North Waterloo, Phase 1 Groundwater and Surface Water Monitoring Program



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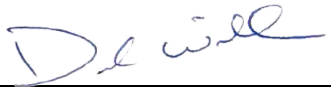
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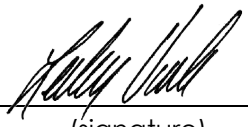
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Abbreviations

BGS	below ground surface
BTOC	below top of casing
City	City of Waterloo
the Client	Northgate Corporation, 2115881 Ontario Ltd., Activa Holdings, and Erbsville Kartway
HDPE	high density polyethylene
KWCS	Kitchener-Waterloo Climate Station
LCWS	Laurel Creek Watershed Study
NWSSS	North Waterloo Scoped Subwatershed Study
MNR	Ministry of Natural Resources
RCS	Roseville Climate Station
Region	Regional Municipality of Waterloo
the Site	proposed development, generally bounded by Erbsville Road, Beaver Creek Road, Laurel Creek Conservation lands and City limits
Stantec	Stantec Consulting Ltd.
SWMF	storm water management facility
TSS	total suspended solids
UWWS	University of Waterloo Weather Station

1.0 INTRODUCTION

Northgate Corporation, 2115881 Ontario Ltd., Activa Holdings, and Erbsville Kartway (the client) are proposing future development within properties located in the northwestern portion of the City of Waterloo (City), within the Regional Municipality of Waterloo (Region). The City of Waterloo formally refers to this area as the Beaver Creek Meadows District. The proposed development is generally bounded by Erbsville Road to the west, Beaver Creek Road to the east, the Laurel Creek Conservation lands to the south and the City limits to the north (the Site). This Site is located within the study boundary of the North Waterloo Scoped Subwatershed Study (NWSSS).

In support of development, the City requires that monitoring programs be completed by the developer and must include Stage I, II and III monitoring per the Laurel Creek Watershed Development Monitoring Program. Stage I consists of 2 years of pre-development monitoring, Stage II represents during construction conditions, and Stage III extends for 24 months following substantial completion of the development (i.e., 90% stabilization of the catchment area).

The NWSSS presented initial groundwater and surface water monitoring results from 2009 and 2010 (Ecoplans, MHBC, Stantec, 2013). Stantec Consulting Ltd. (Stantec) was retained to complete the 2011 to 2015 surface water and groundwater monitoring and to prepare the 2014 and 2015 monitoring report in support of proposed development of the Site. Natural Resource Solutions Inc. was retained to complete the terrestrial monitoring components, which are provided under separate cover. The following report presents the surface water and groundwater monitoring data collected from 2011 to 2015 along with the historical data for reference.

This report is arranged in six sections, including this introduction. Section 2 presents a background of the previous investigations. Section 3 presents the methodology while the 2009 to 2015 monitoring results are presented in Section 4. Section 5 provides conclusions and recommendations based on the 2011 to 2015 monitoring program results while Section 6 provides a list of references.

All figures and tables referenced in the report are presented in Appendices A and B, respectively. Appendices C to E present the approved Phase I Monitoring Program, surface water flow data and analysis and laboratory certificates of analysis, respectively.

2.0 BACKGROUND

The NWSSS focused on lands located in the northwestern portion of the City including the current Site. The overall goal of the NWSSS was to assess existing characteristics within the study area and develop a management strategy for the study area that protected, maintained and enhanced the ecological function and significant natural features.

2.1 NWSSS HYDROGEOLOGIC INVESTIGATION

The following section presents a summary of the findings from the NWSSS (2013) hydrogeologic investigation with respect to the current Site. Full details of the investigation and reports are included in the subwatershed report (Ecoplans, MHBC, Stantec, 2013).

The Site is located within the Waterloo Moraine, a complex deposit of ice contact and glacial outwash sands and gravels separated by silt and clay tills. The conceptual hydrogeologic model for the moraine consists of four (4) overburden aquifers (Aquifers 1 to 4), separated by four aquitards (Aquitards 1 to 4). The upper portion of the bedrock aquifer in the area was classified as being part of the fourth aquifer unit. The overburden in the vicinity of the Site is approximately 70 m thick and overlies dolostone and shale bedrock of the Salina Formation.

The surficial geology within the Site consists predominately of sandy glaciofluvial deposits associated with Aquifer 1 overlain by discontinuous deposits of clay to silt-textured till associated with Aquitard 1. Modern alluvial deposits were found in low lying areas associated with Beaver Creek and Laurel Creek.

Aquitards 2/3 are generally continuous within the Waterloo Moraine; however, within the Site, Aquitards 2/3 were eroded by a glacial meltwater channel that extends in a general northwest to southeast direction. Aquitard 2 was absent within select areas of the Site and within the meltwater channel, Aquitard 3 was eroded to only 6 m. The erosion of Aquitard 2/3 created hydraulic connections with the underlying aquifer.

Groundwater flow within the shallow deposits of Aquifer 1 is predominantly towards Beaver Creek and Laurel Creek from areas of topographic highs. The local groundwater flow contours are consistent with regional groundwater flow direction. Groundwater level data from monitoring wells within the Site and available topography suggest that groundwater discharge to Laurel Creek may be occurring.

Based on surface water flow rate data and groundwater / surface water hydraulic gradients, groundwater discharge conditions are interpreted along Laurel Creek during both low and high groundwater levels. Minimal groundwater discharge/recharge is interpreted along the majority of Beaver Creek with the exception of seasonal groundwater discharge conditions interpreted at the southern extent of the creek. Groundwater recharge conditions may be occurring within Beaver Creek to the northwest of the Site during low groundwater conditions.

Water quality results within deposits of Aquifer 1 within the northeastern portion of the Site were characterized by aerobic groundwater with nitrate present suggesting influence from local agricultural fields. Within the western portion of the property, shallow water quality results indicated slightly anaerobic water with both manganese and nitrate present and typically low dissolved oxygen levels. Water quality results within the deep monitoring wells at the western extent of the Site including MW8-10D and MW12-10D indicated elevated sulphate concentrations of up to 370 mg/L, suggesting a hydraulic connection with the deeper hydrostratigraphic units, likely a result of the eroded deposits of Aquitards 2/3 within the glacial meltwater channel.

2.2 NWSSS SURFACE WATER INVESTIGATION

The following section presents a summary of the findings from the NWSSS (2013) surface water investigation with respect to the current Site. Full details of the investigation and reports are included in the subwatershed report (Ecoplans, MHBC, Stantec, 2013).

Laurel Creek and its associated tributaries represent the main surface water feature near the Site. Laurel Creek flows immediately south of the Site discharging into the Laurel Creek Reservoir. Beaver Creek, a tributary of Laurel Creek, flows from the northwest of the Site, meanders through the Site before discharging to Laurel Creek just upstream of the Laurel Creek Reservoir.

Laurel Creek is a headwater tributary of the Grand River that flows in a southeasterly direction through the Site and discharges to the Grand River south of the Site. The reach immediately downstream of the Site (and upstream of the reservoir) has been classified as an existing coldwater system as well as an important source for groundwater discharge, possibly supplying baseflow to the creek and its associated wetland features (GRCA 1993). In addition, the portion of Laurel Creek within the Site is considered by the Ministry of Natural Resources (MNR) to be 'a trout stream containing a naturally reproducing population of Brown Trout and possibly Brook Trout.

Beaver Creek is a headwater tributary of Laurel Creek and flows in a southerly direction through the Site, discharging into Laurel Creek at the southern end of the Site. According to the Laurel Creek Watershed Study (LCWS) (GRCA 1993), this tributary was classified as a potential coldwater stream, although portions of the watercourse have been degraded by intensive agricultural activities through the years.

2.3 NORTH WATERLOO MONITORING PROGRAM

The NWSSS included groundwater and surface water monitoring data for the Site from 2009 and 2010. The groundwater and surface water monitoring has been on-going since 2011. The Phase 1 Monitoring Program for the Site was approved in mid-2014, which included a reduced monitoring program within the Site itself and eliminated monitoring of adjacent wells. The monitoring wells and current status are detailed in Table 1. A copy of the approved monitoring program is included in Appendix C.

3.0 METHODOLOGY

The following section details the methodology for monitoring from 2011 to 2015, including groundwater and surface water level monitoring, surface water flow monitoring, groundwater quality sampling and analysis, and climate data.

3.1.1 Water Level Monitoring

In 2011, the groundwater and surface water level monitoring was continued at the Site for all locations included in the original monitoring program for the NWSSS. The monitoring locations are presented on Figure 1 with well construction details and monitoring status presented in Table 1. Since 2011, the following modifications were completed to the program:

- Groundwater level monitoring was completed at WN1-91-1/2/3/4 until September 2013. The loggers were removed to allow well upgrades by the Region. Stantec indicated that no additional monitoring was required at this location
- Groundwater level monitoring was completed at WN2-91-1/4 until April 2014. Stantec indicated that no additional monitoring was required at this location and the Region was planning to abandon this well
- Groundwater level monitoring was completed at WN3-91-1/2 until September 2013. Stantec indicated that no additional monitoring was required at this location and the Region abandoned this well
- Groundwater level monitoring was attempted at MW9-10S/D; however, due to on-going issues with artesian conditions, the wells were abandoned in December 2013
- With the approval of the 2014 monitoring program, groundwater level monitoring requirement was removed for the majority of locations outside of the Site. The following locations were removed from the monitoring program between Spring and Fall 2014:
    - Monitoring wells MW1-05, MW8-05, WN-TW2-06, MW1-10, MW4-10 and MW5-10
    - Drivepoint Piezometers DP2-09, DP4-09, DP6-09 and DP8-09
- Groundwater and surface water level monitoring was completed at DP7-09 until September 2014. The surface water characteristics at the drivepoint had changed over the monitoring period and accurate stream flow data could no longer be recorded. Drivepoint Piezometer DP10-14 was installed in September 2014 downstream of DP7-09, as a replacement. This location was considered the closest suitable monitoring location based on stream conditions

Groundwater and surface water level monitoring was completed using a combination of manual and automated techniques. Monitoring wells and drivepoint piezometers were instrumented with Solinst® LT Leveloggers® and were set to record at 15-minute intervals (in September 2015, the interval was increased to 60-min). The Leveloggers® are not vented to the atmosphere and therefore record total pressure. As a result, data obtained from the

Leveloggers® was corrected for atmospheric pressure to obtain the actual height of water above the sensor. The atmospheric corrections were made using data collected from a Solinst Barologger®, which was initially located at MW1-05 and later moved to MW7-10.

Manual measurements were collected at all wells using a battery operated probe and calibrated tape. Water depths were recorded in meters below the top of the well casing (BTOC).

The surface water level data and groundwater level data from the drivepoint monitoring locations were reviewed. Surface water data were omitted when temperatures as recorded by the logger decreased below 0°C. Groundwater data were reviewed and omitted if clearly impacted by freezing conditions. It is expected that some of the groundwater and surface water level data from the drivepoints are still impacted by freezing conditions, and care should be given when interpreting winter data.

Groundwater and surface water level hydrographs are presented in Figures 2 to 6 for all monitoring locations.

3.1.2 Surface Water Flow Monitoring

The locations of the drivepoint piezometers established along Laurel Creek (DP6-09, DP7-09, DP9-09, and DP10-14) and Beaver Creek (DP1-09 to DP5-09 and DP8-09) are shown on Figure 1.

Stream flow at each drivepoint location was calculated using the velocity-area method (Dingman, 1994). Measurements were obtained by placing a measuring tape across the width of the stream and dividing the distance into equal sections. At each point, the depth of water was measured and the flow rate recorded using a Marsh-McBirney Inc. Model 201 portable water flow meter. Total discharge through the section was then calculated using the U.S. Geological Survey approved mid-section method as discussed in Hipolito and Loureiro (1988) and Dingman (1994).

Stream flows were measured at DP1-09 to DP9-09 on eight (8) select dates between May 2012 and August 2014. Stream flows were measured at DP1-09, DP3-09, DP5-09 and DP9-09 on at least three (3) occasions between August and December 2014, and three (3) occasions in 2015. Monitoring was also completed at DP7-09 in 2014 before this location was replaced be DP10-14 for the 2015 monitoring. Table 2 presents a summary of manual stream flow measurements at each location with detailed stream flow data and calculations included in Appendix D.

3.1.3 Surface Water Quality

Water quality sampling for City of Waterloo Monitoring Station 17 - Beaver Creek at Conservation Drive (DP3-09) was completed by the City of Waterloo. Beaver Creek converges with Laurel Creek just upstream of the Laurel Creek Reservoir. Since the watercourse is part of the Laurel Creek Watershed, it is governed by in-stream water quality targets established in the LCWS (GRCA, 1993). The in-stream quality targets are summarized below:

- **Temperature** – Target in-stream surface water temperatures to protect the coldwater fish species upstream of the Laurel Creek reservoir are:
    - Laurel Creek (cold water) - 22°C from April 1 to October 31 and between 4°C and 14°C from November 1 to March 31
    - Beaver Creek (warm water) - 29 °C from May 31 to October 31 and 26°C from June 1 to August
- **Dissolved Oxygen** – Target in-stream dissolved oxygen concentrations upstream of Laurel Creek Reservoir are:
    - Laurel Creek (cold water) – 6 mg/L
    - Beaver Creek (warm water) – 5 mg/L
- **Total Phosphorous** – Target instream phosphorous concentrations upstream of the Laurel Creek Reservoir are:
    - Laurel Creek (cold water) – 0.03 mg/L
    - Beaver Creek (warm water) – 0.08 mg/L
- **Total Suspended Solids (TSS)** – Maintain a concentration of less than 25 mg/L TSS for the effluent from storm water management facility (SWMF)
- **Bacteria** – Specific targets have not been established for new development, other than "maximizing bacteria removal." The LCWS target for *E.Coli* is based on Provincial Water Quality Guidelines for bathing beaches. The instream target for *E.Coli* is 100 CFU/100 mL for areas tributary to the Laurel Creek Reservoir

3.1.4 Groundwater Sampling and Water Quality Testing

Stantec completed groundwater water quality sampling within the shallow and deep monitoring wells at MW2-10, MW3-10, MW4-10, MW6-10, MW7-10, MW8-10S/D, and MW10-10 through MW13-10 in August 2014 and September 2015. The sampling was completed to document water quality prior to construction activity.

Groundwater samples were primarily collected using dedicated inertial-lift Waterra™ sampling pumps. The use of dedicated equipment reduced the possibility of cross contamination of samples between sampling locations. The Waterra™ sampling pumps were constructed of 16 mm diameter high density polyethylene (HDPE) tubing connected to a Waterra™ Delrin foot valve. For deep monitoring wells including MW3-10D, MW8-10D, and MW12-10D, a 38 mm Waterra™ submersible pump attached to 16 mm diameter HDPE tubing was employed to facilitate sample collection. Efforts were made to remove at least three (3) casing volumes from each well prior to sampling to remove stagnant water from the well casing. In cases where the well was purged dry, the well was allowed to fully recover prior to sampling. Prior to sample collection, the sampling system was lowered to within or just above the top of the well screen.

Field measurements of conductivity, temperature and pH were made using a Hanna Instruments model HI 991300 multiparameter water quality meter. This meter was calibrated prior to use according to the manufacturers' specifications with the appropriate calibration standards. Field parameters were monitored and allowed to stabilize prior to sampling.

Following purging, groundwater samples were collected directly from the HDPE tubing into the appropriate pre-labeled sample containers. Groundwater samples for metals analysis were field-filtered using disposable, in-line, 0.45 µm filters attached to the HDPE tubing and as such the results for metal parameters represent dissolved concentrations.

All groundwater samples collected were packed into sample coolers, which were refrigerated using ice packs, and delivered to Maxxam Analytics Inc. for laboratory analyses. All groundwater samples were analyzed for general inorganic, metals and nutrient analysis. Chain of custody forms were completed and included with the samples. The results of the groundwater quality testing are presented in Table 3 with a copy of the Laboratory Certificates of Analysis being provided in Appendix E.

3.1.5 Climatic Data

The University of Waterloo Weather Station (UWWS) is located approximately 4 km southeast of the Site. Except in 2015 when issues arose with UWWS data, daily precipitation and temperature data were collected from the UWWS. The 2015 data were obtained from the Environment Canada for the Kitchener-Waterloo Climate Station (KWCS) (located at the Region of Waterloo International Airport) and Roseville Climate Station (RCS). The KWCS and RCS are located approximately 24 km to the southeast and 20 km to the south of the Site, respectively. Historical precipitation data were obtained from RCS. Recent and historical precipitation data are presented on Figure 7.

4.0 MONITORING RESULTS

The 2011 to 2015 monitoring data was summarized with hydrographs presented in Figures 2 to 6, well construction details in Table 1, surface water flow data in Table 2 and groundwater analytical data in Table 3. In general, groundwater and surface water observations from 2011 to 2015 were consistent with the overall results and interpretations as presented in the NWSSS with respect to groundwater flow, levels and chemistry and surface water conditions. The following sections detail additional observations, clarifications or changes to the understanding of Site conditions since the NWSSS.

4.1 LOW PRECIPITATION - SUMMER 2012

Historical precipitation data for the RCS and from the UWWS was reviewed with a graph of the historical data presented on Figure 7. Over the 17 year monitoring period at UWWS (1998-2014), the average annual precipitation was 909 mm, and over the 30 year monitoring period at the RCS (1996-2015), the annual average precipitation was 899 mm.

The 2011 to 2015 data generally indicated above or near annual average precipitation over the monitoring period, with the exception of 2012, where below average precipitation was generally noted from February to August 2012. The annual precipitation in 2012 was recorded as 754 mm from the RCS, which is 16% below the 30-year average and 789 mm from the UWWS, which is 13% below the 17-year average.

Groundwater hydrographs from the monitoring wells and drivepoint piezometers within and adjacent to the Site are presented in Figures 2 to 6. The below average precipitation in summer 2012 resulted in groundwater level decrease at all shallow monitoring wells, with many monitoring wells reaching their lowest observed levels from 2009 to 2015. Precipitation and recharge in Fall 2012, resulted in groundwater level recovery at all locations.

The NWSSS indicated variable vertical hydraulic gradients along both Beaver Creek and Laurel Creek and did not consistently indicate areas of groundwater recharge or discharge. During the summer of 2012, gradients along Beaver Creek remained upward at DP1-09, DP2-09 and DP5-09 but became downward at DP8-09, DP3-09 and DP4-09, while along Laurel Creek gradients remained upward at DP7-09 and neutral at DP9-09 but became downward at DP6-09. Vertical gradients returned to previous conditions in Fall 2012, following precipitation events.

Stream flows along Beaver Creek and Laurel Creek measured during August 2012 ranged from 6 L/s to 10 L/s and 16 L/s to 21 L/s, respectively. Stream flow data were generally at their lowest historical levels. Surface water flow rates indicated some variation along the flow path but did not indicate a consistent increase or decrease in flow rate, suggesting the streams are not gaining or losing within the Site during this period.

This period of below average precipitation in summer 2012 indicated the potential for lower groundwater levels than previously presented in the NWSSS and also indicated that groundwater discharge conditions may not be occurring within Laurel Creek during periods of low groundwater conditions.

4.2 GROUNDWATER LEVELS – SPRING 2013/2014

As previously stated, the 2011 to 2015 data generally indicated above or near average annual precipitation over the monitoring period, with the exception of 2012 as discussed above. The annual precipitation in 2013 was recorded at 1231 mm from the UWWS, which is 35% above average. Above average monthly precipitation was measured in nine months in 2013, with peak precipitation occurring in July and October 2013. The annual precipitation in 2014 was recorded at 946 mm from the UWWS, which is 4% above average, with above average monthly precipitation primarily occurring in July and September 2014.

Within the shallow monitoring wells installed within Aquitard 1, the hydrographs indicated rapid response to individual precipitation events as the ground became saturated and water slowly infiltrated as noted at MW8-10S (Figure 4). Monitoring wells installed within deposits of Aquifer 1, with a larger unsaturated zone, such as MW7-10 (Figure 5) indicated a steady response to overall precipitation and recharge, but did not respond to individual events. These trends and responses to precipitation are consistent with the NWSSS.

However, the periods of above average precipitation and groundwater recharge in 2013 and 2014, resulted in higher shallow groundwater levels observed at all monitoring wells than suggested by the 2009/2010 data. The spring groundwater levels were compared to those originally presented in the NWSSS to evaluate the difference in levels. Levels were compared after a period of minimal precipitation in order to represent steady state levels. Within the Site, peak spring water levels increased at the following locations:

- At MW8-10S, located at the western extent of the Site, spring levels increased by 0.9 m compared to data from May 2012. This monitoring well is located adjacent to a swale area south of Conservation Drive, and is likely influenced by surface water / recharge occurring within the swale.
- At MW12-10S and MW13-10, located at the southern extent of the Site, spring groundwater levels increased by 0.6 m to 0.2 m, respectively.
- At MW10-10, within the western portion of the Site, spring groundwater levels did not significantly change as they were already at or near ground surface.
- Within the northeastern portion of the Site, spring groundwater levels increased by 0.9 m at MW3-10S and MW7-10, 0.4 m at MW2-10 and 0.5 m at MW6-10.

In general, these data indicate the potential for shallower groundwater conditions across the Site than previously expected. Within the northeastern portion of the Site, where an increase in spring groundwater levels of up to 0.9 m was predicted, there is a thick unsaturated zone and minimal impact to proposed construction is expected due to this change in peak spring levels.

Within the southern portion of the property, spring groundwater levels are generally expected to increase 0.2 m to 0.6 m from previous levels presented in the NWSSS. The NWSSS indicated that spring groundwater levels within the developable portion of the southern portion of the Site were generally expected at greater than 3 m below ground surface (BGS). The higher spring groundwater levels could impact some areas depending on proposed construction. The proposed development should take these revised levels into consideration.

4.3 GROUNDWATER CHEMISTRY 2014 AND 2015

Stantec completed groundwater water quality sampling at MW2-10, MW3-10S/D, MW4-10, MW6-10, MW7-10, MW8-10S/D, MW10-10, MW12-10S/D and MW13-10 in August 2014 and September 2015. MW11-10 was sampled in August 2014 but could not be sampled in September 2015 as the well had been damaged. Stantec is currently organizing well replacement. Water quality results are presented in Table 3 with copies of the laboratory certificates of analysis included in Appendix E. In general, the results are consistent with the data presented in the NWSSS, with the exception of:

- A decrease in chloride concentration at MW8-10S from 800 mg/L and 970 mg/L in 2010 to 500 mg/L in 2014 and 550 mg/L in 2015. This monitoring well is located near a swale adjacent to Conservation Drive and is influenced by winter road salting activities. It is interpreted that chloride concentration may fluctuate at this location, but remain elevated
- At MW3-10S, MW6-10 and MW11-10, water chemistry has changed since initial monitoring

At MW3-10S, the following changes were noted:

  - chloride decreasing from 28 and 23 mg/L in 2010 to 15 mg/L in 2014 and 17 mg/L in 2015
  - nitrate decreasing from 37 and 28 mg/L in 2010 to 22 mg/L in 2014 and 24 mg/L in 2015

At MW6-10, the following changes were noted:

  - nitrate decreasing from 23 mg/L in 2010 to 20 mg/L in 2014 and 16 mg/L in 2015

At MW11-10, the following changes were noted (monitoring could not be completed in 2015 as mentioned previously):

  - sulphate decreasing from 32 and 55 mg/L in 2010 to 18 mg/L in 2014
  - sodium decreasing from 46 and 85 mg/L in 2010 to 13 mg/L in 2014

- nitrate increasing from 11 and 13 mg/L in 2010 to 16 mg/L in 2014

These changes in shallow groundwater chemistry may be a function of changes in agricultural activity within the Site.

4.4 SURFACE WATER FLOW AND WATER LEVEL ANALYSIS

Historical flow and manual water level measurements were used to develop a rating curve for each of the flow monitoring sites. The rating curve was then applied to the continuous water level measurements derived from the deployed leveloggers to produce a hydrograph. Rating curves and associated hydrographs are presented in Appendix D.

A rating curve and hydrograph has not been produced for DP10-14 as it was installed in 2014 and does not have enough data to develop a rating curve at this time. This monitoring location was installed to replace DP7-10 as flow at this location is too disperse for accurate measurement.

In general, flow measurements during low flow and base flow events have produced consistent values, resulting in a well-defined rating curve for flow conditions at or near baseflow. Only a few flow measurements have been completed during periods of high flow, resulting in a rating curve producing significant increases in flow for marginal increases in water surface elevation. Future surface water flow measurements should be attempted during larger monitoring events in order to supplement the missing data within the presented rating curves.

4.5 SURFACE WATER QUALITY RESULTS

Surface water quality results for Beaver Creek at Conservation Drive – Station 17 were provided by the City of Waterloo, and are included in Appendix D. Water quality results were compared to targets established in the LCWS. The results of the analysis are listed below:

- TSS targets were met in 54% of the samples
- Dissolved oxygen targets were met in 90% of the samples
- Total phosphorous concentration targets were met in 790% of the samples
- Temperature targets were met in all samples
- Bacteria was not monitored by the City of Waterloo

Flow measurements completed by the City of Waterloo at Station 17 were cross referenced with estimated flows established using the rating curves developed as part of this study. Estimated flows were similar to those measured, however did not match up exactly. Further development of the rating curves should allow for estimated flow rates and flow rates measured by others to converge as more data is incorporated.

5.0 CONCLUSIONS AND RECOMMENDATIONS

Based on the results of the Phase 1 monitoring completed following the NWSSS, the following conclusions are provided:

- The NWSSS indicated that groundwater discharge conditions were expected within Laurel Creek, south of the Site, during both low and high groundwater conditions. Data during summer 2012 indicated that during prolonged periods of below average precipitation, groundwater levels will decrease and groundwater discharge to Laurel Creek may not be occurring

- Spring groundwater levels from 2013 and 2014 indicated an increase in peak groundwater levels throughout the Site of up to 0.9 m depending on the location. It is interpreted that this increase will have minimal impact on the northeastern portion of the Site due to the thick unsaturated zone. Groundwater levels within the developable portion of the southern portion of the Site were generally expected to be greater than 3 m BGS and the higher spring groundwater levels could impact some areas depending on proposed construction

- Groundwater quality results throughout the Site were generally consistent with historical data. Minor water quality changes at MW3-10S, MW6-10 and MW11-10 observed in 2014/2015 may be a function of changes in agricultural activity in the area

- Surface water hydrographs were created through the use of continuous water level loggers and manual flow measurements to develop a rating curve at each monitoring site

- Water quality monitoring at Station 17 (Beaver Creek at Conservation Drive) was completed by the City of Waterloo. In general LCWS targets were met for dissolved oxygen and temperature, however targets were not met for TSS and total phosphorous on a regular basis

Based on the results of the Phase 1 monitoring, the following recommendations are provided:

- The proposed grading and development within the Site should be reviewed with respect to the updated peak spring groundwater levels to confirm development design and grading

- Surface water levels and manual flow measurements should continue to be collected to gain further confidence in the rating curves. Monitoring should be focused on larger storm events to further refine the rating curve at higher water level elevations. Pre-development rating curves will provide a basis for comparison of during and post-construction monitoring results as development commences and SWM systems are installed

- Water quality monitoring at Station 17 should continue to be used to establish background water quality characteristics

6.0 REFERENCES

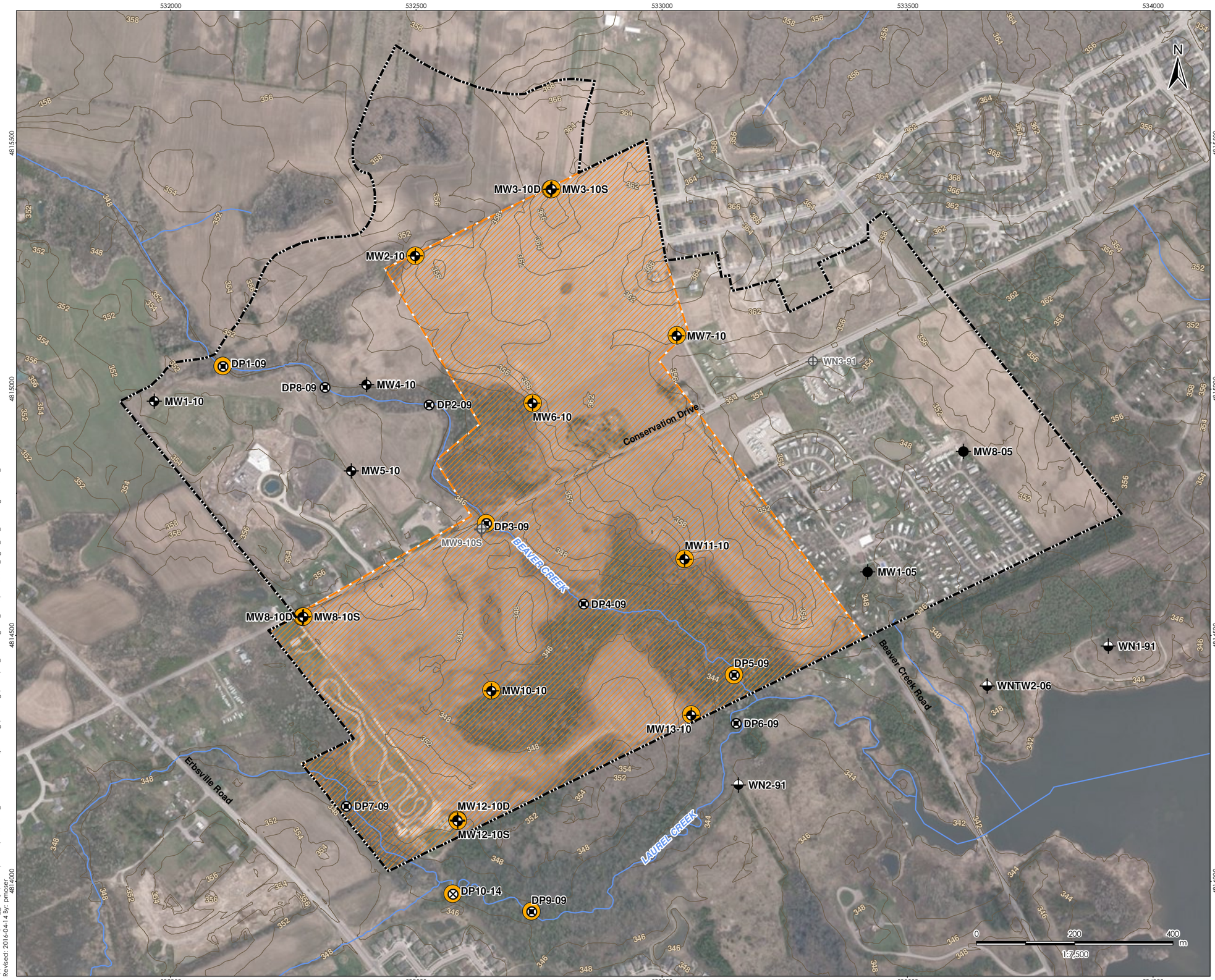
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APPENDIX A
FIGURES



Stantec

Legend

- North Waterloo Scoped Subwatershed Study area
- Monitoring Well (Stantec, 2010)
- Monitoring Well (Stantec, 2005)
- Monitoring Well (Other)
- Drive-Point Piezometer (Stantec, 2010)
- Drive Point Piezometer (Stantec, 2014)
- Abandoned Monitoring Well (Other)
- Phase 1 Monitoring Location
- Watercourse
- Topographic Contour - 2m Inerval
- Proposed Development Area



Notes

1. Coordinate System: NAD 1983 UTM Zone 17N
2. Base features produced under license with the Ontario Ministry of Natural Resources © Queen's Printer for Ontario, 2013.
3. Orthoimagery © First Base Solutions, 2014.
4. Topogrpahic Contours © Region of Waterloo, 2008

April 2016
160310875

Client/Project

North Waterloo Scoped Watershed Study
Phase I - Groundwater and
Surface Water Monitoring Program

Figure No.

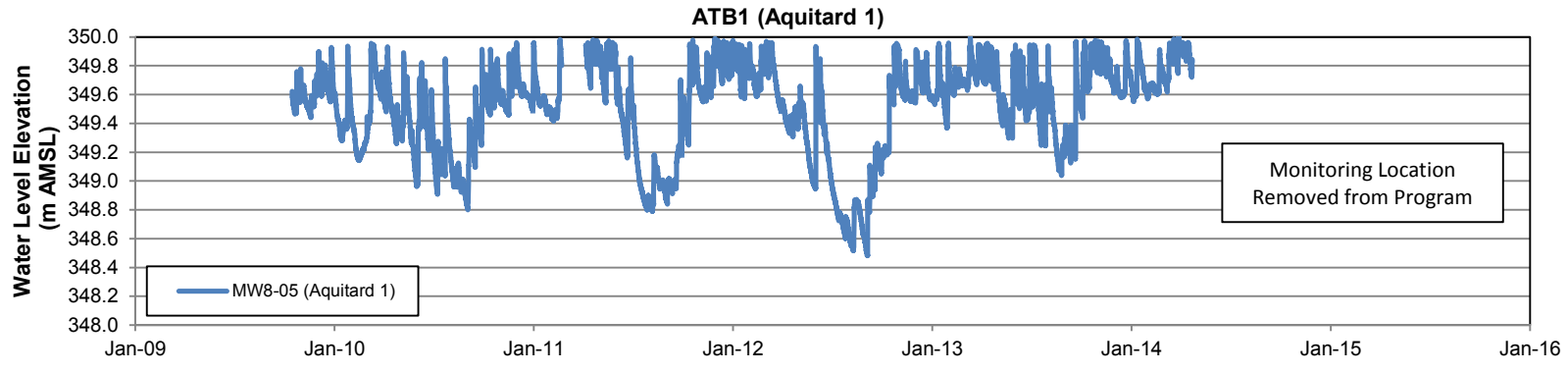
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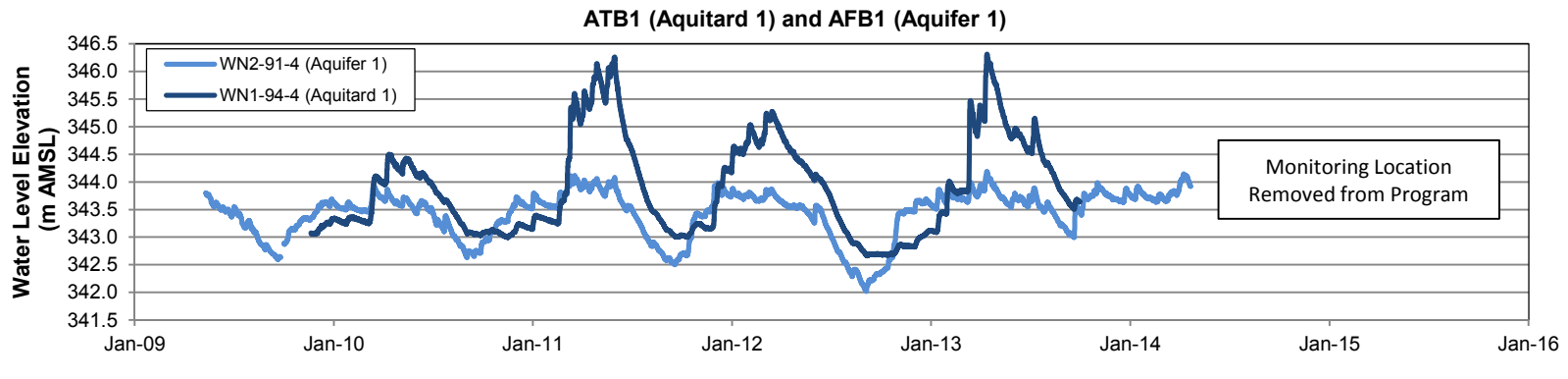
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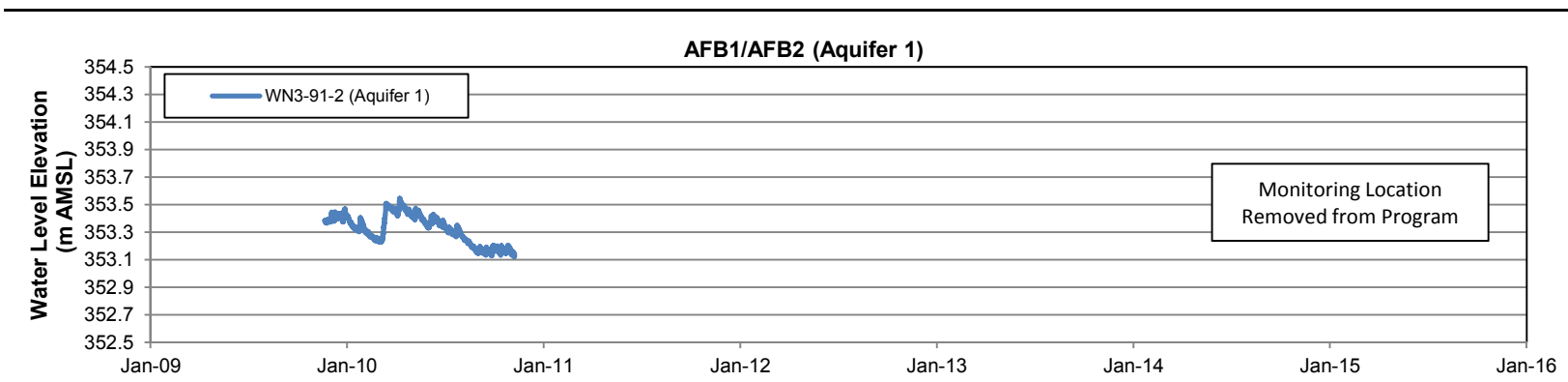
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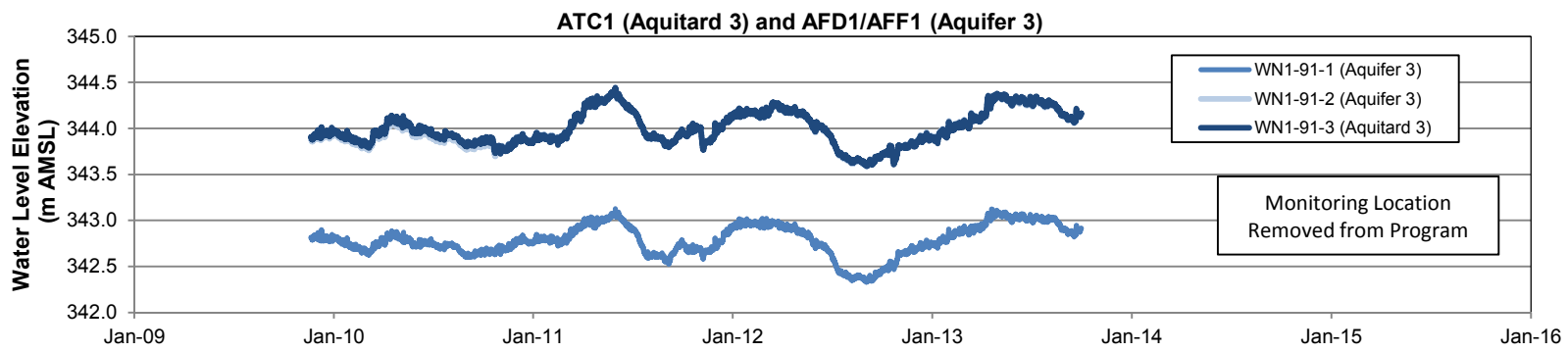
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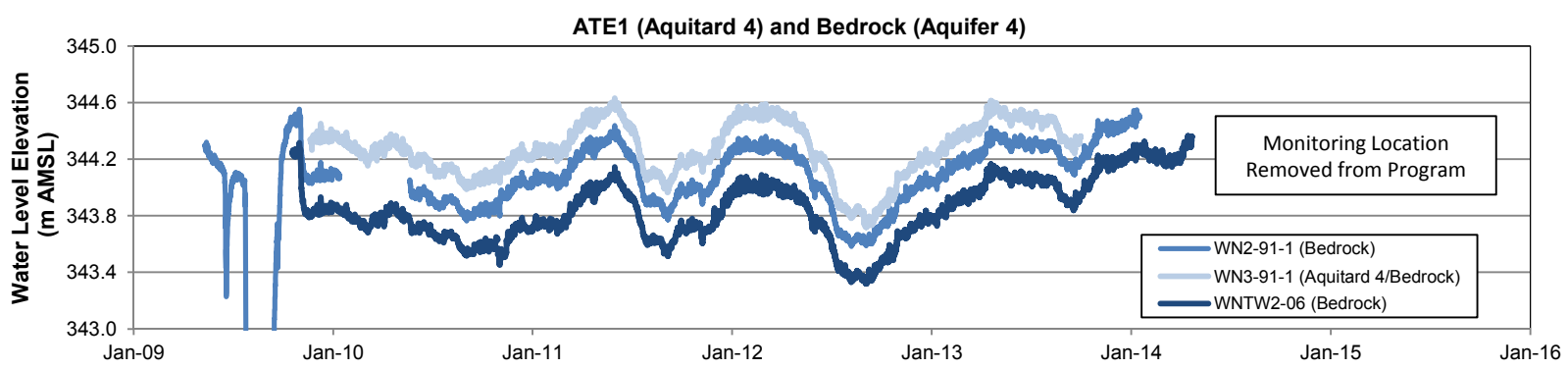
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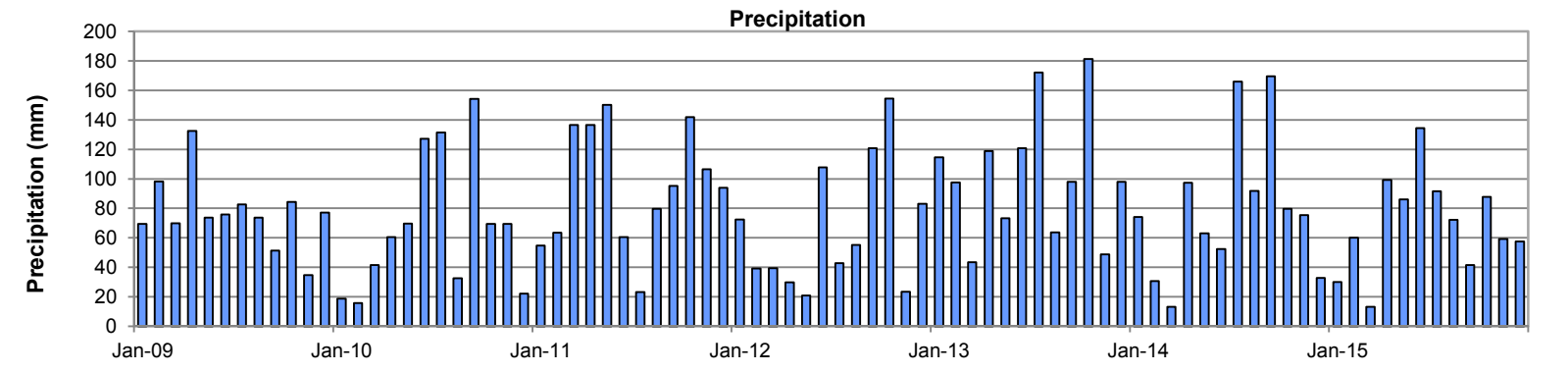












Stantec

Waterloo North pumping test completed from July 25, 2009 to September 4, 2009 as part of the Waterloo North Class EA.

