		0.0010	mg/L	10-MAY-18		5		
	Zirconium (Zr)-Dissolved	<0.00030		0.00030	mg/L	10-MAY-18				

** Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.

* Analytical result for this parameter exceeds Guideline Limit listed on this report. Guideline Limits applied:

Ontario Drinking Water Regulation (ODWQS) JAN.1,2018 = [Suite] - ON-DW-STANDARD+GUIDELINES

#1: Schedule 1 (Microbiological) and 2 (Chemical) Standards (JAN,2018) **#2: Ontario DW Aesthetic and Operational Guidelines**

Reference Information

Sample Parameter Qualifier key listed:

Qualifier	Description
DLUI	Detection Limit Raised: Unknown Interference generated an apparent false positive test result.
CINT	Cooling initiated. Samples were received packed with ice or ice packs and were sampled the same day as received.

Methods Listed (if applicable):

<table>
<tr><th>ALS Test Code</th><th>Matrix</th><th>Test Description</th><th>Method Reference***</th></tr>
<tr><td>ALK-AUTO-WT</td><td>Water</td><td>Automated Speciated Alkalinity</td><td>EPA 310.2</td></tr>
<tr><td colspan="4">This analysis is carried out using procedures adapted from EPA Method 310.2 "Alkalinity". Total Alkalinity is determined using the methyl orange colourimetric method.</td></tr>
<tr><td>ALK-SPECIATED-WT</td><td>Water</td><td>pH Measurement for Spec. Alk</td><td>APHA 4500 H-Electrode</td></tr>
<tr><td colspan="4">Water samples are analyzed directly by a calibrated pH meter.</td></tr>
<tr><td>BR-IC-N-WT</td><td>Water</td><td>Bromide in Water by IC</td><td>EPA 300.1 (mod)</td></tr>
<tr><td colspan="4">Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.</td></tr>
<tr><td>CL-IC-N-WT</td><td>Water</td><td>Chloride by IC</td><td>EPA 300.1 (mod)</td></tr>
<tr><td colspan="4">Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).</td></tr>
<tr><td>EC-WT</td><td>Water</td><td>Conductivity</td><td>APHA 2510 B</td></tr>
<tr><td colspan="4">Water samples can be measured directly by immersing the conductivity cell into the sample.</td></tr>
<tr><td>F-IC-N-WT</td><td>Water</td><td>Fluoride in Water by IC</td><td>EPA 300.1 (mod)</td></tr>
<tr><td colspan="4">Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.</td></tr>
<tr><td>IONBALANCE-OP03-WT</td><td>Water</td><td>Detailed Ion Balance Calculation</td><td>APHA 1030E, 2330B, 2510A</td></tr>
<tr><td>MET-D-CCMS-WT</td><td>Water</td><td>Dissolved Metals in Water by CRC ICPMS</td><td>APHA 3030B/6020A (mod)</td></tr>
<tr><td colspan="4">Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.
Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.
Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).</td></tr>
<tr><td>NO2-IC-WT</td><td>Water</td><td>Nitrite in Water by IC</td><td>EPA 300.1 (mod)</td></tr>
<tr><td colspan="4">Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.</td></tr>
<tr><td>NO3-IC-WT</td><td>Water</td><td>Nitrate in Water by IC</td><td>EPA 300.1 (mod)</td></tr>
<tr><td colspan="4">Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.</td></tr>
<tr><td>SO4-IC-N-WT</td><td>Water</td><td>Sulfate in Water by IC</td><td>EPA 300.1 (mod)</td></tr>
<tr><td colspan="4">Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.</td></tr>
<tr><td>SOLIDS-TDS-WT</td><td>Water</td><td>Total Dissolved Solids</td><td>APHA 2540C</td></tr>
<tr><td colspan="4">This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Dissolved Solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.</td></tr>
<tr><td>TKN-WT</td><td>Water</td><td>Total Kjeldahl Nitrogen</td><td>APHA 4500-Norg D</td></tr>
<tr><td colspan="4">This analysis is carried out using procedures adapted from APHA Method 4500-Norg "Nitrogen (Organic)". Total Kjeldahl Nitrogen is determined by sample digestion at 380 Celsius with analysis using an automated colorimetric method.</td></tr>
</table>

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

Chain of Custody numbers:

m81832

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

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

Reference Information

GLOSSARY OF REPORT TERMS

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

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

Application of guidelines is provided "as is" without warranty of any kind, either expressed or implied, including, but not limited to fitness for a particular purpose, or non-infringement. ALS assumes no responsibility for errors or omissions in the information.

Quality Control Report

Workorder: L2091912 Report Date: 15-MAY-18

Client: MATRIX SOLUTIONS INC.
31 Beacon Point Court
Breslau ON N0B 1M0
Contact: DUSTIN MARTIN

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
ALK-AUTO-WT	**Water**							
Batch R4041710								
WG2770442-3 CRM		**WT-ALK-CRM**						
Alkalinity, Total (as CaCO3)			93.9		%		80-120	11-MAY-18
WG2770442-4 DUP		**L2091249-1**						
Alkalinity, Total (as CaCO3)		85	86		mg/L	0.5	20	11-MAY-18
WG2770442-2 LCS								
Alkalinity, Total (as CaCO3)			98.1		%		85-115	11-MAY-18
WG2770442-1 MB								
Alkalinity, Total (as CaCO3)			<10		mg/L		10	11-MAY-18
ALK-SPECIATED-WT	**Water**							
Batch R4040409								
WG2768990-8 DUP		**WG2768990-7**						
pH		7.92	7.88	J	pH units	0.04	0.2	10-MAY-18
WG2768990-6 LCS								
pH			7.00		pH units		6.9-7.1	10-MAY-18
BR-IC-N-WT	**Water**							
Batch R4041628								
WG2770329-4 DUP		**WG2770329-3**						
Bromide (Br)		<0.10	<0.10	RPD-NA	mg/L	N/A	20	12-MAY-18
WG2770329-2 LCS								
Bromide (Br)			98.2		%		85-115	12-MAY-18
WG2770329-1 MB								
Bromide (Br)			<0.10		mg/L		0.1	12-MAY-18
WG2770329-5 MS		**WG2770329-3**						
Bromide (Br)			82.6		%		75-125	12-MAY-18
CL-IC-N-WT	**Water**							
Batch R4041628								
WG2770329-4 DUP		**WG2770329-3**						
Chloride (Cl)		23.1	23.1		mg/L	0.0	20	12-MAY-18
WG2770329-2 LCS								
Chloride (Cl)			101.7		%		90-110	12-MAY-18
WG2770329-1 MB								
Chloride (Cl)			<0.50		mg/L		0.5	12-MAY-18
WG2770329-5 MS		**WG2770329-3**						
Chloride (Cl)			100.4		%		75-125	12-MAY-18
EC-WT	**Water**							

Quality Control Report

Client: MATRIX SOLUTIONS INC.
31 Beacon Point Court
Breslau ON N0B 1M0
Contact: DUSTIN MARTIN

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
EC-WT	**Water**							
Batch R4040409								
WG2768990-8 DUP		**WG2768990-7**						
Conductivity		999	999		umhos/cm	0.0	10	10-MAY-18
WG2768990-6 LCS								
Conductivity			109.8		%		90-110	10-MAY-18
WG2768990-5 MB								
Conductivity			<3.0		umhos/cm		3	10-MAY-18
F-IC-N-WT	**Water**							
Batch R4041628								
WG2770329-4 DUP		**WG2770329-3**						
Fluoride (F)		0.106	0.105		mg/L	1.0	20	12-MAY-18
WG2770329-2 LCS								
Fluoride (F)			102.3		%		90-110	12-MAY-18
WG2770329-1 MB								
Fluoride (F)			<0.020		mg/L		0.02	12-MAY-18
WG2770329-5 MS		**WG2770329-3**						
Fluoride (F)			100.1		%		75-125	12-MAY-18
MET-D-CCMS-WT	**Water**							
Batch R4040462								
WG2768867-4 DUP		**WG2768867-3**						
Aluminum (Al)-Dissolved		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	10-MAY-18
Antimony (Sb)-Dissolved		0.00013	0.00013		mg/L	2.8	20	10-MAY-18
Arsenic (As)-Dissolved		0.00134	0.00135		mg/L	1.1	20	10-MAY-18
Barium (Ba)-Dissolved		0.187	0.184		mg/L	1.4	20	10-MAY-18
Beryllium (Be)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	10-MAY-18
Bismuth (Bi)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	10-MAY-18
Boron (B)-Dissolved		0.045	0.045		mg/L	0.2	20	10-MAY-18
Cadmium (Cd)-Dissolved		0.0000063	0.0000060		mg/L	5.4	20	10-MAY-18
Calcium (Ca)-Dissolved		119	119		mg/L	0.2	20	10-MAY-18
Cesium (Cs)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	10-MAY-18
Chromium (Cr)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	10-MAY-18
Cobalt (Co)-Dissolved		0.00032	0.00032		mg/L	1.8	20	10-MAY-18
Copper (Cu)-Dissolved		0.00039	0.00039		mg/L	1.1	20	10-MAY-18
Iron (Fe)-Dissolved		<0.010	<0.010	RPD-NA	mg/L	N/A	20	10-MAY-18
Lead (Pb)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	10-MAY-18
Lithium (Li)-Dissolved		0.0012	0.0011		mg/L	4.6	20	10-MAY-18

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-WT	**Water**							
Batch R4040462								
WG2768867-4 DUP		**WG2768867-3**						
Magnesium (Mg)-Dissolved		27.1	27.5		mg/L	1.6	20	10-MAY-18
Manganese (Mn)-Dissolved		0.0717	0.0722		mg/L	0.8	20	10-MAY-18
Molybdenum (Mo)-Dissolved		0.00180	0.00177		mg/L	1.6	20	10-MAY-18
Nickel (Ni)-Dissolved		0.00066	0.00067		mg/L	1.0	20	10-MAY-18
Phosphorus (P)-Dissolved		<0.050	<0.050	RPD-NA	mg/L	N/A	20	10-MAY-18
Potassium (K)-Dissolved		2.67	2.68		mg/L	0.4	20	10-MAY-18
Rubidium (Rb)-Dissolved		0.00314	0.00330		mg/L	4.7	20	10-MAY-18
Selenium (Se)-Dissolved		0.00385	0.00393		mg/L	1.9	20	10-MAY-18
Silicon (Si)-Dissolved		4.16	4.14		mg/L	0.4	20	10-MAY-18
Silver (Ag)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	10-MAY-18
Sodium (Na)-Dissolved		27.7	28.1		mg/L	1.5	20	10-MAY-18
Strontium (Sr)-Dissolved		0.228	0.228		mg/L	0.1	20	10-MAY-18
Sulfur (S)-Dissolved		6.14	6.22		mg/L	1.2	20	10-MAY-18
Tellurium (Te)-Dissolved		<0.00020	<0.00020	RPD-NA	mg/L	N/A	20	10-MAY-18
Thallium (Tl)-Dissolved		0.000020	0.000017		mg/L	18	20	10-MAY-18
Thorium (Th)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	10-MAY-18
Tin (Sn)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	10-MAY-18
Titanium (Ti)-Dissolved		<0.00030	<0.00030	RPD-NA	mg/L	N/A	20	10-MAY-18
Tungsten (W)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	10-MAY-18
Uranium (U)-Dissolved		0.000788	0.000804		mg/L	2.0	20	10-MAY-18
Vanadium (V)-Dissolved		0.00066	0.00068		mg/L	3.1	20	10-MAY-18
Zinc (Zn)-Dissolved		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	10-MAY-18
Zirconium (Zr)-Dissolved		<0.00030	<0.00030	RPD-NA	mg/L	N/A	20	10-MAY-18
WG2768867-2 LCS								
Aluminum (Al)-Dissolved			103.4		%		80-120	10-MAY-18
Antimony (Sb)-Dissolved			101.0		%		80-120	10-MAY-18
Arsenic (As)-Dissolved			103.2		%		80-120	10-MAY-18
Barium (Ba)-Dissolved			101.3		%		80-120	10-MAY-18
Beryllium (Be)-Dissolved			103.8		%		80-120	10-MAY-18
Bismuth (Bi)-Dissolved			102.5		%		80-120	10-MAY-18
Boron (B)-Dissolved			103.2		%		80-120	10-MAY-18
Cadmium (Cd)-Dissolved			104.4		%		80-120	10-MAY-18
Calcium (Ca)-Dissolved			105.1		%		80-120	10-MAY-18

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-WT	**Water**							
Batch R4040462								
WG2768867-2 LCS								
Cesium (Cs)-Dissolved			100.7		%		80-120	10-MAY-18
Chromium (Cr)-Dissolved			103.7		%		80-120	10-MAY-18
Cobalt (Co)-Dissolved			102.8		%		80-120	10-MAY-18
Copper (Cu)-Dissolved			104.9		%		80-120	10-MAY-18
Iron (Fe)-Dissolved			107.1		%		80-120	10-MAY-18
Lead (Pb)-Dissolved			103.0		%		80-120	10-MAY-18
Lithium (Li)-Dissolved			107.4		%		80-120	10-MAY-18
Magnesium (Mg)-Dissolved			103.8		%		80-120	10-MAY-18
Manganese (Mn)-Dissolved			106.2		%		80-120	10-MAY-18
Molybdenum (Mo)-Dissolved			104.6		%		80-120	10-MAY-18
Nickel (Ni)-Dissolved			104.5		%		80-120	10-MAY-18
Phosphorus (P)-Dissolved			107.5		%		80-120	10-MAY-18
Potassium (K)-Dissolved			96.2		%		80-120	10-MAY-18
Rubidium (Rb)-Dissolved			101.3		%		80-120	10-MAY-18
Selenium (Se)-Dissolved			106.9		%		80-120	10-MAY-18
Silicon (Si)-Dissolved			105.6		%		60-140	10-MAY-18
Silver (Ag)-Dissolved			99.3		%		80-120	10-MAY-18
Sodium (Na)-Dissolved			106.8		%		80-120	10-MAY-18
Strontium (Sr)-Dissolved			104.5		%		80-120	10-MAY-18
Sulfur (S)-Dissolved			101.4		%		80-120	10-MAY-18
Tellurium (Te)-Dissolved			106.2		%		80-120	10-MAY-18
Thallium (Tl)-Dissolved			104.5		%		80-120	10-MAY-18
Thorium (Th)-Dissolved			101.2		%		80-120	10-MAY-18
Tin (Sn)-Dissolved			103.0		%		80-120	10-MAY-18
Titanium (Ti)-Dissolved			100.6		%		80-120	10-MAY-18
Tungsten (W)-Dissolved			103.5		%		80-120	10-MAY-18
Uranium (U)-Dissolved			110.4		%		80-120	10-MAY-18
Vanadium (V)-Dissolved			104.0		%		80-120	10-MAY-18
Zinc (Zn)-Dissolved			106.8		%		80-120	10-MAY-18
Zirconium (Zr)-Dissolved			100.6		%		80-120	10-MAY-18
WG2768867-1 MB								
Aluminum (Al)-Dissolved			<0.0050		mg/L		0.005	10-MAY-18
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	10-MAY-18
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	10-MAY-18

Quality Control Report

Client: MATRIX SOLUTIONS INC.
31 Beacon Point Court
Breslau ON N0B 1M0
Contact: DUSTIN MARTIN

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-WT	**Water**							
Batch **R4040462**								
WG2768867-1 **MB**								
Barium (Ba)-Dissolved			<0.00010		mg/L		0.0001	10-MAY-18
Beryllium (Be)-Dissolved			<0.00010		mg/L		0.0001	10-MAY-18
Bismuth (Bi)-Dissolved			<0.000050		mg/L		0.00005	10-MAY-18
Boron (B)-Dissolved			<0.010		mg/L		0.01	10-MAY-18
Cadmium (Cd)-Dissolved			<0.000005		mg/L		0.000005	10-MAY-18
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	10-MAY-18
Cesium (Cs)-Dissolved			<0.000010		mg/L		0.00001	10-MAY-18
Chromium (Cr)-Dissolved			<0.00050		mg/L		0.0005	10-MAY-18
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	10-MAY-18
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	10-MAY-18
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	10-MAY-18
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	10-MAY-18
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	10-MAY-18
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	10-MAY-18
Manganese (Mn)-Dissolved			<0.00050		mg/L		0.0005	10-MAY-18
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	10-MAY-18
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	10-MAY-18
Phosphorus (P)-Dissolved			<0.050		mg/L		0.05	10-MAY-18
Potassium (K)-Dissolved			<0.050		mg/L		0.05	10-MAY-18
Rubidium (Rb)-Dissolved			<0.00020		mg/L		0.0002	10-MAY-18
Selenium (Se)-Dissolved			<0.000050		mg/L		0.00005	10-MAY-18
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	10-MAY-18
Silver (Ag)-Dissolved			<0.000050		mg/L		0.00005	10-MAY-18
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	10-MAY-18
Strontium (Sr)-Dissolved			<0.0010		mg/L		0.001	10-MAY-18
Sulfur (S)-Dissolved			<0.50		mg/L		0.5	10-MAY-18
Tellurium (Te)-Dissolved			<0.00020		mg/L		0.0002	10-MAY-18
Thallium (Tl)-Dissolved			<0.000010		mg/L		0.00001	10-MAY-18
Thorium (Th)-Dissolved			<0.00010		mg/L		0.0001	10-MAY-18
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	10-MAY-18
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	10-MAY-18
Tungsten (W)-Dissolved			<0.00010		mg/L		0.0001	10-MAY-18
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	10-MAY-18

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-WT	**Water**							
Batch R4040462								
WG2768867-1 MB								
Vanadium (V)-Dissolved			<0.00050		mg/L		0.0005	10-MAY-18
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	10-MAY-18
Zirconium (Zr)-Dissolved			<0.00030		mg/L		0.0003	10-MAY-18
WG2768867-5 MS		**WG2768867-6**						
Aluminum (Al)-Dissolved			103.5		%		70-130	10-MAY-18
Antimony (Sb)-Dissolved			100.4		%		70-130	10-MAY-18
Arsenic (As)-Dissolved			101.3		%		70-130	10-MAY-18
Barium (Ba)-Dissolved			N/A	MS-B	%		-	10-MAY-18
Beryllium (Be)-Dissolved			103.1		%		70-130	10-MAY-18
Bismuth (Bi)-Dissolved			89.0		%		70-130	10-MAY-18
Boron (B)-Dissolved			94.7		%		70-130	10-MAY-18
Cadmium (Cd)-Dissolved			103.5		%		70-130	10-MAY-18
Calcium (Ca)-Dissolved			N/A	MS-B	%		-	10-MAY-18
Cesium (Cs)-Dissolved			104.8		%		70-130	10-MAY-18
Chromium (Cr)-Dissolved			101.0		%		70-130	10-MAY-18
Cobalt (Co)-Dissolved			97.1		%		70-130	10-MAY-18
Copper (Cu)-Dissolved			95.1		%		70-130	10-MAY-18
Iron (Fe)-Dissolved			98.4		%		70-130	10-MAY-18
Lead (Pb)-Dissolved			95.8		%		70-130	10-MAY-18
Lithium (Li)-Dissolved			105.2		%		70-130	10-MAY-18
Magnesium (Mg)-Dissolved			N/A	MS-B	%		-	10-MAY-18
Manganese (Mn)-Dissolved			N/A	MS-B	%		-	10-MAY-18
Molybdenum (Mo)-Dissolved			101.2		%		70-130	10-MAY-18
Nickel (Ni)-Dissolved			96.3		%		70-130	10-MAY-18
Phosphorus (P)-Dissolved			102.9		%		70-130	10-MAY-18
Potassium (K)-Dissolved			N/A	MS-B	%		-	10-MAY-18
Rubidium (Rb)-Dissolved			106.3		%		70-130	10-MAY-18
Selenium (Se)-Dissolved			111.1		%		70-130	10-MAY-18
Silicon (Si)-Dissolved			N/A	MS-B	%		-	10-MAY-18
Silver (Ag)-Dissolved			91.5		%		70-130	11-MAY-18
Sodium (Na)-Dissolved			N/A	MS-B	%		-	10-MAY-18
Strontium (Sr)-Dissolved			N/A	MS-B	%		-	10-MAY-18
Sulfur (S)-Dissolved			N/A	MS-B	%		-	10-MAY-18
Tellurium (Te)-Dissolved			101.1		%		70-130	10-MAY-18

Quality Control Report

Client: MATRIX SOLUTIONS INC.
31 Beacon Point Court
Breslau ON N0B 1M0
Contact: DUSTIN MARTIN

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-WT	**Water**							
Batch R4040462								
WG2768867-5 MS		**WG2768867-6**						
Thallium (Tl)-Dissolved			99.8		%		70-130	10-MAY-18
Thorium (Th)-Dissolved			96.4		%		70-130	10-MAY-18
Tin (Sn)-Dissolved			104.1		%		70-130	10-MAY-18
Titanium (Ti)-Dissolved			99.8		%		70-130	10-MAY-18
Tungsten (W)-Dissolved			98.4		%		70-130	10-MAY-18
Uranium (U)-Dissolved			N/A	MS-B	%		-	10-MAY-18
Vanadium (V)-Dissolved			104.4		%		70-130	10-MAY-18
Zinc (Zn)-Dissolved			111.8		%		70-130	10-MAY-18
Zirconium (Zr)-Dissolved			96.7		%		70-130	10-MAY-18
NO2-IC-WT	**Water**							
Batch R4041628								
WG2770329-4 DUP		**WG2770329-3**						
Nitrite (as N)		<0.010	<0.010	RPD-NA	mg/L	N/A	25	12-MAY-18
WG2770329-2 LCS								
Nitrite (as N)			103.2		%		70-130	12-MAY-18
WG2770329-1 MB								
Nitrite (as N)			<0.010		mg/L		0.01	12-MAY-18
WG2770329-5 MS		**WG2770329-3**						
Nitrite (as N)			96.9		%		70-130	12-MAY-18
NO3-IC-WT	**Water**							
Batch R4041628								
WG2770329-4 DUP		**WG2770329-3**						
Nitrate (as N)		8.09	8.09		mg/L	0.0	25	12-MAY-18
WG2770329-2 LCS								
Nitrate (as N)			100.6		%		70-130	12-MAY-18
WG2770329-1 MB								
Nitrate (as N)			<0.020		mg/L		0.02	12-MAY-18
WG2770329-5 MS		**WG2770329-3**						
Nitrate (as N)			N/A	MS-B	%		-	12-MAY-18
SO4-IC-N-WT	**Water**							
Batch R4041628								
WG2770329-4 DUP		**WG2770329-3**						
Sulfate (SO4)		47.0	47.1		mg/L	0.2	20	12-MAY-18
WG2770329-2 LCS								
Sulfate (SO4)			102.5		%		90-110	12-MAY-18
WG2770329-1 MB								

Quality Control Report

Client: MATRIX SOLUTIONS INC.
31 Beacon Point Court
Breslau ON N0B 1M0
Contact: DUSTIN MARTIN

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
SO4-IC-N-WT	**Water**							
Batch R4041628								
WG2770329-1 MB								
Sulfate (SO4)			<0.30		mg/L		0.3	12-MAY-18
WG2770329-5 MS		**WG2770329-3**						
Sulfate (SO4)			102.1		%		75-125	12-MAY-18
SOLIDS-TDS-WT	**Water**							
Batch R4044006								
WG2770309-3 DUP		**L2091912-1**						
Total Dissolved Solids		393	391		mg/L	0.5	20	11-MAY-18
WG2770309-2 LCS								
Total Dissolved Solids			100.0		%		85-115	11-MAY-18
WG2770309-1 MB								
Total Dissolved Solids			<10		mg/L		10	11-MAY-18
TKN-WT	**Water**							
Batch R4040865								
WG2770032-3 DUP		**L2091707-1**						
Total Kjeldahl Nitrogen		0.22	0.24		mg/L	5.2	20	11-MAY-18
WG2770032-2 LCS								
Total Kjeldahl Nitrogen			98.1		%		75-125	11-MAY-18
WG2770032-1 MB								
Total Kjeldahl Nitrogen			<0.15		mg/L		0.15	11-MAY-18
WG2770032-4 MS		**L2091707-1**						
Total Kjeldahl Nitrogen			106.9		%		70-130	11-MAY-18
Batch R4043434								
WG2771471-3 DUP		**L2091912-2**						
Total Kjeldahl Nitrogen		0.44	0.47		mg/L	6.5	20	14-MAY-18
WG2771472-3 DUP		**L2091912-3**						
Total Kjeldahl Nitrogen		0.28	0.25		mg/L	9.6	20	14-MAY-18
WG2771471-2 LCS								
Total Kjeldahl Nitrogen			101.5		%		75-125	14-MAY-18
WG2771472-2 LCS								
Total Kjeldahl Nitrogen			96.8		%		75-125	14-MAY-18
WG2771471-1 MB								
Total Kjeldahl Nitrogen			<0.15		mg/L		0.15	14-MAY-18
WG2771472-1 MB								
Total Kjeldahl Nitrogen			<0.15		mg/L		0.15	14-MAY-18
WG2771471-4 MS		**L2091912-2**						
Total Kjeldahl Nitrogen			104.9		%		70-130	14-MAY-18
WG2771472-4 MS		**L2091912-3**						

Quality Control Report

Client: MATRIX SOLUTIONS INC.
31 Beacon Point Court
Breslau ON N0B 1M0
Contact: DUSTIN MARTIN

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
TKN-WT	**Water**							
Batch **R4043434**								
WG2771472-4 MS		**L2091912-3**						
Total Kjeldahl Nitrogen			104.2		%		70-130	14-MAY-18

Quality Control Report

Workorder: L2091912 Report Date: 15-MAY-18

Client: MATRIX SOLUTIONS INC.
31 Beacon Point Court
Breslau ON N0B 1M0
Contact: DUSTIN MARTIN

Legend:

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

Sample Parameter Qualifier Definitions:

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

Hold Time Exceedances:

All test results reported with this submission were conducted within ALS recommended hold times.

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

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

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

Matrix Solution
ENVIRONMENT & ENGI

L2091912-COFC

81832

Page: 1 of 1

Lab Submitted to : ALS WATERLOO
Lab Agreement no : Q58595
Lab Job ID: L2091912 RCOC

Invoice to: Require Report: Y ☒ N ☐
Company Name: MATRIX SOLUTIONS INC
Contact Name: DUSTIN MARTIN
Address:
PC:
Phone / Fax#: Ph: 519 504 8770 Fax:
AFE #: 147164

Copy of Report to:
Matrix Solutions - Data Management
Suite 200, 150 - 13th Avenue SW
Calgary, Alberta, Canada
T2R 0V2
Ph: 403-237-0606 Fax: 403-263-2493
Fax draft copy of invoice to Matrix Solutions Inc.

Matrix Project # : 23089
Matrix Proj. Name: CLAIR MALTBY CEIS
Location:
Sampler's Name(s): D. MARTIN

REGULATORY REQUIREMENTS: (check)
☐ Alberta Tier 1
☐ SPIGEC
☐ Freshwater Aquatic Life (Low Level Metals)
☐ Canadian Drinking Water
☐ BC Regs
☒ Other: ODWQS

SERVICE REQUESTED:
☐ **RUSH** (Please ensure you contact the lab) **Due Date:**
☒ REGULAR Turnaround

REPORT DISTRIBUTION: always send to data_management@matrix-solutions.com
☒ Additional Emails dmartin@matrix-solutions.com
dabbey@matrix-solutions.com

Analysis Required

	Sample Number (14 digits only) yr-mth-day	Sample Point Name	Depth (cm)	Sample Type	Date/Time Sampled	Quantity # of Jars	Quantity # of Bags	Q58595	Lab Sample Number
1	23089180509001	MW04S	—	WATER	18/05/09 16:30	3	—	X	
2	23089180509002	MW04D	—	↓	09:15	3	—	X	
3	23089180509003	MW05S	—	↓	12:00	3	—	X	
4	23089180509004	MW05D	—	↓	11:40	3	—	X	
5	23089180509005	MW06S	—	↓	13:25	3	—	X	
6	23089180509006	MW06D	—	↓	14:55	3	—	X	
7									
8									
9									
10									
11									
12									
13									
14									
15									

*For metals in water samples indicate if you want Total (T), Dissolved (D) or Extractable (E) as part of "Analysis Required"

Preserved/Filtered: X / X

Relinquished by: Jeff Melchin
Date/Time: 09/May/18 17:50
Signature:

Received by:
Date/Time: 09-May-18 17:50
Signature:

COMMENTS/SPECIAL INSTRUCTIONS
DISSOLVED METALS FIELD FILTERED. SEE Q58595 FOR SPECIFIC ANALYSES

20.4°C

MATRIX SOLUTIONS INC.
ATTN: Dustin Martin
31 Beacon Point Court
Breslau ON N0B 1M0

Date Received: 10-MAY-18
Report Date: 22-MAY-18 08:17 (MT)
Version: FINAL

Client Phone: 519-772-3777

Certificate of Analysis

Lab Work Order #: L2092995

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

Gayle Braun

Gayle Braun
Senior Account Manager

ADDRESS: 309 Exeter Road Unit #29, London, ON N6L 1C1 Canada | Phone: +1 519 652 6044 | Fax: +1 519 652 0671
ALS CANADA LTD Part of the ALS Group An ALS Limited Company

ANALYTICAL GUIDELINE REPORT

Sample Details Grouping	Analyte	Result	Qualifier	D.L.	Units	Analyzed	Guideline Limits #1	Guideline Limits #2
L2092995-1	23089180510001 MW02S							
Sampled By:	D.MARTIN on 10-MAY-18 @ 09:0							
Matrix:	WATER							
Physical Tests								
	Conductivity	668		3.0	umhos/cm	12-MAY-18		
	pH	7.66		0.10	pH units	11-MAY-18		6.5-8.5
	Total Dissolved Solids	399		20	mg/L	16-MAY-18		500
Anions and Nutrients								
	Alkalinity, Bicarbonate (as CaCO3)	380		10	mg/L	14-MAY-18		
	Alkalinity, Carbonate (as CaCO3)	<10		10	mg/L	14-MAY-18		
	Alkalinity, Hydroxide (as CaCO3)	<10		10	mg/L	14-MAY-18		
	Alkalinity, Total (as CaCO3)	380		10	mg/L	14-MAY-18		30-500
	Bromide (Br)	<0.10		0.10	mg/L	15-MAY-18		
	Chloride (Cl)	18.6		0.50	mg/L	15-MAY-18		250
	Computed Conductivity	637			uS/cm	17-MAY-18		
	Conductivity % Difference	-4.7			%	17-MAY-18		
	Fluoride (F)	0.078		0.020	mg/L	15-MAY-18	1.5	
	Hardness (as CaCO3)	364			mg/L	17-MAY-18		*80-100
	Ion Balance	107			%	17-MAY-18		
	Langelier Index	0.8			No Unit	17-MAY-18		
	Nitrate (as N)	0.035		0.020	mg/L	15-MAY-18	10	
	Nitrite (as N)	<0.010		0.010	mg/L	15-MAY-18	1	
	Total Kjeldahl Nitrogen	0.33		0.15	mg/L	17-MAY-18		
	Saturation pH	6.87			pH	17-MAY-18		
	TDS (Calculated)	404			mg/L	17-MAY-18		
	Sulfate (SO4)	18.1		0.30	mg/L	15-MAY-18		500
	Anion Sum	7.16			me/L	17-MAY-18		
	Cation Sum	7.68			me/L	17-MAY-18		
	Cation - Anion Balance	3.5			%	17-MAY-18		
Dissolved Metals								
	Dissolved Metals Filtration Location	FIELD			No Unit	11-MAY-18		
	Aluminum (Al)-Dissolved	0.0071		0.0050	mg/L	11-MAY-18		0.1
	Antimony (Sb)-Dissolved	0.00012		0.00010	mg/L	11-MAY-18	0.006	
	Arsenic (As)-Dissolved	0.0294		0.00010	mg/L	11-MAY-18	*0.0100	
	Barium (Ba)-Dissolved	0.0420		0.00010	mg/L	11-MAY-18	1	
	Beryllium (Be)-Dissolved	<0.00010		0.00010	mg/L	11-MAY-18		
	Bismuth (Bi)-Dissolved	<0.000050		0.000050	mg/L	11-MAY-18		
	Boron (B)-Dissolved	0.016		0.010	mg/L	11-MAY-18	5	
	Cadmium (Cd)-Dissolved	<0.0000050		0.0000050	mg/L	11-MAY-18	0.005	
	Calcium (Ca)-Dissolved	103		0.050	mg/L	11-MAY-18		
	Cesium (Cs)-Dissolved	<0.000010		0.000010	mg/L	11-MAY-18		
	Chromium (Cr)-Dissolved	<0.00050		0.00050	mg/L	11-MAY-18	0.05	
	Cobalt (Co)-Dissolved	0.00116		0.00010	mg/L	11-MAY-18		
	Copper (Cu)-Dissolved	<0.00020		0.00020	mg/L	11-MAY-18		1
	Iron (Fe)-Dissolved	1.68		0.010	mg/L	11-MAY-18		*0.3
	Lead (Pb)-Dissolved	0.000172		0.000050	mg/L	11-MAY-18	0.01	
	Lithium (Li)-Dissolved	0.0016		0.0010	mg/L	11-MAY-18		
	Magnesium (Mg)-Dissolved	25.6		0.0050	mg/L	11-MAY-18		
	Manganese (Mn)-Dissolved	0.492		0.00050	mg/L	11-MAY-18		*0.05
	Molybdenum (Mo)-Dissolved	0.000649		0.000050	mg/L	11-MAY-18		

** Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.

* Analytical result for this parameter exceeds Guideline Limit listed on this report. Guideline Limits applied:

Ontario Drinking Water Regulation (ODWQS) JAN.1,2018 = [Suite] - ON-DW-STANDARD+GUIDELINES

#1: Schedule 1 (Microbiological) and 2 (Chemical) Standards (JAN,2018)

#2: Ontario DW Aesthetic and Operational Guidelines

ANALYTICAL GUIDELINE REPORT

CLAIR MALTBY CEIS

Sample Details Grouping	Analyte	Result	Qualifier	D.L.	Units	Analyzed	Guideline Limits #1	Guideline Limits #2
L2092995-1	23089180510001 MW02S							
Sampled By:	D.MARTIN on 10-MAY-18 @ 09:00							
Matrix:	WATER							
Dissolved Metals								
	Nickel (Ni)-Dissolved	0.00593		0.00050	mg/L	11-MAY-18		
	Phosphorus (P)-Dissolved	<0.050		0.050	mg/L	11-MAY-18		
	Potassium (K)-Dissolved	0.428		0.050	mg/L	11-MAY-18		
	Rubidium (Rb)-Dissolved	0.00079		0.00020	mg/L	11-MAY-18		
	Selenium (Se)-Dissolved	0.000069		0.000050	mg/L	11-MAY-18	0.05	
	Silicon (Si)-Dissolved	3.51		0.050	mg/L	11-MAY-18		
	Silver (Ag)-Dissolved	<0.000050		0.000050	mg/L	11-MAY-18		
	Sodium (Na)-Dissolved	9.26		0.050	mg/L	11-MAY-18	20	200
	Strontium (Sr)-Dissolved	0.133		0.0010	mg/L	11-MAY-18		
	Sulfur (S)-Dissolved	5.90		0.50	mg/L	11-MAY-18		
	Tellurium (Te)-Dissolved	<0.00020		0.00020	mg/L	11-MAY-18		
	Thallium (Tl)-Dissolved	<0.000010		0.000010	mg/L	11-MAY-18		
	Thorium (Th)-Dissolved	<0.00010		0.00010	mg/L	11-MAY-18		
	Tin (Sn)-Dissolved	<0.00010		0.00010	mg/L	11-MAY-18		
	Titanium (Ti)-Dissolved	0.00032		0.00030	mg/L	11-MAY-18		
	Tungsten (W)-Dissolved	<0.00010		0.00010	mg/L	11-MAY-18		
	Uranium (U)-Dissolved	0.00360		0.000010	mg/L	11-MAY-18	0.02	
	Vanadium (V)-Dissolved	0.00085		0.00050	mg/L	11-MAY-18		
	Zinc (Zn)-Dissolved	0.0969		0.0010	mg/L	11-MAY-18		5
	Zirconium (Zr)-Dissolved	0.00045		0.00030	mg/L	11-MAY-18		
L2092995-2	23089180510002 MW02D							
Sampled By:	D.MARTIN on 10-MAY-18 @ 09:05							
Matrix:	WATER							
Physical Tests								
	Conductivity	666		3.0	umhos/cm	12-MAY-18		
	pH	7.89		0.10	pH units	11-MAY-18		6.5-8.5
	Total Dissolved Solids	420		20	mg/L	16-MAY-18		500
Anions and Nutrients								
	Alkalinity, Bicarbonate (as CaCO3)	358		10	mg/L	14-MAY-18		
	Alkalinity, Carbonate (as CaCO3)	<10		10	mg/L	14-MAY-18		
	Alkalinity, Hydroxide (as CaCO3)	<10		10	mg/L	14-MAY-18		
	Alkalinity, Total (as CaCO3)	358		10	mg/L	14-MAY-18		30-500
	Bromide (Br)	<0.10		0.10	mg/L	15-MAY-18		
	Chloride (Cl)	16.8		0.50	mg/L	15-MAY-18		250
	Computed Conductivity	640			uS/cm	17-MAY-18		
	Conductivity % Difference	-4.0			%	17-MAY-18		
	Fluoride (F)	0.062		0.020	mg/L	15-MAY-18	1.5	
	Hardness (as CaCO3)	373			mg/L	17-MAY-18		*80-100
	Ion Balance	110			%	17-MAY-18		
	Langelier Index	1.0			No Unit	17-MAY-18		
	Nitrate (as N)	<0.020		0.020	mg/L	15-MAY-18	10	
	Nitrite (as N)	<0.010		0.010	mg/L	15-MAY-18	1	
	Total Kjeldahl Nitrogen	0.34		0.15	mg/L	18-MAY-18		
	Saturation pH	6.90			pH	17-MAY-18		
	TDS (Calculated)	399			mg/L	17-MAY-18		
	Sulfate (SO4)	29.8		0.30	mg/L	15-MAY-18		500

** Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
* Analytical result for this parameter exceeds Guideline Limit listed on this report. Guideline Limits applied:

Ontario Drinking Water Regulation (ODWQS) JAN.1,2018 = [Suite] - ON-DW-STANDARD+GUIDELINES

#1: Schedule 1 (Microbiological) and 2 (Chemical) Standards (JAN,2018) **#2: Ontario DW Aesthetic and Operational Guidelines**

ANALYTICAL GUIDELINE REPORT

CLAIR MALTBY CEIS

Sample Details Grouping	Analyte	Result	Qualifier	D.L.	Units	Analyzed	Guideline Limits #1	Guideline Limits #2
L2092995-2	23089180510002 MW02D							
Sampled By:	D.MARTIN on 10-MAY-18 @ 09:05							
Matrix:	WATER							
Anions and Nutrients								
	Anion Sum	7.01			me/L	17-MAY-18		
	Cation Sum	7.74			me/L	17-MAY-18		
	Cation - Anion Balance	4.9			%	17-MAY-18		
Dissolved Metals								
	Dissolved Metals Filtration Location	FIELD			No Unit	11-MAY-18		
	Aluminum (Al)-Dissolved	<0.0050		0.0050	mg/L	11-MAY-18		0.1
	Antimony (Sb)-Dissolved	<0.00010		0.00010	mg/L	11-MAY-18	0.006	
	Arsenic (As)-Dissolved	0.00604		0.00010	mg/L	11-MAY-18	0.0100	
	Barium (Ba)-Dissolved	0.0781		0.00010	mg/L	11-MAY-18	1	
	Beryllium (Be)-Dissolved	<0.00010		0.00010	mg/L	11-MAY-18		
	Bismuth (Bi)-Dissolved	<0.000050		0.000050	mg/L	11-MAY-18		
	Boron (B)-Dissolved	0.011		0.010	mg/L	11-MAY-18	5	
	Cadmium (Cd)-Dissolved	<0.0000050		0.0000050	mg/L	11-MAY-18	0.005	
	Calcium (Ca)-Dissolved	102		0.050	mg/L	11-MAY-18		
	Cesium (Cs)-Dissolved	<0.000010		0.000010	mg/L	11-MAY-18		
	Chromium (Cr)-Dissolved	<0.00050		0.00050	mg/L	11-MAY-18	0.05	
	Cobalt (Co)-Dissolved	0.00024		0.00010	mg/L	11-MAY-18		
	Copper (Cu)-Dissolved	<0.00020		0.00020	mg/L	11-MAY-18		1
	Iron (Fe)-Dissolved	2.00		0.010	mg/L	11-MAY-18		*0.3
	Lead (Pb)-Dissolved	0.000461		0.000050	mg/L	11-MAY-18	0.01	
	Lithium (Li)-Dissolved	0.0020		0.0010	mg/L	11-MAY-18		
	Magnesium (Mg)-Dissolved	28.6		0.0050	mg/L	11-MAY-18		
	Manganese (Mn)-Dissolved	0.148		0.00050	mg/L	11-MAY-18		*0.05
	Molybdenum (Mo)-Dissolved	0.000429		0.000050	mg/L	11-MAY-18		
	Nickel (Ni)-Dissolved	0.00129		0.00050	mg/L	11-MAY-18		
	Phosphorus (P)-Dissolved	<0.050		0.050	mg/L	11-MAY-18		
	Potassium (K)-Dissolved	0.713		0.050	mg/L	11-MAY-18		
	Rubidium (Rb)-Dissolved	0.00099		0.00020	mg/L	11-MAY-18		
	Selenium (Se)-Dissolved	<0.000050		0.000050	mg/L	11-MAY-18	0.05	
	Silicon (Si)-Dissolved	6.96		0.050	mg/L	11-MAY-18		
	Silver (Ag)-Dissolved	<0.000050		0.000050	mg/L	11-MAY-18		
	Sodium (Na)-Dissolved	6.23		0.050	mg/L	11-MAY-18	20	200
	Strontium (Sr)-Dissolved	0.133		0.0010	mg/L	11-MAY-18		
	Sulfur (S)-Dissolved	9.71		0.50	mg/L	11-MAY-18		
	Tellurium (Te)-Dissolved	<0.00020		0.00020	mg/L	11-MAY-18		
	Thallium (Tl)-Dissolved	<0.000010		0.000010	mg/L	11-MAY-18		
	Thorium (Th)-Dissolved	<0.00010		0.00010	mg/L	11-MAY-18		
	Tin (Sn)-Dissolved	<0.00010		0.00010	mg/L	11-MAY-18		
	Titanium (Ti)-Dissolved	<0.00030		0.00030	mg/L	11-MAY-18		
	Tungsten (W)-Dissolved	<0.00010		0.00010	mg/L	11-MAY-18		
	Uranium (U)-Dissolved	0.000715		0.000010	mg/L	11-MAY-18	0.02	
	Vanadium (V)-Dissolved	<0.00050		0.00050	mg/L	11-MAY-18		
	Zinc (Zn)-Dissolved	0.0423		0.0010	mg/L	11-MAY-18		5
	Zirconium (Zr)-Dissolved	<0.00030		0.00030	mg/L	11-MAY-18		

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Ontario Drinking Water Regulation (ODWQS) JAN.1,2018 = [Suite] - ON-DW-STANDARD+GUIDELINES

#1: Schedule 1 (Microbiological) and 2 (Chemical) Standards (JAN,2018) **#2: Ontario DW Aesthetic and Operational Guidelines**

ANALYTICAL GUIDELINE REPORT

CLAIR MALTBY CEIS

Sample Details Grouping	Analyte	Result	Qualifier	D.L.	Units	Analyzed	Guideline Limits #1	Guideline Limits #2
L2092995-3	23089180510003 MW01S							
Sampled By:	D.MARTIN on 10-MAY-18 @ 10:25							
Matrix:	WATER							
Physical Tests								
	Conductivity	613		3.0	umhos/cm	12-MAY-18		
	pH	7.97		0.10	pH units	11-MAY-18		6.5-8.5
	Total Dissolved Solids	406	DLDS	20	mg/L	16-MAY-18		500
Anions and Nutrients								
	Alkalinity, Bicarbonate (as CaCO3)	300		10	mg/L	14-MAY-18		
	Alkalinity, Carbonate (as CaCO3)	<10		10	mg/L	14-MAY-18		
	Alkalinity, Hydroxide (as CaCO3)	<10		10	mg/L	14-MAY-18		
	Alkalinity, Total (as CaCO3)	300		10	mg/L	14-MAY-18		30-500
	Bromide (Br)	<0.10		0.10	mg/L	15-MAY-18		
	Chloride (Cl)	38.5		0.50	mg/L	15-MAY-18		250
	Computed Conductivity	618			uS/cm	17-MAY-18		
	Conductivity % Difference	0.9			%	17-MAY-18		
	Fluoride (F)	0.083		0.020	mg/L	15-MAY-18	1.5	
	Hardness (as CaCO3)	316			mg/L	17-MAY-18		*80-100
	Ion Balance	111			%	17-MAY-18		
	Langelier Index	0.9			No Unit	17-MAY-18		
	Nitrate (as N)	3.09		0.020	mg/L	15-MAY-18	10	
	Nitrite (as N)	<0.010		0.010	mg/L	15-MAY-18	1	
	Total Kjeldahl Nitrogen	0.30	TKNI	0.15	mg/L	18-MAY-18		
	Saturation pH	7.05			pH	17-MAY-18		
	TDS (Calculated)	381			mg/L	17-MAY-18		
	Sulfate (SO4)	15.5		0.30	mg/L	15-MAY-18		500
	Anion Sum	6.59			me/L	17-MAY-18		
	Cation Sum	7.31			me/L	17-MAY-18		
	Cation - Anion Balance	5.2			%	17-MAY-18		
Dissolved Metals								
	Dissolved Metals Filtration Location	FIELD			No Unit	11-MAY-18		
	Aluminum (Al)-Dissolved	<0.0050		0.0050	mg/L	11-MAY-18		0.1
	Antimony (Sb)-Dissolved	<0.00010		0.00010	mg/L	11-MAY-18	0.006	
	Arsenic (As)-Dissolved	0.00012		0.00010	mg/L	11-MAY-18	0.0100	
	Barium (Ba)-Dissolved	0.0412		0.00010	mg/L	11-MAY-18	1	
	Beryllium (Be)-Dissolved	<0.00010		0.00010	mg/L	11-MAY-18		
	Bismuth (Bi)-Dissolved	<0.000050		0.000050	mg/L	11-MAY-18		
	Boron (B)-Dissolved	0.016		0.010	mg/L	11-MAY-18	5	
	Cadmium (Cd)-Dissolved	0.000165		0.0000050	mg/L	11-MAY-18	0.005	
	Calcium (Ca)-Dissolved	84.3		0.050	mg/L	11-MAY-18		
	Cesium (Cs)-Dissolved	<0.000010		0.000010	mg/L	11-MAY-18		
	Chromium (Cr)-Dissolved	<0.00050		0.00050	mg/L	11-MAY-18	0.05	
	Cobalt (Co)-Dissolved	<0.00010		0.00010	mg/L	11-MAY-18		
	Copper (Cu)-Dissolved	0.00161		0.00020	mg/L	11-MAY-18		1
	Iron (Fe)-Dissolved	<0.010		0.010	mg/L	11-MAY-18		0.3
	Lead (Pb)-Dissolved	0.000266		0.000050	mg/L	11-MAY-18	0.01	
	Lithium (Li)-Dissolved	0.0014		0.0010	mg/L	11-MAY-18		
	Magnesium (Mg)-Dissolved	25.7		0.0050	mg/L	11-MAY-18		
	Manganese (Mn)-Dissolved	<0.00050		0.00050	mg/L	11-MAY-18		0.05
	Molybdenum (Mo)-Dissolved	0.000302		0.000050	mg/L	11-MAY-18		

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#1: Schedule 1 (Microbiological) and 2 (Chemical) Standards (JAN,2018)

#2: Ontario DW Aesthetic and Operational Guidelines

ANALYTICAL GUIDELINE REPORT

CLAIR MALTBY CEIS

Sample Details Grouping	Analyte	Result	Qualifier	D.L.	Units	Analyzed	Guideline Limits #1	#2
L2092995-3	23089180510003 MW01S							
Sampled By:	D.MARTIN on 10-MAY-18 @ 10:25							
Matrix:	WATER						#1	#2
Dissolved Metals								
	Nickel (Ni)-Dissolved	0.00055		0.00050	mg/L	11-MAY-18		
	Phosphorus (P)-Dissolved	<0.050		0.050	mg/L	11-MAY-18		
	Potassium (K)-Dissolved	1.12		0.050	mg/L	11-MAY-18		
	Rubidium (Rb)-Dissolved	0.00170		0.00020	mg/L	11-MAY-18		
	Selenium (Se)-Dissolved	0.000309		0.000050	mg/L	11-MAY-18	0.05	
	Silicon (Si)-Dissolved	3.31		0.050	mg/L	11-MAY-18		
	Silver (Ag)-Dissolved	<0.000050		0.000050	mg/L	11-MAY-18		
	Sodium (Na)-Dissolved	22.1		0.050	mg/L	11-MAY-18	*20	200
	Strontium (Sr)-Dissolved	0.250		0.0010	mg/L	11-MAY-18		
	Sulfur (S)-Dissolved	5.02		0.50	mg/L	11-MAY-18		
	Tellurium (Te)-Dissolved	<0.00020		0.00020	mg/L	11-MAY-18		
	Thallium (Tl)-Dissolved	0.000020		0.000010	mg/L	11-MAY-18		
	Thorium (Th)-Dissolved	<0.00010		0.00010	mg/L	11-MAY-18		
	Tin (Sn)-Dissolved	<0.00010		0.00010	mg/L	11-MAY-18		
	Titanium (Ti)-Dissolved	<0.00030		0.00030	mg/L	11-MAY-18		
	Tungsten (W)-Dissolved	<0.00010		0.00010	mg/L	11-MAY-18		
	Uranium (U)-Dissolved	0.000583		0.000010	mg/L	11-MAY-18	0.02	
	Vanadium (V)-Dissolved	<0.00050		0.00050	mg/L	11-MAY-18		
	Zinc (Zn)-Dissolved	0.0979		0.0010	mg/L	11-MAY-18		5
	Zirconium (Zr)-Dissolved	<0.00030		0.00030	mg/L	11-MAY-18		
L2092995-4	23089180510004 MW01B							
Sampled By:	D.MARTIN on 10-MAY-18 @ 10:20							
Matrix:	WATER						#1	#2
Physical Tests								
	Conductivity	589		3.0	umhos/cm	12-MAY-18		
	pH	8.20		0.10	pH units	11-MAY-18		6.5-8.5
	Total Dissolved Solids	373	DLDS	20	mg/L	16-MAY-18		500
Anions and Nutrients								
	Alkalinity, Bicarbonate (as CaCO3)	233		10	mg/L	14-MAY-18		
	Alkalinity, Carbonate (as CaCO3)	<10		10	mg/L	14-MAY-18		
	Alkalinity, Hydroxide (as CaCO3)	<10		10	mg/L	14-MAY-18		
	Alkalinity, Total (as CaCO3)	233		10	mg/L	14-MAY-18		30-500
	Bromide (Br)	<0.10		0.10	mg/L	15-MAY-18		
	Chloride (Cl)	48.5		0.50	mg/L	15-MAY-18		250
	Computed Conductivity	561			uS/cm	17-MAY-18		
	Conductivity % Difference	-4.8			%	17-MAY-18		
	Fluoride (F)	0.144		0.020	mg/L	15-MAY-18	1.5	
	Hardness (as CaCO3)	225			mg/L	17-MAY-18		*80-100
	Ion Balance	99.2			%	17-MAY-18		
	Langelier Index	0.7			No Unit	17-MAY-18		
	Nitrate (as N)	<0.020		0.020	mg/L	15-MAY-18	10	
	Nitrite (as N)	<0.010		0.010	mg/L	15-MAY-18	1	
	Total Kjeldahl Nitrogen	<1.5	DLM	1.5	mg/L	18-MAY-18		
	Saturation pH	7.47			pH	17-MAY-18		
	TDS (Calculated)	337			mg/L	17-MAY-18		
	Sulfate (SO4)	41.4		0.30	mg/L	15-MAY-18		500

** Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
* Analytical result for this parameter exceeds Guideline Limit listed on this report. Guideline Limits applied:

Ontario Drinking Water Regulation (ODWQS) JAN.1,2018 = [Suite] - ON-DW-STANDARD+GUIDELINES

#1: Schedule 1 (Microbiological) and 2 (Chemical) Standards (JAN,2018)   **#2: Ontario DW Aesthetic and Operational Guidelines**

ANALYTICAL GUIDELINE REPORT

CLAIR MALTBY CEIS

L2092995-4 23089180510004 MW01B
Sampled By: D.MARTIN on 10-MAY-18 @ 10:20
Matrix: WATER

Sample Details Grouping / Analyte	Result	Qualifier	D.L.	Units	Analyzed	Guideline Limits #1	Guideline Limits #2
Anions and Nutrients							
Anion Sum	6.12			me/L	17-MAY-18		
Cation Sum	6.07			me/L	17-MAY-18		
Cation - Anion Balance	-0.4			%	17-MAY-18		
Dissolved Metals							
Dissolved Metals Filtration Location	FIELD			No Unit	11-MAY-18		
Aluminum (Al)-Dissolved	<0.0050		0.0050	mg/L	11-MAY-18		0.1
Antimony (Sb)-Dissolved	<0.00010		0.00010	mg/L	11-MAY-18	0.006	
Arsenic (As)-Dissolved	0.00873		0.00010	mg/L	11-MAY-18	0.0100	
Barium (Ba)-Dissolved	0.0448		0.00010	mg/L	11-MAY-18	1	
Beryllium (Be)-Dissolved	<0.00010		0.00010	mg/L	11-MAY-18		
Bismuth (Bi)-Dissolved	<0.000050		0.000050	mg/L	11-MAY-18		
Boron (B)-Dissolved	0.066		0.010	mg/L	11-MAY-18	5	
Cadmium (Cd)-Dissolved	<0.0000050		0.0000050	mg/L	11-MAY-18	0.005	
Calcium (Ca)-Dissolved	39.6		0.050	mg/L	11-MAY-18		
Cesium (Cs)-Dissolved	<0.000010		0.000010	mg/L	11-MAY-18		
Chromium (Cr)-Dissolved	<0.00050		0.00050	mg/L	11-MAY-18	0.05	
Cobalt (Co)-Dissolved	0.00012		0.00010	mg/L	11-MAY-18		
Copper (Cu)-Dissolved	<0.00020		0.00020	mg/L	11-MAY-18		1
Iron (Fe)-Dissolved	0.025		0.010	mg/L	11-MAY-18		0.3
Lead (Pb)-Dissolved	<0.000050		0.000050	mg/L	11-MAY-18	0.01	
Lithium (Li)-Dissolved	0.0042		0.0010	mg/L	11-MAY-18		
Magnesium (Mg)-Dissolved	30.6		0.0050	mg/L	11-MAY-18		
Manganese (Mn)-Dissolved	0.00930		0.00050	mg/L	11-MAY-18		0.05
Molybdenum (Mo)-Dissolved	0.00264		0.000050	mg/L	11-MAY-18		
Nickel (Ni)-Dissolved	0.00066		0.00050	mg/L	11-MAY-18		
Phosphorus (P)-Dissolved	<0.050		0.050	mg/L	11-MAY-18		
Potassium (K)-Dissolved	0.810		0.050	mg/L	11-MAY-18		
Rubidium (Rb)-Dissolved	0.00045		0.00020	mg/L	11-MAY-18		
Selenium (Se)-Dissolved	0.000065		0.000050	mg/L	11-MAY-18	0.05	
Silicon (Si)-Dissolved	5.74		0.050	mg/L	11-MAY-18		
Silver (Ag)-Dissolved	<0.000050		0.000050	mg/L	11-MAY-18		
Sodium (Na)-Dissolved	35.7		0.050	mg/L	11-MAY-18	*20	200
Strontium (Sr)-Dissolved	0.527		0.0010	mg/L	11-MAY-18		
Sulfur (S)-Dissolved	12.6		0.50	mg/L	11-MAY-18		
Tellurium (Te)-Dissolved	<0.00020		0.00020	mg/L	11-MAY-18		
Thallium (Tl)-Dissolved	<0.000010		0.000010	mg/L	11-MAY-18		
Thorium (Th)-Dissolved	<0.00010		0.00010	mg/L	11-MAY-18		
Tin (Sn)-Dissolved	<0.00010		0.00010	mg/L	11-MAY-18		
Titanium (Ti)-Dissolved	<0.00030		0.00030	mg/L	11-MAY-18		
Tungsten (W)-Dissolved	<0.00010		0.00010	mg/L	11-MAY-18		
Uranium (U)-Dissolved	0.000415		0.000010	mg/L	11-MAY-18	0.02	
Vanadium (V)-Dissolved	0.00068		0.00050	mg/L	11-MAY-18		
Zinc (Zn)-Dissolved	<0.0010		0.0010	mg/L	11-MAY-18		5
Zirconium (Zr)-Dissolved	<0.00030		0.00030	mg/L	11-MAY-18		

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Ontario Drinking Water Regulation (ODWQS) JAN.1,2018 = [Suite] - ON-DW-STANDARD+GUIDELINES

#1: Schedule 1 (Microbiological) and 2 (Chemical) Standards (JAN,2018) **#2: Ontario DW Aesthetic and Operational Guidelines**

ANALYTICAL GUIDELINE REPORT

L2092995-5 23089180510005 MW03S
Sampled By: D.MARTIN on 10-MAY-18 @ 11:40
Matrix: WATER

Sample Details Grouping / Analyte	Result	Qualifier	D.L.	Units	Analyzed	Guideline Limits #1	Guideline Limits #2
Physical Tests							
Conductivity	507		3.0	umhos/cm	12-MAY-18		
pH	7.97		0.10	pH units	11-MAY-18		6.5-8.5
Total Dissolved Solids	357	DLDS	20	mg/L	16-MAY-18		500
Anions and Nutrients							
Alkalinity, Bicarbonate (as CaCO3)	316		10	mg/L	14-MAY-18		
Alkalinity, Carbonate (as CaCO3)	<10		10	mg/L	14-MAY-18		
Alkalinity, Hydroxide (as CaCO3)	<10		10	mg/L	14-MAY-18		
Alkalinity, Total (as CaCO3)	316		10	mg/L	14-MAY-18		30-500
Bromide (Br)	<0.10		0.10	mg/L	15-MAY-18		
Chloride (Cl)	12.4		0.50	mg/L	15-MAY-18		250
Computed Conductivity	563			uS/cm	17-MAY-18		
Conductivity % Difference	10.5			%	17-MAY-18		
Fluoride (F)	0.047		0.020	mg/L	15-MAY-18	1.5	
Hardness (as CaCO3)	324			mg/L	17-MAY-18		*80-100
Ion Balance	113			%	17-MAY-18		
Langelier Index	0.9			No Unit	17-MAY-18		
Nitrate (as N)	1.32		0.020	mg/L	15-MAY-18	10	
Nitrite (as N)	<0.010		0.010	mg/L	15-MAY-18	1	
Total Kjeldahl Nitrogen	<0.15		0.15	mg/L	18-MAY-18		
Saturation pH	7.02			pH	17-MAY-18		
TDS (Calculated)	348			mg/L	17-MAY-18		
Sulfate (SO4)	19.2		0.30	mg/L	15-MAY-18		500
Anion Sum	6.08			me/L	17-MAY-18		
Cation Sum	6.84			me/L	17-MAY-18		
Cation - Anion Balance	5.9			%	17-MAY-18		
Dissolved Metals							
Dissolved Metals Filtration Location	FIELD			No Unit	11-MAY-18		
Aluminum (Al)-Dissolved	<0.0050		0.0050	mg/L	11-MAY-18		0.1
Antimony (Sb)-Dissolved	<0.00010		0.00010	mg/L	11-MAY-18	0.006	
Arsenic (As)-Dissolved	0.00021		0.00010	mg/L	11-MAY-18	0.0100	
Barium (Ba)-Dissolved	0.0815		0.00010	mg/L	11-MAY-18	1	
Beryllium (Be)-Dissolved	<0.00010		0.00010	mg/L	11-MAY-18		
Bismuth (Bi)-Dissolved	<0.000050		0.000050	mg/L	11-MAY-18		
Boron (B)-Dissolved	0.010		0.010	mg/L	11-MAY-18	5	
Cadmium (Cd)-Dissolved	0.0000485		0.0000050	mg/L	11-MAY-18	0.005	
Calcium (Ca)-Dissolved	84.9		0.050	mg/L	11-MAY-18		
Cesium (Cs)-Dissolved	<0.000010		0.000010	mg/L	11-MAY-18		
Chromium (Cr)-Dissolved	<0.00050		0.00050	mg/L	11-MAY-18	0.05	
Cobalt (Co)-Dissolved	<0.00010		0.00010	mg/L	11-MAY-18		
Copper (Cu)-Dissolved	0.00044		0.00020	mg/L	11-MAY-18		1
Iron (Fe)-Dissolved	<0.010		0.010	mg/L	11-MAY-18		0.3
Lead (Pb)-Dissolved	0.000116		0.000050	mg/L	11-MAY-18	0.01	
Lithium (Li)-Dissolved	0.0014		0.0010	mg/L	11-MAY-18		
Magnesium (Mg)-Dissolved	27.3		0.0050	mg/L	11-MAY-18		
Manganese (Mn)-Dissolved	0.00211		0.00050	mg/L	11-MAY-18		0.05
Molybdenum (Mo)-Dissolved	0.000220		0.000050	mg/L	11-MAY-18		

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Ontario Drinking Water Regulation (ODWQS) JAN.1,2018 = [Suite] - ON-DW-STANDARD+GUIDELINES

#1: Schedule 1 (Microbiological) and 2 (Chemical) Standards (JAN,2018) **#2: Ontario DW Aesthetic and Operational Guidelines**

ANALYTICAL GUIDELINE REPORT

CLAIR MALTBY CEIS

Sample Details Grouping	Analyte	Result	Qualifier	D.L.	Units	Analyzed	Guideline Limits #1	#2
L2092995-5	23089180510005 MW03S							
Sampled By:	D.MARTIN on 10-MAY-18 @ 11:40							
Matrix:	WATER							
Dissolved Metals								
	Nickel (Ni)-Dissolved	<0.00050		0.00050	mg/L	11-MAY-18		
	Phosphorus (P)-Dissolved	<0.050		0.050	mg/L	11-MAY-18		
	Potassium (K)-Dissolved	1.07		0.050	mg/L	11-MAY-18		
	Rubidium (Rb)-Dissolved	0.00324		0.00020	mg/L	11-MAY-18		
	Selenium (Se)-Dissolved	0.000273		0.000050	mg/L	11-MAY-18	0.05	
	Silicon (Si)-Dissolved	5.30		0.050	mg/L	11-MAY-18		
	Silver (Ag)-Dissolved	<0.000050		0.000050	mg/L	11-MAY-18		
	Sodium (Na)-Dissolved	7.59		0.050	mg/L	11-MAY-18	20	200
	Strontium (Sr)-Dissolved	0.0990		0.0010	mg/L	11-MAY-18		
	Sulfur (S)-Dissolved	6.06		0.50	mg/L	11-MAY-18		
	Tellurium (Te)-Dissolved	<0.00020		0.00020	mg/L	11-MAY-18		
	Thallium (Tl)-Dissolved	0.000018		0.000010	mg/L	11-MAY-18		
	Thorium (Th)-Dissolved	<0.00010		0.00010	mg/L	11-MAY-18		
	Tin (Sn)-Dissolved	<0.00010		0.00010	mg/L	11-MAY-18		
	Titanium (Ti)-Dissolved	<0.00030		0.00030	mg/L	11-MAY-18		
	Tungsten (W)-Dissolved	<0.00010		0.00010	mg/L	11-MAY-18		
	Uranium (U)-Dissolved	0.000430		0.000010	mg/L	11-MAY-18	0.02	
	Vanadium (V)-Dissolved	<0.00050		0.00050	mg/L	11-MAY-18		
	Zinc (Zn)-Dissolved	0.0220		0.0010	mg/L	11-MAY-18		5
	Zirconium (Zr)-Dissolved	<0.00030		0.00030	mg/L	11-MAY-18		
L2092995-6	23089180510006 MW03D							
Sampled By:	D.MARTIN on 10-MAY-18 @ 12:40							
Matrix:	WATER							
Physical Tests								
	Conductivity	450		3.0	umhos/cm	12-MAY-18		
	pH	8.16		0.10	pH units	11-MAY-18		6.5-8.5
	Total Dissolved Solids	326	DLDS	20	mg/L	16-MAY-18		500
Anions and Nutrients								
	Alkalinity, Bicarbonate (as CaCO3)	260		10	mg/L	14-MAY-18		
	Alkalinity, Carbonate (as CaCO3)	<10		10	mg/L	14-MAY-18		
	Alkalinity, Hydroxide (as CaCO3)	<10		10	mg/L	14-MAY-18		
	Alkalinity, Total (as CaCO3)	260		10	mg/L	14-MAY-18		30-500
	Bromide (Br)	<0.10		0.10	mg/L	15-MAY-18		
	Chloride (Cl)	15.1		0.50	mg/L	15-MAY-18		250
	Computed Conductivity	491			uS/cm	17-MAY-18		
	Conductivity % Difference	8.8			%	17-MAY-18		
	Fluoride (F)	0.066		0.020	mg/L	15-MAY-18	1.5	
	Hardness (as CaCO3)	273			mg/L	17-MAY-18		*80-100
	Ion Balance	107			%	17-MAY-18		
	Langelier Index	1.0			No Unit	17-MAY-18		
	Nitrate (as N)	<0.020		0.020	mg/L	15-MAY-18	10	
	Nitrite (as N)	<0.010		0.010	mg/L	15-MAY-18	1	
	Total Kjeldahl Nitrogen	<0.15		0.15	mg/L	18-MAY-18		
	Saturation pH	7.20			pH	17-MAY-18		
	TDS (Calculated)	295			mg/L	17-MAY-18		
	Sulfate (SO4)	26.7		0.30	mg/L	15-MAY-18		500

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Ontario Drinking Water Regulation (ODWQS) JAN.1,2018 = [Suite] - ON-DW-STANDARD+GUIDELINES

#1: Schedule 1 (Microbiological) and 2 (Chemical) Standards (JAN,2018) **#2: Ontario DW Aesthetic and Operational Guidelines**

ANALYTICAL GUIDELINE REPORT

CLAIR MALTBY CEIS

Sample Details Grouping	Analyte	Result	Qualifier	D.L.	Units	Analyzed	Guideline Limits #1	Guideline Limits #2
L2092995-6	23089180510006 MW03D							
Sampled By:	D.MARTIN on 10-MAY-18 @ 12:40							
Matrix:	WATER							
Anions and Nutrients								
	Anion Sum	5.31			me/L	17-MAY-18		
	Cation Sum	5.66			me/L	17-MAY-18		
	Cation - Anion Balance	3.2			%	17-MAY-18		
Dissolved Metals								
	Dissolved Metals Filtration Location	FIELD			No Unit	11-MAY-18		
	Aluminum (Al)-Dissolved	<0.0050		0.0050	mg/L	11-MAY-18		0.1
	Antimony (Sb)-Dissolved	<0.00010		0.00010	mg/L	11-MAY-18	0.006	
	Arsenic (As)-Dissolved	0.00196		0.00010	mg/L	11-MAY-18	0.0100	
	Barium (Ba)-Dissolved	0.0824		0.00010	mg/L	11-MAY-18	1	
	Beryllium (Be)-Dissolved	<0.00010		0.00010	mg/L	11-MAY-18		
	Bismuth (Bi)-Dissolved	<0.000050		0.000050	mg/L	11-MAY-18		
	Boron (B)-Dissolved	<0.010		0.010	mg/L	11-MAY-18	5	
	Cadmium (Cd)-Dissolved	<0.0000050		0.0000050	mg/L	11-MAY-18	0.005	
	Calcium (Ca)-Dissolved	65.9		0.050	mg/L	11-MAY-18		
	Cesium (Cs)-Dissolved	<0.000010		0.000010	mg/L	11-MAY-18		
	Chromium (Cr)-Dissolved	<0.00050		0.00050	mg/L	11-MAY-18	0.05	
	Cobalt (Co)-Dissolved	<0.00010		0.00010	mg/L	11-MAY-18		
	Copper (Cu)-Dissolved	0.00029		0.00020	mg/L	11-MAY-18		1
	Iron (Fe)-Dissolved	0.198		0.010	mg/L	11-MAY-18		0.3
	Lead (Pb)-Dissolved	<0.000050		0.000050	mg/L	11-MAY-18	0.01	
	Lithium (Li)-Dissolved	0.0030		0.0010	mg/L	11-MAY-18		
	Magnesium (Mg)-Dissolved	26.3		0.0050	mg/L	11-MAY-18		
	Manganese (Mn)-Dissolved	0.0131		0.00050	mg/L	11-MAY-18		0.05
	Molybdenum (Mo)-Dissolved	0.000699		0.000050	mg/L	11-MAY-18		
	Nickel (Ni)-Dissolved	<0.00050		0.00050	mg/L	11-MAY-18		
	Phosphorus (P)-Dissolved	<0.050		0.050	mg/L	11-MAY-18		
	Potassium (K)-Dissolved	0.895		0.050	mg/L	11-MAY-18		
	Rubidium (Rb)-Dissolved	0.00050		0.00020	mg/L	11-MAY-18		
	Selenium (Se)-Dissolved	<0.000050		0.000050	mg/L	11-MAY-18	0.05	
	Silicon (Si)-Dissolved	6.77		0.050	mg/L	11-MAY-18		
	Silver (Ag)-Dissolved	<0.000050		0.000050	mg/L	11-MAY-18		
	Sodium (Na)-Dissolved	4.26		0.050	mg/L	11-MAY-18	20	200
	Strontium (Sr)-Dissolved	0.116		0.0010	mg/L	11-MAY-18		
	Sulfur (S)-Dissolved	8.43		0.50	mg/L	11-MAY-18		
	Tellurium (Te)-Dissolved	<0.00020		0.00020	mg/L	11-MAY-18		
	Thallium (Tl)-Dissolved	<0.000010		0.000010	mg/L	11-MAY-18		
	Thorium (Th)-Dissolved	<0.00010		0.00010	mg/L	11-MAY-18		
	Tin (Sn)-Dissolved	<0.00010		0.00010	mg/L	11-MAY-18		
	Titanium (Ti)-Dissolved	<0.00030		0.00030	mg/L	11-MAY-18		
	Tungsten (W)-Dissolved	<0.00010		0.00010	mg/L	11-MAY-18		
	Uranium (U)-Dissolved	0.000541		0.000010	mg/L	11-MAY-18	0.02	
	Vanadium (V)-Dissolved	<0.00050		0.00050	mg/L	11-MAY-18		
	Zinc (Zn)-Dissolved	0.0011		0.0010	mg/L	11-MAY-18		5
	Zirconium (Zr)-Dissolved	<0.00030		0.00030	mg/L	11-MAY-18		

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Ontario Drinking Water Regulation (ODWQS) JAN.1,2018 = [Suite] - ON-DW-STANDARD+GUIDELINES

#1: Schedule 1 (Microbiological) and 2 (Chemical) Standards (JAN,2018) **#2: Ontario DW Aesthetic and Operational Guidelines**

ANALYTICAL GUIDELINE REPORT

CLAIR MALTBY CEIS

L2092995-7 23089180510007 MW08S
Sampled By: D.MARTIN on 10-MAY-18 @ 14:10
Matrix: WATER

Sample Details Grouping	Analyte	Result	Qualifier	D.L.	Units	Analyzed	Guideline Limits #1	Guideline Limits #2
Physical Tests								
	Conductivity	575		3.0	umhos/cm	12-MAY-18		
	pH	7.89		0.10	pH units	11-MAY-18		6.5-8.5
	Total Dissolved Solids	435	DLDS	20	mg/L	16-MAY-18		500
Anions and Nutrients								
	Alkalinity, Bicarbonate (as CaCO3)	368		10	mg/L	14-MAY-18		
	Alkalinity, Carbonate (as CaCO3)	<10		10	mg/L	14-MAY-18		
	Alkalinity, Hydroxide (as CaCO3)	<10		10	mg/L	14-MAY-18		
	Alkalinity, Total (as CaCO3)	368		10	mg/L	14-MAY-18		30-500
	Bromide (Br)	<0.10		0.10	mg/L	15-MAY-18		
	Chloride (Cl)	18.3		0.50	mg/L	15-MAY-18		250
	Computed Conductivity	649			uS/cm	17-MAY-18		
	Conductivity % Difference	12.1			%	17-MAY-18		
	Fluoride (F)	0.047		0.020	mg/L	15-MAY-18	1.5	
	Hardness (as CaCO3)	391			mg/L	17-MAY-18		*80-100
	Ion Balance	114			%	17-MAY-18		
	Langelier Index	1.0			No Unit	17-MAY-18		
	Nitrate (as N)	3.03		0.020	mg/L	15-MAY-18	10	
	Nitrite (as N)	<0.010		0.010	mg/L	15-MAY-18	1	
	Total Kjeldahl Nitrogen	0.21	TKNI	0.15	mg/L	18-MAY-18		
	Saturation pH	6.85			pH	17-MAY-18		
	TDS (Calculated)	407			mg/L	17-MAY-18		
	Sulfate (SO4)	11.1		0.30	mg/L	15-MAY-18		500
	Anion Sum	7.04			me/L	17-MAY-18		
	Cation Sum	8.02			me/L	17-MAY-18		
	Cation - Anion Balance	6.5			%	17-MAY-18		
Dissolved Metals								
	Dissolved Metals Filtration Location	FIELD			No Unit	11-MAY-18		
	Aluminum (Al)-Dissolved	<0.0050		0.0050	mg/L	11-MAY-18		0.1
	Antimony (Sb)-Dissolved	<0.00010		0.00010	mg/L	11-MAY-18	0.006	
	Arsenic (As)-Dissolved	0.00018		0.00010	mg/L	11-MAY-18	0.0100	
	Barium (Ba)-Dissolved	0.0136		0.00010	mg/L	11-MAY-18	1	
	Beryllium (Be)-Dissolved	<0.00010		0.00010	mg/L	11-MAY-18		
	Bismuth (Bi)-Dissolved	<0.000050		0.000050	mg/L	11-MAY-18		
	Boron (B)-Dissolved	0.011		0.010	mg/L	11-MAY-18	5	
	Cadmium (Cd)-Dissolved	0.0000586		0.0000050	mg/L	11-MAY-18	0.005	
	Calcium (Ca)-Dissolved	111		0.050	mg/L	11-MAY-18		
	Cesium (Cs)-Dissolved	<0.000010		0.000010	mg/L	11-MAY-18		
	Chromium (Cr)-Dissolved	<0.00050		0.00050	mg/L	11-MAY-18	0.05	
	Cobalt (Co)-Dissolved	<0.00010		0.00010	mg/L	11-MAY-18		
	Copper (Cu)-Dissolved	0.00080		0.00020	mg/L	11-MAY-18		1
	Iron (Fe)-Dissolved	<0.010		0.010	mg/L	11-MAY-18		0.3
	Lead (Pb)-Dissolved	0.000074		0.000050	mg/L	11-MAY-18	0.01	
	Lithium (Li)-Dissolved	0.0011		0.0010	mg/L	11-MAY-18		
	Magnesium (Mg)-Dissolved	27.7		0.0050	mg/L	11-MAY-18		
	Manganese (Mn)-Dissolved	0.00099		0.00050	mg/L	11-MAY-18		0.05
	Molybdenum (Mo)-Dissolved	0.000074		0.000050	mg/L	11-MAY-18		

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* Analytical result for this parameter exceeds Guideline Limit listed on this report. Guideline Limits applied:

Ontario Drinking Water Regulation (ODWQS) JAN.1,2018 = [Suite] - ON-DW-STANDARD+GUIDELINES

#1: Schedule 1 (Microbiological) and 2 (Chemical) Standards (JAN,2018) **#2: Ontario DW Aesthetic and Operational Guidelines**

ANALYTICAL GUIDELINE REPORT

CLAIR MALTBY CEIS

Sample Details Grouping	Analyte	Result	Qualifier	D.L.	Units	Analyzed	Guideline Limits #1	Guideline Limits #2
L2092995-7	23089180510007 MW08S							
Sampled By:	D.MARTIN on 10-MAY-18 @ 14:10							
Matrix:	WATER						#1	#2
Dissolved Metals								
	Nickel (Ni)-Dissolved	<0.00050		0.00050	mg/L	11-MAY-18		
	Phosphorus (P)-Dissolved	<0.050		0.050	mg/L	11-MAY-18		
	Potassium (K)-Dissolved	0.807		0.050	mg/L	11-MAY-18		
	Rubidium (Rb)-Dissolved	0.00032		0.00020	mg/L	11-MAY-18		
	Selenium (Se)-Dissolved	0.000083		0.000050	mg/L	11-MAY-18	0.05	
	Silicon (Si)-Dissolved	4.18		0.050	mg/L	11-MAY-18		
	Silver (Ag)-Dissolved	<0.000050		0.000050	mg/L	11-MAY-18		
	Sodium (Na)-Dissolved	4.45		0.050	mg/L	11-MAY-18	20	200
	Strontium (Sr)-Dissolved	0.135		0.0010	mg/L	11-MAY-18		
	Sulfur (S)-Dissolved	3.43		0.50	mg/L	11-MAY-18		
	Tellurium (Te)-Dissolved	<0.00020		0.00020	mg/L	11-MAY-18		
	Thallium (Tl)-Dissolved	<0.000010		0.000010	mg/L	11-MAY-18		
	Thorium (Th)-Dissolved	<0.00010		0.00010	mg/L	11-MAY-18		
	Tin (Sn)-Dissolved	<0.00010		0.00010	mg/L	11-MAY-18		
	Titanium (Ti)-Dissolved	<0.00030		0.00030	mg/L	11-MAY-18		
	Tungsten (W)-Dissolved	<0.00010		0.00010	mg/L	11-MAY-18		
	Uranium (U)-Dissolved	0.000200		0.000010	mg/L	11-MAY-18	0.02	
	Vanadium (V)-Dissolved	<0.00050		0.00050	mg/L	11-MAY-18		
	Zinc (Zn)-Dissolved	0.0082		0.0010	mg/L	11-MAY-18		5
	Zirconium (Zr)-Dissolved	<0.00030		0.00030	mg/L	11-MAY-18		
L2092995-8	23089180510008 MW08D							
Sampled By:	D.MARTIN on 10-MAY-18 @ 14:20							
Matrix:	WATER						#1	#2
Physical Tests								
	Conductivity	1060		3.0	umhos/cm	12-MAY-18		
	pH	8.06		0.10	pH units	11-MAY-18		6.5-8.5
	Total Dissolved Solids	630	DLDS	20	mg/L	16-MAY-18		*500
Anions and Nutrients								
	Alkalinity, Bicarbonate (as CaCO3)	308		10	mg/L	14-MAY-18		
	Alkalinity, Carbonate (as CaCO3)	<10		10	mg/L	14-MAY-18		
	Alkalinity, Hydroxide (as CaCO3)	<10		10	mg/L	14-MAY-18		
	Alkalinity, Total (as CaCO3)	308		10	mg/L	14-MAY-18		30-500
	Bromide (Br)	0.28		0.10	mg/L	15-MAY-18		
	Chloride (Cl)	167		0.50	mg/L	15-MAY-18		250
	Computed Conductivity	982			uS/cm	17-MAY-18		
	Conductivity % Difference	-7.1			%	17-MAY-18		
	Fluoride (F)	0.060		0.020	mg/L	15-MAY-18	1.5	
	Hardness (as CaCO3)	366			mg/L	17-MAY-18		*80-100
	Ion Balance	104			%	17-MAY-18		
	Langelier Index	1.1			No Unit	17-MAY-18		
	Nitrate (as N)	1.44		0.020	mg/L	15-MAY-18	10	
	Nitrite (as N)	0.023		0.010	mg/L	15-MAY-18	1	
	Total Kjeldahl Nitrogen	<0.15		0.15	mg/L	18-MAY-18		
	Saturation pH	7.00			pH	17-MAY-18		
	TDS (Calculated)	601			mg/L	17-MAY-18		
	Sulfate (SO4)	29.7		0.30	mg/L	15-MAY-18		500

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#1: Schedule 1 (Microbiological) and 2 (Chemical) Standards (JAN,2018) **#2: Ontario DW Aesthetic and Operational Guidelines**

ANALYTICAL GUIDELINE REPORT

CLAIR MALTBY CEIS

Sample Details Grouping	Analyte	Result	Qualifier	D.L.	Units	Analyzed	Guideline Limits #1	#2
L2092995-8	23089180510008 MW08D							
Sampled By:	D.MARTIN on 10-MAY-18 @ 14:20							
Matrix:	WATER							
Anions and Nutrients								
	Anion Sum	10.5			me/L	17-MAY-18		
	Cation Sum	11.0			me/L	17-MAY-18		
	Cation - Anion Balance	2.0			%	17-MAY-18		
Dissolved Metals								
	Dissolved Metals Filtration Location	FIELD			No Unit	11-MAY-18		
	Aluminum (Al)-Dissolved	<0.0050		0.0050	mg/L	11-MAY-18		0.1
	Antimony (Sb)-Dissolved	<0.00010		0.00010	mg/L	11-MAY-18	0.006	
	Arsenic (As)-Dissolved	0.00011		0.00010	mg/L	11-MAY-18	0.0100	
	Barium (Ba)-Dissolved	0.138		0.00010	mg/L	11-MAY-18	1	
	Beryllium (Be)-Dissolved	<0.00010		0.00010	mg/L	11-MAY-18		
	Bismuth (Bi)-Dissolved	<0.000050		0.000050	mg/L	11-MAY-18		
	Boron (B)-Dissolved	0.014		0.010	mg/L	11-MAY-18	5	
	Cadmium (Cd)-Dissolved	0.000101		0.0000050	mg/L	11-MAY-18	0.005	
	Calcium (Ca)-Dissolved	101		0.050	mg/L	11-MAY-18		
	Cesium (Cs)-Dissolved	<0.000010		0.000010	mg/L	11-MAY-18		
	Chromium (Cr)-Dissolved	<0.00050		0.00050	mg/L	11-MAY-18	0.05	
	Cobalt (Co)-Dissolved	0.00038		0.00010	mg/L	11-MAY-18		
	Copper (Cu)-Dissolved	0.00129		0.00020	mg/L	11-MAY-18		1
	Iron (Fe)-Dissolved	<0.010		0.010	mg/L	11-MAY-18		0.3
	Lead (Pb)-Dissolved	0.000290		0.000050	mg/L	11-MAY-18	0.01	
	Lithium (Li)-Dissolved	0.0033		0.0010	mg/L	11-MAY-18		
	Magnesium (Mg)-Dissolved	27.6		0.0050	mg/L	11-MAY-18		
	Manganese (Mn)-Dissolved	0.0181		0.00050	mg/L	11-MAY-18		0.05
	Molybdenum (Mo)-Dissolved	0.000638		0.000050	mg/L	11-MAY-18		
	Nickel (Ni)-Dissolved	0.00219		0.00050	mg/L	11-MAY-18		
	Phosphorus (P)-Dissolved	<0.050		0.050	mg/L	11-MAY-18		
	Potassium (K)-Dissolved	3.22		0.050	mg/L	11-MAY-18		
	Rubidium (Rb)-Dissolved	0.00241		0.00020	mg/L	11-MAY-18		
	Selenium (Se)-Dissolved	0.000311		0.000050	mg/L	11-MAY-18	0.05	
	Silicon (Si)-Dissolved	5.17		0.050	mg/L	11-MAY-18		
	Silver (Ag)-Dissolved	<0.000050		0.000050	mg/L	11-MAY-18		
	Sodium (Na)-Dissolved	81.8		0.050	mg/L	11-MAY-18	*20	200
	Strontium (Sr)-Dissolved	0.168		0.0010	mg/L	11-MAY-18		
	Sulfur (S)-Dissolved	9.81		0.50	mg/L	11-MAY-18		
	Tellurium (Te)-Dissolved	<0.00020		0.00020	mg/L	11-MAY-18		
	Thallium (Tl)-Dissolved	0.000057		0.000010	mg/L	11-MAY-18		
	Thorium (Th)-Dissolved	<0.00010		0.00010	mg/L	11-MAY-18		
	Tin (Sn)-Dissolved	<0.00010		0.00010	mg/L	11-MAY-18		
	Titanium (Ti)-Dissolved	<0.00030		0.00030	mg/L	11-MAY-18		
	Tungsten (W)-Dissolved	<0.00010		0.00010	mg/L	11-MAY-18		
	Uranium (U)-Dissolved	0.000503		0.000010	mg/L	11-MAY-18	0.02	
	Vanadium (V)-Dissolved	<0.00050		0.00050	mg/L	11-MAY-18		
	Zinc (Zn)-Dissolved	0.212		0.0010	mg/L	11-MAY-18		5
	Zirconium (Zr)-Dissolved	<0.00030		0.00030	mg/L	11-MAY-18		

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ANALYTICAL GUIDELINE REPORT

CLAIR MALTBY CEIS

Sample Details Grouping	Analyte	Result	Qualifier	D.L.	Units	Analyzed	Guideline Limits #1	Guideline Limits #2
L2092995-9	23089180510009 MW09S							
Sampled By:	D.MARTIN on 10-MAY-18 @ 15:0							
Matrix:	WATER							
Physical Tests								
	Conductivity	501		3.0	umhos/cm	12-MAY-18		
	pH	8.05		0.10	pH units	11-MAY-18		6.5-8.5
	Total Dissolved Solids	386	DLDS	20	mg/L	16-MAY-18		500
Anions and Nutrients								
	Alkalinity, Bicarbonate (as CaCO3)	343		10	mg/L	14-MAY-18		
	Alkalinity, Carbonate (as CaCO3)	<10		10	mg/L	14-MAY-18		
	Alkalinity, Hydroxide (as CaCO3)	<10		10	mg/L	14-MAY-18		
	Alkalinity, Total (as CaCO3)	340	DLM	100	mg/L	14-MAY-18		30-500
	Bromide (Br)	<0.10		0.10	mg/L	15-MAY-18		
	Chloride (Cl)	16.0		0.50	mg/L	15-MAY-18		250
	Computed Conductivity	592			uS/cm	17-MAY-18		
	Conductivity % Difference	16.7			%	17-MAY-18		
	Fluoride (F)	0.037		0.020	mg/L	15-MAY-18	1.5	
	Hardness (as CaCO3)	309			mg/L	17-MAY-18		*80-100
	Ion Balance	91.9			%	17-MAY-18		
	Langelier Index	1.1			No Unit	17-MAY-18		
	Nitrate (as N)	7.81		0.020	mg/L	15-MAY-18	10	
	Nitrite (as N)	<0.010		0.010	mg/L	15-MAY-18	1	
	Total Kjeldahl Nitrogen	0.25	TKNI	0.15	mg/L	18-MAY-18		
	Saturation pH	6.98			pH	17-MAY-18		
	TDS (Calculated)	388			mg/L	17-MAY-18		
	Sulfate (SO4)	15.1		0.30	mg/L	15-MAY-18		500
	Anion Sum	7.01			me/L	17-MAY-18		
	Cation Sum	6.44			me/L	17-MAY-18		
	Cation - Anion Balance	-4.2			%	17-MAY-18		
Dissolved Metals								
	Dissolved Metals Filtration Location	FIELD			No Unit	11-MAY-18		
	Aluminum (Al)-Dissolved	<0.0050		0.0050	mg/L	11-MAY-18		0.1
	Antimony (Sb)-Dissolved	<0.00010		0.00010	mg/L	11-MAY-18	0.006	
	Arsenic (As)-Dissolved	0.00011		0.00010	mg/L	11-MAY-18	0.0100	
	Barium (Ba)-Dissolved	0.0857		0.00010	mg/L	11-MAY-18	1	
	Beryllium (Be)-Dissolved	<0.00010		0.00010	mg/L	11-MAY-18		
	Bismuth (Bi)-Dissolved	<0.000050		0.000050	mg/L	11-MAY-18		
	Boron (B)-Dissolved	0.012		0.010	mg/L	11-MAY-18	5	
	Cadmium (Cd)-Dissolved	0.0000443		0.0000050	mg/L	11-MAY-18	0.005	
	Calcium (Ca)-Dissolved	85.8		0.050	mg/L	11-MAY-18		
	Cesium (Cs)-Dissolved	<0.000010		0.000010	mg/L	11-MAY-18		
	Chromium (Cr)-Dissolved	<0.00050		0.00050	mg/L	11-MAY-18	0.05	
	Cobalt (Co)-Dissolved	<0.00010		0.00010	mg/L	11-MAY-18		
	Copper (Cu)-Dissolved	0.00188		0.00020	mg/L	11-MAY-18		1
	Iron (Fe)-Dissolved	<0.010		0.010	mg/L	11-MAY-18		0.3
	Lead (Pb)-Dissolved	0.000118		0.000050	mg/L	11-MAY-18	0.01	
	Lithium (Li)-Dissolved	0.0014		0.0010	mg/L	11-MAY-18		
	Magnesium (Mg)-Dissolved	23.0		0.0050	mg/L	11-MAY-18		
	Manganese (Mn)-Dissolved	<0.00050		0.00050	mg/L	11-MAY-18		0.05
	Molybdenum (Mo)-Dissolved	0.000179		0.000050	mg/L	11-MAY-18		

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#1: Schedule 1 (Microbiological) and 2 (Chemical) Standards (JAN,2018) **#2: Ontario DW Aesthetic and Operational Guidelines**

ANALYTICAL GUIDELINE REPORT

CLAIR MALTBY CEIS

Sample Details Grouping	Analyte	Result	Qualifier	D.L.	Units	Analyzed	Guideline Limits #1	Guideline Limits #2
L2092995-9 23089180510009 MW09S Sampled By: D.MARTIN on 10-MAY-18 @ 15:00 Matrix: WATER								
Dissolved Metals								
	Nickel (Ni)-Dissolved	<0.00050		0.00050	mg/L	11-MAY-18		
	Phosphorus (P)-Dissolved	<0.050		0.050	mg/L	11-MAY-18		
	Potassium (K)-Dissolved	3.41		0.050	mg/L	11-MAY-18		
	Rubidium (Rb)-Dissolved	0.00053		0.00020	mg/L	11-MAY-18		
	Selenium (Se)-Dissolved	0.000340		0.000050	mg/L	11-MAY-18	0.05	
	Silicon (Si)-Dissolved	4.10		0.050	mg/L	11-MAY-18		
	Silver (Ag)-Dissolved	<0.000050		0.000050	mg/L	11-MAY-18		
	Sodium (Na)-Dissolved	4.05		0.050	mg/L	11-MAY-18	20	200
	Strontium (Sr)-Dissolved	0.102		0.0010	mg/L	11-MAY-18		
	Sulfur (S)-Dissolved	4.85		0.50	mg/L	11-MAY-18		
	Tellurium (Te)-Dissolved	<0.00020		0.00020	mg/L	11-MAY-18		
	Thallium (Tl)-Dissolved	<0.000010		0.000010	mg/L	11-MAY-18		
	Thorium (Th)-Dissolved	<0.00010		0.00010	mg/L	11-MAY-18		
	Tin (Sn)-Dissolved	0.00011		0.00010	mg/L	11-MAY-18		
	Titanium (Ti)-Dissolved	<0.00030		0.00030	mg/L	11-MAY-18		
	Tungsten (W)-Dissolved	<0.00010		0.00010	mg/L	11-MAY-18		
	Uranium (U)-Dissolved	0.000282		0.000010	mg/L	11-MAY-18	0.02	
	Vanadium (V)-Dissolved	<0.00050		0.00050	mg/L	11-MAY-18		
	Zinc (Zn)-Dissolved	0.0245		0.0010	mg/L	11-MAY-18		5
	Zirconium (Zr)-Dissolved	<0.00030		0.00030	mg/L	11-MAY-18		
L2092995-10 23089180510010 MW07 Sampled By: D.MARTIN on 10-MAY-18 @ 17:00 Matrix: WATER								
Physical Tests								
	Conductivity	556		3.0	umhos/cm	12-MAY-18		
	pH	8.12		0.10	pH units	11-MAY-18		6.5-8.5
	Total Dissolved Solids	405	DLDS	20	mg/L	16-MAY-18		500
Anions and Nutrients								
	Alkalinity, Bicarbonate (as CaCO3)	288		10	mg/L	14-MAY-18		
	Alkalinity, Carbonate (as CaCO3)	<10		10	mg/L	14-MAY-18		
	Alkalinity, Hydroxide (as CaCO3)	<10		10	mg/L	14-MAY-18		
	Alkalinity, Total (as CaCO3)	288		10	mg/L	14-MAY-18		30-500
	Bromide (Br)	<0.10		0.10	mg/L	15-MAY-18		
	Chloride (Cl)	35.1		0.50	mg/L	15-MAY-18		250
	Computed Conductivity	606			uS/cm	17-MAY-18		
	Conductivity % Difference	8.7			%	17-MAY-18		
	Fluoride (F)	0.076		0.020	mg/L	15-MAY-18	1.5	
	Hardness (as CaCO3)	309			mg/L	17-MAY-18		*80-100
	Ion Balance	103			%	17-MAY-18		
	Langelier Index	1.0			No Unit	17-MAY-18		
	Nitrate (as N)	0.436		0.020	mg/L	15-MAY-18	10	
	Nitrite (as N)	0.015		0.010	mg/L	15-MAY-18	1	
	Total Kjeldahl Nitrogen	<0.15		0.15	mg/L	18-MAY-18		
	Saturation pH	7.10			pH	17-MAY-18		
	TDS (Calculated)	370			mg/L	17-MAY-18		
	Sulfate (SO4)	39.8		0.30	mg/L	15-MAY-18		500

** Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.

* Analytical result for this parameter exceeds Guideline Limit listed on this report. Guideline Limits applied:

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ANALYTICAL GUIDELINE REPORT

CLAIR MALTBY CEIS

L2092995-10 23089180510010 MW07
Sampled By: D.MARTIN on 10-MAY-18 @ 17:0
Matrix: WATER

Sample Details Grouping	Analyte	Result	Qualifier	D.L.	Units	Analyzed	Guideline Limits #1	Guideline Limits #2
Anions and Nutrients								
	Anion Sum	6.64			me/L	17-MAY-18		
	Cation Sum	6.81			me/L	17-MAY-18		
	Cation - Anion Balance	1.3			%	17-MAY-18		
Dissolved Metals								
	Dissolved Metals Filtration Location	FIELD			No Unit	11-MAY-18		
	Aluminum (Al)-Dissolved	0.0065		0.0050	mg/L	11-MAY-18		0.1
	Antimony (Sb)-Dissolved	<0.00010		0.00010	mg/L	11-MAY-18	0.006	
	Arsenic (As)-Dissolved	0.00034		0.00010	mg/L	11-MAY-18	0.0100	
	Barium (Ba)-Dissolved	0.119		0.00010	mg/L	11-MAY-18	1	
	Beryllium (Be)-Dissolved	<0.00010		0.00010	mg/L	11-MAY-18		
	Bismuth (Bi)-Dissolved	<0.000050		0.000050	mg/L	11-MAY-18		
	Boron (B)-Dissolved	<0.010		0.010	mg/L	11-MAY-18	5	
	Cadmium (Cd)-Dissolved	0.0000230		0.0000050	mg/L	11-MAY-18	0.005	
	Calcium (Ca)-Dissolved	77.8		0.050	mg/L	11-MAY-18		
	Cesium (Cs)-Dissolved	<0.000010		0.000010	mg/L	11-MAY-18		
	Chromium (Cr)-Dissolved	<0.00050		0.00050	mg/L	11-MAY-18	0.05	
	Cobalt (Co)-Dissolved	0.00021		0.00010	mg/L	11-MAY-18		
	Copper (Cu)-Dissolved	0.00181		0.00020	mg/L	11-MAY-18		1
	Iron (Fe)-Dissolved	0.017		0.010	mg/L	11-MAY-18		0.3
	Lead (Pb)-Dissolved	0.000185		0.000050	mg/L	11-MAY-18	0.01	
	Lithium (Li)-Dissolved	0.0037		0.0010	mg/L	11-MAY-18		
	Magnesium (Mg)-Dissolved	27.9		0.0050	mg/L	11-MAY-18		
	Manganese (Mn)-Dissolved	0.0527		0.00050	mg/L	11-MAY-18		*0.05
	Molybdenum (Mo)-Dissolved	0.000824		0.000050	mg/L	11-MAY-18		
	Nickel (Ni)-Dissolved	0.00122		0.00050	mg/L	11-MAY-18		
	Phosphorus (P)-Dissolved	<0.050		0.050	mg/L	11-MAY-18		
	Potassium (K)-Dissolved	1.27		0.050	mg/L	11-MAY-18		
	Rubidium (Rb)-Dissolved	0.00116		0.00020	mg/L	11-MAY-18		
	Selenium (Se)-Dissolved	0.000083		0.000050	mg/L	11-MAY-18	0.05	
	Silicon (Si)-Dissolved	6.10		0.050	mg/L	11-MAY-18		
	Silver (Ag)-Dissolved	<0.000050		0.000050	mg/L	11-MAY-18		
	Sodium (Na)-Dissolved	13.7		0.050	mg/L	11-MAY-18	20	200
	Strontium (Sr)-Dissolved	0.120		0.0010	mg/L	11-MAY-18		
	Sulfur (S)-Dissolved	12.8		0.50	mg/L	11-MAY-18		
	Tellurium (Te)-Dissolved	<0.00020		0.00020	mg/L	11-MAY-18		
	Thallium (Tl)-Dissolved	0.000016		0.000010	mg/L	11-MAY-18		
	Thorium (Th)-Dissolved	<0.00010		0.00010	mg/L	11-MAY-18		
	Tin (Sn)-Dissolved	<0.00010		0.00010	mg/L	11-MAY-18		
	Titanium (Ti)-Dissolved	<0.00030		0.00030	mg/L	11-MAY-18		
	Tungsten (W)-Dissolved	<0.00010		0.00010	mg/L	11-MAY-18		
	Uranium (U)-Dissolved	0.000858		0.000010	mg/L	11-MAY-18	0.02	
	Vanadium (V)-Dissolved	<0.00050		0.00050	mg/L	11-MAY-18		
	Zinc (Zn)-Dissolved	0.0243		0.0010	mg/L	11-MAY-18		5
	Zirconium (Zr)-Dissolved	<0.00030		0.00030	mg/L	11-MAY-18		

** Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
* Analytical result for this parameter exceeds Guideline Limit listed on this report. Guideline Limits applied:

Ontario Drinking Water Regulation (ODWQS) JAN.1,2018 = [Suite] - ON-DW-STANDARD+GUIDELINES

#1: Schedule 1 (Microbiological) and 2 (Chemical) Standards (JAN,2018) **#2: Ontario DW Aesthetic and Operational Guidelines**

Reference Information

Sample Parameter Qualifier key listed:

Qualifier	Description
DLDS	Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.
TKNI	TKN result may be biased low due to Nitrate interference. Nitrate-N is > 10x TKN.
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Method Reference***
ALK-AUTO-WT	Water	Automated Speciated Alkalinity	EPA 310.2
This analysis is carried out using procedures adapted from EPA Method 310.2 "Alkalinity". Total Alkalinity is determined using the methyl orange colourimetric method.			
ALK-SPECIATED-WT	Water	pH Measurement for Spec. Alk	APHA 4500 H-Electrode
Water samples are analyzed directly by a calibrated pH meter.			
BR-IC-N-WT	Water	Bromide in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
CL-IC-N-WT	Water	Chloride by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection. Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).			
EC-WT	Water	Conductivity	APHA 2510 B
Water samples can be measured directly by immersing the conductivity cell into the sample.			
F-IC-N-WT	Water	Fluoride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
IONBALANCE-OP03-WT	Water	Detailed Ion Balance Calculation	APHA 1030E, 2330B, 2510A
MET-D-CCMS-WT	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B/6020A (mod)
Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS. Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method. Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).			
NO2-IC-WT	Water	Nitrite in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
NO3-IC-WT	Water	Nitrate in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
SO4-IC-N-WT	Water	Sulfate in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
SOLIDS-TDS-WT	Water	Total Dissolved Solids	APHA 2540C
This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Dissolved Solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.			
TKN-WT	Water	Total Kjeldahl Nitrogen	APHA 4500-Norg D
This analysis is carried out using procedures adapted from APHA Method 4500-Norg "Nitrogen (Organic)". Total Kjeldahl Nitrogen is determined by sample digestion at 380 Celsius with analysis using an automated colorimetric method.			