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NORTH WATERLOO, PHASE 1 GROUNDWATER AND SURFACE WATER MONITORING PROGRAM

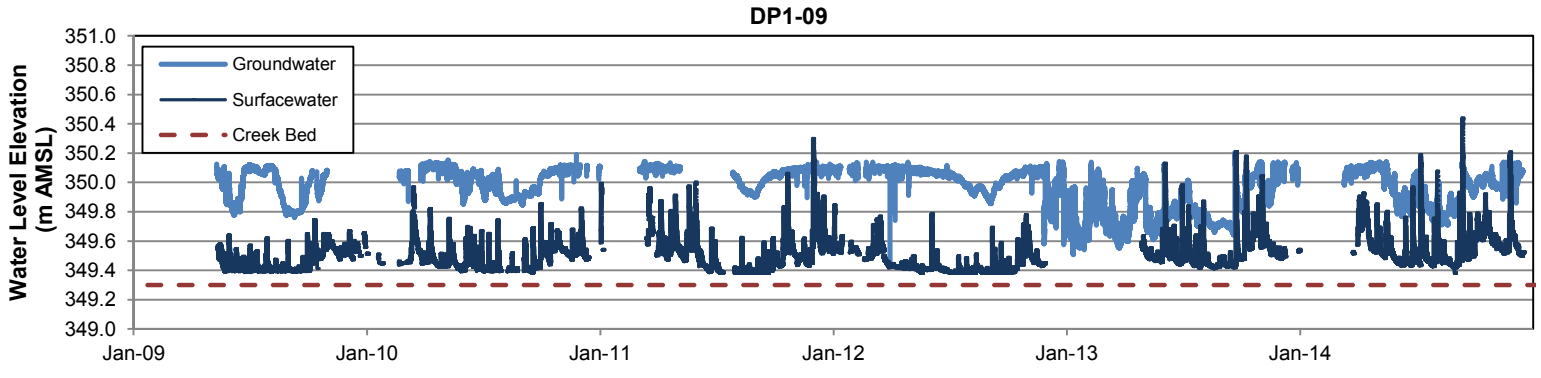
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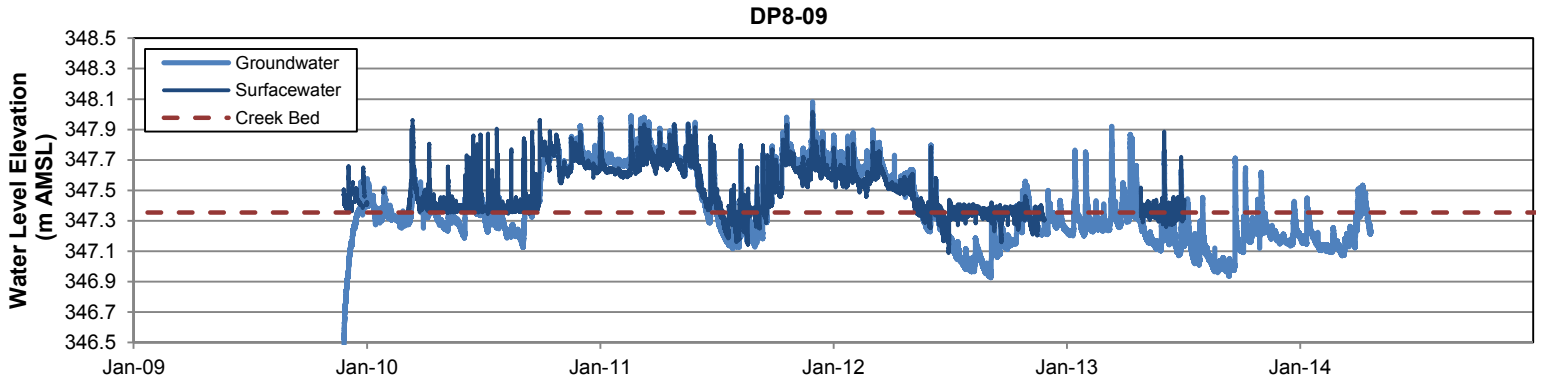
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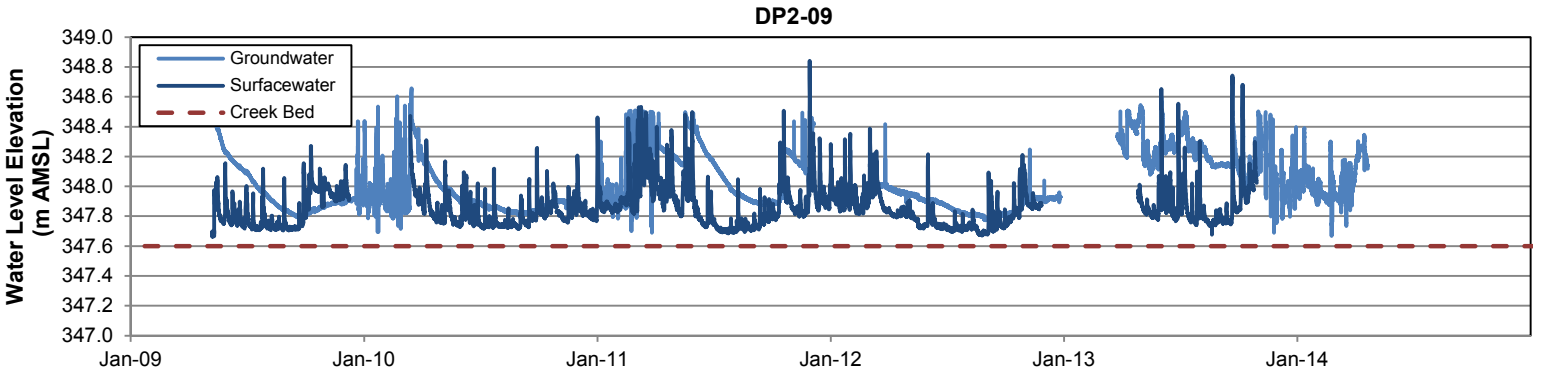
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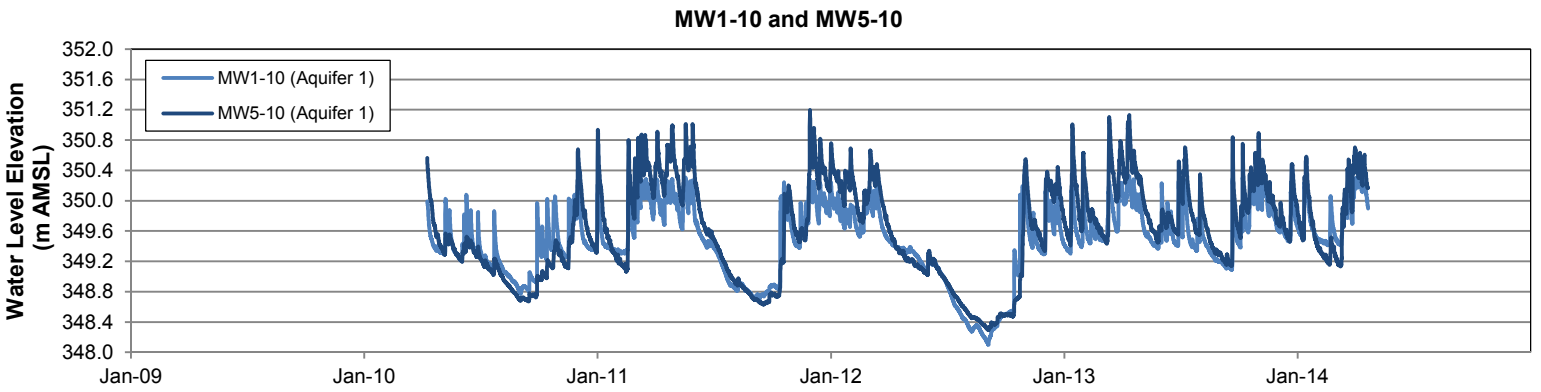
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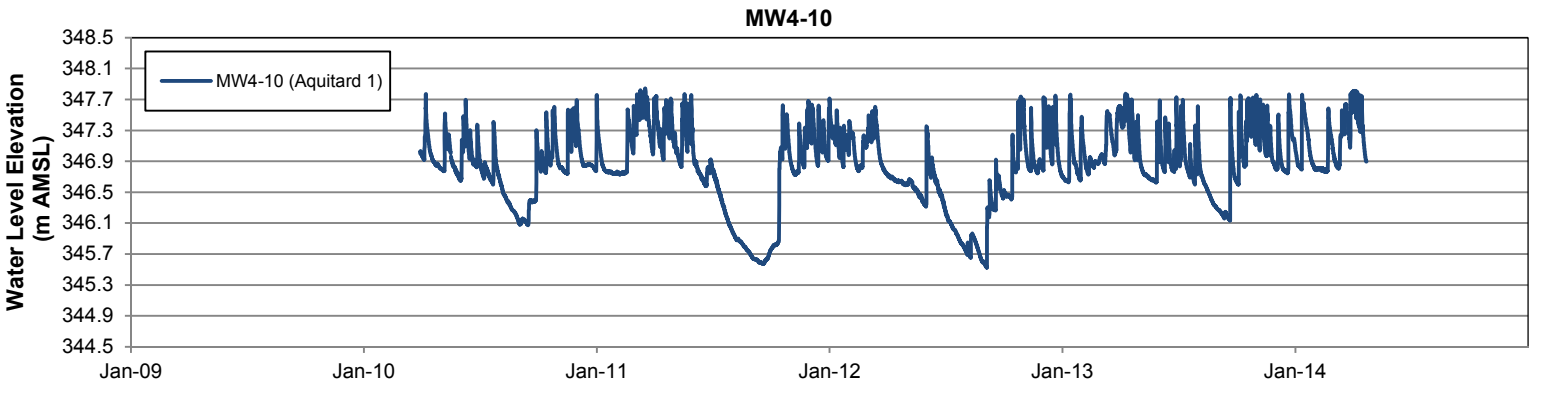
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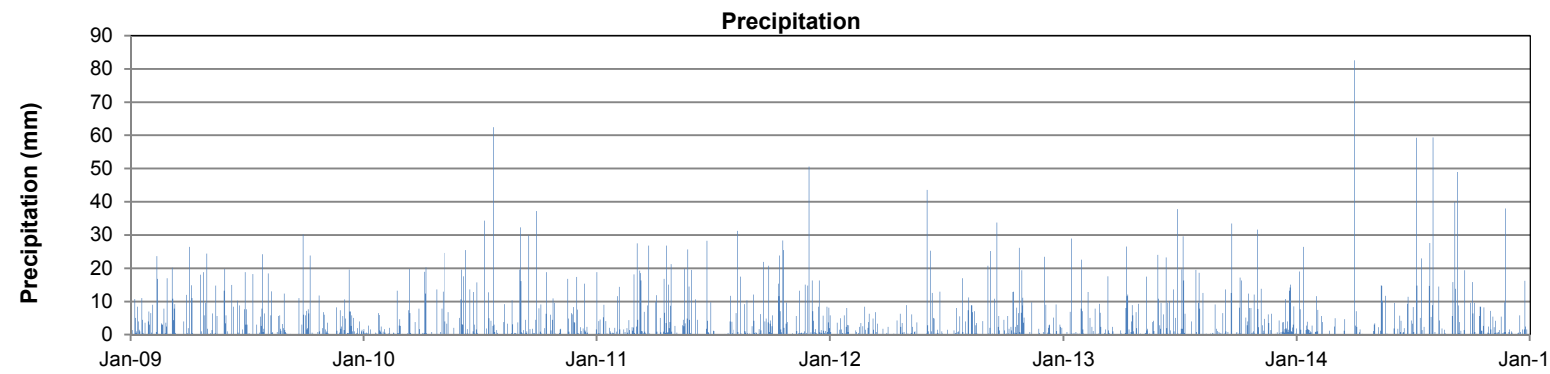












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Figure to be updated to be consistent with Figures 4 to 6. Only DP1-09 was monitored in 2015.

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NORTH WATERLOO, PHASE 1 GROUNDWATER AND SURFACE WATER MONITORING PROGRAM

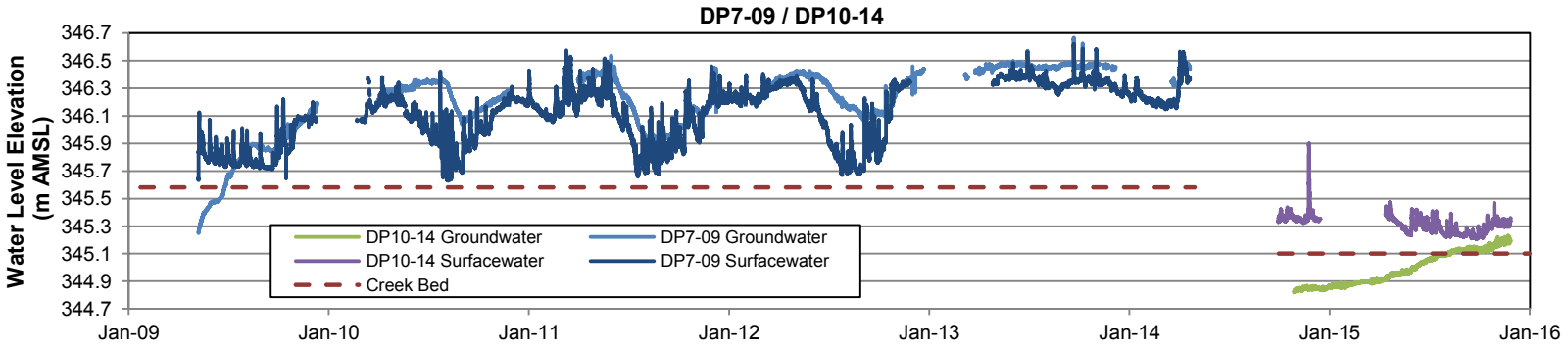
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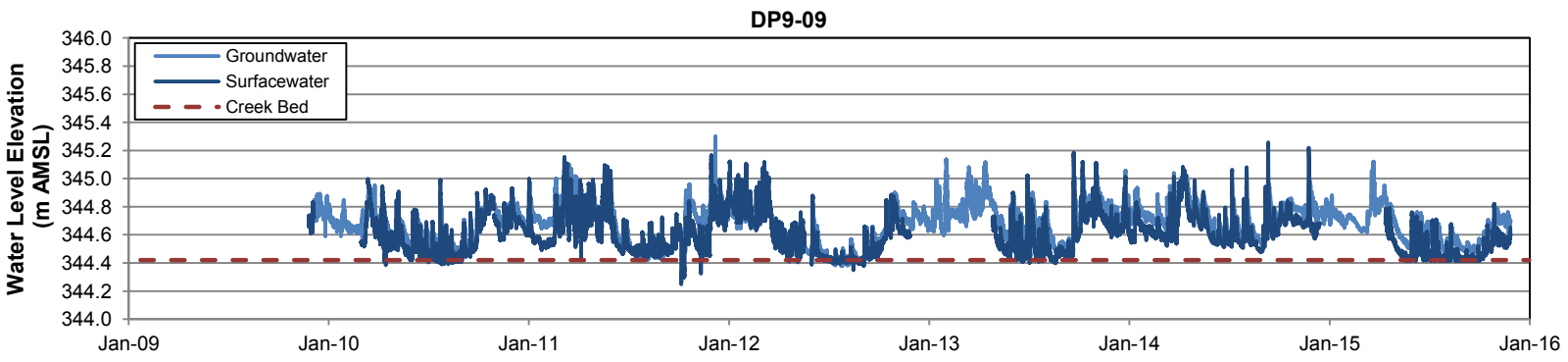
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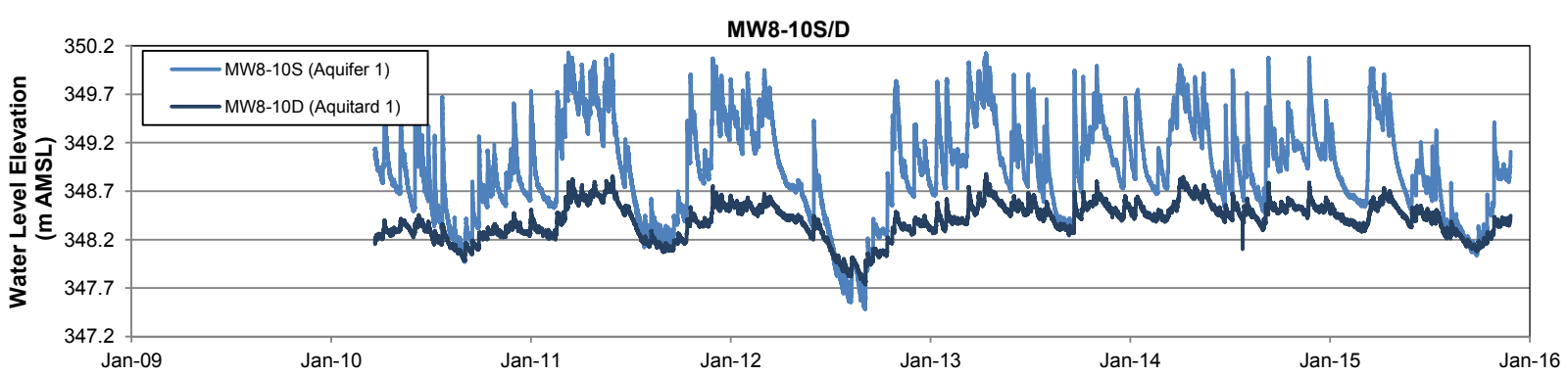
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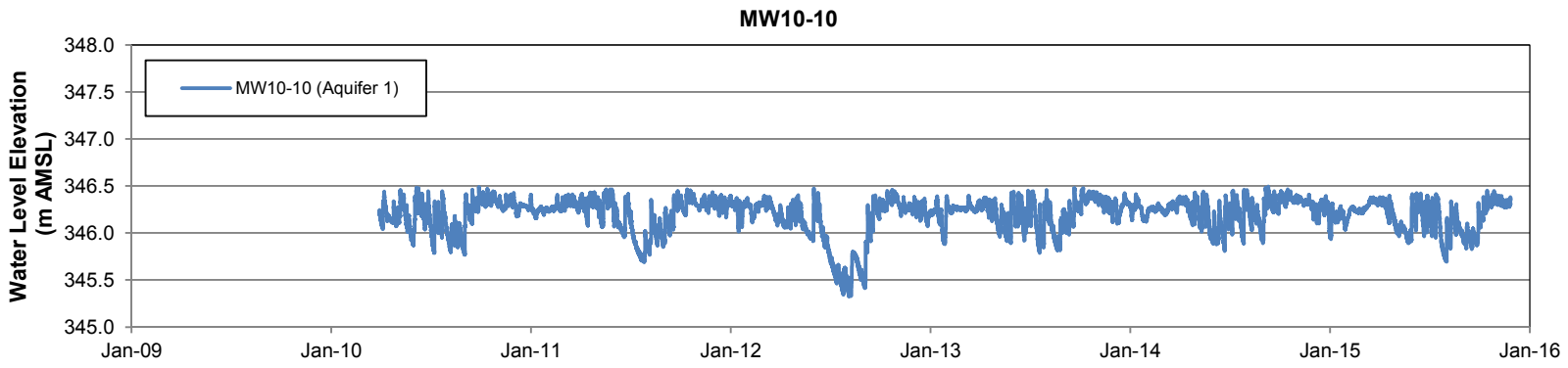
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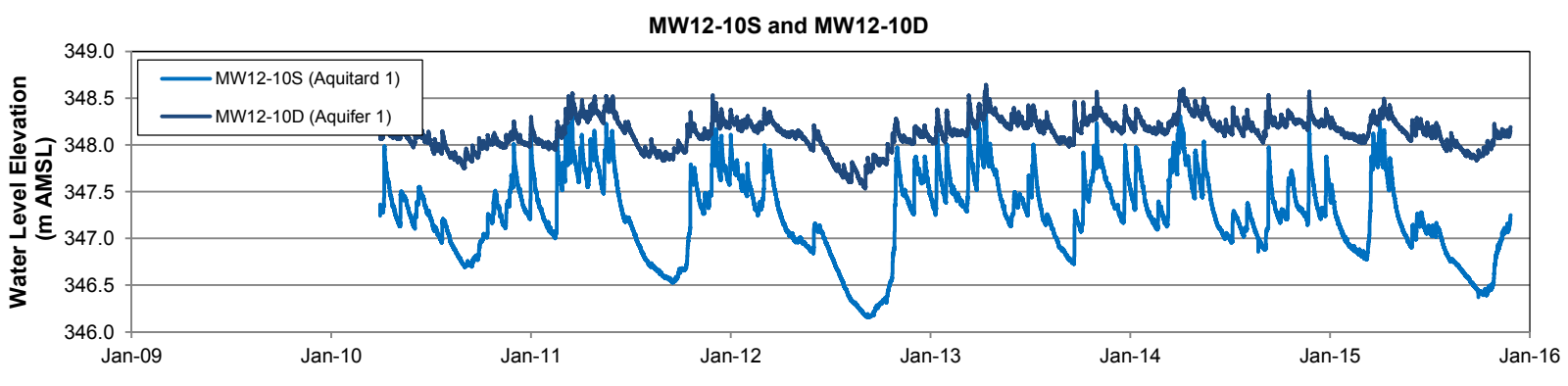
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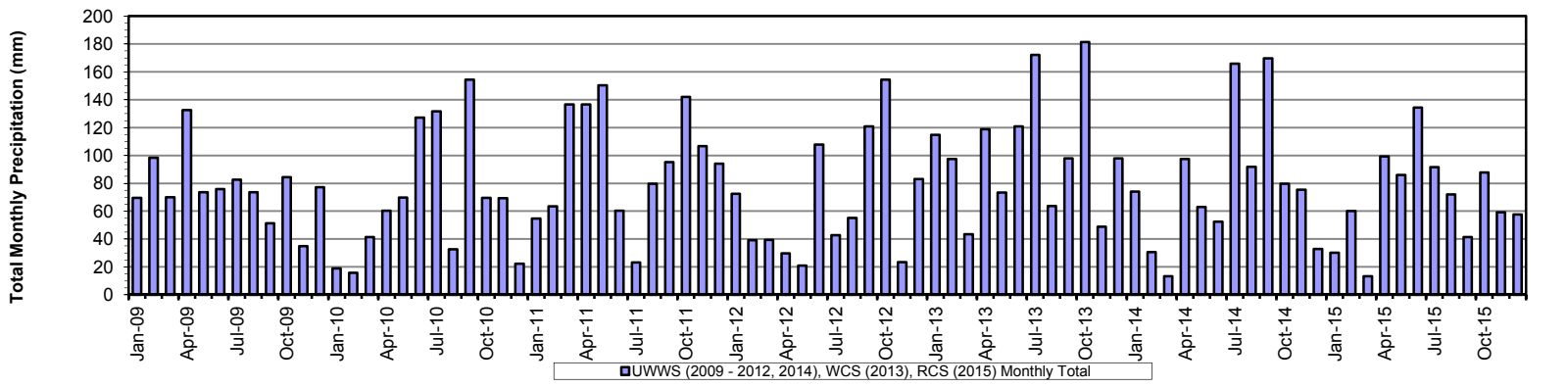












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Top of casing and streambed elevations at DP10-14 are estimated based on topographic mapping and DP7-09 and DP9-09.

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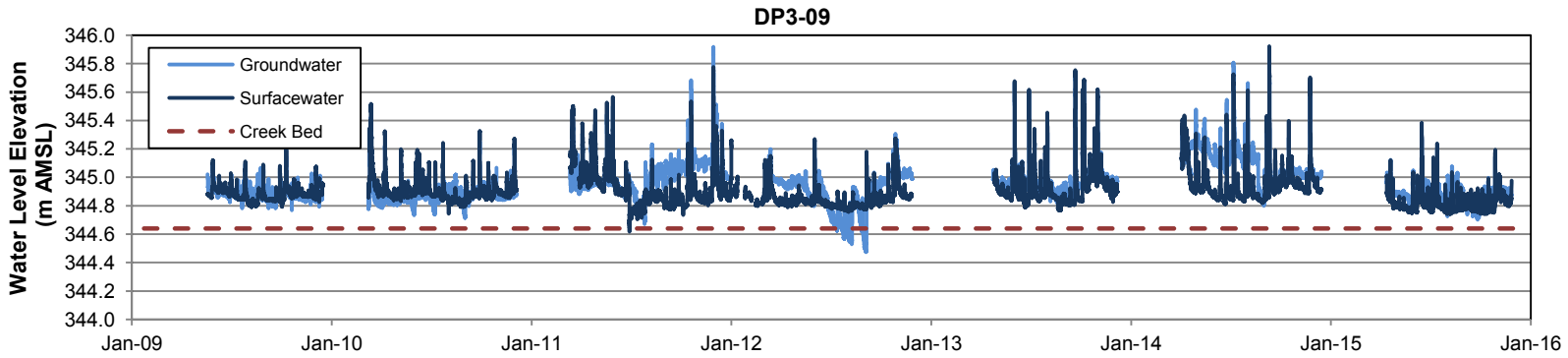
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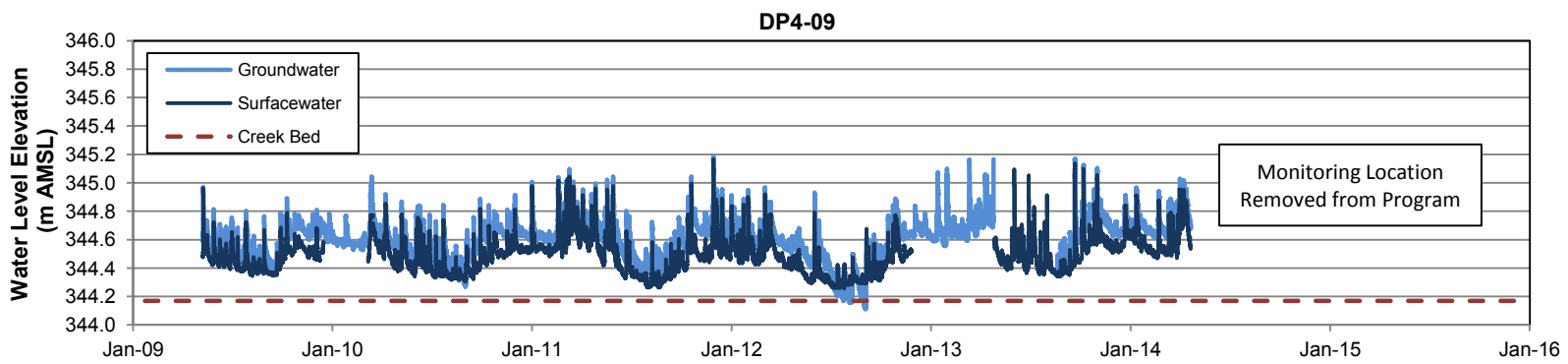
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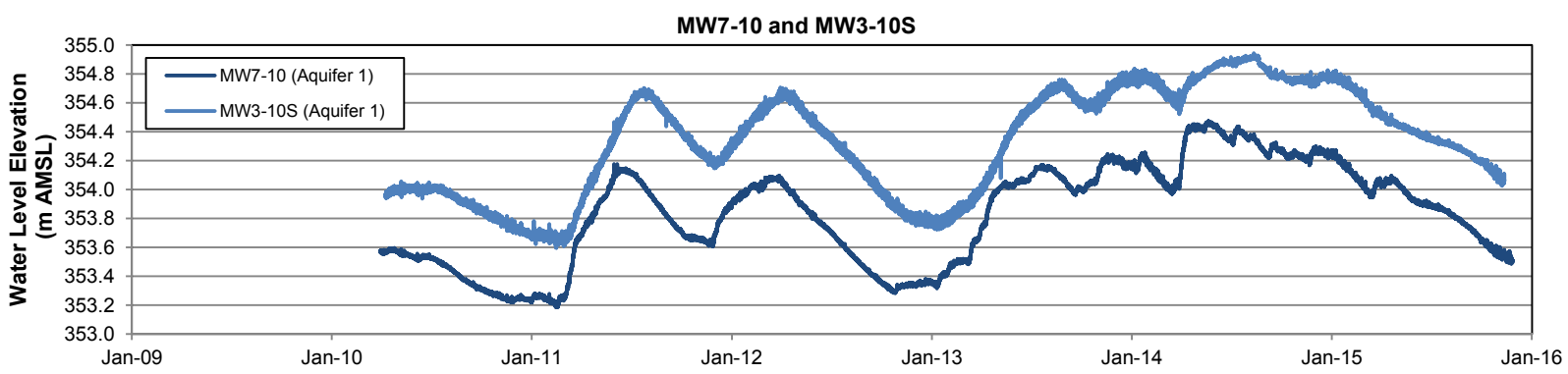
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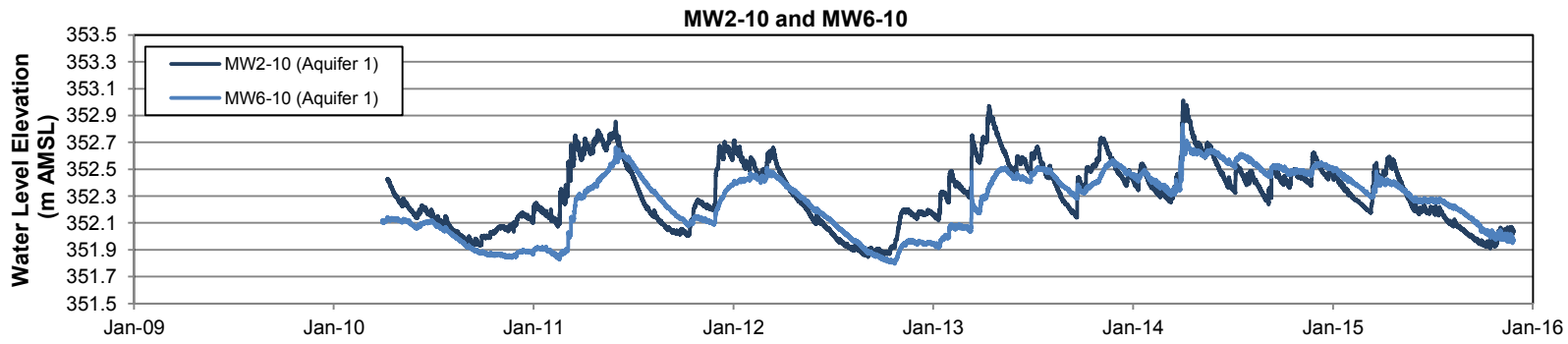
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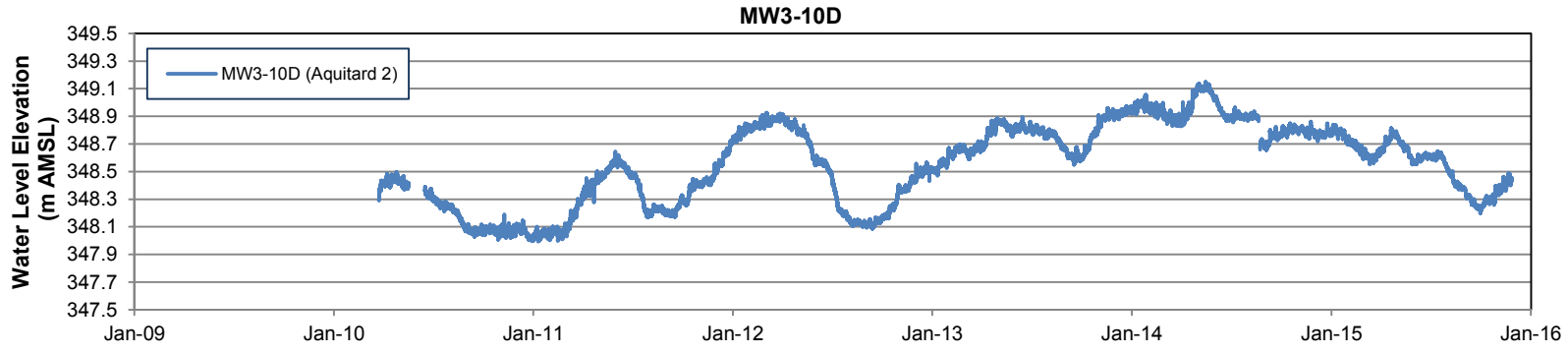
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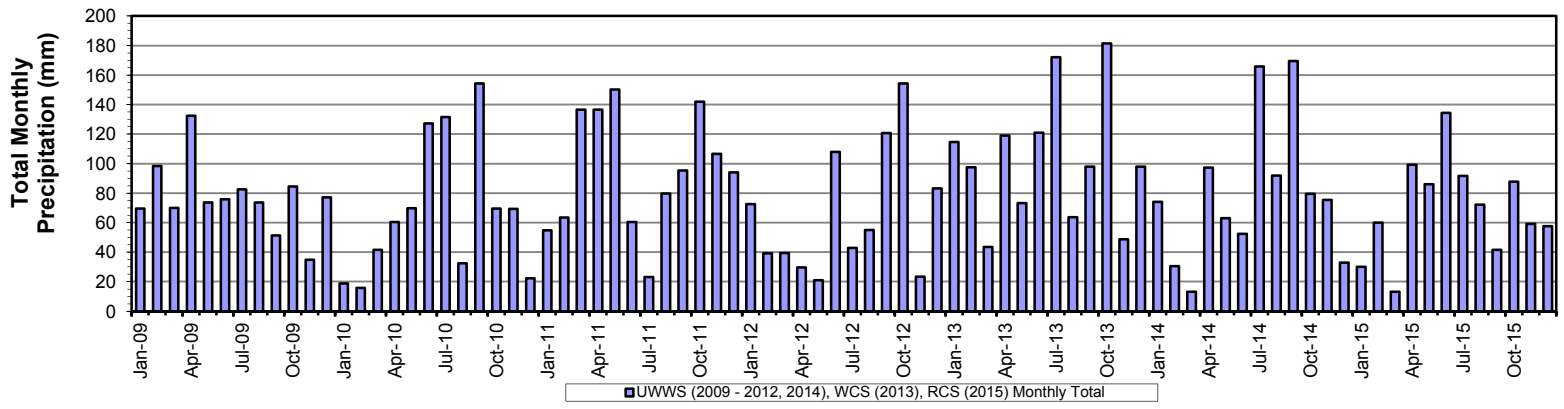












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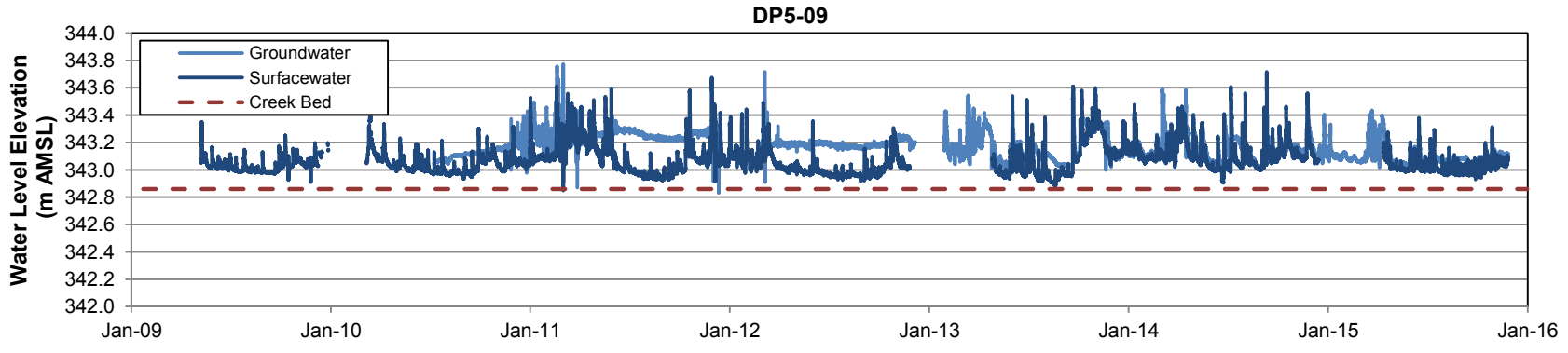
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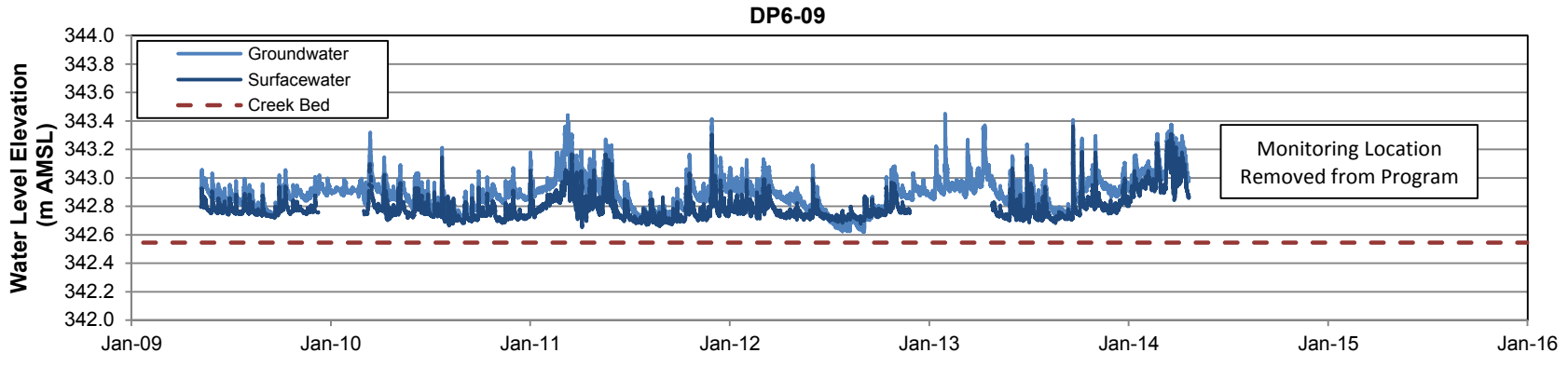
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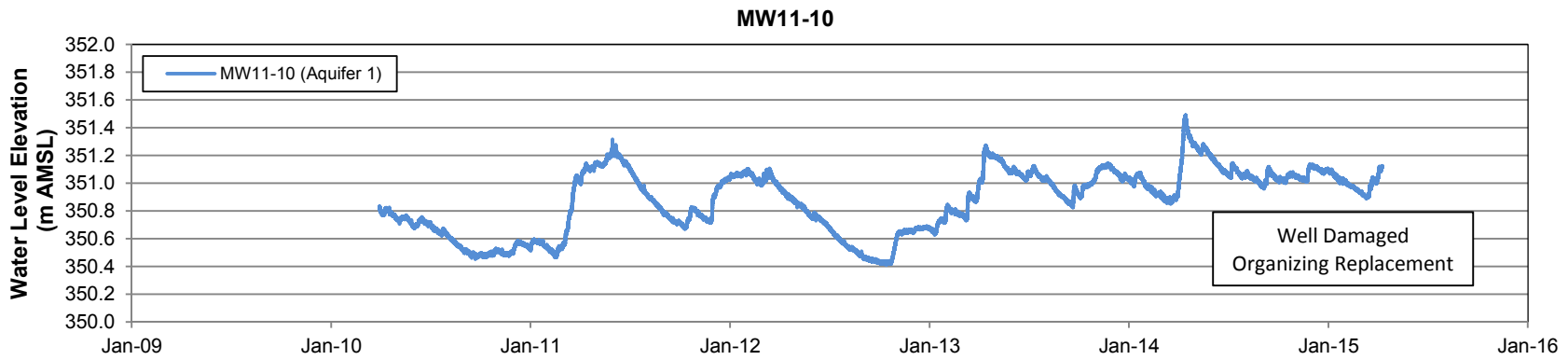
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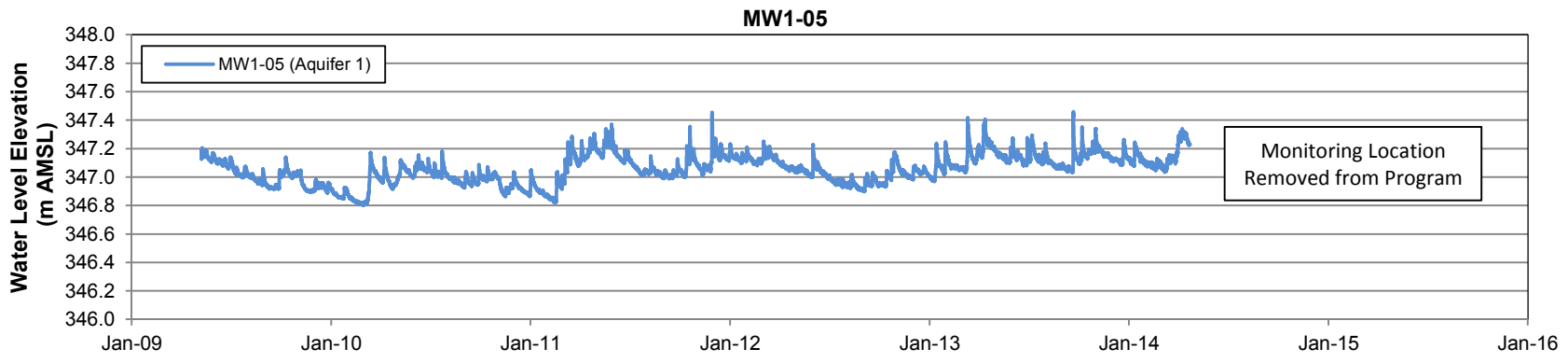
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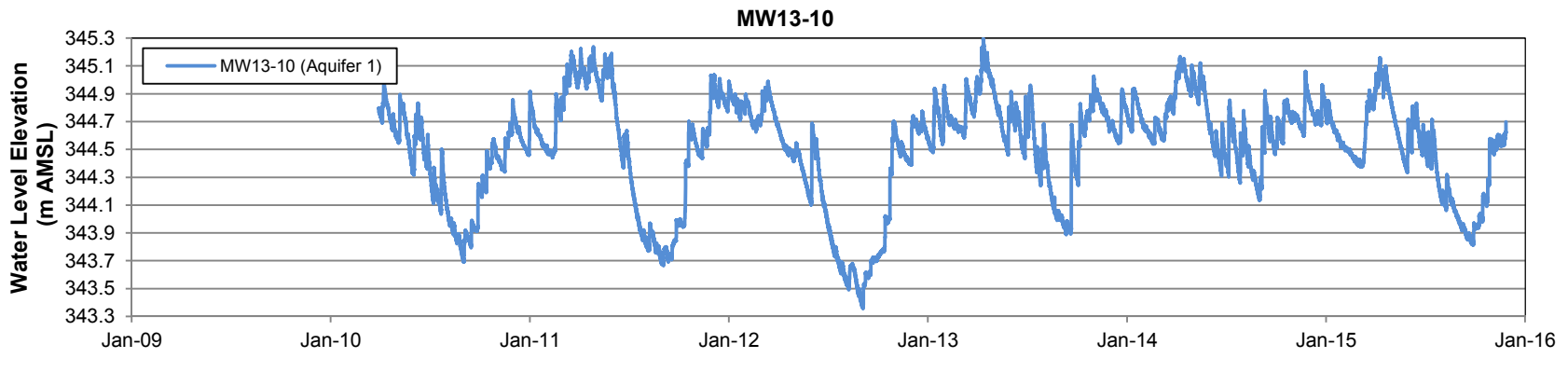
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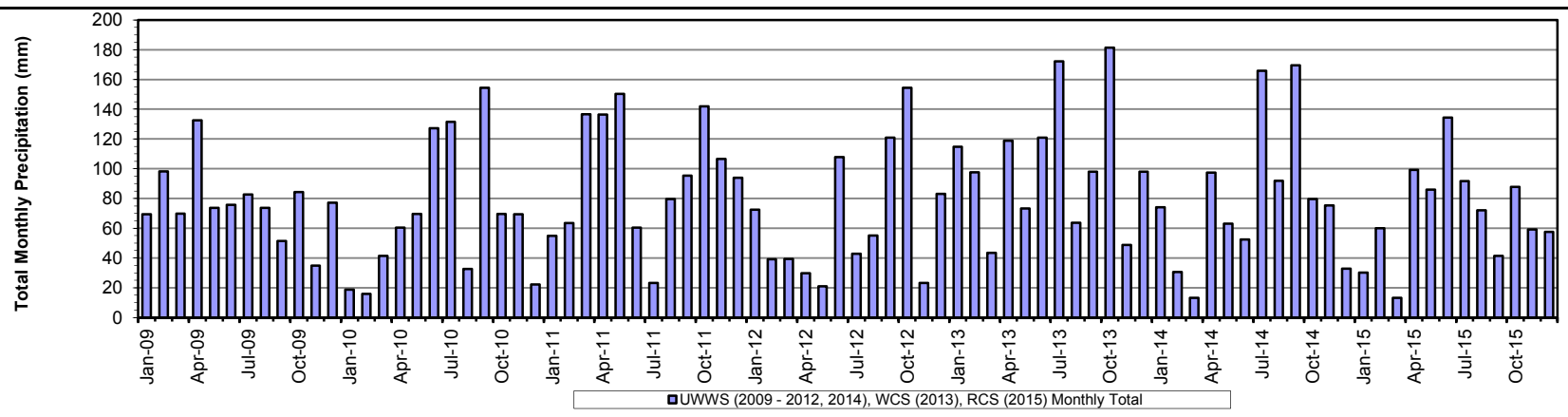












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NORTH WATERLOO, PHASE 1 GROUNDWATER AND SURFACE WATER MONITORING PROGRAM

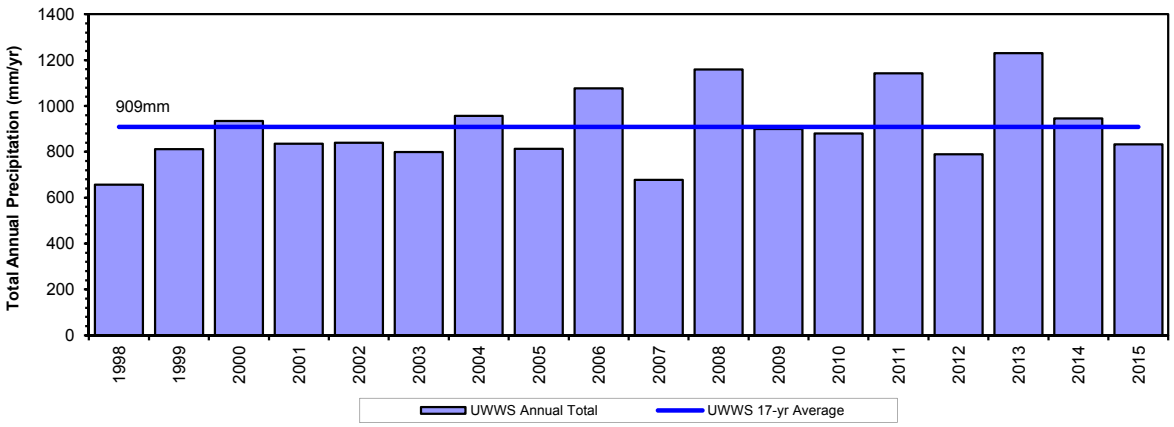
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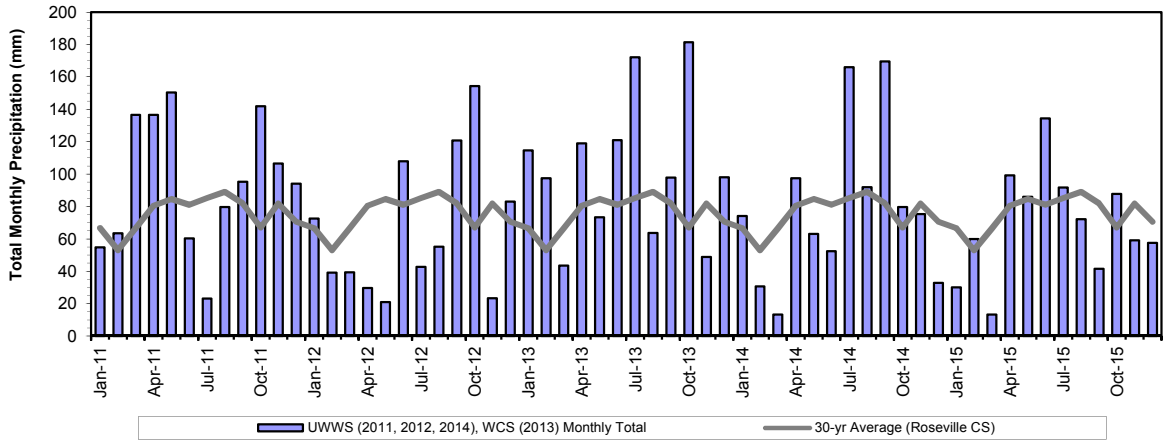
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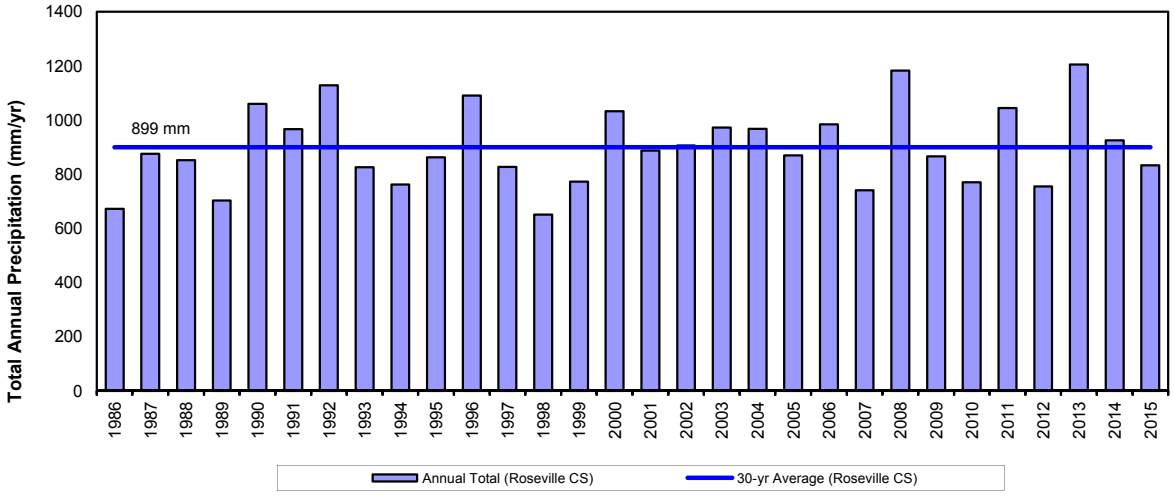
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Notes:

Precipitation data obtained from University of Waterloo Climate Station (UWWS), except for 2015 data which was obtained from Roseville Climate Station (RCS). The UWWS and RCS are located approximately 4 km to the southeast and 20 km to the south of the Site, respectively.





Notes:

Precipitation data obtained from Roseville Climate Station (RCS). For 2014, missing values from RCS in September (7 days), November (7 days) and December (3 days) supplemented with data from Waterloo-Wellington Climate Station.

Stantec	NORTH WATERLOO, PHASE 1 GROUNDWATER AND SURFACE WATER MONITORING	
	TRENDS IN TOTAL PRECIPITATION	
DATE: 12-Apr-15	SCALE: not to scale	PROJECT No. 1603-10875	FIGURE No. **FIGURE 7**

APPENDIX B
TABLES

TABLE 1
WELL INSTALLATION DETAILS

Monitoring Well ID	Date Installed	Location			Elevations			Drilling Borehole Depth	Well Casing			Screened Interval				Screened Material		Monitoring Status
		Northing NAD 83	Easting NAD 83	Coordinate Source	Top of Casing	Ground Surface	Source		Depth	Diameter	Stick-up	Top of Screen		Bottom of Screen				
					(mAMSL)	(mAMSL)		(mBGS)	(mBGS)	(mm)	(mAGS)	(mBGS)	(mAMSL)	(mBGS)	(mAMSL)	Unit	Description	
Monitoring Wells																		
MW1-05	Jan-05	4,814,629	533,419	Total Station (Stantec, 2010)	349.22	348.37	Total Station (Stantec, 2010)	3.80	-	50	0.87	2.10	346.3	3.60	344.8	Aquifer 1	Gravelly Sand	Removed from program in 2014
MW8-05	Feb-05	4,814,874	533,614	Total Station (Stantec, 2010)	350.85	349.94	Total Station (Stantec, 2010)	3.80	-	50	0.84	2.30	347.6	3.80	346.1	Aquitard 1	Silt with trace Sand	Removed from program in 2014
WN1-91-1	Aug-91	4,814,480	533,907	Total Station (Stantec, 2010)	347.18	346.44	Total Station (Stantec, 2010)	70.40	68.00	51	0.74	68.00	278.4	70.40	276.0	Aquifer 3	Clay Till / Shale	Removed from program in 2014
WN1-91-2	Aug-91	4,814,478	533,908	Total Station (Stantec, 2010)	347.57	346.64	Total Station (Stantec, 2010)	47.00	41.00	32	0.93	41.00	305.6	47.00	299.6	Aquifer 3	Fine Sand, some gravel	Removed from program in 2014
WN1-91-3	Aug-91	4,814,478	533,908	Total Station (Stantec, 2010)	347.57	346.64	Total Station (Stantec, 2010)	28.50	25.50	32	0.93	25.50	321.1	28.50	318.1	Aquitard 3	Silt Till	Removed from program in 2014
WN1-91-4	Aug-91	4,814,478	533,908	Total Station (Stantec, 2010)	347.57	346.64	Total Station (Stantec, 2010)	8.30	7.50	32	0.93	7.50	339.1	8.30	338.3	Aquitard 1	Fine Sand, silty	Removed from program in 2014
WN2-91-1	Aug-91	4,814,196	533,156	Total Station (Stantec, 2010)	345.35	344.65	Total Station (Stantec, 2010)	71.93	68.00	51	0.70	68.00	276.7	71.93	272.7	Bedrock	Shale	Removed from program in 2014
WN2-91-4	Aug-91	4,814,199	533,157	Total Station (Stantec, 2010)	345.18	344.65	Total Station (Stantec, 2010)	10.50	9.00	51	0.53	9.00	335.7	10.50	334.2	Aquifer 1	Sand and Silt, some clay	Removed from program in 2014
WN3-91-1	Sep-91	4,815,057	533,308	Total Station (Stantec, 2010)	354.78	354.86	Total Station (Stantec, 2010)	64.92	60.50	51	-0.08	60.50	294.4	64.92	289.9	Aquitard 4 Bedrock	Sand Till / Shale	Well Abandoned
WN3-91-2	Sep-91	4,815,056	533,308	Total Station (Stantec, 2010)	354.71	354.79	Total Station (Stantec, 2010)	11.50	9.00	51	-0.08	9.00	345.8	11.50	343.3	Aquifer 1	Silt Till / Fine Sand	Well Abandoned
WNTW2-06	Oct-06	4,814,398	533,662	Total Station (Stantec, 2010)	349.26	348.59	Total Station (Stantec, 2010)	73.15	64.92	159	0.67	64.92	283.7	73.15	275.4	Bedrock	Bedrock	Removed from program in 2014
MW1-10	Mar-10	4,814,976	531,967	Total Station (Stantec, 2010)	350.96	350.07	Total Station (Stantec, 2010)	4.57	3.05	51	0.89	3.05	347.0	4.57	345.5	Aquifer 1	Silty Sand	Removed from program in 2014
MW2-10	Mar-10	4,815,271	532,498	Total Station (Stantec, 2010)	356.52	355.56	Total Station (Stantec, 2010)	4.57	3.08	51	0.96	3.08	352.5	4.60	351.0	Aquifer 1	Sand	North Waterloo Monitoring Location
MW3-10S	Mar-10	4,815,407	532,776	Total Station (Stantec, 2010)	367.62	366.81	Total Station (Stantec, 2010)	13.72	12.18	51	0.81	12.18	354.6	13.70	353.1	Aquifer 1	Sand	North Waterloo Monitoring Location
MW3-10D	Mar-10	4,815,406	532,774	Total Station (Stantec, 2010)	367.60	366.84	Total Station (Stantec, 2010)	41.61	40.08	51	0.76	40.08	326.8	41.60	325.2	Aquitard 2	Clay Till / Sand Till	North Waterloo Monitoring Location
MW4-10	Mar-10	4,815,010	532,399	Total Station (Stantec, 2010)	348.64	347.87	Total Station (Stantec, 2010)	3.05	1.52	51	0.77	1.52	346.3	3.05	344.8	Aquitard 1	Silty Sand to Clayey Silt	Removed from program in 2014
MW5-10	Mar-10	4,814,834	532,368	Total Station (Stantec, 2010)	351.91	351.08	Total Station (Stantec, 2010)	4.27	2.74	51	0.83	2.74	348.3	4.27	346.8	Aquifer 1	Silty Sand	Removed from program in 2014
MW6-10	Mar-10	4,814,972	532,737	Total Station (Stantec, 2010)	356.48	355.58	Total Station (Stantec, 2010)	4.57	3.05	51	0.90	3.05	352.5	4.57	351.0	Aquifer 1	Medium Sand	North Waterloo Monitoring Location
MW7-10	Mar-10	4,815,108	533,031	Total Station (Stantec, 2010)	359.67	358.74	Total Station (Stantec, 2010)	7.32	5.79	51	0.93	5.79	352.9	7.32	351.4	Aquifer 1	Fine to Medium Sand	North Waterloo Monitoring Location
MW8-10S	Mar-10	4,814,538	532,271	Total Station (Stantec, 2010)	351.28	350.38	Total Station (Stantec, 2010)	4.57	3.05	51	0.90	3.05	347.3	4.57	345.8	Aquitard 1	Silt	North Waterloo Monitoring Location
MW8-10D	Mar-10	4,814,537	532,269	Total Station (Stantec, 2010)	351.26	350.44	Total Station (Stantec, 2010)	39.62	38.16	51	0.82	38.16	312.3	39.68	310.8	Aquifer 1	Sand / Sand and cobble	North Waterloo Monitoring Location

Notes:

(mAMSL) metres above mean sea level
(mBGS) metres below ground surface
(mAGS) metres above ground surface

TABLE 1
WELL INSTALLATION DETAILS

Monitoring Well ID	Date Installed	Location			Elevations			Drilling Borehole Depth	Well Casing			Screened Interval				Screened Material		Monitoring Status
		Northing NAD 83	Easting NAD 83	Coordinate Source	Top of Casing	Ground Surface	Source		Depth	Diameter	Stick-up	Top of Screen		Bottom of Screen				
					(mAMSL)	(mAMSL)		(mBGS)	(mBGS)	(mm)	(mAGS)	(mBGS)	(mAMSL)	(mBGS)	(mAMSL)	Unit	Description	
Monitoring Wells																		
MW9-10S	Mar-10	4,814,715	532,634	Total Station (Stantec, 2010)	346.69	345.83	Total Station (Stantec, 2010)	4.57	3.05	51	0.86	3.05	342.8	4.57	341.3	Aquitard 1	Clay	Well Abandoned
MW9-10D	Mar-10	4,814,717	532,634	Total Station (Stantec, 2010)	346.50	345.71	Total Station (Stantec, 2010)	26.39	25.99	51	0.79	25.99	319.7	27.51	318.2	Aquitard 3	Silt Till	Well Abandoned
MW10-10	Mar-10	4,814,388	532,654	Total Station (Stantec, 2010)	347.05	346.25	Total Station (Stantec, 2010)	3.05	1.52	51	0.80	1.52	344.7	3.05	343.2	Aquifer 1	Fine Sand	North Waterloo Monitoring Location
MW11-10	Mar-10	4,814,655	533,047	Total Station (Stantec, 2010)	355.96	355.07	Total Station (Stantec, 2010)	5.79	4.27	51	0.89	4.27	350.8	5.79	349.3	Aquifer 1	Fine to Coarse Sand	North Waterloo Monitoring Location Well Damaged, Organizing Replacement
MW12-10S	Mar-10	4,814,123	532,585	Total Station (Stantec, 2010)	349.35	348.51	Total Station (Stantec, 2010)	6.71	5.06	51	0.84	5.06	343.5	6.58	341.9	Aquitard 1	Silty Clay	North Waterloo Monitoring Location
MW12-10D	Mar-10	4,814,125	532,584	Total Station (Stantec, 2010)	349.52	348.63	Total Station (Stantec, 2010)	25.60	23.98	51	0.89	23.98	324.7	25.50	323.1	Aquifer 1	Sand and Gravel	North Waterloo Monitoring Location
MW13-10	Mar-10	4,814,339	533,060	Total Station (Stantec, 2010)	346.15	345.34	Total Station (Stantec, 2010)	4.57	3.05	51	0.81	3.05	342.3	4.57	340.8	Aquifer 1	Silty Sand	North Waterloo Monitoring Location
Drivepoint Piezometers																		
DP1-09	Apr-09	4,815,046	532,107	Total Station (Stantec, 2010)	350.09	349.30	Total Station (Stantec, 2010)	1.46	1.04	25	0.79	1.04	348.3	1.46	347.8	-	-	North Waterloo Monitoring Location
DP2-09	Apr-09	4,814,968	532,526	Total Station (Stantec, 2010)	348.46	347.60	Total Station (Stantec, 2010)	1.39	0.97	25	0.86	0.97	346.6	1.39	346.2	-	-	Removed from program in 2014
DP3-09	Apr-09	4,814,727	532,643	Total Station (Stantec, 2010)	346.65	345.07	Total Station (Stantec, 2010)	1.14	0.72	25	1.58	0.72	344.4	1.14	343.9	-	-	North Waterloo Monitoring Location
DP4-09	Apr-09	4,814,564	532,840	Total Station (Stantec, 2010)	345.13	344.17	Total Station (Stantec, 2010)	1.59	1.17	25	0.96	1.17	343.0	1.59	342.6	-	-	Removed from program in 2014
DP5-09	Apr-09	4,814,419	533,147	Total Station (Stantec, 2010)	343.84	342.86	Total Station (Stantec, 2010)	1.57	1.15	25	0.98	1.15	341.7	1.57	341.3	-	-	North Waterloo Monitoring Location
DP6-09	Apr-09	4,814,321	533,151	Total Station (Stantec, 2010)	343.44	342.55	Total Station (Stantec, 2010)	1.66	1.24	25	0.90	1.24	341.3	1.66	340.9	-	-	Removed from program in 2014
DP7-09	Apr-09	4,814,153	532,358	Total Station (Stantec, 2010)	346.46	345.58	Total Station (Stantec, 2010)	1.37	0.95	25	0.88	0.95	344.6	1.37	344.2	-	-	North Waterloo Monitoring Location (replaced by DP10-14)
DP8-09	Nov-09	4,815,003	532,314	Total Station (Stantec, 2010)	348.27	347.36	Total Station (Stantec, 2010)	1.64	1.22	25	0.92	1.22	346.1	1.64	345.7	-	-	Removed from program in 2014
DP9-09	Nov-09	4,813,939	532,735	Total Station (Stantec, 2010)	345.45	344.48	Total Station (Stantec, 2010)	1.58	1.16	25	0.97	1.16	343.3	1.58	342.9	-	-	North Waterloo Monitoring Location
DP10-14	Sep-14	4,813,975	532,575	Aerial Mapping	346.39	345.10	Estimated based on DP9-09 and DP7-09	1.29	0.87	25	1.26	0.87	344.2	1.29	343.8	-	-	North Waterloo Monitoring Location (replaced DP7-09)

Notes:

(mAMSL) metres above mean sea level
(mBGS) metres below ground surface
(mAGS) metres above ground surface

Table 2
Stream Flow Measurements

Date	Monitoring Locations within Beaver Creek																		Monitoring Locations within Laurel Creek											
	SF1			SF8			SF2			SF3			SF4			SF5			SF7			SF10			SF9			SF6		
	Flow (L/s)	Max. Depth (m)	Width (m)	Flow (L/s)	Max. Depth (m)	Width (m)	Flow (L/s)	Max. Depth (m)	Width (m)	Flow (L/s)	Max. Depth (m)	Width (m)	Flow (L/s)	Max. Depth (m)	Width (m)	Flow (L/s)	Max. Depth (m)	Width (m)	Flow (L/s)	Max. Depth (m)	Width (m)	Flow (L/s)	Max. Depth (m)	Width (m)	Flow (L/s)	Max. Depth (m)	Width (m)	Flow (L/s)	Max. Depth (m)	Width (m)
23-Apr-09	70.9	0.20	3.30	-	-	-	82.3	0.26	2.50	92.4	0.29	2.95	81.8	0.35	2.20	90.4	0.25	3.40	-	-	-	-	-	-	-	-	-	237.0	0.24	4.20
15-Oct-09	47.2	0.27	3.10	-	-	-	44.8	0.33	2.70	39.5	0.19	2.80	43.3	0.33	2.40	36.4	0.15	2.40	106.1	0.38	4.10	-	-	-	-	-	-	117.6	0.19	3.80
25-Nov-09	84.8	0.29	3.40	86.5	0.28	3.30	103.1	0.38	2.70	59.8 60.6	0.23 0.23	2.90 2.90	74.7	0.34	2.40	74.8	0.16	3.20	108.7	0.61	4.50	-	-	-	82.5	0.29	5.80	149.1	0.21	4.10
31-Mar-10	58.6	0.21	2.75	55.4	0.24	2.60	56.1	0.27	2.60	40.7	0.19	3.00	49.5	0.38	2.15	51.9	0.14	3.00	172.3	0.73	5.80	-	-	-	143.5	0.18	5.50	147.5	0.22	4.00
20-May-10	28.1	0.16	2.00	29.0	0.15	1.80	32.5	0.13	2.10	25.1	0.15	2.60	32.0	0.24	1.60	30.3	0.10	2.45	46.4	0.72	5.70	-	-	-	56.6	0.10	5.00	80.7	0.15	4.00
23-Jul-10	366	0.56	4.75	345	0.78	5.00	363	0.49	2.75	421	0.56	3.00	409	0.54	2.90	401	0.30	3.85	-	-	-	-	-	-	2799	0.54	5.50	1129	0.74	5.50
30-Aug-10	7.9	0.11	1.20	3.7	0.20	1.80	6.2	0.14	1.80	8.6	0.12	1.90	3.2	0.14	1.40	4.7	0.06	2.20	11.0	0.28	3.00	-	-	-	31.0	0.21	4.25	17.2	0.14	3.75
29-Oct-10	56.0	0.32	3.80	44.6	0.50	4.80	43.1	0.28	2.40	46.2	0.16	2.90	39.2	0.36	2.30	44.3	0.21	3.80	108.2	0.71	5.90	-	-	-	115.8	0.38	5.80	96.1	0.16	4.40
17-May-12	16.8	0.10	2.15	14.7	0.12	2.20	15.0	0.19	1.30	15.6	0.13	1.95	8.9	0.22	1.50	11.0	0.09	2.70	20.9	0.80	5.50	-	-	-	41.3	0.11	4.75	43.6	0.16	4.10
28-Aug-12	9.4	0.08	1.40	-	-	-	9.8	0.14	1.00	7.9	0.09	2.20	9.0	0.14	1.30	5.7	0.07	2.65	19.5	0.25	3.40	-	-	-	16.4	0.07	3.15	20.8	0.10	4.10
26-Nov-12	34.3	0.18	2.40	36.4	0.28	0.95	38.9	0.25	1.80	40.3	0.16	3.00	45.3	0.36	2.20	35.0	0.14	2.90	87.3	0.85	5.80	-	-	-	78.8	0.22	5.75	85.0	0.15	4.40
25-Apr-13	124.9	0.31	3.45	145.2	0.45	3.40	149.1	0.43	0.00	167.3	0.30	3.50	153.7	0.54	2.95	155.4	0.27	3.50	na	Ponded	Ponded	-	-	-	344.9	0.34	5.85	359.1	0.24	4.90
20-Aug-13	15.8	0.21	2.10	20.3	0.33	2.15	15.5	0.12	2.20	16.4	0.14	2.20	15.2	0.14	1.50	13.2	0.08	2.50	na	Ponded	Ponded	-	-	-	48.4	0.11	5.30	46.8	0.12	4.50
29-Oct-13	95.5	0.33	3.90	91.2	0.46	2.50	105.4	0.42	2.40	111.3	0.31	3.30	116.0	0.40	2.60	107.0	0.38	4.40	na	Ponded	Ponded	-	-	-	215.9	0.34	5.90	256.0	0.22	4.85
16-Jan-14	110.0	0.24	3.60	108.2	0.44	2.55	111.2	0.36	2.50	117.4	0.29	2.75	148.6	0.42	2.50	151.2	0.28	4.70	na	Frozen	Frozen	-	-	-	334.9	0.38	5.80		Frozen	Frozen
21-Apr-14	96.2	0.21	3.25	113.3	0.60	3.25	93.7	0.33	2.60	107.6	0.21	3.00	105.8	0.34	2.50	120.3	0.20	3.65	na	Ponded	Ponded	-	-	-	276.4	0.29	5.80	296.5	0.24	4.90
21-Aug-14	29.5	0.15	2.50	Removed from Program			Removed from Program			30.6	0.14	3.00	Removed from Program			41.3	0.10	3.00	Replaced by SF10			93.6	0.30	4.25	82.7	0.12	5.50	Removed from Program		
29-Sep-14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	121.1	0.34	4.40	-	-	-	-	-	-
28-Oct-14	57.1	0.30	3.50	-	-	-	-	-	-	58.3	0.26	2.80	-	-	-	68.1	0.20	3.70	-	-	-	116.7	0.36	4.50	119.7	0.26	5.85	-	-	-
15-Dec-14	54.5	0.22	2.60	-	-	-	-	-	-	70.2	0.23	2.75	-	-	-	67.6	0.18	3.60	-	-	-	132.7	0.36	4.80	145.6	0.24	5.80	-	-	-
13-Apr-15	104.5	0.38	3.75	-	-	-	-	-	-	131.3	0.28	3.40	-	-	-	134.7	0.19	3.45	-	-	-	307.6	0.39	4.95	319.9	0.30	5.95	-	-	-
28-Sep-15	4.3	0.11	1.80	-	-	-	-	-	-	4.7	0.09	1.80	-	-	-	4.4	0.08	2.40	-	-	-	30.7	0.21	3.60	28.1	0.08	4.40	-	-	-
27-Nov-15	89.0	0.31	3.00	-	-	-	-	-	-	113.5	0.27	2.80	-	-	-	121.4	0.24	3.90	-	-	-	228.3	0.37	5.30	236.0	0.32	5.90	-	-	-

Table 3
Summary of Groundwater Analytical Results
Waterloo North Hydrogeological Assessment

Sample Location			MW1-10			MW2-10						MW3-10D				MW3-10S				MW4-10	
Sample Date			18-May-10	18-May-10	26-Oct-10	17-May-10	25-Oct-10	21-Aug-14	21-Aug-14	28-Sep-15	28-Sep-15	20-May-10	27-Oct-10	21-Aug-14	28-Sep-15	19-May-10	25-Oct-10	21-Aug-14	29-Sep-15	17-May-10	25-Oct-10
Sample ID			WG-160340875-20100518-AV09	WG-160340875-20100518-AV09LR	WG-160340875-20101026-JK8	WG-160340875-20100517-AV05	WG-160340875-20101025-JK2	WG-160310875-20140821-AV02	WG-160310875-20140821-AV02LR	WG-160310875-20150928-AV04	WG-160310875-20150928-AV04LR	WG-160340875-20100520-AV17	WG-160340875-20101027-JK 12	WG-160310875-20140821-AV03	WG-160310875-20150928-AV03	WG-160340875-20100519-AV13	WG-160340875-20101025-JK1	WG-160310875-20140821-AV01	WG-160310875-20150929-AV06	WG-160340875-20100517-AV04	WG-160340875-20101025-JK3
Sampling Company			STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC
Laboratory			MAXX	MAXX	MAXX	MAXX	MAXX	MAXX	MAXX	MAXX	MAXX	MAXX	MAXX	MAXX	MAXX	MAXX	MAXX	MAXX	MAXX	MAXX	MAXX
Laboratory Work Order			B062483	B062483	B0F2316	B062483	B0F1430	B4F3646	B4F3646	B5J8856	B5J8856	B064180	B0F3108	B4F3646	B5J8856	B064180	B0F1430	B4F3646	B5J8856	B062483	B0F1430
Laboratory Sample ID			FX4449	FX4449	HQ0824	FX4445	HP6282	XG4185	XG4185	BBU089	BBU089	FY2702	HQ4300	XG4186	BBU088	FY2698	HP6281	XG4184	BBU091	FX4444	HP6283
Sample Type	Units	ODWS		Lab Replicate					Lab Replicate		Lab Replicate										
Field Parameters																					
Dissolved oxygen, Field	mg/L	n/v	3.9	-	1.0	5.9	-	-	-	-	-	-	2.3	-	2.38	6.6	-	-	19.08	2.9	-
Specific Conductivity	mS/cm	n/v	-	-	-	-	-	-	-	0.326	-	-	-	-	0.421	-	-	-	0.652	-	-
Oxidation Reduction Potential, field	mV	n/v	-	-	-	-	-	-	-	-	-	-	-	-	45.3	-	-	-	68.8	-	-
pH, Field	S.U.	6.5-8.5[D]	7.4	-	-	8.0	7.7	7.51	-	7.52	-	7.9	-	8.41	6.87	7.5	7.6	7.38	7.36	7.4	7.1
Specific Conductance, Field	µS/cm	n/v	773	-	-	390	452	441	-	-	-	343	-	313	-	-	730	654	-	617	622
Temperature, Field	deg C	15[C]	9.9	-	-	9.4	12.7	11.70	-	11.7	-	13.5	-	9.49	9.5	10.8	12.5	9.46	9.5	9.4	12.6
General Chemistry																					
Alkalinity, Bicarbonate (as CaCO3)	mg/L	n/v	349	-	355	138	154	170	-	180	-	155	158	180	200	223	229	240	250	309	338
Alkalinity, Carbonate (as CaCO3)	mg/L	n/v	5	-	3	2	1	1.3	-	1.1	-	3	2	2.6	1.1	3	2	1.7	1.7	4	2
Alkalinity, Total (as CaCO3)	mg/L	30-500[D]	353	357	358	140	155	170	180	180	190	158	160	180	200	226	231	240	250	313	340
Ammonia (as N)	mg/L	n/v	0.06	-	0.16	<0.05	0.06	0.051	-	<0.050	-	0.11	0.23	0.29	0.18	0.09	0.07	0.082	<0.050	0.09	0.15
Anion Sum	meq/L	n/v	8.45	-	8.47	3.91	4.79	4.84	-	4.75	-	3.58	4.31	4.45	5.03	8.65	7.96	7.62	7.99	6.76	7.33
Cation Sum	meq/L	n/v	8.84	-	8.29	3.93	4.95	5.03	-	4.86	-	3.31	4.42	4.57	4.46	8.18	7.69	7.86	7.84	7.18	7.52
Chloride	mg/L	250[C]	12	-	13	4	6	14	-	3.5	3.6	6	12	7	8.4	28	23	15	17	6	6
Dissolved Organic Carbon (DOC)	mg/L	5[C]	2.0	-	2.3	1.4	1.7	1.1	-	1.4	-	**5.1[C]**	**5.7[C]**	**6.5[C]**	4.8	1.7	1.7	1.6	1.9	1.4	1.7
Electrical Conductivity, Lab	µmhos/cm	n/v	755	758	760	388	473	480	480	460	460	342	432	410	440	847	774	720	760	625	667
Hardness (as CaCO3)	mg/L	80-100[D]	**430[D]**	-	**400[D]**	**190[D]**	**240[D]**	**240[D]**	-	**240[D]**	-	**43[D]**	**66[D]**	**64[D]**	**78[D]**	**390[D]**	**360[D]**	**360[D]**	**360[D]**	**350[D]**	**370[D]**
Ion Balance	%	n/v	2.29	-	1.12	0.270	1.58	1.95	-	1.10	-	3.91	1.26	1.35	5.98	2.78	1.70	1.54	0.950	2.99	1.29
Langelier Index (at 20 C)	none	n/v	1.25	-	0.973	0.653	0.559	0.599	-	0.490	-	0.140	0.128	0.275	-0.0170	0.989	0.733	0.780	0.787	1.13	0.896
Langelier Index (at 4 C)	none	n/v	0.996	-	0.725	0.404	0.310	0.350	-	0.241	-	-0.110	-0.121	0.0260	-0.267	0.741	0.485	0.532	0.539	0.883	0.647
Nitrate (as N)	mg/L	10.0_{ig}[A]	<0.1	-	<0.1	**12[A]**	**19[A]**	**12.0[A]**	-	**12.1[A]**	**12.1[A]**	<0.1	<0.1	<0.10	<0.10	**37[A]**	**28[A]**	**22.5[A]**	**24.3[A]**	2.1	2.9
Nitrate + Nitrite (as N)	mg/L	10.0_{ig}[A]	<0.1	-	<0.1	**12[A]**	**19[A]**	**12.0[A]**	-	**12.1[A]**	**12.1[A]**	<0.1	<0.1	<0.10	<0.10	**37[A]**	**28[A]**	**22.5[A]**	**24.3[A]**	2.1	2.9
Nitrite (as N)	mg/L	1.0_{ig}[A]	0.03	-	<0.01	<0.01	<0.01	<0.010	-	<0.010	<0.010	<0.01	<0.01	<0.010	0.021	0.03	<0.01	<0.010	<0.010	0.02	<0.01
Orthophosphate(as P)	mg/L	n/v	<0.01	-	<0.01	<0.01	<0.01	<0.010	-	<0.010	<0.010	0.08	0.06	0.068	0.021	<0.01	0.03	<0.010	<0.010	<0.01	0.01
pH	S.U.	6.5-8.5[D]	8.1	8.1	7.88	8.1	7.92	7.90	7.88	7.79	7.82	8.3	8.09	8.20	7.78	8.1	7.86	7.89	7.87	8.1	7.80
Saturation pH (at 20 C)	none	n/v	6.89	-	6.90	7.49	7.36	7.30	-	7.30	-	8.15	7.96	7.93	7.80	7.13	7.13	7.11	7.08	6.95	6.90
Saturation pH (at 4 C)	none	n/v	7.14	-	7.15	7.74	7.61	7.55	-	7.54	-	8.40	8.21	8.17	8.05	7.38	7.37	7.36	7.33	7.20	7.15
Sulfate	mg/L	500_{ic}[C]	50	-	47	6	6	5	-	4.6	4.6	12	37	33	37	35	34	35	37	9	8
Total Dissolved Solids (Calculated)	mg/L	500[C]	441	-	433	226	289	280	-	270	-	194	250	260	270	**519[C]**	469	450	470	349	375
Metals																					
Aluminum	mg/L	0.1[D]	<0.005	-	<0.005	0.006	0.012	0.0080	-	<0.0050	-	0.011	0.011	0.020	0.012	<0.005	0.024	0.0050	<0.0050	<0.005	<0.005
Antimony	mg/L	0.006[B]	<0.0005	-	<0.0005	<0.0005	<0.0005	<0.00050	-	<0.00050	-	<0.0005	<0.0005	0.0010	<0.00050	0.0006	<0.0005	<0.00050	<0.00050	<0.0005	<0.0005
Arsenic	mg/L	0.025[B]	<0.001	-	<0.001	<0.001	<0.001	<0.0010	-	<0.0010	-	0.003	0.002	0.0020	0.0018	<0.001	<0.001	<0.0010	<0.0010	<0.001	<0.001
Barium	mg/L	1[A]	0.087	-	0.083	0.012	0.016	0.011	-	0.011	-	0.012	0.015	0.025	0.034	0.067	0.050	0.074	0.074	0.047	0.058
Beryllium	mg/L	n/v	<0.0005	-	<0.0005	<0.0005	<0.0005	<0.00050	-	<0.00050	-	<0.0005	<0.0005	<0.00050	<0.00050	<0.0005	<0.0005	<0.00050	<0.00050	<0.0005	<0.0005
Boron	mg/L	5[B]	<0.01	-	<0.01	<0.01	0.01	0.010	-	<0.010	-	0.14	0.16	0.16	0.14	0.02	0.02	0.024	0.020	<0.01	0.01
Cadmium	mg/L	0.005[A]	<0.0001	-	0.0001	<0.0001	0.0001	<0.00010	-	<0.00010	-	<0.0001	<0.0001	<0.00010	<0.00010	<0.0001	0.0001	<0.00010	<0.00010	<0.0001	<0.0001
Calcium	mg/L	n/v	100	-	99	57	73	75	-	71	-	11	17	17	20	96	94	92	96	96	100
Chromium	mg/L	0.05[A]	<0.005	-	<0.005	<0.005	<0.005	<0.0050	-	<0.0050	-	<0.005	<0.005	<0.0050	<0.0050	<0.005	<0.005	<0.0050	<0.0050	<0.005	<0.005
Cobalt	mg/L	n/v	0.0025	-	0.0019	<0.0005	<0.0005	<0.00050	-	<0.00050	-	0.0008	<0.0005	0.0010	<0.00050	<0.0005	<0.0005	<0.00050	<0.00050	<0.0005	<0.0005
Copper	mg/L	1[C]	0.002	-	0.001	0.003	0.002	0.0020	-	0.0013	-	<0.001	<0.001	0.0010	<0.0010	0.003	0.002	0.0020	0.0021	0.002	0.002
Iron	mg/L	0.3[C]	<0.1	-	<0.1	<0.1	<0.1	<0.10	-	<0.10	-	<0.1	<0.1	<0.10	<0.10	<0.1	<0.1	<0.10	<0.10	<0.1	<0.1

See notes on last page

Table 3
Summary of Groundwater Analytical Results
Waterloo North Hydrogeological Assessment

Sample Location			MW1-10			MW2-10						MW3-10D				MW3-10S				MW4-10	
Sample Date			18-May-10	18-May-10	26-Oct-10	17-May-10	25-Oct-10	21-Aug-14	21-Aug-14	28-Sep-15	28-Sep-15	20-May-10	27-Oct-10	21-Aug-14	28-Sep-15	19-May-10	25-Oct-10	21-Aug-14	29-Sep-15	17-May-10	25-Oct-10
Sample ID			WG-160340875-20100518-AV09	WG-160340875-20100518-AV09LR	WG-160340875-20101026-JK8	WG-160340875-20100517-AV05	WG-160340875-20101025-JK2	WG-160310875-20140821-AV02	WG-160310875-20140821-AV02LR	WG-160310875-20150928-AV04	WG-160310875-20150928-AV04LR	WG-160340875-20100520-AV17	WG-160340875-20101027-JK 12	WG-160310875-20140821-AV03	WG-160310875-20150928-AV03	WG-160340875-20100519-AV13	WG-160340875-20101025-JK1	WG-160310875-20140821-AV01	WG-160310875-20150929-AV06	WG-160340875-20100517-AV04	WG-160340875-20101025-JK3
Sampling Company			STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC
Laboratory			MAXX	MAXX	MAXX	MAXX	MAXX	MAXX	MAXX	MAXX	MAXX	MAXX	MAXX	MAXX	MAXX	MAXX	MAXX	MAXX	MAXX	MAXX	MAXX
Laboratory Work Order			B062483	B062483	B0F2316	B062483	B0F1430	B4F3646	B4F3646	B5J8856	B5J8856	B064180	B0F3108	B4F3646	B5J8856	B064180	B0F1430	B4F3646	B5J8856	B062483	B0F1430
Laboratory Sample ID			FX4449	FX4449	HQ0824	FX4445	HP6282	XG4185	XG4185	BBU089	BBU089	FY2702	HQ4300	XG4186	BBU088	FY2698	HP6281	XG4184	BBU091	FX4444	HP6283
Sample Type	Units	ODWS		Lab Replicate					Lab Replicate		Lab Replicate										
Metals (Continued)																					
Lead	mg/L	0.01$_c$[A]	<0.0005	-	<0.0005	0.0005	<0.0005	<0.00050	-	<0.00050	-	<0.0005	<0.0005	<0.00050	<0.00050	<0.0005	<0.0005	<0.00050	<0.00050	<0.0005	<0.0005
Magnesium	mg/L	n/v	41	-	37	12	14	14	-	15	-	3.8	5.5	5.2	6.6	35	31	31	29	26	27
Manganese	mg/L	0.05[C]	**0.33[C]**	-	**0.34[C]**	0.005	0.003	<0.0020	-	<0.0020	-	**0.080[C]**	**0.097[C]**	**0.055[C]**	0.049	0.047	0.008	<0.0020	<0.0020	0.028	0.036
Molybdenum	mg/L	n/v	0.003	-	0.003	<0.001	<0.001	0.0010	-	0.00068	-	0.042	0.039	0.038	0.031	0.001	<0.001	0.0010	<0.00050	<0.001	<0.001
Nickel	mg/L	n/v	0.002	-	<0.001	0.001	<0.001	0.0070	-	<0.0010	-	0.001	0.002	0.0030	<0.0010	0.002	<0.001	0.0010	<0.0010	0.002	0.001
Phosphorus	mg/L	n/v	<0.1	-	<0.1	<0.1	<0.1	<0.10	-	<0.10	-	0.2	0.1	<0.10	<0.10	<0.1	<0.1	<0.10	<0.10	<0.1	<0.1
Potassium	mg/L	n/v	3.0	-	2.6	2.6	3.3	3.6	-	3.6	-	1.1	1.1	0.96	0.90	2.9	1.8	1.8	1.7	1.4	1.9
Selenium	mg/L	0.01[A]	<0.002	-	<0.002	<0.002	<0.002	<0.0020	-	<0.0020	-	<0.002	<0.002	<0.0020	<0.0020	<0.002	<0.002	<0.0020	<0.0020	<0.002	<0.002
Silicon	mg/L	n/v	6.5	-	7.0	2.0	2.5	2.5	-	2.6	-	4.6	4.9	5.1	4.7	6.8	6.6	7.3	6.8	4.4	5.0
Silver	mg/L	n/v	<0.0001	-	<0.0001	<0.0001	<0.0001	<0.00010	-	<0.00010	-	<0.0001	<0.0001	<0.00010	<0.00010	<0.0001	<0.0001	<0.00010	<0.00010	<0.0001	<0.0001
Sodium	mg/L	200$_g$[C] 20$_g$[E]	5.9	-	5.1	1.4	1.6	1.6	-	1.1	-	**55[E]**	**70[E]**	**75[E]**	**66[E]**	8.9	9.0	14	14	3.7	3.8
Strontium	mg/L	n/v	0.26	-	0.22	0.069	0.092	0.092	-	0.095	-	0.19	0.26	0.29	0.38	0.22	0.16	0.14	0.15	0.17	0.20
Thallium	mg/L	n/v	<0.00005	-	<0.00005	<0.00005	<0.00005	<0.000050	-	<0.000050	-	<0.00005	<0.00005	<0.000050	<0.000050	<0.00005	<0.00005	<0.000050	<0.000050	<0.00005	<0.00005
Titanium	mg/L	n/v	<0.005	-	<0.005	<0.005	<0.005	<0.0050	-	<0.0050	-	<0.005	<0.005	<0.0050	<0.0050	<0.005	<0.005	<0.0050	<0.0050	<0.005	<0.005
Uranium	mg/L	0.02[A]	0.0059	-	0.0049	0.0002	0.0002	<0.00010	-	0.00015	-	0.0009	0.0013	0.0020	0.0022	0.0032	0.0009	0.0010	0.00081	0.0012	0.0013
Vanadium	mg/L	n/v	<0.001	-	<0.001	<0.001	<0.001	<0.00050	-	<0.00050	-	<0.001	0.001	0.0020	0.0013	<0.001	<0.001	<0.00050	<0.00050	<0.001	<0.001
Zinc	mg/L	5[C]	0.14	-	0.009	0.016	0.017	0.0080	-	<0.0050	-	0.017	0.013	0.0070	<0.0050	0.086	0.017	0.0050	0.020	0.009	0.006