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

Chain of Custody numbers:

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

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

Reference Information

GLOSSARY OF REPORT TERMS

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

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

Matrix Solutions Inc.
ENVIRONMENT & ENGINEERING

COC # M 81831

Page: 1 **of** 1

Lab Submitted to : ALS WATERLOO
Lab Agreement no : Q58595
Lab Job ID: L2092995

Invoice to: Require Report: Y X N___
Company Name: MATRIX SOLUTIONS
Contact Name: DUSTIN MARTIN
Address:
PC:
Phone / Fax#: Ph: 519 504 8770 Fax:

Copy of Report to:
Matrix Solutions - Data Management
Suite 200, 150 - 13th Avenue SW
Calgary, Alberta, Canada
T2R 0V2
Ph: 403-237-0606 Fax: 403-263-2493
Fax draft copy of invoice to Matrix Solutions Inc.

Matrix Project # : 23089-528
Matrix Proj. Name: CLAIR MALTBY CEIS
Location:
Sampler's Name(s): D. MARTIN

AFE #: 149006

REGULATORY REQUIREMENTS: (check)
☐ Alberta Tier 1
☐ SPIGEC
☐ Freshwater Aquatic Life (Low Level Metals)
☐ Canadian Drinking Water
☐ BC Regs
✓ Other: ODWQS

SERVICE REQUESTED:
☐ **RUSH** (Please ensure you contact the lab) **Due Date:**
☒ REGULAR Turnaround

REPORT DISTRIBUTION: always send to data_management@matrix-solutions.com
☒ Additional Emails dmartin@matrix-solutions.com
dabbey@matrix-solutions.com

Analysis Required

L2092995-COFC

	Sample Number (14 digits only) yr-mth-day	Sample Point Name	Depth (cm)	Sample Type	Date/Time Sampled	Quantity # of Jars	Quantity # of Bags	Q58595												Lab Sample Number
1	23089180510001	MW02S	—	WATER	May 10/18 9:00	3	0	X												
2	23089180510002	MW02D	—	↓	9:05	3	0	X												
3	23089180510003	MW01S	—	↓	10:25	3	0	X												
4	23089180510004	MW01D	—	↓	10:20	3	0	X												
5	23089180510005	MW03S	—	↓	11:40	3	0	X												
6	23089180510006	MW03D	—	↓	12:40	3	0	X												
7	23089180510007	MW08S	—	↓	14:10	3	0	X												
8	23089180510008	MW08D	—	↓	14:20	3	0	X												
9	23089180510009	MW09S	—	↓	15:00	3	0	X												
10	23089180510010	MW07	—		17:00	3	0	X												
11																				
12																				
13																				
14																				
15																				
							Preserved/Filtered													

*For metals in water samples indicate if you want Total (T), Dissolved (D) or Extractable (E) as part of "Analysis Required"

Relinquished by: DUSTIN MARTIN **Date/Time:** MAY 10/2018 19:20
Signature:
Received by: **Date/Time:** 10-May-18 19:20 @ 8.4°C
Signature: ESmith

COMMENTS/SPECIAL INSTRUCTIONS DISSOLVED METALS FIELD FILTERED
SEE Q58595 FOR SPECIFIC ANALYSES

Matrix Solutions Inc.
ENVIRONMENT & ENGINEERING

COC # M 81831

Page: 1 of 1

Lab Submitted to : ALS WATERLOO
Lab Agreement no : Q58595
Lab Job ID: L2092995

Invoice to: Require Report: Y X N___

Company Name: MATRIX SOLUTIONS
Contact Name: DUSTIN MARTIN
Address:
PC:
Phone / Fax#: Ph: 519 504 8770 Fax:

Copy of Report to:
Matrix Solutions - Data Management
Suite 200, 150 - 13th Avenue SW
Calgary, Alberta, Canada
T2R 0V2
Ph: 403-237-0606 Fax: 403-263-2493
Fax draft copy of invoice to Matrix Solutions Inc.

Matrix Project # : 23089-528
Matrix Proj. Name: CLAIR MALTBY CEIS
Location:
Sampler's Name(s): D. MARTIN

AFE #: 149006

REGULATORY REQUIREMENTS: (check)
- ☐ Alberta Tier 1
- ☐ SPIGEC
- ☐ Freshwater Aquatic Life (Low Level Metals)
- ☐ Canadian Drinking Water
- ☐ BC Regs
- ☒ Other: ODWQS

SERVICE REQUESTED:
- ☐ **RUSH** (Please ensure you contact the lab) **Due Date:**
- ☒ REGULAR Turnaround

REPORT DISTRIBUTION: always send to data_management@matrix-solutions.com
- ☒ Additional Emails dmartin@matrix-solutions.com
  dabbey@matrix-solutions.com

Analysis Required

L2092995-COFC

	Sample Number (14 digits only) yr-mth-day	Sample Point Name	Depth (cm)	Sample Type	Date/Time Sampled	Quantity # of Jars	Quantity # of Bags	Q58595	Lab Sample Number
1	23089180510 001	MW02S	—	WATER	May 10/18 9:00	3	0	X	
2	23089180510002	MW02D	—		9:05	3	0	X	
3	23089180510003	MW01S	—		10:25	3	0	X	
4	23089180510004	MW01D	—		10:20	3	0	X	
5	23089180510005	MW03S	—		11:40	3	0	X	
6	23089180810006	MW03D	—		12:40	3	0	X	
7	23089180510007	MW08S	—		14:10	3	0	X	
8	23089180510 008	MW08D	—		14:20	3	0	X	
9	23089180510 009	MW09S	—		15:00	3	0	X	
10	23089180510010	MW07	—		17:00	3	0	X	
11									
12									
13									
14									
15									

*For metals in water samples indicate if you want Total (T), Dissolved (D) or Extractable (E) as part of "Analysis Required" Preserved/Filtered

Relinquished by: Dustin Martin Date/Time: MAY 10/2018 19:20
Signature:
Received by: Date/Time: 10-May-18
Signature: ESmith 19:20 @ 8.4°C

COMMENTS/SPECIAL INSTRUCTIONS DISSOLVED METALS FIELD FILTERED
SEE Q58545 FOR SPECIFIC ANALYSES

MATRIX SOLUTIONS INC.
ATTN: DUSTIN MARTIN
650 WOODLAWN RD W
UNIT 7B
GUELPH ON N1K 1B8

Date Received: 08-JUN-18
Report Date: 15-JUN-18 07:21 (MT)
Version: FINAL

Client Phone: 519-504-8770

Certificate of Analysis

Lab Work Order #: L2109053

Project P.O. #: NOT SUBMITTED
Job Reference: 23089
C of C Numbers: 81833
Legal Site Desc:

Gayle Braun

Gayle Braun
Senior Account Manager

ANALYTICAL REPORT

WATER - [Combined] - Ontario PWQO + ODWS

		ALS ID	L2109053-1
		Sampled Date	08-JUN-18
		Sampled Time	13:20
		Sample ID	**23089180608001**
Grouping	Analyte	Unit	
Physical Tests	Conductivity	umhos/cm	446
	pH	pH units	8.01
	Total Dissolved Solids	mg/L	DLDS 278
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3)	mg/L	245
	Alkalinity, Carbonate (as CaCO3)	mg/L	<10
	Alkalinity, Hydroxide (as CaCO3)	mg/L	<10
	Alkalinity, Total (as CaCO3)	mg/L	245
	Bromide (Br)	mg/L	<0.10
	Chloride (Cl)	mg/L	3.32
	Computed Conductivity	uS/cm	419
	Conductivity % Difference	%	-6.2
	Fluoride (F)	mg/L	0.119
	Hardness (as CaCO3)	mg/L	246
	Ion Balance	%	121
	Langelier Index		0.8
	Nitrate (as N)	mg/L	<0.020
	Nitrite (as N)	mg/L	<0.010
	Total Kjeldahl Nitrogen	mg/L	0.55
	Saturation pH	pH	7.26
	TDS (Calculated)	mg/L	250
	Sulfate (SO4)	mg/L	8.04
	Anion Sum	me/L	4.32
	Cation Sum	me/L	5.25
	Cation - Anion Balance	%	9.7

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

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

WATER - [Combined] - Ontario PWQO + ODWS

		ALS ID	L2109053-1
		Sampled Date	08-JUN-18
		Sampled Time	13:20
		Sample ID	**23089180608001**
Grouping	Analyte	Unit	
Dissolved Metals	Dissolved Metals Filtration Location		FIELD
	Aluminum (Al)-Dissolved	mg/L	<0.0050
	Antimony (Sb)-Dissolved	mg/L	<0.00010
	Arsenic (As)-Dissolved	mg/L	0.00523
	Barium (Ba)-Dissolved	mg/L	0.0959
	Beryllium (Be)-Dissolved	mg/L	<0.00010
	Bismuth (Bi)-Dissolved	mg/L	<0.000050
	Boron (B)-Dissolved	mg/L	0.012
	Cadmium (Cd)-Dissolved	mg/L	0.0000156
	Calcium (Ca)-Dissolved	mg/L	59.6
	Cesium (Cs)-Dissolved	mg/L	<0.000010
	Chromium (Cr)-Dissolved	mg/L	<0.00050
	Cobalt (Co)-Dissolved	mg/L	0.00049
	Copper (Cu)-Dissolved	mg/L	0.00121
	Iron (Fe)-Dissolved	mg/L	0.119
	Lead (Pb)-Dissolved	mg/L	<0.000050
	Lithium (Li)-Dissolved	mg/L	0.0031
	Magnesium (Mg)-Dissolved	mg/L	23.5
	Manganese (Mn)-Dissolved	mg/L	0.0492
	Molybdenum (Mo)-Dissolved	mg/L	0.00137
	Nickel (Ni)-Dissolved	mg/L	0.00067
	Phosphorus (P)-Dissolved	mg/L	<0.050
	Potassium (K)-Dissolved	mg/L	1.04
	Rubidium (Rb)-Dissolved	mg/L	0.00065

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

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

WATER - [Combined] - Ontario PWQO + ODWS

		ALS ID	L2109053-1
		Sampled Date	08-JUN-18
		Sampled Time	13:20
		Sample ID	**23089180608001**
Grouping	Analyte	Unit	
Dissolved Metals	Selenium (Se)-Dissolved	mg/L	<0.000050
	Silicon (Si)-Dissolved	mg/L	8.28
	Silver (Ag)-Dissolved	mg/L	<0.000050
	Sodium (Na)-Dissolved	mg/L	7.18
	Strontium (Sr)-Dissolved	mg/L	0.139
	Sulfur (S)-Dissolved	mg/L	1.82
	Tellurium (Te)-Dissolved	mg/L	<0.00020
	Thallium (Tl)-Dissolved	mg/L	0.000013
	Thorium (Th)-Dissolved	mg/L	<0.00010
	Tin (Sn)-Dissolved	mg/L	0.00025
	Titanium (Ti)-Dissolved	mg/L	<0.00030
	Tungsten (W)-Dissolved	mg/L	<0.00010
	Uranium (U)-Dissolved	mg/L	0.000346
	Vanadium (V)-Dissolved	mg/L	<0.00050
	Zinc (Zn)-Dissolved	mg/L	0.0099
	Zirconium (Zr)-Dissolved	mg/L	<0.00030

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

ANALYTICAL REPORT

Summary of Guideline Exceedances: [Combined] - Ontario PWQO + ODWS

Guideline ALS ID	Client ID	Grouping	Analyte	Result	Guideline Limit	Unit
Surface Water PWQO						
(No parameter exceedances)						
L2109053-1	23089180608001	Dissolved Metals	Arsenic (As)-Dissolved	0.00523	0.005	mg/L
			Copper (Cu)-Dissolved	0.00121	0.001	mg/L
			Phosphorus (P)-Dissolved	<0.050	0.01	mg/L
Ontario DW Aesthetic and Operational Guidelines						
L2109053-1	23089180608001	Anions and Nutrients	Hardness (as CaCO3)	246	80-100	mg/L
Schedule 1 (Microbiological) and 2 (Chemical) Standards (JAN,2017)						
(No parameter exceedances)						

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

Reference Information

Qualifiers for Individual Parameters Listed:

Qualifier	Description
DLDS	Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.

Methods Listed (if applicable):

<table>
<tr><th>ALS Test Code</th><th>Matrix</th><th>Test Description</th><th>Method Reference**</th></tr>
<tr><td>ALK-AUTO-WT</td><td>Water</td><td>Automated Speciated Alkalinity</td><td>EPA 310.2</td></tr>
<tr><td colspan="4">This analysis is carried out using procedures adapted from EPA Method 310.2 "Alkalinity". Total Alkalinity is determined using the methyl orange colourimetric method.</td></tr>
<tr><td>ALK-SPECIATED-WT</td><td>Water</td><td>pH Measurement for Spec. Alk</td><td>APHA 4500 H-Electrode</td></tr>
<tr><td colspan="4">Water samples are analyzed directly by a calibrated pH meter.</td></tr>
<tr><td>BR-IC-N-WT</td><td>Water</td><td>Bromide in Water by IC</td><td>EPA 300.1 (mod)</td></tr>
<tr><td colspan="4">Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.</td></tr>
<tr><td>CL-IC-N-WT</td><td>Water</td><td>Chloride by IC</td><td>EPA 300.1 (mod)</td></tr>
<tr><td colspan="4">Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).</td></tr>
<tr><td>EC-WT</td><td>Water</td><td>Conductivity</td><td>APHA 2510 B</td></tr>
<tr><td colspan="4">Water samples can be measured directly by immersing the conductivity cell into the sample.</td></tr>
<tr><td>F-IC-N-WT</td><td>Water</td><td>Fluoride in Water by IC</td><td>EPA 300.1 (mod)</td></tr>
<tr><td colspan="4">Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.</td></tr>
<tr><td>IONBALANCE-OP03-WT</td><td>Water</td><td>Detailed Ion Balance Calculation</td><td>APHA 1030E, 2330B, 2510A</td></tr>
<tr><td>MET-D-CCMS-WT</td><td>Water</td><td>Dissolved Metals in Water by CRC ICPMS</td><td>APHA 3030B/6020A (mod)</td></tr>
<tr><td colspan="4">Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.
Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.
Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).</td></tr>
<tr><td>NO2-IC-WT</td><td>Water</td><td>Nitrite in Water by IC</td><td>EPA 300.1 (mod)</td></tr>
<tr><td colspan="4">Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.</td></tr>
<tr><td>NO3-IC-WT</td><td>Water</td><td>Nitrate in Water by IC</td><td>EPA 300.1 (mod)</td></tr>
<tr><td colspan="4">Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.</td></tr>
<tr><td>SO4-IC-N-WT</td><td>Water</td><td>Sulfate in Water by IC</td><td>EPA 300.1 (mod)</td></tr>
<tr><td colspan="4">Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.</td></tr>
</table>

Reference Information

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Method Reference**
SOLIDS-TDS-WT	Water	Total Dissolved Solids	APHA 2540C

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

ALS Test Code	Matrix	Test Description	Method Reference**
TKN-WT	Water	Total Kjeldahl Nitrogen	APHA 4500-Norg D

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

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

Chain of Custody Numbers:

81833

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

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

GLOSSARY OF REPORT TERMS

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

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

Application of guidelines is provided "as is" without warranty of any kind, either expressed or implied, including, but not limited to fitness for a particular purpose, or non-infringement. ALS assumes no responsibility for errors or omissions in the information.

Quality Control Report

Workorder: L2109053 Report Date: 15-JUN-18

Client: MATRIX SOLUTIONS INC.
650 WOODLAWN RD W UNIT 7B
GUELPH ON N1K 1B8
Contact: DUSTIN MARTIN

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
ALK-AUTO-WT	**Water**							
Batch R4082921								
WG2796215-3 CRM		**WT-ALK-CRM**						
Alkalinity, Total (as CaCO3)			93.6		%		80-120	13-JUN-18
WG2796215-4 DUP		**L2108774-1**						
Alkalinity, Total (as CaCO3)		92	91		mg/L	0.8	20	13-JUN-18
WG2796215-2 LCS								
Alkalinity, Total (as CaCO3)			97.0		%		85-115	13-JUN-18
WG2796215-1 MB								
Alkalinity, Total (as CaCO3)			<10		mg/L		10	13-JUN-18
ALK-SPECIATED-WT	**Water**							
Batch R4079928								
WG2792850-12 DUP		**WG2792850-11**						
pH		7.58	7.70	J	pH units	0.11	0.2	09-JUN-18
WG2792850-10 LCS								
pH			6.99		pH units		6.9-7.1	09-JUN-18
BR-IC-N-WT	**Water**							
Batch R4083055								
WG2795842-4 DUP		**WG2795842-3**						
Bromide (Br)		<0.10	<0.10	RPD-NA	mg/L	N/A	20	13-JUN-18
WG2795842-2 LCS								
Bromide (Br)			98.5		%		85-115	13-JUN-18
WG2795842-1 MB								
Bromide (Br)			<0.10		mg/L		0.1	13-JUN-18
WG2795842-5 MS		**WG2795842-3**						
Bromide (Br)			105.2		%		75-125	13-JUN-18
CL-IC-N-WT	**Water**							
Batch R4083055								
WG2795842-4 DUP		**WG2795842-3**						
Chloride (Cl)		3.33	3.32		mg/L	0.2	20	13-JUN-18
WG2795842-2 LCS								
Chloride (Cl)			100.4		%		90-110	13-JUN-18
WG2795842-1 MB								
Chloride (Cl)			<0.50		mg/L		0.5	13-JUN-18
WG2795842-5 MS		**WG2795842-3**						
Chloride (Cl)			101.6		%		75-125	13-JUN-18
EC-WT	**Water**							

Quality Control Report

Client: MATRIX SOLUTIONS INC.
650 WOODLAWN RD W UNIT 7B
GUELPH ON N1K 1B8
Contact: DUSTIN MARTIN

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
EC-WT	**Water**							
Batch R4079928								
WG2792850-12 DUP		**WG2792850-11**						
Conductivity		1920	1920		umhos/cm	0.3	10	09-JUN-18
WG2792850-10 LCS								
Conductivity			96.7		%		90-110	09-JUN-18
WG2792850-9 MB								
Conductivity			<3.0		umhos/cm		3	09-JUN-18
F-IC-N-WT	**Water**							
Batch R4083055								
WG2795842-4 DUP		**WG2795842-3**						
Fluoride (F)		0.120	0.120		mg/L	0.0	20	13-JUN-18
WG2795842-2 LCS								
Fluoride (F)			101.8		%		90-110	13-JUN-18
WG2795842-1 MB								
Fluoride (F)			<0.020		mg/L		0.02	13-JUN-18
WG2795842-5 MS		**WG2795842-3**						
Fluoride (F)			100.1		%		75-125	13-JUN-18
MET-D-CCMS-WT	**Water**							
Batch R4079649								
WG2793634-4 DUP		**WG2793634-3**						
Aluminum (Al)-Dissolved		<0.050	<0.050	RPD-NA	mg/L	N/A	20	11-JUN-18
Antimony (Sb)-Dissolved		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	11-JUN-18
Arsenic (As)-Dissolved		0.0027	0.0026		mg/L	2.6	20	11-JUN-18
Barium (Ba)-Dissolved		0.106	0.103		mg/L	3.0	20	11-JUN-18
Beryllium (Be)-Dissolved		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	11-JUN-18
Bismuth (Bi)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	11-JUN-18
Boron (B)-Dissolved		0.20	0.20		mg/L	1.6	20	11-JUN-18
Cadmium (Cd)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	11-JUN-18
Calcium (Ca)-Dissolved		197	194		mg/L	1.9	20	11-JUN-18
Cesium (Cs)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	11-JUN-18
Chromium (Cr)-Dissolved		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	11-JUN-18
Cobalt (Co)-Dissolved		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	11-JUN-18
Copper (Cu)-Dissolved		<0.0020	0.0020	RPD-NA	mg/L	N/A	20	11-JUN-18
Iron (Fe)-Dissolved		<0.10	<0.10	RPD-NA	mg/L	N/A	20	11-JUN-18
Lead (Pb)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	11-JUN-18
Lithium (Li)-Dissolved		0.022	0.022		mg/L	3.4	20	11-JUN-18

ALS Environmental

Quality Control Report

Client: MATRIX SOLUTIONS INC.
650 WOODLAWN RD W UNIT 7B
GUELPH ON N1K 1B8
Contact: DUSTIN MARTIN

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-WT	**Water**							
Batch R4079649								
WG2793634-4 DUP		**WG2793634-3**						
Magnesium (Mg)-Dissolved		193	193		mg/L	0.4	20	11-JUN-18
Manganese (Mn)-Dissolved		0.129	0.131		mg/L	1.4	20	11-JUN-18
Molybdenum (Mo)-Dissolved		0.0291	0.0296		mg/L	1.8	20	11-JUN-18
Nickel (Ni)-Dissolved		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	11-JUN-18
Phosphorus (P)-Dissolved		<0.50	<0.50	RPD-NA	mg/L	N/A	20	11-JUN-18
Potassium (K)-Dissolved		8.72	8.62		mg/L	1.2	20	11-JUN-18
Rubidium (Rb)-Dissolved		0.0053	0.0056		mg/L	5.0	20	11-JUN-18
Selenium (Se)-Dissolved		0.00069	0.00058		mg/L	19	20	11-JUN-18
Silicon (Si)-Dissolved		5.03	5.06		mg/L	0.6	20	11-JUN-18
Silver (Ag)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	11-JUN-18
Sodium (Na)-Dissolved		566	559		mg/L	1.2	20	11-JUN-18
Strontium (Sr)-Dissolved		4.90	4.79		mg/L	2.3	20	11-JUN-18
Sulfur (S)-Dissolved		225	226		mg/L	0.1	20	11-JUN-18
Tellurium (Te)-Dissolved		<0.0020	<0.0020	RPD-NA	mg/L	N/A	20	11-JUN-18
Thallium (Tl)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	11-JUN-18
Thorium (Th)-Dissolved		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	11-JUN-18
Tin (Sn)-Dissolved		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	11-JUN-18
Titanium (Ti)-Dissolved		<0.0030	<0.0030	RPD-NA	mg/L	N/A	20	11-JUN-18
Tungsten (W)-Dissolved		0.0031	0.0031		mg/L	1.4	20	11-JUN-18
Uranium (U)-Dissolved		0.00423	0.00412		mg/L	2.6	20	11-JUN-18
Vanadium (V)-Dissolved		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	11-JUN-18
Zinc (Zn)-Dissolved		<0.010	<0.010	RPD-NA	mg/L	N/A	20	11-JUN-18
Zirconium (Zr)-Dissolved		<0.0030	<0.0030	RPD-NA	mg/L	N/A	20	11-JUN-18
WG2793634-2 LCS								
Aluminum (Al)-Dissolved			109.4		%		80-120	11-JUN-18
Antimony (Sb)-Dissolved			98.5		%		80-120	11-JUN-18
Arsenic (As)-Dissolved			99.96		%		80-120	11-JUN-18
Barium (Ba)-Dissolved			108.9		%		80-120	11-JUN-18
Beryllium (Be)-Dissolved			107.2		%		80-120	11-JUN-18
Bismuth (Bi)-Dissolved			98.1		%		80-120	11-JUN-18
Boron (B)-Dissolved			102.5		%		80-120	11-JUN-18
Cadmium (Cd)-Dissolved			96.2		%		80-120	11-JUN-18
Calcium (Ca)-Dissolved			100.4		%		80-120	11-JUN-18

Client: MATRIX SOLUTIONS INC.
650 WOODLAWN RD W UNIT 7B
GUELPH ON N1K 1B8
Contact: DUSTIN MARTIN

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-WT	**Water**							
Batch R4079649								
WG2793634-2 LCS								
Cesium (Cs)-Dissolved			103.8		%		80-120	11-JUN-18
Chromium (Cr)-Dissolved			103.1		%		80-120	11-JUN-18
Cobalt (Co)-Dissolved			99.1		%		80-120	11-JUN-18
Copper (Cu)-Dissolved			99.2		%		80-120	11-JUN-18
Iron (Fe)-Dissolved			100.4		%		80-120	11-JUN-18
Lead (Pb)-Dissolved			101.2		%		80-120	11-JUN-18
Lithium (Li)-Dissolved			110.3		%		80-120	11-JUN-18
Magnesium (Mg)-Dissolved			109.3		%		80-120	11-JUN-18
Manganese (Mn)-Dissolved			101.9		%		80-120	11-JUN-18
Molybdenum (Mo)-Dissolved			95.3		%		80-120	11-JUN-18
Nickel (Ni)-Dissolved			99.7		%		80-120	11-JUN-18
Phosphorus (P)-Dissolved			107.8		%		80-120	11-JUN-18
Potassium (K)-Dissolved			106.8		%		80-120	11-JUN-18
Rubidium (Rb)-Dissolved			103.6		%		80-120	11-JUN-18
Selenium (Se)-Dissolved			96.8		%		80-120	11-JUN-18
Silicon (Si)-Dissolved			108.2		%		60-140	11-JUN-18
Silver (Ag)-Dissolved			92.9		%		80-120	11-JUN-18
Sodium (Na)-Dissolved			106.0		%		80-120	11-JUN-18
Strontium (Sr)-Dissolved			96.4		%		80-120	11-JUN-18
Sulfur (S)-Dissolved			97.7		%		80-120	11-JUN-18
Tellurium (Te)-Dissolved			98.2		%		80-120	11-JUN-18
Thallium (Tl)-Dissolved			102.3		%		80-120	11-JUN-18
Thorium (Th)-Dissolved			97.1		%		80-120	11-JUN-18
Tin (Sn)-Dissolved			97.8		%		80-120	11-JUN-18
Titanium (Ti)-Dissolved			101.0		%		80-120	11-JUN-18
Tungsten (W)-Dissolved			102.5		%		80-120	11-JUN-18
Uranium (U)-Dissolved			99.96		%		80-120	11-JUN-18
Vanadium (V)-Dissolved			103.4		%		80-120	11-JUN-18
Zinc (Zn)-Dissolved			96.5		%		80-120	11-JUN-18
Zirconium (Zr)-Dissolved			95.4		%		80-120	11-JUN-18
WG2793634-1 MB								
Aluminum (Al)-Dissolved			<0.0050		mg/L		0.005	11-JUN-18
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	11-JUN-18
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	11-JUN-18

Quality Control Report

Client: MATRIX SOLUTIONS INC.
650 WOODLAWN RD W UNIT 7B
GUELPH ON N1K 1B8
Contact: DUSTIN MARTIN

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-WT	**Water**							
Batch R4079649								
WG2793634-1 MB								
Barium (Ba)-Dissolved			<0.00010		mg/L		0.0001	11-JUN-18
Beryllium (Be)-Dissolved			<0.00010		mg/L		0.0001	11-JUN-18
Bismuth (Bi)-Dissolved			<0.000050		mg/L		0.00005	11-JUN-18
Boron (B)-Dissolved			<0.010		mg/L		0.01	11-JUN-18
Cadmium (Cd)-Dissolved			<0.000005		mg/L		0.000005	11-JUN-18
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	11-JUN-18
Cesium (Cs)-Dissolved			<0.000010		mg/L		0.00001	11-JUN-18
Chromium (Cr)-Dissolved			<0.00050		mg/L		0.0005	11-JUN-18
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	11-JUN-18
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	11-JUN-18
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	11-JUN-18
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	11-JUN-18
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	11-JUN-18
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	11-JUN-18
Manganese (Mn)-Dissolved			<0.00050		mg/L		0.0005	11-JUN-18
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	11-JUN-18
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	11-JUN-18
Phosphorus (P)-Dissolved			<0.050		mg/L		0.05	11-JUN-18
Potassium (K)-Dissolved			<0.050		mg/L		0.05	11-JUN-18
Rubidium (Rb)-Dissolved			<0.00020		mg/L		0.0002	11-JUN-18
Selenium (Se)-Dissolved			<0.000050		mg/L		0.00005	11-JUN-18
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	11-JUN-18
Silver (Ag)-Dissolved			<0.000050		mg/L		0.00005	11-JUN-18
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	11-JUN-18
Strontium (Sr)-Dissolved			<0.0010		mg/L		0.001	11-JUN-18
Sulfur (S)-Dissolved			<0.50		mg/L		0.5	11-JUN-18
Tellurium (Te)-Dissolved			<0.00020		mg/L		0.0002	11-JUN-18
Thallium (Tl)-Dissolved			<0.000010		mg/L		0.00001	11-JUN-18
Thorium (Th)-Dissolved			<0.00010		mg/L		0.0001	11-JUN-18
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	11-JUN-18
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	11-JUN-18
Tungsten (W)-Dissolved			<0.00010		mg/L		0.0001	11-JUN-18
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	11-JUN-18

Client: MATRIX SOLUTIONS INC.
650 WOODLAWN RD W UNIT 7B
GUELPH ON N1K 1B8
Contact: DUSTIN MARTIN

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-WT	**Water**							
Batch R4079649								
WG2793634-1 MB								
Vanadium (V)-Dissolved			<0.00050		mg/L		0.0005	11-JUN-18
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	11-JUN-18
Zirconium (Zr)-Dissolved			<0.00030		mg/L		0.0003	11-JUN-18
WG2793634-5 MS		**WG2793634-3**						
Aluminum (Al)-Dissolved			95.0		%		70-130	11-JUN-18
Antimony (Sb)-Dissolved			89.8		%		70-130	11-JUN-18
Arsenic (As)-Dissolved			92.2		%		70-130	11-JUN-18
Barium (Ba)-Dissolved			N/A	MS-B	%		-	11-JUN-18
Beryllium (Be)-Dissolved			99.9		%		70-130	11-JUN-18
Bismuth (Bi)-Dissolved			91.4		%		70-130	11-JUN-18
Boron (B)-Dissolved			N/A	MS-B	%		-	11-JUN-18
Cadmium (Cd)-Dissolved			94.1		%		70-130	11-JUN-18
Calcium (Ca)-Dissolved			N/A	MS-B	%		-	11-JUN-18
Cesium (Cs)-Dissolved			97.9		%		70-130	11-JUN-18
Chromium (Cr)-Dissolved			98.2		%		70-130	11-JUN-18
Cobalt (Co)-Dissolved			92.0		%		70-130	11-JUN-18
Copper (Cu)-Dissolved			76.4		%		70-130	11-JUN-18
Lead (Pb)-Dissolved			91.7		%		70-130	11-JUN-18
Lithium (Li)-Dissolved			N/A	MS-B	%		-	11-JUN-18
Magnesium (Mg)-Dissolved			N/A	MS-B	%		-	11-JUN-18
Manganese (Mn)-Dissolved			N/A	MS-B	%		-	11-JUN-18
Molybdenum (Mo)-Dissolved			N/A	MS-B	%		-	11-JUN-18
Nickel (Ni)-Dissolved			81.8		%		70-130	11-JUN-18
Phosphorus (P)-Dissolved			104.4		%		70-130	11-JUN-18
Potassium (K)-Dissolved			N/A	MS-B	%		-	11-JUN-18
Rubidium (Rb)-Dissolved			N/A	MS-B	%		-	11-JUN-18
Selenium (Se)-Dissolved			93.6		%		70-130	11-JUN-18
Silicon (Si)-Dissolved			N/A	MS-B	%		-	11-JUN-18
Silver (Ag)-Dissolved			76.7		%		70-130	11-JUN-18
Sodium (Na)-Dissolved			N/A	MS-B	%		-	11-JUN-18
Strontium (Sr)-Dissolved			N/A	MS-B	%		-	11-JUN-18
Sulfur (S)-Dissolved			N/A	MS-B	%		-	11-JUN-18
Tellurium (Te)-Dissolved			84.1		%		70-130	11-JUN-18
Thallium (Tl)-Dissolved			90.7		%		70-130	11-JUN-18

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-WT	**Water**							
Batch R4079649								
WG2793634-5 MS		**WG2793634-3**						
Thorium (Th)-Dissolved			93.3		%		70-130	11-JUN-18
Tin (Sn)-Dissolved			94.2		%		70-130	11-JUN-18
Titanium (Ti)-Dissolved			99.6		%		70-130	11-JUN-18
Uranium (U)-Dissolved			N/A	MS-B	%		-	11-JUN-18
Vanadium (V)-Dissolved			91.2		%		70-130	11-JUN-18
Zinc (Zn)-Dissolved			84.2		%		70-130	11-JUN-18
Zirconium (Zr)-Dissolved			89.4		%		70-130	11-JUN-18
NO2-IC-WT	**Water**							
Batch R4083055								
WG2795842-4 DUP		**WG2795842-3**						
Nitrite (as N)		<0.010	<0.010	RPD-NA	mg/L	N/A	25	13-JUN-18
WG2795842-2 LCS								
Nitrite (as N)			100.5		%		70-130	13-JUN-18
WG2795842-1 MB								
Nitrite (as N)			<0.010		mg/L		0.01	13-JUN-18
WG2795842-5 MS		**WG2795842-3**						
Nitrite (as N)			95.8		%		70-130	13-JUN-18
NO3-IC-WT	**Water**							
Batch R4083055								
WG2795842-4 DUP		**WG2795842-3**						
Nitrate (as N)		<0.020	<0.020	RPD-NA	mg/L	N/A	25	13-JUN-18
WG2795842-2 LCS								
Nitrate (as N)			99.6		%		70-130	13-JUN-18
WG2795842-1 MB								
Nitrate (as N)			<0.020		mg/L		0.02	13-JUN-18
WG2795842-5 MS		**WG2795842-3**						
Nitrate (as N)			99.8		%		70-130	13-JUN-18
SO4-IC-N-WT	**Water**							
Batch R4083055								
WG2795842-4 DUP		**WG2795842-3**						
Sulfate (SO4)		8.07	7.99		mg/L	1.1	20	13-JUN-18
WG2795842-2 LCS								
Sulfate (SO4)			101.1		%		90-110	13-JUN-18
WG2795842-1 MB								
Sulfate (SO4)			<0.30		mg/L		0.3	13-JUN-18
WG2795842-5 MS		**WG2795842-3**						

Test		Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
SO4-IC-N-WT		**Water**							
Batch	**R4083055**								
WG2795842-5	**MS**		**WG2795842-3**						
Sulfate (SO4)				102.7		%		75-125	13-JUN-18
SOLIDS-TDS-WT		**Water**							
Batch	**R4082070**								
WG2794595-3	**DUP**		**L2108616-3**						
Total Dissolved Solids			442	440		mg/L	0.5	20	12-JUN-18
WG2794595-2	**LCS**								
Total Dissolved Solids				102.6		%		85-115	12-JUN-18
WG2794595-1	**MB**								
Total Dissolved Solids				<10		mg/L		10	12-JUN-18
TKN-WT		**Water**							
Batch	**R4082219**								
WG2795721-3	**DUP**		**L2109053-1**						
Total Kjeldahl Nitrogen			0.55	0.57		mg/L	2.8	20	13-JUN-18
WG2795721-2	**LCS**								
Total Kjeldahl Nitrogen				110.3		%		75-125	13-JUN-18
WG2795721-1	**MB**								
Total Kjeldahl Nitrogen				<0.15		mg/L		0.15	13-JUN-18
WG2795721-4	**MS**		**L2109053-1**						
Total Kjeldahl Nitrogen				106.1		%		70-130	13-JUN-18

Legend:

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

Sample Parameter Qualifier Definitions:

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

Hold Time Exceedances:

All test results reported with this submission were conducted within ALS recommended hold times.

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

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

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

L2109053 My

Matrix Solutions Inc.
ENVIRONMENT & ENGINEERING

COC # M [illegible]

L2109053-COFC

Page: 1 of 1

Lab Submitted to : ALS WATERLOO
Lab Agreement no : Q58595
Lab Job ID:

Invoice to: Require Report: Y X N___

Company Name: MATRIX SOLUTIONS INC.
Contact Name: DUSTIN MARTIN
Address:
PC:
Phone / Fax#: Ph: 519 504 8770 Fax:

Calgary, Alberta, Canada
T2R 0V2
Ph: 403-237-0606 Fax: 403-263-2493
Fax draft copy of invoice to Matrix Solutions Inc.

Matrix Project # : 23089
Matrix Proj. Name: CLAIR MALTBY CEIS
Location:
Sampler's Name(s): D. MARTIN

AFE #: 147164

REGULATORY REQUIREMENTS: (check)
☐ Alberta Tier 1
☐ SPIGEC
☐ Freshwater Aquatic Life (Low Level Metals)
☐ Canadian Drinking Water
☐ BC Regs
☒ Other: ODWQS G

SERVICE REQUESTED:
☐ **RUSH** (Please ensure you contact the lab) **Due Date:**
☒ REGULAR Turnaround

REPORT DISTRIBUTION: always send to data_management@matrix-solutions.com
☒ Additional Emails dmartin@matrix-solutions.com
dabbey@matrix-solutions.com

Analysis Required

	Sample Number (14 digits only) yr-mth-day	Sample Point Name	Depth (cm)	Sample Type	Date/Time Sampled	Quantity # of Jars	Quantity # of Bags	Q58595	Lab Sample Number
1	23089180608001	MW09-D	—	WATER	JUNE8 13:20	3	—	X	
2									
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									
15									

*For metals in water samples indicate if you want Total (T), Dissolved (D) or Extractable (E) as part of "Analysis Required" Preserved/Filtered X X

Relinquished by: DUSTIN MARTIN Date/Time: 08/JUNE/18 15:50 Received by: Emily Smith Date/Time: 08-Jun-18
Signature: Signature: Emily
9.8°C.

COMMENTS/SPECIAL INSTRUCTIONS dissolved metals field filtered.
see Q58595 for specific analyses.

MATRIX SOLUTIONS INC.
ATTN: SCOTT MILLER
650 WOODLAWN RD W
UNIT 7B
GUELPH ON N1K 1B8

Date Received:	20-DEC-18
Report Date:	24-JAN-19 12:05 (MT)
Version:	FINAL REV. 2

Client Phone: 519-772-3777

Certificate of Analysis

Lab Work Order #: L2213518

Project P.O. #:	NOT SUBMITTED
Job Reference:	23089-528
C of C Numbers:	92249, 92250
Legal Site Desc:	

Comments:

24-JAN-2019 Ion Balance calculation corrected

Gayle Braun

Gayle Braun
Senior Account Manager

ALS Environmental

23089-528

ANALYTICAL GUIDELINE REPORT

L2213518 CONTD....
Page 2 of 29
24-JAN-19 12:05 (MT)

Sample Details Grouping	Analyte	Result	Qualifier	D.L.	Units	Analyzed	Guideline Limits			
L2213518-1	23089181218001									
Sampled By:	T. MARTIN on 18-DEC-18 @ 09:0									
Matrix:	WATER						#1	#2		
Physical Tests										
	Conductivity	596		3.0	umhos/cm	21-DEC-18				
	pH	7.65		0.10	pH units	21-DEC-18		6.5-8.5		
	Total Dissolved Solids	340	DLDS	20	mg/L	24-DEC-18		500		
Anions and Nutrients										
	Alkalinity, Bicarbonate (as CaCO3)	360	DLM	250	mg/L	22-DEC-18				
	Alkalinity, Carbonate (as CaCO3)	<250	DLM	250	mg/L	22-DEC-18				
	Alkalinity, Hydroxide (as CaCO3)	<250	DLM	250	mg/L	22-DEC-18				
	Alkalinity, Total (as CaCO3)	360	DLM	250	mg/L	22-DEC-18		30-500		
	Bromide (Br)	<0.10		0.10	mg/L	21-DEC-18				
	Chloride (Cl)	13.2		0.50	mg/L	21-DEC-18		250		
	Computed Conductivity	584			uS/cm	21-JAN-19				
	Conductivity % Difference	-2.0			%	21-JAN-19				
	Fluoride (F)	0.044		0.020	mg/L	21-DEC-18	1.5			
	Hardness (as CaCO3)	321			mg/L	21-JAN-19		*80-100		
	Ion Balance	99.8			%	21-JAN-19				
	Langelier Index	0.7			No Unit	21-JAN-19				
	Nitrate (as N)	1.30		0.020	mg/L	21-DEC-18	10			
	Nitrite (as N)	0.017		0.010	mg/L	21-DEC-18	1			
	Total Kjeldahl Nitrogen	0.55		0.15	mg/L	24-DEC-18				
	Saturation pH	6.98			pH	21-JAN-19				
	TDS (Calculated)	374			mg/L	21-JAN-19				
	Sulfate (SO4)	18.7		0.30	mg/L	21-DEC-18		500		
	Anion Sum	6.80			me/L	21-JAN-19				
	Cation Sum	6.79			me/L	21-JAN-19				
	Cation - Anion Balance	-0.1			%	21-JAN-19				
Dissolved Metals										
	Dissolved Metals Filtration Location	FIELD			No Unit	21-DEC-18				
	Aluminum (Al)-Dissolved	<0.0050		0.0050	mg/L	21-DEC-18		0.1		
	Antimony (Sb)-Dissolved	<0.00010		0.00010	mg/L	21-DEC-18	0.006			
	Arsenic (As)-Dissolved	0.00017		0.00010	mg/L	21-DEC-18	0.0100			
	Barium (Ba)-Dissolved	0.0807		0.00010	mg/L	21-DEC-18	1			
	Beryllium (Be)-Dissolved	<0.00010		0.00010	mg/L	21-DEC-18				
	Bismuth (Bi)-Dissolved	<0.000050		0.000050	mg/L	21-DEC-18				
	Boron (B)-Dissolved	<0.010		0.010	mg/L	21-DEC-18	5			
	Cadmium (Cd)-Dissolved	0.0000158		0.0000050	mg/L	21-DEC-18	0.005			
	Calcium (Ca)-Dissolved	81.7		0.050	mg/L	21-DEC-18				
	Cesium (Cs)-Dissolved	<0.000010		0.000010	mg/L	21-DEC-18				
	Chromium (Cr)-Dissolved	<0.00050		0.00050	mg/L	21-DEC-18	0.05			
	Cobalt (Co)-Dissolved	<0.00010		0.00010	mg/L	21-DEC-18				
	Copper (Cu)-Dissolved	0.00033		0.00020	mg/L	21-DEC-18		1		
	Iron (Fe)-Dissolved	0.012		0.010	mg/L	21-DEC-18		0.3		
	Lead (Pb)-Dissolved	0.000091		0.000050	mg/L	21-DEC-18	0.01			
	Lithium (Li)-Dissolved	0.0011		0.0010	mg/L	21-DEC-18				
	Magnesium (Mg)-Dissolved	28.3		0.0050	mg/L	21-DEC-18				
	Manganese (Mn)-Dissolved	0.00451		0.00050	mg/L	21-DEC-18		0.05		
	Molybdenum (Mo)-Dissolved	0.000248		0.000050	mg/L	21-DEC-18				

** Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
* Analytical result for this parameter exceeds Guideline Limit listed on this report. Guideline Limits applied:

Ontario Drinking Water Regulation (ODWQS) JAN.1,2018 = [Suite] - ON-DW-STANDARD+GUIDELINES

#1: Schedule 1 (Microbiological) and 2 (Chemical) Standards (JAN,2018) **#2: Ontario DW Aesthetic and Operational Guidelines**

ANALYTICAL GUIDELINE REPORT

Sample Details Grouping	Analyte	Result	Qualifier	D.L.	Units	Analyzed	Guideline Limits	
L2213518-1	23089181218001							
Sampled By:	T. MARTIN on 18-DEC-18 @ 09:0							
Matrix:	WATER						#1	#2
Dissolved Metals								
	Nickel (Ni)-Dissolved	0.00150		0.00050	mg/L	21-DEC-18		
	Phosphorus (P)-Dissolved	<0.050		0.050	mg/L	21-DEC-18		
	Potassium (K)-Dissolved	1.35		0.050	mg/L	21-DEC-18		
	Rubidium (Rb)-Dissolved	0.00427		0.00020	mg/L	21-DEC-18		
	Selenium (Se)-Dissolved	0.000310		0.000050	mg/L	21-DEC-18	0.05	
	Silicon (Si)-Dissolved	5.44		0.050	mg/L	21-DEC-18		
	Silver (Ag)-Dissolved	<0.000050		0.000050	mg/L	21-DEC-18		
	Sodium (Na)-Dissolved	7.89		0.050	mg/L	21-DEC-18	20	200
	Strontium (Sr)-Dissolved	0.0968		0.0010	mg/L	21-DEC-18		
	Sulfur (S)-Dissolved	6.08		0.50	mg/L	21-DEC-18		
	Tellurium (Te)-Dissolved	<0.00020		0.00020	mg/L	21-DEC-18		
	Thallium (Tl)-Dissolved	<0.000010		0.000010	mg/L	21-DEC-18		
	Thorium (Th)-Dissolved	<0.00010		0.00010	mg/L	21-DEC-18		
	Tin (Sn)-Dissolved	<0.00010		0.00010	mg/L	21-DEC-18		
	Titanium (Ti)-Dissolved	<0.00030		0.00030	mg/L	21-DEC-18		
	Tungsten (W)-Dissolved	<0.00010		0.00010	mg/L	21-DEC-18		
	Uranium (U)-Dissolved	0.000423		0.000010	mg/L	21-DEC-18	0.02	
	Vanadium (V)-Dissolved	<0.00050		0.00050	mg/L	21-DEC-18		
	Zinc (Zn)-Dissolved	0.0164		0.0010	mg/L	21-DEC-18		5
	Zirconium (Zr)-Dissolved	<0.00030		0.00030	mg/L	21-DEC-18		
L2213518-2	23089181218002							
Sampled By:	T. MARTIN on 18-DEC-18 @ 09:0							
Matrix:	WATER						#1	#2
Physical Tests								
	Conductivity	485		3.0	umhos/cm	21-DEC-18		
	pH	7.63		0.10	pH units	21-DEC-18		6.5-8.5
	Total Dissolved Solids	292	DLDS	20	mg/L	24-DEC-18		500
Anions and Nutrients								
	Alkalinity, Bicarbonate (as CaCO3)	244		10	mg/L	22-DEC-18		
	Alkalinity, Carbonate (as CaCO3)	<10		10	mg/L	22-DEC-18		
	Alkalinity, Hydroxide (as CaCO3)	<10		10	mg/L	22-DEC-18		
	Alkalinity, Total (as CaCO3)	244		10	mg/L	22-DEC-18		30-500
	Bromide (Br)	<0.10		0.10	mg/L	21-DEC-18		
	Chloride (Cl)	14.6		0.50	mg/L	21-DEC-18		250
	Computed Conductivity	484			uS/cm	21-JAN-19		
	Conductivity % Difference	-0.2			%	21-JAN-19		
	Fluoride (F)	0.078		0.020	mg/L	21-DEC-18	1.5	
	Hardness (as CaCO3)	277			mg/L	21-JAN-19		*80-100
	Ion Balance	115			%	21-JAN-19		
	Langelier Index	0.4			No Unit	21-JAN-19		
	Nitrate (as N)	<0.020		0.020	mg/L	21-DEC-18	10	
	Nitrite (as N)	<0.010		0.010	mg/L	21-DEC-18	1	
	Total Kjeldahl Nitrogen	<0.15		0.15	mg/L	24-DEC-18		
	Saturation pH	7.22			pH	21-JAN-19		
	TDS (Calculated)	288			mg/L	21-JAN-19		
	Sulfate (SO4)	28.3		0.30	mg/L	21-DEC-18		500

** Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
* Analytical result for this parameter exceeds Guideline Limit listed on this report. Guideline Limits applied:

Ontario Drinking Water Regulation (ODWQS) JAN.1,2018 = [Suite] - ON-DW-STANDARD+GUIDELINES

#1: Schedule 1 (Microbiological) and 2 (Chemical) Standards (JAN,2018) **#2: Ontario DW Aesthetic and Operational Guidelines**

ANALYTICAL GUIDELINE REPORT

L2213518-2 23089181218002
Sampled By: T. MARTIN on 18-DEC-18 @ 09:02
Matrix: WATER

Sample Details Grouping / Analyte	Result	Qualifier	D.L.	Units	Analyzed	Guideline Limits #1	Guideline Limits #2
Anions and Nutrients							
Anion Sum	5.02			me/L	21-JAN-19		
Cation Sum	5.76			me/L	21-JAN-19		
Cation - Anion Balance	6.8			%	21-JAN-19		
Dissolved Metals							
Dissolved Metals Filtration Location	FIELD			No Unit	21-DEC-18		
Aluminum (Al)-Dissolved	<0.0050		0.0050	mg/L	21-DEC-18		0.1
Antimony (Sb)-Dissolved	<0.00010		0.00010	mg/L	21-DEC-18	0.006	
Arsenic (As)-Dissolved	0.00207		0.00010	mg/L	21-DEC-18	0.0100	
Barium (Ba)-Dissolved	0.0804		0.00010	mg/L	21-DEC-18	1	
Beryllium (Be)-Dissolved	<0.00010		0.00010	mg/L	21-DEC-18		
Bismuth (Bi)-Dissolved	<0.000050		0.000050	mg/L	21-DEC-18		
Boron (B)-Dissolved	<0.010		0.010	mg/L	21-DEC-18	5	
Cadmium (Cd)-Dissolved	<0.0000050		0.0000050	mg/L	21-DEC-18	0.005	
Calcium (Ca)-Dissolved	66.4		0.050	mg/L	21-DEC-18		
Cesium (Cs)-Dissolved	<0.000010		0.000010	mg/L	21-DEC-18		
Chromium (Cr)-Dissolved	<0.00050		0.00050	mg/L	21-DEC-18	0.05	
Cobalt (Co)-Dissolved	<0.00010		0.00010	mg/L	21-DEC-18		
Copper (Cu)-Dissolved	0.00098		0.00020	mg/L	21-DEC-18		1
Iron (Fe)-Dissolved	0.260		0.010	mg/L	21-DEC-18		0.3
Lead (Pb)-Dissolved	<0.000050		0.000050	mg/L	21-DEC-18	0.01	
Lithium (Li)-Dissolved	0.0028		0.0010	mg/L	21-DEC-18		
Magnesium (Mg)-Dissolved	27.0		0.0050	mg/L	21-DEC-18		
Manganese (Mn)-Dissolved	0.0131		0.00050	mg/L	21-DEC-18		0.05
Molybdenum (Mo)-Dissolved	0.000776		0.000050	mg/L	21-DEC-18		
Nickel (Ni)-Dissolved	<0.00050		0.00050	mg/L	21-DEC-18		
Phosphorus (P)-Dissolved	<0.050		0.050	mg/L	21-DEC-18		
Potassium (K)-Dissolved	1.01		0.050	mg/L	21-DEC-18		
Rubidium (Rb)-Dissolved	0.00054		0.00020	mg/L	21-DEC-18		
Selenium (Se)-Dissolved	<0.000050		0.000050	mg/L	21-DEC-18	0.05	
Silicon (Si)-Dissolved	7.00		0.050	mg/L	21-DEC-18		
Silver (Ag)-Dissolved	<0.000050		0.000050	mg/L	21-DEC-18		
Sodium (Na)-Dissolved	4.56		0.050	mg/L	21-DEC-18	20	200
Strontium (Sr)-Dissolved	0.113		0.0010	mg/L	21-DEC-18		
Sulfur (S)-Dissolved	9.36		0.50	mg/L	21-DEC-18		
Tellurium (Te)-Dissolved	<0.00020		0.00020	mg/L	21-DEC-18		
Thallium (Tl)-Dissolved	<0.000010		0.000010	mg/L	21-DEC-18		
Thorium (Th)-Dissolved	<0.00010		0.00010	mg/L	21-DEC-18		
Tin (Sn)-Dissolved	0.00012		0.00010	mg/L	21-DEC-18		
Titanium (Ti)-Dissolved	<0.00030		0.00030	mg/L	21-DEC-18		
Tungsten (W)-Dissolved	<0.00010		0.00010	mg/L	21-DEC-18		
Uranium (U)-Dissolved	0.000496		0.000010	mg/L	21-DEC-18	0.02	
Vanadium (V)-Dissolved	<0.00050		0.00050	mg/L	21-DEC-18		
Zinc (Zn)-Dissolved	0.0036		0.0010	mg/L	21-DEC-18		5
Zirconium (Zr)-Dissolved	<0.00030		0.00030	mg/L	21-DEC-18		

** Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
* Analytical result for this parameter exceeds Guideline Limit listed on this report. Guideline Limits applied:

Ontario Drinking Water Regulation (ODWQS) JAN.1,2018 = [Suite] - ON-DW-STANDARD+GUIDELINES

#1: Schedule 1 (Microbiological) and 2 (Chemical) Standards (JAN,2018) **#2: Ontario DW Aesthetic and Operational Guidelines**

ANALYTICAL GUIDELINE REPORT

Sample Details Grouping	Analyte	Result	Qualifier	D.L.	Units	Analyzed	Guideline Limits #1	#2
L2213518-3	23089181218003							
Sampled By:	T. MARTIN on 18-DEC-18 @ 09:0							
Matrix:	WATER							
Physical Tests								
	Conductivity	571		3.0	umhos/cm	21-DEC-18		
	pH	7.48		0.10	pH units	21-DEC-18		6.5-8.5
	Total Dissolved Solids	413	DLDS	20	mg/L	24-DEC-18		500
Anions and Nutrients								
	Alkalinity, Bicarbonate (as CaCO3)	410	DLM	250	mg/L	22-DEC-18		
	Alkalinity, Carbonate (as CaCO3)	<250	DLM	250	mg/L	22-DEC-18		
	Alkalinity, Hydroxide (as CaCO3)	<250	DLM	250	mg/L	22-DEC-18		
	Alkalinity, Total (as CaCO3)	410	DLM	250	mg/L	22-DEC-18		30-500
	Bromide (Br)	<0.10		0.10	mg/L	21-DEC-18		
	Chloride (Cl)	15.6		0.50	mg/L	21-DEC-18		250
	Computed Conductivity	637			uS/cm	21-JAN-19		
	Conductivity % Difference	10.9			%	21-JAN-19		
	Fluoride (F)	0.036		0.020	mg/L	21-DEC-18	1.5	
	Hardness (as CaCO3)	321			mg/L	21-JAN-19		*80-100
	Ion Balance	82.9			%	21-JAN-19		
	Langelier Index	0.6			No Unit	21-JAN-19		
	Nitrate (as N)	8.07		0.020	mg/L	21-DEC-18	10	
	Nitrite (as N)	0.011		0.010	mg/L	21-DEC-18	1	
	Total Kjeldahl Nitrogen	<0.15	TKNI	0.15	mg/L	24-DEC-18		
	Saturation pH	6.90			pH	21-JAN-19		
	TDS (Calculated)	434			mg/L	21-JAN-19		
	Sulfate (SO4)	15.0		0.30	mg/L	21-DEC-18		500
	Anion Sum	8.09			me/L	21-JAN-19		
	Cation Sum	6.71			me/L	21-JAN-19		
	Cation - Anion Balance	-9.3			%	21-JAN-19		
Dissolved Metals								
	Dissolved Metals Filtration Location	FIELD			No Unit	21-DEC-18		
	Aluminum (Al)-Dissolved	<0.0050		0.0050	mg/L	21-DEC-18		0.1
	Antimony (Sb)-Dissolved	<0.00010		0.00010	mg/L	21-DEC-18	0.006	
	Arsenic (As)-Dissolved	0.00010		0.00010	mg/L	21-DEC-18	0.0100	
	Barium (Ba)-Dissolved	0.0904		0.00010	mg/L	21-DEC-18	1	
	Beryllium (Be)-Dissolved	<0.00010		0.00010	mg/L	21-DEC-18		
	Bismuth (Bi)-Dissolved	<0.000050		0.000050	mg/L	21-DEC-18		
	Boron (B)-Dissolved	0.012		0.010	mg/L	21-DEC-18	5	
	Cadmium (Cd)-Dissolved	0.0000467		0.0000050	mg/L	21-DEC-18	0.005	
	Calcium (Ca)-Dissolved	87.9		0.050	mg/L	21-DEC-18		
	Cesium (Cs)-Dissolved	<0.000010		0.000010	mg/L	21-DEC-18		
	Chromium (Cr)-Dissolved	<0.00050		0.00050	mg/L	21-DEC-18	0.05	
	Cobalt (Co)-Dissolved	<0.00010		0.00010	mg/L	21-DEC-18		
	Copper (Cu)-Dissolved	0.00127		0.00020	mg/L	21-DEC-18		1
	Iron (Fe)-Dissolved	<0.010		0.010	mg/L	21-DEC-18		0.3
	Lead (Pb)-Dissolved	0.000075		0.000050	mg/L	21-DEC-18	0.01	
	Lithium (Li)-Dissolved	0.0013		0.0010	mg/L	21-DEC-18		
	Magnesium (Mg)-Dissolved	24.6		0.0050	mg/L	21-DEC-18		
	Manganese (Mn)-Dissolved	<0.00050		0.00050	mg/L	21-DEC-18		0.05
	Molybdenum (Mo)-Dissolved	0.000163		0.000050	mg/L	21-DEC-18		

** Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.

* Analytical result for this parameter exceeds Guideline Limit listed on this report. Guideline Limits applied:

Ontario Drinking Water Regulation (ODWQS) JAN.1,2018 = [Suite] - ON-DW-STANDARD+GUIDELINES

#1: Schedule 1 (Microbiological) and 2 (Chemical) Standards (JAN,2018)

#2: Ontario DW Aesthetic and Operational Guidelines

ANALYTICAL GUIDELINE REPORT

Sample Details Grouping	Analyte	Result	Qualifier	D.L.	Units	Analyzed	Guideline Limits	
L2213518-3	23089181218003							
Sampled By:	T. MARTIN on 18-DEC-18 @ 09:02						#1	#2
Matrix:	WATER							
Dissolved Metals								
	Nickel (Ni)-Dissolved	<0.00050		0.00050	mg/L	21-DEC-18		
	Phosphorus (P)-Dissolved	<0.050		0.050	mg/L	21-DEC-18		
	Potassium (K)-Dissolved	3.95		0.050	mg/L	21-DEC-18		
	Rubidium (Rb)-Dissolved	0.00050		0.00020	mg/L	21-DEC-18		
	Selenium (Se)-Dissolved	0.000299		0.000050	mg/L	21-DEC-18	0.05	
	Silicon (Si)-Dissolved	4.29		0.050	mg/L	21-DEC-18		
	Silver (Ag)-Dissolved	<0.000050		0.000050	mg/L	21-DEC-18		
	Sodium (Na)-Dissolved	4.47		0.050	mg/L	21-DEC-18	20	200
	Strontium (Sr)-Dissolved	0.0999		0.0010	mg/L	21-DEC-18		
	Sulfur (S)-Dissolved	5.07		0.50	mg/L	21-DEC-18		
	Tellurium (Te)-Dissolved	<0.00020		0.00020	mg/L	21-DEC-18		
	Thallium (Tl)-Dissolved	<0.000010		0.000010	mg/L	21-DEC-18		
	Thorium (Th)-Dissolved	<0.00010		0.00010	mg/L	21-DEC-18		
	Tin (Sn)-Dissolved	0.00014		0.00010	mg/L	21-DEC-18		
	Titanium (Ti)-Dissolved	<0.00030		0.00030	mg/L	21-DEC-18		
	Tungsten (W)-Dissolved	<0.00010		0.00010	mg/L	21-DEC-18		
	Uranium (U)-Dissolved	0.000255		0.000010	mg/L	21-DEC-18	0.02	
	Vanadium (V)-Dissolved	<0.00050		0.00050	mg/L	21-DEC-18		
	Zinc (Zn)-Dissolved	0.0251		0.0010	mg/L	21-DEC-18		5
	Zirconium (Zr)-Dissolved	<0.00030		0.00030	mg/L	21-DEC-18		
L2213518-4	23089181218004							
Sampled By:	T. MARTIN on 18-DEC-18 @ 09:02						#1	#2
Matrix:	WATER							
Physical Tests								
	Conductivity	412		3.0	umhos/cm	21-DEC-18		
	pH	7.71		0.10	pH units	21-DEC-18		6.5-8.5
	Total Dissolved Solids	259	DLDS	20	mg/L	24-DEC-18		500
Anions and Nutrients								
	Alkalinity, Bicarbonate (as CaCO3)	257		10	mg/L	22-DEC-18		
	Alkalinity, Carbonate (as CaCO3)	<10		10	mg/L	22-DEC-18		
	Alkalinity, Hydroxide (as CaCO3)	<10		10	mg/L	22-DEC-18		
	Alkalinity, Total (as CaCO3)	257		10	mg/L	22-DEC-18		30-500
	Bromide (Br)	<0.10		0.10	mg/L	21-DEC-18		
	Chloride (Cl)	3.34		0.50	mg/L	21-DEC-18		250
	Computed Conductivity	412			uS/cm	27-DEC-18		
	Conductivity % Difference	0.0			%	27-DEC-18		
	Fluoride (F)	0.124		0.020	mg/L	21-DEC-18	1.5	
	Hardness (as CaCO3)	234			mg/L	27-DEC-18		*80-100
	Ion Balance	114			%	27-DEC-18		
	Langelier Index	0.5			No Unit	27-DEC-18		
	Nitrate (as N)	<0.020		0.020	mg/L	21-DEC-18	10	
	Nitrite (as N)	<0.010		0.010	mg/L	21-DEC-18	1	
	Total Kjeldahl Nitrogen	0.36		0.15	mg/L	24-DEC-18		
	Saturation pH	7.25			pH	27-DEC-18		
	TDS (Calculated)	251			mg/L	27-DEC-18		
	Sulfate (SO4)	5.07		0.30	mg/L	21-DEC-18		500

** Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.

* Analytical result for this parameter exceeds Guideline Limit listed on this report. Guideline Limits applied:

Ontario Drinking Water Regulation (ODWQS) JAN.1,2018 = [Suite] - ON-DW-STANDARD+GUIDELINES

#1: Schedule 1 (Microbiological) and 2 (Chemical) Standards (JAN,2018) **#2: Ontario DW Aesthetic and Operational Guidelines**

ANALYTICAL GUIDELINE REPORT

Sample Details Grouping	Analyte	Result	Qualifier	D.L.	Units	Analyzed	Guideline Limits #1	Guideline Limits #2
L2213518-4	23089181218004							
Sampled By:	T. MARTIN on 18-DEC-18 @ 09:02							
Matrix:	WATER							
Anions and Nutrients								
	Anion Sum	4.44			me/L	27-DEC-18		
	Cation Sum	5.05			me/L	27-DEC-18		
	Cation - Anion Balance	6.4			%	27-DEC-18		
Dissolved Metals								
	Dissolved Metals Filtration Location	FIELD			No Unit	21-DEC-18		
	Aluminum (Al)-Dissolved	<0.0050		0.0050	mg/L	21-DEC-18		0.1
	Antimony (Sb)-Dissolved	<0.00010		0.00010	mg/L	21-DEC-18	0.006	
	Arsenic (As)-Dissolved	0.00534		0.00010	mg/L	21-DEC-18	0.0100	
	Barium (Ba)-Dissolved	0.0960		0.00010	mg/L	21-DEC-18	1	
	Beryllium (Be)-Dissolved	<0.00010		0.00010	mg/L	21-DEC-18		
	Bismuth (Bi)-Dissolved	<0.000050		0.000050	mg/L	21-DEC-18		
	Boron (B)-Dissolved	0.011		0.010	mg/L	21-DEC-18	5	
	Cadmium (Cd)-Dissolved	<0.0000050		0.0000050	mg/L	21-DEC-18	0.005	
	Calcium (Ca)-Dissolved	56.9		0.050	mg/L	21-DEC-18		
	Cesium (Cs)-Dissolved	<0.000010		0.000010	mg/L	21-DEC-18		
	Chromium (Cr)-Dissolved	<0.00050		0.00050	mg/L	21-DEC-18	0.05	
	Cobalt (Co)-Dissolved	0.00047		0.00010	mg/L	21-DEC-18		
	Copper (Cu)-Dissolved	0.00111		0.00020	mg/L	21-DEC-18		1
	Iron (Fe)-Dissolved	0.163		0.010	mg/L	21-DEC-18		0.3
	Lead (Pb)-Dissolved	0.000059		0.000050	mg/L	21-DEC-18	0.01	
	Lithium (Li)-Dissolved	0.0024		0.0010	mg/L	21-DEC-18		
	Magnesium (Mg)-Dissolved	22.2		0.0050	mg/L	21-DEC-18		
	Manganese (Mn)-Dissolved	0.0464		0.00050	mg/L	21-DEC-18		0.05
	Molybdenum (Mo)-Dissolved	0.00141		0.000050	mg/L	21-DEC-18		
	Nickel (Ni)-Dissolved	0.00064		0.00050	mg/L	21-DEC-18		
	Phosphorus (P)-Dissolved	<0.050		0.050	mg/L	21-DEC-18		
	Potassium (K)-Dissolved	1.05		0.050	mg/L	21-DEC-18		
	Rubidium (Rb)-Dissolved	0.00065		0.00020	mg/L	21-DEC-18		
	Selenium (Se)-Dissolved	<0.000050		0.000050	mg/L	21-DEC-18	0.05	
	Silicon (Si)-Dissolved	7.94		0.050	mg/L	21-DEC-18		
	Silver (Ag)-Dissolved	<0.000050		0.000050	mg/L	21-DEC-18		
	Sodium (Na)-Dissolved	8.05		0.050	mg/L	21-DEC-18	20	200
	Strontium (Sr)-Dissolved	0.146		0.0010	mg/L	21-DEC-18		
	Sulfur (S)-Dissolved	1.68		0.50	mg/L	21-DEC-18		
	Tellurium (Te)-Dissolved	<0.00020		0.00020	mg/L	21-DEC-18		
	Thallium (Tl)-Dissolved	<0.000010		0.000010	mg/L	21-DEC-18		
	Thorium (Th)-Dissolved	<0.00010		0.00010	mg/L	21-DEC-18		
	Tin (Sn)-Dissolved	0.00021		0.00010	mg/L	21-DEC-18		
	Titanium (Ti)-Dissolved	<0.00030		0.00030	mg/L	21-DEC-18		
	Tungsten (W)-Dissolved	<0.00010		0.00010	mg/L	21-DEC-18		
	Uranium (U)-Dissolved	0.000364		0.000010	mg/L	21-DEC-18	0.02	
	Vanadium (V)-Dissolved	<0.00050		0.00050	mg/L	21-DEC-18		
	Zinc (Zn)-Dissolved	0.0079		0.0010	mg/L	21-DEC-18		5
	Zirconium (Zr)-Dissolved	<0.00030		0.00030	mg/L	21-DEC-18		

** Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.

* Analytical result for this parameter exceeds Guideline Limit listed on this report. Guideline Limits applied:

Ontario Drinking Water Regulation (ODWQS) JAN.1,2018 = [Suite] - ON-DW-STANDARD+GUIDELINES

#1: Schedule 1 (Microbiological) and 2 (Chemical) Standards (JAN,2018) **#2: Ontario DW Aesthetic and Operational Guidelines**

ANALYTICAL GUIDELINE REPORT

L2213518-5 23089181218005
Sampled By: T. MARTIN on 18-DEC-18 @ 09:0
Matrix: WATER

Sample Details Grouping / Analyte	Result	Qualifier	D.L.	Units	Analyzed	Guideline Limits #1	Guideline Limits #2
Physical Tests							
Conductivity	682		3.0	umhos/cm	21-DEC-18		
pH	7.06		0.10	pH units	21-DEC-18		6.5-8.5
Total Dissolved Solids	414	DLDS	20	mg/L	24-DEC-18		500
Anions and Nutrients							
Alkalinity, Bicarbonate (as CaCO3)	341		10	mg/L	22-DEC-18		
Alkalinity, Carbonate (as CaCO3)	<10		10	mg/L	22-DEC-18		
Alkalinity, Hydroxide (as CaCO3)	<10		10	mg/L	22-DEC-18		
Alkalinity, Total (as CaCO3)	341		10	mg/L	22-DEC-18		30-500
Bromide (Br)	<0.10		0.10	mg/L	21-DEC-18		
Chloride (Cl)	31.8		0.50	mg/L	21-DEC-18		250
Computed Conductivity	643			uS/cm	27-DEC-18		
Conductivity % Difference	-6.0			%	27-DEC-18		
Fluoride (F)	0.110		0.020	mg/L	21-DEC-18	1.5	
Hardness (as CaCO3)	351			mg/L	27-DEC-18		*80-100
Ion Balance	117			%	27-DEC-18		
Langelier Index	0.1			No Unit	27-DEC-18		
Nitrate (as N)	<0.020		0.020	mg/L	21-DEC-18	10	
Nitrite (as N)	<0.010		0.010	mg/L	21-DEC-18	1	
Total Kjeldahl Nitrogen	0.38		0.15	mg/L	24-DEC-18		
Saturation pH	6.92			pH	27-DEC-18		
TDS (Calculated)	398			mg/L	27-DEC-18		
Sulfate (SO4)	14.7		0.30	mg/L	21-DEC-18		500
Anion Sum	6.80			me/L	27-DEC-18		
Cation Sum	7.98			me/L	27-DEC-18		
Cation - Anion Balance	8.0			%	27-DEC-18		
Dissolved Metals							
Dissolved Metals Filtration Location	FIELD			No Unit	21-DEC-18		
Aluminum (Al)-Dissolved	0.0076		0.0050	mg/L	21-DEC-18		0.1
Antimony (Sb)-Dissolved	0.00011		0.00010	mg/L	21-DEC-18	0.006	
Arsenic (As)-Dissolved	0.0229		0.00010	mg/L	21-DEC-18	*0.0100	
Barium (Ba)-Dissolved	0.0499		0.00010	mg/L	21-DEC-18	1	
Beryllium (Be)-Dissolved	<0.00010		0.00010	mg/L	21-DEC-18		
Bismuth (Bi)-Dissolved	<0.000050		0.000050	mg/L	21-DEC-18		
Boron (B)-Dissolved	0.020		0.010	mg/L	21-DEC-18	5	
Cadmium (Cd)-Dissolved	<0.0000050		0.0000050	mg/L	21-DEC-18	0.005	
Calcium (Ca)-Dissolved	100		0.050	mg/L	21-DEC-18		
Cesium (Cs)-Dissolved	<0.000010		0.000010	mg/L	21-DEC-18		
Chromium (Cr)-Dissolved	<0.00050		0.00050	mg/L	21-DEC-18	0.05	
Cobalt (Co)-Dissolved	0.00069		0.00010	mg/L	21-DEC-18		
Copper (Cu)-Dissolved	0.00049		0.00020	mg/L	21-DEC-18		1
Iron (Fe)-Dissolved	1.68		0.010	mg/L	21-DEC-18		*0.3
Lead (Pb)-Dissolved	0.000085		0.000050	mg/L	21-DEC-18	0.01	
Lithium (Li)-Dissolved	0.0017		0.0010	mg/L	21-DEC-18		
Magnesium (Mg)-Dissolved	24.6		0.0050	mg/L	21-DEC-18		
Manganese (Mn)-Dissolved	0.471		0.00050	mg/L	21-DEC-18		*0.05
Molybdenum (Mo)-Dissolved	0.000872		0.000050	mg/L	21-DEC-18		

** Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
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Ontario Drinking Water Regulation (ODWQS) JAN.1,2018 = [Suite] - ON-DW-STANDARD+GUIDELINES

#1: Schedule 1 (Microbiological) and 2 (Chemical) Standards (JAN,2018) **#2: Ontario DW Aesthetic and Operational Guidelines**

ANALYTICAL GUIDELINE REPORT

Sample Details Grouping	Analyte	Result	Qualifier	D.L.	Units	Analyzed	Guideline Limits #1	Guideline Limits #2
L2213518-5	23089181218005							
Sampled By:	T. MARTIN on 18-DEC-18 @ 09:0							
Matrix:	WATER						#1	#2
Dissolved Metals								
	Nickel (Ni)-Dissolved	0.00403		0.00050	mg/L	21-DEC-18		
	Phosphorus (P)-Dissolved	<0.050		0.050	mg/L	21-DEC-18		
	Potassium (K)-Dissolved	0.608		0.050	mg/L	21-DEC-18		
	Rubidium (Rb)-Dissolved	0.00105		0.00020	mg/L	21-DEC-18		
	Selenium (Se)-Dissolved	0.000063		0.000050	mg/L	21-DEC-18	0.05	
	Silicon (Si)-Dissolved	4.06		0.050	mg/L	21-DEC-18		
	Silver (Ag)-Dissolved	<0.000050		0.000050	mg/L	21-DEC-18		
	Sodium (Na)-Dissolved	21.7		0.050	mg/L	21-DEC-18	*20	200
	Strontium (Sr)-Dissolved	0.155		0.0010	mg/L	21-DEC-18		
	Sulfur (S)-Dissolved	5.34		0.50	mg/L	21-DEC-18		
	Tellurium (Te)-Dissolved	<0.00020		0.00020	mg/L	21-DEC-18		
	Thallium (Tl)-Dissolved	<0.000010		0.000010	mg/L	21-DEC-18		
	Thorium (Th)-Dissolved	<0.00010		0.00010	mg/L	21-DEC-18		
	Tin (Sn)-Dissolved	<0.00010		0.00010	mg/L	21-DEC-18		
	Titanium (Ti)-Dissolved	<0.00030		0.00030	mg/L	21-DEC-18		
	Tungsten (W)-Dissolved	<0.00010		0.00010	mg/L	21-DEC-18		
	Uranium (U)-Dissolved	0.00229		0.000010	mg/L	21-DEC-18	0.02	
	Vanadium (V)-Dissolved	0.00111		0.00050	mg/L	21-DEC-18		
	Zinc (Zn)-Dissolved	0.0531		0.0010	mg/L	21-DEC-18		5
	Zirconium (Zr)-Dissolved	0.00056		0.00030	mg/L	21-DEC-18		
L2213518-6	23089181218006							
Sampled By:	T. MARTIN on 18-DEC-18 @ 09:0							
Matrix:	WATER						#1	#2
Physical Tests								
	Conductivity	652		3.0	umhos/cm	21-DEC-18		
	pH	7.18		0.10	pH units	21-DEC-18		6.5-8.5
	Total Dissolved Solids	409	DLDS	20	mg/L	24-DEC-18		500
Anions and Nutrients								
	Alkalinity, Bicarbonate (as CaCO3)	342		10	mg/L	22-DEC-18		
	Alkalinity, Carbonate (as CaCO3)	<10		10	mg/L	22-DEC-18		
	Alkalinity, Hydroxide (as CaCO3)	<10		10	mg/L	22-DEC-18		
	Alkalinity, Total (as CaCO3)	342		10	mg/L	22-DEC-18		30-500
	Bromide (Br)	<0.10		0.10	mg/L	21-DEC-18		
	Chloride (Cl)	20.7		0.50	mg/L	21-DEC-18		250
	Computed Conductivity	634			uS/cm	27-DEC-18		
	Conductivity % Difference	-2.8			%	27-DEC-18		
	Fluoride (F)	0.086		0.020	mg/L	21-DEC-18	1.5	
	Hardness (as CaCO3)	371			mg/L	27-DEC-18		*80-100
	Ion Balance	118			%	27-DEC-18		
	Langelier Index	0.3			No Unit	27-DEC-18		
	Nitrate (as N)	<0.020		0.020	mg/L	21-DEC-18	10	
	Nitrite (as N)	<0.010		0.010	mg/L	21-DEC-18	1	
	Total Kjeldahl Nitrogen	0.28		0.15	mg/L	24-DEC-18		
	Saturation pH	6.91			pH	27-DEC-18		
	TDS (Calculated)	392			mg/L	27-DEC-18		
	Sulfate (SO4)	24.1		0.30	mg/L	21-DEC-18		500

** Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
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#1: Schedule 1 (Microbiological) and 2 (Chemical) Standards (JAN,2018) **#2: Ontario DW Aesthetic and Operational Guidelines**

ANALYTICAL GUIDELINE REPORT

Sample Details Grouping	Analyte	Result	Qualifier	D.L.	Units	Analyzed	Guideline Limits #1	Guideline Limits #2
L2213518-6	23089181218006							
Sampled By:	T. MARTIN on 18-DEC-18 @ 09:02							
Matrix:	WATER							
Anions and Nutrients								
	Anion Sum	6.70			me/L	27-DEC-18		
	Cation Sum	7.91			me/L	27-DEC-18		
	Cation - Anion Balance	8.3			%	27-DEC-18		
Dissolved Metals								
	Dissolved Metals Filtration Location	FIELD			No Unit	21-DEC-18		
	Aluminum (Al)-Dissolved	<0.0050		0.0050	mg/L	21-DEC-18		0.1
	Antimony (Sb)-Dissolved	<0.00010		0.00010	mg/L	21-DEC-18	0.006	
	Arsenic (As)-Dissolved	0.0157		0.00010	mg/L	21-DEC-18	*0.0100	
	Barium (Ba)-Dissolved	0.0622		0.00010	mg/L	21-DEC-18	1	
	Beryllium (Be)-Dissolved	<0.00010		0.00010	mg/L	21-DEC-18		
	Bismuth (Bi)-Dissolved	<0.000050		0.000050	mg/L	21-DEC-18		
	Boron (B)-Dissolved	0.015		0.010	mg/L	21-DEC-18	5	
	Cadmium (Cd)-Dissolved	<0.0000050		0.0000050	mg/L	21-DEC-18	0.005	
	Calcium (Ca)-Dissolved	103		0.050	mg/L	21-DEC-18		
	Cesium (Cs)-Dissolved	<0.000010		0.000010	mg/L	21-DEC-18		
	Chromium (Cr)-Dissolved	<0.00050		0.00050	mg/L	21-DEC-18	0.05	
	Cobalt (Co)-Dissolved	0.00035		0.00010	mg/L	21-DEC-18		
	Copper (Cu)-Dissolved	0.00034		0.00020	mg/L	21-DEC-18		1
	Iron (Fe)-Dissolved	1.97		0.010	mg/L	21-DEC-18		*0.3
	Lead (Pb)-Dissolved	0.000696		0.000050	mg/L	21-DEC-18	0.01	
	Lithium (Li)-Dissolved	0.0017		0.0010	mg/L	21-DEC-18		
	Magnesium (Mg)-Dissolved	27.9		0.0050	mg/L	21-DEC-18		
	Manganese (Mn)-Dissolved	0.289		0.00050	mg/L	21-DEC-18		*0.05
	Molybdenum (Mo)-Dissolved	0.000699		0.000050	mg/L	21-DEC-18		
	Nickel (Ni)-Dissolved	0.00214		0.00050	mg/L	21-DEC-18		
	Phosphorus (P)-Dissolved	<0.050		0.050	mg/L	21-DEC-18		
	Potassium (K)-Dissolved	0.642		0.050	mg/L	21-DEC-18		
	Rubidium (Rb)-Dissolved	0.00100		0.00020	mg/L	21-DEC-18		
	Selenium (Se)-Dissolved	<0.000050		0.000050	mg/L	21-DEC-18	0.05	
	Silicon (Si)-Dissolved	5.88		0.050	mg/L	21-DEC-18		
	Silver (Ag)-Dissolved	<0.000050		0.000050	mg/L	21-DEC-18		
	Sodium (Na)-Dissolved	10.9		0.050	mg/L	21-DEC-18	20	200
	Strontium (Sr)-Dissolved	0.135		0.0010	mg/L	21-DEC-18		
	Sulfur (S)-Dissolved	7.86		0.50	mg/L	21-DEC-18		
	Tellurium (Te)-Dissolved	<0.00020		0.00020	mg/L	21-DEC-18		
	Thallium (Tl)-Dissolved	<0.000010		0.000010	mg/L	21-DEC-18		
	Thorium (Th)-Dissolved	<0.00010		0.00010	mg/L	21-DEC-18		
	Tin (Sn)-Dissolved	<0.00010		0.00010	mg/L	21-DEC-18		
	Titanium (Ti)-Dissolved	<0.00030		0.00030	mg/L	21-DEC-18		
	Tungsten (W)-Dissolved	<0.00010		0.00010	mg/L	21-DEC-18		
	Uranium (U)-Dissolved	0.00144		0.000010	mg/L	21-DEC-18	0.02	
	Vanadium (V)-Dissolved	<0.00050		0.00050	mg/L	21-DEC-18		
	Zinc (Zn)-Dissolved	0.0604		0.0010	mg/L	21-DEC-18		5
	Zirconium (Zr)-Dissolved	0.00039		0.00030	mg/L	21-DEC-18		

** Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
* Analytical result for this parameter exceeds Guideline Limit listed on this report. Guideline Limits applied:

Ontario Drinking Water Regulation (ODWQS) JAN.1,2018 = [Suite] - ON-DW-STANDARD+GUIDELINES

#1: Schedule 1 (Microbiological) and 2 (Chemical) Standards (JAN,2018) **#2: Ontario DW Aesthetic and Operational Guidelines**

ANALYTICAL GUIDELINE REPORT

Sample Details Grouping / Analyte	Result	Qualifier	D.L.	Units	Analyzed	Guideline Limits #1	Guideline Limits #2
L2213518-7 23089181218007							
Sampled By: T. MARTIN on 18-DEC-18 @ 09:0							
Matrix: WATER							
Physical Tests							
Conductivity	742		3.0	umhos/cm	21-DEC-18		
pH	7.65		0.10	pH units	21-DEC-18		6.5-8.5
Total Dissolved Solids	435	DLDS	20	mg/L	24-DEC-18		500
Anions and Nutrients							
Alkalinity, Bicarbonate (as CaCO3)	312		10	mg/L	22-DEC-18		
Alkalinity, Carbonate (as CaCO3)	<10		10	mg/L	22-DEC-18		
Alkalinity, Hydroxide (as CaCO3)	<10		10	mg/L	22-DEC-18		
Alkalinity, Total (as CaCO3)	312		10	mg/L	22-DEC-18		30-500
Bromide (Br)	<0.10		0.10	mg/L	21-DEC-18		
Chloride (Cl)	62.6		0.50	mg/L	21-DEC-18		250
Computed Conductivity	711			uS/cm	27-DEC-18		
Conductivity % Difference	-4.2			%	27-DEC-18		
Fluoride (F)	0.061		0.020	mg/L	21-DEC-18	1.5	
Hardness (as CaCO3)	356			mg/L	27-DEC-18		*80-100
Ion Balance	115			%	27-DEC-18		
Langelier Index	0.6			No Unit	27-DEC-18		
Nitrate (as N)	3.17		0.020	mg/L	21-DEC-18	10	
Nitrite (as N)	<0.010		0.010	mg/L	21-DEC-18	1	
Total Kjeldahl Nitrogen	0.45		0.15	mg/L	24-DEC-18		
Saturation pH	7.01			pH	27-DEC-18		
TDS (Calculated)	435			mg/L	27-DEC-18		
Sulfate (SO4)	14.8		0.30	mg/L	21-DEC-18		500
Anion Sum	7.45			me/L	27-DEC-18		
Cation Sum	8.57			me/L	27-DEC-18		
Cation - Anion Balance	7.0			%	27-DEC-18		
Dissolved Metals							
Dissolved Metals Filtration Location	FIELD			No Unit	21-DEC-18		
Aluminum (Al)-Dissolved	<0.0050		0.0050	mg/L	21-DEC-18		0.1
Antimony (Sb)-Dissolved	<0.00010		0.00010	mg/L	21-DEC-18	0.006	
Arsenic (As)-Dissolved	0.00011		0.00010	mg/L	21-DEC-18	0.0100	
Barium (Ba)-Dissolved	0.0480		0.00010	mg/L	21-DEC-18	1	
Beryllium (Be)-Dissolved	<0.00010		0.00010	mg/L	21-DEC-18		
Bismuth (Bi)-Dissolved	<0.000050		0.000050	mg/L	21-DEC-18		
Boron (B)-Dissolved	0.016		0.010	mg/L	21-DEC-18	5	
Cadmium (Cd)-Dissolved	0.000212		0.0000050	mg/L	21-DEC-18	0.005	
Calcium (Ca)-Dissolved	90.5		0.050	mg/L	21-DEC-18		
Cesium (Cs)-Dissolved	<0.000010		0.000010	mg/L	21-DEC-18		
Chromium (Cr)-Dissolved	<0.00050		0.00050	mg/L	21-DEC-18	0.05	
Cobalt (Co)-Dissolved	<0.00010		0.00010	mg/L	21-DEC-18		
Copper (Cu)-Dissolved	0.00111		0.00020	mg/L	21-DEC-18		1
Iron (Fe)-Dissolved	<0.010		0.010	mg/L	21-DEC-18		0.3
Lead (Pb)-Dissolved	0.000359		0.000050	mg/L	21-DEC-18	0.01	
Lithium (Li)-Dissolved	0.0011		0.0010	mg/L	21-DEC-18		
Magnesium (Mg)-Dissolved	31.6		0.0050	mg/L	21-DEC-18		
Manganese (Mn)-Dissolved	<0.00050		0.00050	mg/L	21-DEC-18		0.05
Molybdenum (Mo)-Dissolved	0.000201		0.000050	mg/L	21-DEC-18		

** Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.

* Analytical result for this parameter exceeds Guideline Limit listed on this report. Guideline Limits applied:

Ontario Drinking Water Regulation (ODWQS) JAN.1,2018 = [Suite] - ON-DW-STANDARD+GUIDELINES

#1: Schedule 1 (Microbiological) and 2 (Chemical) Standards (JAN,2018) **#2: Ontario DW Aesthetic and Operational Guidelines**

ANALYTICAL GUIDELINE REPORT

Sample Details Grouping	Analyte	Result	Qualifier	D.L.	Units	Analyzed	Guideline Limits #1	Guideline Limits #2
L2213518-7	23089181218007							
Sampled By:	T. MARTIN on 18-DEC-18 @ 09:0							
Matrix:	WATER							
Dissolved Metals								
	Nickel (Ni)-Dissolved	0.00081		0.00050	mg/L	21-DEC-18		
	Phosphorus (P)-Dissolved	<0.050		0.050	mg/L	21-DEC-18		
	Potassium (K)-Dissolved	1.20		0.050	mg/L	21-DEC-18		
	Rubidium (Rb)-Dissolved	0.00169		0.00020	mg/L	21-DEC-18		
	Selenium (Se)-Dissolved	0.000343		0.000050	mg/L	21-DEC-18	0.05	
	Silicon (Si)-Dissolved	3.72		0.050	mg/L	21-DEC-18		
	Silver (Ag)-Dissolved	<0.000050		0.000050	mg/L	21-DEC-18		
	Sodium (Na)-Dissolved	32.7		0.050	mg/L	21-DEC-18	*20	200
	Strontium (Sr)-Dissolved	0.143		0.0010	mg/L	21-DEC-18		
	Sulfur (S)-Dissolved	5.29		0.50	mg/L	21-DEC-18		
	Tellurium (Te)-Dissolved	<0.00020		0.00020	mg/L	21-DEC-18		
	Thallium (Tl)-Dissolved	0.000017		0.000010	mg/L	21-DEC-18		
	Thorium (Th)-Dissolved	<0.00010		0.00010	mg/L	21-DEC-18		
	Tin (Sn)-Dissolved	<0.00010		0.00010	mg/L	21-DEC-18		
	Titanium (Ti)-Dissolved	<0.00030		0.00030	mg/L	21-DEC-18		
	Tungsten (W)-Dissolved	<0.00010		0.00010	mg/L	21-DEC-18		
	Uranium (U)-Dissolved	0.000425		0.000010	mg/L	21-DEC-18	0.02	
	Vanadium (V)-Dissolved	<0.00050		0.00050	mg/L	21-DEC-18		
	Zinc (Zn)-Dissolved	0.132		0.0010	mg/L	21-DEC-18		5
	Zirconium (Zr)-Dissolved	<0.00030		0.00030	mg/L	21-DEC-18		
L2213518-8	23089181218008							
Sampled By:	T. MARTIN on 18-DEC-18 @ 09:0							
Matrix:	WATER							
Physical Tests								
	Conductivity	561		3.0	umhos/cm	21-DEC-18		
	pH	7.85		0.10	pH units	21-DEC-18		6.5-8.5
	Total Dissolved Solids	347	DLDS	20	mg/L	24-DEC-18		500
Anions and Nutrients								
	Alkalinity, Bicarbonate (as CaCO3)	690	DLM	250	mg/L	22-DEC-18		
	Alkalinity, Carbonate (as CaCO3)	<250	DLM	250	mg/L	22-DEC-18		
	Alkalinity, Hydroxide (as CaCO3)	<250	DLM	250	mg/L	22-DEC-18		
	Alkalinity, Total (as CaCO3)	690	DLM	250	mg/L	22-DEC-18		*30-500
	Bromide (Br)	<0.10		0.10	mg/L	21-DEC-18		
	Chloride (Cl)	43.6		0.50	mg/L	21-DEC-18		250
	Computed Conductivity	813			uS/cm	27-DEC-18		
	Conductivity % Difference	36.7			%	27-DEC-18		
	Fluoride (F)	0.160		0.020	mg/L	21-DEC-18	1.5	
	Hardness (as CaCO3)	242			mg/L	27-DEC-18		*80-100
	Ion Balance	48.0			%	27-DEC-18		
	Langelier Index	0.8			No Unit	27-DEC-18		
	Nitrate (as N)	0.056		0.020	mg/L	21-DEC-18	10	
	Nitrite (as N)	<0.010		0.010	mg/L	21-DEC-18	1	
	Total Kjeldahl Nitrogen	<1.5	DLM	1.5	mg/L	24-DEC-18		
	Saturation pH	7.01			pH	27-DEC-18		
	TDS (Calculated)	609			mg/L	27-DEC-18		
	Sulfate (SO4)	37.6		0.30	mg/L	21-DEC-18		500

** Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.

* Analytical result for this parameter exceeds Guideline Limit listed on this report. Guideline Limits applied:

Ontario Drinking Water Regulation (ODWQS) JAN.1,2018 = [Suite] - ON-DW-STANDARD+GUIDELINES

#1: Schedule 1 (Microbiological) and 2 (Chemical) Standards (JAN,2018) **#2: Ontario DW Aesthetic and Operational Guidelines**

ANALYTICAL GUIDELINE REPORT

Sample Details Grouping Analyte	Result	Qualifier	D.L.	Units	Analyzed	Guideline Limits #1	Guideline Limits #2
L2213518-8 23089181218008							
Sampled By: T. MARTIN on 18-DEC-18 @ 09:02							
Matrix: WATER							
Anions and Nutrients							
Anion Sum	13.4			me/L	27-DEC-18		
Cation Sum	6.45			me/L	27-DEC-18		
Cation - Anion Balance	-35.2			%	27-DEC-18		
Dissolved Metals							
Dissolved Metals Filtration Location	FIELD			No Unit	21-DEC-18		
Aluminum (Al)-Dissolved	0.0054		0.0050	mg/L	21-DEC-18		0.1
Antimony (Sb)-Dissolved	<0.00010		0.00010	mg/L	21-DEC-18	0.006	
Arsenic (As)-Dissolved	0.00737		0.00010	mg/L	21-DEC-18	0.0100	
Barium (Ba)-Dissolved	0.0477		0.00010	mg/L	21-DEC-18	1	
Beryllium (Be)-Dissolved	<0.00010		0.00010	mg/L	21-DEC-18		
Bismuth (Bi)-Dissolved	<0.000050		0.000050	mg/L	21-DEC-18		
Boron (B)-Dissolved	0.055		0.010	mg/L	21-DEC-18	5	
Cadmium (Cd)-Dissolved	<0.0000050		0.0000050	mg/L	21-DEC-18	0.005	
Calcium (Ca)-Dissolved	42.1		0.050	mg/L	21-DEC-18		
Cesium (Cs)-Dissolved	<0.000010		0.000010	mg/L	21-DEC-18		
Chromium (Cr)-Dissolved	<0.00050		0.00050	mg/L	21-DEC-18	0.05	
Cobalt (Co)-Dissolved	<0.00010		0.00010	mg/L	21-DEC-18		
Copper (Cu)-Dissolved	0.00040		0.00020	mg/L	21-DEC-18		1
Iron (Fe)-Dissolved	0.081		0.010	mg/L	21-DEC-18		0.3
Lead (Pb)-Dissolved	0.000692		0.000050	mg/L	21-DEC-18	0.01	
Lithium (Li)-Dissolved	0.0040		0.0010	mg/L	21-DEC-18		
Magnesium (Mg)-Dissolved	33.3		0.0050	mg/L	21-DEC-18		
Manganese (Mn)-Dissolved	0.0108		0.00050	mg/L	21-DEC-18		0.05
Molybdenum (Mo)-Dissolved	0.00201		0.000050	mg/L	21-DEC-18		
Nickel (Ni)-Dissolved	0.00107		0.00050	mg/L	21-DEC-18		
Phosphorus (P)-Dissolved	<0.050		0.050	mg/L	21-DEC-18		
Potassium (K)-Dissolved	0.910		0.050	mg/L	21-DEC-18		
Rubidium (Rb)-Dissolved	0.00045		0.00020	mg/L	21-DEC-18		
Selenium (Se)-Dissolved	0.000070		0.000050	mg/L	21-DEC-18	0.05	
Silicon (Si)-Dissolved	6.27		0.050	mg/L	21-DEC-18		
Silver (Ag)-Dissolved	<0.000050		0.000050	mg/L	21-DEC-18		
Sodium (Na)-Dissolved	36.4		0.050	mg/L	21-DEC-18	*20	200
Strontium (Sr)-Dissolved	0.498		0.0010	mg/L	21-DEC-18		
Sulfur (S)-Dissolved	12.8		0.50	mg/L	21-DEC-18		
Tellurium (Te)-Dissolved	<0.00020		0.00020	mg/L	21-DEC-18		
Thallium (Tl)-Dissolved	<0.000010		0.000010	mg/L	21-DEC-18		
Thorium (Th)-Dissolved	<0.00010		0.00010	mg/L	21-DEC-18		
Tin (Sn)-Dissolved	<0.00010		0.00010	mg/L	21-DEC-18		
Titanium (Ti)-Dissolved	<0.00030		0.00030	mg/L	21-DEC-18		
Tungsten (W)-Dissolved	<0.00010		0.00010	mg/L	21-DEC-18		
Uranium (U)-Dissolved	0.000344		0.000010	mg/L	21-DEC-18	0.02	
Vanadium (V)-Dissolved	<0.00050		0.00050	mg/L	21-DEC-18		
Zinc (Zn)-Dissolved	0.0029		0.0010	mg/L	21-DEC-18		5
Zirconium (Zr)-Dissolved	<0.00030		0.00030	mg/L	21-DEC-18		

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Ontario Drinking Water Regulation (ODWQS) JAN.1,2018 = [Suite] - ON-DW-STANDARD+GUIDELINES

#1: Schedule 1 (Microbiological) and 2 (Chemical) Standards (JAN,2018) **#2: Ontario DW Aesthetic and Operational Guidelines**

L2213518-9 23089181218009
Sampled By: T. MARTIN on 18-DEC-18 @ 09:02
Matrix: WATER

Sample Details Grouping	Analyte	Result	Qualifier	D.L.	Units	Analyzed	Guideline Limits	
							#1	#2
Physical Tests								
	Conductivity	545		3.0	umhos/cm	21-DEC-18		
	pH	7.68		0.10	pH units	21-DEC-18		6.5-8.5
	Total Dissolved Solids	361	DLDS	20	mg/L	24-DEC-18		500
Anions and Nutrients								
	Alkalinity, Bicarbonate (as CaCO3)	670	DLM	250	mg/L	22-DEC-18		
	Alkalinity, Carbonate (as CaCO3)	<250	DLM	250	mg/L	22-DEC-18		
	Alkalinity, Hydroxide (as CaCO3)	<250	DLM	250	mg/L	22-DEC-18		
	Alkalinity, Total (as CaCO3)	670	DLM	250	mg/L	22-DEC-18		*30-500
	Bromide (Br)	<0.10		0.10	mg/L	21-DEC-18		
	Chloride (Cl)	23.8		0.50	mg/L	21-DEC-18		250
	Computed Conductivity	774			uS/cm	21-JAN-19		
	Conductivity % Difference	34.7			%	21-JAN-19		
	Fluoride (F)	0.097		0.020	mg/L	21-DEC-18	1.5	
	Hardness (as CaCO3)	287			mg/L	21-JAN-19		*80-100
	Ion Balance	49.7			%	21-JAN-19		
	Langelier Index	0.9			No Unit	21-JAN-19		
	Nitrate (as N)	0.077		0.020	mg/L	21-DEC-18	10	
	Nitrite (as N)	<0.010		0.010	mg/L	21-DEC-18	1	
	Total Kjeldahl Nitrogen	0.88		0.15	mg/L	27-DEC-18		
	Saturation pH	6.82			pH	21-JAN-19		
	TDS (Calculated)	579			mg/L	21-JAN-19		
	Sulfate (SO4)	43.3		0.30	mg/L	21-DEC-18		500
	Anion Sum	12.6			me/L	21-JAN-19		
	Cation Sum	6.27			me/L	21-JAN-19		
	Cation - Anion Balance	-33.6			%	21-JAN-19		
Dissolved Metals								
	Dissolved Metals Filtration Location	FIELD			No Unit	21-DEC-18		
	Aluminum (Al)-Dissolved	<0.0050		0.0050	mg/L	21-DEC-18		0.1
	Antimony (Sb)-Dissolved	0.00013		0.00010	mg/L	21-DEC-18	0.006	
	Arsenic (As)-Dissolved	0.00315		0.00010	mg/L	21-DEC-18	0.0100	
	Barium (Ba)-Dissolved	0.0596		0.00010	mg/L	21-DEC-18	1	
	Beryllium (Be)-Dissolved	<0.00010		0.00010	mg/L	21-DEC-18		
	Bismuth (Bi)-Dissolved	<0.000050		0.000050	mg/L	21-DEC-18		
	Boron (B)-Dissolved	0.011		0.010	mg/L	21-DEC-18	5	
	Cadmium (Cd)-Dissolved	0.0000056		0.0000050	mg/L	21-DEC-18	0.005	
	Calcium (Ca)-Dissolved	66.9		0.050	mg/L	21-DEC-18		
	Cesium (Cs)-Dissolved	<0.000010		0.000010	mg/L	21-DEC-18		
	Chromium (Cr)-Dissolved	<0.00050		0.00050	mg/L	21-DEC-18	0.05	
	Cobalt (Co)-Dissolved	0.00012		0.00010	mg/L	21-DEC-18		
	Copper (Cu)-Dissolved	0.00140		0.00020	mg/L	21-DEC-18		1
	Iron (Fe)-Dissolved	<0.010		0.010	mg/L	21-DEC-18		0.3
	Lead (Pb)-Dissolved	0.000056		0.000050	mg/L	21-DEC-18	0.01	
	Lithium (Li)-Dissolved	0.0041		0.0010	mg/L	21-DEC-18		
	Magnesium (Mg)-Dissolved	29.2		0.0050	mg/L	21-DEC-18		
	Manganese (Mn)-Dissolved	0.0140		0.00050	mg/L	21-DEC-18		0.05
	Molybdenum (Mo)-Dissolved	0.00225		0.000050	mg/L	21-DEC-18		

** Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
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Ontario Drinking Water Regulation (ODWQS) JAN.1,2018 = [Suite] - ON-DW-STANDARD+GUIDELINES

#1: Schedule 1 (Microbiological) and 2 (Chemical) Standards (JAN,2018) **#2: Ontario DW Aesthetic and Operational Guidelines**

ANALYTICAL GUIDELINE REPORT

Sample Details Grouping / Analyte	Result	Qualifier	D.L.	Units	Analyzed	Guideline Limits #1	Guideline Limits #2
L2213518-9 23089181218009							
Sampled By: T. MARTIN on 18-DEC-18 @ 09:02							
Matrix: WATER						#1	#2
Dissolved Metals							
Nickel (Ni)-Dissolved	0.00073		0.00050	mg/L	21-DEC-18		
Phosphorus (P)-Dissolved	<0.050		0.050	mg/L	21-DEC-18		
Potassium (K)-Dissolved	1.44		0.050	mg/L	21-DEC-18		
Rubidium (Rb)-Dissolved	0.00059		0.00020	mg/L	21-DEC-18		
Selenium (Se)-Dissolved	<0.000050		0.000050	mg/L	21-DEC-18	0.05	
Silicon (Si)-Dissolved	9.32		0.050	mg/L	21-DEC-18		
Silver (Ag)-Dissolved	<0.000050		0.000050	mg/L	21-DEC-18		
Sodium (Na)-Dissolved	11.3		0.050	mg/L	21-DEC-18	20	200
Strontium (Sr)-Dissolved	0.145		0.0010	mg/L	21-DEC-18		
Sulfur (S)-Dissolved	14.6		0.50	mg/L	21-DEC-18		
Tellurium (Te)-Dissolved	<0.00020		0.00020	mg/L	21-DEC-18		
Thallium (Tl)-Dissolved	0.000010		0.000010	mg/L	21-DEC-18		
Thorium (Th)-Dissolved	<0.00010		0.00010	mg/L	21-DEC-18		
Tin (Sn)-Dissolved	0.00015		0.00010	mg/L	21-DEC-18		
Titanium (Ti)-Dissolved	<0.00030		0.00030	mg/L	21-DEC-18		
Tungsten (W)-Dissolved	<0.00010		0.00010	mg/L	21-DEC-18		
Uranium (U)-Dissolved	0.00111		0.000010	mg/L	21-DEC-18	0.02	
Vanadium (V)-Dissolved	<0.00050		0.00050	mg/L	21-DEC-18		
Zinc (Zn)-Dissolved	0.0060		0.0010	mg/L	21-DEC-18		5
Zirconium (Zr)-Dissolved	<0.00030		0.00030	mg/L	21-DEC-18		
L2213518-10 23089181218010							
Sampled By: T. MARTIN on 18-DEC-18 @ 09:02							
Matrix: WATER						#1	#2
Physical Tests							
Conductivity	424		3.0	umhos/cm	21-DEC-18		
pH	7.84		0.10	pH units	21-DEC-18		6.5-8.5
Total Dissolved Solids	263	DLDS	20	mg/L	24-DEC-18		500
Anions and Nutrients							
Alkalinity, Bicarbonate (as CaCO3)	730	DLM	250	mg/L	22-DEC-18		
Alkalinity, Carbonate (as CaCO3)	<250	DLM	250	mg/L	22-DEC-18		
Alkalinity, Hydroxide (as CaCO3)	<250	DLM	250	mg/L	22-DEC-18		
Alkalinity, Total (as CaCO3)	730	DLM	250	mg/L	22-DEC-18		*30-500
Bromide (Br)	<0.10		0.10	mg/L	21-DEC-18		
Chloride (Cl)	7.69		0.50	mg/L	21-DEC-18		250
Computed Conductivity	710			uS/cm	21-JAN-19		
Conductivity % Difference	50.4			%	21-JAN-19		
Fluoride (F)	0.194		0.020	mg/L	21-DEC-18	1.5	
Hardness (as CaCO3)	236			mg/L	21-JAN-19		*80-100
Ion Balance	41.0			%	21-JAN-19		
Langelier Index	0.9			No Unit	21-JAN-19		
Nitrate (as N)	<0.020		0.020	mg/L	21-DEC-18	10	
Nitrite (as N)	<0.010		0.010	mg/L	21-DEC-18	1	
Total Kjeldahl Nitrogen	0.19		0.15	mg/L	27-DEC-18		
Saturation pH	6.90			pH	21-JAN-19		
TDS (Calculated)	555			mg/L	21-JAN-19		
Sulfate (SO4)	20.1		0.30	mg/L	21-DEC-18		500

** Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
* Analytical result for this parameter exceeds Guideline Limit listed on this report. Guideline Limits applied:

Ontario Drinking Water Regulation (ODWQS) JAN.1,2018 = [Suite] - ON-DW-STANDARD+GUIDELINES

#1: Schedule 1 (Microbiological) and 2 (Chemical) Standards (JAN,2018) **#2: Ontario DW Aesthetic and Operational Guidelines**

ANALYTICAL GUIDELINE REPORT

L2213518-10 23089181218010
Sampled By: T. MARTIN on 18-DEC-18 @ 09:0
Matrix: WATER

Sample Details Grouping / Analyte	Result	Qualifier	D.L.	Units	Analyzed	Guideline Limits #1	#2
Anions and Nutrients							
Anion Sum	12.7			me/L	21-JAN-19		
Cation Sum	5.20			me/L	21-JAN-19		
Cation - Anion Balance	-41.9			%	21-JAN-19		
Dissolved Metals							
Dissolved Metals Filtration Location	FIELD			No Unit	21-DEC-18		
Aluminum (Al)-Dissolved	<0.0050		0.0050	mg/L	21-DEC-18		0.1
Antimony (Sb)-Dissolved	<0.00010		0.00010	mg/L	21-DEC-18	0.006	
Arsenic (As)-Dissolved	0.0104		0.00010	mg/L	21-DEC-18	*0.0100	
Barium (Ba)-Dissolved	0.0630		0.00010	mg/L	21-DEC-18	1	
Beryllium (Be)-Dissolved	<0.00010		0.00010	mg/L	21-DEC-18		
Bismuth (Bi)-Dissolved	<0.000050		0.000050	mg/L	21-DEC-18		
Boron (B)-Dissolved	0.014		0.010	mg/L	21-DEC-18	5	
Cadmium (Cd)-Dissolved	<0.0000050		0.0000050	mg/L	21-DEC-18	0.005	
Calcium (Ca)-Dissolved	49.8		0.050	mg/L	21-DEC-18		
Cesium (Cs)-Dissolved	<0.000010		0.000010	mg/L	21-DEC-18		
Chromium (Cr)-Dissolved	<0.00050		0.00050	mg/L	21-DEC-18	0.05	
Cobalt (Co)-Dissolved	<0.00010		0.00010	mg/L	21-DEC-18		
Copper (Cu)-Dissolved	<0.00020		0.00020	mg/L	21-DEC-18		1
Iron (Fe)-Dissolved	0.362		0.010	mg/L	21-DEC-18		*0.3
Lead (Pb)-Dissolved	<0.000050		0.000050	mg/L	21-DEC-18	0.01	
Lithium (Li)-Dissolved	0.0057		0.0010	mg/L	21-DEC-18		
Magnesium (Mg)-Dissolved	27.1		0.0050	mg/L	21-DEC-18		
Manganese (Mn)-Dissolved	0.0121		0.00050	mg/L	21-DEC-18		0.05
Molybdenum (Mo)-Dissolved	0.00124		0.000050	mg/L	21-DEC-18		
Nickel (Ni)-Dissolved	<0.00050		0.00050	mg/L	21-DEC-18		
Phosphorus (P)-Dissolved	<0.050		0.050	mg/L	21-DEC-18		
Potassium (K)-Dissolved	1.22		0.050	mg/L	21-DEC-18		
Rubidium (Rb)-Dissolved	0.00037		0.00020	mg/L	21-DEC-18		
Selenium (Se)-Dissolved	0.000113		0.000050	mg/L	21-DEC-18	0.05	
Silicon (Si)-Dissolved	9.89		0.050	mg/L	21-DEC-18		
Silver (Ag)-Dissolved	<0.000050		0.000050	mg/L	21-DEC-18		
Sodium (Na)-Dissolved	10.4		0.050	mg/L	21-DEC-18	20	200
Strontium (Sr)-Dissolved	0.167		0.0010	mg/L	21-DEC-18		
Sulfur (S)-Dissolved	6.51		0.50	mg/L	21-DEC-18		
Tellurium (Te)-Dissolved	<0.00020		0.00020	mg/L	21-DEC-18		
Thallium (Tl)-Dissolved	<0.000010		0.000010	mg/L	21-DEC-18		
Thorium (Th)-Dissolved	<0.00010		0.00010	mg/L	21-DEC-18		
Tin (Sn)-Dissolved	<0.00010		0.00010	mg/L	21-DEC-18		
Titanium (Ti)-Dissolved	<0.00030		0.00030	mg/L	21-DEC-18		
Tungsten (W)-Dissolved	<0.00010		0.00010	mg/L	21-DEC-18		
Uranium (U)-Dissolved	0.000340		0.000010	mg/L	21-DEC-18	0.02	
Vanadium (V)-Dissolved	<0.00050		0.00050	mg/L	21-DEC-18		
Zinc (Zn)-Dissolved	<0.0010		0.0010	mg/L	21-DEC-18		5
Zirconium (Zr)-Dissolved	<0.00030		0.00030	mg/L	21-DEC-18		

** Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
* Analytical result for this parameter exceeds Guideline Limit listed on this report. Guideline Limits applied:

Ontario Drinking Water Regulation (ODWQS) JAN.1,2018 = [Suite] - ON-DW-STANDARD+GUIDELINES

#1: Schedule 1 (Microbiological) and 2 (Chemical) Standards (JAN,2018) **#2: Ontario DW Aesthetic and Operational Guidelines**

Sample Details Grouping	Analyte	Result	Qualifier	D.L.	Units	Analyzed	Guideline Limits #1	Guideline Limits #2
L2213518-11	23089181218011							
Sampled By:	T. MARTIN on 18-DEC-18 @ 09:0							
Matrix:	WATER							
Physical Tests								
	Conductivity	560		3.0	umhos/cm	21-DEC-18		
	pH	7.79		0.10	pH units	21-DEC-18		6.5-8.5
	Total Dissolved Solids	353	DLDS	20	mg/L	24-DEC-18		500
Anions and Nutrients								
	Alkalinity, Bicarbonate (as CaCO3)	310	DLM	250	mg/L	22-DEC-18		
	Alkalinity, Carbonate (as CaCO3)	<250	DLM	250	mg/L	22-DEC-18		
	Alkalinity, Hydroxide (as CaCO3)	<250	DLM	250	mg/L	22-DEC-18		
	Alkalinity, Total (as CaCO3)	310	DLM	250	mg/L	22-DEC-18		30-500
	Bromide (Br)	<0.10		0.10	mg/L	21-DEC-18		
	Chloride (Cl)	19.6		0.50	mg/L	21-DEC-18		250
	Computed Conductivity	566			uS/cm	21-JAN-19		
	Conductivity % Difference	1.0			%	21-JAN-19		
	Fluoride (F)	0.063		0.020	mg/L	21-DEC-18	1.5	
	Hardness (as CaCO3)	327			mg/L	21-JAN-19		*80-100
	Ion Balance	109			%	21-JAN-19		
	Langelier Index	0.8			No Unit	21-JAN-19		
	Nitrate (as N)	4.31		0.020	mg/L	21-DEC-18	10	
	Nitrite (as N)	<0.010		0.010	mg/L	21-DEC-18	1	
	Total Kjeldahl Nitrogen	0.39	TKNI	0.15	mg/L	27-DEC-18		
	Saturation pH	6.99			pH	21-JAN-19		
	TDS (Calculated)	353			mg/L	21-JAN-19		
	Sulfate (SO4)	6.18		0.30	mg/L	21-DEC-18		500
	Anion Sum	6.18			me/L	21-JAN-19		
	Cation Sum	6.73			me/L	21-JAN-19		
	Cation - Anion Balance	4.3			%	21-JAN-19		
Dissolved Metals								
	Dissolved Metals Filtration Location	FIELD			No Unit	21-DEC-18		
	Aluminum (Al)-Dissolved	<0.0050		0.0050	mg/L	21-DEC-18		0.1
	Antimony (Sb)-Dissolved	<0.00010		0.00010	mg/L	21-DEC-18	0.006	
	Arsenic (As)-Dissolved	0.00020		0.00010	mg/L	21-DEC-18	0.0100	
	Barium (Ba)-Dissolved	0.0129		0.00010	mg/L	21-DEC-18	1	
	Beryllium (Be)-Dissolved	<0.00010		0.00010	mg/L	21-DEC-18		
	Bismuth (Bi)-Dissolved	<0.000050		0.000050	mg/L	21-DEC-18		
	Boron (B)-Dissolved	<0.010		0.010	mg/L	21-DEC-18	5	
	Cadmium (Cd)-Dissolved	0.0000461		0.0000050	mg/L	21-DEC-18	0.005	
	Calcium (Ca)-Dissolved	90.3		0.050	mg/L	21-DEC-18		
	Cesium (Cs)-Dissolved	<0.000010		0.000010	mg/L	21-DEC-18		
	Chromium (Cr)-Dissolved	<0.00050		0.00050	mg/L	21-DEC-18	0.05	
	Cobalt (Co)-Dissolved	<0.00010		0.00010	mg/L	21-DEC-18		
	Copper (Cu)-Dissolved	0.00134		0.00020	mg/L	21-DEC-18		1
	Iron (Fe)-Dissolved	<0.010		0.010	mg/L	21-DEC-18		0.3
	Lead (Pb)-Dissolved	0.000072		0.000050	mg/L	21-DEC-18	0.01	
	Lithium (Li)-Dissolved	<0.0010		0.0010	mg/L	21-DEC-18		
	Magnesium (Mg)-Dissolved	24.6		0.0050	mg/L	21-DEC-18		
	Manganese (Mn)-Dissolved	0.00197		0.00050	mg/L	21-DEC-18		0.05
	Molybdenum (Mo)-Dissolved	0.000088		0.000050	mg/L	21-DEC-18		

** Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.

* Analytical result for this parameter exceeds Guideline Limit listed on this report. Guideline Limits applied:

Ontario Drinking Water Regulation (ODWQS) JAN.1,2018 = [Suite] - ON-DW-STANDARD+GUIDELINES

#1: Schedule 1 (Microbiological) and 2 (Chemical) Standards (JAN,2018) **#2: Ontario DW Aesthetic and Operational Guidelines**

Sample Details Grouping	Analyte	Result	Qualifier	D.L.	Units	Analyzed	Guideline Limits	
L2213518-11	23089181218011							
Sampled By:	T. MARTIN on 18-DEC-18 @ 09:0							
Matrix:	WATER						#1	#2
Dissolved Metals								
	Nickel (Ni)-Dissolved	<0.00050		0.00050	mg/L	21-DEC-18		
	Phosphorus (P)-Dissolved	<0.050		0.050	mg/L	21-DEC-18		
	Potassium (K)-Dissolved	0.877		0.050	mg/L	21-DEC-18		
	Rubidium (Rb)-Dissolved	0.00031		0.00020	mg/L	21-DEC-18		
	Selenium (Se)-Dissolved	0.000120		0.000050	mg/L	21-DEC-18	0.05	
	Silicon (Si)-Dissolved	3.80		0.050	mg/L	21-DEC-18		
	Silver (Ag)-Dissolved	<0.000050		0.000050	mg/L	21-DEC-18		
	Sodium (Na)-Dissolved	3.92		0.050	mg/L	21-DEC-18	20	200
	Strontium (Sr)-Dissolved	0.105		0.0010	mg/L	21-DEC-18		
	Sulfur (S)-Dissolved	2.15		0.50	mg/L	21-DEC-18		
	Tellurium (Te)-Dissolved	<0.00020		0.00020	mg/L	21-DEC-18		
	Thallium (Tl)-Dissolved	<0.000010		0.000010	mg/L	21-DEC-18		
	Thorium (Th)-Dissolved	<0.00010		0.00010	mg/L	21-DEC-18		
	Tin (Sn)-Dissolved	0.00010		0.00010	mg/L	21-DEC-18		
	Titanium (Ti)-Dissolved	<0.00030		0.00030	mg/L	21-DEC-18		
	Tungsten (W)-Dissolved	<0.00010		0.00010	mg/L	21-DEC-18		
	Uranium (U)-Dissolved	0.000172		0.000010	mg/L	21-DEC-18	0.02	
	Vanadium (V)-Dissolved	<0.00050		0.00050	mg/L	21-DEC-18		
	Zinc (Zn)-Dissolved	0.0078		0.0010	mg/L	21-DEC-18		5
	Zirconium (Zr)-Dissolved	<0.00030		0.00030	mg/L	21-DEC-18		
L2213518-12	23089181218012							
Sampled By:	T. MARTIN on 18-DEC-18 @ 09:0							
Matrix:	WATER						#1	#2
Physical Tests								
	Conductivity	1060		3.0	umhos/cm	21-DEC-18		
	pH	7.53		0.10	pH units	21-DEC-18		6.5-8.5
	Total Dissolved Solids	643	DLDS	20	mg/L	24-DEC-18		*500
Anions and Nutrients								
	Alkalinity, Bicarbonate (as CaCO3)	307		10	mg/L	22-DEC-18		
	Alkalinity, Carbonate (as CaCO3)	<10		10	mg/L	22-DEC-18		
	Alkalinity, Hydroxide (as CaCO3)	<10		10	mg/L	22-DEC-18		
	Alkalinity, Total (as CaCO3)	307		10	mg/L	22-DEC-18		30-500
	Bromide (Br)	0.31		0.10	mg/L	21-DEC-18		
	Chloride (Cl)	170		0.50	mg/L	21-DEC-18		250
	Computed Conductivity	1000			uS/cm	27-DEC-18		
	Conductivity % Difference	-5.2			%	27-DEC-18		
	Fluoride (F)	0.063		0.020	mg/L	21-DEC-18	1.5	
	Hardness (as CaCO3)	370			mg/L	27-DEC-18		*80-100
	Ion Balance	109			%	27-DEC-18		
	Langelier Index	0.5			No Unit	27-DEC-18		
	Nitrate (as N)	1.21		0.020	mg/L	21-DEC-18	10	
	Nitrite (as N)	0.021		0.010	mg/L	21-DEC-18	1	
	Total Kjeldahl Nitrogen	0.42		0.15	mg/L	27-DEC-18		
	Saturation pH	7.00			pH	27-DEC-18		
	TDS (Calculated)	613			mg/L	27-DEC-18		
	Sulfate (SO4)	27.9		0.30	mg/L	21-DEC-18		500

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Ontario Drinking Water Regulation (ODWQS) JAN.1,2018 = [Suite] - ON-DW-STANDARD+GUIDELINES

#1: Schedule 1 (Microbiological) and 2 (Chemical) Standards (JAN,2018) **#2: Ontario DW Aesthetic and Operational Guidelines**

ANALYTICAL GUIDELINE REPORT

23089-528

Sample Details Grouping Analyte	Result	Qualifier	D.L.	Units	Analyzed	Guideline Limits #1	Guideline Limits #2
L2213518-12 23089181218012							
Sampled By: T. MARTIN on 18-DEC-18 @ 09:02							
Matrix: WATER							
Anions and Nutrients							
Anion Sum	10.5			me/L	27-DEC-18		
Cation Sum	11.5			me/L	27-DEC-18		
Cation - Anion Balance	4.3			%	27-DEC-18		
Dissolved Metals							
Dissolved Metals Filtration Location	FIELD			No Unit	21-DEC-18		
Aluminum (Al)-Dissolved	<0.0050		0.0050	mg/L	21-DEC-18		0.1
Antimony (Sb)-Dissolved	<0.00010		0.00010	mg/L	21-DEC-18	0.006	
Arsenic (As)-Dissolved	0.00010		0.00010	mg/L	21-DEC-18	0.0100	
Barium (Ba)-Dissolved	0.126		0.00010	mg/L	21-DEC-18	1	
Beryllium (Be)-Dissolved	<0.00010		0.00010	mg/L	21-DEC-18		
Bismuth (Bi)-Dissolved	<0.000050		0.000050	mg/L	21-DEC-18		
Boron (B)-Dissolved	0.014		0.010	mg/L	21-DEC-18	5	
Cadmium (Cd)-Dissolved	0.0000601		0.0000050	mg/L	21-DEC-18	0.005	
Calcium (Ca)-Dissolved	101		0.050	mg/L	21-DEC-18		
Cesium (Cs)-Dissolved	<0.000010		0.000010	mg/L	21-DEC-18		
Chromium (Cr)-Dissolved	<0.00050		0.00050	mg/L	21-DEC-18	0.05	
Cobalt (Co)-Dissolved	0.00026		0.00010	mg/L	21-DEC-18		
Copper (Cu)-Dissolved	0.00087		0.00020	mg/L	21-DEC-18		1
Iron (Fe)-Dissolved	<0.010		0.010	mg/L	21-DEC-18		0.3
Lead (Pb)-Dissolved	0.000175		0.000050	mg/L	21-DEC-18	0.01	
Lithium (Li)-Dissolved	0.0029		0.0010	mg/L	21-DEC-18		
Magnesium (Mg)-Dissolved	28.5		0.0050	mg/L	21-DEC-18		
Manganese (Mn)-Dissolved	0.0134		0.00050	mg/L	21-DEC-18		0.05
Molybdenum (Mo)-Dissolved	0.000527		0.000050	mg/L	21-DEC-18		
Nickel (Ni)-Dissolved	0.00196		0.00050	mg/L	21-DEC-18		
Phosphorus (P)-Dissolved	<0.050		0.050	mg/L	21-DEC-18		
Potassium (K)-Dissolved	3.33		0.050	mg/L	21-DEC-18		
Rubidium (Rb)-Dissolved	0.00171		0.00020	mg/L	21-DEC-18		
Selenium (Se)-Dissolved	0.000261		0.000050	mg/L	21-DEC-18	0.05	
Silicon (Si)-Dissolved	5.29		0.050	mg/L	21-DEC-18		
Silver (Ag)-Dissolved	<0.000050		0.000050	mg/L	21-DEC-18		
Sodium (Na)-Dissolved	92.4		0.050	mg/L	21-DEC-18	*20	200
Strontium (Sr)-Dissolved	0.160		0.0010	mg/L	21-DEC-18		
Sulfur (S)-Dissolved	9.89		0.50	mg/L	21-DEC-18		
Tellurium (Te)-Dissolved	<0.00020		0.00020	mg/L	21-DEC-18		
Thallium (Tl)-Dissolved	0.000034		0.000010	mg/L	21-DEC-18		
Thorium (Th)-Dissolved	<0.00010		0.00010	mg/L	21-DEC-18		
Tin (Sn)-Dissolved	<0.00010		0.00010	mg/L	21-DEC-18		
Titanium (Ti)-Dissolved	<0.00030		0.00030	mg/L	21-DEC-18		
Tungsten (W)-Dissolved	<0.00010		0.00010	mg/L	21-DEC-18		
Uranium (U)-Dissolved	0.000462		0.000010	mg/L	21-DEC-18	0.02	
Vanadium (V)-Dissolved	<0.00050		0.00050	mg/L	21-DEC-18		
Zinc (Zn)-Dissolved	0.150		0.0010	mg/L	21-DEC-18		5
Zirconium (Zr)-Dissolved	<0.00030		0.00030	mg/L	21-DEC-18		

** Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.

* Analytical result for this parameter exceeds Guideline Limit listed on this report. Guideline Limits applied:

Ontario Drinking Water Regulation (ODWQS) JAN.1,2018 = [Suite] - ON-DW-STANDARD+GUIDELINES

#1: Schedule 1 (Microbiological) and 2 (Chemical) Standards (JAN,2018) **#2: Ontario DW Aesthetic and Operational Guidelines**

ANALYTICAL GUIDELINE REPORT

Sample Details Grouping Analyte	Result	Qualifier	D.L.	Units	Analyzed	Guideline Limits #1	Guideline Limits #2
L2213518-13 23089181220013							
Sampled By: T. MARTIN on 18-DEC-18 @ 09:0							
Matrix: WATER							
Physical Tests							
Conductivity	583		3.0	umhos/cm	21-DEC-18		
pH	7.64		0.10	pH units	21-DEC-18		6.5-8.5
Total Dissolved Solids	393	DLDS	20	mg/L	24-DEC-18		500
Anions and Nutrients							
Alkalinity, Bicarbonate (as CaCO3)	350	DLM	250	mg/L	22-DEC-18		
Alkalinity, Carbonate (as CaCO3)	<250	DLM	250	mg/L	22-DEC-18		
Alkalinity, Hydroxide (as CaCO3)	<250	DLM	250	mg/L	22-DEC-18		
Alkalinity, Total (as CaCO3)	350	DLM	250	mg/L	22-DEC-18		30-500
Bromide (Br)	<0.10		0.10	mg/L	21-DEC-18		
Chloride (Cl)	12.9		0.50	mg/L	21-DEC-18		250
Computed Conductivity	661			uS/cm	27-DEC-18		
Conductivity % Difference	12.5			%	27-DEC-18		
Fluoride (F)	0.096		0.020	mg/L	21-DEC-18	1.5	
Hardness (as CaCO3)	323			mg/L	27-DEC-18		*80-100
Ion Balance	91.9			%	27-DEC-18		
Langelier Index	0.6			No Unit	27-DEC-18		
Nitrate (as N)	0.081		0.020	mg/L	21-DEC-18	10	
Nitrite (as N)	<0.010		0.010	mg/L	21-DEC-18	1	
Total Kjeldahl Nitrogen	<1.5	DLM	1.5	mg/L	28-DEC-18		
Saturation pH	7.04			pH	27-DEC-18		
TDS (Calculated)	427			mg/L	27-DEC-18		
Sulfate (SO4)	82.2		0.30	mg/L	21-DEC-18		500
Anion Sum	7.77			me/L	27-DEC-18		
Cation Sum	7.13			me/L	27-DEC-18		
Cation - Anion Balance	-4.2			%	27-DEC-18		
Dissolved Metals							
Dissolved Metals Filtration Location	FIELD			No Unit	21-DEC-18		
Aluminum (Al)-Dissolved	0.165		0.0050	mg/L	21-DEC-18		*0.1
Antimony (Sb)-Dissolved	<0.00010		0.00010	mg/L	21-DEC-18	0.006	
Arsenic (As)-Dissolved	0.00196		0.00010	mg/L	21-DEC-18	0.0100	
Barium (Ba)-Dissolved	0.112		0.00010	mg/L	21-DEC-18	1	
Beryllium (Be)-Dissolved	<0.00010		0.00010	mg/L	21-DEC-18		
Bismuth (Bi)-Dissolved	<0.000050		0.000050	mg/L	21-DEC-18		
Boron (B)-Dissolved	<0.010		0.010	mg/L	21-DEC-18	5	
Cadmium (Cd)-Dissolved	0.0000131		0.0000050	mg/L	21-DEC-18	0.005	
Calcium (Ca)-Dissolved	76.6		0.050	mg/L	21-DEC-18		
Cesium (Cs)-Dissolved	0.000017		0.000010	mg/L	21-DEC-18		
Chromium (Cr)-Dissolved	<0.00050		0.00050	mg/L	21-DEC-18	0.05	
Cobalt (Co)-Dissolved	0.00018		0.00010	mg/L	21-DEC-18		
Copper (Cu)-Dissolved	0.00118		0.00020	mg/L	21-DEC-18		1
Iron (Fe)-Dissolved	0.887		0.010	mg/L	21-DEC-18		*0.3
Lead (Pb)-Dissolved	0.00155		0.000050	mg/L	21-DEC-18	0.01	
Lithium (Li)-Dissolved	0.0027		0.0010	mg/L	21-DEC-18		
Magnesium (Mg)-Dissolved	32.0		0.0050	mg/L	21-DEC-18		
Manganese (Mn)-Dissolved	0.0584		0.00050	mg/L	21-DEC-18		*0.05
Molybdenum (Mo)-Dissolved	0.00219		0.000050	mg/L	21-DEC-18		

** Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.

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Ontario Drinking Water Regulation (ODWQS) JAN.1,2018 = [Suite] - ON-DW-STANDARD+GUIDELINES

#1: Schedule 1 (Microbiological) and 2 (Chemical) Standards (JAN,2018) **#2: Ontario DW Aesthetic and Operational Guidelines**

ANALYTICAL GUIDELINE REPORT

L2213518-13 23089181220013
Sampled By: T. MARTIN on 18-DEC-18 @ 09:0
Matrix: WATER

Sample Details Grouping / Analyte	Result	Qualifier	D.L.	Units	Analyzed	Guideline Limits #1	Guideline Limits #2
Dissolved Metals							
Nickel (Ni)-Dissolved	0.00068		0.00050	mg/L	21-DEC-18		
Phosphorus (P)-Dissolved	<0.050		0.050	mg/L	21-DEC-18		
Potassium (K)-Dissolved	1.54		0.050	mg/L	21-DEC-18		
Rubidium (Rb)-Dissolved	0.00117		0.00020	mg/L	21-DEC-18		
Selenium (Se)-Dissolved	<0.000050		0.000050	mg/L	21-DEC-18	0.05	
Silicon (Si)-Dissolved	6.86		0.050	mg/L	21-DEC-18		
Silver (Ag)-Dissolved	<0.000050		0.000050	mg/L	21-DEC-18		
Sodium (Na)-Dissolved	14.8		0.050	mg/L	21-DEC-18	20	200
Strontium (Sr)-Dissolved	0.141		0.0010	mg/L	21-DEC-18		
Sulfur (S)-Dissolved	27.8		0.50	mg/L	21-DEC-18		
Tellurium (Te)-Dissolved	<0.00020		0.00020	mg/L	21-DEC-18		
Thallium (Tl)-Dissolved	<0.000010		0.000010	mg/L	21-DEC-18		
Thorium (Th)-Dissolved	<0.00010		0.00010	mg/L	21-DEC-18		
Tin (Sn)-Dissolved	0.00035		0.00010	mg/L	21-DEC-18		
Titanium (Ti)-Dissolved	<0.0060	DLUI	0.0060	mg/L	21-DEC-18		
Tungsten (W)-Dissolved	<0.00010		0.00010	mg/L	21-DEC-18		
Uranium (U)-Dissolved	0.00154		0.000010	mg/L	21-DEC-18	0.02	
Vanadium (V)-Dissolved	<0.00050		0.00050	mg/L	21-DEC-18		
Zinc (Zn)-Dissolved	0.0073		0.0010	mg/L	21-DEC-18		5
Zirconium (Zr)-Dissolved	<0.00030		0.00030	mg/L	21-DEC-18		

L2213518-14 23089181220014
Sampled By: T. MARTIN on 18-DEC-18 @ 09:0
Matrix: WATER

Sample Details Grouping / Analyte	Result	Qualifier	D.L.	Units	Analyzed	Guideline Limits #1	Guideline Limits #2
Physical Tests							
Conductivity	388		3.0	umhos/cm	21-DEC-18		
pH	7.85		0.10	pH units	21-DEC-18		6.5-8.5
Total Dissolved Solids	238	DLDS	20	mg/L	24-DEC-18		500
Anions and Nutrients							
Alkalinity, Bicarbonate (as CaCO3)	211		10	mg/L	22-DEC-18		
Alkalinity, Carbonate (as CaCO3)	<10		10	mg/L	22-DEC-18		
Alkalinity, Hydroxide (as CaCO3)	<10		10	mg/L	22-DEC-18		
Alkalinity, Total (as CaCO3)	211		10	mg/L	22-DEC-18		30-500
Bromide (Br)	<0.10		0.10	mg/L	21-DEC-18		
Chloride (Cl)	3.51		0.50	mg/L	21-DEC-18		250
Computed Conductivity	380			uS/cm	21-JAN-19		
Conductivity % Difference	-2.2			%	21-JAN-19		
Fluoride (F)	0.056		0.020	mg/L	21-DEC-18	1.5	
Hardness (as CaCO3)	217			mg/L	21-JAN-19		*80-100
Ion Balance	116			%	21-JAN-19		
Langelier Index	0.5			No Unit	21-JAN-19		
Nitrate (as N)	<0.020		0.020	mg/L	21-DEC-18	10	
Nitrite (as N)	<0.010		0.010	mg/L	21-DEC-18	1	
Total Kjeldahl Nitrogen	<0.15		0.15	mg/L	28-DEC-18		
Saturation pH	7.36			pH	21-JAN-19		
TDS (Calculated)	226			mg/L	21-JAN-19		
Sulfate (SO4)	16.3		0.30	mg/L	21-DEC-18		500

** Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
* Analytical result for this parameter exceeds Guideline Limit listed on this report. Guideline Limits applied:

Ontario Drinking Water Regulation (ODWQS) JAN.1,2018 = [Suite] - ON-DW-STANDARD+GUIDELINES

#1: Schedule 1 (Microbiological) and 2 (Chemical) Standards (JAN,2018) **#2: Ontario DW Aesthetic and Operational Guidelines**

23089-528

ANALYTICAL GUIDELINE REPORT

L2213518-14 23089181220014
Sampled By: T. MARTIN on 18-DEC-18 @ 09:02
Matrix: WATER

Sample Details Grouping	Analyte	Result	Qualifier	D.L.	Units	Analyzed	Guideline Limits #1	#2
Anions and Nutrients								
	Anion Sum	3.93			me/L	21-JAN-19		
	Cation Sum	4.55			me/L	21-JAN-19		
	Cation - Anion Balance	7.3			%	21-JAN-19		
Dissolved Metals								
	Dissolved Metals Filtration Location	FIELD			No Unit	21-DEC-18		
	Aluminum (Al)-Dissolved	<0.0050		0.0050	mg/L	21-DEC-18		0.1
	Antimony (Sb)-Dissolved	<0.00010		0.00010	mg/L	21-DEC-18	0.006	
	Arsenic (As)-Dissolved	0.00119		0.00010	mg/L	21-DEC-18	0.0100	
	Barium (Ba)-Dissolved	0.103		0.00010	mg/L	21-DEC-18	1	
	Beryllium (Be)-Dissolved	<0.00010		0.00010	mg/L	21-DEC-18		
	Bismuth (Bi)-Dissolved	<0.000050		0.000050	mg/L	21-DEC-18		
	Boron (B)-Dissolved	<0.010		0.010	mg/L	21-DEC-18	5	
	Cadmium (Cd)-Dissolved	0.0000061		0.0000050	mg/L	21-DEC-18	0.005	
	Calcium (Ca)-Dissolved	53.2		0.050	mg/L	21-DEC-18		
	Cesium (Cs)-Dissolved	<0.000010		0.000010	mg/L	21-DEC-18		
	Chromium (Cr)-Dissolved	<0.00050		0.00050	mg/L	21-DEC-18	0.05	
	Cobalt (Co)-Dissolved	<0.00010		0.00010	mg/L	21-DEC-18		
	Copper (Cu)-Dissolved	0.00045		0.00020	mg/L	21-DEC-18		1
	Iron (Fe)-Dissolved	0.081		0.010	mg/L	21-DEC-18		0.3
	Lead (Pb)-Dissolved	0.00117		0.000050	mg/L	21-DEC-18	0.01	
	Lithium (Li)-Dissolved	0.0022		0.0010	mg/L	21-DEC-18		
	Magnesium (Mg)-Dissolved	20.4		0.0050	mg/L	21-DEC-18		
	Manganese (Mn)-Dissolved	0.0138		0.00050	mg/L	21-DEC-18		0.05
	Molybdenum (Mo)-Dissolved	0.000618		0.000050	mg/L	21-DEC-18		
	Nickel (Ni)-Dissolved	0.00112		0.00050	mg/L	21-DEC-18		
	Phosphorus (P)-Dissolved	<0.050		0.050	mg/L	21-DEC-18		
	Potassium (K)-Dissolved	0.962		0.050	mg/L	21-DEC-18		
	Rubidium (Rb)-Dissolved	0.00047		0.00020	mg/L	21-DEC-18		
	Selenium (Se)-Dissolved	<0.000050		0.000050	mg/L	21-DEC-18	0.05	
	Silicon (Si)-Dissolved	7.72		0.050	mg/L	21-DEC-18		
	Silver (Ag)-Dissolved	<0.000050		0.000050	mg/L	21-DEC-18		
	Sodium (Na)-Dissolved	4.46		0.050	mg/L	21-DEC-18	20	200
	Strontium (Sr)-Dissolved	0.0969		0.0010	mg/L	21-DEC-18		
	Sulfur (S)-Dissolved	5.46		0.50	mg/L	21-DEC-18		
	Tellurium (Te)-Dissolved	<0.00020		0.00020	mg/L	21-DEC-18		
	Thallium (Tl)-Dissolved	<0.000010		0.000010	mg/L	21-DEC-18		
	Thorium (Th)-Dissolved	<0.00010		0.00010	mg/L	21-DEC-18		
	Tin (Sn)-Dissolved	<0.00010		0.00010	mg/L	21-DEC-18		
	Titanium (Ti)-Dissolved	<0.00030		0.00030	mg/L	21-DEC-18		
	Tungsten (W)-Dissolved	0.00014		0.00010	mg/L	21-DEC-18		
	Uranium (U)-Dissolved	0.000185		0.000010	mg/L	21-DEC-18	0.02	
	Vanadium (V)-Dissolved	<0.00050		0.00050	mg/L	21-DEC-18		
	Zinc (Zn)-Dissolved	0.0061		0.0010	mg/L	21-DEC-18		5
	Zirconium (Zr)-Dissolved	<0.00030		0.00030	mg/L	21-DEC-18		

** Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
* Analytical result for this parameter exceeds Guideline Limit listed on this report. Guideline Limits applied:

Ontario Drinking Water Regulation (ODWQS) JAN.1,2018 = [Suite] - ON-DW-STANDARD+GUIDELINES

#1: Schedule 1 (Microbiological) and 2 (Chemical) Standards (JAN,2018) **#2: Ontario DW Aesthetic and Operational Guidelines**

L2213518-15 23089181220015
Sampled By: T. MARTIN on 18-DEC-18 @ 09:0
Matrix: WATER

Sample Details Grouping	Analyte	Result	Qualifier	D.L.	Units	Analyzed	Guideline Limits #1	Guideline Limits #2
Physical Tests								
	Conductivity	587		3.0	umhos/cm	21-DEC-18		
	pH	7.67		0.10	pH units	21-DEC-18		6.5-8.5
	Total Dissolved Solids	361	DLDS	20	mg/L	24-DEC-18		500
Anions and Nutrients								
	Alkalinity, Bicarbonate (as CaCO3)	280		10	mg/L	22-DEC-18		
	Alkalinity, Carbonate (as CaCO3)	<10		10	mg/L	22-DEC-18		
	Alkalinity, Hydroxide (as CaCO3)	<10		10	mg/L	22-DEC-18		
	Alkalinity, Total (as CaCO3)	280		10	mg/L	22-DEC-18		30-500
	Bromide (Br)	<0.10		0.10	mg/L	21-DEC-18		
	Chloride (Cl)	12.4		0.50	mg/L	21-DEC-18		250
	Computed Conductivity	584			uS/cm	27-DEC-18		
	Conductivity % Difference	-0.5			%	27-DEC-18		
	Fluoride (F)	0.066		0.020	mg/L	21-DEC-18	1.5	
	Hardness (as CaCO3)	340			mg/L	27-DEC-18		*80-100
	Ion Balance	116			%	27-DEC-18		
	Langelier Index	0.6			No Unit	27-DEC-18		
	Nitrate (as N)	0.031		0.020	mg/L	21-DEC-18	10	
	Nitrite (as N)	<0.010		0.010	mg/L	21-DEC-18	1	
	Total Kjeldahl Nitrogen	0.27		0.15	mg/L	28-DEC-18		
	Saturation pH	7.07			pH	27-DEC-18		
	TDS (Calculated)	354			mg/L	27-DEC-18		
	Sulfate (SO4)	51.4		0.30	mg/L	21-DEC-18		500
	Anion Sum	6.04			me/L	27-DEC-18		
	Cation Sum	7.03			me/L	27-DEC-18		
	Cation - Anion Balance	7.6			%	27-DEC-18		
Dissolved Metals								
	Dissolved Metals Filtration Location	FIELD			No Unit	21-DEC-18		
	Aluminum (Al)-Dissolved	<0.0050		0.0050	mg/L	21-DEC-18		0.1
	Antimony (Sb)-Dissolved	<0.00010		0.00010	mg/L	21-DEC-18	0.006	
	Arsenic (As)-Dissolved	0.00208		0.00010	mg/L	21-DEC-18	0.0100	
	Barium (Ba)-Dissolved	0.121		0.00010	mg/L	21-DEC-18	1	
	Beryllium (Be)-Dissolved	<0.00010		0.00010	mg/L	21-DEC-18		
	Bismuth (Bi)-Dissolved	<0.000050		0.000050	mg/L	21-DEC-18		
	Boron (B)-Dissolved	<0.010		0.010	mg/L	21-DEC-18	5	
	Cadmium (Cd)-Dissolved	<0.0000050		0.0000050	mg/L	21-DEC-18	0.005	
	Calcium (Ca)-Dissolved	86.2		0.050	mg/L	21-DEC-18		
	Cesium (Cs)-Dissolved	<0.000010		0.000010	mg/L	21-DEC-18		
	Chromium (Cr)-Dissolved	<0.00050		0.00050	mg/L	21-DEC-18	0.05	
	Cobalt (Co)-Dissolved	0.00015		0.00010	mg/L	21-DEC-18		
	Copper (Cu)-Dissolved	<0.00020		0.00020	mg/L	21-DEC-18		1
	Iron (Fe)-Dissolved	0.317		0.010	mg/L	21-DEC-18		*0.3
	Lead (Pb)-Dissolved	0.000057		0.000050	mg/L	21-DEC-18	0.01	
	Lithium (Li)-Dissolved	0.0030		0.0010	mg/L	21-DEC-18		
	Magnesium (Mg)-Dissolved	30.4		0.0050	mg/L	21-DEC-18		
	Manganese (Mn)-Dissolved	0.0949		0.00050	mg/L	21-DEC-18		*0.05
	Molybdenum (Mo)-Dissolved	0.00105		0.000050	mg/L	21-DEC-18		

** Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
* Analytical result for this parameter exceeds Guideline Limit listed on this report. Guideline Limits applied:

Ontario Drinking Water Regulation (ODWQS) JAN.1,2018 = [Suite] - ON-DW-STANDARD+GUIDELINES

#1: Schedule 1 (Microbiological) and 2 (Chemical) Standards (JAN,2018) **#2: Ontario DW Aesthetic and Operational Guidelines**

ANALYTICAL GUIDELINE REPORT

Sample Details Grouping	Analyte	Result	Qualifier	D.L.	Units	Analyzed	Guideline Limits #1	#2
L2213518-15	23089181220015							
Sampled By:	T. MARTIN on 18-DEC-18 @ 09:0							
Matrix:	WATER						#1	#2
Dissolved Metals								
	Nickel (Ni)-Dissolved	0.00072		0.00050	mg/L	21-DEC-18		
	Phosphorus (P)-Dissolved	<0.050		0.050	mg/L	21-DEC-18		
	Potassium (K)-Dissolved	1.25		0.050	mg/L	21-DEC-18		
	Rubidium (Rb)-Dissolved	0.00058		0.00020	mg/L	21-DEC-18		
	Selenium (Se)-Dissolved	<0.000050		0.000050	mg/L	21-DEC-18	0.05	
	Silicon (Si)-Dissolved	5.63		0.050	mg/L	21-DEC-18		
	Silver (Ag)-Dissolved	<0.000050		0.000050	mg/L	21-DEC-18		
	Sodium (Na)-Dissolved	4.44		0.050	mg/L	21-DEC-18	20	200
	Strontium (Sr)-Dissolved	0.118		0.0010	mg/L	21-DEC-18		
	Sulfur (S)-Dissolved	17.5		0.50	mg/L	21-DEC-18		
	Tellurium (Te)-Dissolved	<0.00020		0.00020	mg/L	21-DEC-18		
	Thallium (Tl)-Dissolved	<0.000010		0.000010	mg/L	21-DEC-18		
	Thorium (Th)-Dissolved	<0.00010		0.00010	mg/L	21-DEC-18		
	Tin (Sn)-Dissolved	<0.00010		0.00010	mg/L	21-DEC-18		
	Titanium (Ti)-Dissolved	<0.00030		0.00030	mg/L	21-DEC-18		
	Tungsten (W)-Dissolved	<0.00010		0.00010	mg/L	21-DEC-18		
	Uranium (U)-Dissolved	0.00276		0.000010	mg/L	21-DEC-18	0.02	
	Vanadium (V)-Dissolved	<0.00050		0.00050	mg/L	21-DEC-18		
	Zinc (Zn)-Dissolved	0.0170		0.0010	mg/L	21-DEC-18		5
	Zirconium (Zr)-Dissolved	<0.00030		0.00030	mg/L	21-DEC-18		
L2213518-16	23089181220016							
Sampled By:	T. MARTIN on 18-DEC-18 @ 09:0							
Matrix:	WATER						#1	#2
Physical Tests								
	Conductivity	613		3.0	umhos/cm	21-DEC-18		
	pH	7.80		0.10	pH units	21-DEC-18		6.5-8.5
	Total Dissolved Solids	437	DLDS	20	mg/L	24-DEC-18		500
Anions and Nutrients								
	Alkalinity, Bicarbonate (as CaCO3)	540	DLM	250	mg/L	22-DEC-18		
	Alkalinity, Carbonate (as CaCO3)	<250	DLM	250	mg/L	22-DEC-18		
	Alkalinity, Hydroxide (as CaCO3)	<250	DLM	250	mg/L	22-DEC-18		
	Alkalinity, Total (as CaCO3)	540	DLM	250	mg/L	22-DEC-18		*30-500
	Bromide (Br)	<0.10		0.10	mg/L	21-DEC-18		
	Chloride (Cl)	12.2		0.50	mg/L	21-DEC-18		250
	Computed Conductivity	716			uS/cm	21-JAN-19		
	Conductivity % Difference	15.5			%	21-JAN-19		
	Fluoride (F)	0.082		0.020	mg/L	21-DEC-18	1.5	
	Hardness (as CaCO3)	354			mg/L	21-JAN-19		*80-100
	Ion Balance	73.7			%	21-JAN-19		
	Langelier Index	1.0			No Unit	21-JAN-19		
	Nitrate (as N)	<0.020		0.020	mg/L	21-DEC-18	10	
	Nitrite (as N)	<0.010		0.010	mg/L	21-DEC-18	1	
	Total Kjeldahl Nitrogen	1.18		0.15	mg/L	28-DEC-18		
	Saturation pH	6.76			pH	21-JAN-19		
	TDS (Calculated)	497			mg/L	21-JAN-19		
	Sulfate (SO4)	34.5		0.30	mg/L	21-DEC-18		500

** Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.

* Analytical result for this parameter exceeds Guideline Limit listed on this report. Guideline Limits applied:

Ontario Drinking Water Regulation (ODWQS) JAN.1,2018 = [Suite] - ON-DW-STANDARD+GUIDELINES

#1: Schedule 1 (Microbiological) and 2 (Chemical) Standards (JAN,2018) **#2: Ontario DW Aesthetic and Operational Guidelines**

ANALYTICAL GUIDELINE REPORT

Sample Details Grouping	Analyte	Result	Qualifier	D.L.	Units	Analyzed	Guideline Limits	
L2213518-16 23089181220016								
Sampled By: T. MARTIN on 18-DEC-18 @ 09:02								
Matrix: WATER							#1	#2
Anions and Nutrients								
	Anion Sum	9.89			me/L	21-JAN-19		
	Cation Sum	7.29			me/L	21-JAN-19		
	Cation - Anion Balance	-15.2			%	21-JAN-19		
Dissolved Metals								
	Dissolved Metals Filtration Location	FIELD			No Unit	21-DEC-18		
	Aluminum (Al)-Dissolved	<0.0050		0.0050	mg/L	21-DEC-18		0.1
	Antimony (Sb)-Dissolved	<0.00010		0.00010	mg/L	21-DEC-18	0.006	
	Arsenic (As)-Dissolved	0.00015		0.00010	mg/L	21-DEC-18	0.0100	
	Barium (Ba)-Dissolved	0.117		0.00010	mg/L	21-DEC-18	1	
	Beryllium (Be)-Dissolved	<0.00010		0.00010	mg/L	21-DEC-18		
	Bismuth (Bi)-Dissolved	<0.000050		0.000050	mg/L	21-DEC-18		
	Boron (B)-Dissolved	<0.010		0.010	mg/L	21-DEC-18	5	
	Cadmium (Cd)-Dissolved	<0.0000050		0.0000050	mg/L	21-DEC-18	0.005	
	Calcium (Ca)-Dissolved	96.1		0.050	mg/L	21-DEC-18		
	Cesium (Cs)-Dissolved	<0.000010		0.000010	mg/L	21-DEC-18		
	Chromium (Cr)-Dissolved	<0.00050		0.00050	mg/L	21-DEC-18	0.05	
	Cobalt (Co)-Dissolved	<0.00010		0.00010	mg/L	21-DEC-18		
	Copper (Cu)-Dissolved	0.00074		0.00020	mg/L	21-DEC-18		1
	Iron (Fe)-Dissolved	2.97		0.010	mg/L	21-DEC-18		*0.3
	Lead (Pb)-Dissolved	<0.000050		0.000050	mg/L	21-DEC-18	0.01	
	Lithium (Li)-Dissolved	0.0017		0.0010	mg/L	21-DEC-18		
	Magnesium (Mg)-Dissolved	27.8		0.0050	mg/L	21-DEC-18		
	Manganese (Mn)-Dissolved	0.0845		0.00050	mg/L	21-DEC-18		*0.05
	Molybdenum (Mo)-Dissolved	0.000153		0.000050	mg/L	21-DEC-18		
	Nickel (Ni)-Dissolved	<0.00050		0.00050	mg/L	21-DEC-18		
	Phosphorus (P)-Dissolved	<0.050		0.050	mg/L	21-DEC-18		
	Potassium (K)-Dissolved	0.783		0.050	mg/L	21-DEC-18		
	Rubidium (Rb)-Dissolved	0.00055		0.00020	mg/L	21-DEC-18		
	Selenium (Se)-Dissolved	0.000090		0.000050	mg/L	21-DEC-18	0.05	
	Silicon (Si)-Dissolved	8.95		0.050	mg/L	21-DEC-18		
	Silver (Ag)-Dissolved	<0.000050		0.000050	mg/L	21-DEC-18		
	Sodium (Na)-Dissolved	4.18		0.050	mg/L	21-DEC-18	20	200
	Strontium (Sr)-Dissolved	0.139		0.0010	mg/L	21-DEC-18		
	Sulfur (S)-Dissolved	11.8		0.50	mg/L	21-DEC-18		
	Tellurium (Te)-Dissolved	<0.00020		0.00020	mg/L	21-DEC-18		
	Thallium (Tl)-Dissolved	<0.000010		0.000010	mg/L	21-DEC-18		
	Thorium (Th)-Dissolved	<0.00010		0.00010	mg/L	21-DEC-18		
	Tin (Sn)-Dissolved	<0.00010		0.00010	mg/L	21-DEC-18		
	Titanium (Ti)-Dissolved	<0.00030		0.00030	mg/L	21-DEC-18		
	Tungsten (W)-Dissolved	<0.00010		0.00010	mg/L	21-DEC-18		
	Uranium (U)-Dissolved	0.000031		0.000010	mg/L	21-DEC-18	0.02	
	Vanadium (V)-Dissolved	0.00051		0.00050	mg/L	21-DEC-18		
	Zinc (Zn)-Dissolved	0.0023		0.0010	mg/L	21-DEC-18		5
	Zirconium (Zr)-Dissolved	0.00060		0.00030	mg/L	21-DEC-18		

** Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
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Ontario Drinking Water Regulation (ODWQS) JAN.1,2018 = [Suite] - ON-DW-STANDARD+GUIDELINES

#1: Schedule 1 (Microbiological) and 2 (Chemical) Standards (JAN,2018) **#2: Ontario DW Aesthetic and Operational Guidelines**

Sample Details Grouping	Analyte	Result	Qualifier	D.L.	Units	Analyzed	Guideline Limits	
L2213518-17	23089181220017							
Sampled By:	T. MARTIN on 18-DEC-18 @ 09:0							
Matrix:	WATER						#1	#2
Physical Tests								
	Conductivity	594		3.0	umhos/cm	21-DEC-18		
	pH	7.64		0.10	pH units	21-DEC-18		6.5-8.5
	Total Dissolved Solids	376	DLDS	20	mg/L	24-DEC-18		500
Anions and Nutrients								
	Alkalinity, Bicarbonate (as CaCO3)	273		10	mg/L	22-DEC-18		
	Alkalinity, Carbonate (as CaCO3)	<10		10	mg/L	22-DEC-18		
	Alkalinity, Hydroxide (as CaCO3)	<10		10	mg/L	22-DEC-18		
	Alkalinity, Total (as CaCO3)	273		10	mg/L	22-DEC-18		30-500
	Bromide (Br)	<0.10		0.10	mg/L	21-DEC-18		
	Chloride (Cl)	28.5		0.50	mg/L	21-DEC-18		250
	Computed Conductivity	579			uS/cm	27-DEC-18		
	Conductivity % Difference	-2.5			%	27-DEC-18		
	Fluoride (F)	0.075		0.020	mg/L	21-DEC-18	1.5	
	Hardness (as CaCO3)	311			mg/L	27-DEC-18		*80-100
	Ion Balance	112			%	27-DEC-18		
	Langelier Index	0.5			No Unit	27-DEC-18		
	Nitrate (as N)	0.174		0.020	mg/L	21-DEC-18	10	
	Nitrite (as N)	<0.010		0.010	mg/L	21-DEC-18	1	
	Total Kjeldahl Nitrogen	<0.15		0.15	mg/L	28-DEC-18		
	Saturation pH	7.13			pH	27-DEC-18		
	TDS (Calculated)	350			mg/L	27-DEC-18		
	Sulfate (SO4)	36.9		0.30	mg/L	21-DEC-18		500
	Anion Sum	6.09			me/L	27-DEC-18		
	Cation Sum	6.82			me/L	27-DEC-18		
	Cation - Anion Balance	5.7			%	27-DEC-18		
Dissolved Metals								
	Dissolved Metals Filtration Location	FIELD			No Unit	21-DEC-18		
	Aluminum (Al)-Dissolved	<0.0050		0.0050	mg/L	21-DEC-18		0.1
	Antimony (Sb)-Dissolved	<0.00010		0.00010	mg/L	21-DEC-18	0.006	
	Arsenic (As)-Dissolved	0.00037		0.00010	mg/L	21-DEC-18	0.0100	
	Barium (Ba)-Dissolved	0.109		0.00010	mg/L	21-DEC-18	1	
	Beryllium (Be)-Dissolved	<0.00010		0.00010	mg/L	21-DEC-18		
	Bismuth (Bi)-Dissolved	<0.000050		0.000050	mg/L	21-DEC-18		
	Boron (B)-Dissolved	<0.010		0.010	mg/L	21-DEC-18	5	
	Cadmium (Cd)-Dissolved	0.0000102		0.0000050	mg/L	21-DEC-18	0.005	
	Calcium (Ca)-Dissolved	75.8		0.050	mg/L	21-DEC-18		
	Cesium (Cs)-Dissolved	<0.000010		0.000010	mg/L	21-DEC-18		
	Chromium (Cr)-Dissolved	<0.00050		0.00050	mg/L	21-DEC-18	0.05	
	Cobalt (Co)-Dissolved	0.00024		0.00010	mg/L	21-DEC-18		
	Copper (Cu)-Dissolved	0.00105		0.00020	mg/L	21-DEC-18		1
	Iron (Fe)-Dissolved	0.048		0.010	mg/L	21-DEC-18		0.3
	Lead (Pb)-Dissolved	0.000111		0.000050	mg/L	21-DEC-18	0.01	
	Lithium (Li)-Dissolved	0.0033		0.0010	mg/L	21-DEC-18		
	Magnesium (Mg)-Dissolved	29.6		0.0050	mg/L	21-DEC-18		
	Manganese (Mn)-Dissolved	0.0638		0.00050	mg/L	21-DEC-18		*0.05
	Molybdenum (Mo)-Dissolved	0.000805		0.000050	mg/L	21-DEC-18		

** Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.

* Analytical result for this parameter exceeds Guideline Limit listed on this report. Guideline Limits applied:

Ontario Drinking Water Regulation (ODWQS) JAN.1,2018 = [Suite] - ON-DW-STANDARD+GUIDELINES

#1: Schedule 1 (Microbiological) and 2 (Chemical) Standards (JAN,2018) **#2: Ontario DW Aesthetic and Operational Guidelines**

ANALYTICAL GUIDELINE REPORT

Sample Details Grouping	Analyte	Result	Qualifier	D.L.	Units	Analyzed	Guideline Limits #1	 #2
L2213518-17	23089181220017							
Sampled By:	T. MARTIN on 18-DEC-18 @ 09:02							
Matrix:	WATER							
Dissolved Metals								
	Nickel (Ni)-Dissolved	0.00116		0.00050	mg/L	21-DEC-18		
	Phosphorus (P)-Dissolved	<0.050		0.050	mg/L	21-DEC-18		
	Potassium (K)-Dissolved	1.38		0.050	mg/L	21-DEC-18		
	Rubidium (Rb)-Dissolved	0.00097		0.00020	mg/L	21-DEC-18		
	Selenium (Se)-Dissolved	<0.000050		0.000050	mg/L	21-DEC-18	0.05	
	Silicon (Si)-Dissolved	6.34		0.050	mg/L	21-DEC-18		
	Silver (Ag)-Dissolved	<0.000050		0.000050	mg/L	21-DEC-18		
	Sodium (Na)-Dissolved	13.1		0.050	mg/L	21-DEC-18	20	200
	Strontium (Sr)-Dissolved	0.115		0.0010	mg/L	21-DEC-18		
	Sulfur (S)-Dissolved	12.3		0.50	mg/L	21-DEC-18		
	Tellurium (Te)-Dissolved	<0.00020		0.00020	mg/L	21-DEC-18		
	Thallium (Tl)-Dissolved	0.000014		0.000010	mg/L	21-DEC-18		
	Thorium (Th)-Dissolved	<0.00010		0.00010	mg/L	21-DEC-18		
	Tin (Sn)-Dissolved	<0.00010		0.00010	mg/L	21-DEC-18		
	Titanium (Ti)-Dissolved	<0.00030		0.00030	mg/L	21-DEC-18		
	Tungsten (W)-Dissolved	<0.00010		0.00010	mg/L	21-DEC-18		
	Uranium (U)-Dissolved	0.000784		0.000010	mg/L	21-DEC-18	0.02	
	Vanadium (V)-Dissolved	<0.00050		0.00050	mg/L	21-DEC-18		
	Zinc (Zn)-Dissolved	0.0220		0.0010	mg/L	21-DEC-18		5
	Zirconium (Zr)-Dissolved	<0.00030		0.00030	mg/L	21-DEC-18		

** Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.

* Analytical result for this parameter exceeds Guideline Limit listed on this report. Guideline Limits applied:

Ontario Drinking Water Regulation (ODWQS) JAN.1,2018 = [Suite] - ON-DW-STANDARD+GUIDELINES

#1: Schedule 1 (Microbiological) and 2 (Chemical) Standards (JAN,2018) **#2: Ontario DW Aesthetic and Operational Guidelines**

Reference Information

Sample Parameter Qualifier key listed:

Qualifier	Description
DLDS	Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.
DLUI	Detection Limit Raised: Unknown Interference generated an apparent false positive test result.
TKNI	TKN result may be biased low due to Nitrate interference. Nitrate-N is > 10x TKN.
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Method Reference***
ALK-AUTO-WT	Water	Automated Speciated Alkalinity	EPA 310.2

This analysis is carried out using procedures adapted from EPA Method 310.2 "Alkalinity". Total Alkalinity is determined using the methyl orange colourimetric method.

ALS Test Code	Matrix	Test Description	Method Reference***
ALK-SPECIATED-WT	Water	pH Measurement for Spec. Alk	APHA 4500 H-Electrode

Water samples are analyzed directly by a calibrated pH meter.

ALS Test Code	Matrix	Test Description	Method Reference***
BR-IC-N-WT	Water	Bromide in Water by IC	EPA 300.1 (mod)

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

ALS Test Code	Matrix	Test Description	Method Reference***
CL-IC-N-WT	Water	Chloride by IC	EPA 300.1 (mod)

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

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

ALS Test Code	Matrix	Test Description	Method Reference***
EC-WT	Water	Conductivity	APHA 2510 B

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

ALS Test Code	Matrix	Test Description	Method Reference***
F-IC-N-WT	Water	Fluoride in Water by IC	EPA 300.1 (mod)

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

ALS Test Code	Matrix	Test Description	Method Reference***
IONBALANCE-OP03-WT	Water	Detailed Ion Balance Calculation	APHA 1030E, 2330B, 2510A
MET-D-CCMS-WT	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B/6020A (mod)

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

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

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

ALS Test Code	Matrix	Test Description	Method Reference***
NO2-IC-WT	Water	Nitrite in Water by IC	EPA 300.1 (mod)

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

ALS Test Code	Matrix	Test Description	Method Reference***
NO3-IC-WT	Water	Nitrate in Water by IC	EPA 300.1 (mod)

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

ALS Test Code	Matrix	Test Description	Method Reference***
SO4-IC-N-WT	Water	Sulfate in Water by IC	EPA 300.1 (mod)

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

ALS Test Code	Matrix	Test Description	Method Reference***
SOLIDS-TDS-WT	Water	Total Dissolved Solids	APHA 2540C

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

ALS Test Code	Matrix	Test Description	Method Reference***
TKN-WT	Water	Total Kjeldahl Nitrogen	APHA 4500-Norg D

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

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

Chain of Custody numbers:

92249 92250

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

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

Reference Information

GLOSSARY OF REPORT TERMS

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

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

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

Quality Control Report

Workorder: L2213518 Report Date: 24-JAN-19

Client: MATRIX SOLUTIONS INC.
650 WOODLAWN RD W UNIT 7B
GUELPH ON N1K 1B8
Contact: SCOTT MILLER

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
ALK-AUTO-WT	**Water**							
Batch R4412507								
WG2959669-4 DUP		**WG2959669-3**						
Alkalinity, Total (as CaCO3)		585	588		mg/L	0.5	20	22-DEC-18
Alkalinity, Bicarbonate (as CaCO3)		585	588		mg/L	0.5	25	22-DEC-18
Alkalinity, Carbonate (as CaCO3)		<10	<10	RPD-NA	mg/L	N/A	25	22-DEC-18
Alkalinity, Hydroxide (as CaCO3)		<10	<10	RPD-NA	mg/L	N/A	25	22-DEC-18
WG2959669-2 LCS								
Alkalinity, Total (as CaCO3)			99.0		%		85-115	22-DEC-18
WG2959669-6 LCS								
Alkalinity, Total (as CaCO3)			99.2		%		85-115	22-DEC-18
WG2959669-1 MB								
Alkalinity, Total (as CaCO3)			<10		mg/L		10	22-DEC-18
Alkalinity, Bicarbonate (as CaCO3)			<10		mg/L		10	22-DEC-18
Alkalinity, Carbonate (as CaCO3)			<10		mg/L		10	22-DEC-18
Alkalinity, Hydroxide (as CaCO3)			<10		mg/L		10	22-DEC-18
WG2959669-5 MB								
Alkalinity, Bicarbonate (as CaCO3)			<10		mg/L		10	22-DEC-18
Alkalinity, Carbonate (as CaCO3)			<10		mg/L		10	22-DEC-18
Alkalinity, Hydroxide (as CaCO3)			<10		mg/L		10	22-DEC-18
ALK-SPECIATED-WT	**Water**							
Batch R4409375								
WG2958836-3 DUP		**WG2958836-2**						
pH		7.64	7.58	J	pH units	0.06	0.2	21-DEC-18
WG2958836-1 LCS								
pH			6.99		pH units		6.9-7.1	21-DEC-18
BR-IC-N-WT	**Water**							
Batch R4412990								
WG2959277-15 DUP		**WG2959277-13**						
Bromide (Br)		<0.10	<0.10	RPD-NA	mg/L	N/A	20	21-DEC-18
WG2959277-20 DUP		**WG2959277-18**						
Bromide (Br)		<0.10	<0.10	RPD-NA	mg/L	N/A	20	21-DEC-18
WG2959277-12 LCS								
Bromide (Br)			99.0		%		85-115	21-DEC-18
WG2959277-17 LCS								
Bromide (Br)			101.6		%		85-115	21-DEC-18
WG2959277-11 MB								
Bromide (Br)			<0.10		mg/L		0.1	21-DEC-18
WG2959277-16 MB								

Quality Control Report

Client: MATRIX SOLUTIONS INC.
650 WOODLAWN RD W UNIT 7B
GUELPH ON N1K 1B8
Contact: SCOTT MILLER

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
BR-IC-N-WT	**Water**							
Batch R4412990								
WG2959277-16 MB								
Bromide (Br)			<0.10		mg/L		0.1	21-DEC-18
WG2959277-14 MS		**WG2959277-13**						
Bromide (Br)			83.4		%		75-125	21-DEC-18
WG2959277-19 MS		**WG2959277-18**						
Bromide (Br)			95.3		%		75-125	21-DEC-18
CL-IC-N-WT	**Water**							
Batch R4412990								
WG2959277-15 DUP		**WG2959277-13**						
Chloride (Cl)		85.7	86.6		mg/L	1.1	20	21-DEC-18
WG2959277-20 DUP		**WG2959277-18**						
Chloride (Cl)		13.0	12.7		mg/L	1.8	20	21-DEC-18
WG2959277-12 LCS								
Chloride (Cl)			101.2		%		90-110	21-DEC-18
WG2959277-17 LCS								
Chloride (Cl)			102.2		%		90-110	21-DEC-18
WG2959277-11 MB								
Chloride (Cl)			<0.50		mg/L		0.5	21-DEC-18
WG2959277-16 MB								
Chloride (Cl)			<0.50		mg/L		0.5	21-DEC-18
WG2959277-14 MS		**WG2959277-13**						
Chloride (Cl)			100.4		%		75-125	21-DEC-18
WG2959277-19 MS		**WG2959277-18**						
Chloride (Cl)			98.6		%		75-125	21-DEC-18
EC-WT	**Water**							
Batch R4409709								
WG2958838-4 DUP		**WG2958838-3**						
Conductivity		594	596		umhos/cm	0.3	10	21-DEC-18
WG2958838-2 LCS								
Conductivity			99.8		%		90-110	21-DEC-18
WG2958838-1 MB								
Conductivity			<3.0		umhos/cm		3	21-DEC-18
F-IC-N-WT	**Water**							
Batch R4412990								
WG2959277-15 DUP		**WG2959277-13**						
Fluoride (F)		0.115	0.118		mg/L	2.7	20	21-DEC-18
WG2959277-20 DUP		**WG2959277-18**						

Quality Control Report

Workorder: L2213518 Report Date: 24-JAN-19

Client: MATRIX SOLUTIONS INC.
650 WOODLAWN RD W UNIT 7B
GUELPH ON N1K 1B8
Contact: SCOTT MILLER

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
F-IC-N-WT	**Water**							
Batch R4412990								
WG2959277-20 DUP		**WG2959277-18**						
Fluoride (F)		0.098	0.085		mg/L	14	20	21-DEC-18
WG2959277-12 LCS								
Fluoride (F)			101.2		%		90-110	21-DEC-18
WG2959277-17 LCS								
Fluoride (F)			102.3		%		90-110	21-DEC-18
WG2959277-11 MB								
Fluoride (F)			<0.020		mg/L		0.02	21-DEC-18
WG2959277-16 MB								
Fluoride (F)			<0.020		mg/L		0.02	21-DEC-18
WG2959277-14 MS		**WG2959277-13**						
Fluoride (F)			97.0		%		75-125	21-DEC-18
WG2959277-19 MS		**WG2959277-18**						
Fluoride (F)			93.4		%		75-125	21-DEC-18
MET-D-CCMS-WT	**Water**							
Batch R4409207								
WG2958781-4 DUP		**WG2958781-3**						
Aluminum (Al)-Dissolved		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	21-DEC-18
Antimony (Sb)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	21-DEC-18
Arsenic (As)-Dissolved		0.00017	0.00017		mg/L	4.5	20	21-DEC-18
Barium (Ba)-Dissolved		0.0807	0.0854		mg/L	5.7	20	21-DEC-18
Beryllium (Be)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	21-DEC-18
Bismuth (Bi)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	21-DEC-18
Boron (B)-Dissolved		<0.010	<0.010	RPD-NA	mg/L	N/A	20	21-DEC-18
Cadmium (Cd)-Dissolved		0.0000158	0.0000135		mg/L	16	20	21-DEC-18
Calcium (Ca)-Dissolved		81.7	83.8		mg/L	2.5	20	21-DEC-18
Cesium (Cs)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	21-DEC-18
Chromium (Cr)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	21-DEC-18
Cobalt (Co)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	21-DEC-18
Copper (Cu)-Dissolved		0.00033	0.00032		mg/L	2.5	20	21-DEC-18
Iron (Fe)-Dissolved		0.012	0.012		mg/L	2.2	20	21-DEC-18
Lead (Pb)-Dissolved		0.000091	0.000088		mg/L	2.9	20	21-DEC-18
Lithium (Li)-Dissolved		0.0011	0.0010		mg/L	9.7	20	21-DEC-18
Magnesium (Mg)-Dissolved		28.3	28.8		mg/L	1.6	20	21-DEC-18
Manganese (Mn)-Dissolved		0.00451	0.00469		mg/L	4.1	20	21-DEC-18

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-WT	**Water**							
Batch R4409207								
WG2958781-4 DUP		**WG2958781-3**						
Molybdenum (Mo)-Dissolved		0.000248	0.000211		mg/L	16	20	21-DEC-18
Nickel (Ni)-Dissolved		0.00150	0.00145		mg/L	3.5	20	21-DEC-18
Phosphorus (P)-Dissolved		<0.050	<0.050	RPD-NA	mg/L	N/A	20	21-DEC-18
Potassium (K)-Dissolved		1.35	1.37		mg/L	1.1	20	21-DEC-18
Rubidium (Rb)-Dissolved		0.00427	0.00419		mg/L	1.9	20	21-DEC-18
Selenium (Se)-Dissolved		0.000310	0.000229	J	mg/L	0.000081	0.0001	21-DEC-18
Silicon (Si)-Dissolved		5.44	5.43		mg/L	0.0	20	21-DEC-18
Silver (Ag)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	21-DEC-18
Sodium (Na)-Dissolved		7.89	7.77		mg/L	1.5	20	21-DEC-18
Strontium (Sr)-Dissolved		0.0968	0.0947		mg/L	2.2	20	21-DEC-18
Sulfur (S)-Dissolved		6.08	6.15		mg/L	1.2	20	21-DEC-18
Tellurium (Te)-Dissolved		<0.00020	<0.00020	RPD-NA	mg/L	N/A	20	21-DEC-18
Thallium (Tl)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	21-DEC-18
Thorium (Th)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	21-DEC-18
Tin (Sn)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	21-DEC-18
Titanium (Ti)-Dissolved		<0.00030	<0.00030	RPD-NA	mg/L	N/A	20	21-DEC-18
Tungsten (W)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	21-DEC-18
Uranium (U)-Dissolved		0.000423	0.000412		mg/L	2.6	20	21-DEC-18
Vanadium (V)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	21-DEC-18
Zinc (Zn)-Dissolved		0.0164	0.0164		mg/L	0.1	20	21-DEC-18
Zirconium (Zr)-Dissolved		<0.00030	<0.00030	RPD-NA	mg/L	N/A	20	21-DEC-18
WG2958781-2 LCS								
Aluminum (Al)-Dissolved			104.0		%		80-120	21-DEC-18
Antimony (Sb)-Dissolved			99.5		%		80-120	21-DEC-18
Arsenic (As)-Dissolved			102.2		%		80-120	21-DEC-18
Barium (Ba)-Dissolved			100.7		%		80-120	21-DEC-18
Beryllium (Be)-Dissolved			99.6		%		80-120	21-DEC-18
Bismuth (Bi)-Dissolved			97.2		%		80-120	21-DEC-18
Boron (B)-Dissolved			100.6		%		80-120	21-DEC-18
Cadmium (Cd)-Dissolved			97.8		%		80-120	21-DEC-18
Calcium (Ca)-Dissolved			98.7		%		80-120	21-DEC-18
Cesium (Cs)-Dissolved			100.2		%		80-120	21-DEC-18
Chromium (Cr)-Dissolved			99.6		%		80-120	21-DEC-18

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-WT	**Water**							
Batch R4409207								
WG2958781-2 LCS								
Cobalt (Co)-Dissolved			98.8		%		80-120	21-DEC-18
Copper (Cu)-Dissolved			98.4		%		80-120	21-DEC-18
Iron (Fe)-Dissolved			96.7		%		80-120	21-DEC-18
Lead (Pb)-Dissolved			101.5		%		80-120	21-DEC-18
Lithium (Li)-Dissolved			99.4		%		80-120	21-DEC-18
Magnesium (Mg)-Dissolved			98.7		%		80-120	21-DEC-18
Manganese (Mn)-Dissolved			98.6		%		80-120	21-DEC-18
Molybdenum (Mo)-Dissolved			101.0		%		80-120	21-DEC-18
Nickel (Ni)-Dissolved			98.5		%		80-120	21-DEC-18
Phosphorus (P)-Dissolved			100.8		%		80-120	21-DEC-18
Potassium (K)-Dissolved			99.7		%		80-120	21-DEC-18
Rubidium (Rb)-Dissolved			104.6		%		80-120	21-DEC-18
Selenium (Se)-Dissolved			98.0		%		80-120	21-DEC-18
Silicon (Si)-Dissolved			96.3		%		60-140	21-DEC-18
Silver (Ag)-Dissolved			101.9		%		80-120	21-DEC-18
Sodium (Na)-Dissolved			103.9		%		80-120	21-DEC-18
Strontium (Sr)-Dissolved			101.3		%		80-120	21-DEC-18
Sulfur (S)-Dissolved			101.0		%		80-120	21-DEC-18
Tellurium (Te)-Dissolved			102.1		%		80-120	21-DEC-18
Thallium (Tl)-Dissolved			99.3		%		80-120	21-DEC-18
Thorium (Th)-Dissolved			100.4		%		80-120	21-DEC-18
Tin (Sn)-Dissolved			99.6		%		80-120	21-DEC-18
Titanium (Ti)-Dissolved			99.0		%		80-120	21-DEC-18
Tungsten (W)-Dissolved			105.4		%		80-120	21-DEC-18
Uranium (U)-Dissolved			100.2		%		80-120	21-DEC-18
Vanadium (V)-Dissolved			100.7		%		80-120	21-DEC-18
Zinc (Zn)-Dissolved			97.6		%		80-120	21-DEC-18
Zirconium (Zr)-Dissolved			99.4		%		80-120	21-DEC-18
WG2958781-1 MB								
Aluminum (Al)-Dissolved			<0.0050		mg/L		0.005	21-DEC-18
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	21-DEC-18
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	21-DEC-18
Barium (Ba)-Dissolved			<0.00010		mg/L		0.0001	21-DEC-18
Beryllium (Be)-Dissolved			<0.00010		mg/L		0.0001	21-DEC-18

Quality Control Report

Workorder: L2213518 Report Date: 24-JAN-19

Client: MATRIX SOLUTIONS INC.
650 WOODLAWN RD W UNIT 7B
GUELPH ON N1K 1B8
Contact: SCOTT MILLER

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-WT	**Water**							
Batch R4409207								
WG2958781-1 MB								
Bismuth (Bi)-Dissolved			<0.000050		mg/L		0.00005	21-DEC-18
Boron (B)-Dissolved			<0.010		mg/L		0.01	21-DEC-18
Cadmium (Cd)-Dissolved			<0.000005		mg/L		0.000005	21-DEC-18
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	21-DEC-18
Cesium (Cs)-Dissolved			<0.000010		mg/L		0.00001	21-DEC-18
Chromium (Cr)-Dissolved			<0.00050		mg/L		0.0005	21-DEC-18
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	21-DEC-18
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	21-DEC-18
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	21-DEC-18
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	21-DEC-18
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	21-DEC-18
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	21-DEC-18
Manganese (Mn)-Dissolved			<0.00050		mg/L		0.0005	21-DEC-18
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	21-DEC-18
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	21-DEC-18
Phosphorus (P)-Dissolved			<0.050		mg/L		0.05	21-DEC-18
Potassium (K)-Dissolved			<0.050		mg/L		0.05	21-DEC-18
Rubidium (Rb)-Dissolved			<0.00020		mg/L		0.0002	21-DEC-18
Selenium (Se)-Dissolved			<0.000050		mg/L		0.00005	21-DEC-18
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	21-DEC-18
Silver (Ag)-Dissolved			<0.000050		mg/L		0.00005	21-DEC-18
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	21-DEC-18
Strontium (Sr)-Dissolved			<0.0010		mg/L		0.001	21-DEC-18
Sulfur (S)-Dissolved			<0.50		mg/L		0.5	21-DEC-18
Tellurium (Te)-Dissolved			<0.00020		mg/L		0.0002	21-DEC-18
Thallium (Tl)-Dissolved			<0.000010		mg/L		0.00001	21-DEC-18
Thorium (Th)-Dissolved			<0.00010		mg/L		0.0001	21-DEC-18
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	21-DEC-18
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	21-DEC-18
Tungsten (W)-Dissolved			<0.00010		mg/L		0.0001	21-DEC-18
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	21-DEC-18
Vanadium (V)-Dissolved			<0.00050		mg/L		0.0005	21-DEC-18
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	21-DEC-18

Quality Control Report

Client: MATRIX SOLUTIONS INC.
650 WOODLAWN RD W UNIT 7B
GUELPH ON N1K 1B8
Contact: SCOTT MILLER

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-WT	**Water**							
Batch R4409207								
WG2958781-1 MB								
Zirconium (Zr)-Dissolved			<0.00030		mg/L		0.0003	21-DEC-18
WG2958781-5 MS		**WG2958781-6**						
Aluminum (Al)-Dissolved			101.0		%		70-130	21-DEC-18
Antimony (Sb)-Dissolved			98.9		%		70-130	21-DEC-18
Arsenic (As)-Dissolved			102.0		%		70-130	21-DEC-18
Barium (Ba)-Dissolved			N/A	MS-B	%		-	21-DEC-18
Beryllium (Be)-Dissolved			96.9		%		70-130	21-DEC-18
Bismuth (Bi)-Dissolved			80.0		%		70-130	21-DEC-18
Boron (B)-Dissolved			95.5		%		70-130	21-DEC-18
Cadmium (Cd)-Dissolved			100.7		%		70-130	21-DEC-18
Calcium (Ca)-Dissolved			N/A	MS-B	%		-	21-DEC-18
Cesium (Cs)-Dissolved			104.5		%		70-130	21-DEC-18
Chromium (Cr)-Dissolved			96.9		%		70-130	21-DEC-18
Cobalt (Co)-Dissolved			94.9		%		70-130	21-DEC-18
Copper (Cu)-Dissolved			93.2		%		70-130	21-DEC-18
Iron (Fe)-Dissolved			N/A	MS-B	%		-	21-DEC-18
Lead (Pb)-Dissolved			98.2		%		70-130	21-DEC-18
Lithium (Li)-Dissolved			98.0		%		70-130	21-DEC-18
Magnesium (Mg)-Dissolved			N/A	MS-B	%		-	21-DEC-18
Manganese (Mn)-Dissolved			N/A	MS-B	%		-	21-DEC-18
Molybdenum (Mo)-Dissolved			96.3		%		70-130	21-DEC-18
Nickel (Ni)-Dissolved			94.1		%		70-130	21-DEC-18
Phosphorus (P)-Dissolved			109.7		%		70-130	21-DEC-18
Potassium (K)-Dissolved			98.1		%		70-130	21-DEC-18
Rubidium (Rb)-Dissolved			101.9		%		70-130	21-DEC-18
Selenium (Se)-Dissolved			100.4		%		70-130	21-DEC-18
Silicon (Si)-Dissolved			N/A	MS-B	%		-	21-DEC-18
Silver (Ag)-Dissolved			82.6		%		70-130	24-DEC-18
Sodium (Na)-Dissolved			N/A	MS-B	%		-	21-DEC-18
Strontium (Sr)-Dissolved			N/A	MS-B	%		-	21-DEC-18
Sulfur (S)-Dissolved			N/A	MS-B	%		-	21-DEC-18
Tellurium (Te)-Dissolved			99.0		%		70-130	21-DEC-18
Thallium (Tl)-Dissolved			99.8		%		70-130	21-DEC-18
Thorium (Th)-Dissolved			98.1		%		70-130	21-DEC-18

Quality Control Report

Client: MATRIX SOLUTIONS INC.
650 WOODLAWN RD W UNIT 7B
GUELPH ON N1K 1B8
Contact: SCOTT MILLER

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-WT	**Water**							
Batch R4409207								
WG2958781-5 MS		**WG2958781-6**						
Tin (Sn)-Dissolved			100.9		%		70-130	21-DEC-18
Titanium (Ti)-Dissolved			100.7		%		70-130	21-DEC-18
Tungsten (W)-Dissolved			101.3		%		70-130	21-DEC-18
Uranium (U)-Dissolved			N/A	MS-B	%		-	21-DEC-18
Vanadium (V)-Dissolved			101.1		%		70-130	21-DEC-18
Zinc (Zn)-Dissolved			95.4		%		70-130	21-DEC-18
Zirconium (Zr)-Dissolved			97.4		%		70-130	21-DEC-18
NO2-IC-WT	**Water**							
Batch R4412990								
WG2959277-15 DUP		**WG2959277-13**						
Nitrite (as N)		<0.010	<0.010	RPD-NA	mg/L	N/A	25	21-DEC-18
WG2959277-20 DUP		**WG2959277-18**						
Nitrite (as N)		<0.010	<0.010	RPD-NA	mg/L	N/A	25	21-DEC-18
WG2959277-12 LCS								
Nitrite (as N)			97.2		%		70-130	21-DEC-18
WG2959277-17 LCS								
Nitrite (as N)			98.2		%		70-130	21-DEC-18
WG2959277-11 MB								
Nitrite (as N)			<0.010		mg/L		0.01	21-DEC-18
WG2959277-16 MB								
Nitrite (as N)			<0.010		mg/L		0.01	21-DEC-18
WG2959277-14 MS		**WG2959277-13**						
Nitrite (as N)			93.2		%		70-130	21-DEC-18
WG2959277-19 MS		**WG2959277-18**						
Nitrite (as N)			91.6		%		70-130	21-DEC-18
NO3-IC-WT	**Water**							
Batch R4412990								
WG2959277-15 DUP		**WG2959277-13**						
Nitrate (as N)		<0.020	<0.020	RPD-NA	mg/L	N/A	25	21-DEC-18
WG2959277-20 DUP		**WG2959277-18**						
Nitrate (as N)		0.080	0.078		mg/L	3.2	25	21-DEC-18
WG2959277-12 LCS								
Nitrate (as N)			99.2		%		70-130	21-DEC-18
WG2959277-17 LCS								
Nitrate (as N)			100.3		%		70-130	21-DEC-18
WG2959277-11 MB								

Quality Control Report

Client: MATRIX SOLUTIONS INC.
650 WOODLAWN RD W UNIT 7B
GUELPH ON N1K 1B8
Contact: SCOTT MILLER

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NO3-IC-WT	**Water**							
Batch R4412990								
WG2959277-11 MB								
Nitrate (as N)			<0.020		mg/L		0.02	21-DEC-18
WG2959277-16 MB								
Nitrate (as N)			<0.020		mg/L		0.02	21-DEC-18
WG2959277-14 MS		**WG2959277-13**						
Nitrate (as N)			96.5		%		70-130	21-DEC-18
WG2959277-19 MS		**WG2959277-18**						
Nitrate (as N)			96.2		%		70-130	21-DEC-18
SO4-IC-N-WT	**Water**							
Batch R4412990								
WG2959277-15 DUP		**WG2959277-13**						
Sulfate (SO4)		48.5	49.1		mg/L	1.3	20	21-DEC-18
WG2959277-20 DUP		**WG2959277-18**						
Sulfate (SO4)		82.9	81.3		mg/L	1.9	20	21-DEC-18
WG2959277-12 LCS								
Sulfate (SO4)			101.4		%		90-110	21-DEC-18
WG2959277-17 LCS								
Sulfate (SO4)			102.7		%		90-110	21-DEC-18
WG2959277-11 MB								
Sulfate (SO4)			<0.30		mg/L		0.3	21-DEC-18
WG2959277-16 MB								
Sulfate (SO4)			<0.30		mg/L		0.3	21-DEC-18
WG2959277-14 MS		**WG2959277-13**						
Sulfate (SO4)			102.7		%		75-125	21-DEC-18
WG2959277-19 MS		**WG2959277-18**						
Sulfate (SO4)			99.8		%		75-125	21-DEC-18
SOLIDS-TDS-WT	**Water**							
Batch R4415868								
WG2960570-3 DUP		**L2213518-1**						
Total Dissolved Solids		340	342		mg/L	0.6	20	24-DEC-18
WG2960570-2 LCS								
Total Dissolved Solids			97.3		%		85-115	24-DEC-18
WG2960570-1 MB								
Total Dissolved Solids			<10		mg/L		10	24-DEC-18
TKN-WT	**Water**							

Client: MATRIX SOLUTIONS INC.
650 WOODLAWN RD W UNIT 7B
GUELPH ON N1K 1B8
Contact: SCOTT MILLER

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
TKN-WT	**Water**							
Batch R4413836								
WG2959332-3 DUP		**L2213368-1**						
Total Kjeldahl Nitrogen		1.43	1.40		mg/L	2.6	20	24-DEC-18
WG2959332-2 LCS								
Total Kjeldahl Nitrogen			103.8		%		75-125	24-DEC-18
WG2959332-1 MB								
Total Kjeldahl Nitrogen			<0.15		mg/L		0.15	24-DEC-18
WG2959332-4 MS		**L2213368-1**						
Total Kjeldahl Nitrogen			108.8		%		70-130	24-DEC-18
Batch R4416908								
WG2960125-3 DUP		**L2213518-9**						
Total Kjeldahl Nitrogen		0.88	0.79		mg/L	12	20	27-DEC-18
WG2960125-2 LCS								
Total Kjeldahl Nitrogen			114.1		%		75-125	27-DEC-18
WG2960125-1 MB								
Total Kjeldahl Nitrogen			<0.15		mg/L		0.15	27-DEC-18
WG2960125-4 MS		**L2213518-9**						
Total Kjeldahl Nitrogen			90.9		%		70-130	27-DEC-18
Batch R4420030								
WG2961059-3 DUP		**L2214098-1**						
Total Kjeldahl Nitrogen		1.27	1.11		mg/L	13	20	28-DEC-18
WG2961059-2 LCS								
Total Kjeldahl Nitrogen			95.0		%		75-125	28-DEC-18
WG2961059-1 MB								
Total Kjeldahl Nitrogen			<0.15		mg/L		0.15	28-DEC-18
WG2961059-4 MS		**L2214098-1**						
Total Kjeldahl Nitrogen			104.1		%		70-130	28-DEC-18

Quality Control Report

Workorder: L2213518 Report Date: 24-JAN-19

Client: MATRIX SOLUTIONS INC.
650 WOODLAWN RD W UNIT 7B
GUELPH ON N1K 1B8
Contact: SCOTT MILLER

Legend:

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

Sample Parameter Qualifier Definitions:

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

Hold Time Exceedances:

All test results reported with this submission were conducted within ALS recommended hold times.