See notes on last page

Table 3
Summary of Groundwater Analytical Results
Waterloo North Hydrogeological Assessment

Sample Location			MW5-10		MW6-10					MW7-10								MW8-10D					
Sample Date			17-May-10	26-Oct-10	17-May-10	27-Oct-10	22-Aug-14	28-Sep-15	28-Sep-15	17-May-10	17-May-10	17-May-10	26-Oct-10	26-Oct-10	22-Aug-14	28-Sep-15	28-Sep-15	18-May-10	18-May-10	26-Oct-10	22-Aug-14	22-Aug-14	29-Sep-15
Sample ID			WG-160340875-20100517-AV08	WG-160340875-20101026-JK9	WG-160340875-20100517-AV01	WG-160340875-20101027-JK 15	WG-160310875-20140822-AV11	WG-160310875-20150928-AV05	WG-160310875-20150928-AV05LR	WG-160340875-20100517-AV02	WG-160340875-20100517-AV03	WG-160340875-20100517-AV03LR	WG-160340875-20101026-JK11	WG-160340875-20101026-JK11LR	WG-160310875-20140822-AV12	WG-160310875-20150928-AV02	WG-160310875-20150928-AV02LR	WG-160340875-20100518-AV11	WG-160340875-20100518-AV11LR	WG-160340875-20101026-JK5	WG-160310875-20140822-AV08	WG-160310875-20140822-AV08LR	WG-160310875-20150929-AV010
Sampling Company			STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC		STANTEC	STANTEC	STANTEC	STANTEC
Laboratory			MAXX	MAXX	MAXX	MAXX	MAXX	MAXX	MAXX	MAXX	MAXX	MAXX	MAXX	MAXX	MAXX	MAXX	MAXX	MAXX	MAXX	MAXX	MAXX	MAXX	MAXX
Laboratory Work Order			B062483	B0F2316	B062483	B0F3108	B4F3646	B5J8856	B5J8856	B062483	B062483	B062483	B0F2316	B0F2316	B4F3646	B5J8856	B5J8856	B064180	B064180	B0F2316	B4F3646	B4F3646	B5J8856
Laboratory Sample ID			FX4448	HQ0825	FX4441	HQ4303	XG4194	BBU090	BBU090	FX4442	FX4443	FX4443	HQ0827	HQ0827	XG4195	BBU087	BBU087	FY2696	FY2696	HQ0821	XG4191	XG4191	BBU095
Sample Type	Units	ODWS							Lab Replicate		Field Duplicate	Lab Replicate		Lab Replicate			Lab Replicate		Lab Replicate			Lab Replicate	
Field Parameters																							
Dissolved oxygen, Field	mg/L	n/v	4.9	2.5	7.7	1.0	-	32.43	-	6.9	-	-	1.2	-	-	-	-	0.7	-	0.8	-	-	1.65
Specific Conductivity	mS/cm	n/v	-	-	-	-	-	0.428	-	-	-	-	-	-	-	0.372	-	-	-	-	-	-	0.657
Oxidation Reduction Potential, field	mV	n/v	-	-	-	-	-	95.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-81.3
pH, Field	S.U.	6.5-8.5[D]	7.6	-	7.9	7.7	7.71	7.66	-	7.6	-	-	-	-	7.38	7.44	-	7.5	-	-	7.54	-	7.57
Specific Conductance, Field	µS/cm	n/v	569	-	467	490	489	-	-	645	-	-	-	-	544	-	-	-	-	-	601	-	-
Temperature, Field	deg C	15[C]	9.9	-	9.3	12.9	11.70	12.2	-	9.4	-	-	-	-	9.1	10.1	-	10.6	-	-	9.10	-	9.3
General Chemistry																							
Alkalinity, Bicarbonate (as CaCO3)	mg/L	n/v	252	317	130	153	160	180	-	267	283	-	313	-	250	280	-	238	-	233	240	-	240
Alkalinity, Carbonate (as CaCO3)	mg/L	n/v	2	2	1	2	1.3	<1.0	-	2	2	-	3	-	2.1	1.9	-	3	-	2	2.1	-	1.8
Alkalinity, Total (as CaCO3)	mg/L	30-500[D]	254	319	132	155	170	180	-	269	286	-	316	-	260	280	-	241	-	235	240	-	240
Ammonia (as N)	mg/L	n/v	0.07	0.19	<0.05	0.05	<0.050	0.11	-	0.06	0.06	-	0.09	-	<0.050	<0.050	-	0.11	0.10	0.18	0.12	-	0.087
Anion Sum	meq/L	n/v	5.51	6.85	4.53	5.28	5.27	5.23	-	6.23	6.54	-	7.18	-	5.55	6.24	-	7.50	-	7.25	6.94	-	7.00
Cation Sum	meq/L	n/v	6.28	7.10	4.63	5.40	5.23	4.91	-	7.31	6.97	-	7.23	-	5.79	6.24	-	7.17	-	7.43	7.17	-	6.92
Chloride	mg/L	250[C]	7	7	4	14	12	11	11	10	10	-	10	9	6	8.7	-	11	11	7	26	26	26
Dissolved Organic Carbon (DOC)	mg/L	5[C]	0.8	1.3	1.2	1.6	0.79	1.1	-	0.9	0.8	-	1.2	-	0.48	0.69	-	**7.1[C]**	-	**7.5[C]**	0.74	0.75	0.86
Electrical Conductivity, Lab	µmhos/cm	n/v	508	621	469	531	530	510	-	571	599	-	654	-	510	570	-	688	-	673	660	-	660
Hardness (as CaCO3)	mg/L	80-100[D]	**310[D]**	**340[D]**	**230[D]**	**260[D]**	**250[D]**	**240[D]**	-	**350[D]**	**340[D]**	-	**350[D]**	-	**280[D]**	**300[D]**	-	**290[D]**	-	**320[D]**	**290[D]**	-	**290[D]**
Ion Balance	%	n/v	6.60	1.75	1.07	1.06	0.400	3.24	-	8.00	3.24	-	0.350	-	2.05	0.0100	-	2.23	-	1.26	1.59	-	0.550
Langelier Index (at 20 C)	none	n/v	0.923	0.902	0.564	0.767	0.626	0.429	-	0.936	0.932	-	1.02	-	0.846	0.808	-	0.977	-	0.804	0.818	-	0.756
Langelier Index (at 4 C)	none	n/v	0.674	0.654	0.315	0.518	0.376	0.180	-	0.687	0.684	-	0.769	-	0.597	0.559	-	0.729	-	0.556	0.569	-	0.508
Nitrate (as N)	mg/L	10.0$_{ig}$[A]	1.1	1.1	**23[A]**	**23[A]**	**20.3[A]**	**15.9[A]**	-	2.6	2.6	-	3.0	-	1.87	2.56	-	<0.1	<0.1	<0.1	<0.10	-	<0.10
Nitrate + Nitrite (as N)	mg/L	10.0$_{ig}$[A]	1.1	1.1	**23[A]**	**23[A]**	**20.3[A]**	**15.9[A]**	-	2.6	2.6	-	3.0	-	1.87	2.56	-	<0.1	<0.1	<0.1	<0.10	-	<0.10
Nitrite (as N)	mg/L	1.0$_{ig}$[A]	<0.01	<0.01	<0.01	<0.01	<0.010	<0.010	-	<0.01	<0.01	-	<0.01	-	<0.010	<0.010	-	<0.01	<0.01	<0.01	<0.010	-	<0.010
Orthophosphate(as P)	mg/L	n/v	<0.01	<0.01	<0.01	<0.01	<0.010	<0.010	<0.010	<0.01	<0.01	-	<0.01	<0.01	<0.010	<0.010	-	<0.01	<0.01	<0.01	<0.010	<0.010	<0.010
pH	S.U.	6.5-8.5[D]	8.0	7.82	8.0	8.10	7.93	7.71	-	7.9	7.9	-	7.96	-	7.95	7.85	-	8.1	-	7.93	7.98	-	7.91
Saturation pH (at 20 C)	none	n/v	7.07	6.91	7.45	7.33	7.30	7.28	-	7.01	7.00	-	6.94	-	7.11	7.04	-	7.17	-	7.13	7.16	-	7.16
Saturation pH (at 4 C)	none	n/v	7.32	7.16	7.70	7.58	7.55	7.53	-	7.25	7.25	-	7.19	-	7.36	7.29	-	7.41	-	7.38	7.41	-	7.40
Sulfate	mg/L	500$_{ic}$[C]	7	10	6	7	8	7.0	7.0	18	18	-	18	18	7	9.9	-	110	110	110	69	70	72
Total Dissolved Solids (Calculated)	mg/L	500[C]	296	355	283	323	310	300	-	344	347	-	373	-	290	320	-	423	-	419	390	-	390
Metals																							
Aluminum	mg/L	0.1[D]	<0.005	<0.005	0.007	0.006	0.013	<0.0050	-	<0.005	<0.005	<0.005	<0.005	-	<0.0050	<0.0050	<0.0050	<0.005	-	0.007	0.0050	-	<0.0050
Antimony	mg/L	0.006[B]	<0.0005	<0.0005	<0.0005	<0.0005	<0.00050	<0.00050	-	<0.0005	<0.0005	<0.0005	<0.0005	-	<0.00050	<0.00050	<0.00050	<0.0005	-	<0.0005	<0.00050	-	<0.00050
Arsenic	mg/L	0.025[B]	<0.001	<0.001	<0.001	<0.001	<0.0010	<0.0010	-	<0.001	<0.001	<0.001	<0.001	-	<0.0010	<0.0010	<0.0010	0.004	-	0.004	0.0040	-	0.0046
Barium	mg/L	1[A]	0.024	0.032	0.017	0.015	0.020	0.016	-	0.025	0.023	0.024	0.021	-	0.015	0.015	0.014	0.049	-	0.045	0.039	-	0.041
Beryllium	mg/L	n/v	<0.0005	<0.0005	<0.0005	<0.0005	<0.00050	<0.00050	-	<0.0005	<0.0005	<0.0005	<0.0005	-	<0.00050	<0.00050	<0.00050	<0.0005	-	<0.0005	<0.00050	-	<0.00050
Boron	mg/L	5[B]	0.01	0.01	<0.01	<0.01	0.010	<0.010	-	<0.01	0.01	0.01	<0.01	-	<0.010	<0.010	<0.010	0.04	-	0.03	0.036	-	0.030
Cadmium	mg/L	0.005[A]	<0.0001	<0.0001	<0.0001	<0.0001	<0.00010	<0.00010	-	<0.0001	<0.0001	<0.0001	0.0001	-	<0.00010	<0.00010	<0.00010	<0.0001	-	<0.0001	<0.00010	-	<0.00010
Calcium	mg/L	n/v	89	100	69	80	80	74	-	99	95	95	100	-	80	86	86	80	-	90	81	-	81
Chromium	mg/L	0.05[A]	<0.005	<0.005	<0.005	<0.005	<0.0050	<0.0050	-	<0.005	<0.005	<0.005	<0.005	-	<0.0050	<0.0050	<0.0050	<0.005	-	<0.005	<0.0050	-	<0.0050
Cobalt	mg/L	n/v	<0.0005	<0.0005	<0.0005	<0.0005	<0.00050	<0.00050	-	<0.0005	<0.0005	<0.0005	<0.0005	-	<0.00050	<0.00050	<0.00050	<0.0005	-	<0.0005	<0.00050	-	<0.00050
Copper	mg/L	1[C]	0.002	0.002	0.002	0.002	0.0020	0.0012	-	0.002	<0.001	<0.001	0.001	-	0.0010	<0.0010	<0.0010	<0.001	-	<0.001	<0.0010	-	<0.0010
Iron	mg/L	0.3[C]	<0.1	<0.1	<0.1	<0.1	<0.10	<0.10	-	<0.1	<0.1	<0.1	<0.1	-	<0.10	<0.10	<0.10	**0.5[C]**	-	**0.6[C]**	**0.73[C]**	-	**0.69[C]**

See notes on last page

Table 3
Summary of Groundwater Analytical Results
Waterloo North Hydrogeological Assessment

Sample Location			MW5-10		MW6-10					MW7-10								MW8-10D					
Sample Date			17-May-10	26-Oct-10	17-May-10	27-Oct-10	22-Aug-14	28-Sep-15	28-Sep-15	17-May-10	17-May-10	17-May-10	26-Oct-10	26-Oct-10	22-Aug-14	28-Sep-15	28-Sep-15	18-May-10	18-May-10	26-Oct-10	22-Aug-14	22-Aug-14	29-Sep-15
Sample ID			WG-160340875-20100517-AV08	WG-160340875-20101026-JK9	WG-160340875-20100517-AV01	WG-160340875-20101027-JK 15	WG-160310875-20140822-AV11	WG-160310875-20150928-AV05	WG-160310875-20150928-AV05LR	WG-160340875-20100517-AV02	WG-160340875-20100517-AV03	WG-160340875-20100517-AV03LR	WG-160340875-20101026-JK11	WG-160340875-20101026-JK11LR	WG-160310875-20140822-AV12	WG-160310875-20150928-AV02	WG-160310875-20150928-AV02LR	WG-160340875-20100518-AV11	WG-160340875-20100518-AV11LR	WG-160340875-20101026-JK5	WG-160310875-20140822-AV08	WG-160310875-20140822-AV08LR	WG-160310875-20150929-AV010
Sampling Company			STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC		STANTEC	STANTEC	STANTEC	STANTEC
Laboratory			MAXX	MAXX	MAXX	MAXX	MAXX	MAXX	MAXX	MAXX	MAXX	MAXX	MAXX	MAXX	MAXX	MAXX	MAXX	MAXX	MAXX	MAXX	MAXX	MAXX	MAXX
Laboratory Work Order			B062483	B0F2316	B062483	B0F3108	B4F3646	B5J8856	B5J8856	B062483	B062483	B062483	B0F2316	B0F2316	B4F3646	B5J8856	B5J8856	B064180	B064180	B0F2316	B4F3646	B4F3646	B5J8856
Laboratory Sample ID			FX4448	HQ0825	FX4441	HQ4303	XG4194	BBU090	BBU090	FX4442	FX4443	FX4443	HQ0827	HQ0827	XG4195	BBU087	BBU087	FY2696	FY2696	HQ0821	XG4191	XG4191	BBU095
Sample Type	Units	ODWS							Lab Replicate		Field Duplicate	Lab Replicate		Lab Replicate			Lab Replicate		Lab Replicate			Lab Replicate	
Metals (Continued)																							
Lead	mg/L	0.01$_c$[A]	<0.0005	<0.0005	<0.0005	<0.0005	<0.00050	<0.00050	-	0.0012	<0.0005	<0.0005	<0.0005	-	<0.00050	<0.00050	<0.00050	<0.0005	-	<0.0005	0.0020	-	<0.00050
Magnesium	mg/L	n/v	20	21	13	15	13	13	-	26	24	25	24	-	20	21	22	22	-	23	23	-	22
Manganese	mg/L	0.05[C]	0.028	**0.059**[C]	<0.002	<0.002	<0.0020	<0.0020	-	0.012	0.011	0.011	<0.002	-	<0.0020	<0.0020	<0.0020	**0.075**[C]	-	**0.12**[C]	**0.11**[C]	-	**0.097**[C]
Molybdenum	mg/L	n/v	0.002	<0.001	<0.001	<0.001	0.0010	<0.00050	-	<0.001	<0.001	<0.001	<0.001	-	<0.00050	<0.00050	<0.00050	0.004	-	0.004	0.0010	-	0.0014
Nickel	mg/L	n/v	<0.001	0.001	<0.001	<0.001	0.0010	<0.0010	-	0.001	<0.001	<0.001	<0.001	-	0.0010	<0.0010	<0.0010	<0.001	-	<0.001	<0.0010	-	<0.0010
Phosphorus	mg/L	n/v	<0.1	<0.1	<0.1	<0.1	<0.10	<0.10	-	<0.1	<0.1	<0.1	<0.1	-	<0.10	<0.10	<0.10	<0.1	-	<0.1	<0.10	-	<0.10
Potassium	mg/L	n/v	1.5	1.8	2.2	1.9	4.6	2.5	-	0.8	0.7	0.7	0.8	-	0.68	0.72	0.71	1.3	-	1.3	1.0	-	0.94
Selenium	mg/L	0.01[A]	<0.002	<0.002	<0.002	<0.002	<0.0020	<0.0020	-	<0.002	<0.002	<0.002	<0.002	-	<0.0020	<0.0020	<0.0020	<0.002	-	<0.002	<0.0020	-	<0.0020
Silicon	mg/L	n/v	5.1	5.8	2.6	3.3	2.7	3.1	-	5.8	5.5	5.6	5.8	-	5.3	5.3	5.3	9.1	-	9.4	9.4	-	9.1
Silver	mg/L	n/v	<0.0001	<0.0001	<0.0001	<0.0001	<0.00010	<0.00010	-	<0.0001	<0.0001	<0.0001	<0.0001	-	<0.00010	<0.00010	<0.00010	<0.0001	-	<0.0001	<0.00010	-	<0.00010
Sodium	mg/L	200$_g$[C] 20$_g$[E]	3.4	3.6	1.6	2.7	1.7	1.3	-	5.1	4.8	4.8	5.3	-	3.5	3.6	3.7	**30**[E]	-	**24**[E]	**28**[E]	-	**23**[E]
Strontium	mg/L	n/v	0.15	0.16	0.081	0.10	0.099	0.10	-	0.11	0.11	0.11	0.12	-	0.086	0.10	0.10	1.6	-	1.7	1.5	-	1.3
Thallium	mg/L	n/v	<0.00005	<0.00005	<0.00005	<0.00005	<0.000050	<0.000050	-	<0.00005	<0.00005	<0.00005	<0.00005	-	<0.000050	<0.000050	<0.000050	<0.00005	-	<0.00005	<0.000050	-	<0.000050
Titanium	mg/L	n/v	<0.005	<0.005	<0.005	<0.005	<0.0050	<0.0050	-	<0.005	<0.005	<0.005	<0.005	-	<0.0050	<0.0050	<0.0050	<0.005	-	<0.005	<0.0050	-	<0.0050
Uranium	mg/L	0.02[A]	0.0009	0.0007	0.0002	<0.0001	<0.00010	0.00019	-	0.0002	0.0002	0.0002	0.0002	-	<0.00010	0.00019	0.00021	0.0006	-	0.0005	<0.00010	-	0.00030
Vanadium	mg/L	n/v	<0.001	0.004	<0.001	0.001	<0.00050	<0.00050	-	<0.001	<0.001	<0.001	<0.001	-	<0.00050	<0.00050	<0.00050	<0.001	-	<0.001	<0.00050	-	<0.00050
Zinc	mg/L	5[C]	0.043	0.044	0.006	0.006	0.0070	<0.0050	-	0.014	0.009	0.007	0.006	-	0.0080	<0.0050	<0.0050	<0.005	-	<0.005	<0.0050	-	<0.0050

See notes on last page

Table 3
Summary of Groundwater Analytical Results
Waterloo North Hydrogeological Assessment

Sample Location			MW8-10S					MW9-10S		MW9-10D			MW10-10				MW11-10			
Sample Date			18-May-10	26-Oct-10	22-Aug-14	22-Aug-14	29-Sep-15	18-May-10	26-Oct-10	20-May-10	27-Oct-10	27-Oct-10	17-May-10	27-Oct-10	21-Aug-14	29-Sep-15	19-May-10	27-Oct-10	27-Oct-10	22-Aug-14
Sample ID			WG-160340875-20100518-AV12	WG-160340875-20101026-JK4	WG-160310875-20140822-AV09	WG-160310875-20140822-AV09LR	WG-160310875-20150929-AV011	WG-160340875-20100518-AV10	WG-160340875-20101026-JK10	WG-160340875-20100520-AV18	WG-160340875-20101027-JK 14	WG-160340875-20101027-JK 14LR	WG-160340875-20100517-AV06	WG-160340875-20101027-JK 16	WG-160310875-20140821-AV05	WG-160310875-20150929-AV07	WG-160340875-20100519-AV16	WG-160340875-20101027-JK 17	WG-160340875-20101027-JK 17LR	WG-160310875-20140822-AV10
Sampling Company			STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC		STANTEC
Laboratory			MAXX	MAXX	MAXX	MAXX	MAXX	MAXX	MAXX	MAXX	MAXX	MAXX	MAXX	MAXX	MAXX	MAXX	MAXX	MAXX	MAXX	MAXX
Laboratory Work Order			B064180	B0F2316	B4F3646	B4F3646	B5J8856	B064180	B0F2316	B064180	B0F3108	B0F3108	B062483	B0F3108	B4F3646	B5J8856	B064180	B0F3108	B0F3108	B4F3646
Laboratory Sample ID			FY2697	HQ0820	XG4192	XG4192	BBU096	FY2695	HQ0826	FY2703	HQ4302	HQ4302	FX4446	HQ4304	XG4188	BBU092	FY2701	HQ4305	HQ4305	XG4193
Sample Type	Units	ODWS				Lab Replicate						Lab Replicate							Lab Replicate	
Field Parameters																				
Dissolved oxygen, Field	mg/L	n/v	0	-	-	-	3.64	0	0.5	2.2	0.8	-	0	-	-	1.67	-	-	-	-
Specific Conductivity	mS/cm	n/v	-	-	-	-	1.97	-	-	-	-	-	-	-	-	0.361	-	-	-	-
Oxidation Reduction Potential, field	mV	n/v	-	-	-	-	-113.2	-	-	-	-	-	-	-	-	-37.2	-	-	-	-
pH, Field	S.U.	6.5-8.5[D]	7.2	-	7.56	-	7.67	7.9	-	7.6	7.7	-	7.9	7.7	7.65	7.52	7.4	-	-	6.72
Specific Conductance, Field	µS/cm	n/v	-	-	1690	-	-	1033	-	551	491	-	491	436	430	-	780	-	-	696
Temperature, Field	deg C	15[C]	10.3	-	11.41	-	13.1	10.0	-	12.5	10.7	-	9.5	13.2	13.03	13.9	11.6	7.0	-	13.5
General Chemistry																				
Alkalinity, Bicarbonate (as CaCO3)	mg/L	n/v	278	307	350	-	310	238	235	228	217	-	239	248	250	250	241	231	-	230
Alkalinity, Carbonate (as CaCO3)	mg/L	n/v	3	2	3.0	-	2.1	3	2	4	4	-	4	3	2.4	2.2	4	3	-	2.1
Alkalinity, Total (as CaCO3)	mg/L	30-500[D]	281	309	350	-	320	241	237	232	221	-	243	251	260	250	245	234	-	230
Ammonia (as N)	mg/L	n/v	0.09	<0.05	0.065	-	<0.050	0.17	0.27	<0.05	0.19	-	0.23	0.34	0.32	0.27	<0.05	0.08	-	0.075
Anion Sum	meq/L	n/v	29.3	34.3	21.7	-	22.2	7.66	6.01	6.08	5.74	-	5.26	5.51	5.49	5.45	7.47	7.22	-	6.87
Cation Sum	meq/L	n/v	30.6	36.1	23.6	-	22.7	7.04	6.14	5.89	6.43	-	5.40	5.53	5.48	5.25	7.56	7.52	-	6.77
Chloride	mg/L	250[C]	**800[C]**	**970[C]**	**500[C]**	-	**550[C]**	13	14	11	8	-	2	2	2	1.9	24	33	-	27
Dissolved Organic Carbon (DOC)	mg/L	5[C]	2.1	2.1	2.4	-	1.5	1.2	1.4	1.6	3.9	3.7	1.0	1.5	2.2	1.0	2.0	3.2	-	1.9
Electrical Conductivity, Lab	µmhos/cm	n/v	3330	3680	2400	-	2400	714	558	569	542	-	474	489	480	480	739	705	-	670
Hardness (as CaCO3)	mg/L	80-100[D]	**530[D]**	**600[D]**	**280[D]**	-	**290[D]**	**230[D]**	**220[D]**	**230[D]**	**240[D]**	-	**250[D]**	**260[D]**	**250[D]**	**240[D]**	**190[D]**	**270[D]**	-	**300[D]**
Ion Balance	%	n/v	2.16	2.57	4.12	-	1.06	4.22	1.02	1.57	5.67	-	1.33	0.210	0.0900	1.89	0.610	2.02	-	0.670
Langelier Index (at 20 C)	none	n/v	1.05	0.849	0.871	-	0.723	0.734	0.679	0.896	0.906	-	0.979	0.902	0.726	0.684	0.832	0.907	-	0.852
Langelier Index (at 4 C)	none	n/v	0.808	0.606	0.626	-	0.478	0.486	0.430	0.647	0.657	-	0.730	0.653	0.477	0.435	0.584	0.658	-	0.604
Nitrate (as N)	mg/L	10.0_{ig}[A]	<0.1	<0.1	<0.10	-	<0.10	<0.1	<0.1	<0.1	<0.1	-	<0.1	<0.1	0.13	0.11	**11[A]**	**13[A]**	**13[A]**	**16.1[A]**
Nitrate + Nitrite (as N)	mg/L	10.0_{ig}[A]	<0.1	<0.1	<0.10	-	<0.10	<0.1	<0.1	<0.1	<0.1	-	<0.1	0.1	0.14	0.16	**11[A]**	**13[A]**	**13[A]**	**16.1[A]**
Nitrite (as N)	mg/L	1.0_{ig}[A]	0.01	<0.01	<0.010	-	<0.010	0.02	0.01	<0.01	0.02	-	<0.01	0.12	0.013	0.056	0.02	0.08	0.08	<0.010
Orthophosphate(as P)	mg/L	n/v	<0.01	<0.01	<0.010	-	<0.010	<0.01	<0.01	<0.01	<0.01	-	<0.01	<0.01	<0.010	0.010	<0.01	<0.01	-	0.046
pH	S.U.	6.5-8.5[D]	8.0	7.74	7.96	-	7.85	8.1	8.01	8.2	8.24	-	8.3	8.16	8.00	7.97	8.2	8.14	-	7.99
Saturation pH (at 20 C)	none	n/v	6.97	6.89	7.09	-	7.13	7.35	7.34	7.32	7.34	-	7.29	7.26	7.28	7.29	7.37	7.23	-	7.14
Saturation pH (at 4 C)	none	n/v	7.22	7.13	7.33	-	7.38	7.59	7.59	7.57	7.59	-	7.54	7.51	7.52	7.54	7.62	7.48	-	7.39
Sulfate	mg/L	500_{ic}[C]	50	40	24	-	21	120	42	55	53	-	17	20	15	14	55	32	-	18
Total Dissolved Solids (Calculated)	mg/L	500[C]	**1680[C]**	**1980[C]**	**1300[C]**	-	**1300[C]**	425	330	327	326	-	279	293	290	280	437	422	-	390
Metals																				
Aluminum	mg/L	0.1[D]	0.006	0.017	0.0080	0.012	<0.0050	0.006	0.081	<0.005	<0.005	-	<0.005	<0.005	0.0050	<0.0050	0.007	0.007	-	0.010
Antimony	mg/L	0.006[B]	<0.0005	<0.0005	<0.00050	<0.00050	<0.00050	0.0008	<0.0005	<0.0005	0.0007	-	<0.0005	<0.0005	<0.00050	<0.00050	<0.0005	<0.0005	-	<0.00050
Arsenic	mg/L	0.025[B]	<0.001	<0.005	0.0010	0.0010	<0.0010	0.003	0.005	0.002	0.001	-	0.011	0.012	0.015	0.015	<0.001	<0.001	-	<0.0010
Barium	mg/L	1[A]	0.20	0.15	0.11	0.11	0.098	0.12	0.071	0.082	0.078	-	0.068	0.068	0.10	0.099	0.039	0.047	-	0.047
Beryllium	mg/L	n/v	<0.0005	<0.0005	<0.00050	<0.00050	<0.00050	<0.0005	<0.0005	<0.0005	<0.0005	-	<0.0005	<0.0005	<0.00050	<0.00050	<0.0005	<0.0005	-	<0.00050
Boron	mg/L	5[B]	0.02	0.02	0.011	0.011	<0.010	0.03	0.03	0.03	0.04	-	0.02	0.03	0.030	0.025	0.01	0.01	-	0.012
Cadmium	mg/L	0.005[A]	<0.0001	0.0002	<0.00010	<0.00010	<0.00010	<0.0001	<0.0001	<0.0001	<0.0001	-	<0.0001	<0.0001	<0.00010	<0.00010	<0.0001	<0.0001	-	<0.00010
Calcium	mg/L	n/v	160	180	88	88	89	53	52	55	56	-	55	57	54	53	50	71	-	88
Chromium	mg/L	0.05[A]	<0.005	<0.005	<0.0050	<0.0050	<0.0050	<0.005	<0.005	<0.005	<0.005	-	<0.005	<0.005	<0.0050	<0.0050	<0.005	<0.005	-	<0.0050
Cobalt	mg/L	n/v	0.0012	<0.0005	0.0010	0.0010	<0.00050	0.0008	0.0007	<0.0005	<0.0005	-	0.0010	0.0007	<0.00050	<0.00050	<0.0005	<0.0005	-	<0.00050
Copper	mg/L	1[C]	0.003	0.002	0.0030	0.0030	<0.0010	0.001	<0.001	<0.001	<0.001	-	0.001	0.001	0.0010	<0.0010	0.003	0.008	-	0.0030
Iron	mg/L	0.3[C]	<0.1	<0.1	<0.10	<0.10	<0.10	<0.1	0.2	0.1	<0.1	-	<0.1	<0.1	0.17	0.20	<0.1	<0.1	-	<0.10

See notes on last page

Table 3
Summary of Groundwater Analytical Results
Waterloo North Hydrogeological Assessment

Sample Location			MW8-10S					MW9-10S		MW9-10D			MW10-10				MW11-10			
Sample Date			18-May-10	26-Oct-10	22-Aug-14	22-Aug-14	29-Sep-15	18-May-10	26-Oct-10	20-May-10	27-Oct-10	27-Oct-10	17-May-10	27-Oct-10	21-Aug-14	29-Sep-15	19-May-10	27-Oct-10	27-Oct-10	22-Aug-14
Sample ID			WG-160340875-20100518-AV12	WG-160340875-20101026-JK4	WG-160310875-20140822-AV09	WG-160310875-20140822-AV09LR	WG-160310875-20150929-AV011	WG-160340875-20100518-AV10	WG-160340875-20101026-JK10	WG-160340875-20100520-AV18	WG-160340875-20101027-JK 14	WG-160340875-20101027-JK 14LR	WG-160340875-20100517-AV06	WG-160340875-20101027-JK 16	WG-160310875-20140821-AV05	WG-160310875-20150929-AV07	WG-160340875-20100519-AV16	WG-160340875-20101027-JK 17	WG-160340875-20101027-JK 17LR	WG-160310875-20140822-AV10
Sampling Company			STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC		STANTEC
Laboratory			MAXX	MAXX	MAXX	MAXX	MAXX	MAXX	MAXX	MAXX	MAXX	MAXX	MAXX	MAXX	MAXX	MAXX	MAXX	MAXX	MAXX	MAXX
Laboratory Work Order			B064180	B0F2316	B4F3646	B4F3646	B5J8856	B064180	B0F2316	B064180	B0F3108	B0F3108	B062483	B0F3108	B4F3646	B5J8856	B064180	B0F3108	B0F3108	B4F3646
Laboratory Sample ID			FY2697	HQ0820	XG4192	XG4192	BBU096	FY2695	HQ0826	FY2703	HQ4302	HQ4302	FX4446	HQ4304	XG4188	BBU092	FY2701	HQ4305	HQ4305	XG4193
Sample Type	Units	ODWS				Lab Replicate						Lab Replicate							Lab Replicate	
Metals (Continued)																				
Lead	mg/L	0.01$_c$[A]	<0.0005	0.0011	<0.00050	<0.00050	<0.00050	<0.0005	<0.0005	<0.0005	<0.0005	-	<0.0005	<0.0005	<0.00050	<0.00050	<0.0005	<0.0005	-	<0.00050
Magnesium	mg/L	n/v	32	35	16	16	16	24	22	22	24	-	27	28	28	27	16	22	-	21
Manganese	mg/L	0.05[C]	**0.28[C]**	**0.21[C]**	**0.056[C]**	**0.058[C]**	**0.066[C]**	**0.13[C]**	**0.20[C]**	**0.070[C]**	**0.13[C]**	-	**0.070[C]**	**0.067[C]**	0.025	0.022	0.014	0.017	-	0.014
Molybdenum	mg/L	n/v	0.004	0.004	0.0010	0.0010	0.00051	0.007	0.004	0.006	0.009	-	0.001	0.001	0.0010	0.0010	0.003	0.002	-	0.0010
Nickel	mg/L	n/v	0.004	0.001	0.0010	0.0020	<0.0010	0.002	<0.001	0.001	0.010	-	0.001	0.001	0.0010	<0.0010	0.002	0.001	-	0.0010
Phosphorus	mg/L	n/v	<0.1	<0.1	<0.10	<0.10	<0.10	<0.1	<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.10	<0.10	<0.1	<0.1	-	<0.10
Potassium	mg/L	n/v	5.8	5.9	3.0	3.1	3.1	2.1	1.7	1.3	1.8	-	1.4	1.3	1.5	1.4	3.6	4.8	-	4.9
Selenium	mg/L	0.01[A]	<0.002	<0.002	<0.0020	<0.0020	<0.0020	<0.002	<0.002	<0.002	<0.002	-	<0.002	<0.002	<0.0020	<0.0020	0.002	<0.002	-	<0.0020
Silicon	mg/L	n/v	4.3	4.8	4.4	4.4	4.2	7.0	8.3	6.7	6.2	-	11	12	12	12	5.1	5.9	-	5.3
Silver	mg/L	n/v	<0.0001	<0.0001	<0.00010	<0.00010	<0.00010	<0.0001	<0.0001	<0.0001	<0.0001	-	<0.0001	<0.0001	<0.00010	<0.00010	<0.0001	<0.0001	-	<0.00010
Sodium	mg/L	200$_g$[C] 20$_g$[E]	**460[CE]**	**550[CE]**	**410[CE]**	**420[CE]**	**390[CE]**	**54[E]**	**37[E]**	**30[E]**	**37[E]**	-	8.1	8.1	9.2	7.8	**85[E]**	**46[E]**	-	13
Strontium	mg/L	n/v	0.50	0.46	0.19	0.19	0.19	0.31	0.30	0.35	0.63	-	0.29	0.32	0.32	0.35	0.13	0.18	-	0.13
Thallium	mg/L	n/v	<0.00005	<0.00005	<0.000050	<0.000050	<0.000050	<0.00005	<0.00005	<0.00005	<0.00005	-	<0.00005	<0.00005	<0.000050	<0.000050	<0.00005	<0.00005	-	<0.000050
Titanium	mg/L	n/v	<0.005	<0.005	<0.0050	<0.0050	<0.0050	<0.005	<0.005	<0.005	<0.005	-	<0.005	<0.005	<0.0050	<0.0050	<0.005	<0.005	-	<0.0050
Uranium	mg/L	0.02[A]	0.0079	0.0048	0.0010	0.0010	0.00075	0.0029	0.0022	0.0013	0.0017	-	0.0013	0.0005	<0.00010	0.00012	0.0048	0.0035	-	0.0020
Vanadium	mg/L	n/v	<0.001	<0.005	<0.00050	<0.00050	<0.00050	<0.001	<0.001	<0.001	0.001	-	<0.001	0.001	<0.00050	<0.00050	<0.001	0.001	-	<0.00050
Zinc	mg/L	5[C]	0.010	0.009	0.012	0.016	0.0066	0.008	<0.005	<0.005	<0.005	-	0.006	<0.005	0.0090	<0.0050	0.006	0.008	-	0.0070

See notes on last page

Table 3
Summary of Groundwater Analytical Results
Waterloo North Hydrogeological Assessment

Sample Location			MW12-10D							MW12-10S				MW13-10				
Sample Date			19-May-10	26-Oct-10	26-Oct-10	22-Aug-14	22-Aug-14	29-Sep-15	29-Sep-15	19-May-10	26-Oct-10	22-Aug-14	29-Sep-15	17-May-10	27-Oct-10	27-Oct-10	21-Aug-14	28-Sep-15
Sample ID			WG-160340875-20100519-AV14	WG-160340875-20101026-JK6	WG-160340875-20101026-JK6LR	WG-160310875-20140822-AV06	WG-160310875-20140822-AV06LR	WG-160310875-20150929-AV08	WG-160310875-20150929-AV08LR	WG-160340875-20100519-AV15	WG-160340875-20101026-JK7	WG-160310875-20140822-AV07	WG-160310875-20150929-AV09	WG-160340875-20100517-AV07	WG-160340875-20101027-JK 13	WG-160340875-20101027-JK 13LR	WG-160310875-20140821-AV04	WG-160310875-20150928-AV01
Sampling Company			STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC
Laboratory			MAXX	MAXX	MAXX	MAXX	MAXX	MAXX	MAXX	MAXX	MAXX	MAXX	MAXX	MAXX	MAXX	MAXX	MAXX	MAXX
Laboratory Work Order			B064180	B0F2316	B0F2316	B4F3646	B4F3646	B5J8856	B5J8856	B064180	B0F2316	B4F3646	B5J8856	B062483	B0F3108	B0F3108	B4F3646	B5J8856
Laboratory Sample ID			FY2699	HQ0822	HQ0822	XG4189	XG4189	BBU093	BBU093	FY2700	HQ0823	XG4190	BBU094	FX4447	HQ4301	HQ4301	XG4187	BBU085
Sample Type	Units	ODWS			Lab Replicate		Lab Replicate		Lab Replicate							Lab Replicate		
Field Parameters																		
Dissolved oxygen, Field	mg/L	n/v	0.7	-	-	-	-	1.40	-	6.6	1.2	-	1.57	0.6	0.7	-	-	-
Specific Conductivity	mS/cm	n/v	-	-	-	-	-	1.22	-	-	-	-	0.700	-	-	-	-	0.493
Oxidation Reduction Potential, field	mV	n/v	-	-	-	-	-	-100.6	-	-	-	-	51.0	-	-	-	-	-
pH, Field	S.U.	6.5-8.5[D]	7.4	-	-	7.38	-	7.30	-	7.3	-	7.33	7.05	7.5	7.3	-	7.25	7.19
Specific Conductance, Field	µS/cm	n/v	1209	-	-	1061	-	-	-	948	-	779	-	705	655	-	687	-
Temperature, Field	deg C	15[C]	10.9	-	-	9.47	-	9.8	-	10.8	-	9.40	11.1	9.1	12	-	10.64	11.7
General Chemistry																		
Alkalinity, Bicarbonate (as CaCO3)	mg/L	n/v	271	244	-	250	-	250	-	434	459	430	410	276	314	-	340	320
Alkalinity, Carbonate (as CaCO3)	mg/L	n/v	2	1	-	1.6	-	1.3	-	5	2	2.5	2.2	2	3	-	2.3	2.0
Alkalinity, Total (as CaCO3)	mg/L	30-500[D]	273	245	-	250	-	250	-	439	461	430	420	279	318	-	340	320
Ammonia (as N)	mg/L	n/v	0.08	0.29	-	0.15	0.15	0.16	0.15	0.11	0.11	0.095	<0.050	0.07	0.14	-	<0.050	<0.050
Anion Sum	meq/L	n/v	13.0	13.2	-	12.4	-	13.9	-	9.87	10.3	9.61	9.24	6.80	7.64	-	8.31	7.73
Cation Sum	meq/L	n/v	12.5	13.9	-	13.5	-	14.2	-	9.98	10.3	9.92	9.64	8.04	8.59	-	8.30	7.60
Chloride	mg/L	250[C]	21	20	-	20	-	20	-	18	18	14	15	11	12	-	12	14
Dissolved Organic Carbon (DOC)	mg/L	5[C]	**14.4[C]**	2.8	-	0.63	-	0.86	-	1.5	1.7	0.96	0.85	0.7	1.4	-	1.1	0.66
Electrical Conductivity, Lab	µmhos/cm	n/v	1140	1210	-	1200	-	1200	-	878	908	850	830	629	705	-	710	700
Hardness (as CaCO3)	mg/L	80-100[D]	**560[D]**	**650[D]**	-	**630[D]**	-	**660[D]**	-	**480[D]**	**490[D]**	**480[D]**	**460[D]**	**390[D]**	**420[D]**	-	**400[D]**	**370[D]**
Ion Balance	%	n/v	1.80	2.81	-	4.08	-	0.820	-	0.560	0.100	1.59	2.12	8.40	5.85	-	0.0800	0.870
Langelier Index (at 20 C)	none	n/v	0.991	0.901	-	0.975	-	0.897	-	1.30	0.931	1.02	0.974	0.979	1.13	-	0.978	0.896
Langelier Index (at 4 C)	none	n/v	0.745	0.654	-	0.728	-	0.650	-	1.05	0.683	0.769	0.726	0.731	0.883	-	0.730	0.648
Nitrate (as N)	mg/L	10.0_{ig}[A]	<0.1	<0.1	-	<0.10	<0.10	<0.10	-	0.5	0.4	1.19	0.95	1.8	0.9	0.9	3.37	3.36
Nitrate + Nitrite (as N)	mg/L	10.0_{ig}[A]	<0.1	<0.1	-	<0.10	<0.10	<0.10	-	0.5	0.4	1.19	0.97	1.8	0.9	0.9	3.37	3.36
Nitrite (as N)	mg/L	1.0_{ig}[A]	0.01	<0.01	-	<0.010	<0.010	<0.010	-	0.02	0.01	<0.010	0.013	0.02	<0.01	0.01	<0.010	<0.010
Orthophosphate(as P)	mg/L	n/v	<0.01	<0.01	-	<0.010	-	<0.010	-	<0.01	<0.01	<0.010	<0.010	<0.01	<0.01	-	<0.010	<0.010
pH	S.U.	6.5-8.5[D]	7.9	7.75	-	7.82	-	7.74	-	8.1	7.66	7.79	7.75	8.0	8.03	-	7.86	7.83
Saturation pH (at 20 C)	none	n/v	6.87	6.84	-	6.84	-	6.84	-	6.76	6.73	6.77	6.77	6.98	6.90	-	6.88	6.93
Saturation pH (at 4 C)	none	n/v	7.12	7.09	-	7.09	-	7.09	-	7.01	6.98	7.02	7.02	7.22	7.15	-	7.13	7.18
Sulfate	mg/L	500_a[C]	330	370	-	330	-	410	-	27	26	22	20	37	42	-	40	33
Total Dissolved Solids (Calculated)	mg/L	500[C]	**767[C]**	**810[C]**	-	**760[C]**	-	**850[C]**	-	500	**520[C]**	490	480	379	416	-	440	400
Metals																		
Aluminum	mg/L	0.1[D]	0.005	<0.005	<0.005	0.0050	-	<0.0050	-	0.014	<0.005	<0.0050	<0.0050	<0.005	0.010	-	<0.0050	<0.0050
Antimony	mg/L	0.006[B]	<0.0005	<0.0005	<0.0005	<0.00050	-	<0.00050	-	<0.0005	<0.0005	<0.00050	<0.00050	<0.0005	<0.0005	-	<0.00050	<0.00050
Arsenic	mg/L	0.025[B]	0.003	0.003	0.003	0.0030	-	0.0032	-	<0.001	<0.001	<0.0010	<0.0010	<0.001	<0.001	-	<0.0010	<0.0010
Barium	mg/L	1[A]	0.042	0.039	0.039	0.024	-	0.027	-	0.087	0.078	0.10	0.092	0.070	0.086	-	0.088	0.075
Beryllium	mg/L	n/v	<0.0005	<0.0005	<0.0005	<0.00050	-	<0.00050	-	<0.0005	<0.0005	<0.00050	<0.00050	<0.0005	<0.0005	-	<0.00050	<0.00050
Boron	mg/L	5[B]	0.06	0.06	0.06	0.053	-	0.051	-	0.02	0.02	0.018	0.011	<0.01	0.01	-	0.011	<0.010
Cadmium	mg/L	0.005[A]	<0.0001	<0.0001	<0.0001	<0.00010	-	<0.00010	-	<0.0001	0.0001	<0.00010	<0.00010	<0.0001	0.0001	-	<0.00010	<0.00010
Calcium	mg/L	n/v	160	190	200	190	-	200	-	120	120	110	120	100	110	-	110	100
Chromium	mg/L	0.05[A]	<0.005	<0.005	<0.005	<0.0050	-	<0.0050	-	<0.005	<0.005	<0.0050	<0.0050	<0.005	<0.005	-	<0.0050	<0.0050
Cobalt	mg/L	n/v	<0.0005	<0.0005	<0.0005	<0.00050	-	<0.00050	-	0.0006	0.0009	0.0010	<0.00050	<0.0005	<0.0005	-	<0.00050	<0.00050
Copper	mg/L	1[C]	<0.001	<0.001	<0.001	<0.0010	-	<0.0010	-	0.002	0.001	0.0010	<0.0010	0.002	0.002	-	0.0020	0.0010
Iron	mg/L	0.3[C]	**1.2[C]**	**1.3[C]**	**1.3[C]**	**1.3[C]**	-	**1.3[C]**	-	<0.1	<0.1	<0.10	<0.10	<0.1	<0.1	-	<0.10	<0.10

See notes on last page

Table 3
Summary of Groundwater Analytical Results
Waterloo North Hydrogeological Assessment

Sample Location			MW12-10D							MW12-10S							MW13-10			
Sample Date			19-May-10	26-Oct-10	26-Oct-10	22-Aug-14	22-Aug-14	29-Sep-15	29-Sep-15	19-May-10	26-Oct-10	22-Aug-14	29-Sep-15	17-May-10	27-Oct-10	27-Oct-10	21-Aug-14	28-Sep-15
Sample ID			WG-160340875-20100519-AV14	WG-160340875-20101026-JK6	WG-160340875-20101026-JK6LR	WG-160310875-20140822-AV06	WG-160310875-20140822-AV06LR	WG-160310875-20150929-AV08	WG-160310875-20150929-AV08LR	WG-160340875-20100519-AV15	WG-160340875-20101026-JK7	WG-160310875-20140822-AV07	WG-160310875-20150929-AV09	WG-160340875-20100517-AV07	WG-160340875-20101027-JK 13	WG-160340875-20101027-JK 13LR	WG-160310875-20140821-AV04	WG-160310875-20150928-AV01
Sampling Company			STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC
Laboratory			MAXX	MAXX	MAXX	MAXX	MAXX	MAXX	MAXX	MAXX	MAXX	MAXX	MAXX	MAXX	MAXX	MAXX	MAXX	MAXX
Laboratory Work Order			B064180	B0F2316	B0F2316	B4F3646	B4F3646	B5J8856	B5J8856	B064180	B0F2316	B4F3646	B5J8856	B062483	B0F3108	B0F3108	B4F3646	B5J8856
Laboratory Sample ID			FY2699	HQ0822	HQ0822	XG4189	XG4189	BBU093	BBU093	FY2700	HQ0823	XG4190	BBU094	FX4447	HQ4301	HQ4301	XG4187	BBU085
Sample Type	Units	ODWS			Lab Replicate		Lab Replicate		Lab Replicate							Lab Replicate		
Metals (Continued)																		
Lead	mg/L	0.01[C,A]	<0.0005	<0.0005	<0.0005	<0.00050	-	<0.00050	-	<0.0005	<0.0005	<0.00050	<0.00050	<0.0005	<0.0005	-	<0.00050	<0.00050
Magnesium	mg/L	n/v	38	40	41	41	-	42	-	46	46	46	42	32	33	-	32	28
Manganese	mg/L	0.05[C]	**0.13[C]**	**0.089[C]**	**0.093[C]**	0.036	-	0.037	-	**0.18[C]**	**0.22[C]**	**0.11[C]**	**0.061[C]**	**0.055[C]**	**0.052[C]**	-	0.0070	0.0058
Molybdenum	mg/L	n/v	0.003	<0.001	<0.001	0.0010	-	0.00073	-	0.002	0.002	0.0010	<0.00050	<0.001	<0.001	-	0.0020	0.00054
Nickel	mg/L	n/v	<0.001	<0.001	<0.001	<0.0010	-	<0.0010	-	0.002	<0.001	0.0010	<0.0010	0.002	0.001	-	0.0010	<0.0010
Phosphorus	mg/L	n/v	<0.1	<0.1	<0.1	<0.10	-	<0.10	-	<0.1	<0.1	<0.10	<0.10	<0.1	<0.1	-	<0.10	<0.10
Potassium	mg/L	n/v	1.7	1.5	1.5	1.4	-	1.5	-	3.4	3.1	2.9	2.5	1.0	1.4	-	1.0	1.0
Selenium	mg/L	0.01[A]	<0.002	<0.002	<0.002	<0.0020	-	<0.0020	-	<0.002	<0.002	<0.0020	<0.0020	<0.002	<0.002	-	<0.0020	<0.0020
Silicon	mg/L	n/v	8.0	7.7	7.9	7.8	-	7.6	-	8.0	8.5	8.0	8.2	6.2	7.0	-	6.8	6.4
Silver	mg/L	n/v	<0.0001	<0.0001	<0.0001	<0.00010	-	<0.00010	-	<0.0001	<0.0001	<0.00010	<0.00010	<0.0001	<0.0001	-	<0.00010	<0.00010
Sodium	mg/L	200[C] 20[E]	**28[E]**	18	19	19	-	18	-	8.0	9.1	8.0	6.7	3.6	5.3	-	4.6	3.2
Strontium	mg/L	n/v	2.8	3.2	3.4	3.0	-	3.1	-	0.46	0.45	0.44	0.35	0.15	0.18	-	0.15	0.15
Thallium	mg/L	n/v	<0.00005	<0.00005	<0.00005	<0.000050	-	<0.000050	-	<0.00005	<0.00005	<0.000050	<0.000050	<0.00005	<0.00005	-	<0.000050	<0.000050
Titanium	mg/L	n/v	<0.005	<0.005	<0.005	<0.0050	-	<0.0050	-	<0.005	<0.005	<0.0050	<0.0050	<0.005	<0.005	-	<0.0050	<0.0050
Uranium	mg/L	0.02[A]	0.0007	0.0005	0.0005	<0.00010	-	0.00030	-	0.0064	0.0044	0.0020	0.0014	0.0010	0.0012	-	0.0010	0.00079
Vanadium	mg/L	n/v	<0.001	<0.001	<0.001	<0.00050	-	<0.00050	-	<0.001	<0.001	<0.00050	<0.00050	<0.001	<0.001	-	<0.00050	<0.00050
Zinc	mg/L	5[C]	<0.005	<0.005	<0.005	<0.0050	-	<0.0050	-	0.013	<0.005	0.0060	<0.0050	0.013	0.010	-	0.016	0.040

Notes:

ODWS	Technical Support Document for Ontario Drinking Water Standards, Objectives and Guidelines (MOE, 2006)
A	ODWS Table 2 - Chemical Standards, Maximum Acceptable Concentration
B	ODWS Table 2 - Chemical Standards, Interim Maximum Acceptable Concentration
C	ODWS Table 4 - Chemical/Physical Objectives and Guidelines, Aesthetic Objectives
D	ODWS Table 4 - Chemical/Physical Objectives and Guidelines, Operational Guidelines
E	ODWS Table 4 - Medical Officer of Health Reporting Limit
6.5[A]	Concentration exceeds the indicated standard.
15.2	Measured concentration was less than the applicable standard.
<0.50	Laboratory reporting limit was greater than the applicable standard.
<0.03	Analyte was not detected at a concentration greater than the laboratory reporting limit.
n/v	No standard/guideline value.
-	Parameter not analyzed / not available.
c	This 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.
d	Where both nitrate and nitrite are present, the total of the two should not exceed 10 mg/L (as nitrogen).
CE g	The aesthetic objective for sodium in drinking water is 200 mg/L. The local Medical Officer of Health should be notified when the sodium concentration exceeds 20 mg/L so that this information may be communicated to local physicians for their use with patients on sodium restricted diets.
h	When sulfate levels exceed 500 mg/L, water may have a laxative effect on some people.

APPENDIX C
PHASE I MONITORING PROGRAM

NORTH WATERLOO
PROPOSED PHASE 1 MONITORING PROGRAM
2014

1.0 STUDY AREA AND CONTEXT

The subject properties comprise a large portion of the Primary Study Area from the North Waterloo Scoped Subwatershed Study. The lands are located in the northwest portion of the City Urban Area and are generally bounded by City limits to the north, Beaver Creek Road / Roy Schmidt Road to the east and Laurel Creek Nature Centre to the south.

The subject properties and adjacent lands are representative of a typical southern Ontario landscape mosaic, consisting of urban, rural residential, institutional (church), natural, agricultural, educational (Laurel Creek Nature Centre), and recreational (Erbsville Kartway) uses.

The broader landscape is predominantly agricultural, with large blocks of natural heritage features. The agricultural areas were generally cleared for agriculture in the early 1800s and have been generally unchanged (notwithstanding year-to-year variations in plough limits and some tree cutting). Rural residential properties have been present on the landscape for many decades; urban residential development is relatively recent and progressing from the south and east toward the north / northwest limits of the City.

The Laurel Creek Forest (ESPA 80) encompasses the forest features south of Conservation Drive and extends beyond the subject properties along Laurel Creek and adjacent features. The Sunfish Lake - Laurel Creek PSW encompasses wetlands north and south of Conservation Drive on the subject properties as part of a large complex of wetlands across the landscape. These designations overlap on the subject properties with additional designations including significant woodlands and natural hazards (i.e., floodplain).

Lands to the north and west of the subject properties, outside the City, are comprised of extensive farmlands designated as Prime Agricultural Areas in the Regional Official Polices Plan (ROPP). Features located on the subject properties extend beyond the City into Woolwich and Wellesley Townships along the Beaver Creek Corridor, providing an ecological link from Laurel Creek (and associated features) to the south and the Laurel Creek Headwaters Environmentally Sensitive Landscape (ESL) in the townships. South and east of the subject properties is the Laurel Creek Conservation Area (CA) and Laurel Creek ESPA 18.

The Study Team is very familiar with the area through extensive surveys and preparation of the North Waterloo Scoped Subwatershed Study for these lands.

2.0 MONITORING STUDY APPROACH

The City of Waterloo requires that monitoring programs be completed for new development applications. These monitoring programs are the responsibility of the developer, and include Stage I, II and III monitoring per the Laurel Creek Watershed Development Monitoring Program. Stage I consists of 2 years of pre-development monitoring, Stage II represents during construction conditions, and Stage III extends for 24 months following substantial completion of the development (i.e., 90% stabilization of the catchment area). Recommended Stage I monitoring components are discussed below. The Stage II and III monitoring programs are to be verified at the draft plan of subdivision application and final engineering design stages (respectively). Monitoring programs will be undertaken by the developer.

2.1 SURFACE WATER MONITORING

Surface water monitoring components prior to development/construction are generally addressed through the City's System Monitoring Program. Monitoring includes water quality (chemistry) and flows (hydrology) where Beaver Creek crosses Conservation Drive (Station #17), and this data will be summarized and discussed in the context of the North Waterloo area monitoring program. Surface water monitoring will be undertaken by Stantec with the monitoring locations shown on Figure 1. Additional monitoring will include:

2.1.1 Surface Water Flow Monitoring

Location. Surface water flow measurements will be completed along Beaver Creek at three (3) drivepoint piezometers (DP1-09, DP3-09 and DP5-09) and along Laurel Creek at two (2) drivepoint piezometers (DP7-09 and DP9-09). The monitoring locations along Laurel Creek will be reviewed in 2014. Sections of Laurel Creek do not exhibit channel flow and there is ponding in the area. The monitoring locations may be modified/replaced based on site conditions to obtain representative flow data. The drivepoint locations are shown on Figure 1.

Timing. Flow measurement will be completed three (3) times annually at the same time as manual water level monitoring is conducted.

Methodology. Surface water flow measurements will be completed using the velocity-area method. Measurements will be obtained at regular intervals across the creek and will include the depth of the tributary and the flow rate recorded using a Marsh-McBirney Inc. Model 201 portable water flow meter.

2.1.2 Water Level Monitoring

Location. Surface water level monitoring will be completed along Beaver Creek at three (3) drivepoint piezometers (DP1-09, DP3-09 and DP5-09) and along Laurel Creek at two (2)

drivepoint piezometers (DP7-09 and DP9-09, or as modified). The drivepoint locations are shown on Figure 1.

Timing. Manual measurements will be collected three (3) times per year and the continuous loggers will be downloaded during each monitoring event.

Methodology. Water level measurements would be collected using a combination of manual and automated techniques.

2.2 GROUNDWATER MONITORING

Groundwater monitoring within the subject properties should include water level measurements and water chemistry analysis under Stage I, II and III conditions.

Due to the expected staged development of the property, it is anticipated that several years may pass between Draft Plan Approval and construction of all stages of the development. The following groundwater monitoring program is recommended for the Stage I monitoring. It is expected that the future monitoring may be reduced in scope based on timing and location of development. Groundwater monitoring will be undertaken by Stantec.

2.2.1 Water Level Monitoring

Location. Groundwater level monitoring will be completed at the 2010 monitoring wells located within the subject lands and within drivepoint piezometers located along Beaver Creek and Laurel Creek including:

- Twelve (12) monitoring wells (MW2-10, MW3-10S, MW3-10D, MW6-10, MW7-10, MW8-10S, MW8-10D, MW10-10, MW11-10, MW12-10S, MW12-10D, MW13-10) including shallow and deep monitoring locations; and
- Three (3) drivepoint piezometers along Beaver Creek (DP1-09, DP3-09 and DP5-09).
- Two (2) drivepoint piezometers along Laurel Creek (DP7-09 and DP9-09, or as modified).

Timing. Manual measurements will be collected three (3) times per year and the loggers will be downloaded during each monitoring event.

Methodology. Water level measurements would be collected using a combination of manual and automated techniques.

2.2.2 Water Chemistry Monitoring

Location. Groundwater quality sampling will be completed at the 2010 monitoring wells located within the subject lands including:

- Twelve (12) monitoring wells (MW2-10, MW3-10S, MW3-10D, MW6-10, MW7-10, MW8-10S, MW8-10D, MW10-10, MW11-10, MW12-10S, MW12-10D, MW13-10) including shallow and deep monitoring locations.

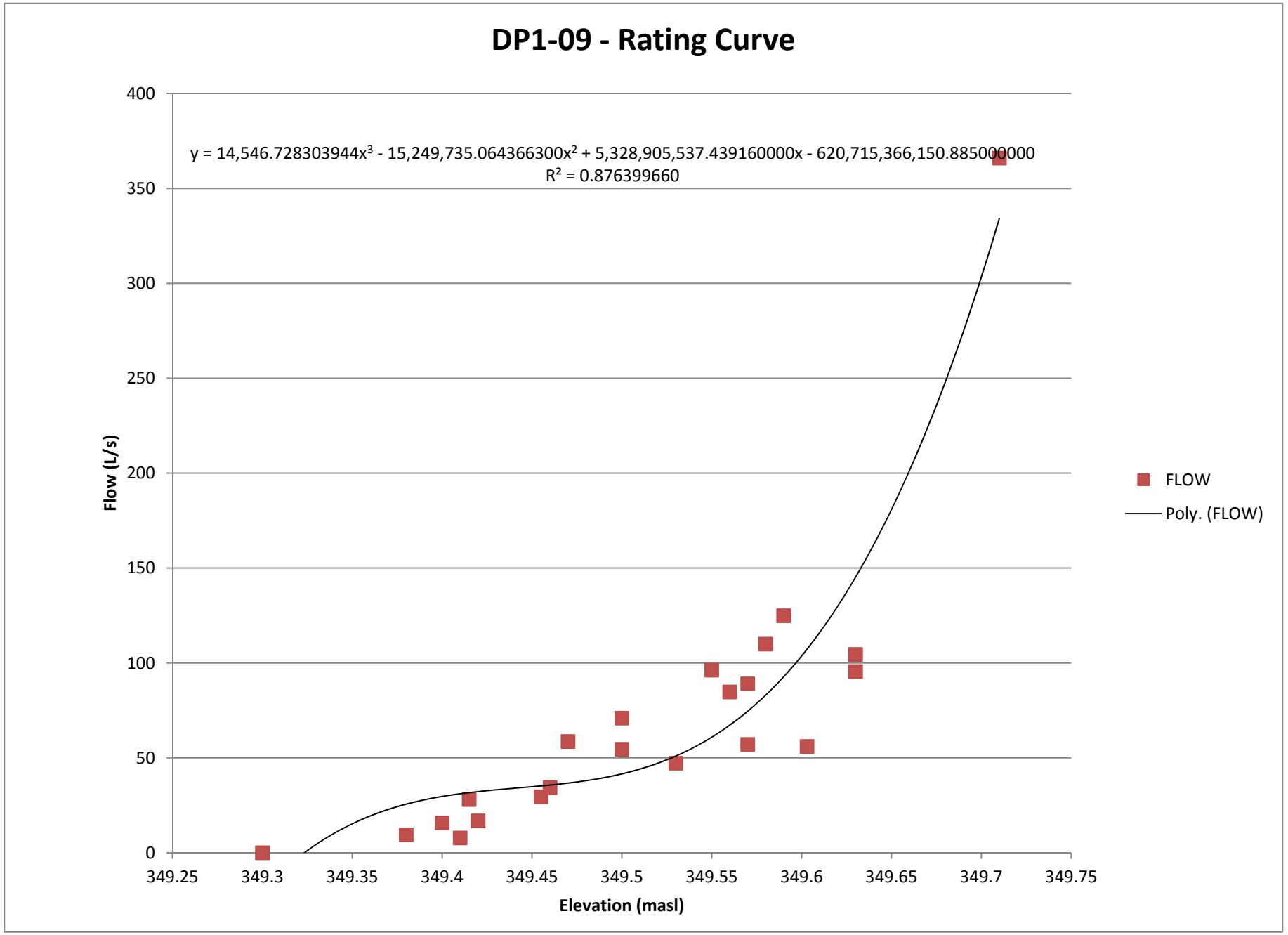
Timing. Water quality samples will be collected once per year in the spring. The 2014 sampling will be completed in August 2014.

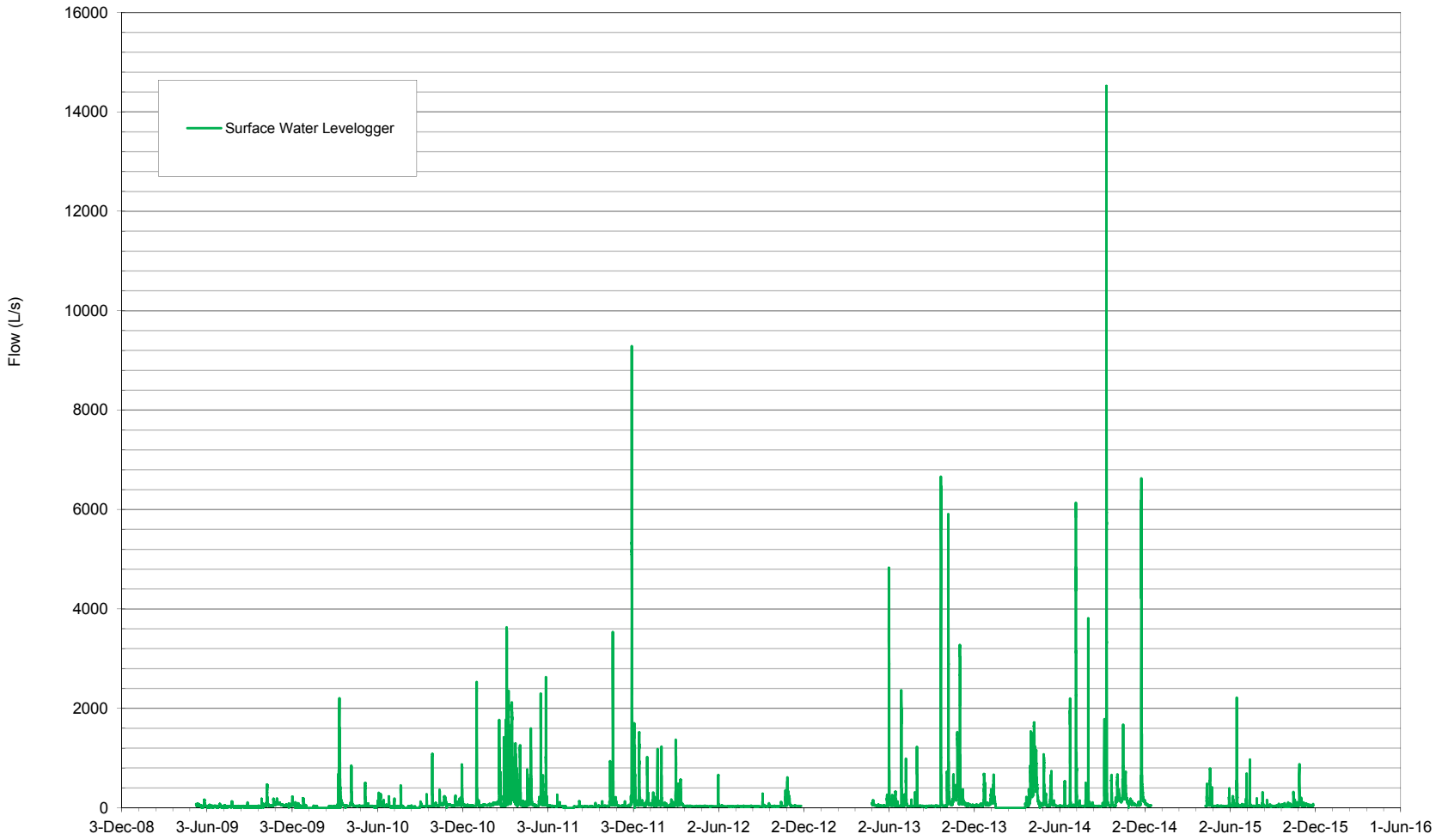
Methodology. Groundwater samples will be collected using foot valve / tubing or submersible pump depending on the location. Each well will be purged of three (3) casing volumes prior to sampling. Groundwater samples for metals analysis will be field filtered. Water quality samples would be analyzed for metals, nutrients and general chemistry.

3.0 REPORTING

Results from groundwater and surface water monitoring for Stage I monitoring will be presented in brief annual reports that include an assessment of results, integration of other monitoring data (as relevant) and recommendations for management or changes to future monitoring protocols, as required. Data sheets and representative photographs will be appended.

APPENDIX D
SURFACE WATER FLOW DATA


DP1-09 - Rating Curve
y = 14,546.728303944x³ - 15,249,735.064366300x² + 5,328,905,537.439160000x - 620,715,366,150.885000000
R² = 0.876399660
Flow (L/s)
Elevation (masl)
400
350
300
250
200
150
100
50
0
349.25
349.3
349.35
349.4
349.45
349.5
349.55
349.6
349.65
349.7
349.75
FLOW
Poly. (FLOW)



Note: Surface water logger removed for winters 2012-2014

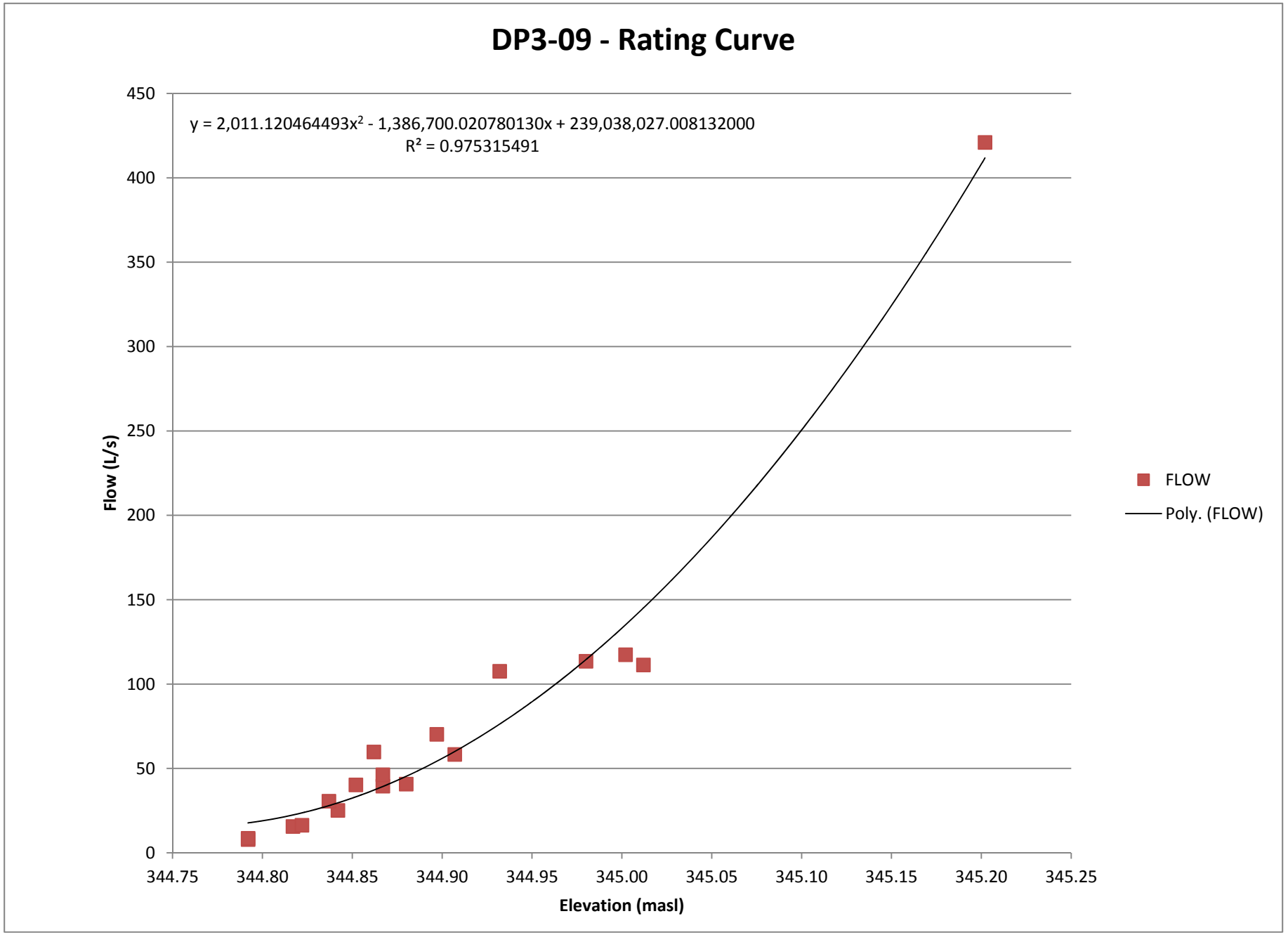
Client/Project

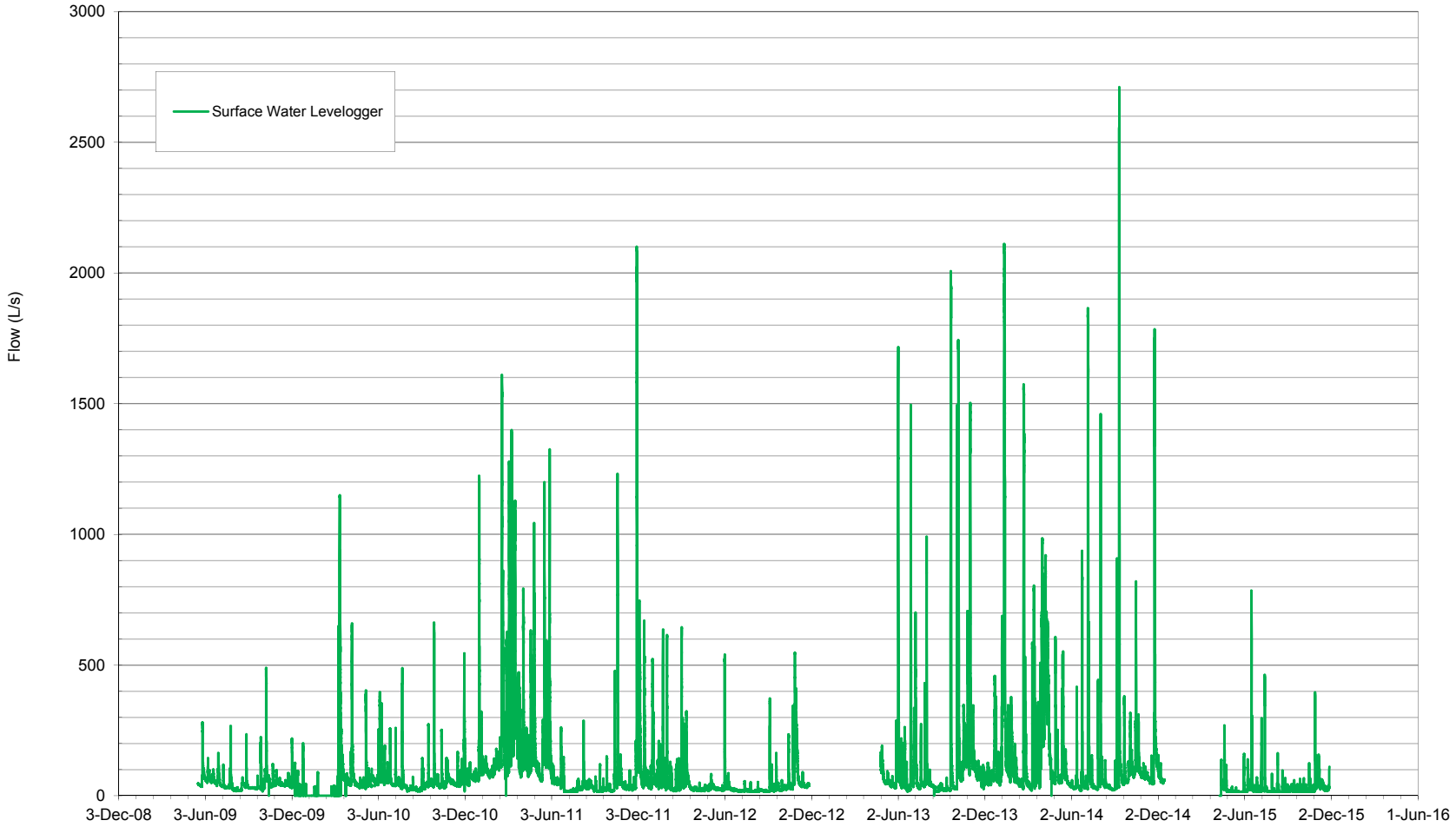
Region Municipality of Waterloo

Waterloo North

Stantec

Title DP1-09 (Hydrograph)


DP3-09 - Rating Curve
y = 2,011.120464493x² - 1,386,700.020780130x + 239,038,027.008132000
R² = 0.975315491
Flow (L/s)
Elevation (masl)
FLOW
Poly. (FLOW)
0
50
100
150
200
250
300
350
400
450
344.75
344.80
344.85
344.90
344.95
345.00
345.05
345.10
345.15
345.20
345.25



Note: Surface water logger removed for winters 2012, 2014, 2015

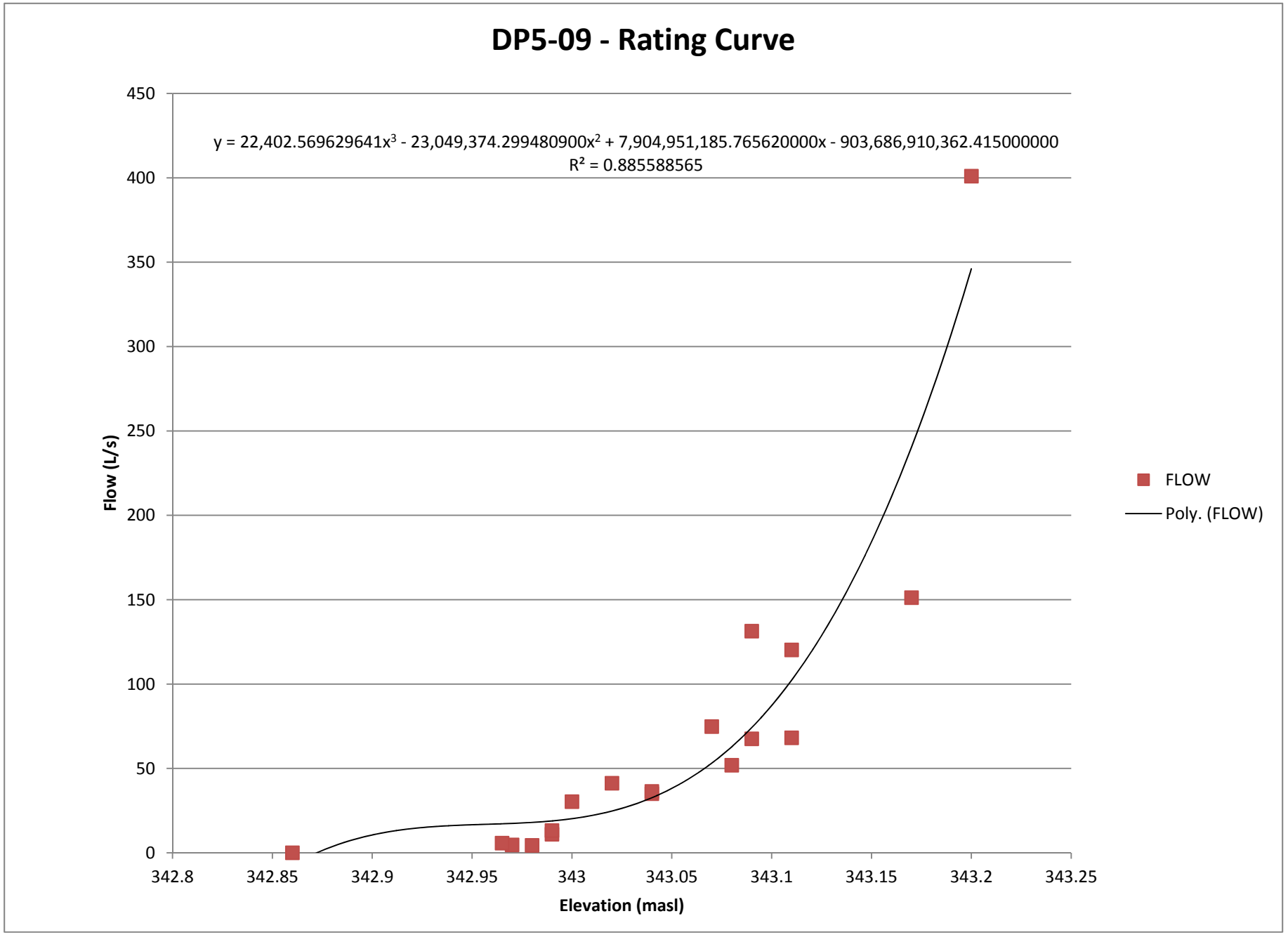
Client/Project

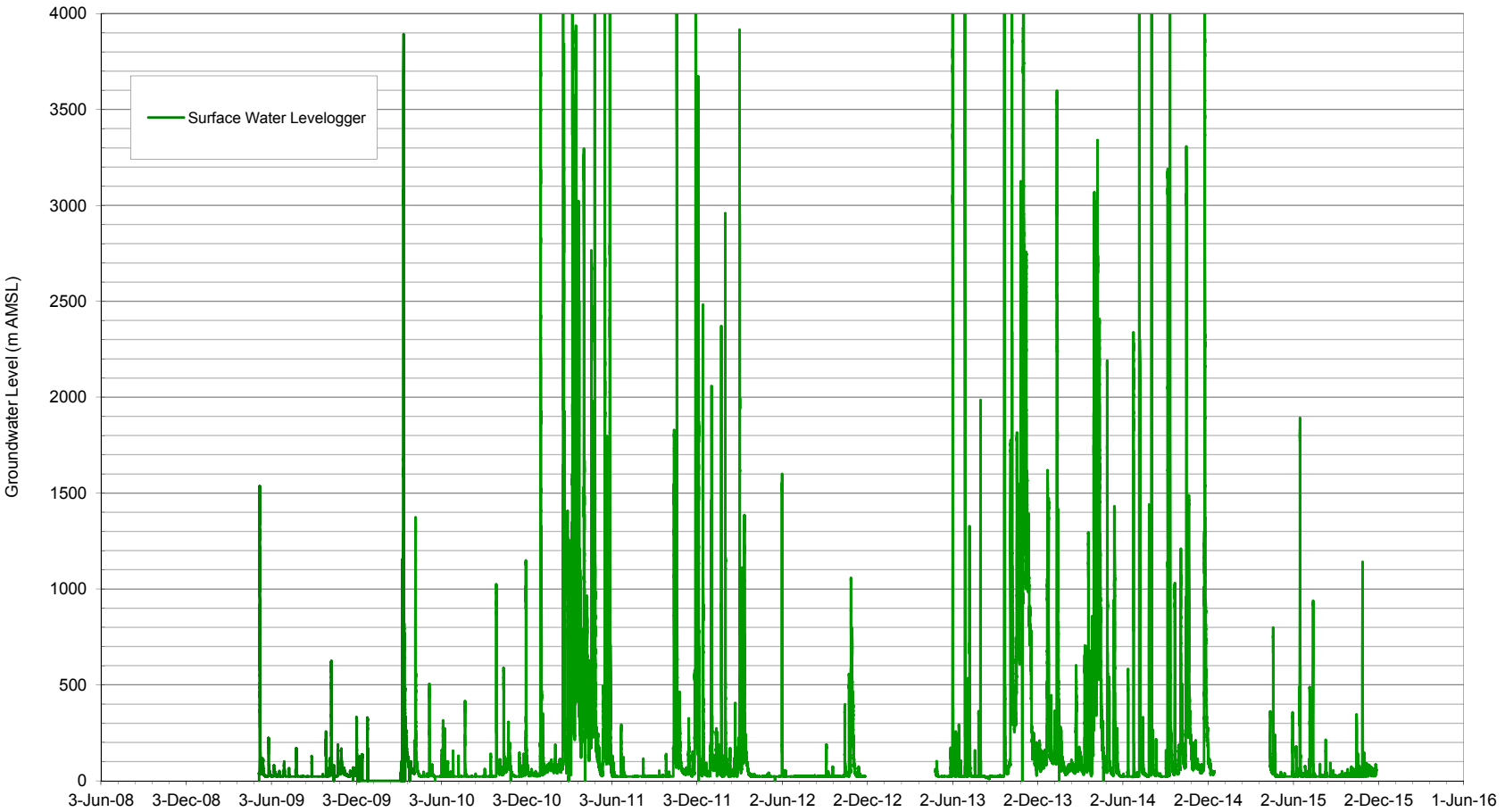
Region Municipality of Waterloo

Waterloo North

Stantec

Title DP3-09 (Hydrograph)


DP5-09 - Rating Curve
y = 22,402.569629641x³ - 23,049,374.299480900x² + 7,904,951,185.765620000x - 903,686,910,362.415000000
R² = 0.885588565
Flow (L/s)
450
400
350
300
250
200
150
100
50
0
342.8
342.85
342.9
342.95
343
343.05
343.1
343.15
343.2
343.25
Elevation (masl)
FLOW
Poly. (FLOW)