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

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

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

Matrix Solutions Inc.
ENVIRONMENT & ENGINEERING

COC # 92249

Page: 1 of 2

Lab Submitted to : ALS Waterloo
t no : Q58595
L2213518

L2213518-COFC

: 23089-528
e: Clair - Maltby
ir - maltby.

Sampler's Name(s): S.M / T.M.

Invoice to: Require Report: Y ✓ N__

Company Name: MATRIX SOLUTIONS
Contact Name: Scott Miller
Address: 650 Woodlawn Rd West
Guelph ON PC:
Phone / Fax#: Ph: Fax:

AFE #: 23089 - 528

Copy of Report t
Matrix Solutions - ED
Suite 600, 214 - 11t
Calgary, Alberta, Ca
T2R 0K1
Ph: 403-237-0606 Fax: 403-263-2493
email invoices to ap@matrix-solutions.com

REGULATORY REQUIREMENTS: (check)

- ☐ Alberta Tier 1
- ☐ Alberta SW FAL
- ☐ Canadian Drinking Water
- ☐ CCME FAL
- ☐ SPIGEC
- ☐ SEQG
- ☐ BC CSR
- Other:

SERVICE REQUESTED:

☐ **RUSH** (Please ensure you contact the lab) **Due Date:**

☒ REGULAR Turnaround

REPORT DISTRIBUTION: always send to eds@matrix-solutions.com

☐ Additional Emails: smiller@matrix-solutions.com

Analysis Required

	Sample Number (14 digits only) yr-mth-day	Sample Point Name	Depth (m)	Sample Type	Date/Time Sampled	Quanity # of Containers J/V	Bags	Bottles	Q58595	HOLD
1	23089181218001			H_2O	Dec 18/18 9:02			3	X	
2	23089181218002			H_2O	Dec 18/18 9:01			3	X	
3	23089181218003			H_2O	Dec 18/18 11:11			3	X	
4	23089181218004			H_2O	Dec 18/18 11:11			3	X	
5	23089181218005			H_2O	Dec 18/18 13:00			3	X	
6	23089 181218066			H_2O	Dec 18/18 13:00			3	X	
7	23089181218007			H_2O	Dec 18/18 14:00			3	X	
8	23089181218008			H_2O	Dec 18/18 14:00			3	X	
9	23089181218009			H_2O	Dec 18/18 14:45			3	X	
10	23089 181218 010			H_2O	Dec 18/18 14:45			3	X	
11	23089181218011			H_2O	Dec 18/18 15:50			3	X	
12	~~23089 181218012~~									
13	~~23089181218013~~									
14	~~23089 181218014~~									
15	2									

*For metals in water samples indicate if you want Total (T) or Dissolved (D) as part of "Analysis Required"

Preserved/Filtered

Relinquished by: Tim Martin Date/Time: Dec 20/18
Signature:

Received by: S. Brennan Date/Time: 12/20/18 19:00 SJF
Signature: SB

COMMENTS/SPECIAL INSTRUCTIONS 6.8, 8.1

J = jars V = vials

Matrix Solutions Inc.
ENVIRONMENT & ENGINEERING

COC # 92250

Page: 2 of 2

Lab Submitted to : ALS Waterloo
Lab Agreement no : Q58595
Job ID: L2213518

x Project # : 23089 - 528
x Proj. Name: Clair - Maltby
tion:
Sampler's Name(s): S.M/ T.M.

Invoice to: Require Report: Y ✓ N

Company Name: Matrix Solutions Inc.
Contact Name: Scott Miller
Address: 650 Woodlawn Rd West
Guelph ON PC:
Phone / Fax#: Ph: Fax:

AFE #: 23089 - 528

Copy of
Matrix So
Suite 600
Calgary, /
T2R 0K1
Ph: 403-237-0606 Fax: 403-263-2493
email invoices to ap@matrix-solutions.com

L2213518-COFC

REGULATORY REQUIREMENTS: (check)

- ☐ Alberta Tier 1
- ☐ Alberta SW FAL
- ☐ Canadian Drinking Water
- ☐ CCME FAL
- ☐ SPIGEC
- ☐ SEQG
- ☐ BC CSR
- Other:

SERVICE REQUESTED:

- ☐ RUSH (Please ensure you contact the lab) Due Date:
- ☒ REGULAR Turnaround

REPORT DISTRIBUTION: always send to eds@matrix-solutions.com

☐ Additional Emails ~~Sco~~ Smiller@matrix-Solutions.com

	Sample Number (14 digits only) yr-mth-day	Sample Point Name	Depth (m)	Sample Type	Date/Time Sampled	Quanity # of Containers J/V	Bags	Bottles	Q58595	HOLD
1	23089181218012			H_2O	Dec 18/18 15:50			3	X	
2	23089181220013			H_2O	Dec 20/18 12:00			3	X	
3	23089181220014			H_2O	Dec 20/18 12:00			3	X	
4	23089181220015			H_2O	Dec 20/18 13:50			3	X	
5	23089181220016			H_2O	Dec 20/18 13:50			3	X	
6	23089181220017			H_2O	Dec 20/18 15:00			3	X	
7										
8										
9										
10										
11										
12										
13										
14										
15										

*For metals in water samples indicate if you want Total (T) or Dissolved (D) as part of "Analysis Required" Preserved/Filtered

Relinquished by: Tim Morton Date/Time: Dec 20/18
Signature:

Received by: S. Brennan Date/Time: 12/20/18 19:00
Signature: SB

6.8, 8.1

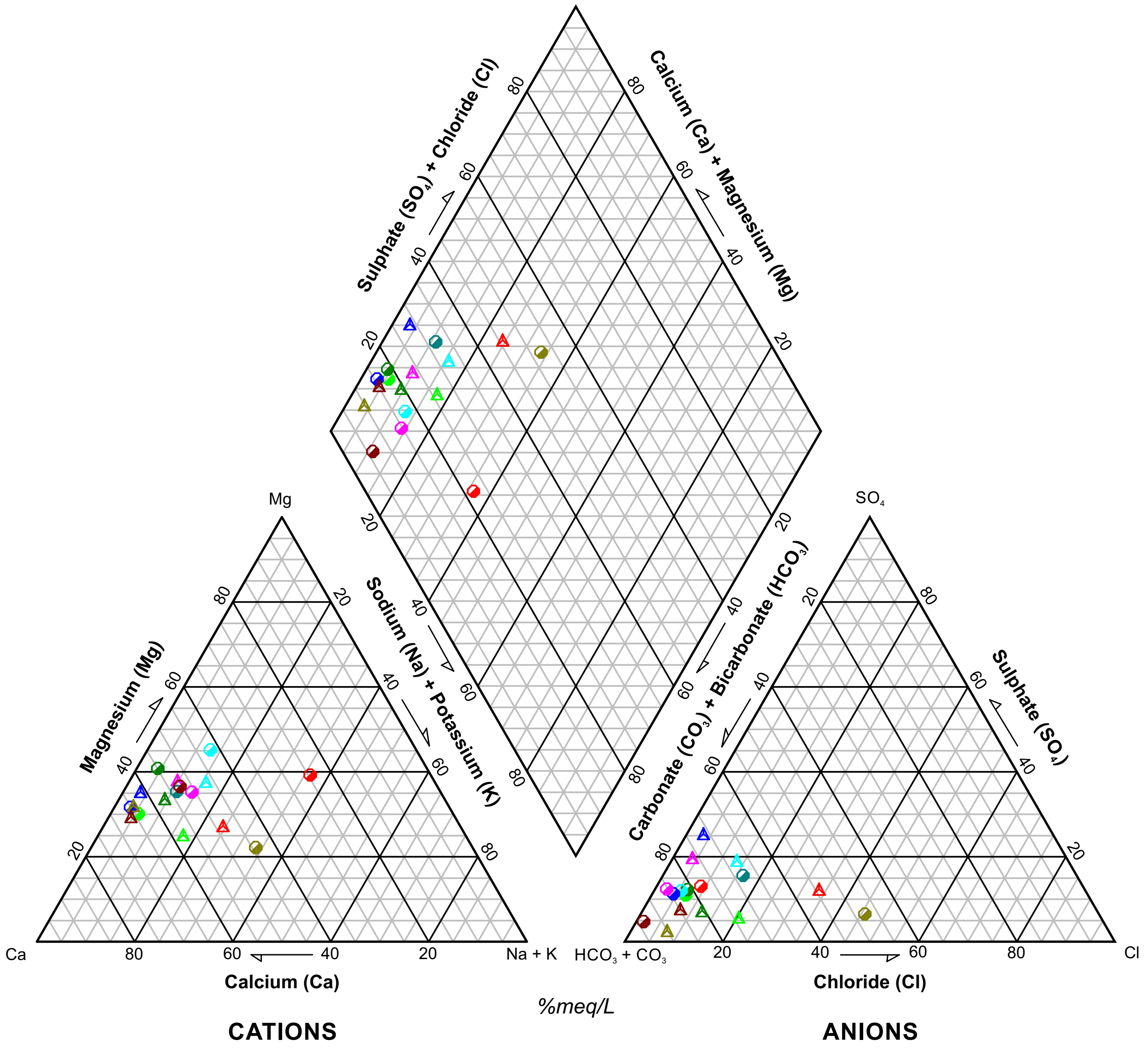
COMMENTS/SPECIAL INSTRUCTIONS

SIF

J = jars V = vials

Appendix GW-5

Hydraulic Conductivity Test Results



- ● MW01-D
- △ MW01-S
- ● MW02-D
- △ MW02-S
- ● MW03-D
- △ MW03-S
- ● MW04-D
- △ MW04-S
- ● MW05-D
- △ MW05-S
- ● MW06-D
- △ MW06-S
- ● MW07-D
- ● MW08-D
- △ MW08-S
- ● MW09-D
- △ MW09-S

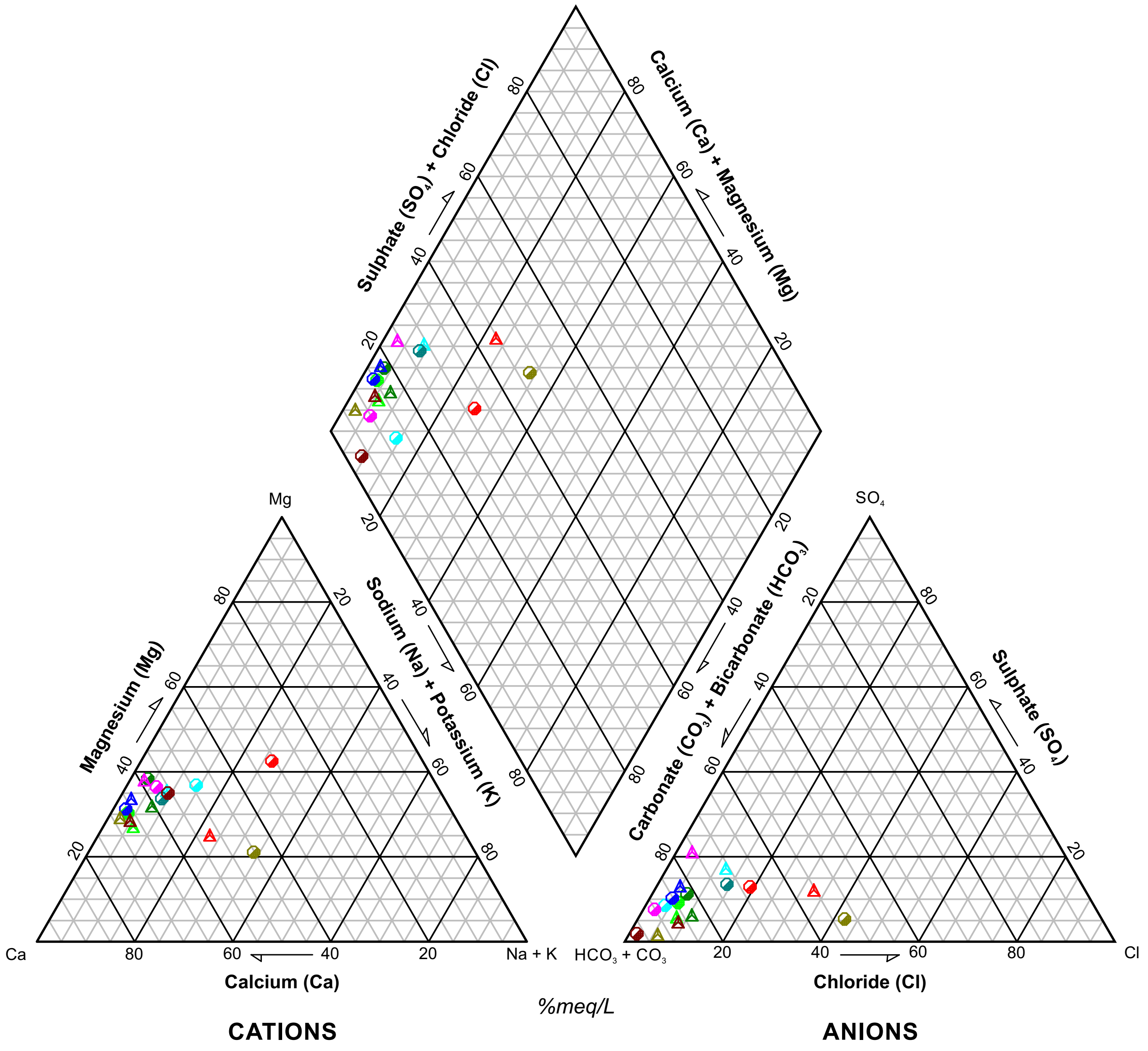
Matrix Solutions Inc.
ENVIRONMENT & ENGINEERING

City of Guelph
Clair-Maltby Comprehensive Environmental Impact Study
Year 3 Monitoring Report

Piper Diagram - October 2016

Date:	Project:	Technical:	Reviewer:
Jan 2018	23089-PD-18	S. Miller	D. Abbey

Figure
B5.1



Matrix Solutions Inc.
ENVIRONMENT & ENGINEERING

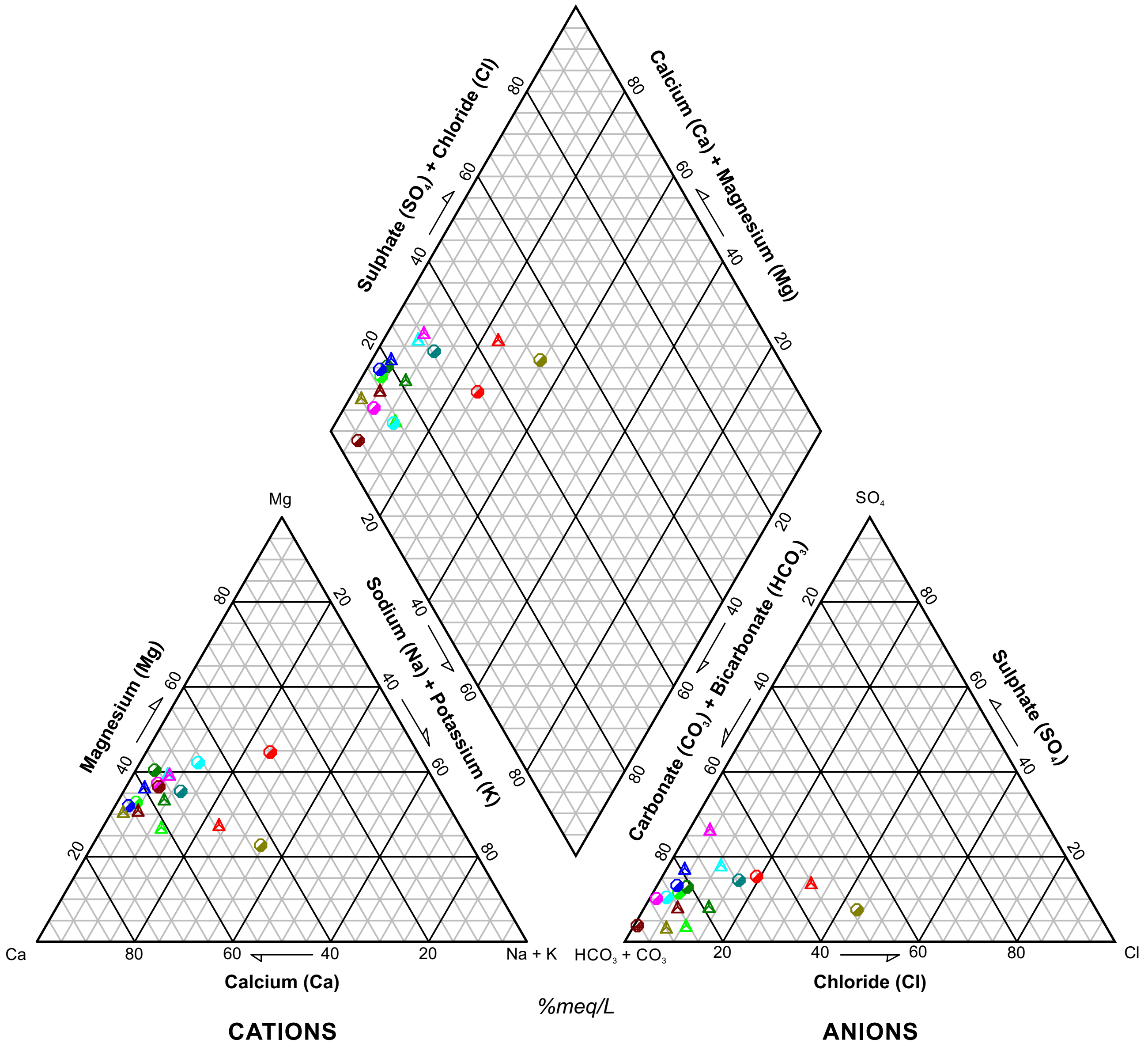
City of Guelph
Clair-Maltby Comprehensive Environmental Impact Study
Year 3 Monitoring Report

Piper Diagram - April 2017

Date: Jan 2018	Project: 23089-PD-18	Technical: S. Miller	Reviewer: D. Abbey

Figure
B5.2

F:\23089\06 Field\piper\pipers.cdr



- ● MW01-D
- △ MW01-S
- ● MW02-D
- △ MW02-S
- ● MW03-D
- △ MW03-S
- ● MW04-D
- △ MW04-S
- ● MW05-D
- △ MW05-S
- ● MW06-D
- △ MW06-S
- ● MW07-D
- ● MW08-D
- △ MW08-S
- ● MW09-D
- △ MW09-S

Matrix Solutions Inc.
ENVIRONMENT & ENGINEERING

City of Guelph
Clair-Maltby Comprehensive Environmental Impact Study
Year 3 Monitoring Report

Piper Diagram - October 2017

Date:	Project:	Technical:	Reviewer:
Jan 2018	23089-PD-18	S. Miller	D. Abbey

Figure
B5.3

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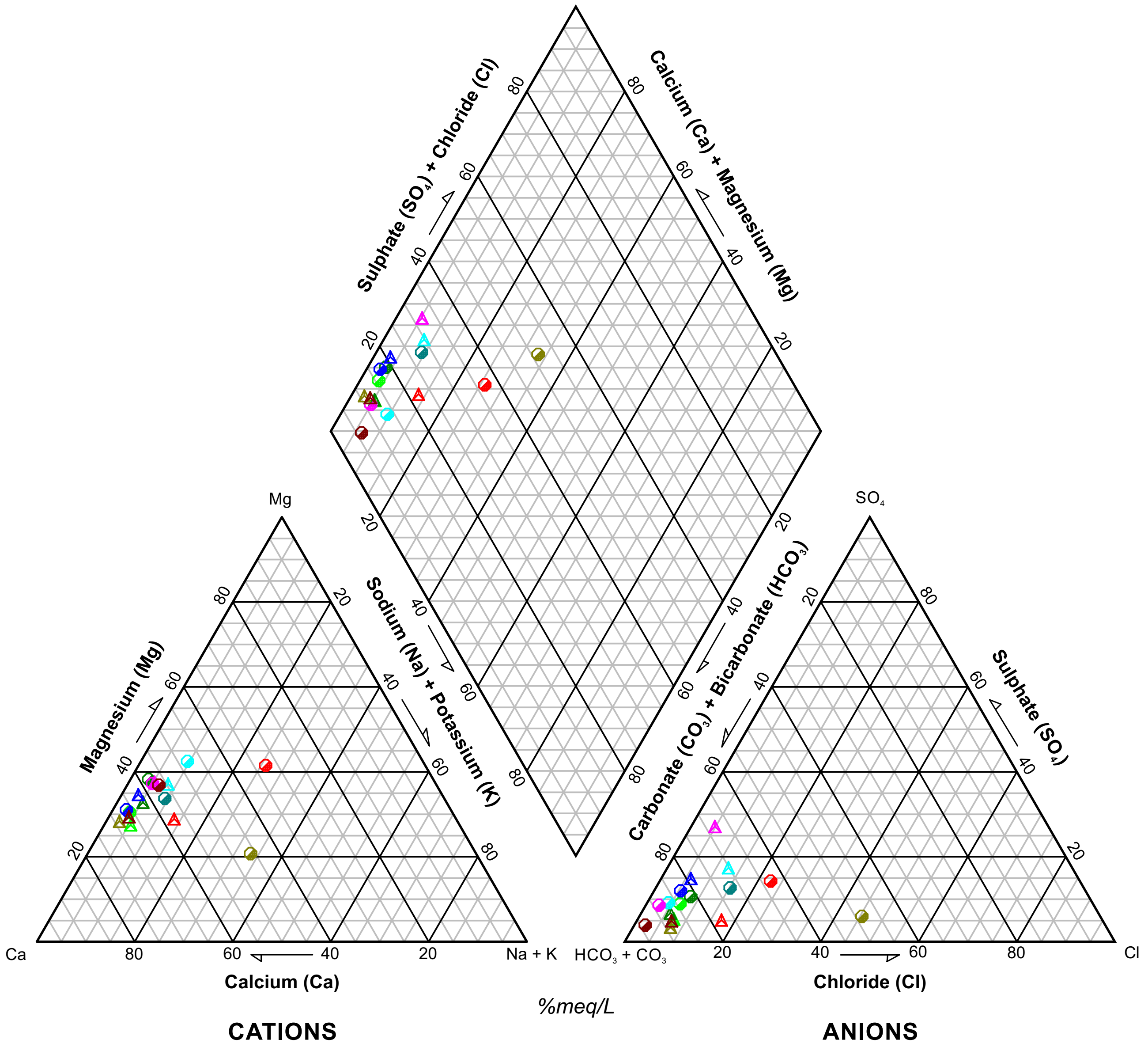


● MW01-D	● MW05-D
△ MW01-S	△ MW05-S
● MW02-D	● MW06-D
△ MW02-S	△ MW06-S
● MW03-D	● MW07-D
△ MW03-S	● MW08-D
● MW04-D	△ MW08-S
△ MW04-S	● MW09-D
	△ MW09-S

Matrix Solutions Inc.
ENVIRONMENT & ENGINEERING

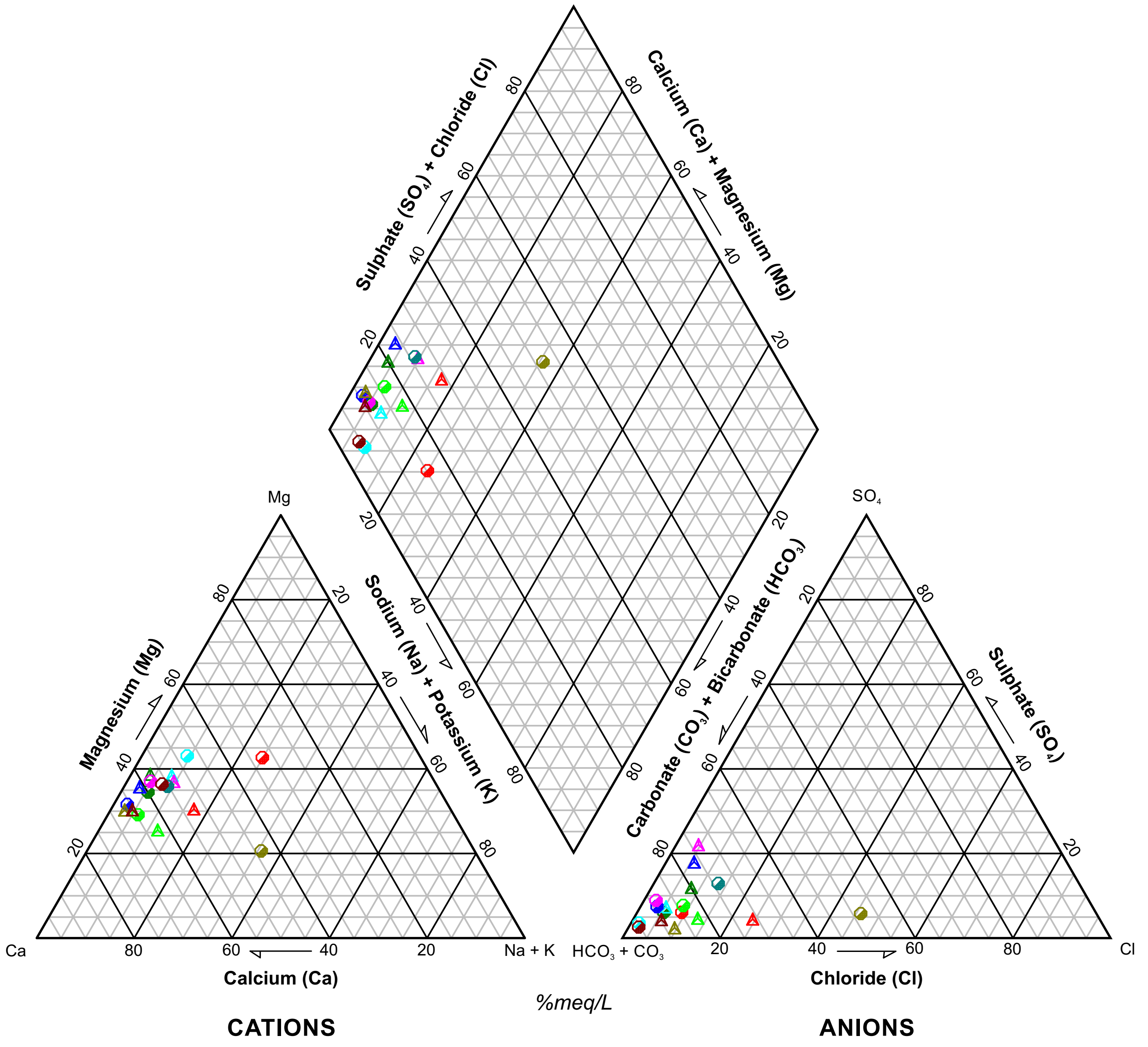
City of Guelph
Clair-Maltby Comprehensive Environmental Impact Study
Year 3 Monitoring Report

Piper Diagram - May 2018

Date:	Project:	Technical:	Reviewer:
Feb 2019	23089-PD-18	S. Miller	D. Abbey

Figure
GW5.4

F:\23089\06 Field\piper\2018.cdr



◐ MW01-D
△ MW01-S
◐ MW02-D
△ MW02-S
◐ MW03-D
△ MW03-S
◐ MW04-D
△ MW04-S

◐ MW05-D
△ MW05-S
◐ MW06-D
△ MW06-S
◐ MW07-D
◐ MW08-D
△ MW08-S
◐ MW09-D
△ MW09-S

Matrix Solutions Inc.
ENVIRONMENT & ENGINEERING

City of Guelph
Clair-Maltby Comprehensive Environmental Impact Study
Year 3 Monitoring Report

Piper Diagram - December 2018

Date:	Project:	Technical:	Reviewer:
Feb 2019	23089-PD-18	S. Miller	D. Abbey

Figure
GW5.5

F:\23089\06 Field\piper\2018.cdr

Appendix NH-1

List of Background Reports and Sources Screened for Natural Heritage Data

Appendix NH-1

List of Background Sources Screened for Natural Heritage Data

Studies that contributed data to the CEIS:

Aboud and Associates Inc. (2010).
1897 Gordon Street (Bird Property) - Environmental Impact Study and Tree Conservation Plan (2nd Submission). Prepared for Thomasfield Homes, September 3, 2010. 145 pp.

Aboud and Associates Inc. and GM BluePlan Engineering. (2010).
2013/2014 Monitoring Report, Bird Landing Subdivision, City of Guelph. Prepared for Bird Landing Subdivision, November 10, 2014. 109 pp.

Aboud and Associates Inc., Banks Groundwater Engineering Limited, and Gamsby and Mannerow Limited. (2013).
Environmental Implementation Report, Bird Landing Subdivision, Draft Plan of Subdivision 23T-08505 (1897 Gordon Street), City of Guelph. Prepared for Thomasfield Homes Limited, February 13, 2013. 995 pp.

Black, Shoemaker, Robinson and Donaldson, Hoyle, K. J., North-South Environmental Inc., Stantec Consulting. (2005).
West Minster Wood East, Phase 2, Environmental Implementation Report. First Draft. 33pp.

Coulson, D., Ertel, P. and Michalak, L. (1993).
Cranberry – Oil Well Bog Complex Wetland Evaluation.

Dance Environmental Inc. (2014).
Scoped E.I.S., 424 Maltby Road, Wellington County, Township of Puslinch. Prepared for Persian Investments Ltd., April 14, 2014. 94 pp.

Dougan & Associates. (2005).
Guelph Amphibian Survey Database.

LGL Limited. (2003).
Bird Property, Gordon Street, City of Guelph, Thomasfield Homes Re-Zoning Application, Environmental Overview and Impact Analysis. Received by Scott Hannah, January 20, 2003. 9 pp.

McCormick Rankin Corporation, and Gamsby and Mannerow Limited. (2003).
Victoria Road Class Environmental Assessment, Environmental Study Report. City of Guelph. 486 pp.

McEachren, J. (2012).
Maltby Road Reconstruction, Post Construction Monitoring 2012. City of Guelph. 8 pp.

Mitz, C. W. (2007).
Southgate Business Park Post-Development Water Balance: Wetland Impacts. Prepared for Joh Perks, December 4, 2007. 5 pp.

Natural Resource Solutions Inc. (2004).
Hanlon Creek Business Park, Consolidated Environmental Impact Study. Prepared for the City of Guelph, November 2004. 110 pp.

Natural Resource Solutions Inc. (2007).
Southgate Business Park, Draft Plan of Subdivision, Environmental Impact Study. Prepared for Industrial Equities Guelph Corporation, July 2007.164 pp.

Natural Resource Solutions Inc. (2009).
Hanlon Creek Business Park, Environmental Implementation Report. Prepared for the City of Guelph, February 2009. 433 pp.

Natural Resource Solutions Inc. (2010).
Maltby Road Wildlife Movement Surveys, 2009-2010 Summary Report. Prepared for the City of Guelph, July 2010. 24 pp.

Natural Resource Solutions Inc. (2011).
Maltby Road Wildlife Movement Surveys, 2009-2011 Summary Report. Prepared for the City of Guelph, June 2011. 26 pp.

Natural Resource Solutions Inc. (2012).
Species at Risk Habitat Screening - Results, 331 Clair Road, Guelph Ontario. Prepared for Acorn Developments, September 10, 2012. 12 pp.

Natural Resource Solutions Inc. (2012).
Southgate Business Park 23T-06503 Environmental Implementation Report. Prepared for Industrial Equities Guelph Corporation, February 2012. 928 pp.

Natural Resource Solutions Inc. (2012).
Southgate Business Park 23T-06503 Environmental Implementation Report, Phase 2 Addendum. Prepared for Industrial Equities Guelph Corporation, November 2012. 331 pp.

Natural Resource Solutions Inc. (2014).
Southgate Business Park Environmental Implementation Report, Phase 2 Addendum Response Package (Final Submission). Prepared for the City of Guelph, January 9, 2014. 148 pp.

Natural Resource Solutions Inc. (2017).
132 Clair Road Environmental Impact Study Addendum Report. Prepared for Mr. Jeff Neumann, October 2017. 218 pp.

Natural Resource Solutions Inc., AECOM, and Banks Groundwater Engineering Limited. (2016).
Hanlon Creek Business Park, 2013 Consolidated Monitoring Report. Prepared for the City of Guelph, January 18, 2016. 125 pp.

North-South Environmental Inc. (2001).
Environmental Impact Study, Westminster Wood East (Adam's Farm). Prepared for Westminster Woods Ltd., July 2001. 82 pp.

North-South Environmental Inc. (2002).
West Minster Wood East, Phase 1, Environmental Implementation Report (Including Tree Conservation Plan). Prepared for Westminster Woods, March 15, 2002. 26 pp.

North-South Environmental Inc. (2014).
161, 205 and 253 Clair Road East, Guelph - Environmental Implementation Report. Prepared for Victoria Wood (Dallan) GP Inc., February 2014. 189 pp.

North-South Environmental Inc. (2016)
161, 205 and 253 Clair Road East, Guelph - Year-End Report (2013-2015). Prepared for the City of Guelph and the Grand River Conservation Authority, August 2016. 61 pp.

North-South Environmental Inc. (2015).
132 Clair Road West, Guelph - Scoped Environmental Impact Study. Prepared for Mr. Jeff Neumann, August 28, 2015. 250 pp.

Paradigm Transportation Solutions Limited, ESG International Inc. and Braun Consulting Engineers. (2003).
Clair Road Class Environmental Assessment. City of Guelph. 265 pp.

Stantec Consulting Ltd. (2007).
Dallan Lands Environmental Impact Statement. Prepared for Victoria Wood, October 2007. 77 pp.

Stantec Consulting Ltd. (2009).
Dallan Lands EIS Addendum Report. Prepared for Victoria Wood, August 2009. 77 pp.

Stantec Consulting Ltd. (2014).
23T-03507 Former Pergola Lands Subdivision Phase II: Environmental Implementation Report. Prepared for Reid's Heritage Homes, February 4, 2014. 204 pp.

Tilt, N., Ferguson, M. S., McCracken, J. D., Coulson, D., Peluch, J. and Kempf, F. (1984).
Mill Creek Wetland Evaluation.

Timmerman, A., Adams, P., Marshall, J., Weeks, G., Ursic, K. and Ursic, M. (2010).
Hall's Pond Wetland Evaluation.

Totten Sims Hubicki Associates, Engineers, Architects, Planners. (2000).
Gordon Street, Wellington Road 46, Class Environmental Assessment, Environmental Study Report, Volume One: Main Report. City of Guelph and the County of Wellington. 122 pp.

TSH Engineers Architects Planners. (2007).
Hanlon Creek Business Park - SWM Design Report. Prepared for the City of Guelph, November 2007. 188 pp.

Background Studies that were screened but did not contribute data to the CEIS:

Aboud and Associates Inc. (2010).
1897 Gordon Street (Bird Property), Draft Plan of Subdivision 23T-08505, City of Guelph, Environmental Impact Study and Tree Conservation Plan." Received by Jessica McEachren, December 9, 2010.

Aboud and Associates Inc. and Gamsby and Mannerow Limited. (2013).
Environmental Implementation Report, Addendum No. 1, Bird Landing Subdivision, Draft Plan of Subdivision 23T-08505 (1897 Gordon Street), City of Guelph. Prepared for Thomasfield Homes Limited, October 23, 2013. 56 pp.

City of Guelph. (2005).
Westminster Woods East Subdivision – File No. 23T – 02502 -Environmental Implementation Report – Terms of Reference. Prepared for the Environmental Advisory Committee, October 12, 2005. 4 pp.

City of Guelph. (2005).
Westminster Woods East Subdivision – Phase 2 – File No. 23T – 02502 -Environmental Implementation Report – Terms of Reference. Prepared for the Environmental Advisory Committee, December 14, 2005. 8 pp.

Chung and Vander Doelen Engineering Ltd. (2012).
Geotechnical Investigation, Proposed Condominium Development, 331 Clair Road East, Guelph Ontario. Prepared for Acorn Developments, May 18, 2012. 25pp.

Gamsby and Mannerow Limited. (2010).
Preliminary Servicing Strategy for the Lands South of Clair Road, City of Guelph. 27 pp.

Gamsby and Mannerow Limited. (2010).
Site Servicing and Stormwater Management Report, 1897 Gordon Street, City of Guelph. 42 pp.

Gamsby and Mannerow Limited. (2010).
Stormwater Management Addendum No. 1, 1897 Gordon Street, City of Guelph. 18 pp.

Gamsby and Mannerow Limited. (2013).
Environmental Implementation Report, Addendum No. 2, Bird Landing Subdivision, 1897 Gordon Street, Draft Plan of Subdivision 23T-08505, City of Guelph. Prepared for Thomasfield Homes Limited, December 17, 2013. 324 pp.

Gamsby and Mannerow Limited. (2013).
Stormwater Management, Final Design Report, Bird Landing Subdivision, 1897 Gordon Street, Draft Plan of Subdivision 23T-08505, City of Guelph. Revised December 17, 2013. 342 pp.

Gamsby and Mannerow Limited. (2014).
Sanitary Sewer Flow Monitoring and Servicing Report, 1897 Gordon Street, City of Guelph. 156 pp.

Gamsby and Mannerow Limited. (2014).
Sanitary Sewer Oversizing, Design Brief, Bird Landing Subdivision, 1897 Gordon Street, City of Guelph. 13 pp.

Gamsby and Mannerow Limited. (2016).
Final Design Brief, Bird Landing Subdivision (1897 Gordon Street), Draft Plan of Subdivision 23T-08505, City of Guelph. Revised May 2, 2016. 10 pp.

IBI Group. (2011).
Southgate Business Park, List of Drawings. 25 pp.

Labbé, A. (2013).
Environmental Implementation Report (EIR) February 13, 2013. Received by Stephen Aboud and Marc Garon-Nielsen, Aboud and Associates, April 5, 2013.

Natural Resource Solutions Inc. (2007).
"Southgate Business Park – 'Old' Tree Inventory." Received by Carrie Musselman, November 22, 2007. 1 pp.

Paul F. J. Eagles Planning Limited. (1993).
An Assessment of Environmental Impacts of the Springfield Golf Course on the Property of the Foundation for the Support of International Medical Training (Canada). 17 pp.

Pickett, K.
"Species at Risk Habitat Screening- Results, 331 Clair Road, Guelph Ontario." Received by Jessica Linton, November 30, 2012.

Powers, H. (2005).
Environmental Planner's Report to the Environmental Advisory Committee – Westminster Wood Subdivision Revisions. January 10, 2005. 2 pp.

Powers, H. (2005).
Environmental Planner's Report to the Environmental Advisory Committee – Westminster Wood East. January 12, 2005. 3 pp.

North-South Environmental Inc. (2002).
Westminster Woods East – Phase 1: Environmental Implementation Report (including Tree Conservation Plan). March 15, 2002.

North-South Environmental Inc. (2002).
Westminster Woods East – Environmental Impact Study Addendum. May 14, 2002.

V. A. Wood (Guelph) Inc. (2003).
Geotechnical Investigation, Gosling Gardens extension, 1897 Gordon Street, Guelph Ontario. Prepared for Thomasfield Homes Limited & Fieldgate Commercial Property Ltd., January 2013. 24 pp.

V. A. Wood (Guelph) Inc. (2004).
Preliminary Geotechnical Investigation, Proposed Residential Development, Bird Property, City of Guelph Ontario. Prepared for Gamsby and Mannerow Limited, December 2004. 23 pp.

V. A. Wood (Guelph) Inc.
"Materials Testing, Bird Property, #1897 Gordon Street, Project No. S-284, City of Guelph, Ontario." Received by Gamsby and Mannerow Limited, September 28, 2006.

Appendix NH-2A

Scoped Headwater Drainage Feature Assessment (HDFA) Representative Photo Log (April 2, 2018)

Appendix NH-2A

Scoped Headwater Drainage Feature Assessment (HDFA) Representative Photo Log (April 2, 2018)

Photo 1 (Photo Location 1)
Reach HC-H7-R1

South-facing view from reach break – standing water conditions.

Photo 2 (Photo Location 2)
Reach HC-H3-R2

North-facing (upstream view) of general conditions from reach break (change in feature type). Minimal flow was observed.

Photo 3 (Photo Location 2)
Reach HC-H3-R2

South-facing (downstream view) of conditions - minimal flow, channelized feature type.

Photo 4 (Photo Location 3)
Reach HC-H3-R2

Upstream view of conditions – minimal flow.

Photo 5 (Photo Location 3)
Reach HC-H3-R2

Downstream view of conditions - minimal flow.

Photo 6 (Photo Location 4)
Reach HC-H3-R2

Downstream view from reach break – minimal flow.

Photo 7 (Photo Location 5)
Reach HC-H3-R3

Upstream view from reach break (change in feature type and flow condition) – wetland feature/standing water.

Photo 8 (Photo Location 6)
Reach HC-H3-R3

South-facing (downstream) view of wetland feature.

Photo 9 (Photo Location 7)
Reach HC-H3-R5

North-facing (downstream view) towards Reach HC-H3-R4. Feature is dry and actively farmed.

Photo 10 (Photo Location 8)
Reach HC-H7-R1

North-facing (downstream view) towards reach (standing water).

Photo 11 (Photo Location 9)
Reach HC-H7-R1

West-facing view of H7 upstream of reach break – no feature present.

Photo 12 (Photo Location 10)
Laneway Wetland

West-facing view wetland – no downstream hydrologic connection was observed with H7.

Photo 13 (Photo Location 11)
General Conditions

East-facing view – no features observed.

Photo 14 (Photo Location 12)
HC-H6-R1

South-facing (downstream) view of conditions.

Photo 15 (Photo Location 13)
HC-H5-R1

Downstream-facing view of wetland feature with standing water conditions.

Photo 16 (Photo Location 14)
HC-H5-R2

West-facing (upstream) view of feature – dry with forested riparian vegetation.

Appendix NH-2B

Terrestrial Monitoring Representative Photo Log

(2016 – 2018)

Appendix NH-2B

Terrestrial Monitoring Representative Photo Log (2016 – 2018)

Photo 1.
Winter Wildlife – Deer Tracks at 2162 Gordon St.
(February 15, 2017)

Photo 2.
Winter Wildlife – Wild Turkey at 2162 Gordon St.
(February 15, 2017)

Photo 3.
Winter Wildlife – Squirrel Activity at 1992 Gordon St. (February 13, 2018)

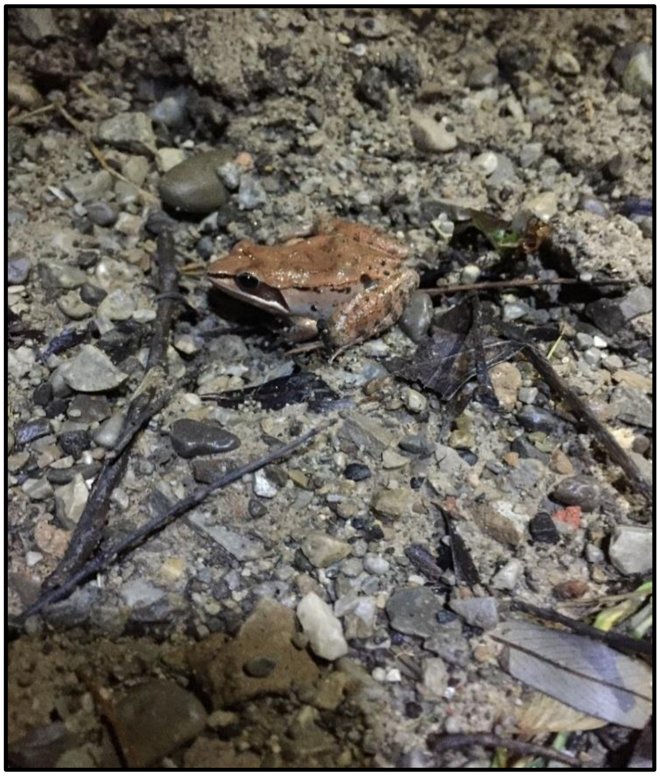


Photo 4.
Amphibian Movement Survey – Wood Frog on Transect 2 (March 27, 2017)

Photo 5.
Amphibian Movement Survey – Blue-spotted Salamander on Transect 3 (March 27, 2017)

Photo 6.
Basking Turtle Survey - Midland Painted Turtle observed at T7 (April 27, 2017)

Photo 7.
Amphibian Movement Survey – Eastern Newt on Transect 3 (October 4, 2017)

Photo 8.
Turtle Survey – Ribbon Snake (April 27, 2017)

Photo 9.
Turtle Survey – Snapping Turtle (May 17, 2017)

Photo 10.

Amphibian Call Survey – Gray Treefrog at 1992 Gordon Street (June 26, 2018))

Photo 11.
Deciduous Forest Community (FOD) near 128 Dallan (September 22, 2016)

Photo 12.
Graminoid Organic Shallow Marsh Ecosite (MAS3) at 24 Serena Lane (September 7, 2017)

Photo 13.
Duckweed Floating-leaved Shallow Aquatic Type (SAF1-3) at 2162 Gordon Street (July 21, 2017)

Photo 14.
Water Lily – Bullhead Lily Floating-leaved Shallow Aquatic Type (SAF1-1) at 2162 Gordon Street (August 17, 2016)

Photo 15.
East side of Submerged Shallow Aquatic (SAS) Community at 1992 Gordon Street (July 21, 2016)

Photo 16.
West side of Submerged Shallow Aquatic (SAS) Community at 1992 Gordon Street (September 22, 2016)

Photo 17.
North side of Mixed Swamp (SWM2-3) at 1992 Gordon Street (June 18, 2018)

Photo 18.
Seep at 2162 Gordon Street (March 17, 2017)

Appendix NH-3

Clair-Maltby Secondary Plan Area
ELC Data Cards

Appendix NH-3

Ecological Land Classification (ELC) Data Cards and Field Verification (2017 – 2018)

ELC data cards were completed for properties where Beacon was provided full access for vegetation surveys in 2017 and/or 2018:

- 1, 4 and 5 Kilkenny Place (June 21, 2017)
- 12 Kilkenny Place (June 21, 2017)
- 24 Serena Lane (June 28, 2017)
- 2162 Gordon Street (June 28, 2017 and Aug. 17, 2018)
- 1968-1992 Gordon Street (June 12, 2018)

Copies of these cards are included in this appendix.

Additional properties visited to undertake scoped verification of ELC in 2018 with the landowner's consultant or representative in attendance included (see Map NH-2 and Map NH-5 series):

- 2093 Gordon Street (Oct. 23, 2018)
- 2187 Gordon Street (Aug. 17, 2018)
- 260 Maltby Road East (July 31, 2018)
- 99 Maltby Road East (Sept. 11, 2018)
- 274 Maltby Road East (Aug. 30, 2018)
- 2007 Victoria Road (Aug. 30, 2018)

ELC data cards were not completed for these properties.

ELC COMMUNITY DESCRIPTION & CLASSIFICATION	SITE: 5 Kilkenny		POLYGON: 1	
	SURVEYOR(S): DW	DATE: June 2 / 2017		UTME
	START	END	UTMZ	UTMN

POLYGON DESCRIPTION

SYSTEM	SUBSTRATE	TOPOGRAPHIC FEATURE	HISTORY	PLANT FORM	COMMUNITY
☑ TERRESTRIAL ☐ WETLAND ☐ AQUATIC	☐ ORGANIC ☑ MINERAL SOIL ☐ PARENT MIN ☐ ACIDIC BEDRK ☐ BASIC BEDRK ☐ CARB. BEDRK	☐ LACUSTRINE ☐ RIVERINE ☐ BOTTOMLAND ☐ TERRACE ☐ VALLEY SLOPE ☐ TABLELAND ☐ ROLL. UPLAND ☐ CLIFF ☐ TALUS ☐ CREVICE / CAVE ☐ ALVAR ☐ ROCKLAND ☐ BEACH / BAR ☐ SAND DUNE ☐ BLUFF	☐ NATURAL ☑ CULTURAL	☐ PLANKTON ☐ SUBMERGED ☐ FLOATING-LVD ☑ GRAMINOID ☐ FORB ☐ LICHEN ☐ BRYOPHYTE ☐ DECIDUOUS ☐ CONIFEROUS ☐ MIXED	☐ LAKE ☐ POND ☐ RIVER ☐ STREAM ☐ MARSH ☐ SWAMP ☐ FEN ☐ BOG ☐ BARREN ☑ MEADOW ☐ PRAIRIE ☐ THICKET ☐ SAVANNAH ☐ WOODLAND ☐ FOREST ☐ PLANTATION
SITE			**COVER**		
☐ OPEN WATER ☐ SHALLOW WATER ☑ SURFICIAL DEP. ☐ BEDROCK			☑ OPEN ☐ SHRUB ☐ TREED		

STAND DESCRIPTION:

	LAYER	HT	CVR	SPECIES IN ORDER OF DECREASING DOMINANCE (>> MUCH GREATER THAN; > GREATER THAN; = ABOUT EQUAL TO)
1	CANOPY	2	1	Acer Quercus
2	SUB-CANOPY	3	1	Fraxinus Pinstro Picea
3	UNDERSTOREY			
4	GRD. LAYER	5	4	bromin daucar dipfull chileuc hesm.

HT CODES: 1 = >25 m 2 = 10<HT 25 m 3 = 2<HT 10 m 4 = 1<HT 2 m 5 = 0.5<HT 1 m 6 = 0.2<HT 0.5 m 7 = HT<0.2 m

CVR CODES 0 = NONE 1 = 0% < CVR 10% 2 = 10 < CVR 25% 3 = 25 < CVR 60% 4 = CVR > 60%

STAND COMPOSITION:				BA:
SIZE CLASS ANALYSIS:	< 10	10 - 24	25 - 50	> 50
STANDING SNAGS:	< 10	10 - 24	25 - 50	> 50
DEADFALL / LOGS:	< 10	10 - 24	25 - 50	> 50

ABUNDANCE CODES: N = NONE R = RARE O = OCCASIONAL A = ABUNDANT

COMM. AGE	PIONEER	YOUNG	MID-AGE	MATURE	OLD GROWTH

SOIL ANALYSIS:

TEXTURE:	DEPTH TO MOTTLES / GLEY	g =	G=
MOISTURE:	DEPTH OF ORGANICS:		(cm)
HOMOGENEOUS / VARIABLE	DEPTH TO BEDROCK:		(cm)

COMMUNITY CLASSIFICATION:

COMMUNITY CLASS: Cultural	CODE:	CU
COMMUNITY SERIES: Cultural Meadow	CODE:	CUM
ECOSITE: Mineral Cultural Meadow	CODE:	CUM1
VEGETATION TYPE: Dry-Moist Old Field Meadow	CODE:	CUM1-1
INCLUSION	CODE:	
COMPLEX	CODE:	

Notes:

CUM1-1 w/ mostly planted trees

ELC PLANT SPECIES LIST	SITE:
	POLYGON:
	DATE:
	SURVEYOR(S):

LAYERS: 1 = CANOPY > 10m 2 = SUB-CANOPY 3 = UNDERSTOREY 4 = GROUND (GRD.) LAYER

ABUNDANCE CODES: R = RARE O = OCCASIONAL A = ABUNDANT D = DOMINANT

SPECIES CODE	LAYER 1	LAYER 2	LAYER 3	LAYER 4	COLL.	SPECIES CODE	LAYER 1	LAYER 2	LAYER 3	LAYER 4	COLL.
crat						bromin					
pyrcomm						echvulg					
Malus						chileuc					
Acer						lotcorn					
Juridllip						plalanc					
Juniv						rotheat					
pynig						hiergrabi					
Prunus						silene (smooth)					
Vibur						daucar					
						viccrac					
						solalti					
						hes					
						cirarv					
						vitrip					
						cirvulg					
						ascsyr					
						lolium					
						poa prat					
						fravir					
						phl prat					
thuocc						sisymont					
moralba						lilphil					
lonitat											
solgigan											
Physocarp											
Hawth											
quercus											

ELC COMMUNITY DESCRIPTION & CLASSIFICATION	SITE: S Kilkenny		POLYGON: 2	
	SURVEYOR(S): DW	DATE: 28 Jun 17		UTME
	START	END	UTMZ	UTMN

POLYGON DESCRIPTION

SYSTEM
☑ TERRESTRIAL
☐ WETLAND
☐ AQUATIC

SITE
☐ OPEN WATER
☐ SHALLOW WATER
☑ SURFICIAL DEP.
☐ BEDROCK

SUBSTRATE
☐ ORGANIC
☑ MINERAL SOIL
☐ PARENT MIN
☐ ACIDIC BEDRK
☐ BASIC BEDRK
☐ CARB. BEDRK

TOPOGRAPHIC FEATURE
☐ LACUSTRINE
☐ RIVERINE
☐ BOTTOMLAND
☐ TERRACE
☐ VALLEY SLOPE
☐ TABLELAND
☐ ROLL. UPLAND
☐ CLIFF
☐ TALUS
☐ CREVICE / CAVE
☐ ALVAR
☐ ROCKLAND
☐ BEACH / BAR
☐ SAND DUNE
☐ BLUFF

HISTORY
☐ NATURAL
☑ CULTURAL

COVER
☐ OPEN
☐ SHRUB
☑ TREED

PLANT FORM
☐ PLANKTON
☐ SUBMERGED
☐ FLOATING-LVD
☐ GRAMINOID
☐ FORB
☐ LICHEN
☐ BRYOPHYTE
☐ DECIDUOUS
☐ CONIFEROUS
☑ MIXED

COMMUNITY
☐ LAKE
☐ POND
☐ RIVER
☐ STREAM
☐ MARSH
☐ SWAMP
☐ FEN
☐ BOG
☐ BARREN
☐ MEADOW
☐ PRAIRIE
☐ THICKET
☐ SAVANNAH
☑ WOODLAND
☐ FOREST
☐ PLANTATION

STAND DESCRIPTION

	LAYER	HT	CVR	SPECIES IN ORDER OF DECREASING DOMINANCE (>> MUCH GREATER THAN; > GREATER THAN; = ABOUT EQUAL TO)
1	CANOPY	2	3	Pinstro Picea Pinsyl W Fraxam
2	SUB-CANOPY			
3	UNDERSTOREY	4	1	Borveu / Rhutyph / Ruballe
4	GRD. LAYER	5	4	grasses herb forbs chrleuc

HT CODES: 1 = >25 m 2 = 10<HT 25 m 3 = 2<HT 10 m 4 = 1<HT 2 m 5 = 0.5<HT 1 m 6 = 0.2<HT 0.5 m 7 = HT<0.2 m
CVR CODES: 0= NONE 1= 0% < CVR 10% 2= 10 < CVR 25% 3= 25 < CVR 60% 4= CVR > 60%

STAND COMPOSITION:							BA:	
SIZE CLASS ANALYSIS:	O	< 10	O	10 - 24	O	25 - 50	N	> 50
STANDING SNAGS:		< 10		10 - 24		25 - 50		> 50
DEADFALL / LOGS:		< 10		10 - 24		25 - 50		> 50

ABUNDANCE CODES: N = NONE R = RARE O = OCCASIONAL A = ABUNDANT

COMM. AGE: PIONEER YOUNG [✓ MID-AGE] MATURE OLD GROWTH

SOIL ANALYSIS:

TEXTURE:	DEPTH TO MOTTLES / GLEY	g =	G=
MOISTURE:	DEPTH OF ORGANICS:		(cm)
HOMOGENEOUS / VARIABLE	DEPTH TO BEDROCK:		(cm)

COMMUNITYCLASSIFICATION:

COMMUNITY CLASS: Cultural	CODE:	CU
COMMUNITY SERIES: Cultural Woodland	CODE:	CUW
ECOSITE: Mineral Cultural Woodland	CODE:	CUW1
VEGETATION TYPE:	CODE:	CUW1
INCLUSION	CODE:	
COMPLEX	CODE:	

Notes:

ELC PLANT SPECIES LIST	SITE:
	POLYGON:
	DATE:
	SURVEYOR(S):

LAYERS: 1 = CANOPY > 10m 2 = SUB-CANOPY 3 = UNDERSTOREY 4 = GROUND (GRD.) LAYER
ABUNDANCE CODES: R = RARE O = OCCASIONAL A = ABUNDANT D = DOMINANT

SPECIES CODE	LAYER 1	LAYER 2	LAYER 3	LAYER 4	COLL.	SPECIES CODE	LAYER 1	LAYER 2	LAYER 3	LAYER 4	COLL.
Pinstro						Solcan					
Querubr						Daucar					
Picabie						Dacglom					
Picpung						Poaprat					
Malpum						Pec					
Pinsyl W						Chrleuc					
Acexfre						Carspic					
Ulmamer						Leuvirg					
Aceplat						Solalti					
Acepseu						Parinse					
Popxcan						Cassign					
Ulmpum						Poapal					
						Trifli					
						Broiner					
						Corvari					
						Viccrac					
						Potrect					
						Junmino					
						Medlupu					
						Arcmin					
						Sedacr					
~~[illegible]~~											
Ruballe											
Borveu											
Rhutyph											

ELC COMMUNITY DESCRIPTION & CLASSIFICATION	SITE S Killemy		POLYGON: 3
	SURVEYOR(S) DW	DATE 28 Jun 17	UTME
	START	END	UTMZ / UTMN

POLYGON DESCRIPTION

SYSTEM
- ☑ TERRESTRIAL
- ☐ WETLAND
- ☐ AQUATIC

SITE
- ☐ OPEN WATER
- ☐ SHALLOW WATER
- ☑ SURFICIAL DEP.
- ☐ BEDROCK

SUBSTRATE
- ☐ ORGANIC
- ☑ MINERAL SOIL
- ☐ PARENT MIN
- ☐ ACIDIC BEDRK
- ☐ BASIC BEDRK
- ☐ CARB. BEDRK

TOPOGRAPHIC FEATURE
- ☐ LACUSTRINE
- ☐ RIVERINE
- ☐ BOTTOMLAND
- ☐ TERRACE
- ☐ VALLEY SLOPE
- ☐ TABLELAND
- ☐ ROLL. UPLAND
- ☐ CLIFF
- ☐ TALUS
- ☐ CREVICE / CAVE
- ☐ ALVAR
- ☐ ROCKLAND
- ☐ BEACH / BAR
- ☐ SAND DUNE
- ☐ BLUFF

HISTORY
- ☐ NATURAL
- ☑ CULTURAL

COVER
- ☐ OPEN
- ☐ SHRUB
- ☑ TREED

PLANT FORM
- ☐ PLANKTON
- ☐ SUBMERGED
- ☐ FLOATING-LVD
- ☐ GRAMINOID
- ☐ FORB
- ☐ LICHEN
- ☐ BRYOPHYTE
- ☐ DECIDUOUS
- ☑ CONIFEROUS
- ☐ MIXED

COMMUNITY
- ☐ LAKE
- ☐ POND
- ☐ RIVER
- ☐ STREAM
- ☐ MARSH
- ☐ SWAMP
- ☐ FEN
- ☐ BOG
- ☐ BARREN
- ☐ MEADOW
- ☐ PRAIRIE
- ☐ THICKET
- ☑ SAVANNAH
- ☐ WOODLAND
- ☐ FOREST
- ☐ PLANTATION

STAND DESCRIPTION:

LAYER		HT	CVR	SPECIES IN ORDER OF DECREASING DOMINANCE (>> MUCH GREATER THAN; > GREATER THAN; ≈ ABOUT EQUAL TO)
1	CANOPY	3	2	PinsylV > Prufru Franex Larix
2	SUB-CANOPY			
3	UNDERSTOREY			
4	GRD. LAYER	4	4	brown dragon hen sotolth

HT CODES: 1 = >25 m 2 = 10<HT 25 m 3 = 2<HT 10 m 4 = 1<HT 2 m 5 = 0.5<HT 1 m 6 = 0.2<HT 0.5 m 7 = HT<0.2 m

CVR CODES 0= NONE 1= 0% < CVR ≤ 10% 2= 10 < CVR ≤ 25% 3= 25 < CVR ≤ 60% 4= CVR > 60%

STAND COMPOSITION:							BA:	
SIZE CLASS ANALYSIS:		< 10		10 - 24		25 - 50		> 50
STANDING SNAGS:		< 10		10 - 24		25 - 50		> 50
DEADFALL / LOGS:		< 10		10 - 24		25 - 50		> 50

ABUNDANCE CODES: N = NONE R = RARE O = OCCASIONAL A = ABUNDANT

COMM. AGE		PIONEER		YOUNG	✓	MID-AGE		MATURE		OLD GROWTH

SOIL ANALYSIS:

TEXTURE:	DEPTH TO MOTTLES / GLEY	g =	G=
MOISTURE:	DEPTH OF ORGANICS:		(cm)
HOMOGENEOUS / VARIABLE	DEPTH TO BEDROCK:		(cm)

COMMUNITYCLASSIFICATION:

COMMUNITY CLASS: Cultural	CODE: CU
COMMUNITY SERIES: Cultural Savanna	CODE: CUS
ECOSITE: Mineral Cultural Savanna	CODE: CUS1
VEGETATION TYPE: Scotch Pine Cultural Savanna	CODE: CUS1
INCLUSION	CODE:
COMPLEX	CODE:

Notes:

ELC PLANT SPECIES LIST	
	SITE:
	POLYGON:
	DATE:
	SURVEYOR(S):

LAYERS: 1 = CANOPY > 10m 2 = SUB-CANOPY 3 = UNDERSTOREY 4 = GROUND (GRD.) LAYER

ABUNDANCE CODES: R = RARE O = OCCASIONAL A = ABUNDANT D = DOMINANT

SPECIES CODE	LAYER				COLL.	SPECIES CODE	LAYER				COLL.
	1	2	3	4			1	2	3	4	

ELC
COMMUNITY DESCRIPTION & CLASSIFICATION

SITE: 5 Kilkenny
POLYGON: 4
SURVEYOR(S): DW
DATE: 29 Jun 17
UTME:
START:
END:
UTMZ:
UTMN:

POLYGON DESCRIPTION

SYSTEM
- ☑ TERRESTRIAL
- ☐ WETLAND
- ☐ AQUATIC

SUBSTRATE
- ☐ ORGANIC
- ☑ MINERAL SOIL
- ☐ PARENT MIN
- ☐ ACIDIC BEDRK
- ☐ BASIC BEDRK
- ☐ CARB. BEDRK

TOPOGRAPHIC FEATURE
- ☐ LACUSTRINE
- ☐ RIVERINE
- ☐ BOTTOMLAND
- ☐ TERRACE
- ☐ VALLEY SLOPE
- ☐ TABLELAND
- ☐ ROLL. UPLAND
- ☐ CLIFF
- ☐ TALUS
- ☐ CREVICE / CAVE
- ☐ ALVAR
- ☐ ROCKLAND
- ☐ BEACH / BAR
- ☐ SAND DUNE
- ☐ BLUFF

HISTORY
- ☐ NATURAL
- ☑ CULTURAL

PLANT FORM
- ☐ PLANKTON
- ☐ SUBMERGED
- ☐ FLOATING-LVD
- ☐ GRAMINOID
- ☐ FORB
- ☐ LICHEN
- ☐ BRYOPHYTE
- ☑ DECIDUOUS
- ☐ CONIFEROUS
- ☐ MIXED

COMMUNITY
- ☐ LAKE
- ☐ POND
- ☐ RIVER
- ☐ STREAM
- ☐ MARSH
- ☐ SWAMP
- ☐ FEN
- ☐ BOG
- ☐ BARREN
- ☐ MEADOW
- ☐ PRAIRIE
- ☑ THICKET
- ☐ SAVANNAH
- ☐ WOODLAND
- ☐ FOREST
- ☐ PLANTATION

SITE
- ☐ OPEN WATER
- ☐ SHALLOW WATER
- ☑ SURFICIAL DEP.
- ☐ BEDROCK

COVER
- ☐ OPEN
- ☑ SHRUB
- ☐ TREED

STAND DESCRIPTION:

LAYER	HT	CVR	SPECIES IN ORDER OF DECREASING DOMINANCE (>> MUCH GREATER THAN; > GREATER THAN; ≈ ABOUT EQUAL TO)
1 CANOPY			
2 SUB-CANOPY	3	4	Rhutyph Salbebb
3 UNDERSTOREY	4	2	Rhutyph
4 GRD. LAYER	5	3	Solalti bromine dacglom ascsyr

HT CODES: 1 = >25 m 2 = 10<HT 25 m 3 = 2<HT 10 m 4 = 1<HT 2 m 5 = 0.5<HT 1 m 6 = 0.2<HT 0.5 m 7 = HT<0.2 m
CVR CODES 0= NONE 1= 0% < CVR ≤ 10% 2= 10 < CVR ≤ 25% 3= 25 < CVR ≤ 60% 4= CVR > 60%

STAND COMPOSITION:
BA:

SIZE CLASS ANALYSIS:	< 10	10 - 24	25 - 50	> 50
STANDING SNAGS:	< 10	10 - 24	25 - 50	> 50
DEADFALL / LOGS:	< 10	10 - 24	25 - 50	> 50

ABUNDANCE CODES: N = NONE R = RARE O = OCCASIONAL A = ABUNDANT

COMM. AGE: PIONEER YOUNG MID-AGE MATURE OLD GROWTH

SOIL ANALYSIS:

TEXTURE:
DEPTH TO MOTTLES / GLEY g = G=
MOISTURE:
DEPTH OF ORGANICS: (cm)
HOMOGENEOUS / VARIABLE
DEPTH TO BEDROCK: (cm)

COMMUNITY CLASSIFICATION:

COMMUNITY CLASS: Cultural CODE: CU
COMMUNITY SERIES: Cultural Thicket CODE: CUT
ECOSITE: Mineral Cultural Thicket CODE: CUT1
VEGETATION TYPE: Sumac Cultural Thicket CODE: CUT1-1
INCLUSION CODE:
COMPLEX CODE:

Notes:

ELC
PLANT SPECIES LIST

SITE:
POLYGON:
DATE:
SURVEYOR(S):

LAYERS: 1 = CANOPY > 10m 2 = SUB-CANOPY 3 = UNDERSTOREY 4 = GROUND (GRD.) LAYER
ABUNDANCE CODES: R = RARE O = OCCASIONAL A = ABUNDANT D = DOMINANT

SPECIES CODE	LAYER 1	2	3	4	COLL.
Rhutyph	D				
Malsyl	R				
Salbeb2	R				

SPECIES CODE	LAYER 1	2	3	4	COLL.
Solalti				A	
broine				A	
poaprat				O	
dacglo				O	
ascsyr				O	
linvul				O	

ELC COMMUNITY DESCRIPTION & CLASSIFICATION	SITE S Kilkenny		POLYGON: 5	
	SURVEYOR(S) DW	DATE 26 Jun 17		UTME
	START	END	UTMZ	UTMN

POLYGON DESCRIPTION

SYSTEM	SUBSTRATE	TOPOGRAPHIC FEATURE	HISTORY	PLANT FORM	COMMUNITY
☐ TERRESTRIAL ☐ WETLAND ☐ AQUATIC	☐ ORGANIC ☐ MINERAL SOIL ☐ PARENT MIN ☐ ACIDIC BEDRK ☐ BASIC BEDRK ☐ CARB. BEDRK	☐ LACUSTRINE ☐ RIVERINE ☐ BOTTOMLAND ☐ TERRACE ☐ VALLEY SLOPE ☐ TABLELAND ☐ ROLL. UPLAND ☐ CLIFF ☐ TALUS ☐ CREVICE / CAVE ☐ ALVAR ☐ ROCKLAND ☐ BEACH / BAR ☐ SAND DUNE ☐ BLUFF	☐ NATURAL ☐ CULTURAL	☐ PLANKTON ☐ SUBMERGED ☐ FLOATING-LVD ☐ GRAMINOID ☐ FORB ☐ LICHEN ☐ BRYOPHYTE ☐ DECIDUOUS ☐ CONIFEROUS ☐ MIXED	☐ LAKE ☐ POND ☐ RIVER ☐ STREAM ☐ MARSH ☐ SWAMP ☐ FEN ☐ BOG ☐ BARREN ☐ MEADOW ☐ PRAIRIE ☐ THICKET ☐ SAVANNAH ☐ WOODLAND ☐ FOREST ☐ PLANTATION
SITE			**COVER**		
☐ OPEN WATER ☐ SHALLOW WATER ☐ SURFICIAL DEP. ☐ BEDROCK			☐ OPEN ☐ SHRUB ☐ TREED		

STAND DESCRIPTION:

	LAYER	HT	CVR	SPECIES IN ORDER OF DECREASING DOMINANCE (>> MUCH GREATER THAN; > GREATER THAN; ≈ ABOUT EQUAL TO)
1	CANOPY			Picpung
2	SUB-CANOPY			
3	UNDERSTOREY			
4	GRD. LAYER			grass Taroffi Trirepe plalare

HT CODES: 1 = >25 m 2 = 10<HT ≤25 m 3 = 2<HT ≤10 m 4 = 1<HT ≤2 m 5 = 0.5<HT ≤1 m 6 = 0.2<HT ≤0.5 m 7 = HT<0.2 m

CVR CODES 0= NONE 1= 0% < CVR ≤ 10% 2= 10 < CVR ≤ 25% 3= 25 < CVR ≤ 60% 4= CVR > 60%

STAND COMPOSITION:							BA:	
SIZE CLASS ANALYSIS:		< 10		10 - 24		25 - 50		> 50
STANDING SNAGS:		< 10		10 - 24		25 - 50		> 50
DEADFALL / LOGS:		< 10		10 - 24		25 - 50		> 50

ABUNDANCE CODES: N = NONE R = RARE O = OCCASIONAL A = ABUNDANT

COMM. AGE		PIONEER		YOUNG		MID-AGE		MATURE	OLD GROWTH

SOIL ANALYSIS:

TEXTURE:	DEPTH TO MOTTLES / GLEY	g =	G=
MOISTURE:	DEPTH OF ORGANICS:		(cm)
HOMOGENEOUS / VARIABLE	DEPTH TO BEDROCK:		(cm)

COMMUNITYCLASSIFICATION:

COMMUNITY CLASS:	CODE:
COMMUNITY SERIES:	CODE:
ECOSITE:	CODE:
VEGETATION TYPE:	CODE:
INCLUSION	CODE:
COMPLEX	CODE:

Notes:

Manicured

ELC PLANT SPECIES LIST	SITE:
	POLYGON:
	DATE:
	SURVEYOR(S):

LAYERS: 1 = CANOPY > 10m 2 = SUB-CANOPY 3 = UNDERSTOREY 4 = GROUND (GRD.) LAYER

ABUNDANCE CODES: R = RARE O = OCCASIONAL A = ABUNDANT D = DOMINANT

SPECIES CODE	LAYER 1	LAYER 2	LAYER 3	LAYER 4	COLL.	SPECIES CODE	LAYER 1	LAYER 2	LAYER 3	LAYER 4	COLL.
Picpung						Agtrom					
Acineg						Taroffi					
Aceplat						Plalare					
						Loncaere					
						Trirepe					
						Poaprat					
						Pruvulg					

kmg wl 2

ELC COMMUNITY DESCRIPTION & CLASSIFICATION	SITE: AMS Kilkenny	POLYGON: ~~[illegible]~~ 2 con't	
	SURVEYOR(S)	DATE	UTME
	START / END	UTMZ	UTMN

POLYGON DESCRIPTION

SYSTEM
☐ TERRESTRIAL
☐ WETLAND
☐ AQUATIC

SITE
☐ OPEN WATER
☐ SHALLOW WATER
☐ SURFICIAL DEP.
☐ BEDROCK

SUBSTRATE
☐ ORGANIC
☐ MINERAL SOIL
☐ PARENT MIN
☐ ACIDIC BEDRK
☐ BASIC BEDRK
☐ CARB. BEDRK

TOPOGRAPHIC FEATURE
☐ LACUSTRINE
☐ RIVERINE
☐ BOTTOMLAND
☐ TERRACE
☐ VALLEY SLOPE
☐ TABLELAND
☐ ROLL. UPLAND
☐ CLIFF
☐ TALUS
☐ CREVICE / CAVE
☐ ALVAR
☐ ROCKLAND
☐ BEACH / BAR
☐ SAND DUNE
☐ BLUFF

HISTORY
☐ NATURAL
☐ CULTURAL

COVER
☐ OPEN
☐ SHRUB
☐ TREED

PLANT FORM
☐ PLANKTON
☐ SUBMERGED
☐ FLOATING-LVD
☐ GRAMINOID
☐ FORB
☐ LICHEN
☐ BRYOPHYTE
☐ DECIDUOUS
☐ CONIFEROUS
☐ MIXED

COMMUNITY
☐ LAKE
☐ POND
☐ RIVER
☐ STREAM
☐ MARSH
☐ SWAMP
☐ FEN
☐ BOG
☐ BARREN
☐ MEADOW
☐ PRAIRIE
☐ THICKET
☐ SAVANNAH
☐ WOODLAND
☐ FOREST
☐ PLANTATION

STAND DESCRIPTION:

LAYER	HT	CVR	SPECIES IN ORDER OF DECREASING DOMINANCE (>> MUCH GREATER THAN; > GREATER THAN; = ABOUT EQUAL TO)
1 CANOPY			Pinstro Pinsylv Frame Pleep
2 SUB-CANOPY			
3 UNDERSTOREY			
4 GRD. LAYER			grasses hein chulen

HT CODES: 1 = >25 m 2 = 10<HT 25 m 3 = 2<HT 10 m 4 = 1<HT 2 m 5 = 0.5<HT 1 m 6 = 0.2<HT 0.5 m 7 = HT<0.2 m
CVR CODES 0= NONE 1= 0% < CVR 10% 2= 10 < CVR 25% 3= 25 < CVR 60% 4= CVR > 60%

STAND COMPOSITION:				BA:
SIZE CLASS ANALYSIS:	< 10	10 - 24	25 - 50	> 50
STANDING SNAGS:	< 10	10 - 24	25 - 50	> 50
DEADFALL / LOGS:	< 10	10 - 24	25 - 50	> 50

ABUNDANCE CODES: N = NONE R = RARE O = OCCASIONAL A = ABUNDANT

COMM. AGE	PIONEER	YOUNG	MID-AGE	MATURE	OLD GROWTH

SOIL ANALYSIS:

TEXTURE:	DEPTH TO MOTTLES / GLEY	g =	G=
MOISTURE:	DEPTH OF ORGANICS:		(cm)
HOMOGENEOUS / VARIABLE	DEPTH TO BEDROCK:		(cm)

COMMUNITYCLASSIFICATION:

COMMUNITY CLASS:	CODE:
COMMUNITY SERIES:	CODE:
ECOSITE:	CODE:
VEGETATION TYPE:	CODE:
INCLUSION	CODE:
COMPLEX	CODE:

Notes:

ELC PLANT SPECIES LIST	SITE:
	POLYGON:
	DATE:
	SURVEYOR(S):

LAYERS: 1 = CANOPY > 10m 2 = SUB-CANOPY 3 = UNDERSTOREY 4 = GROUND (GRD.) LAYER
ABUNDANCE CODES: R = RARE O = OCCASIONAL A = ABUNDANT D = DOMINANT

SPECIES CODE	LAYER 1	2	3	4	COLL.	SPECIES CODE	LAYER 1	2	3	4	COLL.
pinsylv						broine					
popxcan						corvan					
ulmame						solalti					
frama						viccra					
pinrsen						dacglo					
prulin						smilace					
popbsm						potrect					
pinstro						phlprat					
ulmame						linvul					
Acepla						hein					
Acesacm						poaprat					
Acexfree						medlupu					
						astnove					
						sedacr					
chrleuca											
forvesc											
rubidae											
thuocc											

ELC COMMUNITY DESCRIPTION & CLASSIFICATION	SITE: 1 Kilkenny		POLYGON: 6
	SURVEYOR(S): DW	DATE: 21 Jun 17	UTME
	START	END	UTMZ	UTMN

POLYGON DESCRIPTION

SYSTEM
- ☑ TERRESTRIAL
- ☐ WETLAND
- ☐ AQUATIC

SUBSTRATE
- ☐ ORGANIC
- ☑ MINERAL SOIL
- ☐ PARENT MIN
- ☐ ACIDIC BEDRK
- ☐ BASIC BEDRK
- ☐ CARB. BEDRK

TOPOGRAPHIC FEATURE
- ☐ LACUSTRINE
- ☐ RIVERINE
- ☐ BOTTOMLAND
- ☐ TERRACE
- ☐ VALLEY SLOPE
- ☐ TABLELAND
- ☐ ROLL. UPLAND
- ☐ CLIFF
- ☐ TALUS
- ☐ CREVICE / CAVE
- ☐ ALVAR
- ☐ ROCKLAND
- ☐ BEACH / BAR
- ☐ SAND DUNE
- ☐ BLUFF

HISTORY
- ☐ NATURAL
- ☑ CULTURAL

PLANT FORM
- ☐ PLANKTON
- ☐ SUBMERGED
- ☐ FLOATING-LVD
- ☑ GRAMINOID
- ☐ FORB
- ☐ LICHEN
- ☐ BRYOPHYTE
- ☐ DECIDUOUS
- ☐ CONIFEROUS
- ☐ MIXED

COMMUNITY
- ☐ LAKE
- ☐ POND
- ☐ RIVER
- ☐ STREAM
- ☐ MARSH
- ☐ SWAMP
- ☐ FEN
- ☐ BOG
- ☐ BARREN
- ☑ MEADOW
- ☐ PRAIRIE
- ☐ THICKET
- ☐ SAVANNAH
- ☐ WOODLAND
- ☐ FOREST
- ☐ PLANTATION

SITE
- ☐ OPEN WATER
- ☐ SHALLOW WATER
- ☑ SURFICIAL DEP.
- ☐ BEDROCK

COVER
- ☑ OPEN
- ☐ SHRUB
- ☐ TREED

STAND DESCRIPTION:

	LAYER	HT	CVR	SPECIES IN ORDER OF DECREASING DOMINANCE (>> MUCH GREATER THAN; > GREATER THAN; = ABOUT EQUAL TO)
1	CANOPY	2	1	Pic spp
2	SUB-CANOPY	3	1	Pic spp
3	UNDERSTOREY			
4	GRD. LAYER	5	4	grasses solalti viccra chleuc

HT CODES: 1 = >25 m 2 = 10<HT 25 m 3 = 2<HT 10 m 4 = 1<HT 2 m 5 = 0.5<HT 1 m 6 = 0.2<HT 0.5 m 7 = HT<0.2 m

CVR CODES 0= NONE 1= 0% < CVR ≤ 10% 2= 10 < CVR ≤ 25% 3= 25 < CVR ≤ 60% 4= CVR > 60%

STAND COMPOSITION:								BA:	
SIZE CLASS ANALYSIS:		< 10		10 - 24		25 - 50		> 50
STANDING SNAGS:		< 10		10 - 24		25 - 50		> 50
DEADFALL / LOGS:		< 10		10 - 24		25 - 50		> 50

ABUNDANCE CODES: N = NONE R = RARE O = OCCASIONAL A = ABUNDANT

COMM. AGE		PIONEER		YOUNG		MID-AGE		MATURE		OLD GROWTH

SOIL ANALYSIS:

TEXTURE:	DEPTH TO MOTTLES / GLEY	g =	G=
MOISTURE:	DEPTH OF ORGANICS:		(cm)
HOMOGENEOUS / VARIABLE	DEPTH TO BEDROCK:		(cm)

COMMUNITYCLASSIFICATION:

COMMUNITY CLASS: Cultural	CODE: CU
COMMUNITY SERIES: Cultural Meadow	CODE: CUM
ECOSITE: Mineral Cultural Meadow	CODE: CUM1
VEGETATION TYPE: ~~Dry Mois~~ -	CODE: CNM1
INCLUSION	CODE:
COMPLEX	CODE:

Notes:

berm

ELC PLANT SPECIES LIST	SITE:
	POLYGON:
	DATE:
	SURVEYOR(S):

LAYERS: 1 = CANOPY > 10m 2 = SUB-CANOPY 3 = UNDERSTOREY 4 = GROUND (GRD.) LAYER

ABUNDANCE CODES: R = RARE O = OCCASIONAL A = ABUNDANT D = DOMINANT

SPECIES CODE	LAYER 1	LAYER 2	LAYER 3	LAYER 4	COLL.
Pic pung					
AceglA					
Ulame					
phrat					
poaprat					
dacglom					
cmalbl					
chleuc					
viccra					
solalt					
prunse					
broin					
euphorb					
verthap					
appengh					
echvulg					
hypperf					
cirarv					
ascsyri					
phram					

ELC COMMUNITY DESCRIPTION & CLASSIFICATION	SITE 1 Kilkenny		POLYGON: 7	
	SURVEYOR(S) DW	DATE Jun 21 2017		UTME
	START	END	UTMZ	UTMN

POLYGON DESCRIPTION

SYSTEM	SUBSTRATE	TOPOGRAPHIC FEATURE	HISTORY	PLANT FORM	COMMUNITY
☐ TERRESTRIAL ☐ WETLAND ☐ AQUATIC	☐ ORGANIC ☐ MINERAL SOIL ☐ PARENT MIN ☐ ACIDIC BEDRK ☐ BASIC BEDRK ☐ CARB. BEDRK	☐ LACUSTRINE ☐ RIVERINE ☐ BOTTOMLAND ☐ TERRACE ☐ VALLEY SLOPE ☐ TABLELAND ☐ ROLL. UPLAND ☐ CLIFF ☐ TALUS ☐ CREVICE / CAVE ☐ ALVAR ☐ ROCKLAND ☐ BEACH / BAR ☐ SAND DUNE ☐ BLUFF	☐ NATURAL ☐ CULTURAL	☐ PLANKTON ☐ SUBMERGED ☐ FLOATING-LVD. ☐ GRAMINOID ☐ FORB ☐ LICHEN ☐ BRYOPHYTE ☐ DECIDUOUS ☐ CONIFEROUS ☐ MIXED	☐ LAKE ☐ POND ☐ RIVER ☐ STREAM ☐ MARSH ☐ SWAMP ☐ FEN ☐ BOG ☐ BARREN ☐ MEADOW ☐ PRAIRIE ☐ THICKET ☐ SAVANNAH ☐ WOODLAND ☐ FOREST ☐ PLANTATION
SITE			**COVER**		
☐ OPEN WATER ☐ SHALLOW WATER ☐ SURFICIAL DEP. ☐ BEDROCK			☐ OPEN ☐ SHRUB ☐ TREED		

STAND DESCRIPTION:

LAYER		HT	CVR	SPECIES IN ORDER OF DECREASING DOMINANCE (>> MUCH GREATER THAN; > GREATER THAN; ≈ ABOUT EQUAL TO)
1	CANOPY	3	4	Picea
2	SUB-CANOPY			
3	UNDERSTOREY			
4	GRD. LAYER	5	2	grasses anecan chrleu trifr

HT CODES: 1 = >25 m 2 = 10<HT 25 m 3 = 2<HT 10 m 4 = 1<HT 2 m 5 = 0.5<HT 1 m 6 = 0.2<HT 0.5 m 7 = HT<0.2 m

CVR CODES 0= NONE 1= 0% < CVR ≤ 10% 2= 10 < CVR ≤ 25% 3= 25 < CVR ≤ 60% 4= CVR > 60%

STAND COMPOSITION:								BA:	
SIZE CLASS ANALYSIS:		< 10		10 - 24		25 - 50		> 50	
STANDING SNAGS:		< 10		10 - 24		25 - 50		> 50	
DEADFALL / LOGS:		< 10		10 - 24		25 - 50		> 50	

ABUNDANCE CODES: N = NONE R = RARE O = OCCASIONAL A = ABUNDANT

COMM. AGE		PIONEER		YOUNG		MID-AGE		MATURE		OLD GROWTH

SOIL ANALYSIS:

TEXTURE:	DEPTH TO MOTTLES / GLEY	g =	G=
MOISTURE:	DEPTH OF ORGANICS:		(cm)
HOMOGENEOUS / VARIABLE	DEPTH TO BEDROCK:		(cm)

COMMUNITYCLASSIFICATION:

COMMUNITY CLASS:	CODE:
COMMUNITY SERIES:	CODE:
ECOSITE:	CODE:
VEGETATION TYPE:	CODE:
INCLUSION	CODE:
COMPLEX	CODE:

Notes:

ELC PLANT SPECIES LIST	SITE:
	POLYGON:
	DATE:
	SURVEYOR(S):

LAYERS: 1 = CANOPY > 10m 2 = SUB-CANOPY 3 = UNDERSTOREY 4 = GROUND (GRD.) LAYER

ABUNDANCE CODES: R = RARE O = OCCASIONAL A = ABUNDANT D = DOMINANT

SPECIES CODE	LAYER 1	2	3	4	COLL.	SPECIES CODE	LAYER 1	2	3	4	COLL.
						anecan					
						broin					
						dacglo					
						vicia					
						silene					
						trifra					
						solalt					
						verthe					
						chrleu					

ELC COMMUNITY DESCRIPTION & CLASSIFICATION	SITE: Kilkenny		POLYGON: 1	
	SURVEYOR(S): DW	DATE: 21 Jun 17		UTME
	START	END	UTMZ	UTMN

POLYGON DESCRIPTION

SYSTEM
- ☐ TERRESTRIAL
- ☑ WETLAND
- ☐ AQUATIC

SUBSTRATE
- ☑ ORGANIC
- ☐ MINERAL SOIL
- ☐ PARENT MIN
- ☐ ACIDIC BEDRK
- ☐ BASIC BEDRK
- ☐ CARB. BEDRK

TOPOGRAPHIC FEATURE
- ☐ LACUSTRINE
- ☐ RIVERINE
- ☐ BOTTOMLAND
- ☐ TERRACE
- ☐ VALLEY SLOPE
- ☐ TABLELAND
- ☐ ROLL. UPLAND
- ☐ CLIFF
- ☐ TALUS
- ☐ CREVICE / CAVE
- ☐ ALVAR
- ☐ ROCKLAND
- ☐ BEACH / BAR
- ☐ SAND DUNE
- ☐ BLUFF

HISTORY
- ☑ NATURAL
- ☐ CULTURAL

PLANT FORM
- ☐ PLANKTON
- ☐ SUBMERGED
- ☐ FLOATING-LVD
- ☑ GRAMINOID
- ☐ FORB
- ☐ LICHEN
- ☐ BRYOPHYTE
- ☐ DECIDUOUS
- ☐ CONIFEROUS
- ☐ MIXED

COMMUNITY
- ☐ LAKE
- ☐ POND
- ☐ RIVER
- ☐ STREAM
- ☑ MARSH
- ☐ SWAMP
- ☐ FEN
- ☐ BOG
- ☐ BARREN
- ☐ MEADOW
- ☐ PRAIRIE
- ☐ THICKET
- ☐ SAVANNAH
- ☐ WOODLAND
- ☐ FOREST
- ☐ PLANTATION

SITE
- ☐ OPEN WATER
- ☐ SHALLOW WATER
- ☑ SURFICIAL DEP.
- ☐ BEDROCK

COVER
- ☑ OPEN
- ☐ SHRUB
- ☐ TREED

STAND DESCRIPTION:

LAYER		HT	CVR	SPECIES IN ORDER OF DECREASING DOMINANCE (>> MUCH GREATER THAN; > GREATER THAN; = ABOUT EQUAL TO)
1	CANOPY			
2	SUB-CANOPY			
3	UNDERSTOREY			
4	GRD. LAYER			phaarun >> soldulc

HT CODES: 1 = >25 m 2 = 10<HT 25 m 3 = 2<HT 10 m 4 = 1<HT 2 m 5 = 0.5<HT 1 m 6 = 0.2<HT 0.5 m 7 = HT<0.2 m

CVR CODES 0= NONE 1= 0% < CVR ≤ 10% 2= 10 < CVR ≤ 25% 3= 25 < CVR ≤ 60% 4= CVR > 60%

STAND COMPOSITION:							BA:	
SIZE CLASS ANALYSIS:	A	< 10	A	10 - 24	A	25 - 50	R	> 50
STANDING SNAGS:	O	< 10	O	10 - 24	O	25 - 50	R	> 50
DEADFALL / LOGS:	A	< 10	A	10 - 24	O	25 - 50	R	> 50

ABUNDANCE CODES: N = NONE R = RARE O = OCCASIONAL A = ABUNDANT

COMM. AGE		PIONEER		YOUNG		MID-AGE		MATURE		OLD GROWTH

SOIL ANALYSIS:

TEXTURE:	DEPTH TO MOTTLES / GLEY	g =	G=
MOISTURE:	DEPTH OF ORGANICS:		(cm)
HOMOGENEOUS / VARIABLE	DEPTH TO BEDROCK:		(cm)

COMMUNITY CLASSIFICATION:

COMMUNITY CLASS: Marsh	CODE: MA
COMMUNITY SERIES: Shallow Marsh	CODE: MAS
ECOSITE: Mar Organic Shallow Marsh	CODE: MAS3
VEGETATION TYPE: Reed Canary Organic Shallow Marsh	CODE: MAS3
INCLUSION	CODE:
COMPLEX	CODE:

Notes:

ELC PLANT SPECIES LIST	SITE:
	POLYGON:
	DATE:
	SURVEYOR(S):

LAYERS: 1 = CANOPY > 10m 2 = SUB-CANOPY 3 = UNDERSTOREY 4 = GROUND (GRD.) LAYER

ABUNDANCE CODES: R = RARE O = OCCASIONAL A = ABUNDANT D = DOMINANT

SPECIES CODE	LAYER 1	2	3	4	COLL.	SPECIES CODE	LAYER 1	2	3	4	COLL.
Solalta						phaarun					
						pot. sp					
						gal palu					
						soldulc					
						lemmino					
						cicbulb					
						~~[illegible]~~					
						gerrobe					
						solgiga					
						~~[illegible]~~					
						dircan					
						carlasp					
						~~[illegible]~~					
						~~[illegible]~~					
Sawcym											
Sdpetn											

ELC COMMUNITY DESCRIPTION & CLASSIFICATION	SITE 12 Kilkenny		POLYGON: 2	
	SURVEYOR(S) DW	DATE 21 Jun 17		UTME
	START	END	UTMZ	UTMN

POLYGON DESCRIPTION

SYSTEM	SUBSTRATE	TOPOGRAPHIC FEATURE	HISTORY	PLANT FORM	COMMUNITY
☐ TERRESTRIAL ☐ WETLAND ☐ AQUATIC	☐ ORGANIC ☐ MINERAL SOIL ☐ PARENT MIN ☐ ACIDIC BEDRK ☐ BASIC BEDRK ☐ CARB. BEDRK	☐ LACUSTRINE ☐ RIVERINE ☐ BOTTOMLAND ☐ TERRACE ☐ VALLEY SLOPE ☐ TABLELAND ☐ ROLL. UPLAND ☐ CLIFF ☐ TALUS ☐ CREVICE / CAVE ☐ ALVAR ☐ ROCKLAND ☐ BEACH / BAR ☐ SAND DUNE ☐ BLUFF	☐ NATURAL ☐ CULTURAL	☐ PLANKTON ☐ SUBMERGED ☐ FLOATING-LVD ☐ GRAMINOID ☐ FORB ☐ LICHEN ☐ BRYOPHYTE ☐ DECIDUOUS ☐ CONIFEROUS ☐ MIXED	☐ LAKE ☐ POND ☐ RIVER ☐ STREAM ☐ MARSH ☐ SWAMP ☐ FEN ☐ BOG ☐ BARREN ☐ MEADOW ☐ PRAIRIE ☐ THICKET ☐ SAVANNAH ☐ WOODLAND ☐ FOREST ☐ PLANTATION
SITE			**COVER**		
☐ OPEN WATER ☐ SHALLOW WATER ☐ SURFICIAL DEP. ☐ BEDROCK			☐ OPEN ☐ SHRUB ☐ TREED		

STAND DESCRIPTION:

	LAYER	HT	CVR	SPECIES IN ORDER OF DECREASING DOMINANCE (>> MUCH GREATER THAN; > GREATER THAN; = ABOUT EQUAL TO)
1	CANOPY			
2	SUB-CANOPY			
3	UNDERSTOREY			
4	GRD. LAYER	5	4	grasses solalti arecan [illegible]

HT CODES: 1 = >25 m 2 = 15<HT 25 m 3 = 2<HT 10 m 4 = 1<HT 2 m 5 = 0.5<HT 1 m 6 = 0.2<HT 0.5 m 7 = HT<0.2m

CVR CODES 0= NONE 1= 0% < CVR 10% 2= 10 < CVR 25% 3= 25 < CVR 60% 4= CVR > 60%

STAND COMPOSITION:				BA:
SIZE CLASS ANALYSIS:	< 10	10 - 24	25 - 50	> 50
STANDING SNAGS:	< 10	10 - 24	25 - 50	> 50
DEADFALL / LOGS:	< 10	10 - 24	25 - 50	> 50