Note: Surface water logger removed for winters 2012, 2014

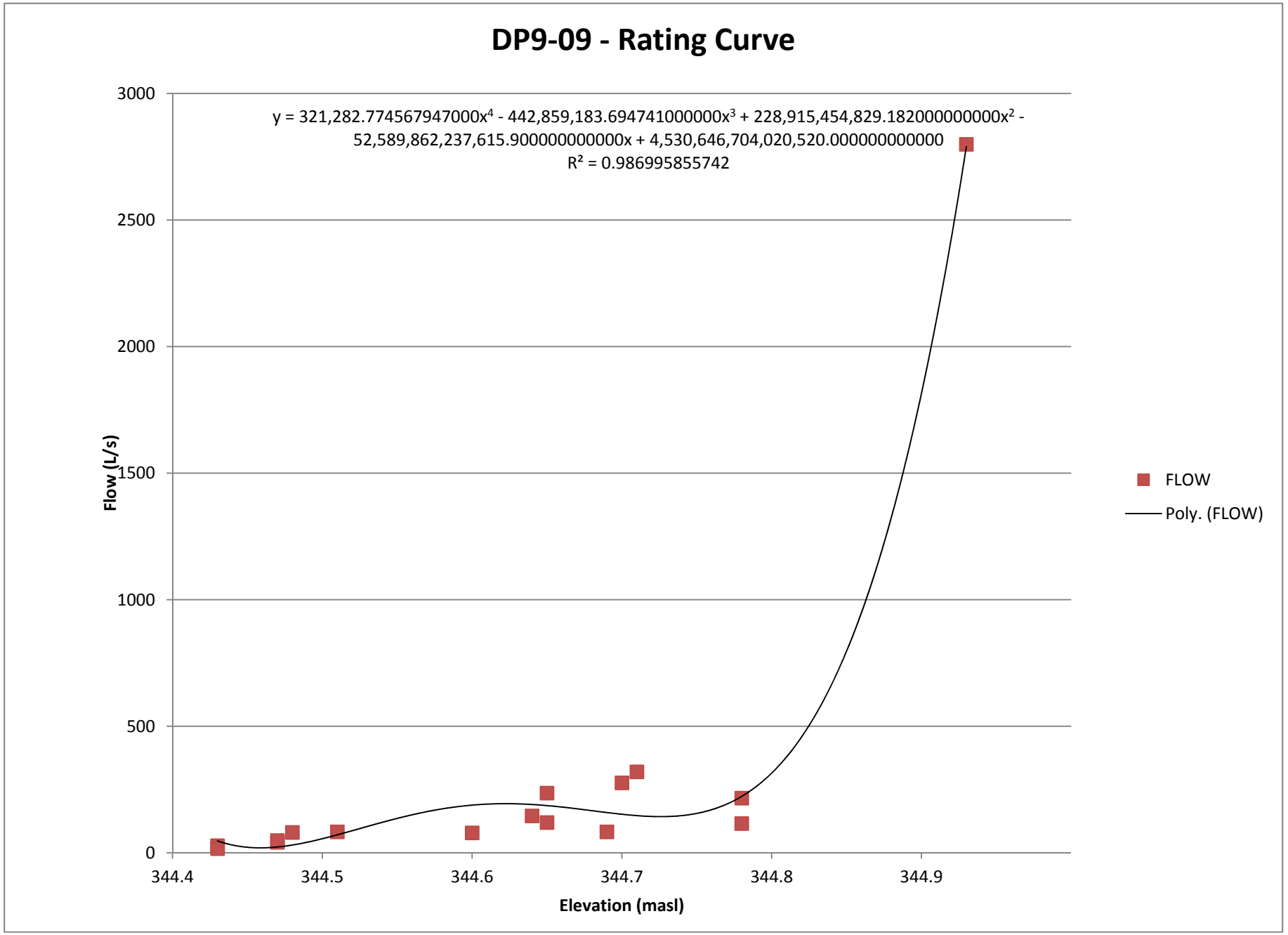
Client/Project

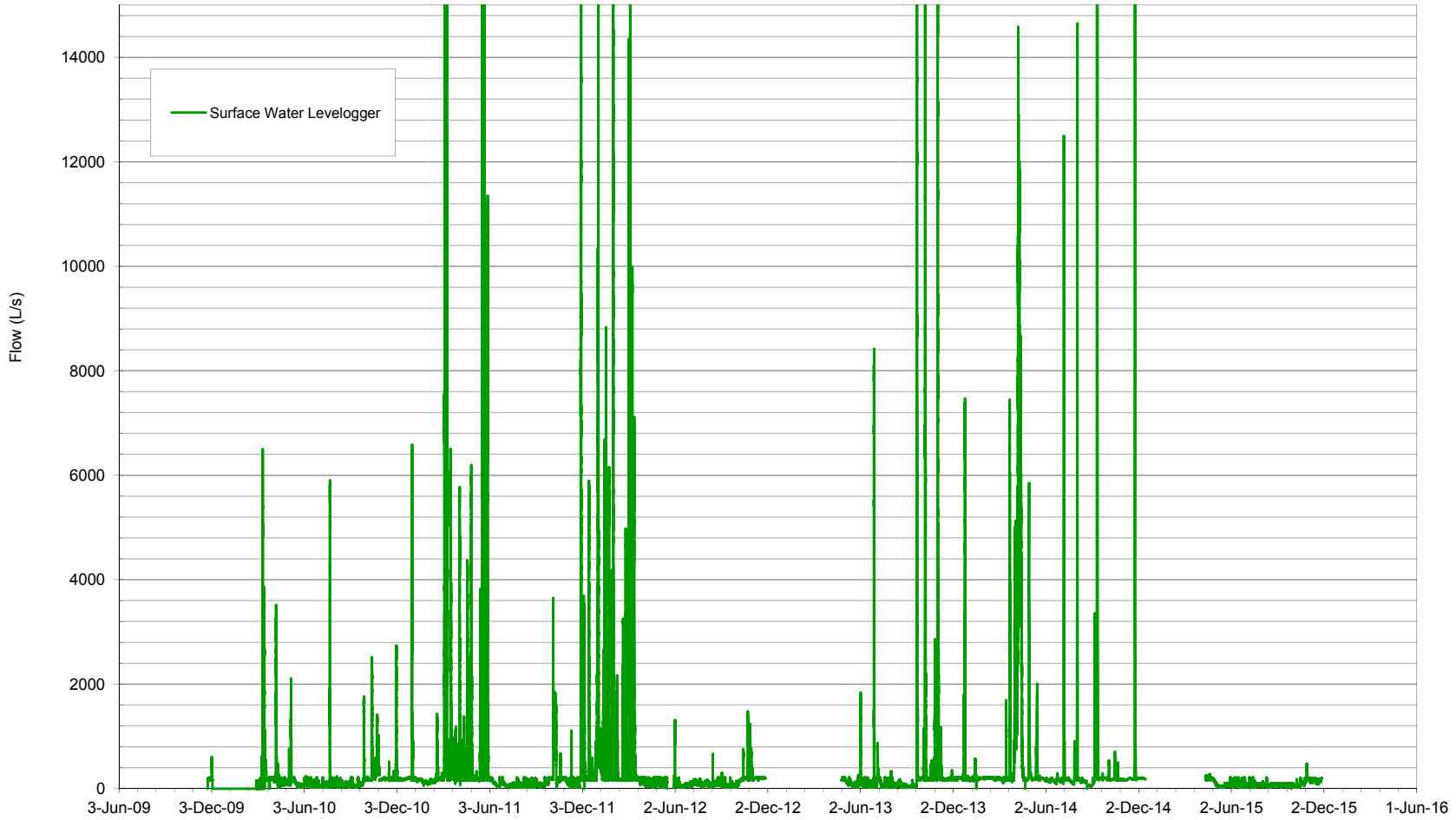
Region Municipality of Waterloo

Waterloo North

Stantec

Title DP5-09 Hydrograph


DP9-09 - Rating Curve
y = 321,282.774567947000x⁴ - 442,859,183.694741000000x³ + 228,915,454,829.182000000000x² - 52,589,862,237,615.900000000000x + 4,530,646,704,020,520.000000000000
R² = 0.986995855742
3000
2500
2000
1500
1000
500
0
Flow (L/s)
344.4
344.5
344.6
344.7
344.8
344.9
Elevation (masl)
FLOW
Poly. (FLOW)



Note: Surface water logger removed for winter 2012

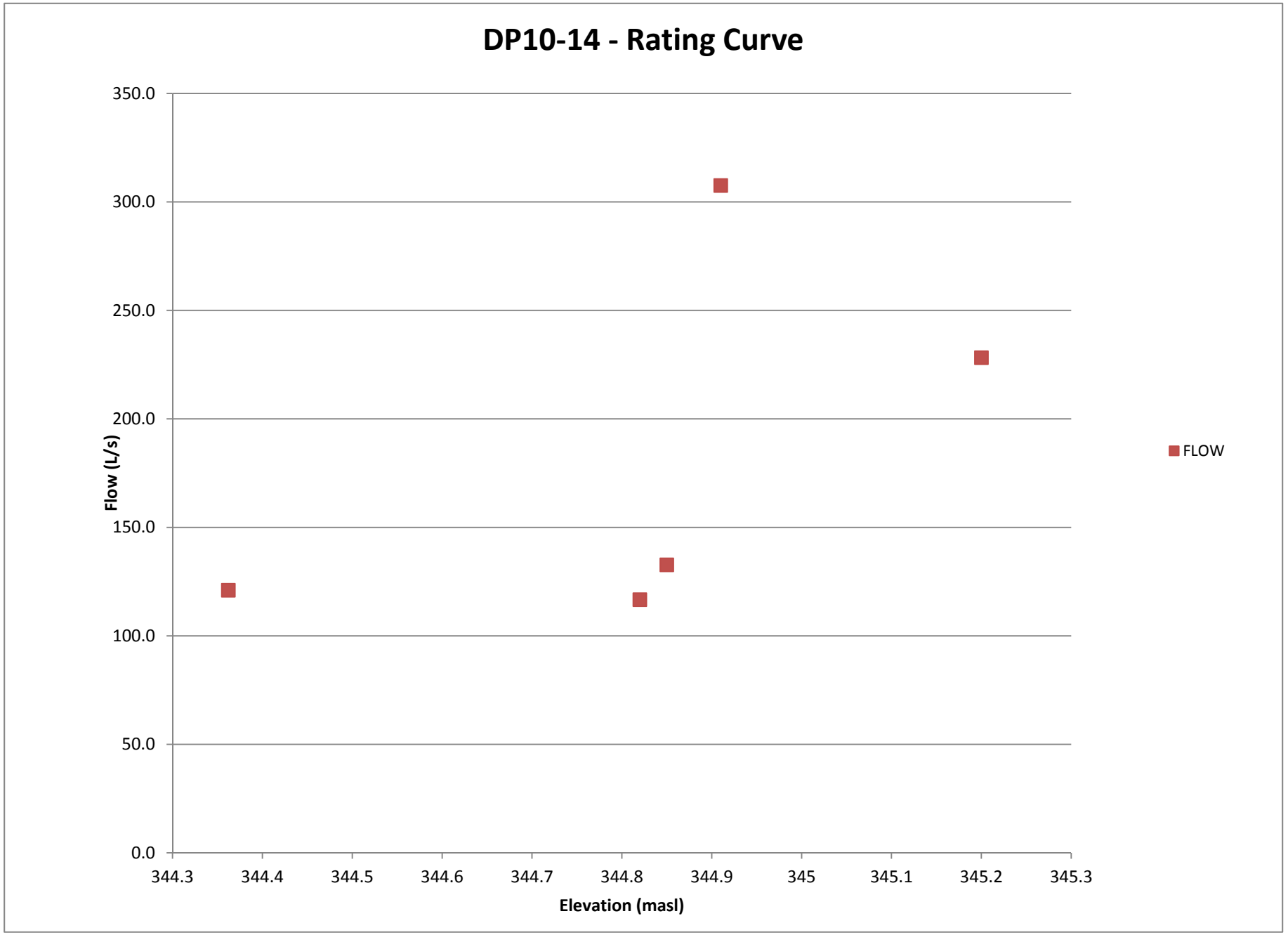
Client/Project

Region Municipality of Waterloo

Waterloo North

Stantec

Title DP9-09 (Hydrograph)


DP10-14 - Rating Curve
350.0
300.0
250.0
200.0
150.0
100.0
50.0
0.0
Flow (L/s)
344.3
344.4
344.5
344.6
344.7
344.8
344.9
345
345.1
345.2
345.3
Elevation (masl)
FLOW

APPENDIX E
LABORATORY CERTIFICATE OF ANALYSIS

Your P.O. #: 16300R-20
Your Project #: 160310875
Your C.O.C. #: 48205901, 482059-01-01

Attention:Lesley Veale

Stantec Consulting Ltd
Kitchener Standing Offer
49 Frederick St
Kitchener, ON
CANADA N2H 6M7

Report Date: 2014/09/03
Report #: R3142785
Version: 1

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B4F3646
Received: 2014/08/22, 15:45

Sample Matrix: Water
Samples Received: 12

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Reference
Alkalinity	12	N/A	2014/08/26	CAM SOP-00448	SM 22 2320 B m
Carbonate, Bicarbonate and Hydroxide	12	N/A	2014/08/27	CAM SOP-00102	APHA 4500-CO2 D
Chloride by Automated Colourimetry	12	N/A	2014/08/27	CAM SOP-00463	EPA 325.2 m
Conductivity	12	N/A	2014/08/26	CAM SOP-00414	SM 22 2510 m
Dissolved Organic Carbon (DOC) (1)	12	N/A	2014/08/25	CAM SOP-00446	SM 22 5310 B m
Hardness (calculated as CaCO3)	12	N/A	2014/09/03	CAM SOP 00102/00408/00447	SM 2340 B
Dissolved Metals by ICPMS	12	N/A	2014/08/27	CAM SOP-00447	EPA 6020 m
Ion Balance (% Difference)	12	N/A	2014/09/03		
Anion and Cation Sum	12	N/A	2014/09/03		
Total Ammonia-N	12	N/A	2014/08/28	CAM SOP-00441	EPA GS I-2522-90 m
Nitrate (NO3) and Nitrite (NO2) in Water (2)	12	N/A	2014/08/28	CAM SOP-00440	SM 22 4500-NO3I/NO2B
pH	12	N/A	2014/08/26	CAM SOP-00413	SM 4500H+ B
Orthophosphate	12	N/A	2014/08/27	CAM SOP-00461	EPA 365.1 m
Sat. pH and Langelier Index (@ 20C)	12	N/A	2014/09/03		
Sat. pH and Langelier Index (@ 4C)	12	N/A	2014/09/03		
Sulphate by Automated Colourimetry	12	N/A	2014/08/27	CAM SOP-00464	EPA 375.4 m
Total Dissolved Solids (TDS calc)	12	N/A	2014/09/03		

Remarks:

Maxxam Analytics has performed all analytical testing herein in accordance with ISO 17025 and the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act. All methodologies comply with this document and are validated for use in the laboratory. The methods and techniques employed in this analysis conform to the performance criteria (detection limits, accuracy and precision) as outlined in the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act.

The CWS PHC methods employed by Maxxam conform to all prescribed elements of the reference method and performance based elements have been validated. All modifications have been validated and proven equivalent following the 'Alberta Environment Draft Addenda to the CWS-PHC, Appendix 6, Validation of Alternate Methods'. Documentation is available upon request. Maxxam has made the following improvements to the CWS-PHC reference benchmark method: (i) Headspace for F1; and, (ii) Mechanical extraction for F2-F4. Note: F4G cannot be added to the C6 to C50 hydrocarbons. The extraction date for samples field preserved with methanol for F1 and Volatile Organic Compounds is considered to be the date sampled.

Maxxam Analytics is accredited for all specific parameters as required by Ontario Regulation 153/04. Maxxam Analytics is limited in liability to the actual

Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Your P.O. #: 16300R-20
Your Project #: 160310875
Your C.O.C. #: 48205901, 482059-01-01

Attention:Lesley Veale

Stantec Consulting Ltd
Kitchener Standing Offer
49 Frederick St
Kitchener, ON
CANADA N2H 6M7

Report Date: 2014/09/03
Report #: R3142785
Version: 1

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B4F3646
Received: 2014/08/22, 15:45

cost of analysis unless otherwise agreed in writing. There is no other warranty expressed or implied. Samples will be retained at Maxxam Analytics for three weeks from receipt of data or as per contract.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

(1) Dissolved Organic Carbon (DOC) present in the sample should be considered as non-purgeable DOC.
(2) Values for calculated parameters may not appear to add up due to rounding of raw data and significant figures.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Renata Spena, Senior Project Manager
Email: RSpena@maxxam.ca
Phone# (905)817-5818 Ext:5818

==========

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Maxxam Job #: B4F3646
Report Date: 2014/09/03

Stantec Consulting Ltd
Client Project #: 160310875
Your P.O. #: 16300R-20
Sampler Initials: AV

RESULTS OF ANALYSES OF WATER

Maxxam ID		XG4184		XG4185	XG4185			
Sampling Date		2014/08/21		2014/08/21	2014/08/21			
COC Number		482059-01-01		482059-01-01	482059-01-01			
	Units	WG-160310875-20140821-AV01	RDL	WG-160310875-20140821-AV02	WG-160310875-20140821-AV02 Lab-Dup	RDL	QC Batch	MDL
Calculated Parameters								
Anion Sum	me/L	7.62	N/A	4.84		N/A	3724125	N/A
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	240	1.0	170		1.0	3724123	0.20
Calculated TDS	mg/L	450	1.0	280		1.0	3724129	0.20
Carb. Alkalinity (calc. as CaCO3)	mg/L	1.7	1.0	1.3		1.0	3724123	0.20
Cation Sum	me/L	7.86	N/A	5.03		N/A	3724125	N/A
Hardness (CaCO3)	mg/L	360	1.0	240		1.0	3723450	1.0
Ion Balance (% Difference)	%	1.54	N/A	1.95		N/A	3723648	N/A
Langelier Index (@ 20C)	N/A	0.780		0.599			3724127	N/A
Langelier Index (@ 4C)	N/A	0.532		0.350			3724128	N/A
Saturation pH (@ 20C)	N/A	7.11		7.30			3724127	N/A
Saturation pH (@ 4C)	N/A	7.36		7.55			3724128	N/A
Inorganics								
Total Ammonia-N	mg/L	0.082	0.050	0.051		0.050	3726610	0.010
Conductivity	umho/cm	720	1.0	480	480	1.0	3725099	0.20
Dissolved Organic Carbon	mg/L	1.6	0.20	1.1		0.20	3724377	N/A
Orthophosphate (P)	mg/L	ND	0.010	ND		0.010	3725139	0.0050
pH	pH	7.89	N/A	7.90	7.88	N/A	3725102	N/A
Dissolved Sulphate (SO4)	mg/L	35	1	5		1	3725140	0.1
Alkalinity (Total as CaCO3)	mg/L	240	1.0	170	180	1.0	3725100	0.20
Dissolved Chloride (Cl)	mg/L	15	1	14		1	3725125	0.3
Nitrite (N)	mg/L	ND	0.010	ND		0.010	3725121	0.0020
Nitrate (N)	mg/L	22.5	1.0	12.0		0.50	3725121	0.020
Nitrate + Nitrite	mg/L	22.5	1.0	12.0		0.50	3725121	0.020

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate
N/A = Not Applicable
ND = Not detected

Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam Job #: B4F3646
Report Date: 2014/09/03

Stantec Consulting Ltd
Client Project #: 160310875
Your P.O. #: 16300R-20
Sampler Initials: AV

RESULTS OF ANALYSES OF WATER

Maxxam ID		XG4186	XG4187	XG4188		XG4189			
Sampling Date		2014/08/21	2014/08/21	2014/08/21		2014/08/22			
COC Number		482059-01-01	482059-01-01	482059-01-01		482059-01-01			
	Units	WG-160310875 -20140821-AV03	WG-160310875 -20140821-AV04	WG-160310875 -20140821-AV05	RDL	WG-160310875 -20140822-AV06	RDL	QC Batch	MDL
Calculated Parameters									
Anion Sum	me/L	4.45	8.31	5.49	N/A	12.4	N/A	3724125	N/A
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	180	340	250	1.0	250	1.0	3724123	0.20
Calculated TDS	mg/L	260	440	290	1.0	760	1.0	3724129	0.20
Carb. Alkalinity (calc. as CaCO3)	mg/L	2.6	2.3	2.4	1.0	1.6	1.0	3724123	0.20
Cation Sum	me/L	4.57	8.30	5.48	N/A	13.5	N/A	3724125	N/A
Hardness (CaCO3)	mg/L	64	400	250	1.0	630	1.0	3723450	1.0
Ion Balance (% Difference)	%	1.35	0.0800	0.0900	N/A	4.08	N/A	3723648	N/A
Langelier Index (@ 20C)	N/A	0.275	0.978	0.726		0.975		3724127	N/A
Langelier Index (@ 4C)	N/A	0.0260	0.730	0.477		0.728		3724128	N/A
Saturation pH (@ 20C)	N/A	7.93	6.88	7.28		6.84		3724127	N/A
Saturation pH (@ 4C)	N/A	8.17	7.13	7.52		7.09		3724128	N/A
Inorganics									
Total Ammonia-N	mg/L	0.29	ND	0.32	0.050	0.15	0.050	3726610	0.010
Conductivity	umho/cm	410	710	480	1.0	1200	1.0	3725099	0.20
Dissolved Organic Carbon	mg/L	6.5	1.1	2.2	0.20	0.63	0.20	3724377	N/A
Orthophosphate (P)	mg/L	0.068	ND	ND	0.010	ND	0.010	3725139	0.0050
pH	pH	8.20	7.86	8.00	N/A	7.82	N/A	3725102	N/A
Dissolved Sulphate (SO4)	mg/L	33	40	15	1	330	2	3725140	0.1
Alkalinity (Total as CaCO3)	mg/L	180	340	260	1.0	250	1.0	3725100	0.20
Dissolved Chloride (Cl)	mg/L	7	12	2	1	20	1	3725125	0.3
Nitrite (N)	mg/L	ND	ND	0.013	0.010	ND	0.010	3725121	0.0020
Nitrate (N)	mg/L	ND	3.37	0.13	0.10	ND	0.10	3725121	0.020
Nitrate + Nitrite	mg/L	ND	3.37	0.14	0.10	ND	0.10	3725121	0.020

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
N/A = Not Applicable
ND = Not detected

Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam Job #: B4F3646
Report Date: 2014/09/03

Stantec Consulting Ltd
Client Project #: 160310875
Your P.O. #: 16300R-20
Sampler Initials: AV

RESULTS OF ANALYSES OF WATER

Maxxam ID		XG4189		XG4190	XG4191	XG4191			
Sampling Date		2014/08/22		2014/08/22	2014/08/22	2014/08/22			
COC Number		482059-01-01		482059-01-01	482059-01-01	482059-01-01			
	Units	WG-160310875-20140822-AV06 Lab-Dup	RDL	WG-160310875-20140822-AV07	WG-160310875-20140822-AV08	WG-160310875-20140822-AV08 Lab-Dup	RDL	QC Batch	MDL
Calculated Parameters									
Anion Sum	me/L		N/A	9.61	6.94		N/A	3724125	N/A
Bicarb. Alkalinity (calc. as CaCO3)	mg/L		1.0	430	240		1.0	3724123	0.20
Calculated TDS	mg/L		1.0	490	390		1.0	3724129	0.20
Carb. Alkalinity (calc. as CaCO3)	mg/L		1.0	2.5	2.1		1.0	3724123	0.20
Cation Sum	me/L		N/A	9.92	7.17		N/A	3724125	N/A
Hardness (CaCO3)	mg/L		1.0	480	290		1.0	3723450	1.0
Ion Balance (% Difference)	%		N/A	1.59	1.59		N/A	3723648	N/A
Langelier Index (@ 20C)	N/A			1.02	0.818			3724127	N/A
Langelier Index (@ 4C)	N/A			0.769	0.569			3724128	N/A
Saturation pH (@ 20C)	N/A			6.77	7.16			3724127	N/A
Saturation pH (@ 4C)	N/A			7.02	7.41			3724128	N/A
Inorganics									
Total Ammonia-N	mg/L	0.15	0.050	0.095	0.12		0.050	3726610	0.010
Conductivity	umho/cm		1.0	850	660		1.0	3725099	0.20
Dissolved Organic Carbon	mg/L		0.20	0.96	0.74	0.75	0.20	3724377	N/A
Orthophosphate (P)	mg/L		0.010	ND	ND	ND	0.010	3725139	0.0050
pH	pH		N/A	7.79	7.98		N/A	3725102	N/A
Dissolved Sulphate (SO4)	mg/L		2	22	69	70	1	3725140	0.1
Alkalinity (Total as CaCO3)	mg/L		1.0	430	240		1.0	3725100	0.20
Dissolved Chloride (Cl)	mg/L		1	14	26	26	1	3725125	0.3
Nitrite (N)	mg/L	ND	0.010	ND	ND		0.010	3725121	0.0020
Nitrate (N)	mg/L	ND	0.10	1.19	ND		0.10	3725121	0.020
Nitrate + Nitrite	mg/L	ND	0.10	1.19	ND		0.10	3725121	0.020

RDL = Reportable Detection Limit
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Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam Job #: B4F3646
Report Date: 2014/09/03

Stantec Consulting Ltd
Client Project #: 160310875
Your P.O. #: 16300R-20
Sampler Initials: AV

RESULTS OF ANALYSES OF WATER

Maxxam ID		XG4192		XG4193	XG4194			
Sampling Date		2014/08/22		2014/08/22	2014/08/22			
COC Number		482059-01-01		482059-01-01	482059-01-01			
	Units	WG-160310875-20140822-AV09	RDL	WG-160310875-20140822-AV10	WG-160310875-20140822-AV11	RDL	QC Batch	MDL
Calculated Parameters								
Anion Sum	me/L	21.7	N/A	6.87	5.27	N/A	3724125	N/A
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	350	1.0	230	160	1.0	3724123	0.20
Calculated TDS	mg/L	1300	1.0	390	310	1.0	3724129	0.20
Carb. Alkalinity (calc. as CaCO3)	mg/L	3.0	1.0	2.1	1.3	1.0	3724123	0.20
Cation Sum	me/L	23.6	N/A	6.77	5.23	N/A	3724125	N/A
Hardness (CaCO3)	mg/L	280	1.0	300	250	1.0	3723450	1.0
Ion Balance (% Difference)	%	4.12	N/A	0.670	0.400	N/A	3723648	N/A
Langelier Index (@ 20C)	N/A	0.871		0.852	0.626		3724127	N/A
Langelier Index (@ 4C)	N/A	0.626		0.604	0.376		3724128	N/A
Saturation pH (@ 20C)	N/A	7.09		7.14	7.30		3724127	N/A
Saturation pH (@ 4C)	N/A	7.33		7.39	7.55		3724128	N/A
Inorganics								
Total Ammonia-N	mg/L	0.065	0.050	0.075	ND	0.050	3726610	0.010
Conductivity	umho/cm	2400	1.0	670	530	1.0	3725099	0.20
Dissolved Organic Carbon	mg/L	2.4	0.20	1.9	0.79	0.20	3724377	N/A
Orthophosphate (P)	mg/L	ND	0.010	0.046	ND	0.010	3725139	0.0050
pH	pH	7.96	N/A	7.99	7.93	N/A	3725102	N/A
Dissolved Sulphate (SO4)	mg/L	24	1	18	8	1	3725140	0.1
Alkalinity (Total as CaCO3)	mg/L	350	1.0	230	170	1.0	3725100	0.20
Dissolved Chloride (Cl)	mg/L	500	6	27	12	1	3725125	0.3
Nitrite (N)	mg/L	ND	0.010	ND	ND	0.010	3725121	0.0020
Nitrate (N)	mg/L	ND	0.10	16.1	20.3	1.0	3725121	0.020
Nitrate + Nitrite	mg/L	ND	0.10	16.1	20.3	1.0	3725121	0.020

RDL = Reportable Detection Limit
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Maxxam Job #: B4F3646
Report Date: 2014/09/03

Stantec Consulting Ltd
Client Project #: 160310875
Your P.O. #: 16300R-20
Sampler Initials: AV

RESULTS OF ANALYSES OF WATER

Maxxam ID		XG4195			
Sampling Date		2014/08/22			
COC Number		482059-01-01			
	Units	WG-160310875 -20140822-AV12	RDL	QC Batch	MDL
Calculated Parameters					
Anion Sum	me/L	5.55	N/A	3724125	N/A
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	250	1.0	3724123	0.20
Calculated TDS	mg/L	290	1.0	3724129	0.20
Carb. Alkalinity (calc. as CaCO3)	mg/L	2.1	1.0	3724123	0.20
Cation Sum	me/L	5.79	N/A	3724125	N/A
Hardness (CaCO3)	mg/L	280	1.0	3723450	1.0
Ion Balance (% Difference)	%	2.05	N/A	3723648	N/A
Langelier Index (@ 20C)	N/A	0.846		3724127	N/A
Langelier Index (@ 4C)	N/A	0.597		3724128	N/A
Saturation pH (@ 20C)	N/A	7.11		3724127	N/A
Saturation pH (@ 4C)	N/A	7.36		3724128	N/A
Inorganics					
Total Ammonia-N	mg/L	ND	0.050	3726610	0.010
Conductivity	umho/cm	510	1.0	3725099	0.20
Dissolved Organic Carbon	mg/L	0.48	0.20	3724377	N/A
Orthophosphate (P)	mg/L	ND	0.010	3725139	0.0050
pH	pH	7.95	N/A	3725102	N/A
Dissolved Sulphate (SO4)	mg/L	7	1	3725140	0.1
Alkalinity (Total as CaCO3)	mg/L	260	1.0	3725100	0.20
Dissolved Chloride (Cl)	mg/L	6	1	3725125	0.3
Nitrite (N)	mg/L	ND	0.010	3725121	0.0020
Nitrate (N)	mg/L	1.87	0.10	3725121	0.020
Nitrate + Nitrite	mg/L	1.87	0.10	3725121	0.020

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Maxxam Job #: B4F3646
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Sampler Initials: AV

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Maxxam ID		XG4184	XG4185	XG4186	XG4187			
Sampling Date		2014/08/21	2014/08/21	2014/08/21	2014/08/21			
COC Number		482059-01-01	482059-01-01	482059-01-01	482059-01-01			
	Units	WG-160310875 -20140821-AV01	WG-160310875 -20140821-AV02	WG-160310875 -20140821-AV03	WG-160310875 -20140821-AV04	RDL	QC Batch	MDL
Metals								
Dissolved Aluminum (Al)	mg/L	0.0050	0.0080	0.020	ND	0.0050	3725648	0.0050
Dissolved Antimony (Sb)	mg/L	ND	ND	0.0010	ND	0.00050	3725648	0.00050
Dissolved Arsenic (As)	mg/L	ND	ND	0.0020	ND	0.0010	3725648	0.0010
Dissolved Barium (Ba)	mg/L	0.074	0.011	0.025	0.088	0.0020	3725648	0.0020
Dissolved Beryllium (Be)	mg/L	ND	ND	ND	ND	0.00050	3725648	0.00050
Dissolved Boron (B)	mg/L	0.024	0.010	0.16	0.011	0.010	3725648	0.010
Dissolved Cadmium (Cd)	mg/L	ND	ND	ND	ND	0.00010	3725648	0.00010
Dissolved Calcium (Ca)	mg/L	92	75	17	110	0.20	3725648	0.20
Dissolved Chromium (Cr)	mg/L	ND	ND	ND	ND	0.0050	3725648	0.0050
Dissolved Cobalt (Co)	mg/L	ND	ND	0.0010	ND	0.00050	3725648	0.00050
Dissolved Copper (Cu)	mg/L	0.0020	0.0020	0.0010	0.0020	0.0010	3725648	0.0010
Dissolved Iron (Fe)	mg/L	ND	ND	ND	ND	0.10	3725648	0.050
Dissolved Lead (Pb)	mg/L	ND	ND	ND	ND	0.00050	3725648	0.00050
Dissolved Magnesium (Mg)	mg/L	31	14	5.2	32	0.050	3725648	0.050
Dissolved Manganese (Mn)	mg/L	ND	ND	0.055	0.0070	0.0020	3725648	0.0020
Dissolved Molybdenum (Mo)	mg/L	0.0010	0.0010	0.038	0.0020	0.00050	3725648	0.00050
Dissolved Nickel (Ni)	mg/L	0.0010	0.0070	0.0030	0.0010	0.0010	3725648	0.0010
Dissolved Phosphorus (P)	mg/L	ND	ND	ND	ND	0.10	3725648	0.050
Dissolved Potassium (K)	mg/L	1.8	3.6	0.96	1.0	0.20	3725648	0.20
Dissolved Selenium (Se)	mg/L	ND	ND	ND	ND	0.0020	3725648	0.0020
Dissolved Silicon (Si)	mg/L	7.3	2.5	5.1	6.8	0.050	3725648	0.050
Dissolved Silver (Ag)	mg/L	ND	ND	ND	ND	0.00010	3725648	0.00010
Dissolved Sodium (Na)	mg/L	14	1.6	75	4.6	0.10	3725648	0.10
Dissolved Strontium (Sr)	mg/L	0.14	0.092	0.29	0.15	0.0010	3725648	0.0010
Dissolved Thallium (Tl)	mg/L	ND	ND	ND	ND	0.000050	3725648	0.000050
Dissolved Titanium (Ti)	mg/L	ND	ND	ND	ND	0.0050	3725648	0.0050
Dissolved Uranium (U)	mg/L	0.0010	ND	0.0020	0.0010	0.00010	3725648	0.00010
Dissolved Vanadium (V)	mg/L	ND	ND	0.0020	ND	0.00050	3725648	0.00050
Dissolved Zinc (Zn)	mg/L	0.0050	0.0080	0.0070	0.016	0.0050	3725648	0.0050

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Maxxam Job #: B4F3646
Report Date: 2014/09/03

Stantec Consulting Ltd
Client Project #: 160310875
Your P.O. #: 16300R-20
Sampler Initials: AV

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Maxxam ID		XG4188	XG4189	XG4190	XG4191			
Sampling Date		2014/08/21	2014/08/22	2014/08/22	2014/08/22			
COC Number		482059-01-01	482059-01-01	482059-01-01	482059-01-01			
	Units	WG-160310875-20140821-AV05	WG-160310875-20140822-AV06	WG-160310875-20140822-AV07	WG-160310875-20140822-AV08	RDL	QC Batch	MDL
Metals								
Dissolved Aluminum (Al)	mg/L	0.0050	0.0050	ND	0.0050	0.0050	3725648	0.0050
Dissolved Antimony (Sb)	mg/L	ND	ND	ND	ND	0.00050	3725648	0.00050
Dissolved Arsenic (As)	mg/L	0.015	0.0030	ND	0.0040	0.0010	3725648	0.0010
Dissolved Barium (Ba)	mg/L	0.10	0.024	0.10	0.039	0.0020	3725648	0.0020
Dissolved Beryllium (Be)	mg/L	ND	ND	ND	ND	0.00050	3725648	0.00050
Dissolved Boron (B)	mg/L	0.030	0.053	0.018	0.036	0.010	3725648	0.010
Dissolved Cadmium (Cd)	mg/L	ND	ND	ND	ND	0.00010	3725648	0.00010
Dissolved Calcium (Ca)	mg/L	54	190	110	81	0.20	3725648	0.20
Dissolved Chromium (Cr)	mg/L	ND	ND	ND	ND	0.0050	3725648	0.0050
Dissolved Cobalt (Co)	mg/L	ND	ND	0.0010	ND	0.00050	3725648	0.00050
Dissolved Copper (Cu)	mg/L	0.0010	ND	0.0010	ND	0.0010	3725648	0.0010
Dissolved Iron (Fe)	mg/L	0.17	1.3	ND	0.73	0.10	3725648	0.050
Dissolved Lead (Pb)	mg/L	ND	ND	ND	0.0020	0.00050	3725648	0.00050
Dissolved Magnesium (Mg)	mg/L	28	41	46	23	0.050	3725648	0.050
Dissolved Manganese (Mn)	mg/L	0.025	0.036	0.11	0.11	0.0020	3725648	0.0020
Dissolved Molybdenum (Mo)	mg/L	0.0010	0.0010	0.0010	0.0010	0.00050	3725648	0.00050
Dissolved Nickel (Ni)	mg/L	0.0010	ND	0.0010	ND	0.0010	3725648	0.0010
Dissolved Phosphorus (P)	mg/L	ND	ND	ND	ND	0.10	3725648	0.050
Dissolved Potassium (K)	mg/L	1.5	1.4	2.9	1.0	0.20	3725648	0.20
Dissolved Selenium (Se)	mg/L	ND	ND	ND	ND	0.0020	3725648	0.0020
Dissolved Silicon (Si)	mg/L	12	7.8	8.0	9.4	0.050	3725648	0.050
Dissolved Silver (Ag)	mg/L	ND	ND	ND	ND	0.00010	3725648	0.00010
Dissolved Sodium (Na)	mg/L	9.2	19	8.0	28	0.10	3725648	0.10
Dissolved Strontium (Sr)	mg/L	0.32	3.0	0.44	1.5	0.0010	3725648	0.0010
Dissolved Thallium (Tl)	mg/L	ND	ND	ND	ND	0.000050	3725648	0.000050
Dissolved Titanium (Ti)	mg/L	ND	ND	ND	ND	0.0050	3725648	0.0050
Dissolved Uranium (U)	mg/L	ND	ND	0.0020	ND	0.00010	3725648	0.00010
Dissolved Vanadium (V)	mg/L	ND	ND	ND	ND	0.00050	3725648	0.00050
Dissolved Zinc (Zn)	mg/L	0.0090	ND	0.0060	ND	0.0050	3725648	0.0050

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Maxxam Job #: B4F3646
Report Date: 2014/09/03

Stantec Consulting Ltd
Client Project #: 160310875
Your P.O. #: 16300R-20
Sampler Initials: AV

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Maxxam ID		XG4192	XG4192		XG4193	XG4194			
Sampling Date		2014/08/22	2014/08/22		2014/08/22	2014/08/22			
COC Number		482059-01-01	482059-01-01		482059-01-01	482059-01-01			
	Units	WG-160310875-20140822-AV09	WG-160310875-20140822-AV09 Lab-Dup	RDL	WG-160310875-20140822-AV10	WG-160310875-20140822-AV11	RDL	QC Batch	MDL
Metals									
Dissolved Aluminum (Al)	mg/L	0.0080	0.012	0.0050	0.010	0.013	0.0050	3725648	0.0050
Dissolved Antimony (Sb)	mg/L	ND	ND	0.00050	ND	ND	0.00050	3725648	0.00050
Dissolved Arsenic (As)	mg/L	0.0010	0.0010	0.0010	ND	ND	0.0010	3725648	0.0010
Dissolved Barium (Ba)	mg/L	0.11	0.11	0.0020	0.047	0.020	0.0020	3725648	0.0020
Dissolved Beryllium (Be)	mg/L	ND	ND	0.00050	ND	ND	0.00050	3725648	0.00050
Dissolved Boron (B)	mg/L	0.011	0.011	0.010	0.012	0.010	0.010	3725648	0.010
Dissolved Cadmium (Cd)	mg/L	ND	ND	0.00010	ND	ND	0.00010	3725648	0.00010
Dissolved Calcium (Ca)	mg/L	88	88	0.20	88	80	0.20	3725648	0.20
Dissolved Chromium (Cr)	mg/L	ND	ND	0.0050	ND	ND	0.0050	3725648	0.0050
Dissolved Cobalt (Co)	mg/L	0.0010	0.0010	0.00050	ND	ND	0.00050	3725648	0.00050
Dissolved Copper (Cu)	mg/L	0.0030	0.0030	0.0020	0.0030	0.0020	0.0010	3725648	0.0010
Dissolved Iron (Fe)	mg/L	ND	ND	0.10	ND	ND	0.10	3725648	0.050
Dissolved Lead (Pb)	mg/L	ND	ND	0.00050	ND	ND	0.00050	3725648	0.00050
Dissolved Magnesium (Mg)	mg/L	16	16	0.050	21	13	0.050	3725648	0.050
Dissolved Manganese (Mn)	mg/L	0.056	0.058	0.0020	0.014	ND	0.0020	3725648	0.0020
Dissolved Molybdenum (Mo)	mg/L	0.0010	0.0010	0.00050	0.0010	0.0010	0.00050	3725648	0.00050
Dissolved Nickel (Ni)	mg/L	0.0010	0.0020	0.0010	0.0010	0.0010	0.0010	3725648	0.0010
Dissolved Phosphorus (P)	mg/L	ND	ND	0.10	ND	ND	0.10	3725648	0.050
Dissolved Potassium (K)	mg/L	3.0	3.1	0.20	4.9	4.6	0.20	3725648	0.20
Dissolved Selenium (Se)	mg/L	ND	ND	0.0020	ND	ND	0.0020	3725648	0.0020
Dissolved Silicon (Si)	mg/L	4.4	4.4	0.050	5.3	2.7	0.050	3725648	0.050
Dissolved Silver (Ag)	mg/L	ND	ND	0.00010	ND	ND	0.00010	3725648	0.00010
Dissolved Sodium (Na)	mg/L	410	420	0.10	13	1.7	0.10	3725648	0.10
Dissolved Strontium (Sr)	mg/L	0.19	0.19	0.0010	0.13	0.099	0.0010	3725648	0.0010
Dissolved Thallium (Tl)	mg/L	ND	ND	0.000050	ND	ND	0.000050	3725648	0.000050
Dissolved Titanium (Ti)	mg/L	ND	ND	0.0050	ND	ND	0.0050	3725648	0.0050
Dissolved Uranium (U)	mg/L	0.0010	0.0010	0.00010	0.0020	ND	0.00010	3725648	0.00010
Dissolved Vanadium (V)	mg/L	ND	ND	0.00050	ND	ND	0.00050	3725648	0.00050
Dissolved Zinc (Zn)	mg/L	0.012	0.016	0.0050	0.0070	0.0070	0.0050	3725648	0.0050

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Maxxam Job #: B4F3646
Report Date: 2014/09/03

Stantec Consulting Ltd
Client Project #: 160310875
Your P.O. #: 16300R-20
Sampler Initials: AV

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Maxxam ID		XG4195			
Sampling Date		2014/08/22			
COC Number		482059-01-01			
	Units	WG-160310875-20140822-AV12	RDL	QC Batch	MDL
Metals					
Dissolved Aluminum (Al)	mg/L	ND	0.0050	3725648	0.0050
Dissolved Antimony (Sb)	mg/L	ND	0.00050	3725648	0.00050
Dissolved Arsenic (As)	mg/L	ND	0.0010	3725648	0.0010
Dissolved Barium (Ba)	mg/L	0.015	0.0020	3725648	0.0020
Dissolved Beryllium (Be)	mg/L	ND	0.00050	3725648	0.00050
Dissolved Boron (B)	mg/L	ND	0.010	3725648	0.010
Dissolved Cadmium (Cd)	mg/L	ND	0.00010	3725648	0.00010
Dissolved Calcium (Ca)	mg/L	80	0.20	3725648	0.20
Dissolved Chromium (Cr)	mg/L	ND	0.0050	3725648	0.0050
Dissolved Cobalt (Co)	mg/L	ND	0.00050	3725648	0.00050
Dissolved Copper (Cu)	mg/L	0.0010	0.0010	3725648	0.0010
Dissolved Iron (Fe)	mg/L	ND	0.10	3725648	0.050
Dissolved Lead (Pb)	mg/L	ND	0.00050	3725648	0.00050
Dissolved Magnesium (Mg)	mg/L	20	0.050	3725648	0.050
Dissolved Manganese (Mn)	mg/L	ND	0.0020	3725648	0.0020
Dissolved Molybdenum (Mo)	mg/L	ND	0.00050	3725648	0.00050
Dissolved Nickel (Ni)	mg/L	0.0010	0.0010	3725648	0.0010
Dissolved Phosphorus (P)	mg/L	ND	0.10	3725648	0.050
Dissolved Potassium (K)	mg/L	0.68	0.20	3725648	0.20
Dissolved Selenium (Se)	mg/L	ND	0.0020	3725648	0.0020
Dissolved Silicon (Si)	mg/L	5.3	0.050	3725648	0.050
Dissolved Silver (Ag)	mg/L	ND	0.00010	3725648	0.00010
Dissolved Sodium (Na)	mg/L	3.5	0.10	3725648	0.10
Dissolved Strontium (Sr)	mg/L	0.086	0.0010	3725648	0.0010
Dissolved Thallium (Tl)	mg/L	ND	0.000050	3725648	0.000050
Dissolved Titanium (Ti)	mg/L	ND	0.0050	3725648	0.0050
Dissolved Uranium (U)	mg/L	ND	0.00010	3725648	0.00010
Dissolved Vanadium (V)	mg/L	ND	0.00050	3725648	0.00050
Dissolved Zinc (Zn)	mg/L	0.0080	0.0050	3725648	0.0050

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Maxxam Job #: B4F3646
Report Date: 2014/09/03

Stantec Consulting Ltd
Client Project #: 160310875
Your P.O. #: 16300R-20
Sampler Initials: AV

TEST SUMMARY

Maxxam ID: XG4184
Sample ID: WG-160310875-20140821-AV01
Matrix: Water

Collected: 2014/08/21
Shipped:
Received: 2014/08/22

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	PH	3725100	N/A	2014/08/26	Surinder Rai
Carbonate, Bicarbonate and Hydroxide	CALC	3724123	N/A	2014/08/27	Automated Statchk
Chloride by Automated Colourimetry	AC	3725125	N/A	2014/08/27	Deonarine Ramnarine
Conductivity	COND	3725099	N/A	2014/08/26	Surinder Rai
Dissolved Organic Carbon (DOC)	TOCV/NDIR	3724377	N/A	2014/08/25	Anastasia Hamanov
Hardness (calculated as CaCO3)		3723450	N/A	2014/09/03	Automated Statchk
Dissolved Metals by ICPMS	ICP/MS	3725648	N/A	2014/08/27	Grace Bu
Ion Balance (% Difference)	CALC	3723648	N/A	2014/09/03	Automated Statchk
Anion and Cation Sum	CALC	3724125	N/A	2014/09/03	Automated Statchk
Total Ammonia-N	LACH/NH4	3726610	N/A	2014/08/28	Charles Opoku-Ware
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	3725121	N/A	2014/08/28	Chandra Nandlal
pH	PH	3725102	N/A	2014/08/26	Surinder Rai
Orthophosphate	AC	3725139	N/A	2014/08/27	Alina Dobreanu
Sat. pH and Langelier Index (@ 20C)	CALC	3724127	N/A	2014/09/03	Automated Statchk
Sat. pH and Langelier Index (@ 4C)	CALC	3724128	N/A	2014/09/03	Automated Statchk
Sulphate by Automated Colourimetry	AC	3725140	N/A	2014/08/27	Deonarine Ramnarine
Total Dissolved Solids (TDS calc)	CALC	3724129	N/A	2014/09/03	Automated Statchk

Maxxam ID: XG4185
Sample ID: WG-160310875-20140821-AV02
Matrix: Water

Collected: 2014/08/21
Shipped:
Received: 2014/08/22

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	PH	3725100	N/A	2014/08/26	Surinder Rai
Carbonate, Bicarbonate and Hydroxide	CALC	3724123	N/A	2014/08/27	Automated Statchk
Chloride by Automated Colourimetry	AC	3725125	N/A	2014/08/27	Deonarine Ramnarine
Conductivity	COND	3725099	N/A	2014/08/26	Surinder Rai
Dissolved Organic Carbon (DOC)	TOCV/NDIR	3724377	N/A	2014/08/25	Anastasia Hamanov
Hardness (calculated as CaCO3)		3723450	N/A	2014/09/03	Automated Statchk
Dissolved Metals by ICPMS	ICP/MS	3725648	N/A	2014/08/27	Grace Bu
Ion Balance (% Difference)	CALC	3723648	N/A	2014/09/03	Automated Statchk
Anion and Cation Sum	CALC	3724125	N/A	2014/09/03	Automated Statchk
Total Ammonia-N	LACH/NH4	3726610	N/A	2014/08/28	Charles Opoku-Ware
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	3725121	N/A	2014/08/28	Chandra Nandlal
pH	PH	3725102	N/A	2014/08/26	Surinder Rai
Orthophosphate	AC	3725139	N/A	2014/08/27	Alina Dobreanu
Sat. pH and Langelier Index (@ 20C)	CALC	3724127	N/A	2014/09/03	Automated Statchk
Sat. pH and Langelier Index (@ 4C)	CALC	3724128	N/A	2014/09/03	Automated Statchk
Sulphate by Automated Colourimetry	AC	3725140	N/A	2014/08/27	Deonarine Ramnarine
Total Dissolved Solids (TDS calc)	CALC	3724129	N/A	2014/09/03	Automated Statchk

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Maxxam Job #: B4F3646
Report Date: 2014/09/03

Stantec Consulting Ltd
Client Project #: 160310875
Your P.O. #: 16300R-20
Sampler Initials: AV

TEST SUMMARY

Maxxam ID: XG4185 Dup
Sample ID: WG-160310875-20140821-AV02
Matrix: Water

Collected: 2014/08/21
Shipped:
Received: 2014/08/22

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	PH	3725100	N/A	2014/08/26	Surinder Rai
Conductivity	COND	3725099	N/A	2014/08/26	Surinder Rai
pH	PH	3725102	N/A	2014/08/26	Surinder Rai

Maxxam ID: XG4186
Sample ID: WG-160310875-20140821-AV03
Matrix: Water

Collected: 2014/08/21
Shipped:
Received: 2014/08/22

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	PH	3725100	N/A	2014/08/26	Surinder Rai
Carbonate, Bicarbonate and Hydroxide	CALC	3724123	N/A	2014/08/27	Automated Statchk
Chloride by Automated Colourimetry	AC	3725125	N/A	2014/08/27	Deonarine Ramnarine
Conductivity	COND	3725099	N/A	2014/08/26	Surinder Rai
Dissolved Organic Carbon (DOC)	TOCV/NDIR	3724377	N/A	2014/08/25	Anastasia Hamanov
Hardness (calculated as CaCO3)		3723450	N/A	2014/09/03	Automated Statchk
Dissolved Metals by ICPMS	ICP/MS	3725648	N/A	2014/08/27	Grace Bu
Ion Balance (% Difference)	CALC	3723648	N/A	2014/09/03	Automated Statchk
Anion and Cation Sum	CALC	3724125	N/A	2014/09/03	Automated Statchk
Total Ammonia-N	LACH/NH4	3726610	N/A	2014/08/28	Charles Opoku-Ware
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	3725121	N/A	2014/08/28	Chandra Nandlal
pH	PH	3725102	N/A	2014/08/26	Surinder Rai
Orthophosphate	AC	3725139	N/A	2014/08/27	Alina Dobreanu
Sat. pH and Langelier Index (@ 20C)	CALC	3724127	N/A	2014/09/03	Automated Statchk
Sat. pH and Langelier Index (@ 4C)	CALC	3724128	N/A	2014/09/03	Automated Statchk
Sulphate by Automated Colourimetry	AC	3725140	N/A	2014/08/27	Deonarine Ramnarine
Total Dissolved Solids (TDS calc)	CALC	3724129	N/A	2014/09/03	Automated Statchk

Maxxam ID: XG4187
Sample ID: WG-160310875-20140821-AV04
Matrix: Water

Collected: 2014/08/21
Shipped:
Received: 2014/08/22

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	PH	3725100	N/A	2014/08/26	Surinder Rai
Carbonate, Bicarbonate and Hydroxide	CALC	3724123	N/A	2014/08/27	Automated Statchk
Chloride by Automated Colourimetry	AC	3725125	N/A	2014/08/27	Deonarine Ramnarine
Conductivity	COND	3725099	N/A	2014/08/26	Surinder Rai
Dissolved Organic Carbon (DOC)	TOCV/NDIR	3724377	N/A	2014/08/25	Anastasia Hamanov
Hardness (calculated as CaCO3)		3723450	N/A	2014/09/03	Automated Statchk
Dissolved Metals by ICPMS	ICP/MS	3725648	N/A	2014/08/27	Grace Bu
Ion Balance (% Difference)	CALC	3723648	N/A	2014/09/03	Automated Statchk
Anion and Cation Sum	CALC	3724125	N/A	2014/09/03	Automated Statchk
Total Ammonia-N	LACH/NH4	3726610	N/A	2014/08/28	Charles Opoku-Ware
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	3725121	N/A	2014/08/28	Chandra Nandlal
pH	PH	3725102	N/A	2014/08/26	Surinder Rai

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Maxxam Job #: B4F3646
Report Date: 2014/09/03

Stantec Consulting Ltd
Client Project #: 160310875
Your P.O. #: 16300R-20
Sampler Initials: AV

TEST SUMMARY

Maxxam ID: XG4187
Sample ID: WG-160310875-20140821-AV04
Matrix: Water

Collected: 2014/08/21
Shipped:
Received: 2014/08/22

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Orthophosphate	AC	3725139	N/A	2014/08/27	Alina Dobreanu
Sat. pH and Langelier Index (@ 20C)	CALC	3724127	N/A	2014/09/03	Automated Statchk
Sat. pH and Langelier Index (@ 4C)	CALC	3724128	N/A	2014/09/03	Automated Statchk
Sulphate by Automated Colourimetry	AC	3725140	N/A	2014/08/27	Deonarine Ramnarine
Total Dissolved Solids (TDS calc)	CALC	3724129	N/A	2014/09/03	Automated Statchk

Maxxam ID: XG4188
Sample ID: WG-160310875-20140821-AV05
Matrix: Water

Collected: 2014/08/21
Shipped:
Received: 2014/08/22

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	PH	3725100	N/A	2014/08/26	Surinder Rai
Carbonate, Bicarbonate and Hydroxide	CALC	3724123	N/A	2014/08/27	Automated Statchk
Chloride by Automated Colourimetry	AC	3725125	N/A	2014/08/27	Deonarine Ramnarine
Conductivity	COND	3725099	N/A	2014/08/26	Surinder Rai
Dissolved Organic Carbon (DOC)	TOCV/NDIR	3724377	N/A	2014/08/25	Anastasia Hamanov
Hardness (calculated as CaCO3)		3723450	N/A	2014/09/03	Automated Statchk
Dissolved Metals by ICPMS	ICP/MS	3725648	N/A	2014/08/27	Grace Bu
Ion Balance (% Difference)	CALC	3723648	N/A	2014/09/03	Automated Statchk
Anion and Cation Sum	CALC	3724125	N/A	2014/09/03	Automated Statchk
Total Ammonia-N	LACH/NH4	3726610	N/A	2014/08/28	Charles Opoku-Ware
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	3725121	N/A	2014/08/28	Chandra Nandlal
pH	PH	3725102	N/A	2014/08/26	Surinder Rai
Orthophosphate	AC	3725139	N/A	2014/08/27	Alina Dobreanu
Sat. pH and Langelier Index (@ 20C)	CALC	3724127	N/A	2014/09/03	Automated Statchk
Sat. pH and Langelier Index (@ 4C)	CALC	3724128	N/A	2014/09/03	Automated Statchk
Sulphate by Automated Colourimetry	AC	3725140	N/A	2014/08/27	Deonarine Ramnarine
Total Dissolved Solids (TDS calc)	CALC	3724129	N/A	2014/09/03	Automated Statchk

Maxxam ID: XG4189
Sample ID: WG-160310875-20140822-AV06
Matrix: Water

Collected: 2014/08/22
Shipped:
Received: 2014/08/22

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	PH	3725100	N/A	2014/08/26	Surinder Rai
Carbonate, Bicarbonate and Hydroxide	CALC	3724123	N/A	2014/08/27	Automated Statchk
Chloride by Automated Colourimetry	AC	3725125	N/A	2014/08/27	Deonarine Ramnarine
Conductivity	COND	3725099	N/A	2014/08/26	Surinder Rai
Dissolved Organic Carbon (DOC)	TOCV/NDIR	3724377	N/A	2014/08/25	Anastasia Hamanov
Hardness (calculated as CaCO3)		3723450	N/A	2014/09/03	Automated Statchk
Dissolved Metals by ICPMS	ICP/MS	3725648	N/A	2014/08/27	Grace Bu
Ion Balance (% Difference)	CALC	3723648	N/A	2014/09/03	Automated Statchk
Anion and Cation Sum	CALC	3724125	N/A	2014/09/03	Automated Statchk
Total Ammonia-N	LACH/NH4	3726610	N/A	2014/08/28	Charles Opoku-Ware

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Maxxam Job #: B4F3646
Report Date: 2014/09/03

Stantec Consulting Ltd
Client Project #: 160310875
Your P.O. #: 16300R-20
Sampler Initials: AV

TEST SUMMARY

Maxxam ID: XG4189
Sample ID: WG-160310875-20140822-AV06
Matrix: Water

Collected: 2014/08/22
Shipped:
Received: 2014/08/22

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	3725121	N/A	2014/08/28	Chandra Nandlal
pH	PH	3725102	N/A	2014/08/26	Surinder Rai
Orthophosphate	AC	3725139	N/A	2014/08/27	Alina Dobreanu
Sat. pH and Langelier Index (@ 20C)	CALC	3724127	N/A	2014/09/03	Automated Statchk
Sat. pH and Langelier Index (@ 4C)	CALC	3724128	N/A	2014/09/03	Automated Statchk
Sulphate by Automated Colourimetry	AC	3725140	N/A	2014/08/27	Deonarine Ramnarine
Total Dissolved Solids (TDS calc)	CALC	3724129	N/A	2014/09/03	Automated Statchk

Maxxam ID: XG4189 Dup
Sample ID: WG-160310875-20140822-AV06
Matrix: Water

Collected: 2014/08/22
Shipped:
Received: 2014/08/22

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Total Ammonia-N	LACH/NH4	3726610	N/A	2014/08/28	Charles Opoku-Ware
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	3725121	N/A	2014/08/28	Chandra Nandlal

Maxxam ID: XG4190
Sample ID: WG-160310875-20140822-AV07
Matrix: Water

Collected: 2014/08/22
Shipped:
Received: 2014/08/22

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	PH	3725100	N/A	2014/08/26	Surinder Rai
Carbonate, Bicarbonate and Hydroxide	CALC	3724123	N/A	2014/08/27	Automated Statchk
Chloride by Automated Colourimetry	AC	3725125	N/A	2014/08/27	Deonarine Ramnarine
Conductivity	COND	3725099	N/A	2014/08/26	Surinder Rai
Dissolved Organic Carbon (DOC)	TOCV/NDIR	3724377	N/A	2014/08/25	Anastasia Hamanov
Hardness (calculated as CaCO3)		3723450	N/A	2014/09/03	Automated Statchk
Dissolved Metals by ICPMS	ICP/MS	3725648	N/A	2014/08/27	Grace Bu
Ion Balance (% Difference)	CALC	3723648	N/A	2014/09/03	Automated Statchk
Anion and Cation Sum	CALC	3724125	N/A	2014/09/03	Automated Statchk
Total Ammonia-N	LACH/NH4	3726610	N/A	2014/08/28	Charles Opoku-Ware
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	3725121	N/A	2014/08/28	Chandra Nandlal
pH	PH	3725102	N/A	2014/08/26	Surinder Rai
Orthophosphate	AC	3725139	N/A	2014/08/27	Alina Dobreanu
Sat. pH and Langelier Index (@ 20C)	CALC	3724127	N/A	2014/09/03	Automated Statchk
Sat. pH and Langelier Index (@ 4C)	CALC	3724128	N/A	2014/09/03	Automated Statchk
Sulphate by Automated Colourimetry	AC	3725140	N/A	2014/08/27	Deonarine Ramnarine
Total Dissolved Solids (TDS calc)	CALC	3724129	N/A	2014/09/03	Automated Statchk

Maxxam ID: XG4191
Sample ID: WG-160310875-20140822-AV08
Matrix: Water

Collected: 2014/08/22
Shipped:
Received: 2014/08/22

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	PH	3725100	N/A	2014/08/26	Surinder Rai

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Maxxam Job #: B4F3646
Report Date: 2014/09/03

Stantec Consulting Ltd
Client Project #: 160310875
Your P.O. #: 16300R-20
Sampler Initials: AV

TEST SUMMARY

Maxxam ID: XG4191
Sample ID: WG-160310875-20140822-AV08
Matrix: Water

Collected: 2014/08/22
Shipped:
Received: 2014/08/22

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Carbonate, Bicarbonate and Hydroxide	CALC	3724123	N/A	2014/08/27	Automated Statchk
Chloride by Automated Colourimetry	AC	3725125	N/A	2014/08/27	Deonarine Ramnarine
Conductivity	COND	3725099	N/A	2014/08/26	Surinder Rai
Dissolved Organic Carbon (DOC)	TOCV/NDIR	3724377	N/A	2014/08/25	Anastasia Hamanov
Hardness (calculated as CaCO3)		3723450	N/A	2014/09/03	Automated Statchk
Dissolved Metals by ICPMS	ICP/MS	3725648	N/A	2014/08/27	Grace Bu
Ion Balance (% Difference)	CALC	3723648	N/A	2014/09/03	Automated Statchk
Anion and Cation Sum	CALC	3724125	N/A	2014/09/03	Automated Statchk
Total Ammonia-N	LACH/NH4	3726610	N/A	2014/08/28	Charles Opoku-Ware
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	3725121	N/A	2014/08/28	Chandra Nandlal
pH	PH	3725102	N/A	2014/08/26	Surinder Rai
Orthophosphate	AC	3725139	N/A	2014/08/27	Alina Dobreanu
Sat. pH and Langelier Index (@ 20C)	CALC	3724127	N/A	2014/09/03	Automated Statchk
Sat. pH and Langelier Index (@ 4C)	CALC	3724128	N/A	2014/09/03	Automated Statchk
Sulphate by Automated Colourimetry	AC	3725140	N/A	2014/08/27	Deonarine Ramnarine
Total Dissolved Solids (TDS calc)	CALC	3724129	N/A	2014/09/03	Automated Statchk

Maxxam ID: XG4191 Dup
Sample ID: WG-160310875-20140822-AV08
Matrix: Water

Collected: 2014/08/22
Shipped:
Received: 2014/08/22

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Chloride by Automated Colourimetry	AC	3725125	N/A	2014/08/27	Deonarine Ramnarine
Dissolved Organic Carbon (DOC)	TOCV/NDIR	3724377	N/A	2014/08/25	Anastasia Hamanov
Orthophosphate	AC	3725139	N/A	2014/08/27	Alina Dobreanu
Sulphate by Automated Colourimetry	AC	3725140	N/A	2014/08/27	Deonarine Ramnarine

Maxxam ID: XG4192
Sample ID: WG-160310875-20140822-AV09
Matrix: Water

Collected: 2014/08/22
Shipped:
Received: 2014/08/22

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	PH	3725100	N/A	2014/08/26	Surinder Rai
Carbonate, Bicarbonate and Hydroxide	CALC	3724123	N/A	2014/08/27	Automated Statchk
Chloride by Automated Colourimetry	AC	3725125	N/A	2014/08/27	Deonarine Ramnarine
Conductivity	COND	3725099	N/A	2014/08/26	Surinder Rai
Dissolved Organic Carbon (DOC)	TOCV/NDIR	3724377	N/A	2014/08/25	Anastasia Hamanov
Hardness (calculated as CaCO3)		3723450	N/A	2014/09/03	Automated Statchk
Dissolved Metals by ICPMS	ICP/MS	3725648	N/A	2014/08/27	Grace Bu
Ion Balance (% Difference)	CALC	3723648	N/A	2014/09/03	Automated Statchk
Anion and Cation Sum	CALC	3724125	N/A	2014/09/03	Automated Statchk
Total Ammonia-N	LACH/NH4	3726610	N/A	2014/08/28	Charles Opoku-Ware
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	3725121	N/A	2014/08/28	Chandra Nandlal
pH	PH	3725102	N/A	2014/08/26	Surinder Rai

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Maxxam Job #: B4F3646
Report Date: 2014/09/03

Stantec Consulting Ltd
Client Project #: 160310875
Your P.O. #: 16300R-20
Sampler Initials: AV

TEST SUMMARY

Maxxam ID: XG4192
Sample ID: WG-160310875-20140822-AV09
Matrix: Water

Collected: 2014/08/22
Shipped:
Received: 2014/08/22

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Orthophosphate	AC	3725139	N/A	2014/08/27	Alina Dobreanu
Sat. pH and Langelier Index (@ 20C)	CALC	3724127	N/A	2014/09/03	Automated Statchk
Sat. pH and Langelier Index (@ 4C)	CALC	3724128	N/A	2014/09/03	Automated Statchk
Sulphate by Automated Colourimetry	AC	3725140	N/A	2014/08/27	Deonarine Ramnarine
Total Dissolved Solids (TDS calc)	CALC	3724129	N/A	2014/09/03	Automated Statchk

Maxxam ID: XG4192 Dup
Sample ID: WG-160310875-20140822-AV09
Matrix: Water

Collected: 2014/08/22
Shipped:
Received: 2014/08/22

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Dissolved Metals by ICPMS	ICP/MS	3725648	N/A	2014/08/27	Grace Bu

Maxxam ID: XG4193
Sample ID: WG-160310875-20140822-AV10
Matrix: Water

Collected: 2014/08/22
Shipped:
Received: 2014/08/22

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	PH	3725100	N/A	2014/08/26	Surinder Rai
Carbonate, Bicarbonate and Hydroxide	CALC	3724123	N/A	2014/08/27	Automated Statchk
Chloride by Automated Colourimetry	AC	3725125	N/A	2014/08/27	Deonarine Ramnarine
Conductivity	COND	3725099	N/A	2014/08/26	Surinder Rai
Dissolved Organic Carbon (DOC)	TOCV/NDIR	3724377	N/A	2014/08/25	Anastasia Hamanov
Hardness (calculated as CaCO3)		3723450	N/A	2014/09/03	Automated Statchk
Dissolved Metals by ICPMS	ICP/MS	3725648	N/A	2014/08/27	Grace Bu
Ion Balance (% Difference)	CALC	3723648	N/A	2014/09/03	Automated Statchk
Anion and Cation Sum	CALC	3724125	N/A	2014/09/03	Automated Statchk
Total Ammonia-N	LACH/NH4	3726610	N/A	2014/08/28	Charles Opoku-Ware
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	3725121	N/A	2014/08/28	Chandra Nandlal
pH	PH	3725102	N/A	2014/08/26	Surinder Rai
Orthophosphate	AC	3725139	N/A	2014/08/27	Alina Dobreanu
Sat. pH and Langelier Index (@ 20C)	CALC	3724127	N/A	2014/09/03	Automated Statchk
Sat. pH and Langelier Index (@ 4C)	CALC	3724128	N/A	2014/09/03	Automated Statchk
Sulphate by Automated Colourimetry	AC	3725140	N/A	2014/08/27	Deonarine Ramnarine
Total Dissolved Solids (TDS calc)	CALC	3724129	N/A	2014/09/03	Automated Statchk

Maxxam ID: XG4194
Sample ID: WG-160310875-20140822-AV11
Matrix: Water

Collected: 2014/08/22
Shipped:
Received: 2014/08/22

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	PH	3725100	N/A	2014/08/26	Surinder Rai
Carbonate, Bicarbonate and Hydroxide	CALC	3724123	N/A	2014/08/27	Automated Statchk
Chloride by Automated Colourimetry	AC	3725125	N/A	2014/08/27	Deonarine Ramnarine
Conductivity	COND	3725099	N/A	2014/08/26	Surinder Rai

Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam Job #: B4F3646
Report Date: 2014/09/03

Stantec Consulting Ltd
Client Project #: 160310875
Your P.O. #: 16300R-20
Sampler Initials: AV

TEST SUMMARY

Maxxam ID: XG4194
Sample ID: WG-160310875-20140822-AV11
Matrix: Water

Collected: 2014/08/22
Shipped:
Received: 2014/08/22

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Dissolved Organic Carbon (DOC)	TOCV/NDIR	3724377	N/A	2014/08/25	Anastasia Hamanov
Hardness (calculated as CaCO3)		3723450	N/A	2014/09/03	Automated Statchk
Dissolved Metals by ICPMS	ICP/MS	3725648	N/A	2014/08/27	Grace Bu
Ion Balance (% Difference)	CALC	3723648	N/A	2014/09/03	Automated Statchk
Anion and Cation Sum	CALC	3724125	N/A	2014/09/03	Automated Statchk
Total Ammonia-N	LACH/NH4	3726610	N/A	2014/08/28	Charles Opoku-Ware
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	3725121	N/A	2014/08/28	Chandra Nandlal
pH	PH	3725102	N/A	2014/08/26	Surinder Rai
Orthophosphate	AC	3725139	N/A	2014/08/27	Alina Dobreanu
Sat. pH and Langelier Index (@ 20C)	CALC	3724127	N/A	2014/09/03	Automated Statchk
Sat. pH and Langelier Index (@ 4C)	CALC	3724128	N/A	2014/09/03	Automated Statchk
Sulphate by Automated Colourimetry	AC	3725140	N/A	2014/08/27	Deonarine Ramnarine
Total Dissolved Solids (TDS calc)	CALC	3724129	N/A	2014/09/03	Automated Statchk

Maxxam ID: XG4195
Sample ID: WG-160310875-20140822-AV12
Matrix: Water

Collected: 2014/08/22
Shipped:
Received: 2014/08/22

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	PH	3725100	N/A	2014/08/26	Surinder Rai
Carbonate, Bicarbonate and Hydroxide	CALC	3724123	N/A	2014/08/27	Automated Statchk
Chloride by Automated Colourimetry	AC	3725125	N/A	2014/08/27	Deonarine Ramnarine
Conductivity	COND	3725099	N/A	2014/08/26	Surinder Rai
Dissolved Organic Carbon (DOC)	TOCV/NDIR	3724377	N/A	2014/08/25	Anastasia Hamanov
Hardness (calculated as CaCO3)		3723450	N/A	2014/09/03	Automated Statchk
Dissolved Metals by ICPMS	ICP/MS	3725648	N/A	2014/08/27	Grace Bu
Ion Balance (% Difference)	CALC	3723648	N/A	2014/09/03	Automated Statchk
Anion and Cation Sum	CALC	3724125	N/A	2014/09/03	Automated Statchk
Total Ammonia-N	LACH/NH4	3726610	N/A	2014/08/28	Charles Opoku-Ware
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	3725121	N/A	2014/08/28	Chandra Nandlal
pH	PH	3725102	N/A	2014/08/26	Surinder Rai
Orthophosphate	AC	3725139	N/A	2014/08/27	Alina Dobreanu
Sat. pH and Langelier Index (@ 20C)	CALC	3724127	N/A	2014/09/03	Automated Statchk
Sat. pH and Langelier Index (@ 4C)	CALC	3724128	N/A	2014/09/03	Automated Statchk
Sulphate by Automated Colourimetry	AC	3725140	N/A	2014/08/27	Deonarine Ramnarine
Total Dissolved Solids (TDS calc)	CALC	3724129	N/A	2014/09/03	Automated Statchk

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Maxxam Job #: B4F3646
Report Date: 2014/09/03

Stantec Consulting Ltd
Client Project #: 160310875
Your P.O. #: 16300R-20
Sampler Initials: AV

GENERAL COMMENTS

Results relate only to the items tested.

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Maxxam Job #: B4F3646
Report Date: 2014/09/03

QUALITY ASSURANCE REPORT

Stantec Consulting Ltd
Client Project #: 160310875
Your P.O. #: 16300R-20
Sampler Initials: AV

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	Units	Value (%)	QC Limits
3724377	Dissolved Organic Carbon	2014/08/25	97	80 - 120	102	80 - 120	ND ,RDL=0.20	mg/L	NC	20
3725099	Conductivity	2014/08/26			102	85 - 115	ND ,RDL=1.0	umho/cm	0.42	25
3725100	Alkalinity (Total as CaCO3)	2014/08/26			96	85 - 115	ND ,RDL=1.0	mg/L	0.48	25
3725102	pH	2014/08/26			102	98 - 103			0.21	N/A
3725121	Nitrate (N)	2014/08/28	102	80 - 120	99	80 - 120	ND ,RDL=0.10	mg/L	NC	25
3725121	Nitrite (N)	2014/08/28	104	80 - 120	104	80 - 120	ND ,RDL=0.010	mg/L	NC	25
3725125	Dissolved Chloride (Cl)	2014/08/27	NC	80 - 120	102	80 - 120	ND ,RDL=1	mg/L	0.15	20
3725139	Orthophosphate (P)	2014/08/27	109	75 - 125	98	80 - 120	ND ,RDL=0.010	mg/L	NC	25
3725140	Dissolved Sulphate (SO4)	2014/08/27	NC	75 - 125	103	80 - 120	ND ,RDL=1	mg/L	0.037	20
3725648	Dissolved Aluminum (Al)	2014/08/27	98	80 - 120	106	80 - 120	ND ,RDL=0.0050	mg/L	NC	20
3725648	Dissolved Antimony (Sb)	2014/08/27	102	80 - 120	101	80 - 120	ND ,RDL=0.00050	mg/L	NC	20
3725648	Dissolved Arsenic (As)	2014/08/27	98	80 - 120	100	80 - 120	ND ,RDL=0.0010	mg/L	NC	20
3725648	Dissolved Barium (Ba)	2014/08/27	99	80 - 120	103	80 - 120	ND ,RDL=0.0020	mg/L	0.90	20
3725648	Dissolved Beryllium (Be)	2014/08/27	104	80 - 120	107	80 - 120	ND ,RDL=0.00050	mg/L	NC	20
3725648	Dissolved Boron (B)	2014/08/27	102	80 - 120	107	80 - 120	ND ,RDL=0.010	mg/L	NC	20
3725648	Dissolved Cadmium (Cd)	2014/08/27	99	80 - 120	101	80 - 120	ND ,RDL=0.00010	mg/L	NC	20
3725648	Dissolved Calcium (Ca)	2014/08/27	NC	80 - 120	104	80 - 120	ND ,RDL=0.20	mg/L	0.29	20
3725648	Dissolved Chromium (Cr)	2014/08/27	97	80 - 120	100	80 - 120	ND ,RDL=0.0050	mg/L	NC	20
3725648	Dissolved Cobalt (Co)	2014/08/27	96	80 - 120	104	80 - 120	ND ,RDL=0.00050	mg/L	NC	20
3725648	Dissolved Copper (Cu)	2014/08/27	92	80 - 120	97	80 - 120	ND ,RDL=0.0010	mg/L	NC	20
3725648	Dissolved Iron (Fe)	2014/08/27	98	80 - 120	104	80 - 120	ND ,RDL=0.10	mg/L	NC	20
3725648	Dissolved Lead (Pb)	2014/08/27	93	80 - 120	98	80 - 120	ND ,RDL=0.00050	mg/L	NC	20
3725648	Dissolved Magnesium (Mg)	2014/08/27	NC	80 - 120	106	80 - 120	ND ,RDL=0.050	mg/L	0.87	20
3725648	Dissolved Manganese (Mn)	2014/08/27	97	80 - 120	101	80 - 120	ND ,RDL=0.0020	mg/L	3.5	20
3725648	Dissolved Molybdenum (Mo)	2014/08/27	101	80 - 120	100	80 - 120	ND ,RDL=0.00050	mg/L	NC	20
3725648	Dissolved Nickel (Ni)	2014/08/27	95	80 - 120	100	80 - 120	ND ,RDL=0.0010	mg/L	NC	20
3725648	Dissolved Phosphorus (P)	2014/08/27	111	80 - 120	110	80 - 120	ND ,RDL=0.10	mg/L	NC	20
3725648	Dissolved Potassium (K)	2014/08/27	105	80 - 120	111	80 - 120	ND ,RDL=0.20	mg/L	2.2	20
3725648	Dissolved Selenium (Se)	2014/08/27	97	80 - 120	100	80 - 120	ND ,RDL=0.0020	mg/L	NC	20
3725648	Dissolved Silicon (Si)	2014/08/27	101	80 - 120	105	80 - 120	ND ,RDL=0.050	mg/L	0.38	20
3725648	Dissolved Silver (Ag)	2014/08/27	84	80 - 120	86	80 - 120	ND ,RDL=0.00010	mg/L	NC	20

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Maxxam Job #: B4F3646
Report Date: 2014/09/03

QUALITY ASSURANCE REPORT(CONT'D)

Stantec Consulting Ltd
Client Project #: 160310875
Your P.O. #: 16300R-20
Sampler Initials: AV

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	Units	Value (%)	QC Limits
3725648	Dissolved Sodium (Na)	2014/08/27	NC	80 - 120	111	80 - 120	0.13 ,RDL=0.10	mg/L	1.8	20
3725648	Dissolved Strontium (Sr)	2014/08/27	95	80 - 120	98	80 - 120	ND ,RDL=0.0010	mg/L	0.53	20
3725648	Dissolved Thallium (Tl)	2014/08/27	96	80 - 120	102	80 - 120	ND ,RDL=0.000050	mg/L	NC	20
3725648	Dissolved Titanium (Ti)	2014/08/27	98	80 - 120	100	80 - 120	ND ,RDL=0.0050	mg/L	NC	20
3725648	Dissolved Uranium (U)	2014/08/27	100	80 - 120	102	80 - 120	ND ,RDL=0.00010	mg/L	0	20
3725648	Dissolved Vanadium (V)	2014/08/27	101	80 - 120	103	80 - 120	ND ,RDL=0.00050	mg/L	NC	20
3725648	Dissolved Zinc (Zn)	2014/08/27	98	80 - 120	101	80 - 120	ND ,RDL=0.0050	mg/L	NC	20
3726610	Total Ammonia-N	2014/08/28	102	80 - 120	99	85 - 115	ND ,RDL=0.050	mg/L	NC	20

N/A = Not Applicable

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spiked amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than 2x that of the native sample concentration).

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (one or both samples < 5x RDL).

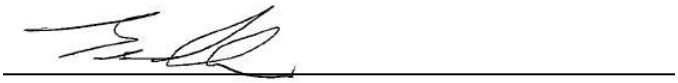
Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam Job #: B4F3646
Report Date: 2014/09/03

Stantec Consulting Ltd
Client Project #: 160310875
Your P.O. #: 16300R-20
Sampler Initials: AV

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).



Brad Newman, Scientific Specialist

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

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IMMEDIATE TEST

STANTEC CHAIN OF CUSTODY RECORD

Page 1 of 2

INVOICE INFORMATION:		REPORT INFORMATION(if differs from invoice):		PROJECT INFORMATION:		Laboratory Use Only:	
Company Name:	#23998 Stantec Consulting Ltd	Company Name:		Quotation #:	B42133	Maxxam Job #:	Bottle Order #:
Contact Name:	Accounts Payable	Contact Name:	Lesley Veale	Task #:	16300R-20		482059
Address:	49 Frederick St Kitchener ON N2H 6M7	Address:		Project #:	160310875	Chain of Custody #:	Project Manager:
Phone:	(519) 579-4410 Fax: (519) 579-6733	Phone:	Fax:	Profit Centre:	1609	C#482059-01-01	Parnian Baber
Email:	Stantec.Accounts.Payable.Invoices@Stantec.com	Email:	lesley.veale@stantec.com ; EDD@stantec.com	Site #:			
				Sampled By:	A. VANDENHOFF / C. DAVIS		

MOE REGULATED DRINKING WATER OR WATER INTENDED FOR HUMAN CONSUMPTION MUST BE SUBMITTED ON THE MAXXAM DRINKING WATER CHAIN OF CUSTODY

Regulation 153 (2011)
☐ Table 1 ☐ Res/Park ☐ Medium/Fine
☐ Table 2 ☐ Ind/Comm ☐ Coarse
☐ Table 3 ☐ Agri/Other ☐ For RSC
☐ Table ___

Other Regulations
☐ CCME ☐ Sanitary Sewer Bylaw
☐ Reg 558. ☐ Storm Sewer Bylaw
☐ MISA Municipality ___
☐ PWQO
☑ Other ODWS

Special Instructions

Include Criteria on Certificate of Analysis (Y/N)? N

ANALYSIS REQUESTED (PLEASE BE SPECIFIC)

Turnaround Time (TAT) Required:
Please provide advance notice for rush projects
Regular (Standard) TAT: ☑
(will be applied if Rush TAT is not specified):
Standard TAT = 5-7 Working days for most tests.
Please note: Standard TAT for certain tests such as BOD and Dioxins/Furans are > 5 days - contact your Project Manager for details.
Job Specific Rush TAT (if applies to entire submission)
Date Required: ___ Time Required: ___ ☐
Rush Confirmation Number: ___ *(call lab for #)*

	Sample Barcode Label	Sample (Location) Identification	Date Sampled	Time Sampled	Matrix	Field Filtered (please circle): (Metals) Hg / Cr VI	RCAp - Comprehensive	# of Bottles	Comments
1		WG-160310875-20140821-AV01	21-Aug	AM	GW	✓	✓	4	
2		-AV02		AM		Y	✓	4	
3		-AV03		PM		Y	✓	4	
4		-AV04		PM		Y	✓	4	
5		-AV05		PM		Y	✓	4	
6		20140822-AV06	22-Aug	AM		Y	✓	4	
7		-AV07		AM		Y	✓	4	
8		-AV08		AM		Y	✓	4	REC'D IN WATERLOO
9		-AV09		PM		Y	✓	4	
10		-AV10		PM		Y	✓	4	

22-Aug-14 15:45
Parnian Baber
B4F3646
CG2 ENV-662

* RELINQUISHED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	RECEIVED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	# jars used and not submitted
AARON VANDENHOFF	14/08/22	15:45	Shadow Lederer	2014/08/22	15:45	
			Ashitha Sukumar	2014/08/22	17:45	

ASHITHA SUKUMAR

Laboratory Use Only					
Time Sensitive	Temperature (°C) on Receipt	Custody Seal	Yes	No
	7.3	Present		✓
		Intact		✓

* IT IS THE RESPONSIBILITY OF THE RELINQUISHER TO ENSURE THE ACCURACY OF THE CHAIN OF CUSTODY RECORD. AN INCOMPLETE CHAIN OF CUSTODY MAY RESULT IN ANALYTICAL TAT DELAYS.

SAMPLES MUST BE KEPT COOL (< 10° C) FROM TIME OF SAMPLING UNTIL DELIVERY TO MAXXAM

White: Maxxam Yellow: Client

Maxxam Analytics International Corporation o/a Maxxam Analytics

8/8/8 WB# 257927

Maxxam Analytics International Corporation o/a Maxxam Analytics
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STANTEC CHAIN OF CUSTODY RECORD

Page 2 of 2

INVOICE INFORMATION:

Company Name: #23998 Stantec Consulting Ltd
Contact Name: Accounts Payable
Address: 49 Frederick St, Kitchener ON N2H 6M7
Phone: (519) 579-4410 Fax: (519) 579-6733
Email: Stantec.Accounts.Payable.Invoices@Stantec.com

REPORT INFORMATION(if differs from invoice):

Company Name:
Contact Name: Lesley Veale
Address:
Phone: Fax:
Email: lesley.veale@stantec.com ; EDD@stantec.com

PROJECT INFORMATION:

Quotation #: B42133
Task #: 16300R-20
Project #: 160310875
Profit Centre: 1609
Site #:
Sampled By: A. VANDENHOFF / C. DAVIS

Laboratory Use Only:

Maxxam Job #:
Bottle Order #: 482059
Chain of Custody #: C#482059-02-01
Project Manager: Parnian Baber

MOE REGULATED DRINKING WATER OR WATER INTENDED FOR HUMAN CONSUMPTION MUST BE SUBMITTED ON THE MAXXAM DRINKING WATER CHAIN OF CUSTODY

Regulation 153 (2011): ☐ Table 1 ☐ Res/Park ☐ Medium/Fine ☐ Table 2 ☐ Ind/Comm ☐ Coarse ☐ Table 3 ☐ Agri/Other ☐ For RSC ☐ Table ___

Other Regulations: ☐ CCME ☐ Sanitary Sewer Bylaw ☐ Reg 558. ☐ Storm Sewer Bylaw ☐ MISA Municipality ☐ PWQO ☑ Other ODWS

Special Instructions:

Include Criteria on Certificate of Analysis (Y/N)? N

Turnaround Time (TAT) Required:
Please provide advance notice for rush projects

Regular (Standard) TAT: ☑
(will be applied if Rush TAT is not specified):
Standard TAT = 5-7 Working days for most tests..
Please note: Standard TAT for certain tests such as BOD and Dioxins/Furans are > 5 days - contact your Project Manager for details.

Job Specific Rush TAT (if applies to entire submission)
Date Required: Time Required: ☐
Rush Confirmation Number: *(call lab for #)*

	Sample Barcode Label	Sample (Location) Identification	Date Sampled	Time Sampled	Matrix	Field Filtered (please circle): Metals / Hg / Cr VI	ANALYSIS REQUESTED (PLEASE BE SPECIFIC): RCAp - Comprehensive	# of Bottles	Comments
1		WG-160310875-20140822-AM1	22-AUG	AM	GW	Y	✓	4	
2		↓ ↓ ↓ -AM2	↓	PM	GW	Y	✓	4	
3									
4									
5									
6									
7									
8									
9									REC'D IN WATERLOO
10									

* RELINQUISHED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	RECEIVED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	# jars used and not submitted
AARON VANDENHOFF	14/08/22	15:45	Ashita Sukhwinder	2014/08/22	17:45	

Laboratory Use Only

Time Sensitive	Temperature (°C) on Receipt	Custody Seal	Yes	No
	2 - 7 - 10	Present	✓	
		Intact	✓	

* IT IS THE RESPONSIBILITY OF THE RELINQUISHER TO ENSURE THE ACCURACY OF THE CHAIN OF CUSTODY RECORD. AN INCOMPLETE CHAIN OF CUSTODY MAY RESULT IN ANALYTICAL TAT DELAYS.