ABUNDANCE CODES: N = NONE R = RARE O = OCCASIONAL A = ABUNDANT

COMM. AGE	PIONEER	YOUNG	MID-AGE	MATURE	OLD GROWTH

SOIL ANALYSIS:

TEXTURE:	DEPTH TO MOTTLES / GLEY	g =	G=
MOISTURE:	DEPTH OF ORGANICS:		(cm)
HOMOGENEOUS / VARIABLE	DEPTH TO BEDROCK:		(cm)

COMMUNITYCLASSIFICATION:

COMMUNITY CLASS:	CODE:
COMMUNITY SERIES:	CODE:
ECOSITE:	CODE:
VEGETATION TYPE:	CODE:
INCLUSION	CODE:
COMPLEX	CODE:

Notes:

ELC PLANT SPECIES LIST	SITE:
	POLYGON:
	DATE:
	SURVEYOR(S):

LAYERS: 1 = CANOPY > 10m 2 = SUB-CANOPY 3 = UNDERSTOREY 4 = GROUND (GRD.) LAYER

ABUNDANCE CODES: R = RARE O = OCCASIONAL A = ABUNDANT D = DOMINANT

SPECIES CODE	LAYER 1	LAYER 2	LAYER 3	LAYER 4	COLL.	SPECIES CODE	LAYER 1	LAYER 2	LAYER 3	LAYER 4	COLL.
Sal alba						solalti					
Bromin						geucana					
Popbals						Rustyp					
						Rosa [illegible]					
						Ampfr					
						cirarv					
						allpeti					
[illegible]											
[illegible]											
[illegible]											
[illegible]											

ELC COMMUNITY DESCRIPTION & CLASSIFICATION	SITE: 12 Kilkenny			POLYGON: 3	
	SURVEYOR(S): DW		DATE: 21 Jun 17		UTME
	START	END		UTMZ	UTMN

POLYGON DESCRIPTION

SYSTEM
☐ TERRESTRIAL
☑ WETLAND
☐ AQUATIC

SUBSTRATE
☐ ORGANIC
☑ MINERAL SOIL
☐ PARENT MIN
☐ ACIDIC BEDRK
☐ BASIC BEDRK
☐ CARB. BEDRK

TOPOGRAPHIC FEATURE
☐ LACUSTRINE
☐ RIVERINE
☐ BOTTOMLAND
☑ TERRACE
☐ VALLEY SLOPE
☐ TABLELAND
☐ ROLL. UPLAND
☐ CLIFF
☐ TALUS
☐ CREVICE / CAVE
☐ ALVAR
☐ ROCKLAND
☐ BEACH / BAR
☐ SAND DUNE
☐ BLUFF

HISTORY
☑ NATURAL
☐ CULTURAL

PLANT FORM
☐ PLANKTON
☐ SUBMERGED
☐ FLOATING-LVD
☐ GRAMINOID
☐ FORB
☐ LICHEN
☐ BRYOPHYTE
☑ DECIDUOUS
☐ CONIFEROUS
☐ MIXED

COMMUNITY
☐ LAKE
☐ POND
☐ RIVER
☐ STREAM
☐ MARSH
☑ SWAMP
☐ FEN
☐ BOG
☐ BARREN
☐ MEADOW
☐ PRAIRIE
☐ THICKET
☐ SAVANNAH
☐ WOODLAND
☐ FOREST
☐ PLANTATION

SITE
☐ OPEN WATER
☐ SHALLOW WATER
☑ SURFICIAL DEP.
☐ BEDROCK

COVER
☐ OPEN
☐ SHRUB
☑ TREED

STAND DESCRIPTION:

LAYER		HT	CVR	SPECIES IN ORDER OF DECREASING DOMINANCE (>> MUCH GREATER THAN; > GREATER THAN; ≈ ABOUT EQUAL TO)
1	CANOPY	2	4	Acexfre >> Fraxpen Poptre
2	SUB-CANOPY			Acefre.
3	UNDERSTOREY	4	4	Rhafran Rhocath
4	GRD. LAYER	5	3	Glystri Cirlute

HT CODES: 1 = >25 m 2 = 10<HT≤25 m 3 = 2<HT≤10 m 4 = 1<HT≤2 m 5 = 0.5<HT≤1 m 6 = 0.2<HT≤0.5 m 7 = HT<0.2 m
CVR CODES 0= NONE 1= 0% < CVR ≤ 10% 2= 10 < CVR ≤ 25% 3= 25 < CVR ≤ 60% 4= CVR > 60%

STAND COMPOSITION:							BA:	
SIZE CLASS ANALYSIS:	A	< 10	A	10 - 24	A	25 - 50	R	> 50
STANDING SNAGS:	O	< 10	O	10 - 24	O	25 - 50	R	> 50
DEADFALL / LOGS:	A	< 10	A	10 - 24	O	25 - 50	R	> 50

ABUNDANCE CODES: N = NONE R = RARE O = OCCASIONAL A = ABUNDANT

COMM. AGE ☐ PIONEER ☐ YOUNG ☐ MID-AGE ☑ MATURE ☐ OLD GROWTH

SOIL ANALYSIS:

TEXTURE:	DEPTH TO MOTTLES / GLEY	g =	G=
MOISTURE:	DEPTH OF ORGANICS:		(cm)
HOMOGENEOUS / VARIABLE	DEPTH TO BEDROCK:		(cm)

COMMUNITY CLASSIFICATION:

COMMUNITY CLASS: Swamp	CODE: SW
COMMUNITY SERIES: Deciduous Swamp	CODE: SWD
ECOSITE: Maple Mineral Deciduous Swamp	CODE: SWD3
VEGETATION TYPE: Swamp Maple Mineral Deciduous Swamp	CODE: SWD3-3
INCLUSION	CODE:
COMPLEX	CODE:

Notes:

ELC PLANT SPECIES LIST	SITE:
	POLYGON:
	DATE:
	SURVEYOR(S):

LAYERS: 1 = CANOPY > 10m 2 = SUB-CANOPY 3 = UNDERSTOREY 4 = GROUND (GRD.) LAYER
ABUNDANCE CODES: R = RARE O = OCCASIONAL A = ABUNDANT D = DOMINANT

SPECIES CODE	LAYER 1	LAYER 2	LAYER 3	LAYER 4	COLL.	SPECIES CODE	LAYER 1	LAYER 2	LAYER 3	LAYER 4	COLL.
Fraxpen						anecana					
Acexfre						galobtu					
Salalba						onosens					
Acerub						glystri					
Ulmame						cirlute					
Poptre						Solalti					
						eupperf					
						fravirg					
						solrugo					
						oxastri					
						ranrecu					
						hydvirg					
						allpeti					
						cargrac					
						carlupu					
						impcapi					
						geucana					
						elycana					
						gerrobe					
						solgiga					
						[illegible]					
						dryclin					
						carhyst					
						lyscili					
						equarve					
Rhocath						menarve					
Rhafran						schtabe					

ELC
COMMUNITY DESCRIPTION & CLASSIFICATION

SITE 12 Kilkenny
POLYGON: 4
SURVEYOR(S) DJ
DATE 21 Jun 17
UTME
START
END
UTMZ
UTMN

POLYGON DESCRIPTION

SYSTEM	SUBSTRATE	TOPOGRAPHIC FEATURE	HISTORY	PLANT FORM	COMMUNITY
☑ TERRESTRIAL ☐ WETLAND ☐ AQUATIC	☐ ORGANIC ☑ MINERAL SOIL ☐ PARENT MIN ☐ ACIDIC BEDRK ☐ BASIC BEDRK ☐ CARB. BEDRK	☐ LACUSTRINE ☐ RIVERINE ☐ BOTTOMLAND ☐ TERRACE ☐ VALLEY SLOPE ☐ TABLELAND ☐ ROLL. UPLAND ☐ CLIFF ☐ TALUS ☐ CREVICE / CAVE ☐ ALVAR ☐ ROCKLAND ☐ BEACH / BAR ☐ SAND DUNE ☐ BLUFF	☑ NATURAL ☐ CULTURAL	☐ PLANKTON ☐ SUBMERGED ☐ FLOATING-LVD ☐ GRAMINOID ☐ FORB ☐ LICHEN ☐ BRYOPHYTE ☑ DECIDUOUS ☐ CONIFEROUS ☐ MIXED	☐ LAKE ☐ POND ☐ RIVER ☐ STREAM ☐ MARSH ☐ SWAMP ☐ FEN ☐ BOG ☐ BARREN ☐ MEADOW ☐ PRAIRIE ☐ THICKET ☐ SAVANNAH ☐ WOODLAND ☑ FOREST ☐ PLANTATION
SITE			**COVER**		
☐ OPEN WATER ☐ SHALLOW WATER ☑ SURFICIAL DEP. ☐ BEDROCK			☐ OPEN ☐ SHRUB ☑ TREED		

STAND DESCRIPTION:

LAYER	HT	CVR	SPECIES IN ORDER OF DECREASING DOMINANCE (>> MUCH GREATER THAN; > GREATER THAN; = ABOUT EQUAL TO)
1 CANOPY			Poptrem > Prunsero Ulmamer Frapenn
2 SUB-CANOPY			
3 UNDERSTOREY	4	3	Rhacath Lontata Frapenn Cratsp
4 GRD. LAYER			Cirlute Fravirg Parinse Solalti

HT CODES: 1 = >25 m 2 = 10<HT 25 m 3 = 2<HT 10 m 4 = 1<HT≤2 m 5 = 0.5<HT 1 m 6 = 0.2<HT 0.5 m 7 = HT<0.2 m
CVR CODES 0= NONE 1= 0% < CVR ≤ 10% 2= 10 < CVR ≤ 25% 3= 25 < CVR ≤ 60% 4= CVR > 60%

STAND COMPOSITION:							BA:	
SIZE CLASS ANALYSIS:	A	< 10	A	10 - 24	R	25 - 50	N	> 50
STANDING SNAGS:		< 10		10 - 24		25 - 50		> 50
DEADFALL / LOGS:	A	< 10	A	10 - 24	A	25 - 50	R	> 50

ABUNDANCE CODES: N = NONE R = RARE O = OCCASIONAL A = ABUNDANT

COMM. AGE		PIONEER		YOUNG	✓	MID-AGE		MATURE		OLD GROWTH

SOIL ANALYSIS:

TEXTURE:	DEPTH TO MOTTLES / GLEY	g =	G=
MOISTURE:	DEPTH OF ORGANICS:		(cm)
HOMOGENEOUS / VARIABLE	DEPTH TO BEDROCK:		(cm)

COMMUNITYCLASSIFICATION:

COMMUNITY CLASS: Forest	CODE: FO
COMMUNITY SERIES: Deciduous Forest	CODE: FOD
ECOSITE: Fresh Moist Poplar - Sassafras	CODE: FOD8
VEGETATION TYPE: Fresh-Moist Poplar Deciduous Forest	CODE: FOD8-1
INCLUSION	CODE:
COMPLEX	CODE:

Notes:

ELC
PLANT SPECIES LIST

SITE:
POLYGON:
DATE:
SURVEYOR(S):

LAYERS: 1 = CANOPY > 10m 2 = SUB-CANOPY 3 = UNDERSTOREY 4 = GROUND (GRD.) LAYER
ABUNDANCE CODES: R = RARE O = OCCASIONAL A = ABUNDANT D = DOMINANT

SPECIES CODE	LAYER 1	LAYER 2	LAYER 3	LAYER 4	COLL.	SPECIES CODE	LAYER 1	LAYER 2	LAYER 3	LAYER 4	COLL.
Poptrem						Cirlute					
Prunsero						Fravirg					
Frapenn						Toxrydb					
Ulmamer						[illegible]					
						Daucaro					
						Parinse					
						Solalti					
						[illegible]					
						[illegible]					
Pruvirg											
Frapenn											
Lontata											
Rhacath											

ELC COMMUNITY DESCRIPTION & CLASSIFICATION	SITE 12 Kilkenny		POLYGON: 5	
	SURVEYOR(S) DW	DATE 21 Jun 17		UTME
	START	END	UTMZ	UTMN

POLYGON DESCRIPTION

SYSTEM	SUBSTRATE	TOPOGRAPHIC FEATURE	HISTORY	PLANT FORM	COMMUNITY
☐ TERRESTRIAL ☑ WETLAND ☐ AQUATIC	☐ ORGANIC ☑ MINERAL SOIL ☐ PARENT MIN ☐ ACIDIC BEDRK ☐ BASIC BEDRK ☐ CARB. BEDRK	☐ LACUSTRINE ☐ RIVERINE ☐ BOTTOMLAND ☐ TERRACE ☐ VALLEY SLOPE ☐ TABLELAND ☐ ROLL. UPLAND ☐ CLIFF ☐ TALUS ☐ CREVICE / CAVE ☐ ALVAR ☐ ROCKLAND ☐ BEACH / BAR ☐ SAND DUNE ☐ BLUFF	☐ NATURAL ☑ CULTURAL	☐ PLANKTON ☐ SUBMERGED ☐ FLOATING-LVD ☑ GRAMINOID ☐ FORB ☐ LICHEN ☐ BRYOPHYTE ☐ DECIDUOUS ☐ CONIFEROUS ☐ MIXED	☐ LAKE ☐ POND ☐ RIVER ☐ STREAM ☑ MARSH ☐ SWAMP ☐ FEN ☐ BOG ☐ BARREN ☐ MEADOW ☐ PRAIRIE ☐ THICKET ☐ SAVANNAH ☐ WOODLAND ☐ FOREST ☐ PLANTATION
SITE			**COVER**		
☐ OPEN WATER ☐ SHALLOW WATER ☑ SURFICIAL DEP. ☐ BEDROCK			☑ OPEN ☐ SHRUB ☐ TREED		

STAND DESCRIPTION:

LAYER		HT	CVR	SPECIES IN ORDER OF DECREASING DOMINANCE (>> MUCH GREATER THAN; > GREATER THAN; = ABOUT EQUAL TO)
1	CANOPY			
2	SUB-CANOPY			
3	UNDERSTOREY			
4	GRD. LAYER	4	4	glysept > typlat scivali siusuav

HT CODES: 1 = >25 m 2 = 10<HT ≤25 m 3 = 2<HT ≤10 m 4 = 1<HT ≤2 m 5 = 0.5<HT ≤1 m 6 = 0.2<HT ≤0.5 m 7 = HT<0.2 m

CVR CODES 0 = NONE 1 = 0% < CVR ≤ 10% 2 = 10 < CVR ≤ 25% 3 = 25 < CVR ≤ 60% 4 = CVR > 60%

STAND COMPOSITION:				BA:
SIZE CLASS ANALYSIS:	< 10	10 - 24	25 - 50	> 50
STANDING SNAGS:	< 10	10 - 24	25 - 50	> 50
DEADFALL / LOGS:	< 10	10 - 24	25 - 50	> 50

ABUNDANCE CODES: N = NONE R = RARE O = OCCASIONAL A = ABUNDANT

COMM. AGE	PIONEER	YOUNG	MID-AGE	MATURE	OLD GROWTH

SOIL ANALYSIS:

TEXTURE:	DEPTH TO MOTTLES / GLEY	g =	G=
MOISTURE:	DEPTH OF ORGANICS:		(cm)
HOMOGENEOUS / VARIABLE	DEPTH TO BEDROCK:		(cm)

COMMUNITYCLASSIFICATION:

COMMUNITY CLASS: Marsh	CODE: MA
COMMUNITY SERIES: Shallow Marsh	CODE: MAS
ECOSITE: Mineral Shallow Marsh	CODE: MAS2
VEGETATION TYPE: Cattail Mineral Shallow Marsh	CODE: MAS2-1
INCLUSION	CODE:
COMPLEX	CODE:

Notes:

ELC PLANT SPECIES LIST	SITE:
	POLYGON:
	DATE:
	SURVEYOR(S):

LAYERS: 1 = CANOPY > 10m 2 = SUB-CANOPY 3 = UNDERSTOREY 4 = GROUND (GRD.) LAYER

ABUNDANCE CODES: R = RARE O = OCCASIONAL A = ABUNDANT D = DOMINANT

SPECIES CODE	LAYER				COLL.	SPECIES CODE	LAYER				COLL.
	1	2	3	4			1	2	3	4	
						alipla					
						typh sp					
						pot sp					
						galpal					
						[illegible]					
						[illegible]					
						hypang					
						verver					
						soldul					
						agrova					
						scival					
						siusuv					
						eqhiy					
						lycame					
						sparg.					

ELC COMMUNITY DESCRIPTION & CLASSIFICATION	SITE: 12 Kilkenny		POLYGON: 6	
	SURVEYOR(S) DW	DATE 21 Jun 17		UTME
	START	END	UTMZ	UTMN

POLYGON DESCRIPTION

SYSTEM
- ☑ TERRESTRIAL
- ☐ WETLAND
- ☐ AQUATIC

SUBSTRATE
- ☐ ORGANIC
- ☑ MINERAL SOIL
- ☐ PARENT MIN
- ☐ ACIDIC BEDRK
- ☐ BASIC BEDRK
- ☐ CARB. BEDRK

TOPOGRAPHIC FEATURE
- ☐ LACUSTRINE
- ☐ RIVERINE
- ☐ BOTTOMLAND
- ☐ TERRACE
- ☐ VALLEY SLOPE
- ☐ TABLELAND
- ☐ ROLL. UPLAND
- ☐ CLIFF
- ☐ TALUS
- ☐ CREVICE / CAVE
- ☐ ALVAR
- ☐ ROCKLAND
- ☐ BEACH / BAR
- ☐ SAND DUNE
- ☐ BLUFF

HISTORY
- ☐ NATURAL
- ☑ CULTURAL

PLANT FORM
- ☐ PLANKTON
- ☐ SUBMERGED
- ☐ FLOATING-LVD
- ☐ GRAMINOID
- ☑ FORB
- ☐ LICHEN
- ☐ BRYOPHYTE
- ☐ DECIDUOUS
- ☐ CONIFEROUS
- ☐ MIXED

COMMUNITY
- ☐ LAKE
- ☐ POND
- ☐ RIVER
- ☐ STREAM
- ☐ MARSH
- ☐ SWAMP
- ☐ FEN
- ☐ BOG
- ☐ BARREN
- ☑ MEADOW
- ☐ PRAIRIE
- ☐ THICKET
- ☐ SAVANNAH
- ☐ WOODLAND
- ☐ FOREST
- ☐ PLANTATION

SITE
- ☐ OPEN WATER
- ☐ SHALLOW WATER
- ☑ SURFICIAL DEP.
- ☐ BEDROCK

COVER
- ☑ OPEN
- ☐ SHRUB
- ☐ TREED

STAND DESCRIPTION:

LAYER		HT	CVR	SPECIES IN ORDER OF DECREASING DOMINANCE (>> MUCH GREATER THAN; > GREATER THAN; = ABOUT EQUAL TO)
1	CANOPY			
2	SUB-CANOPY			
3	UNDERSTOREY			
4	GRD. LAYER	4	4	solalti poaprat apocan bromin

HT CODES: 1 = >25 m 2 = 10<HT 25 m 3 = 2<HT 10 m 4 = 1<HT 2 m 5 = 0.5<HT 1 m 6 = 0.2<HT 0.5 m 7 = HT<0.2 m

CVR CODES 0= NONE 1= 0% < CVR ≤ 10% 2= 10 < CVR ≤ 25% 3= 25 < CVR ≤ 60% 4= CVR > 60%

STAND COMPOSITION:	BA:

SIZE CLASS ANALYSIS:	< 10	10 - 24	25 - 50	> 50
STANDING SNAGS:	< 10	10 - 24	25 - 50	> 50
DEADFALL / LOGS:	< 10	10 - 24	25 - 50	> 50

ABUNDANCE CODES: N = NONE R = RARE O = OCCASIONAL A = ABUNDANT

COMM. AGE	PIONEER	YOUNG	MID-AGE	MATURE	OLD GROWTH

SOIL ANALYSIS:

TEXTURE:	DEPTH TO MOTTLES / GLEY	g =	G=
MOISTURE:	DEPTH OF ORGANICS:		(cm)
HOMOGENEOUS / VARIABLE	DEPTH TO BEDROCK:		(cm)

COMMUNITY CLASSIFICATION:

COMMUNITY CLASS: Cultural	CODE: CU
COMMUNITY SERIES: Cultural Meadow	CODE: CUM
ECOSITE: Mineral Cultural Meadow	CODE: CUM1
VEGETATION TYPE:	CODE: CUM1
INCLUSION	CODE:
COMPLEX	CODE:

Notes:

ELC PLANT SPECIES LIST	SITE:
	POLYGON:
	DATE:
	SURVEYOR(S):

LAYERS: 1 = CANOPY > 10m 2 = SUB-CANOPY 3 = UNDERSTOREY 4 = GROUND (GRD.) LAYER

ABUNDANCE CODES: R = RARE O = OCCASIONAL A = ABUNDANT D = DOMINANT

SPECIES CODE	LAYER 1	2	3	4	COLL.	SPECIES CODE	LAYER 1	2	3	4	COLL.
frapenn						solalti					
popbals						equarve					
junpean						apocan					
						viccrac					
						cirarvi					
						arclapp					
						tusfarf					
						scipend					
						broinin					
[illegible]											

ELC COMMUNITY DESCRIPTION & CLASSIFICATION	SITE 12 Kilkenny		POLYGON: 7	
	SURVEYOR(S) DW	DATE 21 Jun 17		UTME
	START	END	UTMZ	UTMN

POLYGON DESCRIPTION

SYSTEM	SUBSTRATE	TOPOGRAPHIC FEATURE	HISTORY	PLANT FORM	COMMUNITY
☑ TERRESTRIAL ☐ WETLAND ☐ AQUATIC	☐ ORGANIC ☑ MINERAL SOIL ☐ PARENT MIN ☐ ACIDIC BEDRK ☐ BASIC BEDRK ☐ CARB. BEDRK	☐ LACUSTRINE ☐ RIVERINE ☐ BOTTOMLAND ☐ TERRACE ☐ VALLEY SLOPE ☐ TABLELAND ☐ ROLL. UPLAND ☐ CLIFF ☐ TALUS ☐ CREVICE / CAVE ☐ ALVAR ☐ ROCKLAND ☐ BEACH / BAR ☐ SAND DUNE ☐ BLUFF	☑ NATURAL ☐ CULTURAL	☐ PLANKTON ☐ SUBMERGED ☐ FLOATING-LVD ☐ GRAMINOID ☐ FORB ☐ LICHEN ☐ BRYOPHYTE ☑ DECIDUOUS ☐ CONIFEROUS ☐ MIXED	☐ LAKE ☐ POND ☐ RIVER ☐ STREAM ☐ MARSH ☐ SWAMP ☐ FEN ☐ BOG ☐ BARREN ☐ MEADOW ☐ PRAIRIE ☐ THICKET ☐ SAVANNAH ☐ WOODLAND ☑ FOREST ☐ PLANTATION
SITE			**COVER**		
☐ OPEN WATER ☐ SHALLOW WATER ☑ SURFICIAL DEP. ☐ BEDROCK			☐ OPEN ☐ SHRUB ☑ TREED		

STAND DESCRIPTION:

LAYER	HT	CVR	SPECIES IN ORDER OF DECREASING DOMINANCE (>> MUCH GREATER THAN; > GREATER THAN; = ABOUT EQUAL TO)
1 CANOPY	2	4	Acesasa Fraame Fagran Prusero
2 SUB-CANOPY	3	3	Acesasa Fraame Ostvir
3 UNDERSTOREY	4	3	[illegible] [illegible] [illegible]
4 GRD. LAYER	5	3	parinse acesasa [illegible] moss cirlute

HT CODES: 1 = >25 m 2 = 10<HT≤25 m 3 = 2<HT≤10 m 4 = 1<HT≤2 m 5 = 0.5<HT≤1 m 6 = 0.2<HT≤0.5 m 7 = HT<0.2 m

CVR CODES 0 = NONE 1 = 0% < CVR ≤ 10% 2 = 10 < CVR ≤ 25% 3 = 25 < CVR ≤ 60% 4 = CVR > 60%

STAND COMPOSITION:							BA:	
SIZE CLASS ANALYSIS:	A	< 10	A	10 - 24	R	25 - 50	N	> 50
STANDING SNAGS:	O	< 10	R	10 - 24	R	25 - 50	N	> 50
DEADFALL / LOGS:	O	< 10	R	10 - 24	R	25 - 50	N	> 50

ABUNDANCE CODES: N = NONE R = RARE O = OCCASIONAL A = ABUNDANT

COMM. AGE		PIONEER		YOUNG	✓	MID-AGE		MATURE		OLD GROWTH

SOIL ANALYSIS:

TEXTURE:	DEPTH TO MOTTLES / GLEY	g =	G=
MOISTURE:	DEPTH OF ORGANICS:		(cm)
HOMOGENEOUS / VARIABLE	DEPTH TO BEDROCK:		(cm)

COMMUNITY CLASSIFICATION:

COMMUNITY CLASS: Forest	CODE: FO
COMMUNITY SERIES: Deciduous Forest	CODE: FOD
ECOSITE: Dry-Fresh Sugar Maple DF	CODE: FOD5
VEGETATION TYPE: Dry-Fresh Sugar Maple-White Ash DF	CODE: FOD5-8
INCLUSION	CODE:
COMPLEX	CODE:

Notes:

ELC PLANT SPECIES LIST	SITE:
	POLYGON:
	DATE:
	SURVEYOR(S):

LAYERS: 1 = CANOPY > 10m 2 = SUB-CANOPY 3 = UNDERSTOREY 4 = GROUND (GRD.) LAYER

ABUNDANCE CODES: R = RARE O = OCCASIONAL A = ABUNDANT D = DOMINANT

SPECIES CODE	LAYER 1	2	3	4	COLL.	SPECIES CODE	LAYER 1	2	3	4	COLL.
Poptre						galtri					
Fraame						[illegible]					
Acesasa						carfoe					
Aceneg						carlax					✓
Ostvir						cirlute					
Fagran						solflt					
Prusero						[illegible]					
Ulmame						[illegible]					
						[illegible]					
						solcan					
						[illegible]					
						[illegible]					
parinse											
[illegible]											
[illegible]											
[illegible]											
[illegible]											

ELC COMMUNITY DESCRIPTION & CLASSIFICATION	SITE 12 Kilkenny		POLYGON 8	
	SURVEYOR(S)	DATE		UTME
	START	END	UTMZ	UTMN

POLYGON DESCRIPTION

SYSTEM
- ☐ TERRESTRIAL
- ☑ WETLAND
- ☐ AQUATIC

SUBSTRATE
- ☐ ORGANIC
- ☑ MINERAL SOIL
- ☐ PARENT MIN
- ☐ ACIDIC BEDRK
- ☐ BASIC BEDRK
- ☐ CARB. BEDRK

TOPOGRAPHIC FEATURE
- ☐ LACUSTRINE
- ☐ RIVERINE
- ☐ BOTTOMLAND
- ☐ TERRACE
- ☐ VALLEY SLOPE
- ☐ TABLELAND
- ☐ ROLL. UPLAND
- ☐ CLIFF
- ☐ TALUS
- ☐ CREVICE / CAVE
- ☐ ALVAR
- ☐ ROCKLAND
- ☐ BEACH / BAR
- ☐ SAND DUNE
- ☐ BLUFF

HISTORY
- ☑ NATURAL
- ☐ CULTURAL

PLANT FORM
- ☐ PLANKTON
- ☐ SUBMERGED
- ☐ FLOATING-LVD
- ☐ GRAMINOID
- ☐ FORB
- ☐ LICHEN
- ☐ BRYOPHYTE
- ☑ DECIDUOUS
- ☐ CONIFEROUS
- ☐ MIXED

COMMUNITY
- ☐ LAKE
- ☐ POND
- ☐ RIVER
- ☐ STREAM
- ☐ MARSH
- ☑ SWAMP
- ☐ FEN
- ☐ BOG
- ☐ BARREN
- ☐ MEADOW
- ☐ PRAIRIE
- ☐ THICKET
- ☐ SAVANNAH
- ☐ WOODLAND
- ☐ FOREST
- ☐ PLANTATION

SITE
- ☐ OPEN WATER
- ☐ SHALLOW WATER
- ☑ SURFICIAL DEP.
- ☐ BEDROCK

COVER
- ☐ OPEN
- ☐ SHRUB
- ☑ TREED

STAND DESCRIPTION:

	LAYER	HT	CVR	SPECIES IN ORDER OF DECREASING DOMINANCE (>> MUCH GREATER THAN; > GREATER THAN; = ABOUT EQUAL TO)
1	CANOPY	2	4	Frapenn, Popbalm
2	SUB-CANOPY	3	3	Rhafrang Frapenn
3	UNDERSTOREY	4	3	Frapenn Rhafran
4	GRD. LAYER	6	1	Lyscili, Car sp, moss

HT CODES: 1 = >25 m 2 = 10<HT ≤25 m 3 = 2<HT ≤10 m 4 = 1<HT ≤2 m 5 = 0.5<HT ≤1 m 6 = 0.2<HT ≤0.5 m 7 = HT<0.2 m

CVR CODES 0= NONE 1= 0% < CVR ≤ 10% 2= 10 < CVR ≤ 25% 3= 25 < CVR ≤ 60% 4= CVR > 60%

STAND COMPOSITION:					BA:
SIZE CLASS ANALYSIS:		< 10	10 - 24	25 - 50	> 50
STANDING SNAGS:		< 10	10 - 24	25 - 50	> 50
DEADFALL / LOGS:		< 10	10 - 24	25 - 50	> 50

ABUNDANCE CODES: N = NONE R = RARE O = OCCASIONAL A = ABUNDANT

COMM. AGE	PIONEER	YOUNG	✓ MID-AGE	MATURE	OLD GROWTH

SOIL ANALYSIS:

TEXTURE:	DEPTH TO MOTTLES / GLEY	g =	G=
MOISTURE:	DEPTH OF ORGANICS:		(cm)
HOMOGENEOUS / VARIABLE	DEPTH TO BEDROCK:		(cm)

COMMUNITYCLASSIFICATION:

COMMUNITY CLASS: Swamp	CODE: SW
COMMUNITY SERIES: Deciduous Swamp	CODE: SWD
ECOSITE: Mineral Deciduous Swamp	CODE: SWD2
VEGETATION TYPE: Green Ash Mineral Deciduous Swamp	CODE: SWD2-2
INCLUSION	CODE:
COMPLEX	CODE:

Notes:

ELC PLANT SPECIES LIST	SITE:
	POLYGON:
	DATE:
	SURVEYOR(S):

LAYERS: 1 = CANOPY > 10m 2 = SUB-CANOPY 3 = UNDERSTOREY 4 = GROUND (GRD.) LAYER

ABUNDANCE CODES: R = RARE O = OCCASIONAL A = ABUNDANT D = DOMINANT

SPECIES CODE	LAYER				COLL.	SPECIES CODE	LAYER				COLL.
	1	2	3	4			1	2	3	4	
Frapenn						Lyscili					
						Car sp					
						Moss					
Frapenn											
Rhafran											

ELC COMMUNITY DESCRIPTION & CLASSIFICATION			
SITE 12 Kilbrin		POLYGON: 9	
SURVEYOR(S) DW	DATE 21 Jun 17		UTME
START	END	UTMZ	UTMN

POLYGON DESCRIPTION

SYSTEM	SUBSTRATE	TOPOGRAPHIC FEATURE	HISTORY	PLANT FORM	COMMUNITY
☑ TERRESTRIAL ☐ WETLAND ☐ AQUATIC	☐ ORGANIC ☑ MINERAL SOIL ☐ PARENT MIN ☐ ACIDIC BEDRK ☐ BASIC BEDRK ☐ CARB. BEDRK	☐ LACUSTRINE ☐ RIVERINE ☐ BOTTOMLAND ☐ TERRACE ☐ VALLEY SLOPE ☐ TABLELAND ☐ ROLL. UPLAND ☐ CLIFF ☐ TALUS ☐ CREVICE / CAVE ☐ ALVAR ☐ ROCKLAND ☐ BEACH / BAR ☐ SAND DUNE ☐ BLUFF	☐ NATURAL ☑ CULTURAL	☐ PLANKTON ☐ SUBMERGED ☐ FLOATING-LVD ☐ GRAMINOID ☐ FORB ☐ LICHEN ☐ BRYOPHYTE ☑ DECIDUOUS ☐ CONIFEROUS ☐ MIXED	☐ LAKE ☐ POND ☐ RIVER ☐ STREAM ☐ MARSH ☐ SWAMP ☐ FEN ☐ BOG ☐ BARREN ☐ MEADOW ☐ PRAIRIE ☐ THICKET ☐ SAVANNAH ☑ WOODLAND ☐ FOREST ☐ PLANTATION
SITE			**COVER**		
☐ OPEN WATER ☐ SHALLOW WATER ☑ SURFICIAL DEP. ☐ BEDROCK			☐ OPEN ☑ SHRUB ☑ TREED		

STAND DESCRIPTION:

LAYER	HT	CVR	SPECIES IN ORDER OF DECREASING DOMINANCE (>> MUCH GREATER THAN; > GREATER THAN; = ABOUT EQUAL TO)
1 CANOPY	3	4	Fraxpen > Prusero Poptrem Ulmame
2 SUB-CANOPY			
3 UNDERSTOREY	2	3	Fraxpen, rhatyph rhacath lontata
4 GRD. LAYER	5	4	solalti cirlute, sgnovae > prunvul

HT CODES: 1 = >25 m 2 = 10<HT 25 m 3 = 2<HT 10 m 4 = 1<HT 2 m 5 = 0.5<HT 1 m 6 = 0.2<HT 0.5 m 7 = HT<0.2 m

CVR CODES 0= NONE 1= 0% < CVR ≤ 10% 2= 10 < CVR ≤ 25% 3= 25 < CVR ≤ 60% 4= CVR > 60%

STAND COMPOSITION:							BA:	
SIZE CLASS ANALYSIS:	A	< 10	R	10 - 24	N	25 - 50	N	> 50
STANDING SNAGS:	R	< 10	R	10 - 24	N	25 - 50	N	> 50
DEADFALL / LOGS:	O	< 10	R	10 - 24	R	25 - 50	N	> 50

ABUNDANCE CODES: N = NONE R = RARE O = OCCASIONAL A = ABUNDANT

COMM. AGE	☐ PIONEER	☑ YOUNG	☐ MID-AGE	☐ MATURE	☐ OLD GROWTH

SOIL ANALYSIS:

TEXTURE:	DEPTH TO MOTTLES / GLEY	g =	G=
MOISTURE:	DEPTH OF ORGANICS:		(cm)
HOMOGENEOUS / VARIABLE	DEPTH TO BEDROCK:		(cm)

COMMUNITYCLASSIFICATION:

COMMUNITY CLASS: Cultural	CODE: CU
COMMUNITY SERIES: Cultural Woodland	CODE: CUW
ECOSITE: Mineral Cultural Woodland	CODE: CUW1
VEGETATION TYPE: ✓	CODE: CUW1
INCLUSION	CODE:
COMPLEX	CODE:

Notes:

ELC PLANT SPECIES LIST	
	SITE:
	POLYGON:
	DATE:
	SURVEYOR(S):

LAYERS: 1 = CANOPY > 10m 2 = SUB-CANOPY 3 = UNDERSTOREY 4 = GROUND (GRD.) LAYER

ABUNDANCE CODES: R = RARE O = OCCASIONAL A = ABUNDANT D = DOMINANT

SPECIES CODE	LAYER 1	2	3	4	COLL.	SPECIES CODE	LAYER 1	2	3	4	COLL.
Fraxpen						solalti					
Prusero						prunvul					
Poptrem						Sol					
Vitripa						cirlute					
Ulmame						sgnovae					
Pinsylv						agrgiga					
						geucana					
						eripulch					
						chrleuc					
						asturop					
rhafran											
rhacath											

ELC COMMUNITY DESCRIPTION & CLASSIFICATION	SITE: VB-Kilkenny		POLYGON: 10
	SURVEYOR(S): DW	DATE: 21 Jun 17	UTME:
	START:	END:	UTMZ: / UTMN:

POLYGON DESCRIPTION

SYSTEM
- ☑ TERRESTRIAL
- ☐ WETLAND
- ☐ AQUATIC

SITE
- ☐ OPEN WATER
- ☐ SHALLOW WATER
- ☑ SURFICIAL DEP.
- ☐ BEDROCK

SUBSTRATE
- ☐ ORGANIC
- ☑ MINERAL SOIL
- ☐ PARENT MIN
- ☐ ACIDIC BEDRK
- ☐ BASIC BEDRK
- ☐ CARB. BEDRK

TOPOGRAPHIC FEATURE
- ☐ LACUSTRINE
- ☐ RIVERINE
- ☐ BOTTOMLAND
- ☐ TERRACE
- ☐ VALLEY SLOPE
- ☐ TABLELAND
- ☐ ROLL. UPLAND
- ☐ CLIFF
- ☐ TALUS
- ☐ CREVICE / CAVE
- ☐ ALVAR
- ☐ ROCKLAND
- ☐ BEACH / BAR
- ☐ SAND DUNE
- ☐ BLUFF

HISTORY
- ☑ NATURAL
- ☐ CULTURAL

COVER
- ☐ OPEN
- ☐ SHRUB
- ☑ TREED

PLANT FORM
- ☐ PLANKTON
- ☐ SUBMERGED
- ☐ FLOATING-LVD
- ☐ GRAMINOID
- ☐ FORB
- ☐ LICHEN
- ☐ BRYOPHYTE
- ☑ DECIDUOUS
- ☐ CONIFEROUS
- ☐ MIXED

COMMUNITY
- ☐ LAKE
- ☐ POND
- ☐ RIVER
- ☐ STREAM
- ☐ MARSH
- ☑ SWAMP
- ☐ FEN
- ☐ BOG
- ☐ BARREN
- ☐ MEADOW
- ☐ PRAIRIE
- ☐ THICKET
- ☐ SAVANNAH
- ☐ WOODLAND
- ☐ FOREST
- ☐ PLANTATION

STAND DESCRIPTION:

	LAYER	HT	CVR	SPECIES IN ORDER OF DECREASING DOMINANCE (>> MUCH GREATER THAN; > GREATER THAN; = ABOUT EQUAL TO)
1	CANOPY	2	3	fraxpenn >> Acebxfre
2	SUB-CANOPY	3	3	Rhamcath fraxpenn
3	UNDERSTOREY	4	4	rhamcath >> phraaust
4	GRD. LAYER	5	3	glycstri arecana cvlute impcaps

HT CODES: 1 = >25 m 2 = 10<HT 25 m 3 = 2<HT 10 m 4 = 1<HT 2 m 5 = 0.5<HT 1 m 6 = 0.2<HT 0.5 m 7 = HT<0.2m

CVR CODES 0= NONE 1= 0% < CVR ≤ 10% 2= 10 < CVR ≤ 25% 3= 25 < CVR ≤ 60% 4= CVR > 60%

STAND COMPOSITION:							BA:	
SIZE CLASS ANALYSIS:	A	< 10	A	10 - 24	O	25 - 50	R	> 50
STANDING SNAGS:	O	< 10	A	10 - 24	A	25 - 50	R	> 50
DEADFALL / LOGS:		< 10		10 - 24		25 - 50		> 50

ABUNDANCE CODES: N = NONE R = RARE O = OCCASIONAL A = ABUNDANT

COMM. AGE		PIONEER		YOUNG	✓	MID-AGE		MATURE		OLD GROWTH

SOIL ANALYSIS:

TEXTURE:	DEPTH TO MOTTLES / GLEY	g =	G=
MOISTURE:	DEPTH OF ORGANICS:		(cm)
HOMOGENEOUS / VARIABLE	DEPTH TO BEDROCK:		(cm)

COMMUNITY CLASSIFICATION:

COMMUNITY CLASS: Swamp	CODE: SW
COMMUNITY SERIES: Deciduous Swamp	CODE: SWD
ECOSITE: Ash Mineral Deciduous Swamp	CODE: SWD2
VEGETATION TYPE: Green Ash Mineral Deciduous Swamp	CODE: SWD2-2
INCLUSION	CODE:
COMPLEX	CODE:

Notes:

ELC PLANT SPECIES LIST	SITE:
	POLYGON:
	DATE:
	SURVEYOR(S):

LAYERS: 1 = CANOPY > 10m 2 = SUB-CANOPY 3 = UNDERSTOREY 4 = GROUND (GRD.) LAYER

ABUNDANCE CODES: R = RARE O = OCCASIONAL A = ABUNDANT D = DOMINANT

SPECIES CODE	LAYER 1	LAYER 2	LAYER 3	LAYER 4	COLL.	SPECIES CODE	LAYER 1	LAYER 2	LAYER 3	LAYER 4	COLL.
fraxpenn						arecana					
Acebxfre						cvlute					
						Carегran					
						equiarve					
						phararun					
						sympful					
						glycstri					
						lyssali					
						galipalu					
						boehcyl					
						carestip					
						phraaust					
						solialti					
						impcape					
						allipeti					
viburecti											
Rhamcath											

EAB - tree DB

ELC COMMUNITY DESCRIPTION & CLASSIFICATION	SITE 24 Serena		POLYGON: 1	
	SURVEYOR(S) DW	DATE Jun 28 17		UTME
	START	END	UTMZ	UTMN

POLYGON DESCRIPTION

SYSTEM
- ☐ TERRESTRIAL
- ☑ WETLAND
- ☐ AQUATIC

SITE
- ☐ OPEN WATER
- ☐ SHALLOW WATER
- ☑ SURFICIAL DEP.
- ☐ BEDROCK

SUBSTRATE
- ☐ ORGANIC
- ☑ MINERAL SOIL
- ☐ PARENT MIN
- ☐ ACIDIC BEDRK
- ☐ BASIC BEDRK
- ☐ CARB. BEDRK

TOPOGRAPHIC FEATURE
- ☐ LACUSTRINE
- ☐ RIVERINE
- ☐ BOTTOMLAND
- ☐ TERRACE
- ☐ VALLEY SLOPE
- ☐ TABLELAND
- ☐ ROLL. UPLAND
- ☐ CLIFF
- ☐ TALUS
- ☐ CREVICE / CAVE
- ☐ ALVAR
- ☐ ROCKLAND
- ☐ BEACH / BAR
- ☐ SAND DUNE
- ☐ BLUFF

HISTORY
- ☑ NATURAL
- ☐ CULTURAL

COVER
- ☑ OPEN
- ☐ SHRUB
- ☐ TREED

PLANT FORM
- ☐ PLANKTON
- ☐ SUBMERGED
- ☐ FLOATING-LVD
- ☑ GRAMINOID
- ☐ FORB
- ☐ LICHEN
- ☐ BRYOPHYTE
- ☐ DECIDUOUS
- ☐ CONIFEROUS
- ☐ MIXED

COMMUNITY
- ☐ LAKE
- ☐ POND
- ☐ RIVER
- ☐ STREAM
- ☑ MARSH
- ☐ SWAMP
- ☐ FEN
- ☐ BOG
- ☐ BARREN
- ☐ MEADOW
- ☐ PRAIRIE
- ☐ THICKET
- ☐ SAVANNAH
- ☐ WOODLAND
- ☐ FOREST
- ☐ PLANTATION

STAND DESCRIPTION:

LAYER		HT	CVR	SPECIES IN ORDER OF DECREASING DOMINANCE (>> MUCH GREATER THAN; > GREATER THAN; = ABOUT EQUAL TO)
1	CANOPY	2	1	Acexfree
2	SUB-CANOPY			
3	UNDERSTOREY			
4	GRD. LAYER	4	4	pharam??

HT CODES: 1 = >25 m 2 = 10<HT 25 m 3 = 2<HT 10 m 4 = 1<HT 2 m 5 = 0.5<HT 1 m 6 = 0.2<HT 0.5 m 7 = HT<0.2 m

CVR CODES: 0= NONE 1= 0% <CVR 10% 2= 10 < CVR 25% 3= 25 < CVR 60% 4= CVR > 60%

STAND COMPOSITION:				BA:
SIZE CLASS ANALYSIS:	< 10	10 - 24	25 - 50	> 50
STANDING SNAGS:	< 10	10 - 24	25 - 50	> 50
DEADFALL / LOGS:	< 10	10 - 24	25 - 50	> 50

ABUNDANCE CODES: N = NONE R = RARE O = OCCASIONAL A = ABUNDANT

COMM. AGE	PIONEER	YOUNG	MID-AGE	MATURE	OLD GROWTH

SOIL ANALYSIS:

TEXTURE:	DEPTH TO MOTTLES / GLEY	g =	G=
MOISTURE:	DEPTH OF ORGANICS:		(cm)
HOMOGENEOUS / VARIABLE	DEPTH TO BEDROCK:		(cm)

COMMUNITYCLASSIFICATION:

COMMUNITY CLASS: Marsh	CODE: MA
COMMUNITY SERIES: Meadow Marsh	CODE: MAM
ECOSITE: Mineral Meadow Marsh	CODE: MAM2
VEGETATION TYPE:	CODE:
INCLUSION	CODE:
COMPLEX	CODE:

Notes:

ELC PLANT SPECIES LIST	SITE:
	POLYGON:
	DATE:
	SURVEYOR(S):

LAYERS: 1 = CANOPY > 10m 2 = SUB-CANOPY 3 = UNDERSTOREY 4 = GROUND (GRD.) LAYER

ABUNDANCE CODES: R = RARE O = OCCASIONAL A = ABUNDANT D = DOMINANT

SPECIES CODE	LAYER 1	LAYER 2	LAYER 3	LAYER 4	COLL.	SPECIES CODE	LAYER 1	LAYER 2	LAYER 3	LAYER 4	COLL.
Acexfree						pharan					
Frapeng						solalt					
						chegla					
						sun tway					
						ascsyr					
						alpha					
						impcape					
						alllaurt					
						ausebh					
						sci atro					
elevat											

ELC
COMMUNITY DESCRIPTION & CLASSIFICATION

SITE 24 Serern		POLYGON 2	
SURVEYOR(S) DW	DATE June 28		UTME
START	END	UTMZ	UTMN

POLYGON DESCRIPTION

SYSTEM
☑ TERRESTRIAL
☐ WETLAND
☐ AQUATIC

SITE
☐ OPEN WATER
☐ SHALLOW WATER
☑ SURFICIAL DEP.
☐ BEDROCK

SUBSTRATE
☐ ORGANIC
☑ MINERAL SOIL
☐ PARENT MIN
☐ ACIDIC BEDRK
☐ BASIC BEDRK
☐ CARB. BEDRK

TOPOGRAPHIC FEATURE
☐ LACUSTRINE
☐ RIVERINE
☐ BOTTOMLAND
☐ TERRACE
☐ VALLEY SLOPE
☐ TABLELAND
☐ ROLL. UPLAND
☐ CLIFF
☐ TALUS
☐ CREVICE / CAVE
☐ ALVAR
☐ ROCKLAND
☐ BEACH / BAR
☐ SAND DUNE
☐ BLUFF

HISTORY
☑ NATURAL
☐ CULTURAL

COVER
☐ OPEN
☐ SHRUB
☑ TREED

PLANT FORM
☐ PLANKTON
☐ SUBMERGED
☐ FLOATING-LVD
☐ GRAMINOID
☐ FORB
☐ LICHEN
☐ BRYOPHYTE
☑ DECIDUOUS
☐ CONIFEROUS
☐ MIXED

COMMUNITY
☐ LAKE
☐ POND
☐ RIVER
☐ STREAM
☐ MARSH
☐ SWAMP
☐ FEN
☐ BOG
☐ BARREN
☐ MEADOW
☐ PRAIRIE
☐ THICKET
☐ SAVANNAH
☐ WOODLAND
☑ FOREST
☐ PLANTATION

STAND DESCRIPTION

LAYER		HT	CVR	SPECIES IN ORDER OF DECREASING DOMINANCE (>> MUCH GREATER THAN; > GREATER THAN; = ABOUT EQUAL TO)
1	CANOPY	2	4	Acesaso Ulamer Pinstro Frapenn
2	SUB-CANOPY	3	3	Frapenn Acesasa +
3	UNDERSTOREY	4	3	Frapenn Lontata rhacata
4	GRD. LAYER	5	3	Car grac astmacr parquin Carexsp

HT CODES: 1 = >25 m 2 = 10<HT 25 m 3 = 2<HT 10 m 4 = 1<HT 2 m 5 = 0.5<HT 1 m 6 = 0.2<HT 0.5 m 7 = HT<0.2 m
CVR CODES 0= NONE 1= 0% < CVR 10% 2= 10 < CVR 25% 3= 25 < CVR 60% 4= CVR > 60%

STAND COMPOSITION:				BA:
SIZE CLASS ANALYSIS:	O < 10	A 10 - 24	A 25 - 50	R > 50
STANDING SNAGS:	O < 10	R 10 - 24	R 25 - 50	N > 50
DEADFALL / LOGS:	O < 10	O 10 - 24	R 25 - 50	N > 50

ABUNDANCE CODES: N = NONE R = RARE O = OCCASIONAL A = ABUNDANT

COMM. AGE: PIONEER YOUNG MID-AGE [✓ MATURE] OLD GROWTH

SOIL ANALYSIS:

TEXTURE:	DEPTH TO MOTTLES / GLEY	g =	G=
MOISTURE:	DEPTH OF ORGANICS:		(cm)
HOMOGENEOUS / VARIABLE	DEPTH TO BEDROCK:		(cm)

COMMUNITY CLASSIFICATION:

COMMUNITY CLASS: Forest	CODE: FO
COMMUNITY SERIES: Deciduous Forest	CODE: FOD
ECOSITE: Fresh-Moist Sugar Maple DF	CODE: FOD6
VEGETATION TYPE: Fresh-Moist Sugar Maple-Hardwood	CODE: FOD6-5
INCLUSION	CODE:
COMPLEX	CODE:

Notes:

ELC
PLANT SPECIES LIST

SITE:
POLYGON:
DATE:
SURVEYOR(S):

LAYERS: 1 = CANOPY > 10m 2 = SUB-CANOPY 3 = UNDERSTOREY 4 = GROUND (GRD.) LAYER
ABUNDANCE CODES: R = RARE O = OCCASIONAL A = ABUNDANT D = DOMINANT

SPECIES CODE	LAYER 1	2	3	4	COLL.	SPECIES CODE	LAYER 1	2	3	4	COLL.
Betalle	R					onosens					
Acesash	A					cargrac					
Ulamer	O					solgig					
Pinstro	O					maiacan					
Tsucan	R					Carex sp					
carcaro		R				parquin					
fagugra	R					dryocart					
Acerrub	R					astmacr					
ostvirg	R	R				smiherb					
prusero	R					anecan					
frapenn	O					solcaes					
						smiracem					
						pruvulg					
						eripulc					
						cilute					
						triaura					
vitripa											
lonitat											
vibleng A											
rhacath											
chrwitz											
lonbelo											
pruvirg											

ELC COMMUNITY DESCRIPTION & CLASSIFICATION	SITE 24 Seren		POLYGON: 3	
	SURVEYOR(S) Dan	DATE 28 Jun 17		UTME
	START	END	UTMZ	UTMN

POLYGON DESCRIPTION

SYSTEM	SUBSTRATE	TOPOGRAPHIC FEATURE	HISTORY	PLANT FORM	COMMUNITY
☑ TERRESTRIAL	☐ ORGANIC	☐ LACUSTRINE	☑ NATURAL	☐ PLANKTON	☐ LAKE
☐ WETLAND	☑ MINERAL SOIL	☐ RIVERINE	☐ CULTURAL	☐ SUBMERGED	☐ POND
☐ AQUATIC	☐ PARENT MIN	☐ BOTTOMLAND		☐ FLOATING-LVD	☐ RIVER
	☐ ACIDIC BEDRK	☐ TERRACE		☐ GRAMINOID	☐ STREAM
	☐ BASIC BEDRK	☐ VALLEY SLOPE		☐ FORB	☐ MARSH
	☐ CARB. BEDRK	☐ TABLELAND		☐ LICHEN	☐ SWAMP
		☐ ROLL. UPLAND		☐ BRYOPHYTE	☐ FEN
		☐ CLIFF		☑ DECIDUOUS	☐ BOG
		☐ TALUS		☐ CONIFEROUS	☐ BARREN
		☐ CREVICE / CAVE		☐ MIXED	☐ MEADOW
		☐ ALVAR			☐ PRAIRIE
		☐ ROCKLAND			☐ THICKET
		☐ BEACH / BAR			☐ SAVANNAH
		☐ SAND DUNE			☐ WOODLAND
		☐ BLUFF			☑ FOREST
					☒ PLANTATION

SITE	COVER
☐ OPEN WATER	☐ OPEN
☐ SHALLOW WATER	☐ SHRUB
☑ SURFICIAL DEP.	☑ TREED
☐ BEDROCK	

STAND DESCRIPTION:

	LAYER	HT	CVR	SPECIES IN ORDER OF DECREASING DOMINANCE (>> MUCH GREATER THAN; > GREATER THAN; = ABOUT EQUAL TO)
1	CANOPY	2	4	Poptrem>>Frapenn Pruser
2	SUB-CANOPY			
3	UNDERSTOREY	4	4	rhacath lonitata frapenn
4	GRD. LAYER	5	2	caragrac cirlute, [illegible] lyscil

HT CODES: 1 = >25 m 2 = 10<HT 25 m 3 = 2<HT 10 m 4 = 1<HT 2 m 5 = 0.5<HT 1 m 6 = 0.2<HT 0.5 m 7 = HT<0.2 m

CVR CODES 0= NONE 1= 0% < CVR 10% 2= 10 < CVR 25% 3= 25 < CVR 60% 4= CVR > 60%

STAND COMPOSITION:							BA:	
SIZE CLASS ANALYSIS:	A	< 10	A	10 - 24	R	25 - 50	N	> 50
STANDING SNAGS:	R	< 10	R	10 - 24	R	25 - 50	N	> 50
DEADFALL / LOGS:	R	< 10	R	10 - 24	R	25 - 50	N	> 50

ABUNDANCE CODES: N = NONE R = RARE O = OCCASIONAL A = ABUNDANT

COMM. AGE	PIONEER	YOUNG	✓ MID-AGE	MATURE	OLD GROWTH

SOIL ANALYSIS:

TEXTURE:	DEPTH TO MOTTLES / GLEY	g =	G=
MOISTURE:	DEPTH OF ORGANICS:		(cm)
HOMOGENEOUS / VARIABLE	DEPTH TO BEDROCK:		(cm)

COMMUNITYCLASSIFICATION:

COMMUNITY CLASS: Forest	CODE: FO
COMMUNITY SERIES: Deciduous Forest	CODE: FOD
ECOSITE: Fresh-Moist Poplar-Sassafras	CODE: FOD8
VEGETATION TYPE: Fresh-Moist Poplar Deciduous Forest	CODE: FOD8-1
INCLUSION	CODE:
COMPLEX	CODE:

Notes:

ELC PLANT SPECIES LIST	SITE:
	POLYGON:
	DATE:
	SURVEYOR(S):

LAYERS: 1 = CANOPY > 10m 2 = SUB-CANOPY 3 = UNDERSTOREY 4 = GROUND (GRD.) LAYER

ABUNDANCE CODES: R = RARE O = OCCASIONAL A = ABUNDANT D = DOMINANT

SPECIES CODE	LAYER 1	LAYER 2	LAYER 3	LAYER 4	COLL.	SPECIES CODE	LAYER 1	LAYER 2	LAYER 3	LAYER 4	COLL.
Poptrem	A					onosens					
betpapy	R					lyscili					
Pruserot	O					[illegible]					
Frapenn	O					[illegible]					
						caragrac					
						partinse					
						fravirg					
						geuurba					
						cirlute					
						aneucan					
						viola					
rhacath											
frapenn											
lonitata											

ELC COMMUNITY DESCRIPTION & CLASSIFICATION	SITE		POLYGON:	
	SURVEYOR(S)	DATE		UTME
	START	END	UTMZ	UTMN

POLYGON DESCRIPTION

SYSTEM
- ☐ TERRESTRIAL
- ☐ WETLAND
- ☐ AQUATIC

SITE
- ☐ OPEN WATER
- ☐ SHALLOW WATER
- ☐ SURFICIAL DEP.
- ☐ BEDROCK

SUBSTRATE
- ☐ ORGANIC
- ☐ MINERAL SOIL
- ☐ PARENT MIN
- ☐ ACIDIC BEDRK
- ☐ BASIC BEDRK
- ☐ CARB. BEDRK

TOPOGRAPHIC FEATURE
- ☐ LACUSTRINE
- ☐ RIVERINE
- ☐ BOTTOMLAND
- ☐ TERRACE
- ☐ VALLEY SLOPE
- ☐ TABLELAND
- ☐ ROLL. UPLAND
- ☐ CLIFF
- ☐ TALUS
- ☐ CREVICE / CAVE
- ☐ ALVAR
- ☐ ROCKLAND
- ☐ BEACH / BAR
- ☐ SAND DUNE
- ☐ BLUFF

HISTORY
- ☐ NATURAL
- ☐ CULTURAL

COVER
- ☐ OPEN
- ☐ SHRUB
- ☐ TREED

PLANT FORM
- ☐ PLANKTON
- ☐ SUBMERGED
- ☐ FLOATING-LVD
- ☐ GRAMINOID
- ☐ FORB
- ☐ LICHEN
- ☐ BRYOPHYTE
- ☐ DECIDUOUS
- ☐ CONIFEROUS
- ☐ MIXED

COMMUNITY
- ☐ LAKE
- ☐ POND
- ☐ RIVER
- ☐ STREAM
- ☐ MARSH
- ☐ SWAMP
- ☐ FEN
- ☐ BOG
- ☐ BARREN
- ☐ MEADOW
- ☐ PRAIRIE
- ☐ THICKET
- ☐ SAVANNAH
- ☐ WOODLAND
- ☐ FOREST
- ☐ PLANTATION

STAND DESCRIPTION:

LAYER		HT	CVR	SPECIES IN ORDER OF DECREASING DOMINANCE (>> MUCH GREATER THAN; > GREATER THAN; = ABOUT EQUAL TO)
1	CANOPY			
2	SUB-CANOPY			
3	UNDERSTOREY			
4	GRD. LAYER			

HT CODES: 1 = >25 m 2 = 10<HT ≤25 m 3 = 2<HT ≤10 m 4 = 1<HT ≤2 m 5 = 0.5<HT ≤1 m 6 = 0.2<HT ≤0.5 m 7 = HT<0.2 m

CVR CODES 0= NONE 1= 0% < CVR ≤ 10% 2= 10 < CVR ≤ 25% 3= 25 < CVR ≤ 60% 4= CVR > 60%

STAND COMPOSITION:							BA:	
SIZE CLASS ANALYSIS:		< 10		10 - 24		25 - 50		> 50
STANDING SNAGS:		< 10		10 - 24		25 - 50		> 50
DEADFALL / LOGS:		< 10		10 - 24		25 - 50		> 50

ABUNDANCE CODES: N = NONE R = RARE O = OCCASIONAL A = ABUNDANT

COMM. AGE		PIONEER		YOUNG		MID-AGE		MATURE		OLD GROWTH

SOIL ANALYSIS:

TEXTURE:	DEPTH TO MOTTLES / GLEY	g =	G=
MOISTURE:	DEPTH OF ORGANICS:		(cm)
HOMOGENEOUS / VARIABLE	DEPTH TO BEDROCK:		(cm)

COMMUNITYCLASSIFICATION:

COMMUNITY CLASS:	CODE:
COMMUNITY SERIES:	CODE:
ECOSITE:	CODE:
VEGETATION TYPE:	CODE:
INCLUSION	CODE:
COMPLEX	CODE:

Notes:

ELC PLANT SPECIES LIST	SITE:
	POLYGON:
	DATE:
	SURVEYOR(S):

LAYERS: 1 = CANOPY > 10m 2 = SUB-CANOPY 3 = UNDERSTOREY 4 = GROUND (GRD.) LAYER

ABUNDANCE CODES: R = RARE O = OCCASIONAL A = ABUNDANT D = DOMINANT

SPECIES CODE	LAYER				COLL.	SPECIES CODE	LAYER				COLL.
	1	2	3	4			1	2	3	4	

ELC
COMMUNITY DESCRIPTION & CLASSIFICATION

SITE 2162 Gordon		POLYGON:	1
SURVEYOR(S) DW	DATE 28 Jun 17		UTME
START	END	UTMZ	UTMN

POLYGON DESCRIPTION

SYSTEM	SUBSTRATE	TOPOGRAPHIC FEATURE	HISTORY	PLANT FORM	COMMUNITY
☐ TERRESTRIAL ☑ WETLAND ☐ AQUATIC	☐ ORGANIC ☑ MINERAL SOIL ☐ PARENT MIN ☐ ACIDIC BEDRK ☐ BASIC BEDRK ☐ CARB. BEDRK	☐ LACUSTRINE ☐ RIVERINE ☐ BOTTOMLAND ☐ TERRACE ☐ VALLEY SLOPE ☐ TABLELAND ☐ ROLL. UPLAND ☐ CLIFF ☐ TALUS ☐ CREVICE / CAVE ☐ ALVAR ☐ ROCKLAND ☐ BEACH / BAR ☐ SAND DUNE ☐ BLUFF	☑ NATURAL ☐ CULTURAL	☐ PLANKTON ☐ SUBMERGED ☐ FLOATING-LVD ☐ GRAMINOID ☐ FORB ☐ LICHEN ☐ BRYOPHYTE ☑ DECIDUOUS ☐ CONIFEROUS ☐ MIXED	☐ LAKE ☐ POND ☐ RIVER ☐ STREAM ☐ MARSH ☑ SWAMP ☐ FEN ☐ BOG ☐ BARREN ☐ MEADOW ☐ PRAIRIE ☐ THICKET ☐ SAVANNAH ☐ WOODLAND ☐ FOREST ☐ PLANTATION
SITE			**COVER**		
☐ OPEN WATER ☐ SHALLOW WATER ☑ SURFICIAL DEP. ☐ BEDROCK			☐ OPEN ☐ SHRUB ☑ TREED		

STAND DESCRIPTION:

LAYER		HT	CVR	SPECIES IN ORDER OF DECREASING DOMINANCE (>> MUCH GREATER THAN; > GREATER THAN; = ABOUT EQUAL TO)
1	CANOPY	3	4	Acexfre
2	SUB-CANOPY			
3	UNDERSTOREY	4	1	corstol rhafran rhacath Soldisc
4	GRD. LAYER	5	4	onosen phaarun galpalu

HT CODES: 1 = >25 m 2 = 10<HT 25 m 3 = 2<HT 10 m 4 = 1<HT 2 m 5 = 0.5<HT 1 m 6 = 0.2<HT 0.5 m 7 = HT<0.2 m
CVR CODES 0= NONE 1= 0% < CVR 10% 2= 10 < CVR 25% 3= 25 < CVR 60% 4= CVR > 60%

STAND COMPOSITION:							BA:	
SIZE CLASS ANALYSIS:	D	< 10	O	10 - 24	O	25 - 50	R	> 50
STANDING SNAGS:	N	< 10	N	10 - 24	N	25 - 50	N	> 50
DEADFALL / LOGS:	O	< 10	R	10 - 24	N	25 - 50	N	> 50

ABUNDANCE CODES: N = NONE R = RARE O = OCCASIONAL A = ABUNDANT

COMM. AGE	PIONEER	YOUNG	✓ MID-AGE	MATURE	OLD GROWTH

SOIL ANALYSIS:

TEXTURE:	DEPTH TO MOTTLES / GLEY	g =	G=
MOISTURE:	DEPTH OF ORGANICS:		(cm)
HOMOGENEOUS / VARIABLE	DEPTH TO BEDROCK:		(cm)

COMMUNITYCLASSIFICATION:

COMMUNITY CLASS: Swamp	CODE: SW
COMMUNITY SERIES: Deciduous Swamp	CODE: SWD
ECOSITE: Mineral Deciduous Swamp	CODE: SWD3
VEGETATION TYPE: Swamp Maple Mineral Dec. Swamp	CODE: SWD3-3
INCLUSION	CODE:
COMPLEX	CODE:

Notes:

ELC
PLANT SPECIES LIST

SITE:
POLYGON:
DATE:
SURVEYOR(S):

LAYERS: 1 = CANOPY > 10m 2 = SUB-CANOPY 3 = UNDERSTOREY 4 = GROUND (GRD.) LAYER
ABUNDANCE CODES: R = RARE O = OCCASIONAL A = ABUNDANT D = DOMINANT

SPECIES CODE	LAYER 1	2	3	4	COLL.
Acexfre,					
Ulmpumi					
soldisc					
rhafran					
vitripa					
corstol					
rhacath					

SPECIES CODE	LAYER 1	2	3	4	COLL.
onosen					
astpuni					
typangu					
astlanc					
phaarun					
glystri					
equarve					
soldulc					
poapalu					
galpalu					
carretr					
leeoryz					
irivers					
lycamer					
calsepi					
cicbulb					
polamph					
[illegible]					
verhast					

ELC
COMMUNITY DESCRIPTION & CLASSIFICATION

SITE 2162 Gordon		POLYGON: 2	
SURVEYOR(S) DW	DATE 28 Jun 17		UTME
START	END	UTMZ	UTMN

POLYGON DESCRIPTION

SYSTEM
- ☐ TERRESTRIAL
- ☒ WETLAND
- ☐ AQUATIC

SITE
- ☐ OPEN WATER
- ☒ SHALLOW WATER
- ☐ SURFICIAL DEP.
- ☐ BEDROCK

SUBSTRATE
- ☐ ORGANIC
- ☒ MINERAL SOIL
- ☐ PARENT MIN
- ☐ ACIDIC BEDRK
- ☐ BASIC BEDRK
- ☐ CARB. BEDRK

TOPOGRAPHIC FEATURE
- ☐ LACUSTRINE
- ☐ RIVERINE
- ☐ BOTTOMLAND
- ☐ TERRACE
- ☐ VALLEY SLOPE
- ☐ TABLELAND
- ☐ ROLL. UPLAND
- ☐ CLIFF
- ☐ TALUS
- ☐ CREVICE / CAVE
- ☐ ALVAR
- ☐ ROCKLAND
- ☐ BEACH / BAR
- ☐ SAND DUNE
- ☐ BLUFF

HISTORY
- ☒ NATURAL
- ☐ CULTURAL

COVER
- ☐ OPEN
- ☒ SHRUB
- ☐ TREED

PLANT FORM
- ☐ PLANKTON
- ☐ SUBMERGED
- ☐ FLOATING-LVD
- ☐ GRAMINOID
- ☐ FORB
- ☐ LICHEN
- ☐ BRYOPHYTE
- ☒ DECIDUOUS
- ☐ CONIFEROUS
- ☐ MIXED

COMMUNITY
- ☐ LAKE
- ☐ POND
- ☐ RIVER
- ☐ STREAM
- ☐ MARSH
- ☒ SWAMP
- ☐ FEN
- ☐ BOG
- ☐ BARREN
- ☐ MEADOW
- ☐ PRAIRIE
- ☐ THICKET
- ☐ SAVANNAH
- ☐ WOODLAND
- ☐ FOREST
- ☐ PLANTATION

STAND DESCRIPTION:

	LAYER	HT	CVR	SPECIES IN ORDER OF DECREASING DOMINANCE (>> MUCH GREATER THAN; > GREATER THAN; = ABOUT EQUAL TO)
1	CANOPY	3	3	Saldisc Salpeti Salpurp
2	SUB-CANOPY			
3	UNDERSTOREY	4	1	corstol
4	GRD. LAYER	5	4	impcape phaarun galpalu Solalti

HT CODES: 1 = >25 m 2 = 10<HT 25 m 3 = 2<HT 10 m 4 = 1<HT 2 m 5 = 0.5<HT 1 m 6 = 0.2<HT 0.5 m 7 = HT<0.2 m
CVR CODES 0= NONE 1= 0% < CVR 10% 2= 10 < CVR 25% 3= 25 < CVR 60% 4= CVR > 60%

STAND COMPOSITION:				BA:
SIZE CLASS ANALYSIS:	< 10	10 - 24	25 - 50	> 50
STANDING SNAGS:	< 10	10 - 24	25 - 50	> 50
DEADFALL / LOGS:	< 10	10 - 24	25 - 50	> 50

ABUNDANCE CODES: N = NONE R = RARE O = OCCASIONAL A = ABUNDANT

COMM. AGE	PIONEER	YOUNG	MID-AGE	MATURE	OLD GROWTH

SOIL ANALYSIS:

TEXTURE:	DEPTH TO MOTTLES / GLEY	g =	G=
MOISTURE:	DEPTH OF ORGANICS:		(cm)
HOMOGENEOUS / VARIABLE	DEPTH TO BEDROCK:		(cm)

COMMUNITYCLASSIFICATION:

COMMUNITY CLASS: Swamp	CODE: SW
COMMUNITY SERIES: Thicket Swamp	CODE: SWT
ECOSITE: Mineral Thicket Swamp	CODE: SWT
VEGETATION TYPE: Willow Mineral Thicket Swamp	CODE: SWT2-2
INCLUSION	CODE:
COMPLEX	CODE:

Notes:

ELC
PLANT SPECIES LIST

SITE:
POLYGON:
DATE:
SURVEYOR(S):

LAYERS: 1 = CANOPY > 10m 2 = SUB-CANOPY 3 = UNDERSTOREY 4 = GROUND (GRD.) LAYER
ABUNDANCE CODES: R = RARE O = OCCASIONAL A = ABUNDANT D = DOMINANT

SPECIES CODE	LAYER 1	2	3	4	COLL.	SPECIES CODE	LAYER 1	2	3	4	COLL.
Saldisc						solalti					
thuocci						galpalu					
Salpurp						[illegible]					
rhacath						dipfull					
						astlanc					
						rospalu					
						[illegible]					
						nasoffi					
						phaarun					
						[illegible]					
						[illegible]					
						anecana					
						fravirg					
						polamph					
						impcape					
Salpeti											
Corstol											
rhacath											
lontata											

ELC COMMUNITY DESCRIPTION & CLASSIFICATION	SITE 2162 Gordon		POLYGON: 3	
	SURVEYOR(S) DW	DATE 28 June 17		UTME
	START	END	UTMZ	UTMN

POLYGON DESCRIPTION

SYSTEM	SUBSTRATE	TOPOGRAPHIC FEATURE	HISTORY	PLANT FORM	COMMUNITY
☐ TERRESTRIAL ☐ WETLAND ☐ AQUATIC	☐ ORGANIC ☐ MINERAL SOIL ☐ PARENT MIN ☐ ACIDIC BEDRK ☐ BASIC BEDRK ☐ CARB. BEDRK	☐ LACUSTRINE ☐ RIVERINE ☐ BOTTOMLAND ☐ TERRACE ☐ VALLEY SLOPE ☐ TABLELAND ☐ ROLL. UPLAND ☐ CLIFF ☐ TALUS ☐ CREVICE / CAVE ☐ ALVAR ☐ ROCKLAND ☐ BEACH / BAR ☐ SAND DUNE ☐ BLUFF	☐ NATURAL ☐ CULTURAL	☐ PLANKTON ☐ SUBMERGED ☐ FLOATING-LVD ☐ GRAMINOID ☐ FORB ☐ LICHEN ☐ BRYOPHYTE ☐ DECIDUOUS ☐ CONIFEROUS ☐ MIXED	☐ LAKE ☐ POND ☐ RIVER ☐ STREAM ☐ MARSH ☐ SWAMP ☐ FEN ☐ BOG ☐ BARREN ☐ MEADOW ☐ PRAIRIE ☐ THICKET ☐ SAVANNAH ☐ WOODLAND ☐ FOREST ☐ PLANTATION
SITE			**COVER**		
☐ OPEN WATER ☐ SHALLOW WATER ☐ SURFICIAL DEP. ☐ BEDROCK			☐ OPEN ☐ SHRUB ☐ TREED		

STAND DESCRIPTION:

	LAYER	HT	CVR	SPECIES IN ORDER OF DECREASING DOMINANCE (>> MUCH GREATER THAN; > GREATER THAN; = ABOUT EQUAL TO)
1	CANOPY	3	1	Ulpumi thuocci
2	SUB-CANOPY			
3	UNDERSTOREY	4	2	corstol lontata
4	GRD. LAYER	5	4	Solalti grass chrleuc

HT CODES: 1 = >25 m 2 = 10<HT 25 m 3 = 2<HT 10 m 4 = 1<HT 2 m 5 = 0.5<HT 1 m 6 = 0.2<HT 0.5 m 7 = HT<0.2 m

CVR CODES 0= NONE 1= 0% < CVR ≤ 10% 2= 10 < CVR ≤ 25% 3= 25 < CVR ≤ 60% 4= CVR > 60%

STAND COMPOSITION:					BA:
SIZE CLASS ANALYSIS:	< 10	10 - 24	25 - 50	> 50	
STANDING SNAGS:	< 10	10 - 24	25 - 50	> 50	
DEADFALL / LOGS:	< 10	10 - 24	25 - 50	> 50	

ABUNDANCE CODES: N = NONE R = RARE O = OCCASIONAL A = ABUNDANT

COMM. AGE	PIONEER	YOUNG	MID-AGE	MATURE	OLD GROWTH

SOIL ANALYSIS:

TEXTURE:	DEPTH TO MOTTLES / GLEY	g =	G=
MOISTURE:	DEPTH OF ORGANICS:		(cm)
HOMOGENEOUS / VARIABLE	DEPTH TO BEDROCK:		(cm)

COMMUNITYCLASSIFICATION:

COMMUNITY CLASS: Cultural	CODE: CU
COMMUNITY SERIES: Cultural meadow	CODE: CUM
ECOSITE: Mineral Cultural meadow	CODE: CUM1
VEGETATION TYPE: Dry-Moist Old Field Meadow	CODE: CUM1-1
INCLUSION	CODE:
COMPLEX	CODE:

Notes:

ELC PLANT SPECIES LIST	SITE:
	POLYGON:
	DATE:
	SURVEYOR(S):

LAYERS: 1 = CANOPY > 10m 2 = SUB-CANOPY 3 = UNDERSTOREY 4 = GROUND (GRD.) LAYER

ABUNDANCE CODES: R = RARE O = OCCASIONAL A = ABUNDANT D = DOMINANT

SPECIES CODE	LAYER 1	2	3	4	COLL.	SPECIES CODE	LAYER 1	2	3	4	COLL.
Ulpumi						Solalti				A	
thuocci						daucaro					
						chrleuc					
						euphcyp					
						dacglom					
						phlprat					
						poacomp					
						meloff					
						dipsylv					
						Soldag					
						eriann					
						allpeti					
						astlanc					
						ascsyri					
lontata											
corstol											
rubidae											

ELC COMMUNITY DESCRIPTION & CLASSIFICATION	SITE 2162 Gordon		POLYGON: 4	
	SURVEYOR(S) DW	DATE 28 June 17		UTME
	START	END	UTMZ	UTMN

POLYGON DESCRIPTION

SYSTEM
☑ TERRESTRIAL
☐ WETLAND
☐ AQUATIC

SITE
☐ OPEN WATER
☐ SHALLOW WATER
☑ SURFICIAL DEP.
☐ BEDROCK

SUBSTRATE
☐ ORGANIC
☑ MINERAL SOIL
☐ PARENT MIN
☐ ACIDIC BEDRK
☐ BASIC BEDRK
☐ CARB. BEDRK

TOPOGRAPHIC FEATURE
☐ LACUSTRINE
☐ RIVERINE
☐ BOTTOMLAND
☐ TERRACE
☐ VALLEY SLOPE
☐ TABLELAND
☐ ROLL. UPLAND
☐ CLIFF
☐ TALUS
☐ CREVICE / CAVE
☐ ALVAR
☐ ROCKLAND
☐ BEACH / BAR
☐ SAND DUNE
☐ BLUFF

HISTORY
☐ NATURAL
☑ CULTURAL

COVER
☐ OPEN
☐ SHRUB
☑ TREED

PLANT FORM
☐ PLANKTON
☐ SUBMERGED
☐ FLOATING-LVD
☐ GRAMINOID
☐ FORB
☐ LICHEN
☐ BRYOPHYTE
☑ DECIDUOUS
☐ CONIFEROUS
☐ MIXED

COMMUNITY
☐ LAKE
☐ POND
☐ RIVER
☐ STREAM
☐ MARSH
☐ SWAMP
☐ FEN
☐ BOG
☐ BARREN
☐ MEADOW
☐ PRAIRIE
☐ THICKET
☐ SAVANNAH
☑ WOODLAND
☐ FOREST
☐ PLANTATION

STAND DESCRIPTION:

	LAYER	HT	CVR	SPECIES IN ORDER OF DECREASING DOMINANCE (>> MUCH GREATER THAN; > GREATER THAN; ≈ ABOUT EQUAL TO)
1	CANOPY	2	4	Ulmpumi Acesasa
2	SUB-CANOPY			Ulmpumi Vitrip
3	UNDERSTOREY	4	1	Lontata corsto
4	GRD. LAYER	5	4	Solalti brominu poaprat Descard

HT CODES: 1 = >25 m 2 = 15<HT<25 m 3 = 2<HT<10 m 4 = 1<HT<2 m 5 = 0.5<HT<1 m 6 = 0.2<HT<0.5 m 7 = HT<0.2 m
CVR CODES 0= NONE 1= 0% < CVR < 10% 2= 10 < CVR < 25% 3= 25 < CVR < 50% 4= CVR > 60%

STAND COMPOSITION:							BA:	
SIZE CLASS ANALYSIS:		< 10		10 - 24		25 - 50		> 50
STANDING SNAGS:		< 10		10 - 24		25 - 50		> 50
DEADFALL / LOGS:		< 10		10 - 24		25 - 50		> 50

ABUNDANCE CODES: N = NONE R = RARE O = OCCASIONAL A = ABUNDANT

COMM. AGE		PIONEER		YOUNG		MID-AGE		MATURE		OLD GROWTH

SOIL ANALYSIS:

TEXTURE:	DEPTH TO MOTTLES / GLEY	g =	G=
MOISTURE:	DEPTH OF ORGANICS:		(cm)
HOMOGENEOUS / VARIABLE	DEPTH TO BEDROCK:		(cm)

COMMUNITY CLASSIFICATION:

COMMUNITY CLASS:	CODE:
COMMUNITY SERIES:	CODE:
ECOSITE:	CODE:
VEGETATION TYPE: Hedgerow	CODE: H
INCLUSION	CODE:
COMPLEX	CODE:

Notes:

ELC PLANT SPECIES LIST	SITE:
	POLYGON:
	DATE:
	SURVEYOR(S):

LAYERS: 1 = CANOPY > 10m 2 = SUB-CANOPY 3 = UNDERSTOREY 4 = GROUND (GRD.) LAYER
ABUNDANCE CODES: R = RARE O = OCCASIONAL A = ABUNDANT D = DOMINANT

SPECIES CODE	LAYER 1	LAYER 2	LAYER 3	LAYER 4	COLL.	SPECIES CODE	LAYER 1	LAYER 2	LAYER 3	LAYER 4	COLL.
Ulmpum						allpeti					
Acesasn						[illegible]					
						parins					
						[illegible]					
						leocard					
						Solalti					
						acenegu					
						daucaro					
						brominu					
						equarv					
						[illegible]					
						Poaprat					
						ascsyri					
corstol			R								
lontat			R								

ELC COMMUNITY DESCRIPTION & CLASSIFICATION	SITE 2162 Gordon		POLYGON: 5	
	SURVEYOR(S) DW	DATE 28 Jun 17		UTME
	START	END	UTMZ	UTMN

POLYGON DESCRIPTION

SYSTEM	SUBSTRATE	TOPOGRAPHIC FEATURE	HISTORY	PLANT FORM	COMMUNITY
☐ TERRESTRIAL ☑ WETLAND ☐ AQUATIC	☑ ORGANIC ☐ MINERAL SOIL ☐ PARENT MIN ☐ ACIDIC BEDRK ☐ BASIC BEDRK ☐ CARB. BEDRK	☐ LACUSTRINE ☐ RIVERINE ☐ BOTTOMLAND ☐ TERRACE ☐ VALLEY SLOPE ☐ TABLELAND ☐ ROLL. UPLAND ☐ CLIFF ☐ TALUS ☐ CREVICE / CAVE ☐ ALVAR ☐ ROCKLAND ☐ BEACH / BAR ☐ SAND DUNE ☐ BLUFF	☑ NATURAL ☐ CULTURAL	☐ PLANKTON ☐ SUBMERGED ☐ FLOATING-LVD ☑ GRAMINOID ☐ FORB ☐ LICHEN ☐ BRYOPHYTE ☐ DECIDUOUS ☐ CONIFEROUS ☐ MIXED	☐ LAKE ☐ POND ☐ RIVER ☐ STREAM ☑ MARSH ☐ SWAMP ☐ FEN ☐ BOG ☐ BARREN ☐ MEADOW ☐ PRAIRIE ☐ THICKET ☐ SAVANNAH ☐ WOODLAND ☐ FOREST ☐ PLANTATION
SITE			**COVER**		
☐ OPEN WATER ☑ SHALLOW WATER ☐ SURFICIAL DEP. ☐ BEDROCK			☑ OPEN ☐ SHRUB ☐ TREED		

STAND DESCRIPTION

	LAYER	HT	CVR	SPECIES IN ORDER OF DECREASING DOMINANCE (>> MUCH GREATER THAN; > GREATER THAN; = ABOUT EQUAL TO)
1	CANOPY	2	1	Acexfre Salsp Acenegu
2	SUB-CANOPY	4	4	typangu >> typlati
3	UNDERSTOREY	5	2	Phraaustr Solaltis polamph galpalu
4	GRD LAYER	7	1	Lemminor

HT CODES: 1 = >25 m 2 = 10<HT 25 m 3 = 2<HT 10 m 4 = 1<HT 2 m 5 = 0.5<HT 1 m 6 = 0.2<HT 0.5 m 7 = HT<0.2 m

CVR CODES 0= NONE 1= 0% < CVR ≤ 10% 2= 10 < CVR ≤ 25% 3= 25 < CVR ≤ 60% 4= CVR > 60%

STAND COMPOSITION:						BA:		
SIZE CLASS ANALYSIS:		< 10		10 - 24		25 - 50		> 50
STANDING SNAGS:		< 10		10 - 24		25 - 50		> 50
DEADFALL / LOGS:		< 10		10 - 24		25 - 50		> 50

ABUNDANCE CODES: N = NONE R = RARE O = OCCASIONAL A = ABUNDANT

COMM. AGE	PIONEER	YOUNG	MID-AGE	MATURE	OLD GROWTH

SOIL ANALYSIS:

TEXTURE:	DEPTH TO MOTTLES / GLEY	g =	G=
MOISTURE:	DEPTH OF ORGANICS:		(cm)
HOMOGENEOUS / VARIABLE	DEPTH TO BEDROCK:		(cm)

COMMUNITYCLASSIFICATION:

COMMUNITY CLASS: Marsh	CODE: MA
COMMUNITY SERIES: Shallow Marsh	CODE: MAS
ECOSITE: Organic Shallow Marsh	CODE: MAS3
VEGETATION TYPE: Cattail Organic Shallow Marsh	CODE: MAS3-1
INCLUSION	CODE:
COMPLEX	CODE:

Notes:

ELC PLANT SPECIES LIST	SITE:
	POLYGON:
	DATE:
	SURVEYOR(S):

LAYERS: 1 = CANOPY > 10m 2 = SUB-CANOPY 3 = UNDERSTOREY 4 = GROUND (GRD.) LAYER

ABUNDANCE CODES: R = RARE O = OCCASIONAL A = ABUNDANT D = DOMINANT

SPECIES CODE	LAYER 1	2	3	4	COLL.	SPECIES CODE	LAYER 1	2	3	4	COLL.
Acexfrei						typangu					
Acenegu						onosens					
Saldisc						carlacu					
						polamph					
						cicbulb					
						lycame					
						typlati					
						[illegible]					
						phraaus					
						impcape					
						eqarve					
						[illegible]					
						eupmacu					
						galpalu					
						schotab					
						phytri					
						lys [illegible] (lateral)					
						cicbulb					

ELC COMMUNITY DESCRIPTION & CLASSIFICATION	SITE: 2162 Gordon		POLYGON: 6	
	SURVEYOR(S): DW	DATE: 29 Jun 17		UTME
	START	END	UTMZ	UTMN

POLYGON DESCRIPTION

SYSTEM
- ☐ TERRESTRIAL
- ☑ WETLAND
- ☐ AQUATIC

SITE
- ☐ OPEN WATER
- ☐ SHALLOW WATER
- ☑ SURFICIAL DEP.
- ☐ BEDROCK

SUBSTRATE
- ☐ ORGANIC
- ☑ MINERAL SOIL
- ☐ PARENT MIN
- ☐ ACIDIC BEDRK
- ☐ BASIC BEDRK
- ☐ CARB. BEDRK

TOPOGRAPHIC FEATURE
- ☐ LACUSTRINE
- ☐ RIVERINE
- ☐ BOTTOMLAND
- ☐ TERRACE
- ☐ VALLEY SLOPE
- ☐ TABLELAND
- ☐ ROLL. UPLAND
- ☐ CLIFF
- ☐ TALUS
- ☐ CREVICE / CAVE
- ☐ ALVAR
- ☐ ROCKLAND
- ☐ BEACH / BAR
- ☐ SAND DUNE
- ☐ BLUFF

HISTORY
- ☑ NATURAL
- ☐ CULTURAL

COVER
- ☐ OPEN
- ☑ SHRUB
- ☐ TREED

PLANT FORM
- ☐ PLANKTON
- ☐ SUBMERGED
- ☐ FLOATING-LVD
- ☐ GRAMINOID
- ☐ FORB
- ☐ LICHEN
- ☐ BRYOPHYTE
- ☑ DECIDUOUS
- ☐ CONIFEROUS
- ☐ MIXED

COMMUNITY
- ☐ LAKE
- ☐ POND
- ☐ RIVER
- ☐ STREAM
- ☐ MARSH
- ☑ SWAMP
- ☐ FEN
- ☐ BOG
- ☐ BARREN
- ☐ MEADOW
- ☐ PRAIRIE
- ☐ THICKET
- ☐ SAVANNAH
- ☐ WOODLAND
- ☐ FOREST
- ☐ PLANTATION

STAND DESCRIPTION:

	LAYER	HT	CVR	SPECIES IN ORDER OF DECREASING DOMINANCE (>> MUCH GREATER THAN: > GREATER THAN: = ABOUT EQUAL TO)
1	CANOPY	3	4	corstol >> lontata saldisc
2	SUB-CANOPY			
3	UNDERSTOREY			
4	GRD. LAYER	5	1	equarve droffi glyshi fravir

HT CODES: 1 = >25 m 2 = 10<HT 25 m 3 = 2<HT 10 m 4 = 1<HT 2 m 5 = 0.5<HT 1 m 6 = 0.2<HT 0.5 m 7 = HT<0.2 m

CVR CODES 0= NONE 1= 0% < CVR ≤ 10% 2= 10 < CVR ≤ 25% 3= 25 < CVR ≤ 60% 4= CVR > 60%

STAND COMPOSITION:							BA:	
SIZE CLASS ANALYSIS:		< 10		10 - 24		25 - 50		> 50
STANDING SNAGS:		< 10		10 - 24		25 - 50		> 50
DEADFALL / LOGS:		< 10		10 - 24		25 - 50		> 50

ABUNDANCE CODES: N = NONE R = RARE O = OCCASIONAL A = ABUNDANT

COMM. AGE		PIONEER		YOUNG		MID-AGE		MATURE		OLD GROWTH

SOIL ANALYSIS:

TEXTURE:	DEPTH TO MOTTLES / GLEY	g =	G=
MOISTURE:	DEPTH OF ORGANICS:		(cm)
HOMOGENEOUS / VARIABLE	DEPTH TO BEDROCK:		(cm)

COMMUNITYCLASSIFICATION:

COMMUNITY CLASS: Swamp	CODE: SW
COMMUNITY SERIES: Thicket Swamp	CODE: SWT
ECOSITE: Mineral Thicket Swamp	CODE: SWT2
VEGETATION TYPE: Red osier Mineral Thicket Swamp	CODE: SWT2-5
INCLUSION	CODE:
COMPLEX	CODE:

Notes:

ELC PLANT SPECIES LIST	SITE:
	POLYGON:
	DATE:
	SURVEYOR(S):

LAYERS: 1 = CANOPY > 10m 2 = SUB-CANOPY 3 = UNDERSTOREY 4 = GROUND (GRD.) LAYER

ABUNDANCE CODES: R = RARE O = OCCASIONAL A = ABUNDANT D = DOMINANT

SPECIES CODE	LAYER 1	2	3	4	COLL.	SPECIES CODE	LAYER 1	2	3	4	COLL.
						droffi					
						Galpalu					
						Peilan					
						parusi					
						englbl					
						Stalta					
						castlan					
						glyshi					
						dylame					
						astpuni					
						viccrac					
						dauoro					
						fravir					
Saldisc	R										
Lontata	R										
Corstol	D										

ELC COMMUNITY DESCRIPTION & CLASSIFICATION	SITE Gordon 2162		POLYGON: 7	
	SURVEYOR(S)	DATE Jun 29 17		UTME
	START	END	UTMZ	UTMN

POLYGON DESCRIPTION

SYSTEM	SUBSTRATE	TOPOGRAPHIC FEATURE	HISTORY	PLANT FORM	COMMUNITY
☑ TERRESTRIAL ☐ WETLAND ☐ AQUATIC	☐ ORGANIC ☑ MINERAL SOIL ☐ PARENT MIN ☐ ACIDIC BEDRK ☐ BASIC BEDRK ☐ CARB. BEDRK	☐ LACUSTRINE ☐ RIVERINE ☐ BOTTOMLAND ☐ TERRACE ☐ VALLEY SLOPE ☐ TABLELAND ☐ ROLL. UPLAND ☐ CLIFF ☐ TALUS ☐ CREVICE / CAVE ☐ ALVAR ☐ ROCKLAND ☐ BEACH / BAR ☐ SAND DUNE ☐ BLUFF	☐ NATURAL ☑ CULTURAL	☐ PLANKTON ☐ SUBMERGED ☐ FLOATING-LVD ☐ GRAMINOID ☐ FORB ☐ LICHEN ☐ BRYOPHYTE ☑ DECIDUOUS ☐ CONIFEROUS ☐ MIXED	☐ LAKE ☐ POND ☐ RIVER ☐ STREAM ☐ MARSH ☐ SWAMP ☐ FEN ☐ BOG ☐ BARREN ☐ MEADOW ☐ PRAIRIE ☐ THICKET ☐ SAVANNAH ☑ WOODLAND ☐ FOREST ☐ PLANTATION
SITE			**COVER**		
☐ OPEN WATER ☐ SHALLOW WATER ☑ SURFICIAL DEP. ☐ BEDROCK			☐ OPEN ☐ SHRUB ☑ TREED		

STAND DESCRIPTION:

	LAYER	HT	CVR	SPECIES IN ORDER OF DECREASING DOMINANCE (>> MUCH GREATER THAN; > GREATER THAN; = ABOUT EQUAL TO)
1	CANOPY	3	3	Ulmpumi lontata Acenegu jugnigr
2	SUB-CANOPY			
3	UNDERSTOREY	4	2	lontata
4	GRD LAYER	5	4	brominer solalti ascsyri phraaus

HT CODES: 1 = >25 m 2 = 10<HT 25 m 3 = 2<HT 10 m 4 = 1<HT 2 m 5 = 0.5<HT 1 m 6 = 0.2<HT 0.5 m 7 = HT<0.2 m
CVR CODES 0= NONE 1= 0% < CVR ≤ 10% 2= 10 < CVR ≤ 25% 3= 25 < CVR ≤ 60% 4= CVR > 60%

STAND COMPOSITION:				BA:
SIZE CLASS ANALYSIS:	O < 10	O 10 - 24	O 25 - 50	N > 50
STANDING SNAGS:	R < 10	R 10 - 24	R 25 - 50	N > 50
DEADFALL / LOGS:	R < 10	R 10 - 24	R 25 - 50	N > 50

ABUNDANCE CODES: N = NONE R = RARE O = OCCASIONAL A = ABUNDANT

COMM. AGE	PIONEER	YOUNG	MID-AGE	MATURE	OLD GROWTH

SOIL ANALYSIS:

TEXTURE:	DEPTH TO MOTTLES / GLEY	g =	G=
MOISTURE:	DEPTH OF ORGANICS:		(cm)
HOMOGENEOUS / VARIABLE	DEPTH TO BEDROCK:		(cm)

COMMUNITYCLASSIFICATION:

COMMUNITY CLASS: Cultural	CODE: CU
COMMUNITY SERIES: Cultural Woodland	CODE: CUW
ECOSITE: Deciduous Cultural Woodland	CODE: CUW1
VEGETATION TYPE: Deciduous Cultural Woodland	CODE: CUW1
INCLUSION	CODE:
COMPLEX	CODE:

Notes:

ELC PLANT SPECIES LIST	SITE:
	POLYGON:
	DATE:
	SURVEYOR(S):

LAYERS: 1 = CANOPY > 10m 2 = SUB-CANOPY 3 = UNDERSTOREY 4 = GROUND (GRD.) LAYER
ABUNDANCE CODES: R = RARE O = OCCASIONAL A = ABUNDANT D = DOMINANT

SPECIES CODE	LAYER 1	LAYER 2	LAYER 3	LAYER 4	COLL.	SPECIES CODE	LAYER 1	LAYER 2	LAYER 3	LAYER 4	COLL.
Ulmpumi						bromine					
Acenegu						ascsyri					
jugnigr						Daucaro					
						phraaus					
						solalti					
						potrect					
						[illegible]					
						daucaro					
						phlprat					
						chrleuc					
parinqu											
[illegible]											
vitripa											
lontata											

ELC
COMMUNITY DESCRIPTION & CLASSIFICATION

SITE 2162 Gordon
POLYGON: 8
SURVEYOR(S) DW
DATE 28 Jun 17
UTME
START
END
UTMZ
UTMN

POLYGON DESCRIPTION

SYSTEM
☐ TERRESTRIAL
☐ WETLAND
☑ AQUATIC

SITE
☐ OPEN WATER
☑ SHALLOW WATER
☐ SURFICIAL DEP.
☐ BEDROCK

SUBSTRATE
☑ ORGANIC
☐ MINERAL SOIL
☐ PARENT MIN
☐ ACIDIC BEDRK
☐ BASIC BEDRK
☐ CARB. BEDRK

TOPOGRAPHIC FEATURE
☐ LACUSTRINE
☐ RIVERINE
☐ BOTTOMLAND
☐ TERRACE
☐ VALLEY SLOPE
☐ TABLELAND
☐ ROLL. UPLAND
☐ CLIFF
☐ TALUS
☐ CREVICE / CAVE
☐ ALVAR
☐ ROCKLAND
☐ BEACH / BAR
☐ SAND DUNE
☐ BLUFF

HISTORY
☑ NATURAL
☐ CULTURAL

COVER
☑ OPEN
☐ SHRUB
☐ TREED

PLANT FORM
☐ PLANKTON
☐ SUBMERGED
☑ FLOATING-LVD
☐ GRAMINOID
☐ FORB
☐ LICHEN
☐ BRYOPHYTE
☐ DECIDUOUS
☐ CONIFEROUS
☐ MIXED

COMMUNITY
☐ LAKE
☐ POND
☐ RIVER
☐ STREAM
☐ MARSH
☐ SWAMP
☐ FEN
☐ BOG
☐ BARREN
☐ MEADOW
☐ PRAIRIE
☐ THICKET
☐ SAVANNAH
☐ WOODLAND
☐ FOREST
☐ PLANTATION

STAND DESCRIPTION:

LAYER	HT	CVR	SPECIES IN ORDER OF DECREASING DOMINANCE (>> MUCH GREATER THAN; > GREATER THAN; = ABOUT EQUAL TO)
1 CANOPY			
2 SUB-CANOPY			
3 UNDERSTOREY	5	1	phraaun ascinca riveis saglati
4 GRD LAYER	7	4	lemmin >> nupvari potamog

HT CODES: 1 = >25 m 2 = 10<HT ≤25 m 3 = 2<HT ≤10 m 4 = 1<HT ≤2 m 5 = 0.5<HT ≤1 m 6 = 0.2<HT ≤0.5 m 7 = HT<0.2 m
CVR CODES 0= NONE 1= 0% < CVR ≤ 10% 2= 10 < CVR ≤ 25% 3= 25 < CVR ≤ 60% 4= CVR > 60%

STAND COMPOSITION:
BA:

SIZE CLASS ANALYSIS:	< 10	10 - 24	25 - 50	> 50
STANDING SNAGS:	< 10	10 - 24	25 - 50	> 50
DEADFALL / LOGS:	< 10	10 - 24	25 - 50	> 50

ABUNDANCE CODES: N = NONE R = RARE O = OCCASIONAL A = ABUNDANT

COMM. AGE	PIONEER	YOUNG	MID-AGE	MATURE	OLD GROWTH

SOIL ANALYSIS:

TEXTURE:	DEPTH TO MOTTLES / GLEY g = G=
MOISTURE:	DEPTH OF ORGANICS: (cm)
HOMOGENEOUS / VARIABLE	DEPTH TO BEDROCK: (cm)

COMMUNITYCLASSIFICATION:

COMMUNITY CLASS:	CODE:
COMMUNITY SERIES:	CODE:
ECOSITE: Floating leave shallow Aquatic	CODE: SAF1
VEGETATION TYPE: Duckweed Floating-leave Shallow Aquatic	CODE: SAF1-3
INCLUSION	CODE:
COMPLEX	CODE:

Notes:

ELC
PLANT SPECIES LIST

SITE:
POLYGON:
DATE:
SURVEYOR(S):

LAYERS: 1 = CANOPY > 10m 2 = SUB-CANOPY 3 = UNDERSTOREY 4 = GROUND (GRD.) LAYER
ABUNDANCE CODES: R = RARE O = OCCASIONAL A = ABUNDANT D = DOMINANT

SPECIES CODE	LAYER 1	2	3	4	COLL.	SPECIES CODE	LAYER 1	2	3	4	COLL.
						lemmin				A	
						nupvari				O	
						saglati			R		
						riveat			R		
						ascincm			R		
						potomogn				O	
						phraaun			R		

ELC COMMUNITY DESCRIPTION & CLASSIFICATION	SITE: Gordon 2162		POLYGON: 9	
	SURVEYOR(S): DW	DATE: 28 Jun 17		UTME
	START	END	UTMZ	UTMN

POLYGON DESCRIPTION

SYSTEM	SUBSTRATE	TOPOGRAPHIC FEATURE	HISTORY	PLANT FORM	COMMUNITY
☐ TERRESTRIAL ☑ WETLAND ☐ AQUATIC	☐ ORGANIC ☑ MINERAL SOIL ☐ PARENT MIN ☐ ACIDIC BEDRK ☐ BASIC BEDRK ☐ CARB. BEDRK	☐ LACUSTRINE ☐ RIVERINE ☐ BOTTOMLAND ☐ TERRACE ☐ VALLEY SLOPE ☐ TABLELAND ☐ ROLL. UPLAND ☐ CLIFF ☐ TALUS ☐ CREVICE / CAVE ☐ ALVAR ☐ ROCKLAND ☐ BEACH / BAR ☐ SAND DUNE ☐ BLUFF	☑ NATURAL ☐ CULTURAL	☐ PLANKTON ☐ SUBMERGED ☐ FLOATING-LVD ☐ GRAMINOID ☐ FORB ☐ LICHEN ☐ BRYOPHYTE ☑ DECIDUOUS ☐ CONIFEROUS ☐ MIXED	☐ LAKE ☐ POND ☐ RIVER ☐ STREAM ☐ MARSH ☑ SWAMP ☐ FEN ☐ BOG ☐ BARREN ☐ MEADOW ☐ PRAIRIE ☐ THICKET ☐ SAVANNAH ☐ WOODLAND ☐ FOREST ☐ PLANTATION
SITE			**COVER**		
☐ OPEN WATER ☐ SHALLOW WATER ☑ SURFICIAL DEP. ☐ BEDROCK			☐ OPEN ☐ SHRUB ☑ TREED		

STAND DESCRIPTION:

LAYER		HT	CVR	SPECIES IN ORDER OF DECREASING DOMINANCE (>> MUCH GREATER THAN; > GREATER THAN; = ABOUT EQUAL TO)
1	CANOPY	2	4	Acexfre Popdelt Salsp Frapenn
2	SUB-CANOPY			
3	UNDERSTOREY	4	1	Spialba
4	GRD. LAYER	5	4	impcape equarve onosens tusfarf

HT CODES: 1 = >25 m 2 = 10<HT 25 m 3 = 2<HT 10 m 4 = 1<HT 2 m 5 = 0.5<HT 1 m 6 = 0.2<HT 0.5 m 7 = HT<0.2 m

CVR CODES 0= NONE 1= 0% < CVR 10% 2= 10 < CVR 25% 3= 25 < CVR < 60% 4= CVR > 60%

STAND COMPOSITION:							BA:	
SIZE CLASS ANALYSIS:	O	< 10	O	10 - 24	O	25 - 50	R	> 50
STANDING SNAGS:		< 10		10 - 24		25 - 50		> 50
DEADFALL / LOGS:		< 10		10 - 24		25 - 50		> 50

ABUNDANCE CODES: N = NONE R = RARE O = OCCASIONAL A = ABUNDANT

COMM. AGE		PIONEER		YOUNG	✓	MID-AGE		MATURE		OLD GROWTH

SOIL ANALYSIS:

TEXTURE:	DEPTH TO MOTTLES / GLEY	g =	G=
MOISTURE:	DEPTH OF ORGANICS:		(cm)
HOMOGENEOUS / VARIABLE	DEPTH TO BEDROCK:		(cm)

COMMUNITY CLASSIFICATION:

COMMUNITY CLASS: Swamp	CODE: SW
COMMUNITY SERIES: Deciduous Swamp	CODE: SWD
ECOSITE: Mineral Deciduous Swamp	CODE: SWD3
VEGETATION TYPE: Swamp Maple Mineral Deciduous Swamp	CODE: SWD3-3
INCLUSION	CODE:
COMPLEX	CODE:

Notes:

ELC PLANT SPECIES LIST	SITE:
	POLYGON:
	DATE:
	SURVEYOR(S):

LAYERS: 1 = CANOPY > 10m 2 = SUB-CANOPY 3 = UNDERSTOREY 4 = GROUND (GRD.) LAYER

ABUNDANCE CODES: R = RARE O = OCCASIONAL A = ABUNDANT D = DOMINANT

SPECIES CODE	LAYER 1	LAYER 2	LAYER 3	LAYER 4	COLL.	SPECIES CODE	LAYER 1	LAYER 2	LAYER 3	LAYER 4	COLL.
Acexfre						phraus					
Popdelt						impcape					
Sal sp						solalti					
Frapenn						anecana					
						tusfarf					
						equarve					
						[illegible]					
						astlanc					
						calcana					
						galpalu					
						[illegible]					
						[illegible]					
						onosens					
						[illegible]					
Spialba											

ELC
COMMUNITY DESCRIPTION & CLASSIFICATION

SITE 2162 Gordon		POLYGON: 10	
SURVEYOR(S) DW	DATE 28 Jun 17		UTME
START	END	UTMZ	UTMN

POLYGON DESCRIPTION

SYSTEM
☑ TERRESTRIAL
☐ WETLAND
☐ AQUATIC

SITE
☐ OPEN WATER
☐ SHALLOW WATER
☑ SURFICIAL DEP.
☐ BEDROCK

SUBSTRATE
☐ ORGANIC
☑ MINERAL SOIL
☐ PARENT MIN
☐ ACIDIC BEDRK
☐ BASIC BEDRK
☐ CARB. BEDRK

TOPOGRAPHIC FEATURE
☐ LACUSTRINE
☐ RIVERINE
☐ BOTTOMLAND
☐ TERRACE
☐ VALLEY SLOPE
☐ TABLELAND
☐ ROLL. UPLAND
☐ CLIFF
☐ TALUS
☐ CREVICE / CAVE
☐ ALVAR
☐ ROCKLAND
☐ BEACH / BAR
☐ SAND DUNE
☐ BLUFF

HISTORY
☐ NATURAL
☑ CULTURAL

COVER
☐ OPEN
☐ SHRUB
☑ TREED

PLANT FORM
☐ PLANKTON
☐ SUBMERGED
☐ FLOATING-LVD
☐ GRAMINOID
☐ FORB
☐ LICHEN
☐ BRYOPHYTE
☐ DECIDUOUS
☑ CONIFEROUS
☐ MIXED

COMMUNITY
☐ LAKE
☐ POND
☐ RIVER
☐ STREAM
☐ MARSH
☐ SWAMP
☐ FEN
☐ BOG
☐ BARREN
☐ MEADOW
☐ PRAIRIE
☐ THICKET
☐ SAVANNAH
☑ WOODLAND
☐ FOREST
☐ PLANTATION

STAND DESCRIPTION:

LAYER		HT	CVR	SPECIES IN ORDER OF DECREASING DOMINANCE (>> MUCH GREATER THAN; > GREATER THAN; = ABOUT EQUAL TO)
1	CANOPY	2	1	Ace sacu
2	SUB-CANOPY	3	4	Thu occi / Rha cath Lon tata
3	UNDERSTOREY			
4	GRD. LAYER	5	2	Sol alti grasses arc[illegible] parsi

HT CODES: 1 = >25 m 2 = 10<HT 25 m 3 = 2<HT 10 m 4 = 1<HT 2 m 5 = 0.5<HT 1 m 6 = 0.2<HT 0.5 m 7 = HT<0.2 m
CVR CODES 0= NONE 1= 0% < CVR ≤ 10% 2= 10 < CVR ≤ 25% 3= 25 < CVR ≤ 60% 4= CVR > 60%

STAND COMPOSITION:					BA:
SIZE CLASS ANALYSIS:	A < 10	A 10 - 24	R 25 - 50	N > 50	
STANDING SNAGS:	< 10	10 - 24	25 - 50	> 50	
DEADFALL / LOGS:	< 10	10 - 24	25 - 50	> 50	

ABUNDANCE CODES: N = NONE R = RARE O = OCCASIONAL A = ABUNDANT

COMM. AGE	PIONEER	YOUNG ✓	MID-AGE	MATURE	OLD GROWTH

SOIL ANALYSIS:

EXTURE:	DEPTH TO MOTTLES / GLEY	g =	G=
OISTURE:	DEPTH OF ORGANICS:		(cm)
OMOGENEOUS / VARIABLE	DEPTH TO BEDROCK:		(cm)

OMMUNITYCLASSIFICATION:

MMUNITY CLASS: Forest	CODE: FO
IMUNITY SERIES: Coniferous Forest	CODE: FOC
SITE: Fresh Moist White Cedar Con. For	CODE: FOC4
TATION TYPE: F/M White Cedar Con. for.	CODE: FOC4-1
INCLUSION	CODE:
COMPLEX	CODE:

ELC
PLANT SPECIES LIST

SITE:	
POLYGON:	
DATE:	
SURVEYOR(S):	

LAYERS: 1 = CANOPY > 10m 2 = SUB-CANOPY 3 = UNDERSTOREY 4 = GROUND (GRD.) LAYER
ABUNDANCE CODES: R = RARE O = OCCASIONAL A = ABUNDANT D = DOMINANT

SPECIES CODE	LAYER 1	LAYER 2	LAYER 3	LAYER 4	COLL.
Ace sacu	R				
Rha cath		O			
Vit ripa					
Thu occi		D			
Lon tata		R			

SPECIES CODE	LAYER 1	LAYER 2	LAYER 3	LAYER 4	COLL.
Sol alti					
Poa prat					
Ar[illegible]					
Lys [illegible]					
Parinsq					

ELC COMMUNITY DESCRIPTION & CLASSIFICATION	SITE: Gordon 2162		POLYGON: 11
	SURVEYOR(S): DW	DATE: 28 Jun 17	UTME
	START	END	UTMZ	UTMN

POLYGON DESCRIPTION

SYSTEM
☑ TERRESTRIAL
☐ WETLAND
☐ AQUATIC

SITE
☐ OPEN WATER
☐ SHALLOW WATER
☑ SURFICIAL DEP.
☐ BEDROCK

SUBSTRATE
☐ ORGANIC
☑ MINERAL SOIL
☐ PARENT MIN
☐ ACIDIC BEDRK
☐ BASIC BEDRK
☐ CARB. BEDRK

TOPOGRAPHIC FEATURE
☐ LACUSTRINE
☐ RIVERINE
☐ BOTTOMLAND
☐ TERRACE
☐ VALLEY SLOPE
☐ TABLELAND
☐ ROLL. UPLAND
☐ CLIFF
☐ TALUS
☐ CREVICE / CAVE
☐ ALVAR
☐ ROCKLAND
☐ BEACH / BAR
☐ SAND DUNE
☐ BLUFF

HISTORY
☑ NATURAL
☐ CULTURAL

COVER
☐ OPEN
☐ SHRUB
☑ TREED

PLANT FORM
☐ PLANKTON
☐ SUBMERGED
☐ FLOATING-LVD
☐ GRAMINOID
☐ FORB
☐ LICHEN
☐ BRYOPHYTE
☐ DECIDUOUS
☑ CONIFEROUS
☐ MIXED

COMMUNITY
☐ LAKE
☐ POND
☐ RIVER
☐ STREAM
☐ MARSH
☐ SWAMP
☐ FEN
☐ BOG
☐ BARREN
☐ MEADOW
☐ PRAIRIE
☐ THICKET
☐ SAVANNAH
☐ WOODLAND
☑ FOREST
☐ PLANTATION

STAND DESCRIPTION:

	LAYER	HT	CVR	SPECIES IN ORDER OF DECREASING DOMINANCE (>> MUCH GREATER THAN; > GREATER THAN; = ABOUT EQUAL TO)
1	CANOPY	2	3	=Tsucana, Pinstro, Quemacr, Thuocc
2	SUB-CANOPY	3	4	Thuocci,
3	UNDERSTOREY	4	1	rhatyph, prunvirg, sampube -
4	GRD LAYER	6	1	carpedu, maicana, parquin, epihell

HT CODES: 1 = >25 m 2 = 10<HT≤25 m 3 = 2<HT≤10 m 4 = 1<HT≤2 m 5 = 0.5<HT≤1 m 6 = 0.2<HT≤0.5 m 7 = HT<0.2 m
CVR CODES: 0 = NONE 1 = 0% < CVR ≤ 10% 2 = 10 < CVR ≤ 25% 3 = 25 < CVR ≤ 60% 4 = CVR > 60%

STAND COMPOSITION:					BA:
SIZE CLASS ANALYSIS:	A < 10	A 10 - 24	O 25 - 50	O > 50	
STANDING SNAGS:	O < 10	O 10 - 24	R 25 - 50	R > 50	
DEADFALL / LOGS:	O < 10	O 10 - 24	R 25 - 50	R > 50	

ABUNDANCE CODES: N = NONE R = RARE O = OCCASIONAL A = ABUNDANT

COMM. AGE: PIONEER | YOUNG | MID-AGE | ✓ MATURE | OLD GROWTH

SOIL ANALYSIS:

TEXTURE:	DEPTH TO MOTTLES / GLEY g = G=
MOISTURE:	DEPTH OF ORGANICS: (cm)
HOMOGENEOUS / VARIABLE	DEPTH TO BEDROCK: (cm)

COMMUNITY CLASSIFICATION:

COMMUNITY CLASS: Forest	CODE: FO
COMMUNITY SERIES: Conifer Forest	CODE: FOC
ECOSITE: Fresh/Moist White Cedar Conifer	CODE: FOC4
VEGETATION TYPE: F/M White Cedar-Hemlock Conifer	CODE: FOC4-2
INCLUSION	CODE:
COMPLEX	CODE:

Notes:

ELC PLANT SPECIES LIST	SITE:
	POLYGON:
	DATE:
	SURVEYOR(S):

LAYERS: 1 = CANOPY > 10m 2 = SUB-CANOPY 3 = UNDERSTOREY 4 = GROUND (GRD.) LAYER
ABUNDANCE CODES: R = RARE O = OCCASIONAL A = ABUNDANT D = DOMINANT

SPECIES CODE	LAYER 1	2	3	4	COLL.	SPECIES CODE	LAYER 1	2	3	4	COLL.
Thuocci						epihell					
Pinstro						carpedu					
Prusty						maicana					
Ostvirg						parquin					
Quealba						viopube					
Tsucana											
Quemacr											
Sampube											
Prunvirg											
rhatyph											

ELC COMMUNITY DESCRIPTION & CLASSIFICATION	SITE 262 Gordon		POLYGON: 12
	SURVEYOR(S) DW	DATE 28 Jun 17	UTME
	START | END	UTMZ	UTMN

POLYGON DESCRIPTION

SYSTEM
- ☐ TERRESTRIAL
- ☑ WETLAND
- ☐ AQUATIC

SITE
- ☐ OPEN WATER
- ☑ SHALLOW WATER
- ☐ SURFICIAL DEP.
- ☐ BEDROCK

SUBSTRATE
- ☐ ORGANIC
- ☐ MINERAL SOIL
- ☐ PARENT MIN
- ☐ ACIDIC BEDRK
- ☐ BASIC BEDRK
- ☐ CARB. BEDRK

TOPOGRAPHIC FEATURE
- ☐ LACUSTRINE
- ☐ RIVERINE
- ☐ BOTTOMLAND
- ☐ TERRACE
- ☐ VALLEY SLOPE
- ☐ TABLELAND
- ☐ ROLL. UPLAND
- ☐ CLIFF
- ☐ TALUS
- ☐ CREVICE / CAVE
- ☐ ALVAR
- ☐ ROCKLAND
- ☐ BEACH / BAR
- ☐ SAND DUNE
- ☐ BLUFF

HISTORY
- ☑ NATURAL
- ☐ CULTURAL

COVER
- ☑ OPEN
- ☐ SHRUB
- ☐ TREED

PLANT FORM
- ☐ PLANKTON
- ☐ SUBMERGED
- ☑ FLOATING-LVD
- ☐ GRAMINOID
- ☐ FORB
- ☐ LICHEN
- ☐ BRYOPHYTE
- ☐ DECIDUOUS
- ☐ CONIFEROUS
- ☐ MIXED

COMMUNITY
- ☐ LAKE
- ☐ POND
- ☐ RIVER
- ☐ STREAM
- ☑ MARSH
- ☐ SWAMP
- ☐ FEN
- ☐ BOG
- ☐ BARREN
- ☐ MEADOW
- ☐ PRAIRIE
- ☐ THICKET
- ☐ SAVANNAH
- ☐ WOODLAND
- ☐ FOREST
- ☐ PLANTATION

STAND DESCRIPTION

LAYER		HT	CVR	SPECIES IN ORDER OF DECREASING DOMINANCE (>> MUCH GREATER THAN; > GREATER THAN; = ABOUT EQUAL TO)
1	CANOPY			
2	SUB-CANOPY			
3	UNDERSTOREY			
4	GRD. LAYER	7	4	nup var > lem min

HT CODES: 1 = >25 m 2 = 10<HT 25 m 3 = 2<HT 10 m 4 = 1<HT 2 m 5 = 0.5<HT 1 m 6 = 0.2<HT 0.5 m 7 = HT<0.2 m
CVR CODES 0= NONE 1= 0% < CVR 10% 2= 10 < CVR 25% 3= 25 < CVR 60% 4= CVR > 60%

STAND COMPOSITION:							BA:	
SIZE CLASS ANALYSIS:		< 10		10 - 24		25 - 50		> 50
STANDING SNAGS:		< 10		10 - 24		25 - 50		> 50
DEADFALL / LOGS:		< 10		10 - 24		25 - 50		> 50

ABUNDANCE CODES: N = NONE R = RARE O = OCCASIONAL A = ABUNDANT

COMM. AGE	PIONEER	YOUNG	MID-AGE	MATURE	OLD GROWTH

SOIL ANALYSIS:

TEXTURE:	DEPTH TO MOTTLES / GLEY	g =	G=
MOISTURE:	DEPTH OF ORGANICS:		(cm)
HOMOGENEOUS / VARIABLE	DEPTH TO BEDROCK:		(cm)

COMMUNITYCLASSIFICATION:

COMMUNITY CLASS: Shallow Aquatic	CODE: SA
COMMUNITY SERIES: Floating Leaved SA	CODE: SAF1
ECOSITE: W	CODE: w
VEGETATION TYPE: WaterLily / Bullhead Lily Floating Leaved	CODE: SAF1-1
INCLUSION	CODE:
COMPLEX	CODE:

Notes:

ELC PLANT SPECIES LIST	SITE:
	POLYGON:
	DATE:
	SURVEYOR(S):

LAYERS: 1 = CANOPY > 10m 2 = SUB-CANOPY 3 = UNDERSTOREY 4 = GROUND (GRD.) LAYER
ABUNDANCE CODES: R = RARE O = OCCASIONAL A = ABUNDANT D = DOMINANT

SPECIES CODE	LAYER 1	LAYER 2	LAYER 3	LAYER 4	COLL.	SPECIES CODE	LAYER 1	LAYER 2	LAYER 3	LAYER 4	COLL.
						nup var				A	
						lem min				D	

ELC COMMUNITY DESCRIPTION & CLASSIFICATION	SITE Gordon 2162		POLYGON: 13		
	SURVEYOR(S) DW		DATE 28 Jun 17		UTME
	START	END		UTMZ	UTMN

POLYGON DESCRIPTION

SYSTEM	SUBSTRATE	TOPOGRAPHIC FEATURE	HISTORY	PLANT FORM	COMMUNITY
☑ TERRESTRIAL ☐ WETLAND ☐ AQUATIC	☐ ORGANIC ☐ MINERAL SOIL ☐ PARENT MIN ☐ ACIDIC BEDRK ☐ BASIC BEDRK ☐ CARB. BEDRK	☐ LACUSTRINE ☐ RIVERINE ☐ BOTTOMLAND ☐ TERRACE ☐ VALLEY SLOPE ☐ TABLELAND ☑ ROLL. UPLAND ☐ CLIFF ☐ TALUS ☐ CREVICE / CAVE ☐ ALVAR ☐ ROCKLAND ☐ BEACH / BAR ☐ SAND DUNE ☐ BLUFF	☑ NATURAL ☐ CULTURAL	☐ PLANKTON ☐ SUBMERGED ☐ FLOATING-LVD ☐ GRAMINOID ☐ FORB ☐ LICHEN ☐ BRYOPHYTE ☐ DECIDUOUS ☐ CONIFEROUS ☑ MIXED	☐ LAKE ☐ POND ☐ RIVER ☐ STREAM ☐ MARSH ☐ SWAMP ☐ FEN ☐ BOG ☐ BARREN ☐ MEADOW ☐ PRAIRIE ☐ THICKET ☐ SAVANNAH ☐ WOODLAND ☑ FOREST ☐ PLANTATION
SITE			**COVER**		
☐ OPEN WATER ☐ SHALLOW WATER ☑ SURFICIAL DEP. ☐ BEDROCK			☐ OPEN ☐ SHRUB ☑ TREED		

STAND DESCRIPTION:

	LAYER	HT	CVR	SPECIES IN ORDER OF DECREASING DOMINANCE (>> MUCH GREATER THAN; > GREATER THAN; = ABOUT EQUAL TO)
1	CANOPY	2	4	Tsucana Pinstro Ostvirg Acesacn
2	SUB-CANOPY	3	2	Tsucan Acesacc Ostvirg
3	UNDERSTOREY	4	2	Fagrany samrace Lonobl Maican
4	GRD. LAYER	5	3	Carpedu cirlut, Maican gerrobe

HT CODES: 1 = >25 m 2 = 10<HT 25 m 3 = 2<HT 10 m 4 = 1<HT 2 m 5 = 0.5<HT 1 m 6 = 0.2<HT 0.5 m 7 = HT<0.2 m

CVR CODES 0= NONE 1= 0% < CVR ≤ 10% 2= 10 < CVR ≤ 25% 3= 25 < CVR ≤ 60% 4= CVR > 60%

STAND COMPOSITION:							BA:	
SIZE CLASS ANALYSIS:	A	< 10	A	10 - 24	A	25 - 50	O	> 50
STANDING SNAGS:	O	< 10	O	10 - 24	O	25 - 50	O	> 50
DEADFALL / LOGS:	A	< 10	O	10 - 24	O	25 - 50	R	> 50

ABUNDANCE CODES: N = NONE R = RARE O = OCCASIONAL A = ABUNDANT

COMM. AGE	PIONEER	YOUNG	MID-AGE	✓ MATURE	OLD GROWTH

SOIL ANALYSIS:

TEXTURE:	DEPTH TO MOTTLES / GLEY	g =	G=
MOISTURE:	DEPTH OF ORGANICS:		(cm)
HOMOGENEOUS / VARIABLE	DEPTH TO BEDROCK:		(cm)

COMMUNITYCLASSIFICATION:

COMMUNITY CLASS: Forest	CODE: FO
COMMUNITY SERIES: Mixed Forest	CODE: FOM
ECOSITE: Dry Fresh Hemlock Mixed Forest	CODE: FOM3
VEGETATION TYPE: Dry/Fresh Hemlock-Sugar Maple MF	CODE: FOM3-2
INCLUSION	CODE: SAF1-3
COMPLEX	CODE:

Notes:

ELC PLANT SPECIES LIST	SITE:
	POLYGON:
	DATE:
	SURVEYOR(S):

LAYERS: 1 = CANOPY > 10m 2 = SUB-CANOPY 3 = UNDERSTOREY 4 = GROUND (GRD.) LAYER

ABUNDANCE CODES: R = RARE O = OCCASIONAL A = ABUNDANT D = DOMINANT

SPECIES CODE	LAYER 1	2	3	4	COLL.	SPECIES CODE	LAYER 1	2	3	4	COLL.
Pinstro						cirlut					
Poptre						epihell					
Pruserо						thurary					
Thuocc						carex					
Tsucan						maican					
Querru						dryint					
Faggran						arinuc					
Popgra						gerrobe					
						ranabo					
Ostvir						antyp					
Ulmame						oxastr					
Vibace						carpedu					
						pren-sp					
						solcaes					
						sancana					
						polpube					
						lasdeura					
						candiph					
						athfele					
						cysbulb					
						solflex					
						alltric					
						aquican					
rhacath											
pruvir											
rhafra											

Hieracium collected

ELC
COMMUNITY DESCRIPTION & CLASSIFICATION

SITE 2162 Gordon
POLYGON: 17
SURVEYOR(S)
DATE 28 Jun 17
UTME
START
END
UTMZ
UTMN

POLYGON DESCRIPTION

SYSTEM
☐ TERRESTRIAL
☑ WETLAND
☐ AQUATIC

SUBSTRATE
☐ ORGANIC
☑ MINERAL SOIL
☐ PARENT MIN
☐ ACIDIC BEDRK
☐ BASIC BEDRK
☐ CARB. BEDRK

TOPOGRAPHIC FEATURE
☐ LACUSTRINE
☐ RIVERINE
☐ BOTTOMLAND
☐ TERRACE
☐ VALLEY SLOPE
☐ TABLELAND
☐ ROLL. UPLAND
☐ CLIFF
☐ TALUS
☐ CREVICE / CAVE
☐ ALVAR
☐ ROCKLAND
☐ BEACH / BAR
☐ SAND DUNE
☐ BLUFF

HISTORY
☑ NATURAL
☐ CULTURAL

PLANT FORM
☐ PLANKTON
☐ SUBMERGED
☐ FLOATING-LVD
☑ GRAMINOID
☐ FORB
☐ LICHEN
☐ BRYOPHYTE
☐ DECIDUOUS
☐ CONIFEROUS
☐ MIXED

COMMUNITY
☐ LAKE
☐ POND
☐ RIVER
☐ STREAM
☑ MARSH
☐ SWAMP
☐ FEN
☐ BOG
☐ BARREN
☐ MEADOW
☐ PRAIRIE
☐ THICKET
☐ SAVANNAH
☐ WOODLAND
☐ FOREST
☐ PLANTATION

SITE
☐ OPEN WATER
☐ SHALLOW WATER
☑ SURFICIAL DEP.
☐ BEDROCK

COVER
☑ OPEN
☐ SHRUB
☐ TREED

STAND DESCRIPTION

LAYER	HT	CVR	SPECIES IN ORDER OF DECREASING DOMINANCE (>> MUCH GREATER THAN; > GREATER THAN; = ABOUT EQUAL TO)
1 CANOPY	3	1	Sal peti
2 SUB-CANOPY			
3 UNDERSTOREY			
4 GRD. LAYER	4	4	phaaru >> onosens lysthyr

HT CODES: 1 = >25 m 2 = 10<HT≤25 m 3 = 2<HT≤10 m 4 = 1<HT≤2 m 5 = 0.5<HT≤1 m 6 = 0.2<HT≤0.5 m 7 = HT<0.2 m
CVR CODES 0 = NONE 1 = 0% < CVR ≤ 10% 2 = 10 < CVR ≤ 25% 3 = 25 < CVR ≤ 60% 4 = CVR > 60%

STAND COMPOSITION:				BA:	
SIZE CLASS ANALYSIS:		< 10	10 - 24	25 - 50	> 50
STANDING SNAGS:		< 10	10 - 24	25 - 50	> 50
DEADFALL / LOGS:		< 10	10 - 24	25 - 50	> 50

ABUNDANCE CODES: N = NONE R = RARE O = OCCASIONAL A = ABUNDANT

COMM. AGE	PIONEER	YOUNG	MID-AGE	MATURE	OLD GROWTH

SOIL ANALYSIS:

TEXTURE:	DEPTH TO MOTTLES / GLEY	g =	G=
MOISTURE:	DEPTH OF ORGANICS:		(cm)
HOMOGENEOUS / VARIABLE	DEPTH TO BEDROCK:		(cm)

COMMUNITYCLASSIFICATION:

COMMUNITY CLASS: Marsh	CODE: MA
COMMUNITY SERIES: Shallow Marsh	CODE: MAS3
ECOSITE: Organic Shallow Marsh	CODE: MAS3
VEGETATION TYPE: Reed Canary Organic Shallow Marsh	CODE: MAS3
INCLUSION	CODE:
COMPLEX	CODE:

Notes:

ELC
PLANT SPECIES LIST

SITE:
POLYGON:
DATE:
SURVEYOR(S):

LAYERS: 1 = CANOPY > 10m 2 = SUB-CANOPY 3 = UNDERSTOREY 4 = GROUND (GRD.) LAYER
ABUNDANCE CODES: R = RARE O = OCCASIONAL A = ABUNDANT D = DOMINANT

SPECIES CODE	LAYER 1	2	3	4	COLL.
Salpeti	R				

SPECIES CODE	LAYER 1	2	3	4	COLL.
phaaru				D	
soldale				O	
lysnuh (Cattail)				O	
onosens				O	
scirpus				O	
irivers				R	
lysalu				O	
elyglau				O	
juneff				R	
lemnbio				R	
siusauv				R	
aplam				O	
ascinca				R	
menarve				R	
polpun				R	

green frog

ELC
COMMUNITY DESCRIPTION & CLASSIFICATION

SITE Gordon 2162		POLYGON 5	
SURVEYOR(S)	DATE 28 Jun 17		UTME
START	END	UTMZ	UTMN

POLYGON DESCRIPTION

SYSTEM	SUBSTRATE	TOPOGRAPHIC FEATURE	HISTORY	PLANT FORM	COMMUNITY
☑ TERRESTRIAL ☐ WETLAND ☐ AQUATIC	☐ ORGANIC ☑ MINERAL SOIL ☐ PARENT MIN ☐ ACIDIC BEDRK ☐ BASIC BEDRK ☐ CARB. BEDRK	☐ LACUSTRINE ☐ RIVERINE ☐ BOTTOMLAND ☐ TERRACE ☐ VALLEY SLOPE ☐ TABLELAND ☐ ROLL. UPLAND ☐ CLIFF ☐ TALUS ☐ CREVICE / CAVE ☐ ALVAR ☐ ROCKLAND ☐ BEACH / BAR ☐ SAND DUNE ☐ BLUFF	☐ NATURAL ☑ CULTURAL	☐ PLANKTON ☐ SUBMERGED ☐ FLOATING-LVD ☐ GRAMINOID ☐ FORB ☐ LICHEN ☐ BRYOPHYTE ☐ DECIDUOUS ☑ CONIFEROUS ☐ MIXED	☐ LAKE ☐ POND ☐ RIVER ☐ STREAM ☐ MARSH ☐ SWAMP ☐ FEN ☐ BOG ☐ BARREN ☐ MEADOW ☐ PRAIRIE ☐ THICKET ☐ SAVANNAH ☐ WOODLAND ☐ FOREST ☑ PLANTATION
SITE			**COVER**		
☐ OPEN WATER ☐ SHALLOW WATER ☑ SURFICIAL DEP. ☐ BEDROCK			☐ OPEN ☐ SHRUB ☑ TREED		

STAND DESCRIPTION:

	LAYER	HT	CVR	SPECIES IN ORDER OF DECREASING DOMINANCE (>> MUCH GREATER THAN; > GREATER THAN; = ABOUT EQUAL TO)
1	CANOPY	2	4	Pinstro >> Junvirg
2	SUB-CANOPY	3	1	Fraame Acesacc Tsucan
3	UNDERSTOREY	4	3	Fraame Lontata
4	GRD. LAYER	5	1	grasses Taroffi Fraame hier.

HT CODES: 1 = >25 m 2 = 10<HT 25 m 3 = 2<HT 10 m 4 = 1<HT 2 m 5 = 0.5<HT 1 m 6 = 0.2<HT 0.5 m 7 = HT<0.2 m

CVR CODES 0= NONE 1= 0% < CVR 10% 2= 10 < CVR 25% 3= 25 < CVR 60% 4= CVR > 60%

STAND COMPOSITION:							BA:	
SIZE CLASS ANALYSIS:	O	< 10	A	10 - 24	A	25 - 50	R	> 50
STANDING SNAGS:	R	< 10	R	10 - 24	R	25 - 50	N	> 50
DEADFALL / LOGS:	O	< 10	O	10 - 24	R	25 - 50	N	> 50

ABUNDANCE CODES: N = NONE R = RARE O = OCCASIONAL A = ABUNDANT

COMM. AGE		PIONEER		YOUNG	✓	MID-AGE		MATURE		OLD GROWTH

SOIL ANALYSIS:

TEXTURE:	DEPTH TO MOTTLES / GLEY	g =	G=
MOISTURE:	DEPTH OF ORGANICS:		(cm)
HOMOGENEOUS / VARIABLE	DEPTH TO BEDROCK:		(cm)

COMMUNITYCLASSIFICATION:

COMMUNITY CLASS: Cultural	CODE: CU
COMMUNITY SERIES: Cultural Plantation	CODE: CUP
ECOSITE: Coniferous Plantation	CODE: CUP3
VEGETATION TYPE: White Pine Coniferous Plantation	CODE: CUP3-2
INCLUSION	CODE:
COMPLEX	CODE:

Notes:

ELC
PLANT SPECIES LIST

SITE:

POLYGON:

DATE:

SURVEYOR(S):

LAYERS: 1 = CANOPY > 10m 2 = SUB-CANOPY 3 = UNDERSTOREY 4 = GROUND (GRD.) LAYER

ABUNDANCE CODES: R = RARE O = OCCASIONAL A = ABUNDANT D = DOMINANT

SPECIES CODE	LAYER 1	2	3	4	COLL.	SPECIES CODE	LAYER 1	2	3	4	COLL.
Pinstro	D					corpedu					
junvirg	R					hier.					
Acesacc		R				taroffi					
Tsucan		R				allpeti					
						pruvulg					
						carpens					
						dacglom					
						solalti					
						onpilel					
						solcana					
						[illegible]					
						veroffi					
						aquvulg					
						geuurba					
lontata			O								
rhafran			R								
fraame		R	A	D							

ELC COMMUNITY DESCRIPTION & CLASSIFICATION	SITE 2162 Gordon		POLYGON: 16	
	SURVEYOR(S) DW	DATE 28 Jun 17		UTME
	START	END	UTMZ	UTMN

POLYGON DESCRIPTION

SYSTEM	SUBSTRATE	TOPOGRAPHIC FEATURE	HISTORY	PLANT FORM	COMMUNITY
☑ TERRESTRIAL ☐ WETLAND ☐ AQUATIC	☐ ORGANIC ☑ MINERAL SOIL ☐ PARENT MIN ☐ ACIDIC BEDRK ☐ BASIC BEDRK ☐ CARB. BEDRK	☐ LACUSTRINE ☐ RIVERINE ☐ BOTTOMLAND ☐ TERRACE ☐ VALLEY SLOPE ☐ TABLELAND ☐ ROLL. UPLAND ☐ CLIFF ☐ TALUS ☐ CREVICE / CAVE ☐ ALVAR ☐ ROCKLAND ☐ BEACH / BAR ☐ SAND DUNE ☐ BLUFF	☑ NATURAL ☐ CULTURAL	☐ PLANKTON ☐ SUBMERGED ☐ FLOATING-LVD ☐ GRAMINOID ☐ FORB ☐ LICHEN ☐ BRYOPHYTE ☑ DECIDUOUS ☐ CONIFEROUS ☐ MIXED	☐ LAKE ☐ POND ☐ RIVER ☐ STREAM ☐ MARSH ☐ SWAMP ☐ FEN ☐ BOG ☐ BARREN ☐ MEADOW ☐ PRAIRIE ☐ THICKET ☐ SAVANNAH ☐ WOODLAND ☑ FOREST ☐ PLANTATION
SITE			**COVER**		
☐ OPEN WATER ☐ SHALLOW WATER ☑ SURFICIAL DEP. ☐ BEDROCK			☐ OPEN ☐ SHRUB ☑ TREED		

STAND DESCRIPTION

	LAYER	HT	CVR	SPECIES IN ORDER OF DECREASING DOMINANCE (>> MUCH GREATER THAN; > GREATER THAN; = ABOUT EQUAL TO)
1	CANOPY	1	1	Acesasa Pinstro
2	SUB-CANOPY	3	4	Acesasa fraame prusero Ulame
3	UNDERSTOREY	4	3	fraame rhacath lontat!
4	GRD. LAYER	5	4	grasses parinse cirlute geucana

HT CODES: 1 = >25 m 2 = 10<HT 25 m 3 = 2<HT 10 m 4 = 1<HT 2 m 5 = 0.5<HT 1 m 6 = 0.2<HT 0.5 m 7 = HT<0.2 m

CVR CODES 0 = NONE 1 = 0% < CVR 10% 2 = 10 < CVR 25% 3 = 25 < CVR 60% 4 = CVR > 60%

STAND COMPOSITION:							BA:	
SIZE CLASS ANALYSIS:	A	< 10	A	10 - 24	O	25 - 50	R	> 50
STANDING SNAGS:	R	< 10	R	10 - 24	N	25 - 50	N	> 50
DEADFALL / LOGS:	O	< 10	R	10 - 24	R	25 - 50	N	> 50

ABUNDANCE CODES: N = NONE R = RARE O = OCCASIONAL A = ABUNDANT

COMM. AGE		PIONEER	✓	YOUNG		MID-AGE		MATURE		OLD GROWTH

SOIL ANALYSIS:

TEXTURE:	DEPTH TO MOTTLES / GLEY	g =	G=
MOISTURE:	DEPTH OF ORGANICS:		(cm)
HOMOGENEOUS / VARIABLE	DEPTH TO BEDROCK:		(cm)

COMMUNITYCLASSIFICATION:

COMMUNITY CLASS:	CODE:
COMMUNITY SERIES:	CODE:
ECOSITE:	CODE:
VEGETATION TYPE:	CODE:
INCLUSION	CODE:
COMPLEX	CODE:

Notes:

ELC PLANT SPECIES LIST	SITE:
	POLYGON:
	DATE:
	SURVEYOR(S):

LAYERS: 1 = CANOPY > 10m 2 = SUB-CANOPY 3 = UNDERSTOREY 4 = GROUND (GRD.) LAYER

ABUNDANCE CODES: R = RARE O = OCCASIONAL A = ABUNDANT D = DOMINANT

SPECIES CODE	LAYER 1	LAYER 2	LAYER 3	LAYER 4	COLL.	SPECIES CODE	LAYER 1	LAYER 2	LAYER 3	LAYER 4	COLL.
Acesasa						dacglo					
fraame						[illegible]					
Juvirg						solalti					
Ostvirg						carebru					
Ulame						rosmult					
Prusen						clevirg					
Pinstro						solflex					
						parinse					
						geucana					
						veroffi					
						cirlute					
						gerrobe					
						[illegible]					
						Sancana					
lg											
rhacath											
fraame											

ELC
COMMUNITY DESCRIPTION & CLASSIFICATION

SITE: 2162 Gordon		POLYGON: 17	
SURVEYOR(S): DW	DATE: 28 Jun 17		UTME
START	END	UTMZ	UTMN

POLYGON DESCRIPTION

SYSTEM
- ☑ TERRESTRIAL
- ☐ WETLAND
- ☐ AQUATIC

SITE
- ☐ OPEN WATER
- ☐ SHALLOW WATER
- ☑ SURFICIAL DEP.
- ☐ BEDROCK

SUBSTRATE
- ☐ ORGANIC
- ☑ MINERAL SOIL
- ☐ PARENT MIN
- ☐ ACIDIC BEDRK
- ☐ BASIC BEDRK
- ☐ CARB. BEDRK

TOPOGRAPHIC FEATURE
- ☐ LACUSTRINE
- ☐ RIVERINE
- ☐ BOTTOMLAND
- ☐ TERRACE
- ☐ VALLEY SLOPE
- ☐ TABLELAND
- ☐ ROLL. UPLAND
- ☐ CLIFF
- ☐ TALUS
- ☐ CREVICE / CAVE
- ☐ ALVAR
- ☐ ROCKLAND
- ☐ BEACH / BAR
- ☐ SAND DUNE
- ☐ BLUFF

HISTORY
- ☐ NATURAL
- ☑ CULTURAL

COVER
- ☑ OPEN
- ☐ SHRUB
- ☐ TREED

PLANT FORM
- ☐ PLANKTON
- ☐ SUBMERGED
- ☐ FLOATING-LVD
- ☑ GRAMINOID
- ☐ FORB
- ☐ LICHEN
- ☐ BRYOPHYTE
- ☐ DECIDUOUS
- ☐ CONIFEROUS
- ☐ MIXED

COMMUNITY
- ☐ LAKE
- ☐ POND
- ☐ RIVER
- ☐ STREAM
- ☐ MARSH
- ☐ SWAMP
- ☐ FEN
- ☐ BOG
- ☐ BARREN
- ☑ MEADOW
- ☐ PRAIRIE
- ☐ THICKET
- ☐ SAVANNAH
- ☐ WOODLAND
- ☐ FOREST
- ☐ PLANTATION

STAND DESCRIPTION:

	LAYER	HT	CVR	SPECIES IN ORDER OF DECREASING DOMINANCE (>> MUCH GREATER THAN; > GREATER THAN; = ABOUT EQUAL TO)
1	CANOPY	3	2	Fraamer Pinsylv Malus
2	SUB-CANOPY			
3	UNDERSTOREY	4	2	Fraamer lontata Pinsylv
4	GRD. LAYER	5	4	grasses solalti lotcorn chrleuc

HT CODES: 1 = >25 m 2 = 10<HT<25 m 3 = 2<HT<10 m 4 = 1<HT≤2 m 5 = 0.5<HT<1 m 6 = 0.2<HT<0.5 m 7 = HT<0.2 m

CVR CODES 0= NONE 1= 0% < CVR < 10% 2= 10 < CVR < 25% 3= 25 < CVR < 60% 4= CVR > 60%

STAND COMPOSITION:	BA:

SIZE CLASS ANALYSIS:		< 10		10 - 24		25 - 50		> 50
STANDING SNAGS:		< 10		10 - 24		25 - 50		> 50
DEADFALL / LOGS:		< 10		10 - 24		25 - 50		> 50

ABUNDANCE CODES: N = NONE R = RARE O = OCCASIONAL A = ABUNDANT

COMM. AGE .		PIONEER		YOUNG		MID-AGE		MATURE		OLD GROWTH

SOIL ANALYSIS:

TEXTURE:	DEPTH TO MOTTLES / GLEY	g =	G=
MOISTURE:	DEPTH OF ORGANICS:		(cm)
HOMOGENEOUS / VARIABLE	DEPTH TO BEDROCK:		(cm)

COMMUNITYCLASSIFICATION:

COMMUNITY CLASS: Cultural	CODE: CU
COMMUNITY SERIES: Cultural Meadow	CODE: CUM
ECOSITE: Mineral Cultural Meadow	CODE: CUM1
VEGETATION TYPE: Dry-Moist Old Field Meadow	CODE: CUM1-1
☐ INCLUSION	CODE:
☐ COMPLEX	CODE:

Notes:

ELC
PLANT SPECIES LIST

SITE:

POLYGON:

DATE:

SURVEYOR(S):

LAYERS: 1 = CANOPY > 10m 2 = SUB-CANOPY 3 = UNDERSTOREY 4 = GROUND (GRD.) LAYER

ABUNDANCE CODES: R = RARE O = OCCASIONAL A = ABUNDANT D = DOMINANT

SPECIES CODE	LAYER 1	2	3	4	COLL.
Pinsylv	O				
Fraamer	O				
Malus	R				
lontata			O		
Fraamer			O		
Pinsylv			O		

SPECIES CODE	LAYER 1	2	3	4	COLL.
bromin					
potrect					
lotcorn					
echvulg					
chrleuc					
hypperf					
solalti					
hier sp					
phlprat					
viccrac					

ELC COMMUNITY DESCRIPTION & CLASSIFICATION	SITE: 2162 Gordon		POLYGON: 18
	SURVEYOR(S): DW.	DATE: Jun 28 17	UTME
	START	END	UTMZ	UTMN:

POLYGON DESCRIPTION

SYSTEM	SUBSTRATE	TOPOGRAPHIC FEATURE	HISTORY	PLANT FORM	COMMUNITY
☑ TERRESTRIAL ☐ WETLAND ☐ AQUATIC	☐ ORGANIC ☑ MINERAL SOIL ☐ PARENT MIN ☐ ACIDIC BEDRK ☐ BASIC BEDRK ☐ CARB. BEDRK	☐ LACUSTRINE ☐ RIVERINE ☐ BOTTOMLAND ☐ TERRACE ☐ VALLEY SLOPE ☐ TABLELAND ☐ ROLL. UPLAND ☐ CLIFF ☐ TALUS ☐ CREVICE / CAVE ☐ ALVAR ☐ ROCKLAND ☐ BEACH / BAR ☐ SAND DUNE ☐ BLUFF	☐ NATURAL ☑ CULTURAL	☐ PLANKTON ☐ SUBMERGED ☐ FLOATING-LVD ☐ GRAMINOID ☐ FORB ☐ LICHEN ☐ BRYOPHYTE ☑ DECIDUOUS ☐ CONIFEROUS ☐ MIXED	☐ LAKE ☐ POND ☐ RIVER ☐ STREAM ☐ MARSH ☐ SWAMP ☐ FEN ☐ BOG ☐ BARREN ☐ MEADOW ☐ PRAIRIE ☑ THICKET ☐ SAVANNAH ☐ WOODLAND ☐ FOREST ☐ PLANTATION
SITE			**COVER**		
☐ OPEN WATER ☐ SHALLOW WATER ☑ SURFICIAL DEP. ☐ BEDROCK			☐ OPEN ☑ SHRUB ☐ TREED		

STAND DESCRIPTION:

	LAYER	HT	CVR	SPECIES IN ORDER OF DECREASING DOMINANCE (>> MUCH GREATER THAN; > GREATER THAN; = ABOUT EQUAL TO)
1	CANOPY	2	2	fraamer pruserb
2	SUB-CANOPY	3	4	lontata rhacath fraamer syrvulg
3	UNDERSTOREY	4	3	lontata rhacath
4	GRD. LAYER	5	3	parinse geucana cirlute solalti

HT CODES: 1 = >25 m 2 = 10<HT 25 m 3 = 2<HT 10 m 4 = 1<HT≤2 m 5 = 0.5<HT 1 m 6 = 0.2<HT 0.5 m 7 = HT<0.2 m

CVR CODES 0= NONE 1= 0% < CVR ≤ 10% 2= 10 < CVR ≤ 25% 3= 25 < CVR ≤ 60% 4= CVR > 60%

STAND COMPOSITION:								BA:
SIZE CLASS ANALYSIS:		< 10		10 - 24		25 - 50		> 50
STANDING SNAGS:		< 10		10 - 24		25 - 50		> 50
DEADFALL / LOGS:		< 10		10 - 24		25 - 50		> 50

ABUNDANCE CODES: N = NONE R = RARE O = OCCASIONAL A = ABUNDANT

COMM. AGE .		PIONEER		YOUNG		MID-AGE		MATURE		OLD GROWTH

SOIL ANALYSIS:

TEXTURE:	DEPTH TO MOTTLES / GLEY	g =	G=
MOISTURE:	DEPTH OF ORGANICS:		(cm)
HOMOGENEOUS / VARIABLE	DEPTH TO BEDROCK:		(cm)

COMMUNITYCLASSIFICATION:

COMMUNITY CLASS: Cultural	CODE: CU
COMMUNITY SERIES: Cultural Thicket	CODE: CUT
ECOSITE: Mineral Cultural Thicket	CODE: CUT1
VEGETATION TYPE:	CODE: CUT1
INCLUSION	CODE:
COMPLEX	CODE:

Notes:

ELC PLANT SPECIES LIST	SITE:
	POLYGON:
	DATE:
	SURVEYOR(S):

LAYERS: 1 = CANOPY > 10m 2 = SUB-CANOPY 3 = UNDERSTOREY 4 = GROUND (GRD.) LAYER

ABUNDANCE CODES: R = RARE O = OCCASIONAL A = ABUNDANT D = DOMINANT

SPECIES CODE	LAYER 1	LAYER 2	LAYER 3	LAYER 4	COLL.
fraamer	O	O			
pruserb	O		A		
rhacath		A			
syrvulg		R			
hydarbo		R			
lontata		A	A		
geucana				O	
parinse				O	
geuurba				O	
solalti				O	
cirlute				D	
leocard				D	

ELC COMMUNITY DESCRIPTION & CLASSIFICATION	SITE: 2162 Gordon			POLYGON: 19	
	SURVEYOR(S) DW		DATE 28 Jun 17		UTME
	START	END		UTMZ	UTMN:

POLYGON DESCRIPTION

SYSTEM	SUBSTRATE	TOPOGRAPHIC FEATURE	HISTORY	PLANT FORM	COMMUNITY
☑ TERRESTRIAL ☐ WETLAND ☐ AQUATIC	☐ ORGANIC ☑ MINERAL SOIL ☐ PARENT MIN ☐ ACIDIC BEDRK ☐ BASIC BEDRK ☐ CARB. BEDRK	☐ LACUSTRINE ☐ RIVERINE ☐ BOTTOMLAND ☐ TERRACE ☐ VALLEY SLOPE ☐ TABLELAND ☐ ROLL. UPLAND ☐ CLIFF ☐ TALUS ☐ CREVICE / CAVE ☐ ALVAR ☐ ROCKLAND ☐ BEACH / BAR ☐ SAND DUNE ☐ BLUFF	☐ NATURAL ☑ CULTURAL	☐ PLANKTON ☐ SUBMERGED ☐ FLOATING-LVD ☐ GRAMINOID ☐ FORB ☐ LICHEN ☐ BRYOPHYTE ☑ DECIDUOUS ☐ CONIFEROUS ☐ MIXED	☐ LAKE ☐ POND ☐ RIVER ☐ STREAM ☐ MARSH ☐ SWAMP ☐ FEN ☐ BOG ☐ BARREN ☐ MEADOW ☐ PRAIRIE ☑ THICKET ☐ SAVANNAH ☐ WOODLAND ☐ FOREST ☐ PLANTATION
SITE			**COVER**		
☐ OPEN WATER ☐ SHALLOW WATER ☑ SURFICIAL DEP. ☐ BEDROCK			☐ OPEN ☑ SHRUB ☐ TREED		

STAND DESCRIPTION:

	LAYER	HT	CVR	SPECIES IN ORDER OF DECREASING DOMINANCE (>> MUCH GREATER THAN; ≥ GREATER THAN; = ABOUT EQUAL TO)
1	CANOPY	3	3	lonitata rhacath thuocci fraame
2	SUB-CANOPY			
3	UNDERSTOREY	4	3	lonitata rhacath fraame
4	GRD. LAYER	5	1	grasses ascsyri hier-sp solalti

HT CODES: 1 = >25 m 2 = 10<HT≤25 m 3 = 2<HT≤10 m 4 = 1<HT≤2 m 5 = 0.5<HT≤1 m 6 = 0.2<HT≤0.5 m 7 = HT<0.2 m

CVR CODES 0= NONE 1= 0% < CVR ≤ 10% 2= 10 < CVR ≤ 25% 3= 25 < CVR ≤ 60% 4= CVR > 60%

STAND COMPOSITION:								BA:	
SIZE CLASS ANALYSIS:		< 10		10 - 24		25 - 50		> 50	
STANDING SNAGS:		< 10		10 - 24		25 - 50		> 50	
DEADFALL / LOGS:		< 10		10 - 24		25 - 50		> 50	

ABUNDANCE CODES: N = NONE R = RARE O = OCCASIONAL A = ABUNDANT

COMM. AGE .		PIONEER		YOUNG		MID-AGE		MATURE		OLD GROWTH

SOIL ANALYSIS:

TEXTURE:	DEPTH TO MOTTLES / GLEY	g =	G=
MOISTURE:	DEPTH OF ORGANICS:		(cm)
HOMOGENEOUS / VARIABLE	DEPTH TO BEDROCK:		(cm)

COMMUNITYCLASSIFICATION:

COMMUNITY CLASS:	Cultural	CODE: CU
COMMUNITY SERIES:	Cultural Thicket	CODE: CUT
ECOSITE:	Mineral Cultural Thicket	CODE: CUT1
VEGETATION TYPE:	u	CODE: CUT1
INCLUSION		CODE:
COMPLEX		CODE:

Notes:

ELC PLANT SPECIES LIST	SITE:
	POLYGON:
	DATE:
	SURVEYOR(S):

LAYERS: 1 = CANOPY > 10m 2 = SUB-CANOPY 3 = UNDERSTOREY 4 = GROUND (GRD.) LAYER

ABUNDANCE CODES: R = RARE O = OCCASIONAL A = ABUNDANT D = DOMINANT

SPECIES CODE	LAYER 1	LAYER 2	LAYER 3	LAYER 4	COLL.	SPECIES CODE	LAYER 1	LAYER 2	LAYER 3	LAYER 4	COLL.
lonitata						bromine					
rhacath						dacglom					
fraame						solalti					
thuocci						chrleuc					
						hypperf					
						phlprat					
						poaprat					
						ascsyri					
						hier-sp					

ELC COMMUNITY DESCRIPTION & CLASSIFICATION	SITE: 2162 Gordon		POLYGON: 20	
	SURVEYOR(S): DW		DATE: 28 Jun 17	UTME
	START	END	UTMZ	UTMN:

POLYGON DESCRIPTION

SYSTEM
- ☑ TERRESTRIAL
- ☐ WETLAND
- ☐ AQUATIC

SITE
- ☐ OPEN WATER
- ☐ SHALLOW WATER
- ☑ SURFICIAL DEP.
- ☐ BEDROCK

SUBSTRATE
- ☐ ORGANIC
- ☑ MINERAL SOIL
- ☐ PARENT MIN
- ☐ ACIDIC BEDRK
- ☐ BASIC BEDRK
- ☐ CARB. BEDRK

TOPOGRAPHIC FEATURE
- ☐ LACUSTRINE
- ☐ RIVERINE
- ☐ BOTTOMLAND
- ☐ TERRACE
- ☐ VALLEY SLOPE
- ☐ TABLELAND
- ☐ ROLL. UPLAND
- ☐ CLIFF
- ☐ TALUS
- ☐ CREVICE / CAVE
- ☐ ALVAR
- ☐ ROCKLAND
- ☐ BEACH / BAR
- ☐ SAND DUNE
- ☐ BLUFF

HISTORY
- ☐ NATURAL
- ☑ CULTURAL

COVER
- ☑ OPEN
- ☐ SHRUB
- ☐ TREED

PLANT FORM
- ☐ PLANKTON
- ☐ SUBMERGED
- ☐ FLOATING-LVD
- ☑ GRAMINOID
- ☐ FORB
- ☐ LICHEN
- ☐ BRYOPHYTE
- ☐ DECIDUOUS
- ☐ CONIFEROUS
- ☐ MIXED

COMMUNITY
- ☐ LAKE
- ☐ POND
- ☐ RIVER
- ☐ STREAM
- ☐ MARSH
- ☐ SWAMP
- ☐ FEN
- ☐ BOG
- ☐ BARREN
- ☑ MEADOW
- ☐ PRAIRIE
- ☐ THICKET
- ☐ SAVANNAH
- ☐ WOODLAND
- ☐ FOREST
- ☐ PLANTATION

STAND DESCRIPTION:

LAYER		HT	CVR	SPECIES IN ORDER OF DECREASING DOMINANCE (>> MUCH GREATER THAN; > GREATER THAN; = ABOUT EQUAL TO)
1	CANOPY	3	1	None
2	SUB-CANOPY			
3	UNDERSTOREY	4	1	lontata rhacath
4	GRD. LAYER	5	4	bromin solalti chleuc phlprat

HT CODES: 1 = >25 m 2 = 10<HT<25 m 3 = 2<HT<10 m 4 = 1<HT≤2 m 5 = 0.5<HT<1 m 6 = 0.2<HT<0.5 m 7 = HT<0.2 m

CVR CODES 0 = NONE 1 = 0% < CVR < 10% 2 = 10 < CVR < 25% 3 = 25 < CVR < 60% 4 = CVR > 60%

STAND COMPOSITION:							BA:	
SIZE CLASS ANALYSIS:		< 10		10 - 24		25 - 50		> 50
STANDING SNAGS:		< 10		10 - 24		25 - 50		> 50
DEADFALL / LOGS:		< 10		10 - 24		25 - 50		> 50

ABUNDANCE CODES: N = NONE R = RARE O = OCCASIONAL A = ABUNDANT

COMM. AGE .		PIONEER		YOUNG		MID-AGE		MATURE		OLD GROWTH

SOIL ANALYSIS:

TEXTURE:	DEPTH TO MOTTLES / GLEY	g =	G=
MOISTURE:	DEPTH OF ORGANICS:		(cm)
HOMOGENEOUS / VARIABLE	DEPTH TO BEDROCK:		(cm)

COMMUNITYCLASSIFICATION:

COMMUNITY CLASS:	Cultural	CODE: CU
COMMUNITY SERIES:	Cultural Meadow	CODE: CUM
ECOSITE:	Mineral Cultural Meadow	CODE: CUM1
VEGETATION TYPE:	Dry-Moist Old Field Meadow	CODE: CUM1-1
INCLUSION		CODE:
COMPLEX		CODE:

Notes:

ELC PLANT SPECIES LIST	SITE:
	POLYGON:
	DATE:
	SURVEYOR(S):

LAYERS: 1 = CANOPY > 10m 2 = SUB-CANOPY 3 = UNDERSTOREY 4 = GROUND (GRD.) LAYER

ABUNDANCE CODES: R = RARE O = OCCASIONAL A = ABUNDANT D = DOMINANT

SPECIES CODE	LAYER				COLL.	SPECIES CODE	LAYER				COLL.
	1	2	3	4			1	2	3	4	

ELC COMMUNITY DESCRIPTION & CLASSIFICATION	SITE: 2162 Gordon		POLYGON: 2 1
	SURVEYOR(S): DW	DATE: 28 Jun 17	UTME:
	START:	END:	UTMZ: / UTMN:

POLYGON DESCRIPTION

SYSTEM
- ☑ TERRESTRIAL
- ☐ WETLAND
- ☐ AQUATIC

SUBSTRATE
- ☐ ORGANIC
- ☑ MINERAL SOIL
- ☐ PARENT MIN
- ☐ ACIDIC BEDRK
- ☐ BASIC BEDRK
- ☐ CARB. BEDRK

TOPOGRAPHIC FEATURE
- ☐ LACUSTRINE
- ☐ RIVERINE
- ☐ BOTTOMLAND
- ☐ TERRACE
- ☐ VALLEY SLOPE
- ☐ TABLELAND
- ☐ ROLL. UPLAND
- ☐ CLIFF
- ☐ TALUS
- ☐ CREVICE / CAVE
- ☐ ALVAR
- ☐ ROCKLAND
- ☐ BEACH / BAR
- ☐ SAND DUNE
- ☐ BLUFF

HISTORY
- ☐ NATURAL
- ☑ CULTURAL

PLANT FORM
- ☐ PLANKTON
- ☐ SUBMERGED
- ☐ FLOATING-LVD
- ☐ GRAMINOID
- ☐ FORB
- ☐ LICHEN
- ☐ BRYOPHYTE
- ☑ DECIDUOUS
- ☐ CONIFEROUS
- ☐ MIXED

COMMUNITY
- ☐ LAKE
- ☐ POND
- ☐ RIVER
- ☐ STREAM
- ☐ MARSH
- ☐ SWAMP
- ☐ FEN
- ☐ BOG
- ☐ BARREN
- ☐ MEADOW
- ☐ PRAIRIE
- ☑ THICKET
- ☐ SAVANNAH
- ☐ WOODLAND
- ☐ FOREST
- ☐ PLANTATION

SITE
- ☐ OPEN WATER
- ☐ SHALLOW WATER
- ☑ SURFICIAL DEP.
- ☐ BEDROCK

COVER
- ☐ OPEN
- ☑ SHRUB
- ☐ TREED

STAND DESCRIPTION:

	LAYER	HT	CVR	SPECIES IN ORDER OF DECREASING DOMINANCE (>> MUCH GREATER THAN; > GREATER THAN; ≈ ABOUT EQUAL TO)
1	CANOPY	2	1	Fraxame Prusero Ulmpumi
2	SUB-CANOPY	3	3	Lontata vitripa Malus Rhacath
3	UNDERSTOREY	4	3	Lontata vitripa parinse
4	GRD. LAYER	5	4	grasses solalti vitripa

HT CODES: 1 = >25 m 2 = 10<HT≤25 m 3 = 2<HT≤10 m 4 = 1<HT≤2 m 5 = 0.5<HT≤1 m 6 = 0.2<HT≤0.5 m 7 = HT<0.2 m

CVR CODES: 0= NONE 1= 0% < CVR ≤ 10% 2= 10 < CVR ≤ 25% 3= 25 < CVR ≤ 60% 4= CVR > 60%

STAND COMPOSITION:				BA:
SIZE CLASS ANALYSIS:	< 10	10 - 24	25 - 50	> 50
STANDING SNAGS:	< 10	10 - 24	25 - 50	> 50
DEADFALL / LOGS:	< 10	10 - 24	25 - 50	> 50

ABUNDANCE CODES: N = NONE R = RARE O = OCCASIONAL A = ABUNDANT

COMM. AGE .	PIONEER	YOUNG	MID-AGE	MATURE	OLD GROWTH

SOIL ANALYSIS:

TEXTURE:	DEPTH TO MOTTLES / GLEY	g =	G=
MOISTURE:	DEPTH OF ORGANICS:		(cm)
HOMOGENEOUS / VARIABLE	DEPTH TO BEDROCK:		(cm)

COMMUNITYCLASSIFICATION:

COMMUNITY CLASS: Cultural	CODE:	CU
COMMUNITY SERIES: Cultural Thicket	CODE:	CUT
ECOSITE: Mineral Cultural Thicket	CODE:	CUT1
VEGETATION TYPE: "	CODE:	CUT1
INCLUSION	CODE:	
COMPLEX	CODE:	

Notes:

ELC PLANT SPECIES LIST	SITE:
	POLYGON:
	DATE:
	SURVEYOR(S):

LAYERS: 1 = CANOPY > 10m 2 = SUB-CANOPY 3 = UNDERSTOREY 4 = GROUND (GRD.) LAYER

ABUNDANCE CODES: R = RARE O = OCCASIONAL A = ABUNDANT D = DOMINANT

SPECIES CODE	LAYER 1	LAYER 2	LAYER 3	LAYER 4	COLL.
Fraxame	R				
Prusero	R				
Ulmpumi	R				
Malus		O			
Lmorri		R			
Lontata		A	A		
Rhacath		O			
Moralba		R			
Malpum		R			
parinse			O		
vitripa		A	A		

SPECIES CODE	LAYER 1	LAYER 2	LAYER 3	LAYER 4	COLL.
brominer					
agocana					
solalti					
Chrleuc					
medlupu					
viccrac					
parinse					
verthap					
potrect					
vitripa					
silenoe					

ELC

COMMUNITY DESCRIPTION & CLASSIFICATION

SITE: 2162 Gordon		POLYGON: 22	
SURVEYOR(S)	DATE 28 Jun 17		UTME
START	END	UTMZ	UTMN:

POLYGON DESCRIPTION

SYSTEM
- ☑ TERRESTRIAL
- ☐ WETLAND
- ☐ AQUATIC

SITE
- ☐ OPEN WATER
- ☐ SHALLOW WATER
- ☑ SURFICIAL DEP.
- ☐ BEDROCK

SUBSTRATE
- ☐ ORGANIC
- ☑ MINERAL SOIL
- ☐ PARENT MIN
- ☐ ACIDIC BEDRK
- ☐ BASIC BEDRK
- ☐ CARB. BEDRK

TOPOGRAPHIC FEATURE
- ☐ LACUSTRINE
- ☐ RIVERINE
- ☐ BOTTOMLAND
- ☐ TERRACE
- ☐ VALLEY SLOPE
- ☐ TABLELAND
- ☐ ROLL. UPLAND
- ☐ CLIFF
- ☐ TALUS
- ☐ CREVICE / CAVE
- ☐ ALVAR
- ☐ ROCKLAND
- ☐ BEACH / BAR
- ☐ SAND DUNE
- ☐ BLUFF

HISTORY
- ☑ NATURAL
- ☐ CULTURAL

COVER
- ☐ OPEN
- ☐ SHRUB
- ☑ TREED

PLANT FORM
- ☐ PLANKTON
- ☐ SUBMERGED
- ☐ FLOATING-LVD
- ☐ GRAMINOID
- ☐ FORB
- ☐ LICHEN
- ☐ BRYOPHYTE
- ☑ DECIDUOUS
- ☐ CONIFEROUS
- ☐ MIXED

COMMUNITY
- ☐ LAKE
- ☐ POND
- ☐ RIVER
- ☐ STREAM
- ☐ MARSH
- ☐ SWAMP
- ☐ FEN
- ☐ BOG
- ☐ BARREN
- ☐ MEADOW
- ☐ PRAIRIE
- ☐ THICKET
- ☐ SAVANNAH
- ☐ WOODLAND
- ☑ FOREST
- ☐ PLANTATION

STAND DESCRIPTION:

LAYER		HT	CVR	SPECIES IN ORDER OF DECREASING DOMINANCE (>> MUCH GREATER THAN; > GREATER THAN; ≈ ABOUT EQUAL TO)
1	CANOPY	2	4	Acesasa Prusero Fraamer Thuocci
2	SUB-CANOPY	3	2	Acesasa Prusero Thuocci Tilamer
3	UNDERSTOREY	4	3	pruvirg lontata rhacath
4	GRD. LAYER	5	2	geucana cirlute fravirg equarve

HT CODES: 1 = >25 m 2 = 10<HT≤25 m 3 = 2<HT≤10 m 4 = 1<HT≤2 m 5 = 0.5<HT≤1 m 6 = 0.2<HT≤0.5 m 7 = HT<0.2 m

CVR CODES 0= NONE 1= 0% < CVR ≤ 10% 2= 10 < CVR ≤ 25% 3= 25 < CVR ≤ 60% 4= CVR > 60%

STAND COMPOSITION:					BA:

SIZE CLASS ANALYSIS:	A < 10	A 10 - 24	O 25 - 50	R > 50
STANDING SNAGS:	R < 10	R 10 - 24	N 25 - 50	N > 50
DEADFALL / LOGS:	O < 10	R 10 - 24	R 25 - 50	N > 50

ABUNDANCE CODES: N = NONE R = RARE O = OCCASIONAL A = ABUNDANT

COMM. AGE .	PIONEER	YOUNG	✓ MID-AGE	MATURE	OLD GROWTH

SOIL ANALYSIS:

TEXTURE:	DEPTH TO MOTTLES / GLEY	g =	G=
MOISTURE:	DEPTH OF ORGANICS:		(cm)
HOMOGENEOUS / VARIABLE	DEPTH TO BEDROCK:		(cm)

COMMUNITYCLASSIFICATION:

COMMUNITY CLASS:	Forest	CODE: FO
COMMUNITY SERIES:	Deciduous Forest	CODE: FOD
ECOSITE:	Dry-Fresh Sugar Maple DF	CODE: FOD5
VEGETATION TYPE:	"	CODE: FOD5-1
INCLUSION		CODE:
COMPLEX		CODE:

Notes:

ELC

PLANT SPECIES LIST

SITE:	
POLYGON:	
DATE:	
SURVEYOR(S):	

LAYERS: 1 = CANOPY > 10m 2 = SUB-CANOPY 3 = UNDERSTOREY 4 = GROUND (GRD.) LAYER

ABUNDANCE CODES: R = RARE O = OCCASIONAL A = ABUNDANT D = DOMINANT

SPECIES CODE	LAYER 1	LAYER 2	LAYER 3	LAYER 4	COLL.
Acesasa	A	O			
Prusero	R	O			
Fraamer	R				
Thuocci	R	R			
Tilamer	'	R			
rhacath			O		
lontata			O		
pruvirg			A		

SPECIES CODE	LAYER 1	LAYER 2	LAYER 3	LAYER 4	COLL.
geucana				O	
taroffi				O	
cirlute				O	
parinse				O	
solalti				O	
oryphil				O	
fravirg				O	
equarve				O	

ELC COMMUNITY DESCRIPTION & CLASSIFICATION	SITE: 2162 Gordon		POLYGON: 23	
	SURVEYOR(S) DW	DATE 28 Jun 17		UTME
	START	END	UTMZ	UTMN:

POLYGON DESCRIPTION

SYSTEM	SUBSTRATE	TOPOGRAPHIC FEATURE	HISTORY	PLANT FORM	COMMUNITY
☐ TERRESTRIAL ☑ WETLAND ☐ AQUATIC	☑ ORGANIC ☐ MINERAL SOIL ☐ PARENT MIN ☐ ACIDIC BEDRK ☐ BASIC BEDRK ☐ CARB. BEDRK	☐ LACUSTRINE ☐ RIVERINE ☐ BOTTOMLAND ☐ TERRACE ☐ VALLEY SLOPE ☐ TABLELAND ☐ ROLL. UPLAND ☐ CLIFF ☐ TALUS ☐ CREVICE / CAVE ☐ ALVAR ☐ ROCKLAND ☐ BEACH / BAR ☐ SAND DUNE ☐ BLUFF	☑ NATURAL ☐ CULTURAL	☐ PLANKTON ☐ SUBMERGED ☐ FLOATING-LVD ☑ GRAMINOID ☐ FORB ☐ LICHEN ☐ BRYOPHYTE ☐ DECIDUOUS ☐ CONIFEROUS ☐ MIXED	☐ LAKE ☐ POND ☐ RIVER ☐ STREAM ☑ MARSH ☐ SWAMP ☐ FEN ☐ BOG ☐ BARREN ☐ MEADOW ☐ PRAIRIE ☐ THICKET ☐ SAVANNAH ☐ WOODLAND ☐ FOREST ☐ PLANTATION
SITE			**COVER**		
☐ OPEN WATER ☑ SHALLOW WATER ☐ SURFICIAL DEP. ☐ BEDROCK			☑ OPEN ☐ SHRUB ☐ TREED		

STAND DESCRIPTION:

	LAYER	HT	CVR	SPECIES IN ORDER OF DECREASING DOMINANCE (>> MUCH GREATER THAN; > GREATER THAN; = ABOUT EQUAL TO)
1	CANOPY			
2	SUB-CANOPY			
3	UNDERSTOREY			
4	GRD. LAYER	4	4	typlati soldulc car-spp lysthyr

HT CODES: 1 = >25 m 2 = 10<HT≤25 m 3 = 2<HT≤10 m 4 = 1<HT≤2 m 5 = 0.5<HT≤1 m 6 = 0.2<HT≤0.5 m 7 = HT<0.2 m

CVR CODES 0= NONE 1= 0% < CVR ≤ 10% 2= 10 < CVR ≤ 25% 3= 25 < CVR ≤ 60% 4= CVR > 60%

STAND COMPOSITION:							BA:	
SIZE CLASS ANALYSIS:		< 10		10 - 24		25 - 50		> 50
STANDING SNAGS:		< 10		10 - 24		25 - 50		> 50
DEADFALL / LOGS:		< 10		10 - 24		25 - 50		> 50

ABUNDANCE CODES: N = NONE R = RARE O = OCCASIONAL A = ABUNDANT

COMM. AGE		PIONEER		YOUNG		MID-AGE		MATURE	OLD GROWTH

SOIL ANALYSIS:

TEXTURE:	DEPTH TO MOTTLES / GLEY	g =	G=
MOISTURE:	DEPTH OF ORGANICS:		(cm)
HOMOGENEOUS / VARIABLE	DEPTH TO BEDROCK:		(cm)

COMMUNITY CLASSIFICATION:

COMMUNITY CLASS:	Marsh	CODE: MA
COMMUNITY SERIES:	Shallow Marsh	CODE: MAS
ECOSITE:	Organic Shallow Marsh	CODE: MAS3
VEGETATION TYPE:	Cattail Organic Shallow Marsh	CODE: MAS3 1
INCLUSION		CODE:
COMPLEX		CODE:

Notes:

ELC PLANT SPECIES LIST	
	SITE:
	POLYGON:
	DATE:
	SURVEYOR(S):

LAYERS: 1 = CANOPY > 10m 2 = SUB-CANOPY 3 = UNDERSTOREY 4 = GROUND (GRD.) LAYER

ABUNDANCE CODES: R = RARE O = OCCASIONAL A = ABUNDANT D = DOMINANT

SPECIES CODE	LAYER 1	LAYER 2	LAYER 3	LAYER 4	COLL.

SPECIES CODE	LAYER 1	LAYER 2	LAYER 3	LAYER 4	COLL.
siusuav					
impcape					
sagilati					
typlati					
carstipa					
phaarun					
leeoryz					
ranacri					
equifluv					
cicbulb					
glygrand					
aliplan					
ascinca					
onosens					
galpalu					
conlacu					

ELC
COMMUNITY DESCRIPTION & CLASSIFICATION

SITE: 2162 Gordon		POLYGON: 24	
SURVEYOR(S) DW	DATE 28 Jun 17		UTME
START	END	UTMZ	UTMN:

POLYGON DESCRIPTION

SYSTEM
- ☑ TERRESTRIAL
- ☐ WETLAND
- ☐ AQUATIC

SITE
- ☐ OPEN WATER
- ☐ SHALLOW WATER
- ☑ SURFICIAL DEP.
- ☐ BEDROCK

SUBSTRATE
- ☐ ORGANIC
- ☑ MINERAL SOIL
- ☐ PARENT MIN
- ☐ ACIDIC BEDRK
- ☐ BASIC BEDRK
- ☐ CARB. BEDRK

TOPOGRAPHIC FEATURE
- ☐ LACUSTRINE
- ☐ RIVERINE
- ☐ BOTTOMLAND
- ☐ TERRACE
- ☐ VALLEY SLOPE
- ☐ TABLELAND
- ☐ ROLL. UPLAND
- ☐ CLIFF
- ☐ TALUS
- ☐ CREVICE / CAVE
- ☐ ALVAR
- ☐ ROCKLAND
- ☐ BEACH / BAR
- ☐ SAND DUNE
- ☐ BLUFF

HISTORY
- ☐ NATURAL
- ☑ CULTURAL

COVER
- ☐ OPEN
- ☐ SHRUB
- ☑ TREED

PLANT FORM
- ☐ PLANKTON
- ☐ SUBMERGED
- ☐ FLOATING-LVD
- ☐ GRAMINOID
- ☐ FORB
- ☐ LICHEN
- ☐ BRYOPHYTE
- ☐ DECIDUOUS
- ☑ CONIFEROUS
- ☐ MIXED

COMMUNITY
- ☐ LAKE
- ☐ POND
- ☐ RIVER
- ☐ STREAM
- ☐ MARSH
- ☐ SWAMP
- ☐ FEN
- ☐ BOG
- ☐ BARREN
- ☐ MEADOW
- ☐ PRAIRIE
- ☐ THICKET
- ☐ SAVANNAH
- ☐ WOODLAND
- ☐ FOREST
- ☑ PLANTATION

STAND DESCRIPTION:

LAYER		HT	CVR	SPECIES IN ORDER OF DECREASING DOMINANCE (>> MUCH GREATER THAN; > GREATER THAN; = ABOUT EQUAL TO)
1	CANOPY	2	4	Picabie Thuocci Tsucana Pinstro
2	SUB-CANOPY	3	2	Thuocci
3	UNDERSTOREY	4	2	prunvirg rhacath cornalte
4	GRD. LAYER	5	1	Taroffi parinse cirlute arclapp

HT CODES: 1 = >25 m 2 = 10<HT≤25 m 3 = 2<HT≤10 m 4 = 1<HT≤2 m 5 = 0.5<HT≤1 m 6 = 0.2<HT≤0.5 m 7 = HT<0.2 m

CVR CODES 0= NONE 1= 0% < CVR ≤ 10% 2= 10 < CVR ≤ 25% 3= 25 < CVR ≤ 60% 4= CVR > 60%

STAND COMPOSITION:	BA:

SIZE CLASS ANALYSIS:	O	< 10	A	10 - 24	A	25 - 50	R	> 50
STANDING SNAGS:	R	< 10	R	10 - 24	R	25 - 50	N	> 50
DEADFALL / LOGS:	O	< 10	R	10 - 24	R	25 - 50	N	> 50

ABUNDANCE CODES: N = NONE R = RARE O = OCCASIONAL A = ABUNDANT

COMM. AGE .		PIONEER		YOUNG	✓	MID-AGE		MATURE		OLD GROWTH

SOIL ANALYSIS:

TEXTURE:	DEPTH TO MOTTLES / GLEY	g =	G=
MOISTURE:	DEPTH OF ORGANICS:		(cm)
HOMOGENEOUS / VARIABLE	DEPTH TO BEDROCK:		(cm)

COMMUNITYCLASSIFICATION:

COMMUNITY CLASS: Cultural	CODE: CU
COMMUNITY SERIES: Cultural Plantation	CODE: CUP
ECOSITE: Conifer Plantation	CODE: CUP3
VEGETATION TYPE: Norway Spruce Coniferous Plantation	CODE: CUP3
INCLUSION	CODE:
COMPLEX	CODE:

Notes:

ELC
PLANT SPECIES LIST

SITE:
POLYGON:
DATE:
SURVEYOR(S):

LAYERS: 1 = CANOPY > 10m 2 = SUB-CANOPY 3 = UNDERSTOREY 4 = GROUND (GRD.) LAYER

ABUNDANCE CODES: R = RARE O = OCCASIONAL A = ABUNDANT D = DOMINANT

SPECIES CODE	LAYER 1	2	3	4	COLL.
Picabie	A				
Juglcine	R				
Thuocci	O	O			
Tsucana	O				
Pinstro	R				
Acesasa	R				
Salalba	R				
rhacath			O		
prunvirg			O		
cornalte			R		
Prusero			R		

SPECIES CODE	LAYER 1	2	3	4	COLL.
Taroffi				R	
Daucaro				R	
Cirlute				R	
arclapp				R	
Solalti				R	
epihell				R	
gerrobe				R	

ELC COMMUNITY DESCRIPTION & CLASSIFICATION	SITE: 2162 Gordon		POLYGON: 25	
	SURVEYOR(S) DW	DATE 28 Jul 17		UTME
	START	END	UTMZ	UTMN

POLYGON DESCRIPTION

SYSTEM	SUBSTRATE	TOPOGRAPHIC FEATURE	HISTORY	PLANT FORM	COMMUNITY
☐ TERRESTRIAL ☑ WETLAND ☐ AQUATIC	☑ ORGANIC ☐ MINERAL SOIL ☐ PARENT MIN ☐ ACIDIC BEDRK ☐ BASIC BEDRK ☐ CARB. BEDRK	☐ LACUSTRINE ☐ RIVERINE ☐ BOTTOMLAND ☐ TERRACE ☐ VALLEY SLOPE ☐ TABLELAND ☐ ROLL. UPLAND ☐ CLIFF ☐ TALUS ☐ CREVICE / CAVE ☐ ALVAR ☐ ROCKLAND ☐ BEACH / BAR ☐ SAND DUNE ☐ BLUFF	☑ NATURAL ☐ CULTURAL	☐ PLANKTON ☐ SUBMERGED ☐ FLOATING-LVD ☐ GRAMINOID ☐ FORB ☐ LICHEN ☐ BRYOPHYTE ☑ DECIDUOUS ☐ CONIFEROUS ☐ MIXED	☐ LAKE ☐ POND ☐ RIVER ☐ STREAM ☐ MARSH ☑ SWAMP ☐ FEN ☐ BOG ☐ BARREN ☐ MEADOW ☐ PRAIRIE ☐ THICKET ☐ SAVANNAH ☐ WOODLAND ☐ FOREST ☐ PLANTATION
SITE			**COVER**		
☐ OPEN WATER ☐ SHALLOW WATER ☑ SURFICIAL DEP. ☐ BEDROCK			☐ OPEN ☑ SHRUB ☐ TREED		

STAND DESCRIPTION:

	LAYER	HT	CVR	SPECIES IN ORDER OF DECREASING DOMINANCE (>> MUCH GREATER THAN; > GREATER THAN; = ABOUT EQUAL TO)
1	CANOPY	3	4	Salpeta Saldisa ‖Vert costal
2	SUB-CANOPY			
3	UNDERSTOREY			
4	GRD. LAYER	4	4	Onaaru cylaca soldulc

HT CODES: 1 = >25 m 2 = 10<HT≤25 m 3 = 2<HT≤10 m 4 = 1<HT≤2 m 5 = 0.5<HT≤1 m 6 = 0.2<HT≤0.5 m 7 = HT<0.2 m

CVR CODES 0= NONE 1= 0% < CVR ≤ 10% 2= 10 < CVR ≤ 25% 3= 25 < CVR ≤ 60% 4= CVR > 60%

STAND COMPOSITION:	BA:

SIZE CLASS ANALYSIS:		< 10		10 - 24		25 - 50		> 50
STANDING SNAGS:		< 10		10 - 24		25 - 50		> 50
DEADFALL / LOGS:		< 10		10 - 24		25 - 50		> 50

ABUNDANCE CODES: N = NONE R = RARE O = OCCASIONAL A = ABUNDANT

COMM. AGE .		PIONEER		YOUNG		MID-AGE		MATURE		OLD GROWTH

SOIL ANALYSIS:

TEXTURE:	DEPTH TO MOTTLES / GLEY	g =	G=
MOISTURE:	DEPTH OF ORGANICS:		(cm)
HOMOGENEOUS / VARIABLE	DEPTH TO BEDROCK:		(cm)

COMMUNITYCLASSIFICATION:

COMMUNITY CLASS:	Swamp	CODE: SW
COMMUNITY SERIES:	Thicket Swamp	CODE: SWT
ECOSITE:	Organic Thicket Swamp	CODE: SWT3
VEGETATION TYPE:	Willow Organic Thicket Swamp	CODE: SWT3-2
INCLUSION		CODE:
COMPLEX		CODE:

Notes:

ELC PLANT SPECIES LIST	SITE:
	POLYGON:
	DATE:
	SURVEYOR(S):

LAYERS: 1 = CANOPY > 10m 2 = SUB-CANOPY 3 = UNDERSTOREY 4 = GROUND (GRD.) LAYER

ABUNDANCE CODES: R = RARE O = OCCASIONAL A = ABUNDANT D = DOMINANT

SPECIES CODE	LAYER				COLL.	SPECIES CODE	LAYER				COLL.
	1	2	3	4			1	2	3	4	

ELC **COMMUNITY DESCRIPTION & CLASSIFICATION**	SITE: 2162 Gordon		POLYGON: 26	
	SURVEYOR(S) DW	DATE 28 Jun 17		UTME
	START	END	UTMZ	UTMN:

POLYGON DESCRIPTION

SYSTEM	SUBSTRATE	TOPOGRAPHIC FEATURE	HISTORY	PLANT FORM	COMMUNITY
☒ TERRESTRIAL ☑ WETLAND ☐ AQUATIC	☑ ORGANIC ☐ MINERAL SOIL ☐ PARENT MIN ☐ ACIDIC BEDRK ☐ BASIC BEDRK ☐ CARB. BEDRK	☐ LACUSTRINE ☐ RIVERINE ☐ BOTTOMLAND ☐ TERRACE ☐ VALLEY SLOPE ☐ TABLELAND ☐ ROLL. UPLAND ☐ CLIFF ☐ TALUS ☐ CREVICE / CAVE ☐ ALVAR ☐ ROCKLAND ☐ BEACH / BAR ☐ SAND DUNE ☐ BLUFF	☑ NATURAL ☐ CULTURAL	☐ PLANKTON ☐ SUBMERGED ☐ FLOATING-LVD ☑ GRAMINOID ☐ FORB ☐ LICHEN ☐ BRYOPHYTE ☐ DECIDUOUS ☐ CONIFEROUS ☐ MIXED	☐ LAKE ☐ POND ☐ RIVER ☐ STREAM ☑ MARSH ☐ SWAMP ☐ FEN ☐ BOG ☐ BARREN ☐ MEADOW ☐ PRAIRIE ☐ THICKET ☐ SAVANNAH ☐ WOODLAND ☐ FOREST ☐ PLANTATION
SITE			**COVER**		
☐ OPEN WATER ☐ SHALLOW WATER ☑ SURFICIAL DEP. ☐ BEDROCK			☑ OPEN ☐ SHRUB ☐ TREED		

STAND DESCRIPTION:

	LAYER	HT	CVR	SPECIES IN ORDER OF DECREASING DOMINANCE (>> MUCH GREATER THAN; > GREATER THAN; = ABOUT EQUAL TO)
1	CANOPY	5	1	Corstol
2	SUB-CANOPY			
3	UNDERSTOREY			
4	GRD. LAYER	4	4	phaarun conlacu solduh glygran

HT CODES: 1 = >25 m 2 = 10<HT 25 m 3 = 2<HT 10 m 4 = 1<HT≤2 m 5 = 0.5<HT 1 m 6 = 0.2<HT 0.5 m 7 = HT<0.2 m
CVR CODES 0= NONE 1= 0% < CVR ≤ 10% 2= 10 < CVR ≤ 25% 3= 25 < CVR ≤ 60% 4= CVR > 60%

STAND COMPOSITION:								BA:
SIZE CLASS ANALYSIS:		< 10		10 - 24		25 - 50		> 50
STANDING SNAGS:		< 10		10 - 24		25 - 50		> 50
DEADFALL / LOGS:		< 10		10 - 24		25 - 50		> 50

ABUNDANCE CODES: N = NONE R = RARE O = OCCASIONAL A = ABUNDANT

COMM. AGE.		PIONEER		YOUNG		MID-AGE		MATURE		OLD GROWTH

SOIL ANALYSIS:

TEXTURE:	DEPTH TO MOTTLES / GLEY	g =	G=
MOISTURE:	DEPTH OF ORGANICS:		(cm)
HOMOGENEOUS / VARIABLE	DEPTH TO BEDROCK:		(cm)

COMMUNITYCLASSIFICATION:

COMMUNITY CLASS:	Marsh	CODE:	MA
COMMUNITY SERIES:	Shallow Marsh	CODE:	MAS
ECOSITE:	Organic Shallow Marsh	CODE:	MAS3
VEGETATION TYPE:	Reed Canary Organic SM	CODE:	MAS3
INCLUSION		CODE:	
COMPLEX		CODE:	

Notes:

ELC **PLANT SPECIES LIST**	SITE:
	POLYGON:
	DATE:
	SURVEYOR(S):

LAYERS: 1 = CANOPY > 10m 2 = SUB-CANOPY 3 = UNDERSTOREY 4 = GROUND (GRD.) LAYER
ABUNDANCE CODES: R = RARE O = OCCASIONAL A = ABUNDANT D = DOMINANT

SPECIES CODE	LAYER				COLL.	SPECIES CODE	LAYER				COLL.
	1	2	3	4			1	2	3	4	

ELC COMMUNITY DESCRIPTION & CLASSIFICATION	SITE: 1968 Gordon St		POLYGON: 1	
	SURVEYOR(S) DW/NR	DATE Jun 12 2018		UTME
	START	END	UTMZ	UTMN:

POLYGON DESCRIPTION

SYSTEM
☑ TERRESTRIAL
☐ WETLAND
☐ AQUATIC

SITE
☐ OPEN WATER
☐ SHALLOW WATER
☑ SURFICIAL DEP.
☐ BEDROCK

SUBSTRATE
☐ ORGANIC
☑ MINERAL SOIL
☐ PARENT MIN
☐ ACIDIC BEDRK
☐ BASIC BEDRK
☐ CARB. BEDRK

TOPOGRAPHIC FEATURE
☐ LACUSTRINE
☐ RIVERINE
☐ BOTTOMLAND
☐ TERRACE
☐ VALLEY SLOPE
☐ TABLELAND
☐ ROLL. UPLAND
☐ CLIFF
☐ TALUS
☐ CREVICE / CAVE
☐ ALVAR
☐ ROCKLAND
☐ BEACH / BAR
☐ SAND DUNE
☐ BLUFF

HISTORY
☑ NATURAL
☐ CULTURAL

COVER
☐ OPEN
☐ SHRUB
☑ TREED

PLANT FORM
☐ PLANKTON
☐ SUBMERGED
☐ FLOATING-LVD
☐ GRAMINOID
☐ FORB
☐ LICHEN
☐ BRYOPHYTE
☐ DECIDUOUS
☐ CONIFEROUS
☑ MIXED

COMMUNITY
☐ LAKE
☐ POND
☐ RIVER
☐ STREAM
☐ MARSH
☐ SWAMP
☐ FEN
☐ BOG
☐ BARREN
☐ MEADOW
☐ PRAIRIE
☐ THICKET
☐ SAVANNAH
☐ WOODLAND
☑ FOREST
☐ PLANTATION

STAND DESCRIPTION:

LAYER		HT	CVR	SPECIES IN ORDER OF DECREASING DOMINANCE (>> MUCH GREATER THAN; > GREATER THAN; = ABOUT EQUAL TO)
1	CANOPY	2	4	Thuocci > Popgran > Prusero > Querrub
2	SUB-CANOPY	3	2	Rhacath thuocci rhafran
3	UNDERSTOREY	4	1	rhafran prunvirg
4	GRD. LAYER	5	4	parinse maicana carpedu taroffi

HT CODES: 1 = >25 m 2 = 10<HT≤25 m 3 = 2<HT≤10 m 4 = 1<HT≤2 m 5 = 0.5<HT≤1 m 6 = 0.2<HT≤0.5 m 7 = HT<0.2 m
CVR CODES 0= NONE 1= 0% < CVR ≤ 10% 2= 10 < CVR ≤ 25% 3= 25 < CVR ≤ 60% 4= CVR > 60%

STAND COMPOSITION:							BA:	
SIZE CLASS ANALYSIS:	O	< 10	A	10 - 24	O	25 - 50	R	> 50
STANDING SNAGS:		< 10		10 - 24		25 - 50		> 50
DEADFALL / LOGS:		< 10		10 - 24		25 - 50		> 50

ABUNDANCE CODES: N = NONE R = RARE O = OCCASIONAL A = ABUNDANT

COMM. AGE.		PIONEER		YOUNG	✓	MID-AGE		MATURE		OLD GROWTH

SOIL ANALYSIS:

TEXTURE:	DEPTH TO MOTTLES / GLEY	g =	G=
MOISTURE:	DEPTH OF ORGANICS:		(cm)
HOMOGENEOUS / VARIABLE	DEPTH TO BEDROCK:		(cm)

COMMUNITYCLASSIFICATION:

COMMUNITY CLASS: FOREST	CODE: FO
COMMUNITY SERIES: Coniferous Forest	CODE: FOC
ECOSITE: Fresh-Moist White Cedar	CODE: FOC4
VEGETATION TYPE: Fresh-Moist White Cedar Coniferous Forest	CODE: FOC4-1
INCLUSION	CODE:
COMPLEX	CODE:

Notes:

ELC PLANT SPECIES LIST	SITE:
	POLYGON:
	DATE:
	SURVEYOR(S):

LAYERS: 1 = CANOPY > 10m 2 = SUB-CANOPY 3 = UNDERSTOREY 4 = GROUND (GRD.) LAYER
ABUNDANCE CODES: R = RARE O = OCCASIONAL A = ABUNDANT D = DOMINANT

SPECIES CODE	LAYER				COLL.
	1	2	3	4	
Poptrem					
Prusero					
Thuocci					
Frastro					
Querrubr					
Ulmamer					
Popgran					
Prusero					
Aceplat					
Betpapy					
Tsucana					
Betalle					
crat-sp					
rhacath					
frapenn					
Lonitata					
prunvirg					
rhafran					

SPECIES CODE	LAYER				COLL.
	1	2	3	4	
parinse					
epihel					
taroffi					
Solalti					
Leu sp.					
maicana					
onosens					
conmaja					
Carpedu					
Cargrac					
vinmino					

ELC COMMUNITY DESCRIPTION & CLASSIFICATION			
SITE: 1968 Gordon St		POLYGON: 2	
SURVEYOR(S): DW/NC	DATE: Jun 12 2018		UTME
START	END	UTMZ	UTMN:

POLYGON DESCRIPTION

SYSTEM
- ☐ TERRESTRIAL
- ☑ WETLAND
- ☐ AQUATIC

SITE
- ☐ OPEN WATER
- ☑ SHALLOW WATER
- ☐ SURFICIAL DEP.
- ☐ BEDROCK

SUBSTRATE
- ☐ ORGANIC
- ☐ MINERAL SOIL
- ☐ PARENT MIN
- ☐ ACIDIC BEDRK
- ☐ BASIC BEDRK
- ☐ CARB. BEDRK

TOPOGRAPHIC FEATURE
- ☐ LACUSTRINE
- ☐ RIVERINE
- ☐ BOTTOMLAND
- ☐ TERRACE
- ☐ VALLEY SLOPE
- ☐ TABLELAND
- ☐ ROLL. UPLAND
- ☐ CLIFF
- ☐ TALUS
- ☐ CREVICE / CAVE
- ☐ ALVAR
- ☐ ROCKLAND
- ☐ BEACH / BAR
- ☐ SAND DUNE
- ☐ BLUFF

HISTORY
- ☑ NATURAL
- ☐ CULTURAL

COVER
- ☑ OPEN
- ☐ SHRUB
- ☐ TREED

PLANT FORM
- ☐ PLANKTON
- ☐ SUBMERGED
- ☐ FLOATING-LVD
- ☐ GRAMINOID
- ☐ FORB
- ☐ LICHEN
- ☐ BRYOPHYTE
- ☐ DECIDUOUS
- ☐ CONIFEROUS
- ☑ MIXED

COMMUNITY
- ☐ LAKE
- ☑ POND
- ☐ RIVER
- ☐ STREAM
- ☐ MARSH
- ☐ SWAMP
- ☐ FEN
- ☐ BOG
- ☐ BARREN
- ☐ MEADOW
- ☐ PRAIRIE
- ☐ THICKET
- ☐ SAVANNAH
- ☐ WOODLAND
- ☐ FOREST
- ☐ PLANTATION

STAND DESCRIPTION:

LAYER		HT	CVR	SPECIES IN ORDER OF DECREASING DOMINANCE (>> MUCH GREATER THAN; > GREATER THAN; = ABOUT EQUAL TO)
1	CANOPY	3	1	illvert
2	SUB-CANOPY			
3	UNDERSTOREY	4	3	typargu
4	GRD. LAYER	5	4	azstol > thepalu > phraaum

HT CODES: 1 = >25 m 2 = 10<HT<25 m 3 = 2<HT<10 m 4 = 1<HT≤2 m 5 = 0.5<HT≤1 m 6 = 0.2<HT≤0.5 m 7 = HT<0.2 m

CVR CODES 0= NONE 1= 0% < CVR ≤ 10% 2= 10 < CVR ≤ 25% 3= 25 < CVR ≤ 60% 4= CVR > 60%

STAND COMPOSITION:							BA:	
SIZE CLASS ANALYSIS:		< 10		10 - 24		25 - 50		> 50
STANDING SNAGS:		< 10		10 - 24		25 - 50		> 50
DEADFALL / LOGS:		< 10		10 - 24		25 - 50		> 50

ABUNDANCE CODES: N = NONE R = RARE O = OCCASIONAL A = ABUNDANT

COMM. AGE		PIONEER		YOUNG		MID-AGE		MATURE	OLD GROWTH

SOIL ANALYSIS:

TEXTURE:	DEPTH TO MOTTLES / GLEY	g =	G=
MOISTURE:	DEPTH OF ORGANICS:		(cm)
HOMOGENEOUS / VARIABLE	DEPTH TO BEDROCK:		(cm)

COMMUNITYCLASSIFICATION:

COMMUNITY CLASS: Marsh	CODE: MA
COMMUNITY SERIES: Shallow Marsh	CODE: MAS
ECOSITE: Organic Shallow Marsh	CODE: MAS3
VEGETATION TYPE: Cattail Organic Shallow Marsh	CODE: MAS3-1
INCLUSION	CODE:
COMPLEX	CODE:

Notes:

ELC PLANT SPECIES LIST	
	SITE:
	POLYGON:
	DATE:
	SURVEYOR(S):

LAYERS: 1 = CANOPY > 10m 2 = SUB-CANOPY 3 = UNDERSTOREY 4 = GROUND (GRD.) LAYER

ABUNDANCE CODES: R = RARE O = OCCASIONAL A = ABUNDANT D = DOMINANT

SPECIES CODE	LAYER 1	2	3	4	COLL.	SPECIES CODE	LAYER 1	2	3	4	COLL.
						azstol					
						typarzi					
						thepaln					
						soldulc					
						acoamer					
						lytsali					
illvert											

ELC COMMUNITY DESCRIPTION & CLASSIFICATION	SITE: 1968 Gordon St			POLYGON: 3	
	SURVEYOR(S) DW/NZ		DATE Jun 12 2018		UTME
	START	END		UTMZ	UTMN:

POLYGON DESCRIPTION

SYSTEM
- ☐ TERRESTRIAL
- ☑ WETLAND
- ☐ AQUATIC

SUBSTRATE
- ☑ ORGANIC
- ☐ MINERAL SOIL
- ☐ PARENT MIN
- ☐ ACIDIC BEDRK
- ☐ BASIC BEDRK
- ☐ CARB. BEDRK

TOPOGRAPHIC FEATURE
- ☐ LACUSTRINE
- ☐ RIVERINE
- ☐ BOTTOMLAND
- ☐ TERRACE
- ☐ VALLEY SLOPE
- ☐ TABLELAND
- ☐ ROLL. UPLAND
- ☐ CLIFF
- ☐ TALUS
- ☐ CREVICE / CAVE
- ☐ ALVAR
- ☐ ROCKLAND
- ☐ BEACH / BAR
- ☐ SAND DUNE
- ☐ BLUFF

HISTORY
- ☑ NATURAL
- ☐ CULTURAL

PLANT FORM
- ☐ PLANKTON
- ☐ SUBMERGED
- ☐ FLOATING-LVD
- ☑ GRAMINOID
- ☐ FORB
- ☐ LICHEN
- ☐ BRYOPHYTE
- ☐ DECIDUOUS
- ☐ CONIFEROUS
- ☐ MIXED

COMMUNITY
- ☐ LAKE
- ☐ POND
- ☐ RIVER
- ☐ STREAM
- ☑ MARSH
- ☐ SWAMP
- ☐ FEN
- ☐ BOG
- ☐ BARREN
- ☐ MEADOW
- ☐ PRAIRIE
- ☐ THICKET
- ☐ SAVANNAH
- ☐ WOODLAND
- ☐ FOREST
- ☐ PLANTATION

SITE
- ☐ OPEN WATER
- ☑ SHALLOW WATER
- ☑ SURFICIAL DEP.
- ☐ BEDROCK

COVER
- ☑ OPEN
- ☐ SHRUB
- ☐ TREED

STAND DESCRIPTION:

LAYER		HT	CVR	SPECIES IN ORDER OF DECREASING DOMINANCE (>> MUCH GREATER THAN; > GREATER THAN; = ABOUT EQUAL TO)
1	CANOPY			
2	SUB-CANOPY			
3	UNDERSTOREY			
4	GRD. LAYER	5	3	leeoryz car-spp glystri thepalu

HT CODES: 1 = >25 m 2 = 10<HT ≤25 m 3 = 2<HT ≤10 m 4 = 1<HT ≤2 m 5 = 0.5<HT ≤1 m 6 = 0.2<HT ≤0.5 m 7 = HT<0.2 m

CVR CODES 0= NONE 1= 0% < CVR ≤ 10% 2= 10 < CVR ≤ 25% 3= 25 < CVR ≤ 60% 4= CVR > 60%

STAND COMPOSITION:								BA:	
SIZE CLASS ANALYSIS:		< 10		10 - 24		25 - 50		> 50	
STANDING SNAGS:		< 10		10 - 24		25 - 50		> 50	
DEADFALL / LOGS:		< 10		10 - 24		25 - 50		> 50	

ABUNDANCE CODES: N = NONE R = RARE O = OCCASIONAL A = ABUNDANT

COMM. AGE.		PIONEER		YOUNG		MID-AGE		MATURE	OLD GROWTH

SOIL ANALYSIS:

TEXTURE:	DEPTH TO MOTTLES / GLEY	g =	G=
MOISTURE:	DEPTH OF ORGANICS:		(cm)
HOMOGENEOUS / VARIABLE	DEPTH TO BEDROCK:		(cm)

COMMUNITYCLASSIFICATION:

COMMUNITY CLASS: Marsh	CODE:	MA
COMMUNITY SERIES: Shallow Marsh	CODE:	MAS
ECOSITE: Organic Shallow Marsh	CODE:	MAS3
VEGETATION TYPE: Organic Shallow Marsh	CODE:	MAS3
INCLUSION	CODE:	
COMPLEX	CODE:	

Notes:

ELC PLANT SPECIES LIST	SITE:
	POLYGON:
	DATE:
	SURVEYOR(S):

LAYERS: 1 = CANOPY > 10m 2 = SUB-CANOPY 3 = UNDERSTOREY 4 = GROUND (GRD.) LAYER

ABUNDANCE CODES: R = RARE O = OCCASIONAL A = ABUNDANT D = DOMINANT

SPECIES CODE	LAYER				COLL.	SPECIES CODE	LAYER				COLL.
	1	2	3	4			1	2	3	4	
						lyster					
						ele-sp					
						carretr					
						irivers					
						carstip					
						glystri					
						soldulc					
						leeoryz					
						aliplan					
						thepalu					
						galpalu					
						osmcinn					

ELC
COMMUNITY DESCRIPTION & CLASSIFICATION

SITE: 1968 Gordon St		POLYGON: 4	
SURVEYOR(S) DW NC	DATE Jun 12, 2018		UTME
START	END	UTMZ	UTMN:

POLYGON DESCRIPTION

SYSTEM	SUBSTRATE	TOPOGRAPHIC FEATURE	HISTORY	PLANT FORM	COMMUNITY
☐ TERRESTRIAL ☑ WETLAND ☐ AQUATIC	☑ ORGANIC ☐ MINERAL SOIL ☐ PARENT MIN ☐ ACIDIC BEDRK ☐ BASIC BEDRK ☐ CARB. BEDRK	☐ LACUSTRINE ☐ RIVERINE ☐ BOTTOMLAND ☐ TERRACE ☐ VALLEY SLOPE ☐ TABLELAND ☐ ROLL. UPLAND ☐ CLIFF ☐ TALUS ☐ CREVICE / CAVE ☐ ALVAR ☐ ROCKLAND ☐ BEACH / BAR ☐ SAND DUNE ☐ BLUFF	☑ NATURAL ☐ CULTURAL	☐ PLANKTON ☐ SUBMERGED ☐ FLOATING-LVD ☐ GRAMINOID ☐ FORB ☐ LICHEN ☐ BRYOPHYTE ☐ DECIDUOUS ☐ CONIFEROUS ☑ MIXED	☐ LAKE ☐ POND ☐ RIVER ☐ STREAM ☑ MARSH ☐ SWAMP ☐ FEN ☐ BOG ☐ BARREN ☐ MEADOW ☐ PRAIRIE ☐ THICKET ☐ SAVANNAH ☐ WOODLAND ☐ FOREST ☐ PLANTATION
SITE			**COVER**		
☐ OPEN WATER ☐ SHALLOW WATER ☑ SURFICIAL DEP. ☐ BEDROCK			☑ OPEN ☐ SHRUB ☐ TREED		

STAND DESCRIPTION:

LAYER		HT	CVR	SPECIES IN ORDER OF DECREASING DOMINANCE (>> MUCH GREATER THAN; > GREATER THAN; = ABOUT EQUAL TO)
1	CANOPY			
2	SUB-CANOPY			
3	UNDERSTOREY	5	3	typha equfluv ele-sp sciwali
4	GRD. LAYER	7	4	pot-sp lemmino

HT CODES: 1 = >25 m 2 = 10<HT≤25 m 3 = 2<HT≤10 m 4 = 1<HT≤2 m 5 = 0.5<HT≤1 m 6 = 0.2<HT≤0.5 m 7 = HT<0.2 m
CVR CODES 0= NONE 1= 0% < CVR ≤ 10% 2= 10 < CVR ≤ 25% 3= 25 < CVR ≤ 60% 4= CVR > 60%

STAND COMPOSITION:	BA:

SIZE CLASS ANALYSIS:		< 10		10 - 24		25 - 50		> 50
STANDING SNAGS:		< 10		10 - 24		25 - 50		> 50
DEADFALL / LOGS:		< 10		10 - 24		25 - 50		> 50

ABUNDANCE CODES: N = NONE R = RARE O = OCCASIONAL A = ABUNDANT

COMM. AGE		PIONEER		YOUNG		MID-AGE		MATURE		OLD GROWTH

SOIL ANALYSIS:

TEXTURE:	DEPTH TO MOTTLES / GLEY g =	G=
MOISTURE:	DEPTH OF ORGANICS: (cm)	
HOMOGENEOUS / VARIABLE	DEPTH TO BEDROCK: (cm)	

COMMUNITYCLASSIFICATION:

COMMUNITY CLASS: Marsh / Shallow Aquatic	CODE: MA/SA
COMMUNITY SERIES:	CODE:
ECOSITE:	CODE:
VEGETATION TYPE: Organic Shallow Marsh / Mixed Shallow Aquatic	CODE: MAS3/SAM
INCLUSION	CODE:
COMPLEX	CODE:

Notes:

ELC
PLANT SPECIES LIST

SITE:
POLYGON:
DATE:
SURVEYOR(S):

LAYERS: 1 = CANOPY > 10m 2 = SUB-CANOPY 3 = UNDERSTOREY 4 = GROUND (GRD.) LAYER
ABUNDANCE CODES: R = RARE O = OCCASIONAL A = ABUNDANT D = DOMINANT

SPECIES CODE	LAYER 1	2	3	4	COLL.	SPECIES CODE	LAYER 1	2	3	4	COLL.
						equfluv					
						lemmino					
						pot-sp					
						ele-sp					
						sciwali					
						typha					

ELC COMMUNITY DESCRIPTION & CLASSIFICATION	SITE: 1968 Gordon St		POLYGON: 5	
	SURVEYOR(S) DW/NC		DATE Jun 12 2018	UTME
	START	END	UTMZ	UTMN:

POLYGON DESCRIPTION

SYSTEM	SUBSTRATE	TOPOGRAPHIC FEATURE	HISTORY	PLANT FORM	COMMUNITY
☑ TERRESTRIAL ☐ WETLAND ☐ AQUATIC	☐ ORGANIC ☑ MINERAL SOIL ☐ PARENT MIN ☐ ACIDIC BEDRK ☐ BASIC BEDRK ☐ CARB. BEDRK	☐ LACUSTRINE ☐ RIVERINE ☐ BOTTOMLAND ☐ TERRACE ☐ VALLEY SLOPE ☐ TABLELAND ☐ ROLL. UPLAND ☐ CLIFF ☐ TALUS ☐ CREVICE / CAVE ☐ ALVAR ☐ ROCKLAND ☐ BEACH / BAR ☐ SAND DUNE ☐ BLUFF	☐ NATURAL ☑ CULTURAL	☐ PLANKTON ☐ SUBMERGED ☐ FLOATING-LVD ☐ GRAMINOID ☐ FORB ☐ LICHEN ☐ BRYOPHYTE ☐ DECIDUOUS ☑ CONIFEROUS ☐ MIXED	☐ LAKE ☐ POND ☐ RIVER ☐ STREAM ☐ MARSH ☐ SWAMP ☐ FEN ☐ BOG ☐ BARREN ☐ MEADOW ☐ PRAIRIE ☐ THICKET ☐ SAVANNAH ☐ WOODLAND ☐ FOREST ☑ PLANTATION
SITE			**COVER**		
☐ OPEN WATER ☐ SHALLOW WATER ☑ SURFICIAL DEP. ☐ BEDROCK			☐ OPEN ☐ SHRUB ☑ TREED		

STAND DESCRIPTION:

LAYER		HT	CVR	SPECIES IN ORDER OF DECREASING DOMINANCE (>> MUCH GREATER THAN; > GREATER THAN; = ABOUT EQUAL TO)
1	CANOPY	3	4	Pic-spp Pinstro Pinresi Popgran
2	SUB-CANOPY			
3	UNDERSTOREY	4	4	rhacath lontata fraamer acesasa
4	GRD. LAYER	5	3	solalti geuimse fravirg taroffi

HT CODES: 1 = >25 m 2 = 10<HT≤25 m 3 = 2<HT≤10 m 4 = 1<HT≤2 m 5 = 0.5<HT≤1 m 6 = 0.2<HT≤0.5 m 7 = HT<0.2 m

CVR CODES 0= NONE 1= 0% < CVR ≤ 10% 2= 10 < CVR ≤ 25% 3= 25 < CVR ≤ 60% 4= CVR > 60%

STAND COMPOSITION:							BA:	
SIZE CLASS ANALYSIS:	A	< 10	A	10 - 24	O	25 - 50	R	> 50
STANDING SNAGS:		< 10		10 - 24		25 - 50		> 50
DEADFALL / LOGS:	R	< 10	R	10 - 24	N	25 - 50	N	> 50

ABUNDANCE CODES: N = NONE R = RARE O = OCCASIONAL A = ABUNDANT

COMM. AGE	☐	PIONEER	☑	YOUNG	☐	MID-AGE	☐	MATURE	☐ OLD GROWTH

SOIL ANALYSIS:

TEXTURE:	DEPTH TO MOTTLES / GLEY	g =	G=
MOISTURE:	DEPTH OF ORGANICS:		(cm)
HOMOGENEOUS / VARIABLE	DEPTH TO BEDROCK:		(cm)

COMMUNITY CLASSIFICATION:

COMMUNITY CLASS: Cultural	CODE: CU
COMMUNITY SERIES: Cultural Plantation	CODE: CUP
ECOSITE: Coniferous Plantation	CODE: CUP3
VEGETATION TYPE: Coniferous Plantation	CODE: CUP3
INCLUSION	CODE:
COMPLEX	CODE:

Notes:

ELC PLANT SPECIES LIST	
	SITE:
	POLYGON:
	DATE:
	SURVEYOR(S):

LAYERS: 1 = CANOPY > 10m 2 = SUB-CANOPY 3 = UNDERSTOREY 4 = GROUND (GRD.) LAYER

ABUNDANCE CODES: R = RARE O = OCCASIONAL A = ABUNDANT D = DOMINANT

SPECIES CODE	LAYER 1	2	3	4	COLL.	SPECIES CODE	LAYER 1	2	3	4	COLL.
Picglau						taroffi					
Pinresi						solalti					
Pinstro						fravirg					
Popgran						geuurba					
						prunvulg					
						hiersp					
						prunse					
rhamcath											
lonitata											
accesasa											
fraamer											

ELC
COMMUNITY DESCRIPTION & CLASSIFICATION

SITE: 1968 Gordon St		POLYGON: 7	
SURVEYOR(S): DW/NC	DATE: Jun 12 2018		UTME
START	END	UTMZ	UTMN

POLYGON DESCRIPTION

SYSTEM
- ☑ TERRESTRIAL
- ☐ WETLAND
- ☐ AQUATIC

SUBSTRATE
- ☐ ORGANIC
- ☑ MINERAL SOIL
- ☐ PARENT MIN
- ☐ ACIDIC BEDRK
- ☐ BASIC BEDRK
- ☐ CARB. BEDRK

TOPOGRAPHIC FEATURE
- ☐ LACUSTRINE
- ☐ RIVERINE
- ☐ BOTTOMLAND
- ☐ TERRACE
- ☐ VALLEY SLOPE
- ☑ TABLELAND
- ☐ ROLL. UPLAND
- ☐ CLIFF
- ☐ TALUS
- ☐ CREVICE / CAVE
- ☐ ALVAR
- ☐ ROCKLAND
- ☐ BEACH / BAR
- ☐ SAND DUNE
- ☐ BLUFF

HISTORY
- ☑ NATURAL
- ☐ CULTURAL

PLANT FORM
- ☐ PLANKTON
- ☐ SUBMERGED
- ☐ FLOATING-LVD
- ☐ GRAMINOID
- ☐ FORB
- ☐ LICHEN
- ☐ BRYOPHYTE
- ☐ DECIDUOUS
- ☐ CONIFEROUS
- ☑ MIXED

COMMUNITY
- ☐ LAKE
- ☐ POND
- ☐ RIVER
- ☐ STREAM
- ☐ MARSH
- ☐ SWAMP
- ☐ FEN
- ☐ BOG
- ☐ BARREN
- ☐ MEADOW
- ☐ PRAIRIE
- ☐ THICKET
- ☐ SAVANNAH
- ☐ WOODLAND
- ☑ FOREST
- ☐ PLANTATION

SITE
- ☐ OPEN WATER
- ☐ SHALLOW WATER
- ☑ SURFICIAL DEP.
- ☐ BEDROCK

COVER
- ☐ OPEN
- ☐ SHRUB
- ☑ TREED

STAND DESCRIPTION:

LAYER		HT	CVR	SPECIES IN ORDER OF DECREASING DOMINANCE (>> MUCH GREATER THAN; > GREATER THAN; = ABOUT EQUAL TO)
1	CANOPY	2	4	Tsucana Betalle Acesasa Poptrem
2	SUB-CANOPY	3	2	Acesasa Ostvirg Ulmocci Tsucana
3	UNDERSTOREY	4	2	Pruvirg rhacath ribcyno lontata
4	GRD. LAYER	5	3	carpedu solflex maicana gerrobe

HT CODES: 1 = >25 m 2 = 10<HT≤25 m 3 = 2<HT≤10 m 4 = 1<HT≤2 m 5 = 0.5<HT≤1 m 6 = 0.2<HT≤0.5 m 7 = HT<0.2 m

CVR CODES 0= NONE 1= 0% < CVR ≤ 10% 2= 10 < CVR ≤ 25% 3= 25 < CVR ≤ 60% 4= CVR > 60%

STAND COMPOSITION:							BA:	
SIZE CLASS ANALYSIS:	A	< 10	A	10 - 24	A	25 - 50	O	> 50
STANDING SNAGS:	R	< 10	R	10 - 24	R	25 - 50	R	> 50
DEADFALL / LOGS:	A	< 10	O	10 - 24	O	25 - 50	R	> 50

ABUNDANCE CODES: N = NONE R = RARE O = OCCASIONAL A = ABUNDANT

COMM. AGE.		PIONEER		YOUNG		MID-AGE	✓	MATURE	OLD GROWTH

SOIL ANALYSIS:

TEXTURE:	DEPTH TO MOTTLES / GLEY	g =	G=
MOISTURE:	DEPTH OF ORGANICS:		(cm)
HOMOGENEOUS / VARIABLE	DEPTH TO BEDROCK:		(cm)

COMMUNITYCLASSIFICATION:

COMMUNITY CLASS: Forest	CODE: FO
COMMUNITY SERIES: Mixed Forest	CODE: FOM
ECOSITE: Dry-Fresh Hemlock Mixed	CODE: FOM3
VEGETATION TYPE: Dry-Fresh Hardwood-Hemlock Mixed Forest	CODE: FOM3-1
INCLUSION	CODE:
COMPLEX	CODE:

Notes:

ELC
PLANT SPECIES LIST

SITE:

POLYGON:

DATE:

SURVEYOR(S):

LAYERS: 1 = CANOPY > 10m 2 = SUB-CANOPY 3 = UNDERSTOREY 4 = GROUND (GRD.) LAYER

ABUNDANCE CODES: R = RARE O = OCCASIONAL A = ABUNDANT D = DOMINANT

SPECIES CODE	LAYER 1	2	3	4	COLL.
Poptrem					
Ostvirg					
Fraamer					
Tsucana					
Betalle					
Popgran					
Acesasa					
Prusero					
Ulmocci					
dirpalu					
pruvirg					
lontata					
rhacath					
ribcyno					

SPECIES CODE	LAYER 1	2	3	4	COLL.
culute					
mairace					
taroffi					
solflex					
fravirg					
sancana					
polpube					
gerrobe					
drycart					
cargrac					
triaura					
carpedu					
polacro					
carpens					
galtrif					
[illegible]					
trigran					
cardiph					
aranudi					
walfrag					
cirlute					

ELC
COMMUNITY DESCRIPTION & CLASSIFICATION

SITE: 1968 Gordon St		POLYGON: 8	
SURVEYOR(S): DW/NC	DATE: Jun 12 2018		UTME
START	END	UTMZ	UTMN:

POLYGON DESCRIPTION

SYSTEM
- ☑ TERRESTRIAL
- ☐ WETLAND
- ☐ AQUATIC

SITE
- ☐ OPEN WATER
- ☐ SHALLOW WATER
- ☑ SURFICIAL DEP.
- ☐ BEDROCK

SUBSTRATE
- ☐ ORGANIC
- ☑ MINERAL SOIL
- ☐ PARENT MIN
- ☐ ACIDIC BEDRK
- ☐ BASIC BEDRK
- ☐ CARB. BEDRK

TOPOGRAPHIC FEATURE
- ☐ LACUSTRINE
- ☐ RIVERINE
- ☐ BOTTOMLAND
- ☐ TERRACE
- ☐ VALLEY SLOPE
- ☐ TABLELAND
- ☐ ROLL. UPLAND
- ☐ CLIFF
- ☐ TALUS
- ☐ CREVICE / CAVE
- ☐ ALVAR
- ☐ ROCKLAND
- ☐ BEACH / BAR
- ☐ SAND DUNE
- ☐ BLUFF

HISTORY
- ☐ NATURAL
- ☑ CULTURAL

COVER
- ☐ OPEN
- ☐ SHRUB
- ☑ TREED

PLANT FORM
- ☐ PLANKTON
- ☐ SUBMERGED
- ☐ FLOATING-LVD
- ☐ GRAMINOID
- ☐ FORB
- ☐ LICHEN
- ☐ BRYOPHYTE
- ☐ DECIDUOUS
- ☑ CONIFEROUS
- ☐ MIXED

COMMUNITY
- ☐ LAKE
- ☐ POND
- ☐ RIVER
- ☐ STREAM
- ☐ MARSH
- ☐ SWAMP
- ☐ FEN
- ☐ BOG
- ☐ BARREN
- ☐ MEADOW
- ☐ PRAIRIE
- ☐ THICKET
- ☐ SAVANNAH
- ☐ WOODLAND
- ☐ FOREST
- ☑ PLANTATION

STAND DESCRIPTION:

LAYER		HT	CVR	SPECIES IN ORDER OF DECREASING DOMINANCE (>> MUCH GREATER THAN; > GREATER THAN; = ABOUT EQUAL TO)
1	CANOPY	2	4	Picspp Popgran Pinstro Pruserо
2	SUB-CANOPY			
3	UNDERSTOREY	4	4	rhacath frapenn rhosatt
4	GRD. LAYER	5	3	cargrac parinse gerrobe cirlute

HT CODES: 1 = >25 m 2 = 10<HT 25 m 3 = 2<HT 10 m 4 = 1<HT 2 m 5 = 0.5<HT 1 m 6 = 0.2<HT 0.5 m 7 = HT<0.2 m

CVR CODES 0= NONE 1= 0% < CVR < 10% 2= 10 < CVR < 25% 3= 25 < CVR < 60% 4- CVR > 60%

STAND COMPOSITION:							BA:	
SIZE CLASS ANALYSIS:	O	< 10	A	10 - 24	A	25 - 50	N	> 50
STANDING SNAGS:	R	< 10	R	10 - 24	R	25 - 50	N	> 50
DEADFALL / LOGS:	A	< 10	O	10 - 24	O	25 - 50	N	> 50

ABUNDANCE CODES: N = NONE R = RARE O = OCCASIONAL A = ABUNDANT

COMM. AGE		PIONEER		YOUNG	✓	MID-AGE		MATURE		OLD GROWTH

SOIL ANALYSIS:

TEXTURE:	DEPTH TO MOTTLES / GLEY	g =	G=
MOISTURE:	DEPTH OF ORGANICS:		(cm)
HOMOGENEOUS / VARIABLE	DEPTH TO BEDROCK:		(cm)

COMMUNITYCLASSIFICATION:

COMMUNITY CLASS: Cultural	CODE: CU
COMMUNITY SERIES: Cultural Plantation	CODE: CUP
ECOSITE: Coniferous Plantation	CODE: CUP3
VEGETATION TYPE: Coniferous Plantation	CODE: CUP3
INCLUSION	CODE:
COMPLEX	CODE:

Notes:

ELC
PLANT SPECIES LIST

SITE:	
POLYGON:	
DATE:	
SURVEYOR(S):	

LAYERS: 1 = CANOPY > 10m 2 = SUB-CANOPY 3 = UNDERSTOREY 4 = GROUND (GRD.) LAYER

ABUNDANCE CODES: R = RARE O = OCCASIONAL A = ABUNDANT D = DOMINANT

SPECIES CODE	LAYER 1	2	3	4	COLL.
Popgran					
Picabie					
Picglau					
Pruserо					
Fraamer					
Pinstro					
Lonitat					
rhacath					

SPECIES CODE	LAYER 1	2	3	4	COLL.
equarve					
taroffi					
solalti					
cirlute					
prunvulg					
aritrip					
cargrac					
gerrobe					
parinse					

ELC COMMUNITY DESCRIPTION & CLASSIFICATION	SITE: 1968 Gordon St		POLYGON: 10
	SURVEYOR(S) DW/NC	DATE Jun 12 2018	UTME
	START	END	UTMZ	UTMN:

POLYGON DESCRIPTION

SYSTEM
- ☐ TERRESTRIAL
- ☐ WETLAND
- ☐ AQUATIC

SITE
- ☐ OPEN WATER
- ☐ SHALLOW WATER
- ☐ SURFICIAL DEP.
- ☐ BEDROCK

SUBSTRATE
- ☐ ORGANIC
- ☐ MINERAL SOIL
- ☐ PARENT MIN
- ☐ ACIDIC BEDRK
- ☐ BASIC BEDRK
- ☐ CARB. BEDRK

TOPOGRAPHIC FEATURE
- ☐ LACUSTRINE
- ☐ RIVERINE
- ☐ BOTTOMLAND
- ☐ TERRACE
- ☐ VALLEY SLOPE
- ☐ TABLELAND
- ☐ ROLL. UPLAND
- ☐ CLIFF
- ☐ TALUS
- ☐ CREVICE / CAVE
- ☐ ALVAR
- ☐ ROCKLAND
- ☐ BEACH / BAR
- ☐ SAND DUNE
- ☐ BLUFF

HISTORY
- ☐ NATURAL
- ☐ CULTURAL

COVER
- ☐ OPEN
- ☐ SHRUB
- ☐ TREED

PLANT FORM
- ☐ PLANKTON
- ☐ SUBMERGED
- ☐ FLOATING-LVD
- ☐ GRAMINOID
- ☐ FORB
- ☐ LICHEN
- ☐ BRYOPHYTE
- ☐ DECIDUOUS
- ☐ CONIFEROUS
- ☐ MIXED

COMMUNITY
- ☐ LAKE
- ☐ POND
- ☐ RIVER
- ☐ STREAM
- ☐ MARSH
- ☐ SWAMP
- ☐ FEN
- ☐ BOG
- ☐ BARREN
- ☐ MEADOW
- ☐ PRAIRIE
- ☐ THICKET
- ☐ SAVANNAH
- ☐ WOODLAND
- ☐ FOREST
- ☐ PLANTATION

STAND DESCRIPTION:

LAYER		HT	CVR	SPECIES IN ORDER OF DECREASING DOMINANCE (>> MUCH GREATER THAN; > GREATER THAN; = ABOUT EQUAL TO)
1	CANOPY			
2	SUB-CANOPY			
3	UNDERSTOREY			
4	GRD. LAYER	4	4	phaarun >> soldulc onosens

HT CODES: 1 = >25 m 2 = 10<HT≤25 m 3 = 2<HT≤10 m 4 = 1<HT≤2 m 5 = 0.5<HT≤1 m 6 = 0.2<HT≤0.5 m 7 = HT<0.2 m

CVR CODES 0= NONE 1= 0% < CVR ≤ 10% 2= 10 < CVR ≤ 25% 3= 25 < CVR ≤ 60% 4= CVR > 60%

STAND COMPOSITION:							BA:	
SIZE CLASS ANALYSIS:		< 10		10 - 24		25 - 50		> 50
STANDING SNAGS:		< 10		10 - 24		25 - 50		> 50
DEADFALL / LOGS:		< 10		10 - 24		25 - 50		> 50

ABUNDANCE CODES: N = NONE R = RARE O = OCCASIONAL A = ABUNDANT

COMM. AGE		PIONEER		YOUNG		MID-AGE		MATURE		OLD GROWTH

SOIL ANALYSIS:

TEXTURE:	DEPTH TO MOTTLES / GLEY	g =	G=
MOISTURE:	DEPTH OF ORGANICS:		(cm)
HOMOGENEOUS / VARIABLE	DEPTH TO BEDROCK:		(cm)

COMMUNITYCLASSIFICATION:

COMMUNITY CLASS:	Marsh	CODE: MA
COMMUNITY SERIES:	Meadow Marsh	CODE: MAM
ECOSITE:	Organic Meadow Marsh	CODE: MAM3
VEGETATION TYPE:	Reed Canary Organic Meadow Marsh	CODE: MAM3-2
INCLUSION		CODE:
COMPLEX		CODE:

Notes:

ELC PLANT SPECIES LIST	SITE:
	POLYGON:
	DATE:
	SURVEYOR(S):

LAYERS: 1 = CANOPY > 10m 2 = SUB-CANOPY 3 = UNDERSTOREY 4 = GROUND (GRD.) LAYER

ABUNDANCE CODES: R = RARE O = OCCASIONAL A = ABUNDANT D = DOMINANT

SPECIES CODE	LAYER 1	LAYER 2	LAYER 3	LAYER 4	COLL.

SPECIES CODE	LAYER 1	LAYER 2	LAYER 3	LAYER 4	COLL.
phaarun					
soldulc					
siusuav					
impcape					
menarvl					
onosens					
cliplan					
cicbulb					
lycunif					

ELC COMMUNITY DESCRIPTION & CLASSIFICATION	SITE: 968 Gordon St		POLYGON: U
	SURVEYOR(S): AW	DATE: Jun 12 2018	UTME
	START	END	UTMZ	UTMN:

POLYGON DESCRIPTION

SYSTEM	SUBSTRATE	TOPOGRAPHIC FEATURE	HISTORY	PLANT FORM	COMMUNITY
☐ TERRESTRIAL ☑ WETLAND ☐ AQUATIC	☐ ORGANIC ☑ MINERAL SOIL ☐ PARENT MIN ☐ ACIDIC BEDRK ☐ BASIC BEDRK ☐ CARB. BEDRK	☐ LACUSTRINE ☐ RIVERINE ☐ BOTTOMLAND ☐ TERRACE ☐ VALLEY SLOPE ☐ TABLELAND ☐ ROLL. UPLAND ☐ CLIFF ☐ TALUS ☐ CREVICE / CAVE ☐ ALVAR ☐ ROCKLAND ☐ BEACH / BAR ☐ SAND DUNE ☐ BLUFF	☑ NATURAL ☐ CULTURAL	☐ PLANKTON ☐ SUBMERGED ☐ FLOATING-LVD ☑ GRAMINOID ☐ FORB ☐ LICHEN ☐ BRYOPHYTE ☐ DECIDUOUS ☐ CONIFEROUS ☐ MIXED	☐ LAKE ☐ POND ☐ RIVER ☐ STREAM ☑ MARSH ☐ SWAMP ☐ FEN ☐ BOG ☐ BARREN ☐ MEADOW ☐ PRAIRIE ☐ THICKET ☐ SAVANNAH ☐ WOODLAND ☐ FOREST ☐ PLANTATION
SITE			**COVER**		
☐ OPEN WATER ☐ SHALLOW WATER ☑ SURFICIAL DEP. ☐ BEDROCK			☑ OPEN ☐ SHRUB ☐ TREED		

STAND DESCRIPTION:

LAYER		HT	CVR	SPECIES IN ORDER OF DECREASING DOMINANCE (>> MUCH GREATER THAN; > GREATER THAN; = ABOUT EQUAL TO)
1	CANOPY			
2	SUB-CANOPY			
3	UNDERSTOREY			
4	GRD. LAYER			phararun >> typlati

HT CODES: 1 = >25 m 2 = 10<HT≤25 m 3 = 2<HT≤10 m 4 = 1<HT≤2 m 5 = 0.5<HT≤1 m 6 = 0.2<HT≤0.5 m 7 = HT<0.2 m

CVR CODES: 0= NONE 1= 0% < CVR ≤ 10% 2= 10 < CVR ≤ 25% 3= 25 < CVR ≤ 60% 4= CVR > 60%

STAND COMPOSITION:							BA:	
SIZE CLASS ANALYSIS:		< 10		10 - 24		25 - 50		> 50
STANDING SNAGS:		< 10		10 - 24		25 - 50		> 50
DEADFALL / LOGS:		< 10		10 - 24		25 - 50		> 50

ABUNDANCE CODES: N = NONE R = RARE O = OCCASIONAL A = ABUNDANT

COMM. AGE		PIONEER		YOUNG		MID-AGE		MATURE		OLD GROWTH

SOIL ANALYSIS:

TEXTURE:	DEPTH TO MOTTLES / GLEY	g =	G=
MOISTURE:	DEPTH OF ORGANICS:		(cm)
HOMOGENEOUS / VARIABLE	DEPTH TO BEDROCK:		(cm)

COMMUNITYCLASSIFICATION:

COMMUNITY CLASS: Marsh	CODE: MA
COMMUNITY SERIES: Meadow Marsh	CODE: MAM
ECOSITE: Mineral Meadow Marsh	CODE: MAM2
VEGETATION TYPE: Reed Canary Mineral Meadow Marsh	CODE: MAM2-2
INCLUSION	CODE:
COMPLEX	CODE:

Notes:

ELC PLANT SPECIES LIST	SITE:
	POLYGON:
	DATE:
	SURVEYOR(S):

LAYERS: 1 = CANOPY > 10m 2 = SUB-CANOPY 3 = UNDERSTOREY 4 = GROUND (GRD.) LAYER

ABUNDANCE CODES: R = RARE O = OCCASIONAL A = ABUNDANT D = DOMINANT

SPECIES CODE	LAYER				COLL.	SPECIES CODE	LAYER				COLL.
	1	2	3	4			1	2	3	4	
						phararun					
						typlati					

ELC COMMUNITY DESCRIPTION & CLASSIFICATION	SITE 1968 Gordon St		POLYGON: 9	
	SURVEYOR(S) DW/NC	DATE June 12 18		UTME
	START	END	UTMZ	UTMN

POLYGON DESCRIPTION

SYSTEM	SUBSTRATE	TOPOGRAPHIC FEATURE	HISTORY	PLANT FORM	COMMUNITY
☑ TERRESTRIAL ☐ WETLAND ☐ AQUATIC	☐ ORGANIC ☑ MINERAL SOIL ☐ PARENT MIN ☐ ACIDIC BEDRK ☐ BASIC BEDRK ☐ CARB. BEDRK	☐ LACUSTRINE ☐ RIVERINE ☐ BOTTOMLAND ☐ TERRACE ☐ VALLEY SLOPE ☐ TABLELAND ☐ ROLL. UPLAND ☐ CLIFF ☐ TALUS ☐ CREVICE / CAVE ☐ ALVAR ☐ ROCKLAND ☐ BEACH / BAR ☐ SAND DUNE ☐ BLUFF	☑ NATURAL ☐ CULTURAL	☐ PLANKTON ☐ SUBMERGED ☐ FLOATING-LVD ☐ GRAMINOID ☐ FORB ☐ LICHEN ☐ BRYOPHYTE ☑ DECIDUOUS ☐ CONIFEROUS ☐ MIXED	☐ LAKE ☐ POND ☐ RIVER ☐ STREAM ☐ MARSH ☐ SWAMP ☐ FEN ☐ BOG ☐ BARREN ☐ MEADOW ☐ PRAIRIE ☐ THICKET ☐ SAVANNAH ☐ WOODLAND ☑ FOREST ☐ PLANTATION
SITE			**COVER**		
☐ OPEN WATER ☐ SHALLOW WATER ☑ SURFICIAL DEP. ☐ BEDROCK			☐ OPEN ☐ SHRUB ☑ TREED		

STAND DESCRIPTION:

LAYER		HT	CVR	SPECIES IN ORDER OF DECREASING DOMINANCE (>> MUCH GREATER THAN; > GREATER THAN; = ABOUT EQUAL TO)
1	CANOPY	2	4	Acesasa >> Fozgran > Carcord. Tilamer
2	SUB-CANOPY	3	3	Acesasa Ostvirg Carcord Tilamer
3	UNDERSTOREY	4	3	pruvirg rhacath ribcyno fozgran
4	GRD. LAYER	5	3	carex spp parinse cirlute astmacr

HT CODES: 1 = >25 m 2 = 10<HT ≤25 m 3 = 2<HT ≤10 m 4 = 1<HT≤2 m 5 = 0.5<HT ≤1 m 6 = 0.2<HT≤0.5 m 7 = HT<0.2 m

CVR CODES 0= NONE 1= 0% < CVR ≤ 10% 2= 10 < CVR ≤ 25% 3= 25 < CVR ≤ 60% 4= CVR > 60%

STAND COMPOSITION:							BA:	
SIZE CLASS ANALYSIS:	A	< 10	A	10 - 24	A	25 - 50	O	> 50
STANDING SNAGS:		< 10		10 - 24		25 - 50		> 50
DEADFALL / LOGS:	O	< 10	O	10 - 24	O	25 - 50	R	> 50

ABUNDANCE CODES: N = NONE R = RARE O = OCCASIONAL A = ABUNDANT

COMM. AGE		PIONEER		YOUNG		MID-AGE	✓	MATURE		OLD GROWTH

SOIL ANALYSIS:

TEXTURE:	DEPTH TO MOTTLES / GLEY	g =	G=
MOISTURE:	DEPTH OF ORGANICS:		(cm)
HOMOGENEOUS / VARIABLE	DEPTH TO BEDROCK:		(cm)

COMMUNITYCLASSIFICATION:

COMMUNITY CLASS: Forest	CODE: FO
COMMUNITY SERIES: Deciduous Forest	CODE: FOD
ECOSITE: Dry-Fresh Sugar Maple	CODE: FOD5
VEGETATION TYPE: Dry-Fresh Sugar Maple Deciduous Forest	CODE: FOD5-1
INCLUSION	CODE:
COMPLEX	CODE:

Notes:

ELC PLANT SPECIES LIST	SITE:
	POLYGON:
	DATE:
	SURVEYOR(S):

LAYERS: 1 = CANOPY > 10m 2 = SUB-CANOPY 3 = UNDERSTOREY 4 = GROUND (GRD.) LAYER

ABUNDANCE CODES: R = RARE O = OCCASIONAL A = ABUNDANT D = DOMINANT

SPECIES CODE	LAYER 1	2	3	4	COLL.
Acesasa					
Acesacn					
Fozgran					
Ostvirg					
carcord					
Ulmam					
Pinstro					
carcov					
carcord					
Tilamer					
Acerpla					
fozgran					
ribcyno					
pruvirg					
rhafran.					

SPECIES CODE	LAYER 1	2	3	4	COLL.
taroffi					
carblan					
canabr					
carpens					
parinse					
asacana					
carplat					
asturgo					
sancana					
smiherb					
trigrana					
actpach					
[illegible]					
veroffi					
solcaes					
anecana					
cirlute					
athfili					
polacro					
pren.					
drycart					
carrose					
astmacr					

Appendix NH-4

Clair-Maltby Primary Study Area Plant List

Appendix NH-4

Clair-Maltby Primary Study Area Plant List

Family Name	Scientific Name	Common Name	COSEWIC	COSSARO	S-RANK	City of Guelph (2012)
Aceraceae	*Acer negundo*	Manitoba Maple			S5	
Aceraceae	*Acer nigrum*	Black Maple			S4?	LS
Aceraceae	*Acer platanoides*	Norway Maple			SNA	
Aceraceae	*Acer pseudoplatanus*	Sycamore Maple			SNA	
Aceraceae	*Acer rubrum*	Red Maple			S5	
Aceraceae	*Acer saccharinum*	Silver Maple			S5	
Aceraceae	*Acer* x *freemanii*	Freeman's Maple			S5	
Alismataceae	*Alisma triviale*	Broad-leaved Water-plantain			S5	
Alismataceae	*Alisma subcordatum*	Southern Water-plantain			S4?	
Alismataceae	*Sagittaria cuneata*	Wapatum Arrowhead			S4?	
Alismataceae	*Sagittaria latifolia*	Broadleaf Arrowhead			S5	
Amaranthaceae	*Amaranthus retroflexus*	Red-root Amaranth			SNA	
Anacardiaceae	*Rhus typhina*	Staghorn Sumac			S5	
Anacardiaceae	*Toxicodendron rydbergii*	Western Poison Ivy			S5	
Apiaceae	*Cicuta bulbifera*	Bulb-bearing Water-hemlock			S5	
Apiaceae	*Cicuta maculata*	Spotted Water-hemlock			S5	
Apiaceae	*Daucus carota*	Queen Anne's Lace			SNA	
Apiaceae	*Sium suave*	Hemlock Water-parsnip			S5	
Apocynaceae	*Apocynum androsaemifolium* ssp. *androsaemifolium*	Spreading Dogbane			S5	

Family Name	**Scientific Name**	**Common Name**	**COSEWIC**	**COSSARO**	**S-RANK**	**City of Guelph (2012)**
Apocynaceae	*Apocynum cannabinum*	Clasping-leaved Indian Hemp			S5	
Apocynaceae	*Vinca minor*	Periwinkle			SNA	
Aquifoliaceae	*Ilex verticillata*	Winterberry			S5	
Araceae	*Acorus americana*	Sweetflag			S4	
Araceae	*Arisaema triphyllum* ssp. *triphyllum*	Jack-in-the-pulpit			S5	
Araceae	*Calla palustris*	Wild Calla			S5	
Araliaceae	*Aralia nudicaulis*	Wild Sarsaparilla			S5	
Aristolochiaceae	*Asarum canadense*	Wild Ginger			S5	
Asclepiadaceae	*Asclepias incarnata* ssp. *incarnata*	Swamp Milkweed			S5	
Asclepiadaceae	*Asclepias syriaca*	Common Milkweed			S5	
Asteraceae	*Achillea millefolium* var. *millefolium*	Common Yarrow			SNA	
Asteraceae	*Achillea millefolium* var. *lanulosa*	Wooly Yarrow			S5	
Asteraceae	*Ambrosia artemisiifolia*	Annual Ragweed			S5	
Asteraceae	*Antennaria neglecta*	Field Pussytoes			S5	
Asteraceae	*Arctium lappa*	Greater Burdock			SNA	
Asteraceae	*Arctium minus*	Lesser Burdock			SNA	
Asteraceae	*Bidens cernua*	Nodding Beggar's Ticks			S5	
Asteraceae	*Bidens connata*	Purple-stemmed Beggars Tick			S4?	
Asteraceae	*Bidens frondosa*	Devil's Beggar's Ticks			S5	
Asteraceae	*Bidens* sp.	Beggar's Ticks Species				
Asteraceae	*Bidens tripartita*	Three-parted Beggar's Ticks			S5	
Asteraceae	*Carduus nutans* ssp. *leiophyllus*	Musk Thistle			SNA	
Asteraceae	*Centaurea stoebe ssp. micranthos*	Spotted Knapweed			SNA	
Asteraceae	*Centaurea jacea*	Brown Knapweed			SNA	
Asteraceae	*Centaurea* sp.	Knapweed Species				
Asteraceae	*Cichorium intybus*	Chicory			SNA	

Family Name	**Scientific Name**	**Common Name**	**COSEWIC**	**COSSARO**	**S-RANK**	**City of Guelph (2012)**
Asteraceae	*Cirsium arvense*	Creeping Thistle			SNA	
Asteraceae	*Cirsium vulgare*	Bull Thistle			SNA	
Asteraceae	*Erigeron canadensis*	Fleabane			S5	
Asteraceae	*Erigeron annuus*	White-top Fleabane			S5	
Asteraceae	*Erigeron philadelphicus* var. *philadelphicus*	Philadelphia Fleabane			S5	
Asteraceae	*Erigeron pulchellus*	Robin's Plantain			S5	
Asteraceae	*Eupatorium perfoliatum*	Common Boneset			S5	
Asteraceae	*Eurybia macrophylla*	Large-leaved Aster			S5	
Asteraceae	*Euthamia graminifolia*	Grass-leaved Goldenrod			S5	
Asteraceae	*Eutrochium maculatum* var. *maculatum*	Spotted Joe-pye Weed			S5	
Asteraceae	*Hieracium caespitosum*	Field Hawkweed			SNA	
Asteraceae	*Pilosella lachenalii*	Common Hawkweed			SNA	
Asteraceae	*Pilosella piloselloides*	Tall Hawkweed			SNA	
Asteraceae	*Hieracium* sp.	Hawkweed Species				
Asteraceae	*Inula helenium*	Elecampane			SNA	
Asteraceae	*Leucanthemum vulgare*	Oxeye Daisy			SNA	
Asteraceae	*Matricaria discoidea*	Pineapple-weed			SNA	
Asteraceae	*Oclemena acuminatus**	Whorled Aster*			S4	
Asteraceae	*Onopordum acanthium*	Scotch Thistle			SNA	
Asteraceae	*Nabalus altissima*	Tall Rattlesnake-root			S5	
Asteraceae	*Rudbeckia hirta*	Black-eyed Susan			S5	
Asteraceae	*Jacobaea vulgaris*	Tansy Ragwort			SNA	
Asteraceae	*Solidago altissima var. altissima*	Tall Goldenrod			S5	
Asteraceae	*Solidago caesia*	Bluestem Goldenrod			S5	
Asteraceae	*Solidago canadensis*	Canada Goldenrod			S5	
Asteraceae	*Solidago flexicaulis*	Broad-leaved Goldenrod			S5	

Family Name	**Scientific Name**	**Common Name**	**COSEWIC**	**COSSARO**	**S-RANK**	**City of Guelph (2012)**
Asteraceae	*Solidago gigantea*	Smooth Goldenrod			S5	
Asteraceae	*Solidago juncea*	Early Goldenrod			S5	
Asteraceae	*Solidago nemoralis* var. *nemoralis*	Field Goldenrod			S5	
Asteraceae	*Solidago patula*	Rough-leaved Goldenrod			S5	LS
Asteraceae	*Solidago rugosa* ssp. *rugosa*	Rough Goldenrod			S5	
Asteraceae	*Solidago* sp.	Goldenrod Species				
Asteraceae	*Sonchus arvensis* ssp. *arvensis*	Field Sowthistle			SNA	
Asteraceae	*Sonchus asper* ssp. *asper*	Spiny-leaf Sowthistle			SNA	
Asteraceae	*Sonchus oleraceus*	Common Sowthistle			SNA	
Asteraceae	*Symphyotrichum cordifolium*	Heart-leaved Aster			S5	LS
Asteraceae	*Symphyotrichum ericoides* var. *ericoides*	Heath Aster			S5	
Asteraceae	*Symphyotrichum lanceolatum* ssp. *lanceolatum*	Panicled Aster			S5	
Asteraceae	*Symphyotrichum lateriflorum* var. *hirsuticaule**	Hairy Calico Aster*			S4?	
Asteraceae	*Symphyotrichum lateriflorum* var. *lateriflorum*	Calico Aster			S5	
Asteraceae	*Symphyotrichum novae-angliae*	New England Aster			S5	
Asteraceae	*Symphyotrichum oolentangiense*	Sky-blue Aster			S4	LS
Asteraceae	*Symphyotrichum pilosum* var. *pilosum*	Hairy Aster			S5	
Asteraceae	*Symphyotrichum puniceum* var. *puniceum*	Purple-stemmed Aster			S5	
Asteraceae	*Symphyotrichum urophyllum*	Arrow-leaved Aster			S4	
Asteraceae	*Tanacetum vulgare*	Common Tansy			SNA	
Asteraceae	*Taraxacum officinale*	Common Dandelion			SNA	
Asteraceae	*Tragopogon dubius*	Meadow Goat's-beard			SNA	
Asteraceae	*Tragopogon pratensis* ssp. *pratensis*	Meadow Goat's-beard			SNA	
Asteraceae	**Tripleurospermum maritima* ssp. *phaeocephala*	Scentless Chamomile*			S3?	
Asteraceae	*Tussilago farfara*	Colt's Foot			SNA	
Balsaminaceae	*Impatiens capensis*	Spotted Jewel-weed			S5	

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Berberidaceae	*Berberis vulgaris*	European Barberry			SNA	
Berberidaceae	*Caulophyllum thalictroides*	Blue Cohosh			S5	
Berberidaceae	*Podophyllum peltatum*	May Apple			S5	
Betulaceae	*Alnus incana* ssp. *rugosa*	Speckled Alder			S5	
Betulaceae	*Betula alleghaniensis*	Yellow Birch			S5	
Betulaceae	*Betula papyrifera*	Paper Birch			S5	
Betulaceae	*Carpinus caroliniana* ssp. *virginiana*	American Hornbeam			S5	
Betulaceae	*Ostrya virginiana*	Eastern Hop-hornbeam			S5	
Boraginaceae	*Echium vulgare*	Common Viper's-bugloss			SNA	
Boraginaceae	*Hackelia virginiana*	Virginia Stickseed			S5	
Brassicaceae	*Alliaria petiolata*	Garlic Mustard			SNA	
Brassicaceae	*Barbarea vulgaris*	Yellow Rocket			SNA	
Brassicaceae	*Cardamine concatenata*	Cutleaf Toothwort			S5	
Brassicaceae	*Cardamine diphylla*	Broad-leaved Toothwort			S5	
Brassicaceae	*Cardamine pensylvanica*	Pennsylvania Bitter-cress			S5	
Brassicaceae	*Erysimum cheiranthoides* ssp. *cheiranthoides*	Woormseed Mustard			SNA	
Brassicaceae	*Hesperis matronalis*	Dame's Rocket			SNA	
Brassicaceae	*Lepidium densiflorum*	Dense-flower Pepper-grass			SNA	
Brassicaceae	*Rorippa palustris* ssp. *hispida*	Hispid Yellow-cress			S5	
Brassicaceae	*Sinapis arvensis*	Charlock			SNA	
Brassicaceae	*Thlaspi arvense*	Field Penny-cress			SNA	
Cannabaceae	*Humulus japonicus*	Japanese Hop			SNA	
Caprifoliaceae	*Lonicera dioica*	Glaucous Honeysuckle			S5	
Caprifoliaceae	*Lonicera morrowii*	Morrow's Honeysuckle			SNA	
Caprifoliaceae	*Lonicera tatarica*	Tartarian Honeysuckle			SNA	
Caprifoliaceae	*Sambucus canadensis*	Common Elderberry			S5	

Family Name	Scientific Name	Common Name	COSEWIC	COSSARO	S-RANK	City of Guelph (2012)
Caprifoliaceae	*Sambucus racemosa*	Red-berried Elder			S5	
Caprifoliaceae	*Symphoricarpos albus*	Snowberry			S5	
Caprifoliaceae	*Triosteum aurantiacum*	Horse Gentian			S5	
Caprifoliaceae	*Viburnum acerifolium*	Maple-leaf Viburnum			S5	
Caprifoliaceae	*Viburnum lantana*	Wayfaring-tree			SNA	
Caprifoliaceae	*Viburnum lentago*	Nannyberry			S5	
Caprifoliaceae	*Viburnum opulus*	Guelder-rose Viburnum			SNA	
Caprifoliaceae	*Viburnum opulus* var. *americanum*	Highbush Cranberry			S5	
Caryophyllaceae	*Cerastium arvense* ssp. *arvense*	Field Chickweed			SNA	
Caryophyllaceae	*Cerastium fontanum*	Common Mouse-ear Chickweed			SNA	
Caryophyllaceae	*Dianthus armeria*	Deptford-pink			SNA	
Caryophyllaceae	*Saponaria officinalis*	Bouncing-bet			SNA	
Caryophyllaceae	*Silene latifolia*	Bladder Campion			SNA	
Caryophyllaceae	*Silene noctiflora*	Night-flowering Catchfly			SNA	
Caryophyllaceae	*Silene vulgaris*	Maiden's Tears			SNA	
Caryophyllaceae	*Stellaria graminea*	Little Starwort			SNA	
Celastraceae	*Euonymus obovatus*	Running Strawberry-bush			S5	
Ceratophyllaceae	*Ceratophyllum demersum*	Common Hornwort			S5	
Chenopodiaceae	*Atriplex patula*	Halberd-leaf Saltbush			S5	
Chenopodiaceae	*Atriplex rosea**	Tumbling Orach*			SNA	
Chenopodiaceae	*Chenopodium album* var. *album*	White Goosefoot			SNA	
Chenopodiaceae	*Chenopodiastrum simplex*	Giant-seed Goosefoot			S5	
Clusiaceae	*Hypericum perforatum*	St. John's-wort			SNA	
Convolvulaceae	*Convolvulus arvensis*	Field Bindweed			SNA	
Convolvulaceae	*Cuscuta gronovii*	Gronovius Dodder			S5	

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Cornaceae	*Cornus alternifolia*	Alternate-leaf Dogwood			S5	
Cornaceae	*Cornus racemosa*	Gray Dogwood			S5	
Cornaceae	*Cornus sericea* ssp. *sericea*	Red-osier Dogwood			S5	
Crassulaceae	*Sedum acre*	Mossy Stonecrop			SNA	
Cucurbitaceae	*Echinocystis lobata*	Wild Mock-cucumber			S5	
Cupressaceae	*Juniperus communis*	Ground Juniper			S5	
Cupressaceae	*Juniperus virginiana*	Eastern Red Cedar			S5	
Cupressaceae	*Thuja occidentalis*	Northern White Cedar			S5	
Cyperaceae	*Carex atherodes*	Awned Sedge			S4S5	LS
Cyperaceae	*Carex bebbii*	Bebb's Sedge			S5	
Cyperaceae	*Carex cristatella*	Crested Sedge			S5	
Cyperaceae	*Carex disperma*	Softleaf Sedge			S5	
Cyperaceae	*Carex eburnea*	Ebony Sedge			S5	
Cyperaceae	*Carex foenea* var. *foenea*	Hay Sedge			S5	
Cyperaceae	*Carex gracillima*	Graceful Sedge			S5	
Cyperaceae	*Carex hystericina*	Porcupine Sedge			S5	
Cyperaceae	*Carex intumescens*	Bladder Sedge			S5	
Cyperaceae	*Carex lacustris*	Lake-bank Sedge			S5	
Cyperaceae	*Carex lasiocarpa*	Slender Sedge			S5	
Cyperaceae	*Carex lupulina*	Hop Sedge			S5	LS
Cyperaceae	*Carex molesta*	Troublesome Sedge			S4?	
Cyperaceae	*Carex pedunculata*	Longstalk Sedge			S5	
Cyperaceae	*Carex pellita*	Woolly Sedge			S5	
Cyperaceae	*Carex pensylvanica*	Pennsylvania Sedge			S5	
Cyperaceae	*Carex pseudo-cyperus*	Cyperus-like Sedge			S5	
Cyperaceae	*Carex radiata*	Stellate Sedge			S5	

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Cyperaceae	*Carex retrorsa*	Retrorse Sedge			S5	
Cyperaceae	*Carex rosea*	Rosy Sedge			S5	
Cyperaceae	*Carex spicata*	Spiked Sedge			SNA	
Cyperaceae	*Carex stipata*	Stalk-grain Sedge			S5	
Cyperaceae	*Carex stricta*	Tussock Sedge			S5	
Cyperaceae	*Carex utriculata*	Beaked Sedge			S5	
Cyperaceae	*Carex vulpinoidea*	Fox Sedge			S5	
Cyperaceae	*Eleocharis erythropoda*	Bald Spikerush			S5	
Cyperaceae	*Eleocharis obtusa*	Blunt Spikerush			S5	
Cyperaceae	*Eleocharis ovata**	Ovate Spikerush*			S5	
Cyperaceae	*Eleocharis palustris*	Creeping Spikerush			S5	
Cyperaceae	*Schoenoplectus pungens* var. *pungens*	Three-square Bulrush			S5	
Cyperaceae	*Schoenoplectus tabernaemontani*	Soft-stemmed Bulrush			S5	
Cyperaceae	*Scirpus atrovirens*	Woolgrass Bulrush			S5	
Cyperaceae	*Scirpus pendulus*	Pendulous Bulrush			S5	
Dipsacaceae	*Dipsacus fullonum* ssp. *sylvestris*	Common Teasel			SNA	
Dryopteridaceae	*Athyrium filix-femina* var. *angustum*	Lady-fern			S5	
Dryopteridaceae	*Cystopteris bulbifera*	Bulblet Fern			S5	
Dryopteridaceae	*Dryopteris carthusiana*	Spinulose Wood Fern			S5	
Dryopteridaceae	*Dryopteris cristata*	Crested Wood Fern			S5	
Dryopteridaceae	*Dryopteris marginalis*	Marginal Wood Fern			S5	
Dryopteridaceae	*Dryopteris* x *uliginosa*	Braun's Wood Fern			SNA	
Dryopteridaceae	*Matteuccia struthiopteris* var. *pensylvanica*	Ostrich Fern			S5	
Dryopteridaceae	*Onoclea sensibilis*	Sensitive Fern			S5	
Dryopteridaceae	*Polystichum acrostichoides*	Christmas Fern			S5	
Elaeagnaceae	*Elaeagnus angustifolia*	Russian Olive			SNA	

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Elaeagnaceae	*Elaeagnus umbellata*	Autum Olive			SNA	
Elatinaceae	*Elatine triandra**	Long-stemmed Waterwort*			S3	
Equisetaceae	*Equisetum arvense*	Field Horsetail			S5	
Equisetaceae	*Equisetum fluviatile*	Water Horsetail			S5	
Equisetaceae	*Equisetum palustre*	Marsh Horsetail			S5	LS
Equisetaceae	*Equisetum pratense*	Meadow Horsetail			S5	LS
Ericaceae	*Vaccinium corymbosum**	Highbush blueberry*			S5	LS*
Fabaceae	*Coronilla varia*	Crown-vetch			SNA	
Fabaceae	*Desmodium canadense*	Showy Tick-trefoil			S4	
Fabaceae	*Gleditsia triacanthos*	Honey Locust			S2	
Fabaceae	*Lotus corniculatus*	Bird's-foot Trefoil			SNA	
Fabaceae	*Medicago lupulina*	Black Medic			SNA	
Fabaceae	*Medicago sativa* ssp. *falcata*	Alfalfa			SNA	
Fabaceae	*Medicago sativa* ssp. *sativa*	Alfalfa			SNA	
Fabaceae	*Melilotus alba*	White Sweet Clover			SNA	
Fabaceae	*Robinia pseudo-acacia*	Black Locust			SNA	
Fabaceae	*Trifolium aureum*	Yellow Clover			SNA	
Fabaceae	*Trifolium hybridum* ssp. *elegans*	Alsike Clover			SNA	
Fabaceae	*Trifolium pratense*	Red Clover			SNA	
Fabaceae	*Trifolium repens*	White Clover			SNA	
Fabaceae	*Vicia cracca*	Tufted Vetch			SNA	
Fagaceae	*Fagus grandifolia*	American Beech			S5	
Fagaceae	*Quercus alba*	White Oak			S5	
Fagaceae	*Quercus macrocarpa*	Bur Oak			S5	
Fagaceae	*Quercus rubra*	Northern Red Oak			S5	
Gentianaceae	*Gentiana andrewsii*	Closed Gentian			S4	

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Geraniaceae	*Geranium maculatum*	Wild Geranium			S5	
Geraniaceae	*Geranium robertianum*	Herb-robert			S5	
Grossulariaceae	*Ribes americanum*	Wild Black Currant			S5	
Grossulariaceae	*Ribes cynosbati*	Prickly Gooseberry			S5	
Grossulariaceae	*Ribes rubrum*	Northern Red Currant			SNA	
Haloragaceae	*Myriophyllum* sp.	Water-milfoil Species				
Hippocastanaceae	*Aesculus hippocastanum*	Horse Chestnut			SNA	
Hydrocharitaceae	*Vallisneria americana*	Eel-grass			S5	
Iridaceae	*Iris pseudacorus*	Yellow Iris			SNA	
Iridaceae	*Iris* sp.	Iris Species				
Iridaceae	*Iris versicolor*	Blueflag			S5	
Iridaceae	*Sisyrinchium montanum*	Strict Blue-eyed-grass			S5	
Juglandaceae	*Carya cordiformis*	Bitternut Hickory			S5	
Juglandaceae	*Juglans cinerea*	Butternut	END	END	S2?	LS
Juglandaceae	*Juglans nigra*	Black Walnut			S4?	
Juncaceae	*Juncus articulatus*	Jointed Rush			S5	
Juncaceae	*Juncus dudleyi*	Dudley's Rush			S5	
Juncaceae	*Juncus effusus* ssp. *solutus*	Soft Rush			S5	
Juncaceae	*Juncus pylaei*	Rush			S5?	
Juncaceae	*Juncus tenuis*	Slender Rush			S5	
Lamiaceae	*Clinopodium vulgare*	Field Basil			S5	
Lamiaceae	*Leonurus cardiaca* ssp. *cardiaca*	Common Motherwort			SNA	
Lamiaceae	*Lycopus americanus*	American Bugleweed			S5	
Lamiaceae	*Lycopus uniflorus*	Northern Bugleweed			S5	
Lamiaceae	*Mentha arvensis*	Corn Mint			S5	
Lamiaceae	*Nepeta cataria*	Catnip			SNA	

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Lamiaceae	*Prunella vulgaris* ssp. *lanceolata*	Self-heal			S5	
Lamiaceae	*Prunella vulgaris* ssp. *vulgaris*	Common Heal-all			SNA	
Lamiaceae	*Scutellaria galericulata*	Hooded Skullcap			S5	
Lamiaceae	*Scutellaria lateriflora*	Mad Dog Skullcap			S5	
Lemnaceae	*Lemna minor*	Lesser Duckweed			S5	
Lemnaceae	*Lemna trisulca*	Star Duckweed			S5	
Lemnaceae	*Spirodela polyrhiza*	Common Water-flaxseed			S5	
Liliaceae	*Allium tricoccum*	Wild Leek			S5	
Liliaceae	*Asparagus officinalis*	Asparagus			SNA	
Liliaceae	*Clintonia borealis*	Blue Bead Lily			S5	
Liliaceae	*Convallaria majalis*	European Lily-of-the-valley			SNA	
Liliaceae	*Erythronium americanum* ssp. *americanum*	Yellow Trout-lily			S5	
Liliaceae	*Hemerocallis fulva*	Orange Daylily			SNA	
Liliaceae	*Lilium philadelphicum*	Wood Lily			S5	LS
Liliaceae	*Maianthemum canadense*	Wild-lily-of-the-valley			S5	
Liliaceae	*Maianthemum racemosum* ssp. *racemosum*	False Solomon's Seal			S5	
Liliaceae	*Narcissus pseudonarcissus*	Daffodil			SNA	
Liliaceae	*Polygonatum pubescens*	Downy Solomon's Seal			S5	
Liliaceae	*Trillium grandiflorum*	White Trillium			S5	
Lythraceae	*Decodon verticillatus*	Hairy Swamp Loosestrife			S5	LS
Lythraceae	*Lythrum salicaria*	Slender-spike Loosestrife			SNA	
Malvaceae	*Malva neglecta*	Cheeses			SNA	
Monotropaceae	*Hypopitys monotropa*	Pinesap			S4	
Moraceae	*Morus alba*	White Mulberry			SNA	
Nymphaeaceae	*Nuphar variegata*	Bullhead Pond-lily			S5	
Oleaceae	*Forsythia viridissima*	Golden-bells			SNA	

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Oleaceae	*Fraxinus americana*	White Ash			S5	
Oleaceae	*Fraxinus nigra*	Black Ash			S5	
Oleaceae	*Fraxinus pennsylvanica*	Green Ash			S5	
Oleaceae	*Ligustrum vulgare*	European Privet			SNA	
Oleaceae	*Syringa vulgaris*	Common Lilac			SNA	
Onagraceae	*Chamaenerion angustifolium* ssp. *angustifolium*	Fireweed			S5	LS
Onagraceae	*Circaea lutetiana* ssp. *canadensis*	Enchanter's Nightshade			S5	
Onagraceae	*Epilobium ciliatum* ssp. *ciliatum*	Hairy Willow-herb			S5	
Onagraceae	*Epilobium coloratum*	Purple-leaf Willow-herb			S5	
Onagraceae	*Epilobium hirsutum*	Great-hairy Willow-herb			SNA	
Onagraceae	*Epilobium leptophyllum*	Linear-leaved Willow-herb			S5	
Onagraceae	*Epilobium parviflorum*	Small-flower Willow-herb			SNA	
Onagraceae	*Epilobium strictum*	Downy Willow-herb			S5	LS
Onagraceae	*Oenothera biennis*	Common Evening-primrose			S5	
Orchidaceae	*Cypripedium parviflorum* var. *pubescens*	Large Yellow Lady's-slipper			S5	
Orchidaceae	*Epipactis helleborine*	Eastern Helleborine			SNA	
Osmundaceae	*Osmunda cinnamomea*	Cinnamon Fern			S5	
Osmundaceae	*Osmunda claytoniana*	Interrupted Fern			S5	LS
Osmundaceae	*Osmunda regalis* var. *spectabilis*	Royal Fern			S5	
Oxalidaceae	*Oxalis stricta*	Upright Yellow Wood Sorrel			S5	
Paeoniaceae	*Paeonia officinalis*	Common Peony			SNA	
Papaveraceae	*Chelidonium majus*	Greater Celadine			SNA	
Papaveraceae	*Sanguinaria canadensis*	Bloodroot			S5	
Pinaceae	*Abies balsamea*	Balsam Fir			S5	
Pinaceae	*Larix decidua*	European Larch			SNA	
Pinaceae	*Larix laricina*	American Larch			S5	

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Pinaceae	*Picea abies*	Norway Spruce			SNA	
Pinaceae	*Picea glauca*	White Spruce			S5	
Pinaceae	*Picea pungens*	Colorado Spruce			SNA	
Pinaceae	*Pinus banksiana*	Jack Pine			S5	
Pinaceae	*Pinus nigra*	Black Pine			SNA	
Pinaceae	*Pinus resinosa*	Red Pine			S5	
Pinaceae	*Pinus strobus*	Eastern White Pine			S5	
Pinaceae	*Pinus sylvestris*	Scotch Pine			SNA	
Pinaceae	*Tsuga canadensis*	Eastern Hemlock			S5	
Plantaginaceae	*Plantago lanceolata*	English Plantain			SNA	
Plantaginaceae	*Plantago major*	Nipple-seed Plantain			SNA	
Poaceae	*Agrostis gigantea*	Redtop			SNA	
Poaceae	*Agrostis scabra*	Rough Bentgrass			S5	
Poaceae	*Agrostis stolonifera*	Spreading Bentgrass			SNA	
Poaceae	*Bromus inermis* ssp. *inermis*	Smooth Brome			SNA	
Poaceae	*Calamagrostis canadensis*	Blue-joint Reedgrass			S5	
Poaceae	*Dactylis glomerata*	Orchard Grass			SNA	
Poaceae	*Dichanthelium acuminatum* ssp. *implicatum*	Mat Panic Grass			S5	
Poaceae	*Digitaria sanguinalis*	Hairy Crabgrass			SNA	
Poaceae	*Echinochloa crusgalli*	Barnyard Grass			SNA	
Poaceae	*Elymus repens*	Quack Grass			SNA	
Poaceae	*Festuca rubra* ssp. *rubra*	Red Fescue			SNA	
Poaceae	*Glyceria borealis*	Northern Manna Grass			S5	
Poaceae	*Glyceria grandis*	American Manna Grass			S4S5	
Poaceae	*Glyceria septentrionalis*	Floating Manna Grass			S4	
Poaceae	*Glyceria striata*	Fowl Manna Grass			S5	

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Poaceae	*Leersia oryzoides*	Rice Cutgrass			S5	
Poaceae	*Lolium pratense*	Meadow Fescue			SNA	
Poaceae	*Panicum capillare*	Old Panic Grass			S5	
Poaceae	*Phalaris arundinacea*	Reed Canary Grass			S5	
Poaceae	*Phleum pratense*	Timothy			SNA	
Poaceae	*Poa compressa*	Canada Bluegrass			SNA	
Poaceae	*Poa palustris*	Fowl Bluegrass			S5	
Poaceae	*Poa pratensis* ssp. *pratensis*	Kentucky Bluegrass			SNA	
Poaceae	*Secale cereale*	Cultivated Rye			SNA	
Poaceae	*Setaria viridis*	Green Bristle Grass			SNA	
Poaceae	*Spartina pectinate**	Fresh Water Cordgrass*			S4	LS
Polygalaceae	*Persicaria amphibia*	Water Smartweed			S5	
Polygonaceae	*Persicaria maculosa*	Mild Water-pepper			S5	
Polygonaceae	*Polygonum persicaria*	Lady's Thumb			SNA	
Polygonaceae	*Persicaria punctatum*	Dotted Smartweed			S5	
Polygonaceae	*Rumex crispus*	Curly Dock			SNA	
Polygonaceae	*Rumex obtusifolius* ssp. *obtusifolius*	Bitter Dock			SNA	
Portulacaceae	*Portulaca oleracea*	Common Purslane			SNA	
Potamogetonaceae	*Stuckenia pectinatus*	Sago Pondweed			S5	
Primulaceae	*Lysimachia ciliata*	Fringed Loosestrife			S5	
Primulaceae	*Lysimachia nummularia*	Moneywort			SNA	
Primulaceae	*Lysimachia quadrifolia*	Whorled Loosestrife			S4	
Primulaceae	*Lysimachia thyrsiflora*	Water Loosestrife			S5	
Primulaceae	*Lysmiachia terrestris*	Swamp Loosestrife			S5	
Primulaceae	*Trientalis borealis* ssp. *borealis*	Northern Starflower			S5	
Ranunculaceae	*Actaea pachypoda*	White Baneberry			S5	

Family Name	Scientific Name	Common Name	COSEWIC	COSSARO	S-RANK	City of Guelph (2012)
Ranunculaceae	*Anemone americana*	Round-lobed Hepatica			S5	
Ranunculaceae	*Anemone canadensis*	Canada Anemone			S5	
Ranunculaceae	*Anemone virginiana* ssp. *virginiana*	Virginia Anemone			S5	
Ranunculaceae	*Aquilegia canadensis*	Wild Columbine			S5	
Ranunculaceae	*Caltha palustris*	Marsh Marigold			S5	
Ranunculaceae	*Coptis trifolia*	Goldthread			S5	
Ranunculaceae	*Ranunculus abortivus*	Kidney-leaved Buttercup			S5	
Ranunculaceae	*Ranunculus acris*	Tall Buttercup			SNA	
Ranunculaceae	*Ranunculus flabellaris*	Yellow Water-crowfoot			S4?	LS
Ranunculaceae	*Ranunculus gmelinii*	Small Yellow Water Buttercup			S5	LS
Ranunculaceae	*Ranunculus hispidus* var. *caricetorum*	Swamp Buttercup			S5	
Ranunculaceae	*Ranunculus hispidus* var. *hispidus*	Bristly Buttercup			S3	
Ranunculaceae	*Ranunculus pensylvanicus*	Bristly Crowfoot			S5	
Ranunculaceae	*Ranunculus recurvatus* var. *recurvatus*	Hooked Crowfoot			S5	
Ranunculaceae	*Ranunculus repens*	Creeping Buttercup			SNA	
Ranunculaceae	*Ranunculus sceleratus* var. *sceleratus*	Cursed Crowfoot			SNA	
Ranunculaceae	*Thalictrum dioicum*	Early Meadowrue			S5	
Ranunculaceae	*Thalictrum pubescens*	Tall Meadowrue			S5	
Rhamnaceae	*Frangula alnus*	Glossy Buckthorn			SNA	
Rhamnaceae	*Rhamnus cathartica*	Buckthorn			SNA	
Rosaceae	*Agrimonia gryposepala*	Tall Hairy Agrimony			S5	
Rosaceae	*Crataegus macrosperma*	Variable Hawthorn			S5	
Rosaceae	*Crataegus mollis**	Downy Hawthorn*			S5	
Rosaceae	*Crataegus monogyna*	English Hawthorn			SNA	
Rosaceae	*Crataegus punctata*	Dotted Hawthorn			S5	
Rosaceae	*Crataegus* sp.	Hawthorn Species				

Family Name	**Scientific Name**	**Common Name**	**COSEWIC**	**COSSARO**	**S-RANK**	**City of Guelph (2012)**
Rosaceae	*Crataegus succulenta*	Fleshy Hawthorn			S4S5	
Rosaceae	*Fragaria vesca* ssp. *americana*	Woodland Strawberry			S5	
Rosaceae	*Fragaria virginiana*	Wild Stawberry			S5	
Rosaceae	*Geum aleppicum*	Yellow Avens			S5	
Rosaceae	*Geum canadense*	White Avens			S5	
Rosaceae	*Geum laciniatum*	Rough Avens			S4	LS
Rosaceae	*Geum rivale*	Purple Avens			S5	
Rosaceae	*Geum urbanum*	Clover-root			SNA	
Rosaceae	*Malus pumila*	Common Apple			SNA	
Rosaceae	*Malus* sp.	Apple Species				
Rosaceae	*Potentilla argentea*	Silvery Cinquefoil			SNA	
Rosaceae	*Potentilla norvegica* ssp. *monspeliensis*	Norwegian Cinquefoil			S5	
Rosaceae	*Potentilla recta*	Sulphur Cinquefoil			SNA	
Rosaceae	*Prunus avium*	Sweet Cherry			SNA	
Rosaceae	*Prunus mahaleb*	Perfumed Cherry			SNA	
Rosaceae	*Prunus nigra*	Canada Plum			S4	
Rosaceae	*Prunus pensylvanica*	Fire Cherry			S5	
Rosaceae	*Prunus serotina*	Wild Black Cherry			S5	
Rosaceae	*Prunus virginiana* var. *virginiana*	Choke Cherry			S5	
Rosaceae	*Pyrus communis*	Common Pear			SNA	
Rosaceae	*Rosa multiflora*	Rambler Rose			SNA	
Rosaceae	*Rubus allegheniensis*	Allegheny Blackberry			S5	
Rosaceae	*Rubus idaeus* ssp. *strigosus*	Wild Red Raspberry			S5	
Rosaceae	*Rubus occidentalis*	Black Raspberry			S5	
Rosaceae	*Rubus pubescens*	Dwarf Raspberry			S5	
Rosaceae	*Sorbus aucuparia*	European Mountain-ash			SNA	

Family Name	**Scientific Name**	**Common Name**	**COSEWIC**	**COSSARO**	**S-RANK**	**City of Guelph (2012)**
Rosaceae	*Spiraea alba*	Narrow-leaved Meadow-sweet			S5	
Rosaceae	*Waldsteinia fragarioides*	Barren Strawberry			S5	
Rubiaceae	*Cephalanthus occidentalis*	Buttonbush			S5	LS
Rubiaceae	*Galium asprellum*	Rough Bedstraw			S5	
Rubiaceae	*Galium mollugo*	White Bedstraw			SNA	
Rubiaceae	*Galium palustre*	Marsh Bedstraw			S5	
Rubiaceae	*Galium trifidum* ssp. *trifidum*	Small Bedstraw			S5	
Rubiaceae	*Galium triflorum*	Sweet-scent Bedstraw			S5	
Rubiaceae	*Galium verum*	Yellow Bedstraw			SNA	
Rutaceae	*Zanthoxylum americanum*	Northern Prickly Ash			S5	
Salicaceae	*Populus alba*	White Poplar			SNA	
Salicaceae	*Populus balsamifera* ssp. *balsamifera*	Balsam Poplar			S5	
Salicaceae	*Populus deltoides* ssp. *deltoides*	Eastern Cottonwood			S5	
Salicaceae	*Populus grandidentata*	Large-tooth Aspen			S5	
Salicaceae	*Populus tremuloides*	Quaking Aspen			S5	
Salicaceae	*Salix alba*	White Willow			SNA	
Salicaceae	*Salix amygdaloides*	Peach-leaved Willow			S5	
Salicaceae	*Salix bebbiana*	Bebb's Willow			S5	
Salicaceae	*Salix candida*	Hoary Willow			S5	
Salicaceae	*Salix discolor*	Pussy Willow			S5	
Salicaceae	*Salix eriocephala*	Heart-leaved Willow			S5	
Salicaceae	*Salix interior*	Sandbar Willow			S5	
Salicaceae	*Salix fragilis*	Crack Willow			SNA	
Salicaceae	*Salix lucida*	Shining Willow			S5	
Salicaceae	*Salix nigra*	Black Willow			S4?	
Salicaceae	*Salix petiolaris*	Meadow Willow			S5	

Family Name	**Scientific Name**	**Common Name**	**COSEWIC**	**COSSARO**	**S-RANK**	**City of Guelph (2012)**
Salicaceae	*Salix purpurea*	Basket Willow			SNA	
Salicaceae	*Salix serissima*	Autumn Willow			S5	
Salicaceae	*Salix* x *fragilis*	Hybrid Crack Willow			SNA	
Saxifragaceae	*Penthorum sedoides*	Ditch-stonecrop			S5	
Scrophulariaceae	*Chelone glabra*	Turtlehead			S5	
Scrophulariaceae	*Linaria vulgaris*	Butter-and-eggs			SNA	
Scrophulariaceae	*Mimulus ringens*	Square-stem Monkey-flower			S5	
Scrophulariaceae	*Penstemon digitalis*	Foxglove Beardtongue			SNA	
Scrophulariaceae	*Verbascum thapsus*	Common Mullein			SNA	
Scrophulariaceae	*Veronica americana*	American Speedwell			S5	
Scrophulariaceae	*Veronica anagallis-aquatica*	Brook-pimpernell			SNA	
Scrophulariaceae	*Veronica officinalis*	Common Speedwell			SNA	
Scrophulariaceae	*Veronica scutellata*	Marsh Speedwell			S5	
Smilacaceae	*Smilax tamnoides*	Hispid Greenbrier			S4	
Solanaceae	*Solanum dulcamara*	Climbing Nightshade			SNA	
Solanaceae	*Solanum ptychanthum*	Eastern Black Nightshade			S5	
Sparganiaceae	*Sparganium americanum*	American Bur-reed			S4?	
Sparganiaceae	*Sparganium eurycarpum*	Large Bur-reed			S5	
Thelypteridaceae	*Thelypteris palustris* var. *pubescens*	Marsh Fern			S5	
Thymelaeaceae	*Dirca palustris*	Eastern Leatherwood			S4?	
Tiliaceae	*Tilia americana*	American Basswood			S5	
Typhaceae	*Typha angustifolia*	Narrow-leaved Cattail			SNA	
Typhaceae	*Typha latifolia*	Broad-leaf Cattail			S5	
Ulmaceae	*Ulmus americana*	American Elm			S5	
Ulmaceae	*Ulmus pumila*	Siberian Elm			SNA	
Ulmaceae	*Ulmus rubra*	Slippery Elm			S5	

Family Name	Scientific Name	Common Name	COSEWIC	COSSARO	S-RANK	City of Guelph (2012)
Urticaceae	*Boehmeria cylindrica*	False Nettle			S5	
Urticaceae	*Laportea canadensis*	Wood Nettle			S5	
Urticaceae	*Pilea pumila*	Canada Clearweed			S5	LS
Urticaceae	*Urtica dioica* ssp. *gracilis*	Slender Stinging Nettle			S5	
Violaceae	*Viola affinis*	Lecontes Violet			S4?	
Violaceae	*Viola labradorica*	American Dog Violet			S5	
Violaceae	*Viola macloskeyi* ssp. *pallens*	Smooth White Violet			S5	
Violaceae	*Viola pubescens*	Downy Yellow Violet			S5	
Violaceae	*Viola sororia*	Woolly Blue Violet			S5	
Violaceae	*Viola* sp.	Violet Species				
Vitaceae	*Parthenocissus vitacea*	Thicket Creeper			S5	
Vitaceae	*Vitis riparia*	Riverbank Grape			S5	

*Species recorded from a previous site-specific study in the Primary Study Area likely to have been misidentified.

City of Guelph. 2012. Locally Significant Plant List. 24 pp.

LS = Locally Signficant

Appendix NH-5

Clair-Maltby Primary Study Area Wildlife List

Appendix NH-5

Clair-Maltby Primary Study Area Wildlife List

Common Name	Latin Name	COSEWIC (a)	COSSARO (b)	S-Rank (c)	Wellington County (d)	Secondary Plan Area	Primary Study Area	Sources (e)
BIRDS								
Pied-billed Grebe	*Podilymbus podiceps*			S4	S,R	B	B	1,19
Great Blue Heron**	*Ardea herodias*			S4	S,R	x	x	1,2,9,22
Tundra Swan	*Cygnus columbianus*			S4			B	5
Canada Goose	*Branta canadensis*			S5		B	B	1,2,5,9,17,18,19,20
Wood Duck	*Aix sponsa*			S5			B	1,5,19,20
Mallard	*Anas platyrhynchos*			S5		B	B	1,2,5,9,18,19,20,22
Ring-necked Duck	*Aythya collaris*			S5	S,R	x	x	1,19
Bufflehead	*Bucephala albeola*			S4			x	19
Common Merganser	*Mergus merganser*			S5	S,R	x		1
Turkey Vulture	*Cathartes aura*			S5	S,R		x	1,5,9,13,14,19,20,22
Osprey	*Pandion haliaetus*			S5	S,R	B	B	1,19
Northern Harrier	*Circus cyaneus*			S4	S		B	13,14,19
Sharp-shinned Hawk	*Accipiter striatus*			S5	S		B	19
Cooper's Hawk	*Accipiter cooperi*			S4	S	x	B	1,5
Red-shouldered Hawk	*Buteo lineatus*			S4	S,R		x	13,14
Broad-winged Hawk	*Buteo platypterus*			S5	S,R		B	13,14,19
Red-tailed Hawk	*Buteo jamaicensis*			S5		B	B	1,5,13,14,19,20,22
Wild Turkey	*Meleagris gallopavo*			S5		B	x	1,10,11,12,20
Ruffed Grouse	*Bonasa umbellus*			S4		B	B	1,5,13,14,20
Sora	*Porzana carolina*			S4	S,R		B	4,19
Killdeer	*Charadrius vociferus*			S5		B	B	1,2,5,7,9,13,14,17,19,20,22
Spotted Sandpiper	*Actitis macularia*			S5		B		1
American Woodcock	*Scolopax minor*			S4			B	1,7,13,14,19,22
Ring-billed Gull**	*Larus delawarensis*			S5	S,R	x	x	2,5,19,20
Herring Gull**	*Larus argentatus*			S5	S,R		x	20
Tern sp.	*Sternidae sp*			n/a		x	x	1
Rock Pigeon	*Columba livia*			SNA			B	5,9,13,14,19,22
Mourning Dove	*Zenaida macroura*			S5		B	B	1,2,5,9,13,14,19,20,22
Black-billed Cuckoo	*Coccyzus erythropthalmus*			S5	S		B	19
Yellow-billed Cuckoo	*Coccyzus americanus*			S4	S,R		B	7
Great Horned Owl	*Bubo virginianus*			S4			B	13,14,20

Common Name	Latin Name	COSEWIC (a)	COSSARO (b)	S-Rank (c)	Wellington County (d)	Secondary Plan Area	Primary Study Area	Sources (e)
Ruby-throated Hummingbird	*Archilochus colubris*			S5			B	19
Belted Kingfisher	*Ceryle alcyon*			S4		B		1
Yellow-bellied Sapsucker	*Sphyrapicus varius*			S5	S		B	19,20
Red-bellied Woodpecker	*Melanerpes carolinus*			S4			B	20
Downy Woodpecker	*Picoides pubescens*			S5		B	B	1,5,9,13,14,19,20,22
Hairy Woodpecker	*Picoides villosus*			S5	S	B	B	1,5,19,20
Northern Flicker	*Colaptes auratus*			S4	S	B	B	1,5,19,20,22
Pileated Woodpecker	*Dryocopus pileatus*			S5	S	B	B	1,19,20
Eastern Wood-Pewee	*Contopus virens*	SC	SC	S4	S	B	B	1,4,5,7,19
Alder Flycatcher	*Empidonax alnorum*			S5			B	13,14,19
Willow Flycatcher	*Empidonax traillii*			S5	S	B	B	1,2,19
Least Flycatcher	*Empidonax minimus*			S4	S	B	B	1,5,19
Eastern Phoebe	*Sayornis phoebe*			S5		B	B	1,9,19,20
Great Crested Flycatcher	*Myiarchus crinitus*			S4		B	B	1,5,7,9,19
Eastern Kingbird	*Tyrannus tyrannus*			S4	S	B	B	1,2,5,7,9,13,14,19,22
Horned Lark	*Eremophila alpestris*			S5		B	B	1,13,14
Tree Swallow	*Tachycineta bicolor*			S4		B	B	1,2,5,7,9,19,22
N. Rough-winged Swallow	*Stelgidopteryx serripennis*			S4			B	5
Cliff Swallow**	*Petrochelidon pyrrhonota*			S4	S	B	B	5,6,7
Barn Swallow	*Hirundo rustica*	THR	THR	S4		B	B	1,2,5,6,9,19,20,22
Blue Jay	*Cyanocitta cristata*			S5		B	B	1,5,7,9,13,14,17,19,20,22
American Crow	*Corvus brachyrhynchos*			S5		B	B	1,2,5,7,9,13,14,19,20,22
Common Raven	*Corvus corax*			S5	S,R		B	19
Black-capped Chickadee	*Poecile atricapillus*			S5		B	B	1,2,5,7,9,13,14,17,19,20,22
Red-breasted Nuthatch	*Sitta canadensis*			S5	S		B	20
White-breasted Nuthatch	*Sitta carolinensis*			S5		B	B	1,5,13,14,19,20
Brown Creeper	*Certhia americana*			S5	S	B	B	1,20
House Wren	*Troglodytes aedon*			S5		B	B	1,2,5,7,9,13,14,19,22
Winter Wren	*Troglodytes hiemalis*			S5	S		B	20
Golden-crowned Kinglet	*Regulus satrapa*			S5			B	20
Ruby-crowned Kinglet	*Regulus calendula*			S4	S,R		x	1,13,14,20
Eastern Bluebird	*Sialia sialis*			S5			B	7
Hermit Thrush	*Catharus guttatus*			S5			x	20
Wood Thrush	*Hylocichla mustelina*	THR	SC	S4	S		B	4,7
American Robin	*Turdus migratorius*			S5		B	B	1,2,5,6,7,9,13,14,19,20,22
Gray Catbird	*Dumetella carolinensis*			S4		B	B	1,2,5,7,9,13,14,17,19,22

Common Name	Latin Name	COSEWIC (a)	COSSARO (b)	S-Rank (c)	Wellington County (d)	Secondary Plan Area	Primary Study Area	Sources (e)
Brown Thrasher	*Toxostoma rufum*			S4	S	B	B	1,5,13,14,19
Cedar Waxwing	*Bombycilla cedrorum*			S5		B	B	1,2,5,13,14,19,22
European Starling	*Sturnus vulgaris*			SE		B	B	1,2,5,13,14,19,20,22
Warbling Vireo	*Vireo gilvus*			S5		B	B	1,2,5,7,19,22
Red-eyed Vireo	*Vireo olivaceus*			S5		B	B	1,5,13,14,19
Yellow Warbler	*Setophaga petechia*			S5		B	B	1,2,5,9,13,14,19
Chestnut-sided Warbler	*Setophaga pensylvanica*			S5			B	7,19
Magnolia Warbler	*Setophaga magnolia*			S5	S,R		B	13,14
Yellow-rumped Warbler	*Setophaga coronata*			S5			B	19,20
Black-throated Green Warbler	*Setophaga virens*			S5	S,R		B	1,13,14,19
Pine Warbler	*Setophaga pinus*			S5	S	B	B	1,13,14,19,20
Black-and-white Warbler	*Mniotilta varia*			S5	S		B	13,14
American Redstart	*Setophaga ruticilla*			S5	S	B	B	1,2,5
Ovenbird	*Seiurus aurocapillus*			S4			B	19
Northern Waterthrush	*Parkesia noveboracensis*			S5			B	1
Mourning Warbler	*Geothlypis philadelphia*			S4			B	13,14
Common Yellowthroat	*Geothlyphis trichas*			S5		B	B	1,5,13,14,19,22
Yellow-breasted Chat	*Icteria virens*	END	END	S2	S,R		B	19,20,21
Scarlet Tanager	*Piranga olivacea*			S4	S,R	B		1
Northern Cardinal	*Cardinalis cardinalis*			S5		B	B	1,2,5,7,9,13,14,19,20
Rose-breasted Grosbeak	*Pheucticus ludovicianus*			S4	S	B	B	1,5,13,14,19
Indigo Bunting	*Passerina cyanea*			S4		B	B	1,2,5,7,13,14,17,19
Eastern Towhee	*Pipilio erythrophthalmus*			S4	S	B	B	1,5,19
American Tree Sparrow	*Spizelloides arborea*			S4			B	19
Chipping Sparrow	*Spizella passerina*			S5		B	B	1,2,5,7,9,13,14,19
Field Sparrow	*Spizella pusilla*			S4	S	B	B	1,2,5,7,19,22
Vesper Sparrow	*Pooecetes gramineus*			S4	S	B	B	1,13,14,19
Savannah Sparrow	*Passerculus sandwichensis*			S4	S	B	B	1,2,7,9,13,14
Grasshopper Sparrow	*Ammodramus savannarum*			S4	S,R		B	1
Song Sparrow	*Melospiza melodia*			S5		B	B	1,2,5,7,9,13,14,17,19,20,22
Swamp Sparrow	*Melospiza georgiana*			S5		B	B	1,13,14,19
White-throated Sparrow	*Zonotrichia albicollis*			S5			B	19
Dark-eyed Junco	*Junco hyemalis*			S5	S,R		B	13,14,19,20
Bobolink	*Dolichonyx oryzivorus*	THR	THR	S4	S	B	B	2,8,22
Red-winged Blackbird	*Agelaius phoeniceus*			S4		B	B	1,2,5,7,9,13,14,17,19,20,22
Eastern Meadowlark	*Sturnella magna*	THR	THR	S4	S		B	1,2,19,20,22

Common Name	**Latin Name**	**COSEWIC (a)**	**COSSARO (b)**	**S-Rank (c)**	**Wellington County (d)**	**Secondary Plan Area**	**Primary Study Area**	**Sources (e)**
Brewer's Blackbird	*Euphagus cyanocephalus*			S4	S,R		x	20
Common Grackle	*Quiscalus quiscula*			S5		B	B	1,2,5,7,9,19,20
Brown-headed Cowbird	*Molothrus ater*			S4		B	B	1,5,9,13,14,19,20,22
Baltimore Oriole	*Icterus galbula*			S4	S	B	B	1,5,7,9,13,14,19,22
House Finch	*Haemorhous mexicanus*			SNA		B	x	2,13,14
Purple Finch	*Haemorhous purpureus*			S4		B	B	1,20
Pine Siskin	*Spinus pinus*			S4			B	20
American Goldfinch	*Spinus tristis*			S5		B	B	1,2,5,7,9,13,14,17,19,20,22
House Sparrow	*Passer domesticus*			SNA		B		2
AMPHIBIANS								
American Toad	*Bufo americanus americanus*			S5		B	B	1,3,4,5,7,9,10,11,12,19,23
Tetraploid Gray Treefrog	*Hyla versicolor*			S5		B	B	1,2,3,4,5,7,8,9,10,11,12,13,14,19,20,22,23
Western Chorus Frog	*Pseudacris triseriata*	THR		S3	S,R	B	B	1,4,7,8,19,21,23
Spring Peeper	*Pseudacris crucifer crucifer*			S5		B	B	1,2,3,4,5,7,8,9,10,11,12,19,20,22,23
Bullfrog	*Rana catesbeiana*			S4	S,R	B	B	1,3,4,19,20,21
Green Frog	*Rana clamitans*			S5		B	B	1,2,3,4,5,7,8,9,10,11,12,19,20,22
Pickerel Frog	*Rana palustris*			S4	S,R	B	x	3,23
Northern Leopard Frog	*Rana pipiens*			S5		B	B	1,2,3,4,5,8,9,10,11,12,18,19,20,22,23
Wood Frog	*Rana sylvatica*			S5		B	B	1,3,4,5,7,8,9,10,11,12,18,19,20,23
Blue-spotted Salamander	*Ambystoma laterale*			S4	S,R		B	19,20
Blue-spotted dominated polyploid Salamander	*Ambystoma (2) laterale - jeffersonianum*			S4	S,R		B	3,5,10,11,12,20
Blue-spotted/Blue-spotted dominated polyploid Salamander	*Ambystoma laterale or Ambystoma (2) laterale - jeffersonianum*			S4	S,R		x	1,11,12,23
Yellow (Spotted) Salamander	*Ambystoma maculatum*			S4	S,R	B	B	18,19,20
Salamander sp.	*n/a*			n/a			x	1
Eastern Newt	*Notophtalmus viridescens*			S5			x	1,3,5,20
Red-spotted Newt	*Notophtalmus viridescens viridescens*			S5	S,R	B	B	20,23
REPTILES								
Snapping Turtle	*Chelydra serpentina*	SC	SC	S3	S,R	B	B	1,2,3,4,7,18,21
Midland Painted Turtle	*Chrysemys picta marginata*			S5		B	x	1,2,3,5,7,10,11,12,19
Red-eared Slider	*Trachemys scripta elegans*			SE			x	1
Northern Water Snake	*Nerodia sipedon sipedon*			S5	S,R		x	1
Brown Snake	*Storeria dekayi dekayi*			S5	S,R		x	1,5,10,11,12
Redbelly Snake	*Storeria o. occipitomaculata*			S5	S,R	x	x	2,3,4,5,10,11,12,20
Ribbon Snake	*Thamnophis sauritus septentrionalis*	SC	SC	S4		x	x	1,19,20,21

Common Name	Latin Name	COSEWIC (a)	COSSARO (b)	S-Rank (c)	Wellington County (d)	Secondary Plan Area	Primary Study Area	Sources (e)
Eastern Garter Snake	*Thamnophis sirtalis sirtalis*			S5		x	x	1,2,3,4,5,10,11,12,13,14,19,20
MAMMALS								
Northern Short-tailed Shrew	*Blarina brevicauda*			S5			x	5
Shrew Sp.	*Sorex Sp.*			n/a			x	3
Star-nosed Mole	*Condylura cristata*			S5			x	3,4
Small-footed Bat	*Myotis leibii*		END	S2S3	S,R		x	5
Silver-haired Bat	*Lasionycteris noctivagans*			S4			x	5
Big Brown Bat	*Epesicus fuscus*			S4			x	5
Eastern Red Bat	*Lasiurus borealis*			S4			x	5
Hoary Bat	*Lasiurus cinereus*			S4			x	5
Bat Sp.	*n/a*			n/a			x	9
Eastern Cottontail	*Sylvilagus floridanus*			S5		x	x	1,3,5,7,9,19
Eastern Chipmunk	*Tamias striatus*			S5		x	x	1,3,5,10,11,12,13,14,19
Woodchuck	*Marmota monax*			S5			x	21,22
Gray Squirrel	*Sciurus carolinensis*			S5		x	x	1,2,5,9,13,14,19,20
Red Squirrel	*Tamiasciurus hudsonicus*			S5		x	x	1,5,9,18,20
Mouse Sp.	*Peromyscus sp.*			n/a			x	3
Meadow Vole	*Microtus pennsylvanicus*			S5			x	3,19
Norway Rat	*Rattus norvegicus*			SNA			x	5
Muskrat	*Ondatra zibethicus*			S5		x	x	2,3,18,19
Meadow Jumping Mouse	*Zapus hudsonius*			S5			x	22
Woodland Jumping Mouse	*Napeozapus insignis*			S5	S		x	24
Porcupine	*Erethizon dorsatum*			S5			x	19
Coyote	*Canis latrans*			S5		x	x	1,5,7,10,11,12,21
Red Fox	*Vulpes vulpes*			S5		x	x	1,18,19
Raccoon	*Procyon lotor*			S5		x	x	1,2,5,7,10,11,12,13,14,18,20,22
Long-tailed Weasel	*Mustela frenata*			S4	S,R		x	19
Mink	*Mustela vison*			S5			x	3,19
Striped Skunk	*Mephitis mephitis*			S5			x	7
White-tailed Deer	*Odocoileus virginianus*			S5		x	x	1,2,5,7,9,10,11,12,13,14,19,20,21,22
Domestic Dog	*Canis sp.*			n/a		x		1
DRAGONFLIES AND DAMSELFLIES (ODONATES)								
Sweetflag Spreadwing	*Lestes forcipatus*			S4	S,R		x	5
Slender Spreadwing	*Lestes rectangularis*			S5			x	5
Lyre-tipped Spreadwing	*Lestes unguiculatus*			S5			x	5
Spreadwing Sp.	*Lestes sp.*			n/a			x	19
Citrine Forktail	*Ischnura hastata*			SNA	S,R		x	5

Common Name	Latin Name	COSEWIC (a)	COSSARO (b)	S-Rank (c)	Wellington County (d)	Secondary Plan Area	Primary Study Area	Sources (e)
Familiar Bluet	*Enallagma civile*			S5			x	5
Eastern Forktail	*Ischnura verticalis*			S5			x	5
Darner sp.	*Aeshna sp.*			n/a		x	x	1
Common Green Darner	*Anax junius*			S5			x	5,19
Eastern Pondhawk	*Erythemis simplicicollis*			S5			x	5
Widow Skimmer	*Libellula luctuosa*			S5			x	5
Common Whitetail	*Libellula lydia*			S5			x	5,19
Twelve-spotted Skimmer	*Libellula pulchella*			S5			x	5,9,19
Cherry-faced Meadowfly	*Sympetrum internum*			S5			x	5
White-faced Meadowfly	*Sympetrum obtrusum*			S5			x	5,19
Ruby Meadowfly	*Sympetrum rubicundulum*			S5			x	5
Meadowfly sp.	*Sympetrum sp.*			n/a			x	1
Black Saddlebags	*Tramea lacerata*			S4			x	5
BUTTERFLIES								
Least Skipper	*Ancyloxypha numitor*			S5			x	19
Black Swallowtail	*Papilio polyxenes*			S5		x	x	2,5,7,13,14,22
Eastern Tiger Swallowtail	*Papilio glaucus glaucus*			S5			x	5,7,19
Giant Swallowtail	*Papilio cresphontes*			S4	S,R		x	7
Mustard White	*Pieris oleracea*			S4			x	13,14
Cabbage White	*Pieris rapae*			SNA		x	x	1,2,5,7,13,14,17,19
Clouded (Common) Sulphur	*Colias philodice*			S5			x	5,13,14,17
Sulphur Sp.	*Colias sp.*			n/a			x	19
Spring Azure	*Celastrina ladon*			SU			x	5,7,19
Summer Azure	*Celastrina neglecta*			S5			x	5
Great Spangled Fritillary	*Speyeria cybele*			S5			x	13,14
Pearl Crescent	*Phyciodes tharos*			S4			x	5,7,13,14
Northern Crescent	*Phyciodes cocyta*			S5			x	19
Eastern Comma	*Polygonia comma*			S5			x	7
Comma Sp.	*Polygonia Sp.*			n/a			x	5
Mourning Cloak	*Nymphalis antiopa*			S5			x	5,7,19
Viceroy	*Limenitis archippus*			S5			x	5
Little Wood-Satyr	*Megisto cymela*			S5			x	5,19
Common Ringlet	*Coenonympha tullia*			S5			x	7,13,14
Common Wood-Nymph	*Cercyonis pegala*			S5			x	5,7,19,22
Monarch	*Danaus plexippus*	SC	SC	S2	S	x	B	1,2,4,5,7,13,14,17,19,22

LEGEND

x= species not breeding or not specified if breeding
B = species observed breeding
** = Only habitats that support or have recently supported active nests should be considered significant

a COSEWIC = Committee on the Status of Endangered Wildlife in Canada
Staus on shown if: END = Endangered, THR = Threatened, SC = Special Concern

b Species at Risk in Ontario List (as applies to ESA) as designated by COSSARO (Committee on the Status of Species at Risk in Ontario)
Staus on shown if: END = Endangered, THR = Threatened, SC = Special Concern

c SRANK (from Natural Heritage Information Centre) for breeding status if:
S1 (Critically Imperiled), S2 (Imperiled), S3 (Vulnerable), S4 (Apparently Secure), S5 (Secure)
SNA (Not applicable…'because the species is not a suitable target for conservation activities'; includes non-native species)
SE (exotic, i.e. non-native), SU (unrankable)

c Ontario Ministry of Natural Resources (OMNR). 2000. Significant Wildlife Habitat Technical Guide (Appendix G). 151 p plus appendices.

d Significant Wildlife List for Wellington County from the City of Guelph Natural Heritage Strategy, Volume 2 (Dougan & Associates with Snell and Cecile 2009), last updated by the City of Guelph 2012.
Status only shown if: S = Significant, R = Rare
Note that the following designations were excluded from this list:
† = Bank Swallow: Significant only when found nesting in colonies equal to or greater than 100. However, recent OBBA data for Wellington County should be reviewed to see if this is appropriate.
† = Cliff Swallow: Significant only when found nesting in colonies equal to or greater than 8. However, recent OBBA data for Wellington County should be reviewed to see if this is appropriate.
‡ = Being small and secretive, these species are often overlooked. When more information is collected, it is possible that they may not merit significant species status in the future.
o= Habitat protection should be considered only when larval habitat is present at or in close proximity to where adults were documented.
∆ = Considered significant at present, but may prove to be too common to be so regarded in the future.

e Sources
1 - Beacon Environmental Ltd. field studies 2017 and/or 2018.
2 - North-South Environmental Inc. (2015). 132 Clair Road West, Guelph - Scoped Environmental Impact Study. Prepared for Mr. Jeff Neumann, August 28, 2015. 250 pp.
3 - North-South Environmental Inc. (2016). 161, 205 and 253 Clair Road East, Guelph - Year-End Report (2013-2015). Prepared for the City of Guelph and the Grand River Conservation Authority, August 2016. 61 pp.
4 - North-South Environmental Inc. (2014). 161, 205 and 253 Clair Road East, Guelph - Environmental Implementation Report. Prepared for Victoria Wood (Dallan) GP Inc., February 2014. 189 pp.
5 - Dance Environmental Inc. (2014). Scoped E.I.S., 424 Maltby Road, Wellington County, Township of Puslinch. Prepared for Persian Investments Ltd., April 14, 2014. 94 pp.
6 - Natural Resource Solutions Inc. (2012a). Species at Risk Habitat Screening - Results, 331 Clair Road, Guelph Ontario. Prepared for Acorn Developments, September 10, 2012. 12 pp.
7 - Stantec Consulting Ltd. (2007). Dallan Lands Environmental Impact Statement. Prepared for Victoria Wood, October 2007. 77 pp.
8 - Stantec Consulting Ltd. (2009). Dallan Lands EIS Addendum Report. Prepared for Victoria Wood, August 2009. 77 pp.
9 - Aboud and Associates Inc. (2010). 1897 Gordon Street (Bird Property) - Environmental Impact Study and Tree Conservation Plan (2nd Submission). Prepared for Thomasfield Homes, September 3, 2010. 145 pp.
10 - McEachren, J. (2012). Maltby Road Reconstruction, Post Construction Monitoring 2012. City of Guelph. 8 pp.
11 - Natural Resource Solutions Inc. (2010). Maltby Road Wildlife Movement Surveys, 2009-2010 Summary Report. Prepared for the City of Guelph, July 2010. 24 pp.

12 - Natural Resource Solutions Inc. (2011). Maltby Road Wildlife Movement Surveys, 2009-2011 Summary Report. Prepared for the City of Guelph, June 2011. 26 pp.
13 - North-South Environmental Inc. (2001). Environmental Impact Study, Westminster Wood East (Adam's Farm). Prepared for Westminster Woods Ltd., July 2001. 82 pp.
14 - Black, Shoemaker, Robinson and Donaldson, Hoyle, K. J., North-South Environmental Inc., Stantec Consulting. (2005). West Minster Wood East, Phase 2, Environmental Implementation Report. First Draft. 33pp.
15 - Paradigm Transportation Solutions Limited, ESG International Inc. and Braun Consulting Engineers. (2003). Clair Road Class Environmental Assessment. City of Guelph. 265 pp.
16 - Totten Sims Hubicki Associates, Engineers, Architects, Planners. (2000). Gordon Street, Wellington Road 46, Class Environmental Assessment, Environmental Study Report, Volume One: Main Report. City of Guelph and the County of Wellington. 122 pp.
17 - McCormick Rankin Corporation, and Gamsby and Mannerow Limited (2003). Victoria Road Class Environmental Assessment, Environmental Study Report. City of Guelph. 486 pp.
18 - Timmerman, A., Adams, P., Marshall, J., Weeks, G., Ursic, K. and Ursic, M. (2010). Hall's Pond Wetland Evaluation.
19 - Natural Resource Solutions Inc. (2007). Southgate Business Park, Draft Plan of Subdivision, Environmental Impact Study. Prepared for Industrial Equities Guelph Corporation, July 2007.164 pp.
20 - Natural Resource Solutions Inc. (2012c). Southgate Business Park 23T-06503 Environmental Implementation Report, Phase 2 Addendum. Prepared for Industrial Equities Guelph Corporation, November 2012. 331 pp.
21 - Natural Resource Solutions Inc. (2012b). Southgate Business Park 23T-06503 Environmental Implementation Report. Prepared for Industrial Equities Guelph Corporation, February 2012. 928 pp.
22 - Stantec Consulting Ltd. (2014). 23T-03507 Former Pergola Lands Subdivision Phase II: Environmental Implementation Report. Prepared for Reid's Heritage Homes, February 4, 2014. 204 pp.
23 - Dougan & Associates (2005). Guelph Amphibian Survey Database.

Appendix NH-6

Provincially Endangered and Threatened Species at Risk Screening

Appendix NH-6

Provincially Endangered and Threatened Species at Risk Screening

Taxonomy	Column1	ESA Status	SARA Status	Preferred Habitat[1, 2]	Known Species Range[1, 2]	Habitat Presence in PSA	Species Confirmed Present in the PSA or SPA
Plants	Butternut *Juglans cinerea*	END	END Schedule 1	In Ontario, Butternut usually grows alone or in small groups in deciduous forests. It prefers moist, well-drained soil and is often found along streams. It is also found on well-drained gravel sites and rarely on dry rocky soil. This species does not do well in the shade, and often grows in sunny openings and near forest edges.	Butternut can be found throughout central and eastern North America. In Canada, Butternut occurs in Ontario, Quebec and New Brunswick. In Ontario, this species is found throughout the southwest, north to the Bruce Peninsula, and south of the Canadian Shield.	**Yes** Suitable habitat is present within the PSA and SPA	**No** Butternut not confirmed present in PSA or SPA
Amphibians	Jefferson Salamander *Ambystoma jeffersonianum*	END	THR Schedule 1	Adults live in moist, loose soil, under logs or in leaf litter. Your best chance of spotting a Jefferson salamander is in early spring when they travel to woodland ponds to breed. They lay their eggs in clumps attached to underwater vegetation. By midsummer, the larvae lose their gills and leave the pond and head into the surrounding forest. Once in the forest, Jefferson salamanders spend much of their time underground in rodent burrows, and under rocks and stumps. They feed primarily on insects and worms.	In Canada, it is found only in southern Ontario, mainly along the Niagara Escarpment.	**Yes** Suitable habitat is present within the PSA and SPA within woodlands and woodland ponds	**No** Jefferson Salamander not confirmed present in PSA or SPA
Reptiles	Blanding's Turtle *Emydoidea blandingii*	THR	THR Schedule 1	Blanding's Turtles live in shallow water, usually in large wetlands and shallow lakes with lots of water plants. It is not unusual, though, to find them hundreds of metres from the nearest water body, especially while they are searching for a mate or traveling to a nesting site. Blanding's Turtles hibernate in the mud at the bottom of permanent water bodies from late October until the end of April.	The Blanding's Turtle is found in and around the Great Lakes Basin, with isolated populations elsewhere in the United States and Canada. In Canada, the Blanding's Turtle is separated into the Great Lakes-St. Lawrence population and the Nova Scotia population. Blanding's Turtles can be found throughout southern, central and eastern Ontario.	**Yes** Suitable habitat is present within the PSA and SPA within larger wetlands or ponds with lots of water vegetation	**No** Blanding's Turtle not confirmed present in PSA or SPA
Birds	Yellow-breasted Chat *Icteria virens*	END	END Schedule 1	The Yellow-breasted Chat lives in thickets and scrub, especially locations where clearings have become overgrown. These birds spend their winters in coastal marshes.	In Canada, it lives in southern British Columbia, the Prairies, and southwestern Ontario, where it is concentrated in Point Pelee National Park and Pelee Island in Lake Erie.	**Yes** Suitable habitat is present within the PSA and SPA within thicket habitat	**Yes** Yellow-breasted Chat confirmed in the south-western section of the PSA within thicket habitat
Birds	Barn Swallow *Hirundo rustica*	THR	THR Schedule 1	Barn Swallows often live in close association with humans, building their cup-shaped mud nests almost exclusively on human-made structures such as open barns, under bridges and in culverts. The species is attracted to open structures that include ledges where they can build their nests, which are often re-used from year to year. They prefer unpainted, rough-cut wood, since the mud does not adhere as well to smooth surfaces.	The Barn Swallow may be found throughout southern Ontario and can range as far north as Hudson Bay, wherever suitable locations for nests exist.	**Yes** Suitable habitat is present within the PSA and SPA within human-made structures such as barns	**Yes** Barn Swallow confirmed nesting in barns within the PSA and SPA

Taxonomy	Column1	ESA Status	SARA Status	Preferred Habitat[1, 2]	Known Species Range[1, 2]	Habitat Presence in PSA	Species Confirmed Present in the PSA or SPA
Birds	Bobolink *Dolichonyx oryzivorus*	THR	THR Schedule 1	Historically, Bobolinks lived in North American tallgrass prairie and other open meadows. With the clearing of native prairies, Bobolinks moved to living in hayfields. Bobolinks often build their small nests on the ground in dense grasses. Both parents usually tend to their young, sometimes with a third Bobolink helping.	The Bobolink breeds across North America. In Ontario, it is widely distributed throughout most of the province south of the boreal forest, although it may be found in the north where suitable habitat exists.	**Yes** Suitable habitat is present within the PSA and SPA within grassland habitat	**Yes** Bobolink confirmed in the northern section of the PSA and SPA within grassland habitat
Birds	Chimney Swift *Chaetura pelagica*	THR	THR Schedule 1	Before European settlement Chimney Swifts mainly nested on cave walls and in hollow trees or tree cavities in old growth forests. Today, they are more likely to be found in and around urban settlements where they nest and roost (rest or sleep) in chimneys and other manmade structures. They also tend to stay close to water as this is where the flying insects they eat congregate.	The Chimney Swift breeds in eastern North America, possibly as far north as southern Newfoundland. In Ontario, it is most widely distributed in the Carolinian zone in the south and southwest of the province, but has been detected throughout most of the province south of the 49th parallel. It winters in northwestern South America.	**Yes** Suitable habitat is present within the PSA and SPA within human-made structures	**No** Chimney Swift not confirmed present in PSA or SPA
Birds	Eastern Meadowlark *Sturnella magna*	THR	THR Schedule 1	Eastern Meadowlarks breed primarily in moderately tall grasslands, such as pastures and hayfields, but are also found in alfalfa fields, weedy borders of croplands, roadsides, orchards, airports, shrubby overgrown fields, or other open areas. Small trees, shrubs or fence posts are used as elevated song perches.	In Ontario, the Eastern Meadowlark is primarily found south of the Canadian Shield but it also inhabits the Lake Nipissing, Timiskaming and Lake of the Woods areas.	**Yes** Suitable habitat is present within the PSA and SPA within grassland habitat	**Yes** Eastern Meadowlark confirmed in the PSA and SPA within various grassland habitats
Mammals	Eastern Small-footed Myotis (Bat) *Myotis leibii*	END	No Status	In the spring and summer, eastern small-footed bats will roost in a variety of habitats, including in or under rocks, in rock outcrops, in buildings, under bridges, or in caves, mines, or hollow trees. These bats often change their roosting locations every day. At night, they hunt for insects to eat, including beetles, mosquitos, moths, and flies. In the winter, these bats hibernate, most often in caves and abandoned mines. They seem to choose colder and drier sites than similar bats and will return to the same spot each year.	The eastern small-footed bat has been found from south of Georgian Bay to Lake Erie and east to the Pembroke area. There are also records from the Bruce Peninsula, the Espanola area, and Lake Superior Provincial Park. Most documented sightings are of bats in their winter hibernation sites.	**Yes** Suitable habitat is present within the PSA and SPA within treed areas or in buildings	**Yes** Eastern Small-footed Bat confirmed in the south-western section PSA within treed habitats
Mammals	Little Brown Myotis (Bat) *Myotis lucifugus*	END	END Schedule 1	Bats are nocturnal. During the day they roost in trees and buildings. They often select attics, abandoned buildings and barns for summer colonies where they can raise their young. Bats can squeeze through very tiny spaces (as small as six millimeters across) and this is how they access many roosting areas. Little brown bats hibernate from October or November to March or April, most often in caves or abandoned mines that are humid and remain above freezing. This species can typically be associated with any community where suitable roosting (i.e. cavity trees, houses, abandoned buildings, barns, etc.) habitat is available.	The little brown bat is widespread in southern Ontario and found as far north as Moose Factory and Favorable Lake. Outside Ontario, this bat is found across Canada (except in Nunavut) and most of the United States.	**Yes** Suitable habitat is present within the PSA and SPA within treed areas or in buildings	**n/a** Field surveys for Little Brown Bat not completed
Mammals	Northern Myotis *(Bat)* *Myotis septentrionalis*	END	END Schedule 1	Northern Myotis bats are associated with boreal forests, choosing to roost under loose bark and in the cavities of trees. These bats hibernate from October or November to March or April, most often in caves or abandoned mines.	The Northern Myotis is found throughout forested areas in southern Ontario, to the north shore of Lake Superior and occasionally as far north as Moosonee, and west to Lake Nipigon.	**Yes** Suitable habitat is present within the PSA and SPA within treed areas	**n/a** Field surveys for Tri-coloured Bat not completed

Taxonomy	Column1	ESA Status	SARA Status	Preferred Habitat[1, 2]	Known Species Range[1, 2]	Habitat Presence in PSA	Species Confirmed Present in the PSA or SPA
Mammals	Tri-coloured Bat *Perimyotis subflavus*	END	END Schedule 1	Tri-coloured Bat overwinters in caves and mines. Summer maternity colonies are sometimes in buildings, but mostly in large-diameter trees. Foraging occurs over water, along waterways and forest edges. Large open fields or clearcuts are generally avoided.	Tri-coloured Bat ranges Nova Scotia, New Brunswick, Quebec, Ontario, and the eastern half of the United States.	**Yes** Suitable habitat is present within the PSA and SPA within treed areas and buildings	**n/a** Field surveys for Tri-coloured Bat not completed
Insects	Rusty-patched Bumble Bee *Bombus affinis*	END	END Schedule 1	This species, like other bumble bees, can be found in open habitat such as mixed farmland, urban settings, savannah, open woods and sand dunes. The most recent sightings have been in oak savannah, which contains both woodland and grassland flora and fauna.	The Rusty-patched Bumble Bee was once widespread and common in eastern North America, found from southern Ontario south to Georgia and west to the Dakotas. The species has suffered rapid, severe decline throughout its entire range since the 1970s with only a handful of specimens collected in recent years in Ontario. The only sightings of this bee in Canada since 2002 have been at The Pinery Provincial Park on Lake Huron.	**Yes** Suitable habitat is present within the PSA and SPA within the agricultural lands, urban areas and open woodlands	**No** Rusty-patched Bumble Bee not confirmed present in PSA or SPA

Glossary

EXP	ESA - Extirpated - a species that no longer exists in the wild in Ontario but still occurs elsewhere. SARA - Extirpated - a wildlife species that no longer exists in the wild in Canada, but exists elsewhere in the wild.
END	ESA - Endangered - a species facing imminent extinction or extirpation in Ontario which is a candidate for regulation under Ontario's Endangered Species Act. SARA - Endangered - a wildlife species that is facing imminent extirpation or extinction.
THR	ESA - Threatened - a species that is at risk of becoming endangered in Ontario if limiting factors are not reversed. SARA - Threatened - a wildlife species that is likely to become endangered if nothing is done to reverse the factors leading to its extirpation or extinction.
SC	ESA - Special Concern (formerly Vulnerable) - a species with characteristics that make it sensitive to human activities or natural events. SARA - Special Concern - a wildlife species that may become a threatened or an endangered species because of a combination of biological characteristics and identified threats.
MNRF	Ontario Ministry of Natural Resources and Forestry
ESA	Endangered Species Act
SARA	Species at Risk Act (Federal)
Schedule 1	The official list of species that are classified as extirpated, endangered, threatened, and of special concern.
Schedule 2	Species listed in Schedule 2 are species that had been designated as endangered or threatened, and have yet to be re-assessed by COSEWIC using revised criteria. Once these species have been re-assessed, they may be considered for inclusion in Schedule 1.
Schedule 3	Species listed in Schedule 3 are species that had been designated as special concern, and have yet to be re-assessed by COSEWIC using revised criteria. Once these species have been re-assessed, they may be considered for inclusion in Schedule 1.
COSEWIC	Committee on the Status of Endangered Wildlife in Canada - a committee of experts that assesses and designates which wild species are in some danger of disappearing from Canada.

References

1 - Species at Risk. Ontario Ministry of Natural Resources and Forestry. http://www.mnr.gov.on.ca/en/Business/Species/index.html. © Queens Printer for Ontario, 2013.
2 - Species at Risk Status Reports. Committed on the Status of Endangered Wildlife in Canada. Ottawa. http://www.sararegistry.gc.ca/search/advSearchResults_e.cfm?stype=doc&docID=18.

Links
https://www.ontarionature.org/dynamic-maps/dynamic-maps/
http://www.ontarioinsects.org/atlas_online.htm

Appendix NH-7

Non-Provincially Endangered and Threatened Species at Risk Screening

Appendix NH-7

Non-Provincially Endangered and Threatened Species at Risk Screening

Taxonomy	Species	ESA Status	SARA Status	Preferred Habitat[1, 2]	Known Species Range[1, 2]	Habitat Presence in PSA	Species Confirmed Present in the PSA or SPA (See Figure # for confirmed species' locations)
Amphibians	Western Chorus Frog (Great Lakes / St. Lawrence - Canadian Shield population) *Pseudacris maculata*	No Status	THR Schedule 1	Western Chorus Frog is a lowland terrestrial species, and is found on the ground, low shrubs or grass within marshes to wooded wetland areas. For breeding and tadpole development, it requires seasonally dry, temporary ponds without predators (such as fish), and rarely inhabits permanent pond. The Western Chorus Frog is very rarely found in permanent ponds.	In Canada, the Western Chorus Frog is present in southern Ontario and southwestern Quebec. In southern Ontario, its range is bounded by the United States border in the south, Georgian Bay in the northwest, south of Algonquin Park, and up the Ottawa River valley to the vicinity of Eganville in the east. It is also found in the central and northeastern United States.	**Yes** Suitable habitat is present within the PSA and SPA within marshes and woodland ponds	**Yes** Western Chorus Frog confirmed in western portion PSA and SPA within woodlands and marshes
Reptiles	Eastern Ribbonsnake *Thamnophis sauritus*	SC	SC Schedule 1	The Eastern Ribbonsnake is usually found close to water, especially in marshes, where it hunts for frogs and small fish. A good swimmer, it will dive in shallow water, especially if it is fleeing from a potential predator. At the onset of cold weather, these snakes congregate in underground burrows or rock crevices to hibernate together.	In Ontario the eastern Ribbonsnake occurs throughout southern and eastern Ontario and is locally common in parts of the Bruce Peninsula, Georgian Bay and eastern Ontario.	**Yes** Suitable habitat is present within the PSA and SPA within habitats close to water	**Yes** Eastern Ribbonsnake confirmed in PSA within pond behind baseball diamond
Reptiles	Snapping turtle *Chelydra serpentina*	SC	SC Schedule 1	Snapping Turtles spend most of their lives in water. They prefer shallow waters so they can hide under the soft mud and leaf litter, with only their noses exposed to the surface to breathe. During the nesting season, from early to mid-summer, females travel overland in search of a suitable nesting site, usually gravelly or sandy areas along streams. Snapping Turtles often take advantage of man-made structures for nest sites, including roads (especially gravel shoulders), dams and aggregate pits.	The Snapping Turtle's range extends from Ecuador to Canada. In Canada this turtle can be found from Saskatchewan to Nova Scotia. In Ontario, it is primarily limited to the southern part of Ontario. The Snapping Turtle's range is contracting.	**Yes** Suitable habitat is present within the PSA and SPA within ponds/wetlands and on gravelly road sides	**Yes** Snapping Turtle confirmed in PSA and SPA within various ponds/wetlands and on road sides
Reptiles	Midland Painted Turtle (*Chrysemys picta marginata*)	No Status	SC Schedule 1	Painted turtles inhabit waterbodies, such as ponds, marshes, lakes and slow-moving creeks, that have a soft bottom and provide abundant basking sites and aquatic vegetation. These turtles often bask on shorelines or on logs and rocks that protrude from the water. The midland painted turtle hibernates on the bottom of waterbodies[3].	The Midland Painted Turtle's range is within eastern North America and extends from southern Ontario and Quebec in Canada to northern Alabama and Georgia in the United States[4]. In Ontario, it's range is primarily limited to southern Ontario although there are some current and historical records in central Ontario[3].	**Yes** Suitable habitat is present within the PSA and SPA within ponds/wetlands	**Yes** Midland Painted Turtle confirmed in PSA and SPA within various ponds/wetlands and on road sides
Birds	Bald Eagle *Haliaeetus leucocephalus*	SC	No Status	Bald Eagles nest in a variety of habitats and forest types, almost always near a major lake or river where they do most of their hunting. While fish are their main source of food, Bald Eagles can easily catch prey up to the size of ducks, and frequently feed on dead animals, including White-tailed Deer. They usually nest in large trees such as pine and poplar. During the winter, Bald Eagles sometimes congregate near open water such as the St. Lawrence River, or in places with a high deer population where carcasses might be found.	Bald Eagles are widely distributed throughout North America. In Ontario, they nest throughout the north, with the highest density in the northwest near Lake of the Woods. Historically they were also relatively common in southern Ontario, especially along the shore of Lake Erie, but this population was all but wiped out 50 years ago. After an intensive re-introduction program and environmental clean-up efforts, the species has rebounded and can once again be seen in much of its former southern Ontario range.	**Yes** Suitable habitat is present within the PSA and SPA within woodlands	**No** Bald Eagle not confirmed present in PSA or SPA

Taxonomy	Species	ESA Status	SARA Status	Preferred Habitat[1, 2]	Known Species Range[1, 2]	Habitat Presence in PSA	Species Confirmed Present in the PSA or SPA (See Figure # for confirmed species' locations)
Birds	Canada Warbler *Wilsonia canadensis*	SC	THR Schedule 1	The Canada Warbler breeds in a range of deciduous and coniferous, usually wet forest types, all with a well- developed, dense shrub layer. Dense shrub and understory vegetation help conceal Canada Warbler nests that are usually located on or near the ground on mossy logs or roots, along stream banks or on hummocks.	The Canada Warbler only breeds in North America and 80 per cent of its known breeding range is in Canada. Its primary breeding range is in the Boreal Shield, extending north into the Hudson Plains and south into the Mixedwood Plains. Although the Canada Warbler breeds at low densities across its range, in Ontario, it is most abundant along the Southern Shield.	**Yes** Suitable habitat is present within the PSA and SPA in wet woodlands with dense shrub layer	**No** Canada Warbler not confirmed present in PSA or SPA
Birds	Common Nighthawk *Chordeiles minor*	SC	THR Schedule 1	Traditional Common Nighthawk habitat consists of open areas with little to no ground vegetation, such as logged or burned-over areas, forest clearings, rock barrens, peat bogs, lakeshores, and mine tailings. Although the species also nests in cultivated fields, orchards, urban parks, mine tailings and along gravel roads and railways, they tend to occupy natural sites.	The range of the Common Nighthawk spans most of North and Central America. In Canada, the species is found in all provinces and territories except Nunavut. In Ontario, the Common Nighthawk occurs throughout the province except for the coastal regions of James Bay and Hudson Bay.	**Yes** Suitable habitat is present within the PSA and SPA within forest clearings, urban parks and cultivated fields	**No** Common Nighthawk not confirmed present in PSA or SPA
Birds	Golden-winged Warbler *Vermivora chrysoptera*	SC	THR Schedule 1	Golden-winged Warblers prefer to nest in areas with young shrubs surrounded by mature forest – locations that have recently been disturbed, such as field edges, hydro or utility right-of-ways, or logged areas.	In Ontario the Golden-winged Warbler breed in central-eastern Ontario, as far south as Lake Ontario and the St. Lawrence River, and as far north as the northern edge of Georgian Bay. Golden-winged Warblers have also been found in the Lake of the Woods area near the Manitoba border, and around Long Point on Lake Erie.	**Yes** Suitable habitat is present within the PSA and SPA near mature forests and field edges	**No** Golden-winged Warbler not confirmed present in PSA or SPA
Birds	Red-headed Woodpecker *Melanerpes erythrocephalus*	SC	THR Schedule 1	The Red-headed Woodpecker lives in open woodland and woodland edges, and is often found in parks, golf courses and cemeteries. These areas typically have many dead trees, which the bird uses for nesting and perching. This woodpecker regularly winters in the United States, moving to locations where it can find sufficient acorns and beechnuts to eat. A few of these birds will stay the winter in woodlands in southern Ontario if there are adequate supplies of nuts.	The Red-headed Woodpecker is found across southern Ontario, where it is widespread but rare. Outside Ontario, it lives in Alberta, Saskatchewan, Manitoba and Quebec, and is relatively common in the United States.	**Yes** Suitable habitat is present within the PSA and SPA within woodlands and woodland edges, parks and golf courses	**No** Red-headed Woodpecker not confirmed present in PSA or SPA
Birds	Wood Thrush *Hylocichla mustelina*	SC	THR Schedule 1	The Wood Thrush lives in mature deciduous and mixed (conifer-deciduous) forests. They seek moist stands of trees with well-developed undergrowth and tall trees for singing perches. These birds prefer large forests, but will also use smaller stands of trees. They build their nests in living saplings, trees or shrubs, usually in sugar maple or American beech.	The wood thrush is found all across southern Ontario. It is also found, but less common, along the north shore of Lake Huron, as far west as the southeastern tip of Lake Superior. There is a very small population near Lake of the Woods in northwestern Ontario, and there have been scattered sightings in the mixed forest of northern Ontario.	**Yes** Suitable habitat is present within the PSA and SPA in mature deciduous or mixed forests	**Yes** Wood Thrush confirmed in the PSA and SPA within various forested habitats
Birds	Eastern Wood-Pewee *Contopus virens*	SC	SC Schedule 1	The Eastern Wood-pewee lives in the mid-canopy layer of forest clearings and edges of deciduous and mixed forests. It is most abundant in intermediate-age mature forest stands with little understory vegetation.	The eastern wood-pewee is found across most of southern and central Ontario, and in northern Ontario as far north as Red Lake, Lake Nipigon and Timmins.	**Yes** Suitable habitat is present within the PSA and SPA within woodlands	**Yes** Eastern Wood-pewee confirmed in the PSA and SPA within various forested habitats

Taxonomy	Species	ESA Status	SARA Status	Preferred Habitat[1, 2]	Known Species Range[1, 2]	Habitat Presence in PSA	Species Confirmed Present in the PSA or SPA (See Figure # for confirmed species' locations)
Insects	Monarch *Danaus plexippus*	SC	SC Schedule 1	Throughout their life cycle, Monarchs use three different types of habitat. Only the caterpillars feed on milkweed plants and are confined to meadows and open areas where milkweed grows. Adult butterflies can be found in more diverse habitats where they feed on nectar from a variety of wildflowers.	The Monarch's range extends from Central America to southern Canada. In Canada, Monarchs are most abundant in southern Ontario and Quebec where milkweed plants and breeding habitat are widespread. During late summer and fall, Monarchs from Ontario migrate to central Mexico where they spend the winter months. During migration, groups of Monarchs numbering in the thousands can be seen along the north shores of Lake Ontario and Lake Erie.	**Yes** Suitable habitat is present within the PSA and SPA within meadows	**Yes** Monarch confirmed in the PSA and SPA close to or within various meadow habitats
Insects	West Virginia White *Pieris virginiensis*	SC	No Status	The West Virginia White is a small – three to four centimetre wingspan – dingy white butterfly. Its wings appear translucent and on the underside of the hind wing, the veins have grey-brown scaling. As a caterpillar, it is yellow-green with a green stripe along each side. The West Virginia White lives in moist, deciduous woodlots. This butterfly requires a supply of toothwort, a small, spring-blooming plant that is a member of the mustard family, since it is the only food source for larvae.	The majority of sites in the province are in central and southern Ontario, but it also extends north to Manitoulin and St. Joseph islands. The largest populations are in the western Lake Ontario region.	**Yes** Suitable habitat is present within the PSA and SPA within deciduous woodlands	**No** West Virginia White not confirmed present in PSA or SPA

Glossary

COSEWIC	Committee on the Status of Endangered Wildlife in Canada - a committee of experts that assesses and designates which wild species are in some danger of disappearing from Canada.
EXP	ESA - Extirpated - a species that no longer exists in the wild in Ontario but still occurs elsewhere. SARA - Extirpated - a wildlife species that no longer exists in the wild in Canada, but exists elsewhere in the wild.
END	ESA - Endangered - a species facing imminent extinction or extirpation in Ontario which is a candidate for regulation under Ontario's Endangered Species Act. SARA - Endangered - a wildlife species that is facing imminent extirpation or extinction.
THR	ESA - Threatened - a species that is at risk of becoming endangered in Ontario if limiting factors are not reversed. SARA - Threatened - a wildlife species that is likely to become endangered if nothing is done to reverse the factors leading to its extirpation or extinction.
SC	ESA - Special Concern (formerly Vulnerable) - a species with characteristics that make it sensitive to human activities or natural events. SARA - Special Concern - a wildlife species that may become a threatened or an endangered species because of a combination of biological characteristics and identified threats.
MNRF	Ontario Ministry of Natural Resources and Forestry
ESA	Endangered Species Act
SARA	Species at Risk Act (Federal)
Schedule 1	The official list of species that are classified as extirpated, endangered, threatened, and of special concern.
Schedule 2	Species listed in Schedule 2 are species that had been designated as endangered or threatened, and have yet to be re-assessed by COSEWIC using revised criteria. Once these species have been re-assessed, they may be considered for inclusion in Schedule 1.
Schedule 3	Species listed in Schedule 3 are species that had been designated as special concern, and have yet to be re-assessed by COSEWIC using revised criteria. Once these species have been re-assessed, they may be considered for inclusion in Schedule 1.

References

1 Species at Risk. Ontario Ministry of Natural Resources and Forestry. http://www.mnr.gov.on.ca/en/Business/Species/index.html. © Queens Printer for Ontario, 2013.
2 Species at Risk Status Reports. Committed on the Status of Endangered Wildlife in Canada. Ottawa. http://www.sararegistry.gc.ca/search/advSearchResults_e.cfm?stype=doc&docID=18.
3 Ontario Nature, Midland Painted turtle page. https://ontarionature.org/programs/citizen-science/reptile-amphibian-atlas/midland-painted-turtle/ <last accessed Aug. 27, 2018>
4 Wikipedia, Painted turtle page. https://en.wikipedia.org/wiki/Painted_turtle#Range <last accessed Aug. 27, 2018>

Links http://www.ontarionature.org/dynamic-maps/dynamic-maps/
http://www.ontarioinsects.org/atlas_online.htm

Appendix NH-8

Significant Wildlife Habitat (SWH) Screening

Appendix NH-8

Significant Wildlife Habitat (SWH) Screening

Wildlife Habitat Category and Associated Species and Ecological Land Classification (ELC) Communities		Provincial Guidance for SWH in Ecoregion 6E*	Application to the Secondary Plan Area (SPA) and Primary Study Area (PSA)**	Assessed SWH Status in the SPA
Seasonal Concentration Areas				
1. Waterfowl Stopover and Staging Areas (Terrestrial)				
American Black Duck Wood Duck Mallard Northern Pintail Gadwall Blue-winged Teal Green-winged Teal American Wigeon Northern Shoveler	CUM1 CUT1 Plus evidence of annual spring flooding from malt water or run-off within these Ecosites.	*Suitable Habitat* • Fields with sheet water during Spring (mid-March to May) *Suggested Criteria* Studies carried out and verified presence of an annual concentration of any listed species	No suitable habitat identified in the SPA or PSA, and none would be expected to occur.	**Not Applicable**
2. Waterfowl Stopover and Staging Areas (Aquatic)				
Canada Goose Cackling Goose Snow Goose American Black Duck Northern Pintail Northern Shoveler American Wigeon Gadwall Green-winged Teal Blue-winged Teal Hooded Merganser Common Merganser Lesser Scaup Greater Scaup Long-tailed duck Surf Scoter White-winged Scoter Black Scoter Ring-necked duck Common Goldeneye Bufflehead Redhead Ruddy Duck Red-breasted Merganser Brant Canvasback	MAS1 MAS2 MAS3 SAS1 SAM1 SAF1 SWD1 SWD2 SWD3 SWD4 SWD5 SWD6 SWD7	*Suitable Habitat* • Ponds, marshes, lakes, bays, coastal inlets, and watercourses used during migration • Sewage treatment ponds and storm water ponds do not qualify as SWH, however a reservoir managed as a large wetland or pond/lake does qualify • These habitats have an abundant food supply (mostly aquatic invertebrates and vegetation in shallow water) *Suggested Criteria* Studies carried out and verified presence of: • Aggregations of 100 or more of listed species for 7 days, results in > 700 waterfowl use days • Areas with annual staging of ruddy ducks, canvasbacks, and redheads are SWH • Wetland area and shorelines associated with sites identified within the Significant Wildlife Habitat Technical Guide (SWHTG) (MNRF 2000) Appendix K are SWH	All marshes with open water (where incidental observations of migratory waterfowl have been recorded) that could potentially support the required aggregations to be considered Confirmed SWH in the SPA are considered suitable habitat, and have been mapped as Candidate SWH. Specific studies for this category of SWH were not conducted as part of the Clair Maltby Secondary Plan. Site specific study may be required where suitable habitat exists to confirm the status of this SWH type.	**Candidate SWH is mapped (ref. Map NH-6)**
3. Shorebird Migratory Stopover Area				
Greater Yellowlegs Lesser Yellowlegs Marbled Godwit Hudsonian Godwit Black-bellied Plover American Golden-Plover Semipalmated Plover	BBO1 BBO2 BBS1 BBS2 BBT1 BBT2 SDO1	*Suitable Habitat* • Shorelines of lakes, rivers and wetlands, including beach areas, bars and seasonally flooded, muddy and un-vegetated shoreline habitats • Great Lakes coastal shorelines, including groynes and other forms of armour rock lakeshores, are extremely important for migratory shorebirds in May to mid-June and early July to October. Sewage treatment ponds and storm water ponds do not qualify as a SWH	No suitable habitat identified in the SPA or PSA, and none would be expected to occur.	**Not Applicable**

Wildlife Habitat Category and Associated Species and Ecological Land Classification (ELC) Communities		Provincial Guidance for SWH in Ecoregion 6E*	Application to the Secondary Plan Area (SPA) and Primary Study Area (PSA)**	Assessed SWH Status in the SPA
Solitary Sandpiper Spotted Sandpiper Semipalmated Sandpiper Pectoral Sandpiper White-rumped Sandpiper Baird's Sandpiper Least Sandpiper Purple Sandpiper Stilt Sandpiper Short-billed Dowitcher Red-necked Phalarope Whimbrel Ruddy Turnstone Sanderling Dunlin	SDS2 SDT1 MAM1 MAM2 MAM3 MAM4 MAM5	*Suggested Criteria* • Presence of 3 or more of listed species and > 1000 shorebird use days during spring or fall migration period (shorebird use days are the accumulated number of shorebirds counted per day over the course of the fall or spring migration period) • Whimbrel stop briefly (<24hrs) during spring migration, any site with >100 Whimbrel used for 3 years or more is significant • The area of significant shorebird habitat includes the mapped ELC shoreline ecosites plus a 100 m radius area		
4. Raptor Wintering Area				
Rough-legged Hawk Red-tailed Hawk Northern Harrier American Kestrel Snowy Owl Short-eared Owl Bald Eagle	Hawks/Owls: Combination of ELC Community Series; need to have present one Community Series from each land class; Forest: FOD, FOM, FOC. Upland: CUM, CUT, CUS, CUW. Bald Eagle: Forest Community Series: FOD, FOM, FOC, SWD, SWM, or SWC on shoreline areas adjacent to large rivers to adjacent to lakes with open water (hunting area).	*Suitable Habitat* • The habitat provides a combination of fields and woodlands that provide roosting, foraging and resting habitats for wintering raptors • Raptor wintering (hawk/owl) sites need to be > 20 ha with a combination of forest and upland *Suggested Criteria* Studies confirm the use of these habitats by: • One or more Short-eared Owls or; One of more Bald Eagles or at least 10 individuals and two listed hawk/owl species • To be significant a site must be used regularly (3 in 5 years) for a minimum of 20 days by the above number of birds • The habitat area for an Eagle winter site is the shoreline forest ecosites directly adjacent to the prime hunting area	Suitable habitat is present within the PSA but was not field verified as part of the Clair Maltby Secondary Plan project. Two listed species (Red-tailed Hawk and Northern Harrier) have been confirmed in the PSA. However, observations were not in adequate numbers or frequency to meet the suggested criteria. • Northern Harrier was observed in the PSA 2006 on the 385 Maltby Rd W lands (i.e., the Southgate Business Park) (NRSI 2007); • Red-tailed Hawk was observed once incidentally during the field surveys conducted by Beacon in the spring of 2017 at 2162 Gordon Street and the winter of 2018 at 1992 Gordon Street. It was also noted previously as potentially or confirmed breeding within the PSA at: 424 Maltby Road (Dance Environmental Inc. 2014), 1897 Gordon Street (Aboud and Associates Inc. 2010), Westminster Woods East EIS (NSEI 2001) and the 385 Maltby Rd W lands (i.e., the Southgate Business Park) (NRSI 2007). A Red-Tailed Hawk nest with fledged young was confirmed at 424 Maltby Road (Dance Environmental Inc. 2014) in the PSA. Site-specific study will be needed to capture the best and most representative area(s) in the SPA, assuming more than one of the candidate areas meets the established criteria.	**Several Candidate SWH areas are shown approximately with asterisks. Site-specific studies will be needed to a) capture the best and most representative area(s) in the SPA and/ or b) confirm the significance and extent of these habitats (ref. Map NH-6).**
5. Bat Hibernacula				
Big Brown Bat Tri-colored Bat	Bat Hibernacula may be in the Ecosites: CCR1 CCR2 CCA1 CCA2	*Suitable Habitat* • Hibernacula may be found in caves, mine shafts, underground foundations and Karsts *Suggested Criteria* • All sites with confirmed hibernating bats are SWH • The area includes 200m radius around the entrance of the hibernaculum for most development types and for wind farms (Note: buildings are not to be considered SWH)	No suitable habitat identified in the SPA or PSA, and none would be expected to occur.	**Not Applicable**
6. Bat Maternity Colonies				
Big Brown Bat Silver-haired Bat	Maternity Colonies considered for SWH are found in forested Ecosites.	*Suitable Habitat* • Maternity colonies can be found in tree cavities, vegetation and often in buildings (buildings are not considered to be SWH)	All deciduous forest (FO-) and swamp (SW-) communities in the SPA are considered suitable habitat and have been mapped as Candidate SWH.	**Candidate SWH is mapped (ref. Map NH-6)**

Wildlife Habitat Category and Associated Species and Ecological Land Classification (ELC) Communities		Provincial Guidance for SWH in Ecoregion 6E*	Application to the Secondary Plan Area (SPA) and Primary Study Area (PSA)**	Assessed SWH Status in the SPA
	All ELC Ecosites in ELC Community Series: FOD FOM SWD SWM	• Maternity colonies located in mature deciduous or mixed forest stands with >10/ha large diameter (>25cm dbh) wildlife trees • Female bats prefer wildlife tree (snags) in early stages of decay, class 1-3 or class 1 or 2 • Silver-haired Bats prefer older mixed or deciduous forest and form maternity colonies in tree cavities and small hollows. Older forest areas with at least 21 snags/ha are preferred *Suggested Criteria* • Maternity colonies with confirmed use by; – >10 Big Brown Bats – >5 Adult Female Silver-haired Bats The area of the habitat includes the entire woodland or the forest stand ELC ecosite or an ecoelement containing the maternity colonies	Specific studies for this category of SWH were not conducted as part of the Clair Maltby Secondary Plan project, and have not been done for any other studies in the SPA or PSA, except for one EIS south of Maltby Road (424 Maltby Road West). Site specific study may be required where suitable habitat exists to confirm the status of this SWH type.	
7. Turtle Wintering Areas				
Midland Painted Turtle Northern Map Turtle Snapping Turtle	Snapping and Midland Painted Turtles: ELC Community Classes; SW, MA, OA and SA, ELC Community Series; FEO and BOO. Northern Map Turtles: Open Water areas such as deeper rivers, or streams and lakes with current can also be used as over-wintering habitat.	*Suitable Habitat* • For most turtles, wintering areas are in the same general area as their core habitat. Water has to be deep enough not to freeze and have soft mud substrates • Over-wintering sites are permanent water bodies, large wetlands, and bogs or fens with adequate Dissolved Oxygen • Man-made ponds such as sewage lagoons or storm water ponds should not be considered SWH *Suggested Criteria* • Presence of 5 over-wintering Midland Painted Turtles is significant • One or more Northern Map Turtle or Snapping Turtle over-wintering within a wetland is significant • The mapped ELC ecosite area with the over wintering turtles is the SWH • If the hibernation site is within a stream or river, the deep-water pool where the turtles are over wintering is the SWH	Midland Painted Turtles and Snapping Turtles have been documented in ponds throughout the SPA and PSA. Not all ponds were assessed as part of the Clair-Maltby Secondary Plan study. Suitable habitat for wintering is presumed to be present within the PSA and SPA in ponds where these turtles have been observed. Confirmed SWH was mapped for ponds where at least five Painted Turtles and/or at least one Snapping Turtle were documented in 2017. Candidate SWH includes other wetlands or ponds with permanent open water in the SPA. Site specific investigation may be required where ponds have not been assessed as part of this study or to confirm the status of this SWH type in the future where it has been previously confirmed.	**Candidate and Confirmed SWH are mapped (ref. Map NH-6)**
8. Reptile Hibernaculum				
Eastern Gartersnake Northern Water Snake Northern Red-bellied Snake Northern Brownsnake Smooth Green Snake Northern Ring-necked Snake Milksnake Eastern Ribbonsnake Five-lined Skink	For all snakes, habitat may be found in any ecosite other than very wet ones. Talus, Tock Barren, Crevice, Cave and Alvar may be directly related to these habitats. Observations or congregations of snakes on sunny warm days in the spring or fall is a good indicator. For Five-lined Skink, ELC Community Series of FOD and FOM and ecosite: FOC1 and FOC3.	*Suitable Habitat* • For snakes, hibernation takes place in sites located below frost lines in burrows, rock crevices and other natural locations • The existence of features that go below frost line; such as rock piles or slopes, old stone fences, and abandoned crumbling foundations assist in identifying Candidate SWH • Areas of broken and fissured rock are particularly valuable since they provide access to subterranean sites below the frost • Wetlands can also be important over-wintering habitat in conifer or shrub swamps and swales, poor fens, or depressions in bedrock terrain with sparse trees or shrubs with sphagnum moss or sedge hummock ground cover • For five-lined Skink, Community Series FOD and FOM, and FOC1 and FOC3 should be considered. They prefer mixed forests with rock outcrop openings with cover rock overlaying granite bedrock with fissures *Suggested Criteria* Studies confirming: • Presence of snake hibernacula used by a minimum of five individuals of a snake sp. <u>or</u>; individuals of two or more snake spp. • Congregations of a minimum of five individuals of a snake sp. or; individuals of two or more snake spp. near potential hibernacula (e.g., foundation or rocky slope) on sunny warm days in spring	A total of 4 Eastern Garter snakes and 2 Eastern Red-bellied snakes were identified near the foundation of an old building over the course of 15 surveys that were reported in the updated 132 Clair road EIS Addendum (NRSI 2017). Based on this data the Addendum has identified this as a reptile hibernaculum however whether or not it is considered Confirmed SWH in the City of Guelph and, if so, the extent of habitat to be protected remains to be determined. Additional suitable habitat may be present within the SPA and PSA in sites such as animal burrows, old housing foundation and wetlands that go below the frost line, but was not field verified as part of the Clair Maltby Secondary Plan studies. A number of individual listed snake species (i.e., Northern Water Snake, Northern Brownsnake, Eastern Ribbonsnake, Northern Red-bellied Snake and Eastern Gartersnake) have been documented, but no concentrations (i.e., >5 individuals) of reptiles were recorded within the PSA or SPA. Site specific study may be required where suitable habitat exists to confirm the status of this SWH type.	**A candidate SWH area is shown with an asterisk (ref. Map NH-6). Confirmation as SWH by the City is pending.**
9. Colonially-Nesting Bird Breeding Habitat (Bank and Cliff)				
Cliff Swallow Northern Rough-winged Swallow (this species is not colonial but can be found in Cliff Swallow colonies)	Eroding banks, sandy hills, steep slopes and sand piles. Cliff faces, bridge abutments, silos and barns.	*Suitable Habitat* • Any site or areas with exposed soil banks, undisturbed or naturally eroding that is not a licensed/permitted aggregate area • Does not include man-made structures (bridges or buildings) or recently (2 years) disturbed soil areas, such as berms, embankments, soil or aggregate stockpiles	No suitable habitat identified in the SPA or PSA, and none would be expected to occur.	**Not Applicable**

Wildlife Habitat Category and Associated Species and Ecological Land Classification (ELC) Communities		Provincial Guidance for SWH in Ecoregion 6E*	Application to the Secondary Plan Area (SPA) and Primary Study Area (PSA)**	Assessed SWH Status in the SPA
	Habitat found in the following ecosites: CUM1 CLO1 CUT1 CLS1 CUS1 CLT1 BLO1 BLS1 BLT1	• Does not include a licensed/permitted Mineral Aggregate Operation *Suggested Criteria* Studies confirming: • Presence of 1 or more nesting sites with 8 or more cliff swallow pairs or 50 Bank Swallow and/or Rough-winged Swallow pairs during the breeding season A colony identified as SWH will include a 50m radius habitat area from the peripheral nests		
10. Colonially-Nesting Bird Breeding Habitat (Tree/Shrubs)				
Great Blue Heron Black-crowned Night-Heron Great Egret Green Heron	SWM2 SWM3 SWM5 SWM6 SWD1 SWD2 SWD3 SWD4 SWD5 SWD6 SWD7 FET1	*Suitable Habitat* • Nests in live or dead standing trees in wetlands, lakes, islands, and peninsulas. Shrubs and occasionally emergent vegetation may also be used • Most nests in trees are 11 to 15 m from ground, near the top of the tree *Suggested Criteria* Studies confirming: • Presence of 2 or more active nests of Great Blue Heron or other listed species • The habitat extends from the edge of the colony and a minimum 300m radius or extent of the forest ecosite containing the colony or any island <15.0 ha with a colony is the SWH	Suitable habitat may be present within the PSA in treed wetlands/ponds. Great-blue Heron was observed during the 2017 breeding bird season in flying over Breeding Bird Station 4 (ref. **Map NH-2**) and within the large wetland on 2162 Gordon Street Property (by Breeding Bird Station 13, ref. **Map NH-2**), but nests were not found. Site specific study may be required where suitable habitat exists to confirm the status of this SWH type.	**This type of SWH may occur but has not been mapped**
11. Colonially-Nesting Bird Breeding Habitat (Ground)				
Herring Gull Great Black-backed Gull Little Gull Ring-billed Gull Common Tern Caspian Tern Brewer's Blackbird	Any rocky island to peninsula (natural or artificial) with a lake or larger river. Close proximity or watercourses in open fields or pastures with scattered trees or shrubs (Brewer's Blackbird). MAM1-6 MAS1-3 CUM CUT CUS	*Suitable Habitat* • Nesting colonies of gulls and terns are on islands or peninsulas associated with open water or in marshy areas • Brewers Blackbird colonies are found loosely on the ground in or in low bushes in close proximity to streams and irrigation ditches within farmlands *Suggested Criteria* Studies confirming: • Presence of >25 active nests for Herring Gulls or Ring-billed Gulls, >5 active nests for Common Tern or >2 active nests for Caspian Tern • Any active nesting colony of one or more Little Gull, and Great Black-backed Gull is significant • Presence of 5 or more pairs for Brewer's Blackbird • The edge of the colony and a minimum 150m area of habitat, or the extent of the ELC ecosites containing the colony or any island <3.0ha with a colony is the SWH	No suitable habitat identified in the SPA or PSA, and none would be expected to occur.	**Not Applicable**
12. Migratory Butterfly Stopover Areas				
Painted Lady Red Admiral Monarch	Combination of ELC Community Series; need to have present one Community Series from each land class: <u>Field:</u> CUM CUT CUS <u>Forest:</u> FOC FOD COM CUP	*Suitable Habitat* • A butterfly stopover area will be a minimum of 10 ha in size with a combination of field and forest habitat present, and will be located within 5 km of Lake Ontario or Lake Erie • The habitat is typically a combination of field and forest, and provides the butterflies with a location to rest prior to their long migration south • The habitat should not be disturbed, fields/meadows with an abundance of preferred nectar plants and woodland edge providing shelter are requirements for this habitat • Staging areas usually provide protection from the elements and are often spits of land or areas with the shortest *Suggested Criteria* Studies confirm: • The presence of Monarch Use Days (MUD) during fall migration (Aug/Oct). MUD is based on the number of days a site is used by Monarchs, multiplied by the number of individuals using the site.	Suitable habitat not identified in the SPA or PSA due to its distance from Lake Ontario and Lake Erie.	**Not Applicable**

Wildlife Habitat Category and Associated Species and Ecological Land Classification (ELC) Communities		Provincial Guidance for SWH in Ecoregion 6E*	Application to the Secondary Plan Area (SPA) and Primary Study Area (PSA)**	Assessed SWH Status in the SPA
	A candidate site will have a history of butterflies being observed.	- Numbers of butterflies can range from 100-500/day - significant variation can occur between years and multiple years of sampling should occur - MUD of >5000 or >3000 with the presence of Painted Ladies or Red Admirals is to be considered significant		
13. Landbird Migratory Stopover Areas				
All migratory songbirds	All Ecosites associated with the ELC Community Series; FOC FOM FOD SWC SWM SWD	*Suitable Habitat* - Woodlots >10 ha in size and within 5 km of Lake Ontario and Lake Erie - If multiple woodlands are located along the shoreline those Woodlands <2 km from Lake Erie or Ontario are more significant - Sites have a variety of habitats; forest, grassland and wetland complexes - The largest sites are more significant - Woodlots and forest fragments are important habitats to migrating birds, these features located along the shore and located within 5km of Lake Ontario are Candidate SWH *Suggested Criteria* Studies confirm: - Use of the woodlot by >200 birds/day and with >35 species with at least 10 bird spp. recorded on at least 5 different survey dates - This abundance and diversity of migrant bird species is considered above average and significant	No suitable habitat identified in the SPA or PSA due to its distance from Lake Ontario and Lake Erie.	**Not Applicable**
14. Deer Yarding Areas				
White-tailed Deer	*Note: MNRF to determine this habitat.* ELC Community Series providing a thermal cover component for a deer yard would include: FOD, FOC, SWM and SWC. Or ELC Ecosites: CUP2, CUP3, FOD3 and CUT	*Suitable Habitat* - Deer yarding areas or winter concentration areas (yards) are areas deer move to in response to the onset of winter snow and cold. Deer establish traditional use areas with two areas called Stratum I and Stratum II - Stratum II covers entire winter yard and is usually in FOD or FOM (or agricultural lands) where browsing can occur. Deer move here in early winter, and will continue to stay here until snow depths reach about 30 cm. - Stratum I is the core of a deer yard, and is found within the Stratum II, and is critical for deer survival in areas where winter is severe. It is primarily coniferous trees with a canopy cover of at least 60% *Suggested Criteria* Studies confirm: - Snow depth and temperature or the greatest influence on deer use of winter yards. Snow depths of >40 cm for more than 60 days are minimum criteria for a deer yard to be considered as SWH - Deer management is an MNRF responsibility, and they field investigations (by aircraft over a series of winters to establish boundaries of Stratum I and II. Deer yarding areas considered significant will be mapped by MNRF - If SWH is determined for deer wintering area or if a proposed development is within Stratum II yard areas, then movement corridors are to be considered	No suitable habitat identified in the SPA or PSA by MNRF.	**Not Applicable**
15. Deer Winter Congregation Areas				
White-tailed Deer	All Forested Ecosites with these ELC Community Series: FOC FOM FOD SWC SWM SWD	*Suitable Habitat* - Woodlots >100 ha in size. Woodlots <100 ha may be considered significant based on MNRF studies or assessment - Deer movement during winter in Ecoregion 6E are not constrained by snow depth, however deer will annually congregate in large numbers in suitable woodlands - Large woodlots > 100 ha and up to 1500 ha are known to be used annually by densities of deer that range from 0.1-1.5 deer/ha - Woodlots with high densities of deer due to artificial feeding are not significant	No suitable habitat identified in the SPA or PSA by MNRF, nor was suitable habitat identified in the SPA through the Clair Maltby Secondary Plan project. The Environmental Assessment for Gordon Road (Totten Sims Hubicki Associates 1998) stated that wintering areas for White-tailed Deer were found in Hall's Pond Wetland/ESA and Mill Creek Swamp Wetland. However, no woodlands in the SPA meet the established size criteria.	**This type of SWH may occur but has not been mapped**

Wildlife Habitat Category and Associated Species and Ecological Land Classification (ELC) Communities	Provincial Guidance for SWH in Ecoregion 6E*	Application to the Secondary Plan Area (SPA) and Primary Study Area (PSA)**	Assessed SWH Status in the SPA
Conifer Plantations much smaller than 50 ha may also be used.	*Suggested Criteria* Studies confirm: • Deer management is an MNRF responsibility, deer winter congregation areas considered significant will be mapped by MNRF • Use of the woodlot by white-tailed deer will be determined by MNRF, all woodlots exceeding the area criteria are significant, unless determined not to be significant by MNRF • If SWH is determined for deer wintering area or if a proposed development is within Stratum II yard areas, then movement corridors are to be considered	Site specific study may be required where suitable habitat exists to confirm the status of this SWH type.	
Rare Vegetation Communities			
16. Cliffs and Talus Slopes			
ELC Communities: TAO, TAS, TAT, CLO, CLS, CLT	• A Cliff is vertical to near vertical bedrock >3m in height • A Talus Slope is rock rubble at the base of a cliff made up of coarse rocky debris • Most cliff and talus slopes occur along the Niagara Escarpment	No suitable habitat identified in the SPA or PSA, and none would be expected to occur.	**Not Applicable**
17. Sand Barren			
ELC Communities: SBO1, SBS1, BT1	• Sand Barrens typically are exposed sand, generally sparsely vegetated and caused by lack of moisture, periodic fires and erosion • Usually located within other types of natural habitat such as forest or savannah • Vegetation can vary from patchy and barren to tree covered but less than 60% *Suggested Criteria* • A sand barren area >0.5ha in size • Site must not be dominated by exotic or introduced species (<50% vegetative cover exotics).	No suitable habitat identified in the SPA or PSA, and none would be expected to occur.	**Not Applicable**
18. Alvar			
Field studies identify four of the five Alvar indicator species within ELC communities: ALO1, ALS, ALT1, FOC1, FOC2, CUM2, CUS2, CUT2-1, CUW2	• An alvar is typically a level, mostly unfractured calcareous bedrock feature with a mosaic of rock pavements and bedrock overlain by a thin veneer of soil • The hydrology of alvars is complex, with alternating periods of inundation and drought • Vegetation cover varies from sparse lichen-moss associations to grasslands and shrublands and comprising a number of characteristic or indicator plant • Undisturbed alvars can be phyto- and zoogeographically diverse, supporting many uncommon or are relict plant and animal species • Vegetation cover varies from patchy to barren with a less than 60% tree cover *Suggested Criteria* • An Alvar site > 0.5 ha in size • Five indicator species specific to alvars within Ecoregion 6E: *1) Carex crawei 2) Panicum philadelphicum 3) Eleocharis compressa 4) Scutellaria parvula 5) Trichostema brachiatum* • Site must not be dominated by exotic or introduced species (<50% vegetative cover exotics) • The Alvar must be in excellent condition and fit in with surrounding landscape with few conflicting land uses	No suitable habitat identified in the SPA or PSA, and none would be expected to occur.	**Not Applicable**
19. Old Growth Forest			
ELC Communities: FOD FOC FOM SWD SWC SWM	• Old-growth forests are characterized by heavy mortality or turnover of over-storey trees resulting in a mosaic of gaps that encourage development of a multi-layered canopy and an abundance of snags and downed woody debris *Suggested Criteria* • Woodland area is >30 ha with at least 10 ha of interior habitat • If dominant trees species of the ecosite are >140 years old, then stand is SWH • The-forested area containing the old growth characteristics will have experienced no recognizable forestry activities (cut stumps will not be present) • The area of forest ecosites combined or an eco-element within an ecosite that contain the old growth characteristics is the SWH	No suitable habitat identified in the SPA or PSA, and none would be expected to occur.	**Not Applicable**

Wildlife Habitat Category and Associated Species and Ecological Land Classification (ELC) Communities		Provincial Guidance for SWH in Ecoregion 6E*	Application to the Secondary Plan Area (SPA) and Primary Study Area (PSA)**	Assessed SWH Status in the SPA
20. Savannah				
ELC Communities: TPS1 TPS2 TPW1 TPW2 CUS2		- A Savannah is a tallgrass prairie habitat that has tree cover between 25 – 60% *Suggested Criteria* - No minimum size to site. Site must be restored or a natural site. Remnant sites such as railway right of ways are not considered to be SWH - Field studies confirm one or more of the Prairie indicator species listed in Appendix N should be present. Note: Savannah plant spp. list from Ecoregion 6E should be used - Site must not be dominated by exotic or introduced species (<50% vegetative cover exotics)	No suitable habitat identified in the SPA or PSA, and none would be expected to occur.	**Not Applicable**
21. Tallgrass Prairie				
ELC Communities: TPO1 TPO2		- A Tallgrass Prairie has ground cover dominated by prairie grasses. An open Tallgrass Prairie habitat has < 25% tree cover - In ecoregion 6E, known Tallgrass Prairie and savannah remnants are scattered between Lake Huron and Lake Erie, near Lake St. Clair, north of and along the Lake Erie shoreline, in Brantford and in the Toronto area (north of Lake Ontario) *Suggested Criteria* - No minimum size to site. Site must be restored or a natural site. Remnant sites such as railway right of ways are not considered to be SWH - ELC communities TPO1, TPO2 - Field studies confirm one or more of the Prairie indicator species listed in Appendix N in SWHTG (MNRF 2000) should be present. Prairie plant spp. list from Ecoregion 6E should be used - Site must not be dominated by exotic or introduced species (<50% vegetative cover exotics)	No suitable habitat identified in the SPA or PSA, and none would be expected to occur.	**Not Applicable**
22. Other Rare Vegetation Communities				
		- Provincially Rare S1, S2 and S3 vegetation communities are listed in Appendix M of the SWHTG (MNRF 2000) - Rare Vegetation Communities may include beaches, fens, forest, marsh, barrens, dunes and swamps - ELC Ecosite codes that have the potential to be a rare ELC Vegetation Type as outlined in SWHTG (MNRF 2000) Appendix M - The MNRF/NHIC will have up to date listing for rare vegetation communities	In 2006, NRSI identified a small Buttonbush Mineral Deciduous Thicket Swamp Type (SWT3-4) community within the southwestern PSA, which is considered rare in Ontario (with an S-rank of S3). Additional provincially rare communities may be identified through site specific study.	**One Confirmed SWH is mapped (ref. Map NH-6); other rare communities may be identified**
Specialized Habitat for Species				
23. Waterfowl Nesting Area				
American Black Duck Northern Pintail Northern Shoveler Gadwall Blue-winged Teal Green-winged Teal Wood Duck Hooded Merganser Mallard	All upland habitats located adjacent to these wetland ELC Ecosites are Candidate SWH: MAS1, MAS2, MAS3 SAS1, SAM1, SAF1 MAM1, MAM2, MAM3, MAM4, MAM5, MAM6 SWT1, SWT2, SWD1, SWD2, SWD3, SWD4 Note: Includes adjacency to Provincially Significant Wetlands	*Suitable Habitat* - A waterfowl nesting area extends 120 m from a wetland (> 0.5 ha) or a wetland (>0.5 ha) with small wetlands (<0.5ha) within 120m or a cluster of 3 or more small (<0.5 ha) wetlands within 120 m of each individual wetland where waterfowl nesting is known to occur - Upland areas should be at least 120m wide so that predators such as racoons, skunks, and foxes have difficulty finding nests *Suggested Criteria* Studies confirm: - Presence of 3 or more nesting pairs for listed species excluding Mallards, or presence of 10 or more nesting pairs for listed species including Mallards - Any active nesting site of an American Black Duck is considered significant - Wood Ducks and Hooded Mergansers utilize large diameter trees (>40 cm dbh) in woodlands for cavity nest sites	A total of 20 Mallards were identified in the lands immediately adjacent to Neumann's Pond (NRSI 2017). Based on this data the EIS Addendum has identified waterfowl nesting area however whether or not it is considered Confirmed SWH in the City of Guelph and, if so, the extent of habitat to be protected remains to be determined. Additional suitable habitat may be present within the SPA and/or PSA in the vicinity of ponds, but surveys conducted as part of the Clair-Maltby Secondary Plan studies did not document adequate numbers of listed species. Site specific study may be required where suitable habitat exists to confirm the status of this SWH type.	**A candidate SWH area is shown with an asterisk (ref. Map NH-6). Confirmation as SWH by the City is pending.**

Wildlife Habitat Category and Associated Species and Ecological Land Classification (ELC) Communities		**Provincial Guidance for SWH in Ecoregion 6E***	**Application to the Secondary Plan Area (SPA) and Primary Study Area (PSA)****	**Assessed SWH Status in the SPA**
24. Bald Eagle and Osprey Nesting, Foraging and Perching Habitat				
Osprey Bald Eagle	ELC Forest Community Series: FOD, FOM, FOC, SWD, SWM, SWC directly adjacent to riparian areas - rivers, lakes, ponds and wetlands.	*Suitable Habitat* • Nests are associated with lakes, ponds, rivers or wetlands along forested shorelines, islands, or on structures over water • Osprey nests are usually at the top a tree whereas Bald Eagle nests are typically in super canopy trees in a notch within the tree's canopy • Nests located on man-made objects are not to be included as SWH (e.g. telephone poles and constructed nesting platforms) *Suggested Criteria Studies confirm the use of these nests by:* • One or more active Osprey or Bald Eagle nests in an area • Some species have more than one nest in a given area and priority is given to the primary nest with alternate nests included within the area of the SWH • For an Osprey, the active nest and a 300 m radius around the nest or the contiguous woodland stand is the SWH [ccvii], maintaining undisturbed shorelines with large trees within this area is important • For a Bald Eagle the active nest and a 400-800 m radius around the nest is the SWH. Area of the habitat from 400-800m is dependent on site lines from the nest to the development and inclusion of perching and foraging habitat • To be significant a site must be used annually. When found inactive, the site must be known to be inactive for >3 years or suspected of not being used for >5 years before being considered not significant	Suitable habitat is present within the PSA and SPA in the vicinity of ponds and wetlands. No evidence for Bald Eagle was noted during field studies in 2017 or in previous studies in the PSA. One active Osprey nest was located on a lighting post by the baseball diamonds in the northwestern PSA in 2017. This nest is on a man-made structure, so it is not SWH. The area around the nest provides foraging and perching habitat. Other supplemental data suggests Osprey are located in the PSA and SPA. Site specific study may be required where suitable habitat exists to confirm the status of this SWH type.	**This type of SWH may occur but has not been mapped**
25. Woodland Raptor Nesting Habitat				
Northern Goshawk Cooper's Hawk Sharp-shinned Hawk Red-shouldered Hawk Barred Owl Broad-winged Hawk	May be found in all forested ELC Ecosites. May also be found in: SWC SWM SWD CUP3	*Suitable Habitat* • All natural or conifer plantation woodland/forest stands combined >30ha or with >4 ha of interior habitat; interior habitat determined with a 200 m buffer • Stick nests found in a variety of intermediate-aged to mature conifer, deciduous or mixed forests within tops or crotches of trees. Species such as Coopers hawk nest along forest edges sometimes on peninsulas or small off-shore island • In disturbed sites, nests may be used again, or a new nest will be in close proximity to old nest *Suggested Criteria* Studies confirm: • Presence of 1 or more active nests from species list is considered significant • Red-shouldered Hawk and Northern Goshawk – a 400m radius around the nest or 28 ha of suitable habitat is the SWH. (the 28 ha habitat area would be applied where optimal habitat is irregularly shaped around the nest) • Barred Owl – a 200m radius around the nest is the SWH • Broad-winged Hawk and Coopers Hawk,– a 100m radius around the nest is the SWH • Sharp-Shinned Hawk – a 50m radius around the nest is the SWH	No suitable habitat has been identified in the SPA or PSA due to the lack of interior forest, although a few of the listed species may occur.	**Not Applicable**
26. Turtle Nesting Areas				
Midland Painted Turtle Northern Map Turtle Snapping Turtle	Exposed mineral soil (sand or gravel) areas adjacent (<100 m) to within the following Ecosites: MAS1 MAS2 MAS3 SAS1 SAM1	*Suitable Habitat* • Best nesting habitat for turtles are close to water and away from roads and sites less prone to loss of eggs by predation from skunks, raccoons or other animals • For an area to function as a turtle-nesting area, it must provide sand and gravel that turtles are able to dig in and are located in open, sunny areas • Nesting areas on the sides of municipal or provincial road embankments and shoulders are not SWH	Potential suitable habitat is present within the PSA and SPA in areas surrounding marshes and open aquatic ecosites, particularly adjacent to ponds where Midland Painted Turtles and /or Snapping Turtle have been documented (see SWH Type #7)**.** Two Snapping Turtle nests were documented in the vicinity of the Neumann Pond (Basking Turtle Monitoring Station T1, ref. **Map NH-2**) but the locations are unknown (North-South Environmental Inc. 2015). Snapping Turtle was also observed nesting within areas of marshes	**This type of SWH occurs and is to be mapped through site-specific study**

Wildlife Habitat Category and Associated Species and Ecological Land Classification (ELC) Communities		Provincial Guidance for SWH in Ecoregion 6E*	Application to the Secondary Plan Area (SPA) and Primary Study Area (PSA)**	Assessed SWH Status in the SPA
	SAF1 BOO1 FEO1	- Sand and gravel beaches adjacent to undisturbed shallow weedy areas of marshes, lakes, and rivers are most frequently used *Suggested Criteria* Studies confirm: - Presence of 5 or more nesting Midland Painted Turtles - One or more Northern Map Turtle or Snapping Turtle nesting - The area or collection of sites within an area of exposed mineral soils where the turtles nest, plus a radius of 30-100m around the nesting area dependant on slope, riparian vegetation and adjacent land use is the SWH - Travel routes from wetland to nesting area are to be considered within the SWH	located in the northern central PSA in the vicinity of Dallan Drive. North-South Environmental (2016) noted Snapping Turtle basking and nesting close to the SWM Pond and wetland just east of Hawkins Drive, while Stantec (2007) observed nesting Snapping Turtle in a wetland south of Dallan Drive within the SPA. Additional turtle nesting areas may be identified through site specific study, and may be confirmed as SWH.	
27. Seeps and Springs				
Wild Turkey Ruffed Grouse Spruce Grouse White-tailed Deer Salamander spp.	Seeps and springs are areas where ground water comes to the surface. Often, they are found within headwater areas within forested habitats. Any forested Ecosite within headwater areas of a stream could have seeps/springs.	*Suitable Habitat* - Any forested area (with <25% meadow/field/pasture) within the headwaters of a stream or river system (could contain a seep or spring - areas where groundwater comes to the surface) - Seeps and springs are important feeding and drinking areas especially in the winter will typically support a variety of plant and animal species - The protection of the recharge area considering the slope, vegetation, height of trees and groundwater condition need to be considered in delineation the habitat *Suggested Criteria* Studies confirm: - Presence of a site with 2 or more seeps/springs should be considered SWH - The area of an ELC forest ecosite containing the seeps/springs is the SWH	Suitable habitat occurs within the PSA and SPA. One seep was by Beacon in 2017 within the SPA on the 2162 Gordon Street property. Additional seepage areas may be identified through site specific study, and may be confirmed as SWH.	**One Confirmed SWH is mapped (ref. Map NH-6); additional seeps or springs may occur**
28. Amphibian Breeding Habitat (Woodland)				
Eastern Newt Blue-spotted Salamander Spotted Salamander Gray Treefrog Spring Peeper Western Chorus Frog Wood Frog	All Ecosites associated within these ELC Community Series: FOC, FOM, FOD, SWC, SWM, SWD Breeding pools within the woodland or the shortest distance from the forest habitat are more significant because they are more likely to be used due to reduced risk to migrating amphibians.	*Suitable Habitat* - Presence of a wetland, pond, or woodland pool within or adjacent (within 120m) to a woodland (no minimum size) - Some small wetlands may not be mapped and may be important breeding pools for amphibians - Woodlands with permanent ponds or those containing water in most years until mid-July are more likely to be used as breeding habitat *Suggested Criteria* Studies confirm: Presence of breeding population of 1 or more of the listed salamander species or 2 or more of the listed frog species with at least 20 individuals (adults, juveniles, eggs/larval masses) or 2 or more of the listed frog species with Call Level Codes of 3	Suitable habitat occurs within wetlands in the SPA and PSA, and as documented in the amphibian surveys over 2017, these areas support very healthy levels of Spring Peepers, Gray Treefrogs and Wood Frogs with Eastern Newt, Blue-spotted Salamander and Western Chorus Frog documented in the area as well. All wetlands greater than 500 m^2 located in, or within 120 m of, a woodland (i.e., FOC, FOD or FOM) or swamp in the SPA have been identified as Candidate SWH for this category. Wetlands meeting the suggested criteria based on data collected in 2017 have been identified as Confirmed SWH for this category. Candidate areas should be verified through site-specific study.	**Candidate and Confirmed SWH are mapped (ref. Map NH-6)**
29. Amphibian Breeding Habitat (Wetland)				
Eastern Newt American Toad Spotted Salamander Four-toed Salamander Blue-spotted Salamander Gray Treefrog Western Chorus Frog Northern Leopard Frog Pickerel Frog Green Frog Mink Frog	Classes SW, MA, FE, BO, OA and SA. Typically, these wetland Ecosites will be isolated >120 m) from woodland ecosites, however larger wetlands containing predominantly aquatic species (e.g. Bullfrog) may be adjacent to woodland.	*Suitable Habitat* - Wetlands >500 m^2 (about 25 m diameter) supporting high species diversity are significant - Some small or ephemeral habitats may not be identified on MNRF mapping and could be important amphibian breeding habitats - Presence of shrubs and logs increase significance of pond for some amphibian species because of available structure for calling, foraging, escape and concealment from predators - Bullfrogs require permanent water bodies with abundant emergent vegetation *Suggested Criteria*	Suitable habitat occurs within wetlands in the SPA and PSA, as do the listed species (see SWH Type #28). All wetlands greater than 500 m^2 located more than 120 m from a woodland (i.e., FOC, FOD or FOM) or wooded swamps in the SPA have been identified as Candidate SWH for this category. Wetlands meeting the suggested criteria based on data collected in 2017 have been identified as Confirmed SWH for this category. Candidate areas should be verified through site-specific study. Additional areas may also be identified through site specific study.	**Candidate and Confirmed SWH are mapped (ref. Map NH-6)**

Wildlife Habitat Category and Associated Species and Ecological Land Classification (ELC) Communities		Provincial Guidance for SWH in Ecoregion 6E*	Application to the Secondary Plan Area (SPA) and Primary Study Area (PSA)**	Assessed SWH Status in the SPA
Bullfrog		Studies confirm: • Presence of breeding population of 1 or more of the listed newt/salamander species or 2 or more of the listed frog or toad species and with at least 20 individuals (adults, juveniles, eggs/larval masses) or 2 or more of the listed frog species with Call Level Codes of 3 • The ELC ecosite wetland area and the shoreline are the SWH		
30. Woodland Area-Sensitive Bird Breeding Habitat				
Yellow-bellied Sapsucker Red-breasted Nuthatch Veery Blue-headed Vireo Northern Parula Black-throated Green Warbler Blackburnian Warbler Black-throated Blue Warbler Ovenbird Scarlet Tanager Winter Wren Cerulean Warbler Canada Warbler	All Ecosites associated with these ELC Community Series: FOC FOM FOD SWC SWM SWD	*Suitable Habitat* • Habitats where interior forest breeding birds are breeding • Typically large mature (>60 yrs old) forest stands or woodlots >30 ha • Interior forest habitat is at least 200 m from forest edge habitat *Suggested Criteria* Studies confirm: • Presence of nesting or breeding pairs of 3 or more of the listed wildlife species. Any site with breeding Cerulean Warblers or Canada Warblers is to be considered SWH	No suitable habitat has been identified in the SPA or PSA due to the lack of interior forest, although a few of the listed species have been documented.	**Not Applicable**
Habitat for Species of Conservation Concern				
31. Marsh Bird Breeding Habitat				
American Bittern Virginia Rail Sora Common Moorhen American Coot Pied-billed Grebe Marsh Wren Sedge Wren Common Loon Sandhill Crane Green Heron Trumpeter Swan Black Tern Yellow Rail	MAM 1 MAM2 MAM3 MAM4 MAM5 MAM6 SAS1 SAM1 SAF1 FEO1 BOO1 For Green Heron: All SW, MA and CUM1 sites.	*Suitable Habitat* • Nesting occurs in wetlands • All wetland habitat is to be considered as long as there is shallow water with emergent aquatic vegetation present • For Green Heron, habitat is at the edge of water such as sluggish streams, ponds and marshes sheltered by shrubs and trees. Less frequently, it may be found in upland shrubs or forest a considerable distance from water *Suggested Criteria* Studies confirm: • Presence of 5 or more nesting pairs of Sedge Wren or Marsh Wren or breeding by any combination of 4 or more of the listed species • Note: any wetland with breeding of 1 or more Trumpeter Swans, Black Terns or Yellow Rail is SWH • Area of the ELC ecosite is the SWH	Limited suitable habitat occurs within the PSA and SPA, but most of the listed species have not been documented in the area and would not be expected to occur, with the exception of Pied-billed Grebe, Sora and Green Heron. The results of the breeding bird studies did not document any areas meeting the criteria, but access was limited and it is possible that it may occur. Site specific study may be required where suitable habitat exists to confirm the status of this SWH type.	**This type of SWH may occur but has not been mapped**
32. Open Country Bird Breeding Habitat				
Upland Sandpiper Grasshopper Sparrow Vesper Sparrow Northern Harrier Savannah Sparrow Short-eared Owl	CUM1 CUM2	*Suitable Habitat* • Large grassland areas (includes natural and cultural fields and meadows) >30 ha • Grasslands not Class 1 or 2 agricultural lands, and not being actively used for farming (i.e. no row cropping or intensive hay or livestock pasturing in the last 5 years) • Grassland sites considered significant should have a history of longevity, either abandoned fields, mature hayfields and pasturelands that are at least 5 years or older • The Indicator bird species are area sensitive requiring larger grassland areas than the common grassland species *Suggested Criteria* Field Studies confirm: • Presence of nesting or breeding of 2 or more of the listed species	No suitable habitat has been identified in the SPA or PSA due to the lack of large enough contiguous meadow / grassland habitats, although a few of the listed species have been documented.	**Not Applicable**

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		• A field with 1 or more breeding Short-eared Owls is to be considered SWH. The area of SWH is the contiguous ELC ecosite field areas		
33. Shrub/Early Successional Bird Breeding Habitat				
Indicator Species: Brown Thrasher Clay-coloured Sparrow Common Species: Field Sparrow Black-billed Cuckoo Eastern Towhee Willow Flycatcher Special Concern: Golden-winged Warbler	CUT1 CUT2 CUS1 CUS2 CUW1 CUW2 Patches of shrub ecosites can be complexed into a larger habitat for some bird species.	*Suitable Habitat* • Large natural field areas succeeding to shrub and thicket habitats >10ha in size. Shrub land or early successional fields, not class 1 or 2 agricultural lands, not being actively used for farming (i.e. no row-cropping, haying or live-stock pasturing in the last 5 years) • Shrub thicket habitats (>10 ha) are most likely to support and sustain a diversity of these species • Shrub and thicket habitat sites considered significant should have a history of longevity, either abandoned fields or pasturelands *Suggested Criteria* Field Studies confirm: • Presence of nesting or breeding of 1 of the indicator species and at least 2 of the common species • A habitat with breeding Golden-winged Warbler is to be considered as Significant Wildlife Habitat • The area of the SWH is the contiguous ELC ecosite field/thicket area	Potentially suitable habitat is present within the SPA and PSA due to the presence of cultural thickets of at least 10 ha, including habitat on 132 Clair Road as identified in the EIS Addendum (NRSI 2017). During the 2017 breeding bird surveys, Beacon noted several properties where listed species occurred: 1825 Victoria Road South (Brown Thrasher, Eastern Towhee and Field Sparrow), 132 Clair Road West (Brown Thrasher, Eastern Towhee and Field Sparrow), 2162 Gordon Street (Willow Flycatcher, Field Sparrow), south of Breeding Bird Station B6 (Brown Thrasher), 99 Maltby Road West (Field Sparrow), 2054 Gordon Street (Willow Flycatcher) and 2021 Gordon Street (Brown Thrasher and Field Sparrow). Additionally, background studies confirmed: • Brown Thrasher within the Westminster Woods East lands (NSE 2001, Stantec et al. 2005), and the 385 Maltby Rd. West lands (NRSI 2012); • Field Sparrow in the 132 Clair Road West lands (NSE 2015), 424 Maltby Road (Dance Environmental Inc. 2014), the Dallan lands (Stantec 2007) and the 385 Maltby Rd. West lands (NRSI 2012); • Black-billed Cuckoo on the 385 Maltby Rd. West lands (NRSI 2012); • Eastern Towhee on the 424 Maltby Road (Dance Environmental Inc. 2014) and on the 385 Maltby Rd. West lands (NRSI 2012); and • Willow Flycatcher noted at 132 Clair Road West (NSE 2015, NRSI 2017) and on the 385 Maltby Rd. West lands (NRSI 2012). Site-specific study will be needed to capture the best and most representative area(s) in the SPA.	**Several Candidate SWH areas are shown approximately with asterisks. Site-specific studies will be needed to a) capture the best and most representative area(s) in the SPA and/ or b) confirm the significance and extent of these habitats. (ref. Map NH-6)**
34. Terrestrial Crayfish				
Chimney or Digger Crayfish (*Fallicambarus fodiens*) Devil Crawfish or Meadow Crayfish (*Cambarus Diogenes*)	MAM1, MAM2, MAM3, MAM4, MAM5, MAM6 MAS1, MAS2, MAS3 SWD, SWT, SWM CUM1 within inclusions of above meadow marsh or swamp ecosites can be used by terrestrial crayfish.	*Suitable Habitat* • Wet meadow and edges of shallow marshes (no minimum size) identified should be surveyed for terrestrial crayfish • Constructs burrows in marshes, mudflats, meadows; the ground can't be too moist • Can often be found far from water • Both species are a semi-terrestrial burrower which spends most of its life within burrows consisting of a network of tunnels; usually the soil is not too moist so that the tunnel is well formed *Suggested Criteria* Studies Confirm: • Presence of 1 or more individuals of species listed or their chimneys (burrows) in suitable marsh meadow or terrestrial sites • Area of ELC Ecosite polygon is the SWH	Suitable habitat occurs within the PSA and SPA. No evidence of Terrestrial Crayfish was documented during field studies within the PSA and SPA. However, surveys for this species were incidental and not targeted, and access was limited. Therefore they may occur. Site specific study may be required where suitable habitat exists to confirm the status of this SWH type.	**This type of SWH may occur but has not been mapped**

Wildlife Habitat Category and Associated Species and Ecological Land Classification (ELC) Communities	Provincial Guidance for SWH in Ecoregion 6E*	Application to the Secondary Plan Area (SPA) and Primary Study Area (PSA)**	Assessed SWH Status in the SPA
35. Special Concern and Rare Wildlife Species			
	• All Special Concern and Provincially Rare (S1-S3, SH) plant and animal species • When an element occurrence is identified within a 1 or 10 km grid for a Special Concern or provincially rare species • Linking candidate habitat on the site needs to be completed to ELC Ecosites *Suggested Criteria* Studies confirm: • Assessment/inventory of the site for the identified special concern or rare species needs to be completed during the time of year when the species is present or easily identifiable • Habitat form and function needs to be assessed from the assessment of ELC vegetation types and an area of significant habitat that protects the rare or special concern species identified • The area of the habitat to the finest ELC scale that protects the habitat form and function is the SWH; this must be delineated through detailed field studies • The habitat needs be easily mapped and cover an important life stage component for a species (e.g. specific nesting habitat or foraging habitat)	Suitable habitat occurs within the SPA and PSA for a number of Special Concern species as well as some species list provincially as S1, S2, S3 or SH. These were documented by Beacon in 2017 and in other background studies (ref. Appendix NH-4 and Appendix NH-5). Site specific studies should include screening for these species to confirm the status of this SWH type.	**This type of SWH may occur but has not been mapped**
Animal Movement Corridors			
36. Amphibian Movement Corridors			
Eastern Newt American Toad Spotted Salamander Four-toed Salamander Blue-spotted Salamander Gray Treefrog Western Chorus Frog Northern Leopard Frog Pickerel Frog Green Frog Mink Frog Bullfrog	• Amphibian movement corridors should only be identified as SWH where a confirmed or Candidate SWH has been identified by MNRF or the planning authority • Movement corridors between breeding habitat and summer habitat • Movement corridors must be considered when amphibian breeding habitat is confirmed as SWH • Field Studies must be conducted at the time of year when species are expected to be migrating or entering breeding sites • Corridors should consist of native vegetation, with several layers of vegetation • Corridors unbroken by roads, waterways or bodies, and undeveloped areas are most significant • Corridors should be at least 15 m of vegetation on both sides of waterway or be up to 200 m wide of woodland habitat and with gaps <20 m • Shorter corridors are more significant than longer corridors, however amphibians must be able to get to and from their summer and breeding habitat	The amphibian movement documented through the Clair Maltby Secondary Plan studies, and through previous work (Dougan & Associates with Snell and Cecile 2009a), has been primarily across existing roads. The City has identified several Ecological Linkages which are intended to, among other functions, support amphibian movement. Other portions of the NHS which connect Candidate or Confirmed amphibian breeding habitats with summer foraging or wintering habitats may also provide linkage functions. One or more of these areas may meet the criteria for amphibian movement corridors. Site specific studies should include screening for amphibian movement where suitable habitat exists to confirm the status of this SWH type.	**This type of SWH may occur but has not been mapped**
37. Deer Movement Corridors			
White-tailed Deer	• Deer movement corridors should only be identified as SWH where a confirmed or Candidate SWH has been identified by MNRF or the planning authority • Corridors follow riparian areas, woodlots, areas of physical geography (ravines or ridges) • Field Studies must be conducted at the time of year when species are expected to be migrating or moving to and from winter concentration areas • Corridors that lead deer to wintering habitat should be unbroken by roads or residential areas • Corridors should be at least 200 m wide with gaps less than 20 m, and if following a riparian area, there must be at least 15 m of vegetation on both sides of the waterway	No deer movement corridors meeting the SWH criteria have been identified by MNRF to date in the SPA. However, the City has identified Ecological Linkages that, based on the available information, are in appropriate locations to support deer movement in an urbanized context.	**Not Applicable**

* Adapted from the listed species and habitat criteria provided in the Significant Wildlife Habitat Criteria Schedules for Ecoregion 6E (MNRF 2015) but updated to reflect any relevant changes in species status. For example, Tri-coloured Bat (*Perimyotis subflavus*) is now listed as Threatened and Yellow-breasted Chat (*Icteria virens*) is now listed as Endangered so these species need to be addressed as a Species at Risk under the Endangered Species Act (2007) and not under SWH. See Appendix NH-6.

** The SWH assessment considered the broader PSA (i.e., a 500 m zone surrounding the SPA) where contiguous or adjacent natural and semi-natural areas occur in this zone. The SPA was included in the assessment in two ways: (a) to screen for suitable habitat and (b) to screen for data from background studies (ref. Appendix NH-1) that may inform the assessment. However, ultimate refinements to the SWH mapping will be restricted to within the City's boundaries and will be focussed within the SPA.


wood.