SAMPLES MUST BE KEPT COOL (< 10° C) FROM TIME OF SAMPLING UNTIL DELIVERY TO MAXXAM

White: Maxxam Yellow: Client

ASHITA SUKHWINDER

Maxxam Analytics International Corporation o/a Maxxam Analytics

WBH 351424 8/8/8 2014/08/22 AM

Maxxam
A Bureau Veritas Group Company

Your Project #: 160310875
Your C.O.C. #: 526923-01-01, 526923-02-01

Attention:Lesley Veale

Stantec Consulting Ltd
49 Frederick St
Kitchener, ON
N2H 6M7

Report Date: 2015/10/07
Report #: R3713378
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B5J8856
Received: 2015/09/30, 10:13

Sample Matrix: Water
Samples Received: 11

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Reference
Alkalinity	11	N/A	2015/10/02	CAM SOP-00448	SM 22 2320 B m
Carbonate, Bicarbonate and Hydroxide	11	N/A	2015/10/05	CAM SOP-00102	APHA 4500-CO2 D
Chloride by Automated Colourimetry	11	N/A	2015/10/05	CAM SOP-00463	EPA 325.2 m
Conductivity	11	N/A	2015/10/02	CAM SOP-00414	SM 22 2510 m
Dissolved Organic Carbon (DOC) (1)	11	N/A	2015/10/01	CAM SOP-00446	SM 22 5310 B m
Hardness (calculated as CaCO3)	11	N/A	2015/10/06	CAM SOP 00102/00408/00447	SM 2340 B
Dissolved Metals by ICPMS	11	N/A	2015/10/06	CAM SOP-00447	EPA 6020A m
Ion Balance (% Difference)	11	N/A	2015/10/06		
Anion and Cation Sum	11	N/A	2015/10/06		
Total Ammonia-N	11	N/A	2015/10/06	CAM SOP-00441	EPA GS I-2522-90 m
Nitrate (NO3) and Nitrite (NO2) in Water (2)	11	N/A	2015/10/05	CAM SOP-00440	SM 22 4500-NO3I/NO2B
pH	11	N/A	2015/10/02	CAM SOP-00413	SM 4500H+ B m
Orthophosphate	11	N/A	2015/10/05	CAM SOP-00461	EPA 365.1 m
Sat. pH and Langelier Index (@ 20C)	11	N/A	2015/10/06		
Sat. pH and Langelier Index (@ 4C)	11	N/A	2015/10/06		
Sulphate by Automated Colourimetry	11	N/A	2015/10/05	CAM SOP-00464	EPA 375.4 m
Total Dissolved Solids (TDS calc)	11	N/A	2015/10/06		

Remarks:

Maxxam Analytics has performed all analytical testing herein in accordance with ISO 17025 and the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act. All methodologies comply with this document and are validated for use in the laboratory. The methods and techniques employed in this analysis conform to the performance criteria (detection limits, accuracy and precision) as outlined in the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act.

Maxxam Analytics is accredited for all specific parameters as required by Ontario Regulation 153/04. Maxxam Analytics is limited in liability to the actual cost of analysis unless otherwise agreed in writing. There is no other warranty expressed or implied. Samples will be retained at Maxxam Analytics for three weeks from receipt of data or as per contract.

Reference Method suffix “m” indicates test methods incorporate validated modifications from specific reference methods to improve performance.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

(1) Dissolved Organic Carbon (DOC) present in the sample should be considered as non-purgeable DOC.
(2) Values for calculated parameters may not appear to add up due to rounding of raw data and significant figures.

Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Your Project #: 160310875
Your C.O.C. #: 526923-01-01, 526923-02-01

Attention:Lesley Veale

Stantec Consulting Ltd
49 Frederick St
Kitchener, ON
N2H 6M7

Report Date: 2015/10/07
Report #: R3713378
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B5J8856
Received: 2015/09/30, 10:13

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Augustyna Dobosz, Project Manager
Email: ADobosz@maxxam.ca
Phone# (905)817-5700 Ext:5798

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Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

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Maxxam Job #: B5J8856
Report Date: 2015/10/07

Stantec Consulting Ltd
Client Project #: 160310875
Sampler Initials: AV

RCAP - COMPREHENSIVE (WATER)

Maxxam ID		BBU085	BBU087	BBU087	BBU088		
Sampling Date		2015/09/28 12:09	2015/09/28 16:37	2015/09/28 16:37	2015/09/28 15:59		
COC Number		526923-01-01	526923-01-01	526923-01-01	526923-01-01		
	UNITS	WG-160310875-20150928-AV01	WG-160310875-20150928-AV02	WG-160310875-20150928-AV02 Lab-Dup	WG-160310875-20150928-AV03	RDL	QC Batch
Calculated Parameters							
Anion Sum	me/L	7.73	6.24		5.03	N/A	4211153
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	320	280		200	1.0	4211151
Calculated TDS	mg/L	400	320		270	1.0	4211156
Carb. Alkalinity (calc. as CaCO3)	mg/L	2.0	1.9		1.1	1.0	4211151
Cation Sum	me/L	7.60	6.24		4.46	N/A	4211153
Hardness (CaCO3)	mg/L	370	300		78	1.0	4211907
Ion Balance (% Difference)	%	0.870	0.0100		5.98	N/A	4210924
Langelier Index (@ 20C)	N/A	0.896	0.808		-0.0170		4211154
Langelier Index (@ 4C)	N/A	0.648	0.559		-0.267		4211155
Saturation pH (@ 20C)	N/A	6.93	7.04		7.80		4211154
Saturation pH (@ 4C)	N/A	7.18	7.29		8.05		4211155
Inorganics							
Total Ammonia-N	mg/L	<0.050	<0.050		0.18	0.050	4216954
Conductivity	umho/cm	700	570		440	1.0	4214840
Dissolved Organic Carbon	mg/L	0.66	0.69		4.8	0.20	4213259
Orthophosphate (P)	mg/L	<0.010	<0.010		0.021	0.010	4215045
pH	pH	7.83	7.85		7.78	N/A	4214835
Dissolved Sulphate (SO4)	mg/L	33	9.9		37	1.0	4215046
Alkalinity (Total as CaCO3)	mg/L	320	280		200	1.0	4214821
Dissolved Chloride (Cl)	mg/L	14	8.7		8.4	1.0	4215041
Nitrite (N)	mg/L	<0.010	<0.010		0.021	0.010	4214908
Nitrate (N)	mg/L	3.36	2.56		<0.10	0.10	4214908
Nitrate + Nitrite (N)	mg/L	3.36	2.56		<0.10	0.10	4214908
Metals							
Dissolved Aluminum (Al)	mg/L	<0.0050	<0.0050	<0.0050	0.012	0.0050	4218446
Dissolved Antimony (Sb)	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	0.00050	4218446
Dissolved Arsenic (As)	mg/L	<0.0010	<0.0010	<0.0010	0.0018	0.0010	4218446
Dissolved Barium (Ba)	mg/L	0.075	0.015	0.014	0.034	0.0020	4218446
Dissolved Beryllium (Be)	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	0.00050	4218446
Dissolved Boron (B)	mg/L	<0.010	<0.010	<0.010	0.14	0.010	4218446
Dissolved Cadmium (Cd)	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	0.00010	4218446
Dissolved Calcium (Ca)	mg/L	100	86	86	20	0.20	4218446

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate
N/A = Not Applicable

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Maxxam Job #: B5J8856
Report Date: 2015/10/07

Stantec Consulting Ltd
Client Project #: 160310875
Sampler Initials: AV

RCAP - COMPREHENSIVE (WATER)

Maxxam ID		BBU085	BBU087	BBU087	BBU088		
Sampling Date		2015/09/28 12:09	2015/09/28 16:37	2015/09/28 16:37	2015/09/28 15:59		
COC Number		526923-01-01	526923-01-01	526923-01-01	526923-01-01		
	UNITS	WG-160310875 -20150928-AV01	WG-160310875 -20150928-AV02	WG-160310875 -20150928-AV02 Lab-Dup	WG-160310875 -20150928-AV03	RDL	QC Batch
Dissolved Chromium (Cr)	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	4218446
Dissolved Cobalt (Co)	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	0.00050	4218446
Dissolved Copper (Cu)	mg/L	0.0010	<0.0010	<0.0010	<0.0010	0.0010	4218446
Dissolved Iron (Fe)	mg/L	<0.10	<0.10	<0.10	<0.10	0.10	4218446
Dissolved Lead (Pb)	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	0.00050	4218446
Dissolved Magnesium (Mg)	mg/L	28	21	22	6.6	0.050	4218446
Dissolved Manganese (Mn)	mg/L	0.0058	<0.0020	<0.0020	0.049	0.0020	4218446
Dissolved Molybdenum (Mo)	mg/L	0.00054	<0.00050	<0.00050	0.031	0.00050	4218446
Dissolved Nickel (Ni)	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	4218446
Dissolved Phosphorus (P)	mg/L	<0.10	<0.10	<0.10	<0.10	0.10	4218446
Dissolved Potassium (K)	mg/L	1.0	0.72	0.71	0.90	0.20	4218446
Dissolved Selenium (Se)	mg/L	<0.0020	<0.0020	<0.0020	<0.0020	0.0020	4218446
Dissolved Silicon (Si)	mg/L	6.4	5.3	5.3	4.7	0.050	4218446
Dissolved Silver (Ag)	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	0.00010	4218446
Dissolved Sodium (Na)	mg/L	3.2	3.6	3.7	66	0.10	4218446
Dissolved Strontium (Sr)	mg/L	0.15	0.10	0.10	0.38	0.0010	4218446
Dissolved Thallium (Tl)	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	0.000050	4218446
Dissolved Titanium (Ti)	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	4218446
Dissolved Uranium (U)	mg/L	0.00079	0.00019	0.00021	0.0022	0.00010	4218446
Dissolved Vanadium (V)	mg/L	<0.00050	<0.00050	<0.00050	0.0013	0.00050	4218446
Dissolved Zinc (Zn)	mg/L	0.040	<0.0050	<0.0050	<0.0050	0.0050	4218446

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate

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Maxxam Job #: B5J8856
Report Date: 2015/10/07

Stantec Consulting Ltd
Client Project #: 160310875
Sampler Initials: AV

RCAP - COMPREHENSIVE (WATER)

Maxxam ID		BBU089	BBU089		BBU090	BBU090		
Sampling Date		2015/09/28 15:43	2015/09/28 15:43		2015/09/28 16:49	2015/09/28 16:49		
COC Number		526923-01-01	526923-01-01		526923-01-01	526923-01-01		
	UNITS	WG-160310875-20150928-AV04	WG-160310875-20150928-AV04 Lab-Dup	QC Batch	WG-160310875-20150928-AV05	WG-160310875-20150928-AV05 Lab-Dup	RDL	QC Batch
Calculated Parameters								
Anion Sum	me/L	4.75		4211153	5.23		N/A	4211153
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	180		4211151	180		1.0	4211151
Calculated TDS	mg/L	270		4211156	300		1.0	4211156
Carb. Alkalinity (calc. as CaCO3)	mg/L	1.1		4211151	<1.0		1.0	4211151
Cation Sum	me/L	4.86		4211153	4.91		N/A	4211153
Hardness (CaCO3)	mg/L	240		4211907	240		1.0	4211907
Ion Balance (% Difference)	%	1.10		4210924	3.24		N/A	4210924
Langelier Index (@ 20C)	N/A	0.490		4211154	0.429			4211154
Langelier Index (@ 4C)	N/A	0.241		4211155	0.180			4211155
Saturation pH (@ 20C)	N/A	7.30		4211154	7.28			4211154
Saturation pH (@ 4C)	N/A	7.54		4211155	7.53			4211155
Inorganics								
Total Ammonia-N	mg/L	<0.050		4216954	0.11		0.050	4216954
Conductivity	umho/cm	460	460	4214840	510		1.0	4214763
Dissolved Organic Carbon	mg/L	1.4		4213259	1.1		0.20	4213259
Orthophosphate (P)	mg/L	<0.010	<0.010	4215045	<0.010	<0.010	0.010	4216363
pH	pH	7.79	7.82	4214835	7.71		N/A	4214762
Dissolved Sulphate (SO4)	mg/L	4.6	4.6	4215046	7.0	7.0	1.0	4216369
Alkalinity (Total as CaCO3)	mg/L	180	190	4214821	180		1.0	4214752
Dissolved Chloride (Cl)	mg/L	3.5	3.6	4215041	11	11	1.0	4216362
Nitrite (N)	mg/L	<0.010	<0.010	4214908	<0.010		0.010	4214720
Nitrate (N)	mg/L	12.1	12.1	4214908	15.9		0.50	4214720
Nitrate + Nitrite (N)	mg/L	12.1	12.1	4214908	15.9		0.50	4214720
Metals								
Dissolved Aluminum (Al)	mg/L	<0.0050		4218446	<0.0050		0.0050	4218446
Dissolved Antimony (Sb)	mg/L	<0.00050		4218446	<0.00050		0.00050	4218446
Dissolved Arsenic (As)	mg/L	<0.0010		4218446	<0.0010		0.0010	4218446
Dissolved Barium (Ba)	mg/L	0.011		4218446	0.016		0.0020	4218446
Dissolved Beryllium (Be)	mg/L	<0.00050		4218446	<0.00050		0.00050	4218446
Dissolved Boron (B)	mg/L	<0.010		4218446	<0.010		0.010	4218446
Dissolved Cadmium (Cd)	mg/L	<0.00010		4218446	<0.00010		0.00010	4218446
Dissolved Calcium (Ca)	mg/L	71		4218446	74		0.20	4218446
Dissolved Chromium (Cr)	mg/L	<0.0050		4218446	<0.0050		0.0050	4218446

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate

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Maxxam Job #: B5J8856
Report Date: 2015/10/07

Stantec Consulting Ltd
Client Project #: 160310875
Sampler Initials: AV

RCAP - COMPREHENSIVE (WATER)

Maxxam ID		BBU089	BBU089		BBU090	BBU090		
Sampling Date		2015/09/28 15:43	2015/09/28 15:43		2015/09/28 16:49	2015/09/28 16:49		
COC Number		526923-01-01	526923-01-01		526923-01-01	526923-01-01		
	UNITS	WG-160310875-20150928-AV04	WG-160310875-20150928-AV04 Lab-Dup	QC Batch	WG-160310875-20150928-AV05	WG-160310875-20150928-AV05 Lab-Dup	RDL	QC Batch
Dissolved Cobalt (Co)	mg/L	<0.00050		4218446	<0.00050		0.00050	4218446
Dissolved Copper (Cu)	mg/L	0.0013		4218446	0.0012		0.0010	4218446
Dissolved Iron (Fe)	mg/L	<0.10		4218446	<0.10		0.10	4218446
Dissolved Lead (Pb)	mg/L	<0.00050		4218446	<0.00050		0.00050	4218446
Dissolved Magnesium (Mg)	mg/L	15		4218446	13		0.050	4218446
Dissolved Manganese (Mn)	mg/L	<0.0020		4218446	<0.0020		0.0020	4218446
Dissolved Molybdenum (Mo)	mg/L	0.00068		4218446	<0.00050		0.00050	4218446
Dissolved Nickel (Ni)	mg/L	<0.0010		4218446	<0.0010		0.0010	4218446
Dissolved Phosphorus (P)	mg/L	<0.10		4218446	<0.10		0.10	4218446
Dissolved Potassium (K)	mg/L	3.6		4218446	2.5		0.20	4218446
Dissolved Selenium (Se)	mg/L	<0.0020		4218446	<0.0020		0.0020	4218446
Dissolved Silicon (Si)	mg/L	2.6		4218446	3.1		0.050	4218446
Dissolved Silver (Ag)	mg/L	<0.00010		4218446	<0.00010		0.00010	4218446
Dissolved Sodium (Na)	mg/L	1.1		4218446	1.3		0.10	4218446
Dissolved Strontium (Sr)	mg/L	0.095		4218446	0.10		0.0010	4218446
Dissolved Thallium (Tl)	mg/L	<0.000050		4218446	<0.000050		0.000050	4218446
Dissolved Titanium (Ti)	mg/L	<0.0050		4218446	<0.0050		0.0050	4218446
Dissolved Uranium (U)	mg/L	0.00015		4218446	0.00019		0.00010	4218446
Dissolved Vanadium (V)	mg/L	<0.00050		4218446	<0.00050		0.00050	4218446
Dissolved Zinc (Zn)	mg/L	<0.0050		4218446	<0.0050		0.0050	4218446

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate

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Maxxam Job #: B5J8856
Report Date: 2015/10/07

Stantec Consulting Ltd
Client Project #: 160310875
Sampler Initials: AV

RCAP - COMPREHENSIVE (WATER)

Maxxam ID		BBU091		BBU092			BBU093		
Sampling Date		2015/09/29 09:56		2015/09/29 11:07			2015/09/29 13:24		
COC Number		526923-01-01		526923-01-01			526923-01-01		
	UNITS	WG-160310875-20150929-AV06	RDL	WG-160310875-20150929-AV07	RDL	QC Batch	WG-160310875-20150929-AV08	RDL	QC Batch
Calculated Parameters									
Anion Sum	me/L	7.99	N/A	5.45	N/A	4211153	13.9	N/A	4211153
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	250	1.0	250	1.0	4211151	250	1.0	4211151
Calculated TDS	mg/L	470	1.0	280	1.0	4211156	850	1.0	4211156
Carb. Alkalinity (calc. as CaCO3)	mg/L	1.7	1.0	2.2	1.0	4211151	1.3	1.0	4211151
Cation Sum	me/L	7.84	N/A	5.25	N/A	4211153	14.2	N/A	4211153
Hardness (CaCO3)	mg/L	360	1.0	240	1.0	4211907	660	1.0	4211907
Ion Balance (% Difference)	%	0.950	N/A	1.89	N/A	4210924	0.820	N/A	4210924
Langelier Index (@ 20C)	N/A	0.787		0.684		4211154	0.897		4211154
Langelier Index (@ 4C)	N/A	0.539		0.435		4211155	0.650		4211155
Saturation pH (@ 20C)	N/A	7.08		7.29		4211154	6.84		4211154
Saturation pH (@ 4C)	N/A	7.33		7.54		4211155	7.09		4211155
Inorganics									
Total Ammonia-N	mg/L	<0.050	0.050	0.27	0.050	4216954	0.16	0.050	4216954
Conductivity	umho/cm	760	1.0	480	1.0	4214763	1200	1.0	4214840
Dissolved Organic Carbon	mg/L	1.9	0.20	1.0	0.20	4213259	0.86	0.20	4213259
Orthophosphate (P)	mg/L	<0.010	0.010	0.010	0.010	4215045	<0.010	0.010	4215045
pH	pH	7.87	N/A	7.97	N/A	4214762	7.74	N/A	4214835
Dissolved Sulphate (SO4)	mg/L	37	1.0	14	1.0	4215046	410	2.0	4215046
Alkalinity (Total as CaCO3)	mg/L	250	1.0	250	1.0	4214752	250	1.0	4214821
Dissolved Chloride (Cl)	mg/L	17	1.0	1.9	1.0	4215041	20	1.0	4215041
Nitrite (N)	mg/L	<0.010	0.010	0.056	0.010	4214717	<0.010	0.010	4214908
Nitrate (N)	mg/L	24.3	1.0	0.11	0.10	4214717	<0.10	0.10	4214908
Nitrate + Nitrite (N)	mg/L	24.3	1.0	0.16	0.10	4214717	<0.10	0.10	4214908
Metals									
Dissolved Aluminum (Al)	mg/L	<0.0050	0.0050	<0.0050	0.0050	4218446	<0.0050	0.0050	4218446
Dissolved Antimony (Sb)	mg/L	<0.00050	0.00050	<0.00050	0.00050	4218446	<0.00050	0.00050	4218446
Dissolved Arsenic (As)	mg/L	<0.0010	0.0010	0.015	0.0010	4218446	0.0032	0.0010	4218446
Dissolved Barium (Ba)	mg/L	0.074	0.0020	0.099	0.0020	4218446	0.027	0.0020	4218446
Dissolved Beryllium (Be)	mg/L	<0.00050	0.00050	<0.00050	0.00050	4218446	<0.00050	0.00050	4218446
Dissolved Boron (B)	mg/L	0.020	0.010	0.025	0.010	4218446	0.051	0.010	4218446
Dissolved Cadmium (Cd)	mg/L	<0.00010	0.00010	<0.00010	0.00010	4218446	<0.00010	0.00010	4218446
Dissolved Calcium (Ca)	mg/L	96	0.20	53	0.20	4218446	200	0.20	4218446
Dissolved Chromium (Cr)	mg/L	<0.0050	0.0050	<0.0050	0.0050	4218446	<0.0050	0.0050	4218446

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
N/A = Not Applicable

Maxxam Job #: B5J8856
Report Date: 2015/10/07

Stantec Consulting Ltd
Client Project #: 160310875
Sampler Initials: AV

RCAP - COMPREHENSIVE (WATER)

Maxxam ID		BBU091		BBU092			BBU093		
Sampling Date		2015/09/29 09:56		2015/09/29 11:07			2015/09/29 13:24		
COC Number		526923-01-01		526923-01-01			526923-01-01		
	UNITS	WG-160310875-20150929-AV06	RDL	WG-160310875-20150929-AV07	RDL	QC Batch	WG-160310875-20150929-AV08	RDL	QC Batch
Dissolved Cobalt (Co)	mg/L	<0.00050	0.00050	<0.00050	0.00050	4218446	<0.00050	0.00050	4218446
Dissolved Copper (Cu)	mg/L	0.0021	0.0010	<0.0010	0.0010	4218446	<0.0010	0.0010	4218446
Dissolved Iron (Fe)	mg/L	<0.10	0.10	0.20	0.10	4218446	1.3	0.10	4218446
Dissolved Lead (Pb)	mg/L	<0.00050	0.00050	<0.00050	0.00050	4218446	<0.00050	0.00050	4218446
Dissolved Magnesium (Mg)	mg/L	29	0.050	27	0.050	4218446	42	0.050	4218446
Dissolved Manganese (Mn)	mg/L	<0.0020	0.0020	0.022	0.0020	4218446	0.037	0.0020	4218446
Dissolved Molybdenum (Mo)	mg/L	<0.00050	0.00050	0.0010	0.00050	4218446	0.00073	0.00050	4218446
Dissolved Nickel (Ni)	mg/L	<0.0010	0.0010	<0.0010	0.0010	4218446	<0.0010	0.0010	4218446
Dissolved Phosphorus (P)	mg/L	<0.10	0.10	<0.10	0.10	4218446	<0.10	0.10	4218446
Dissolved Potassium (K)	mg/L	1.7	0.20	1.4	0.20	4218446	1.5	0.20	4218446
Dissolved Selenium (Se)	mg/L	<0.0020	0.0020	<0.0020	0.0020	4218446	<0.0020	0.0020	4218446
Dissolved Silicon (Si)	mg/L	6.8	0.050	12	0.050	4218446	7.6	0.050	4218446
Dissolved Silver (Ag)	mg/L	<0.00010	0.00010	<0.00010	0.00010	4218446	<0.00010	0.00010	4218446
Dissolved Sodium (Na)	mg/L	14	0.10	7.8	0.10	4218446	18	0.10	4218446
Dissolved Strontium (Sr)	mg/L	0.15	0.0010	0.35	0.0010	4218446	3.1	0.0010	4218446
Dissolved Thallium (Tl)	mg/L	<0.000050	0.000050	<0.000050	0.000050	4218446	<0.000050	0.000050	4218446
Dissolved Titanium (Ti)	mg/L	<0.0050	0.0050	<0.0050	0.0050	4218446	<0.0050	0.0050	4218446
Dissolved Uranium (U)	mg/L	0.00081	0.00010	0.00012	0.00010	4218446	0.00030	0.00010	4218446
Dissolved Vanadium (V)	mg/L	<0.00050	0.00050	<0.00050	0.00050	4218446	<0.00050	0.00050	4218446
Dissolved Zinc (Zn)	mg/L	0.020	0.0050	<0.0050	0.0050	4218446	<0.0050	0.0050	4218446

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Maxxam Job #: B5J8856
Report Date: 2015/10/07

Stantec Consulting Ltd
Client Project #: 160310875
Sampler Initials: AV

RCAP - COMPREHENSIVE (WATER)

Maxxam ID		BBU093			BBU094		
Sampling Date		2015/09/29 13:24			2015/09/29 14:58		
COC Number		526923-01-01			526923-01-01		
	UNITS	WG-160310875-20150929-AV08 Lab-Dup	RDL	QC Batch	WG-160310875-20150929-AV09	RDL	QC Batch
Calculated Parameters							
Anion Sum	me/L		N/A	4211153	9.24	N/A	4211153
Bicarb. Alkalinity (calc. as CaCO3)	mg/L		1.0	4211151	410	1.0	4211151
Calculated TDS	mg/L		1.0	4211156	480	1.0	4211156
Carb. Alkalinity (calc. as CaCO3)	mg/L		1.0	4211151	2.2	1.0	4211151
Cation Sum	me/L		N/A	4211153	9.64	N/A	4211153
Hardness (CaCO3)	mg/L		1.0	4211907	460	1.0	4211907
Ion Balance (% Difference)	%		N/A	4210924	2.12	N/A	4210924
Langelier Index (@ 20C)	N/A			4211154	0.974		4211154
Langelier Index (@ 4C)	N/A			4211155	0.726		4211155
Saturation pH (@ 20C)	N/A			4211154	6.77		4211154
Saturation pH (@ 4C)	N/A			4211155	7.02		4211155
Inorganics							
Total Ammonia-N	mg/L	0.15	0.050	4216954	<0.050	0.050	4216954
Conductivity	umho/cm		1.0	4214840	830	1.0	4214763
Dissolved Organic Carbon	mg/L		0.20	4213259	0.85	0.20	4213259
Orthophosphate (P)	mg/L		0.010	4215045	<0.010	0.010	4215045
pH	pH		N/A	4214835	7.75	N/A	4214762
Dissolved Sulphate (SO4)	mg/L		2.0	4215046	20	1.0	4215046
Alkalinity (Total as CaCO3)	mg/L		1.0	4214821	420	1.0	4214752
Dissolved Chloride (Cl)	mg/L		1.0	4215041	15	1.0	4215041
Nitrite (N)	mg/L		0.010	4214908	0.013	0.010	4214720
Nitrate (N)	mg/L		0.10	4214908	0.95	0.10	4214720
Nitrate + Nitrite (N)	mg/L		0.10	4214908	0.97	0.10	4214720
Metals							
Dissolved Aluminum (Al)	mg/L		0.0050	4218446	<0.0050	0.0050	4218446
Dissolved Antimony (Sb)	mg/L		0.00050	4218446	<0.00050	0.00050	4218446
Dissolved Arsenic (As)	mg/L		0.0010	4218446	<0.0010	0.0010	4218446
Dissolved Barium (Ba)	mg/L		0.0020	4218446	0.092	0.0020	4218446
Dissolved Beryllium (Be)	mg/L		0.00050	4218446	<0.00050	0.00050	4218446
Dissolved Boron (B)	mg/L		0.010	4218446	0.011	0.010	4218446
Dissolved Cadmium (Cd)	mg/L		0.00010	4218446	<0.00010	0.00010	4218446
Dissolved Calcium (Ca)	mg/L		0.20	4218446	120	0.20	4218446

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate
N/A = Not Applicable

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Maxxam Job #: B5J8856
Report Date: 2015/10/07

Stantec Consulting Ltd
Client Project #: 160310875
Sampler Initials: AV

RCAP - COMPREHENSIVE (WATER)

Maxxam ID		BBU093			BBU094		
Sampling Date		2015/09/29 13:24			2015/09/29 14:58		
COC Number		526923-01-01			526923-01-01		
	UNITS	WG-160310875-20150929-AV08 Lab-Dup	RDL	QC Batch	WG-160310875-20150929-AV09	RDL	QC Batch
Dissolved Chromium (Cr)	mg/L		0.0050	4218446	<0.0050	0.0050	4218446
Dissolved Cobalt (Co)	mg/L		0.00050	4218446	<0.00050	0.00050	4218446
Dissolved Copper (Cu)	mg/L		0.0010	4218446	<0.0010	0.0010	4218446
Dissolved Iron (Fe)	mg/L		0.10	4218446	<0.10	0.10	4218446
Dissolved Lead (Pb)	mg/L		0.00050	4218446	<0.00050	0.00050	4218446
Dissolved Magnesium (Mg)	mg/L		0.050	4218446	42	0.050	4218446
Dissolved Manganese (Mn)	mg/L		0.0020	4218446	0.061	0.0020	4218446
Dissolved Molybdenum (Mo)	mg/L		0.00050	4218446	<0.00050	0.00050	4218446
Dissolved Nickel (Ni)	mg/L		0.0010	4218446	<0.0010	0.0010	4218446
Dissolved Phosphorus (P)	mg/L		0.10	4218446	<0.10	0.10	4218446
Dissolved Potassium (K)	mg/L		0.20	4218446	2.5	0.20	4218446
Dissolved Selenium (Se)	mg/L		0.0020	4218446	<0.0020	0.0020	4218446
Dissolved Silicon (Si)	mg/L		0.050	4218446	8.2	0.050	4218446
Dissolved Silver (Ag)	mg/L		0.00010	4218446	<0.00010	0.00010	4218446
Dissolved Sodium (Na)	mg/L		0.10	4218446	6.7	0.10	4218446
Dissolved Strontium (Sr)	mg/L		0.0010	4218446	0.35	0.0010	4218446
Dissolved Thallium (Tl)	mg/L		0.000050	4218446	<0.000050	0.000050	4218446
Dissolved Titanium (Ti)	mg/L		0.0050	4218446	<0.0050	0.0050	4218446
Dissolved Uranium (U)	mg/L		0.00010	4218446	0.0014	0.00010	4218446
Dissolved Vanadium (V)	mg/L		0.00050	4218446	<0.00050	0.00050	4218446
Dissolved Zinc (Zn)	mg/L		0.0050	4218446	<0.0050	0.0050	4218446

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate

Maxxam Job #: B5J8856
Report Date: 2015/10/07

Stantec Consulting Ltd
Client Project #: 160310875
Sampler Initials: AV

RCAP - COMPREHENSIVE (WATER)

Maxxam ID		BBU095			BBU096		
Sampling Date		2015/09/29 15:46			2015/09/29 16:15		
COC Number		526923-01-01			526923-02-01		
	UNITS	WG-160310875-20150929-AV010	RDL	QC Batch	WG-160310875-20150929-AV011	RDL	QC Batch
Calculated Parameters							
Anion Sum	me/L	7.00	N/A	4211153	22.2	N/A	4211153
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	240	1.0	4211151	310	1.0	4211151
Calculated TDS	mg/L	390	1.0	4211156	1300	1.0	4211156
Carb. Alkalinity (calc. as CaCO3)	mg/L	1.8	1.0	4211151	2.1	1.0	4211151
Cation Sum	me/L	6.92	N/A	4211153	22.7	N/A	4211153
Hardness (CaCO3)	mg/L	290	1.0	4211907	290	1.0	4211907
Ion Balance (% Difference)	%	0.550	N/A	4210924	1.06	N/A	4210924
Langelier Index (@ 20C)	N/A	0.756		4211154	0.723		4211154
Langelier Index (@ 4C)	N/A	0.508		4211155	0.478		4211155
Saturation pH (@ 20C)	N/A	7.16		4211154	7.13		4211154
Saturation pH (@ 4C)	N/A	7.40		4211155	7.38		4211155
Inorganics							
Total Ammonia-N	mg/L	0.087	0.050	4216954	<0.050	0.050	4216954
Conductivity	umho/cm	660	1.0	4214840	2400	1.0	4214763
Dissolved Organic Carbon	mg/L	0.86	0.20	4213259	1.5	0.20	4213259
Orthophosphate (P)	mg/L	<0.010	0.010	4215045	<0.010	0.010	4215045
pH	pH	7.91	N/A	4214835	7.85	N/A	4214762
Dissolved Sulphate (SO4)	mg/L	72	1.0	4215046	21	1.0	4215046
Alkalinity (Total as CaCO3)	mg/L	240	1.0	4214821	320	1.0	4214752
Dissolved Chloride (Cl)	mg/L	26	1.0	4215041	550	5.0	4215041
Nitrite (N)	mg/L	<0.010	0.010	4214908	<0.010	0.010	4214717
Nitrate (N)	mg/L	<0.10	0.10	4214908	<0.10	0.10	4214717
Nitrate + Nitrite (N)	mg/L	<0.10	0.10	4214908	<0.10	0.10	4214717
Metals							
Dissolved Aluminum (Al)	mg/L	<0.0050	0.0050	4218446	<0.0050	0.0050	4218446
Dissolved Antimony (Sb)	mg/L	<0.00050	0.00050	4218446	<0.00050	0.00050	4218446
Dissolved Arsenic (As)	mg/L	0.0046	0.0010	4218446	<0.0010	0.0010	4218446
Dissolved Barium (Ba)	mg/L	0.041	0.0020	4218446	0.098	0.0020	4218446
Dissolved Beryllium (Be)	mg/L	<0.00050	0.00050	4218446	<0.00050	0.00050	4218446
Dissolved Boron (B)	mg/L	0.030	0.010	4218446	<0.010	0.010	4218446
Dissolved Cadmium (Cd)	mg/L	<0.00010	0.00010	4218446	<0.00010	0.00010	4218446
Dissolved Calcium (Ca)	mg/L	81	0.20	4218446	89	0.20	4218446
Dissolved Chromium (Cr)	mg/L	<0.0050	0.0050	4218446	<0.0050	0.0050	4218446

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
N/A = Not Applicable

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Maxxam Job #: B5J8856
Report Date: 2015/10/07

Stantec Consulting Ltd
Client Project #: 160310875
Sampler Initials: AV

RCAP - COMPREHENSIVE (WATER)

Maxxam ID		BBU095			BBU096		
Sampling Date		2015/09/29 15:46			2015/09/29 16:15		
COC Number		526923-01-01			526923-02-01		
	UNITS	WG-160310875-20150929-AV010	RDL	QC Batch	WG-160310875-20150929-AV011	RDL	QC Batch
Dissolved Cobalt (Co)	mg/L	<0.00050	0.00050	4218446	<0.00050	0.00050	4218446
Dissolved Copper (Cu)	mg/L	<0.0010	0.0010	4218446	<0.0010	0.0010	4218446
Dissolved Iron (Fe)	mg/L	0.69	0.10	4218446	<0.10	0.10	4218446
Dissolved Lead (Pb)	mg/L	<0.00050	0.00050	4218446	<0.00050	0.00050	4218446
Dissolved Magnesium (Mg)	mg/L	22	0.050	4218446	16	0.050	4218446
Dissolved Manganese (Mn)	mg/L	0.097	0.0020	4218446	0.066	0.0020	4218446
Dissolved Molybdenum (Mo)	mg/L	0.0014	0.00050	4218446	0.00051	0.00050	4218446
Dissolved Nickel (Ni)	mg/L	<0.0010	0.0010	4218446	<0.0010	0.0010	4218446
Dissolved Phosphorus (P)	mg/L	<0.10	0.10	4218446	<0.10	0.10	4218446
Dissolved Potassium (K)	mg/L	0.94	0.20	4218446	3.1	0.20	4218446
Dissolved Selenium (Se)	mg/L	<0.0020	0.0020	4218446	<0.0020	0.0020	4218446
Dissolved Silicon (Si)	mg/L	9.1	0.050	4218446	4.2	0.050	4218446
Dissolved Silver (Ag)	mg/L	<0.00010	0.00010	4218446	<0.00010	0.00010	4218446
Dissolved Sodium (Na)	mg/L	23	0.10	4218446	390	0.10	4218446
Dissolved Strontium (Sr)	mg/L	1.3	0.0010	4218446	0.19	0.0010	4218446
Dissolved Thallium (Tl)	mg/L	<0.000050	0.000050	4218446	<0.000050	0.000050	4218446
Dissolved Titanium (Ti)	mg/L	<0.0050	0.0050	4218446	<0.0050	0.0050	4218446
Dissolved Uranium (U)	mg/L	0.00030	0.00010	4218446	0.00075	0.00010	4218446
Dissolved Vanadium (V)	mg/L	<0.00050	0.00050	4218446	<0.00050	0.00050	4218446
Dissolved Zinc (Zn)	mg/L	<0.0050	0.0050	4218446	0.0066	0.0050	4218446

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam Job #: B5J8856
Report Date: 2015/10/07

Stantec Consulting Ltd
Client Project #: 160310875
Sampler Initials: AV

TEST SUMMARY

Maxxam ID: BBU085
Sample ID: WG-160310875-20150928-AV01
Matrix: Water

Collected: 2015/09/28
Shipped:
Received: 2015/09/30

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	4214821	N/A	2015/10/02	Surinder Rai
Carbonate, Bicarbonate and Hydroxide	CALC	4211151	N/A	2015/10/05	Automated Statchk
Chloride by Automated Colourimetry	KONE	4215041	N/A	2015/10/05	Deonarine Ramnarine
Conductivity	AT	4214840	N/A	2015/10/02	Surinder Rai
Dissolved Organic Carbon (DOC)	TOCV/NDIR	4213259	N/A	2015/10/01	Anastasia Hamanov
Hardness (calculated as CaCO3)		4211907	N/A	2015/10/06	Automated Statchk
Dissolved Metals by ICPMS	ICP/MS	4218446	N/A	2015/10/06	Cristina Petran
Ion Balance (% Difference)	CALC	4210924	N/A	2015/10/06	Automated Statchk
Anion and Cation Sum	CALC	4211153	N/A	2015/10/06	Automated Statchk
Total Ammonia-N	LACH/NH4	4216954	N/A	2015/10/06	Charles Opoku-Ware
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	4214908	N/A	2015/10/05	Chandra Nandlal
pH	AT	4214835	N/A	2015/10/02	Surinder Rai
Orthophosphate	KONE	4215045	N/A	2015/10/05	Alina Dobreanu
Sat. pH and Langelier Index (@ 20C)	CALC	4211154	N/A	2015/10/06	Automated Statchk
Sat. pH and Langelier Index (@ 4C)	CALC	4211155	N/A	2015/10/06	Automated Statchk
Sulphate by Automated Colourimetry	KONE	4215046	N/A	2015/10/05	Alina Dobreanu
Total Dissolved Solids (TDS calc)	CALC	4211156	N/A	2015/10/06	Automated Statchk

Maxxam ID: BBU087
Sample ID: WG-160310875-20150928-AV02
Matrix: Water

Collected: 2015/09/28
Shipped:
Received: 2015/09/30

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	4214821	N/A	2015/10/02	Surinder Rai
Carbonate, Bicarbonate and Hydroxide	CALC	4211151	N/A	2015/10/05	Automated Statchk
Chloride by Automated Colourimetry	KONE	4215041	N/A	2015/10/05	Deonarine Ramnarine
Conductivity	AT	4214840	N/A	2015/10/02	Surinder Rai
Dissolved Organic Carbon (DOC)	TOCV/NDIR	4213259	N/A	2015/10/01	Anastasia Hamanov
Hardness (calculated as CaCO3)		4211907	N/A	2015/10/06	Automated Statchk
Dissolved Metals by ICPMS	ICP/MS	4218446	N/A	2015/10/06	Cristina Petran
Ion Balance (% Difference)	CALC	4210924	N/A	2015/10/06	Automated Statchk
Anion and Cation Sum	CALC	4211153	N/A	2015/10/06	Automated Statchk
Total Ammonia-N	LACH/NH4	4216954	N/A	2015/10/06	Charles Opoku-Ware
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	4214908	N/A	2015/10/05	Chandra Nandlal
pH	AT	4214835	N/A	2015/10/02	Surinder Rai
Orthophosphate	KONE	4215045	N/A	2015/10/05	Alina Dobreanu
Sat. pH and Langelier Index (@ 20C)	CALC	4211154	N/A	2015/10/06	Automated Statchk
Sat. pH and Langelier Index (@ 4C)	CALC	4211155	N/A	2015/10/06	Automated Statchk
Sulphate by Automated Colourimetry	KONE	4215046	N/A	2015/10/05	Alina Dobreanu
Total Dissolved Solids (TDS calc)	CALC	4211156	N/A	2015/10/06	Automated Statchk

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Maxxam Job #: B5J8856
Report Date: 2015/10/07

Stantec Consulting Ltd
Client Project #: 160310875
Sampler Initials: AV

TEST SUMMARY

Maxxam ID: BBU087 Dup
Sample ID: WG-160310875-20150928-AV02
Matrix: Water

Collected: 2015/09/28
Shipped:
Received: 2015/09/30

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Dissolved Metals by ICPMS	ICP/MS	4218446	N/A	2015/10/06	Cristina Petran

Maxxam ID: BBU088
Sample ID: WG-160310875-20150928-AV03
Matrix: Water

Collected: 2015/09/28
Shipped:
Received: 2015/09/30

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	4214821	N/A	2015/10/02	Surinder Rai
Carbonate, Bicarbonate and Hydroxide	CALC	4211151	N/A	2015/10/05	Automated Statchk
Chloride by Automated Colourimetry	KONE	4215041	N/A	2015/10/05	Deonarine Ramnarine
Conductivity	AT	4214840	N/A	2015/10/02	Surinder Rai
Dissolved Organic Carbon (DOC)	TOCV/NDIR	4213259	N/A	2015/10/01	Anastasia Hamanov
Hardness (calculated as CaCO3)		4211907	N/A	2015/10/06	Automated Statchk
Dissolved Metals by ICPMS	ICP/MS	4218446	N/A	2015/10/06	Cristina Petran
Ion Balance (% Difference)	CALC	4210924	N/A	2015/10/06	Automated Statchk
Anion and Cation Sum	CALC	4211153	N/A	2015/10/06	Automated Statchk
Total Ammonia-N	LACH/NH4	4216954	N/A	2015/10/06	Charles Opoku-Ware
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	4214908	N/A	2015/10/05	Chandra Nandlal
pH	AT	4214835	N/A	2015/10/02	Surinder Rai
Orthophosphate	KONE	4215045	N/A	2015/10/05	Alina Dobreanu
Sat. pH and Langelier Index (@ 20C)	CALC	4211154	N/A	2015/10/06	Automated Statchk
Sat. pH and Langelier Index (@ 4C)	CALC	4211155	N/A	2015/10/06	Automated Statchk
Sulphate by Automated Colourimetry	KONE	4215046	N/A	2015/10/05	Alina Dobreanu
Total Dissolved Solids (TDS calc)	CALC	4211156	N/A	2015/10/06	Automated Statchk

Maxxam ID: BBU089
Sample ID: WG-160310875-20150928-AV04
Matrix: Water

Collected: 2015/09/28
Shipped:
Received: 2015/09/30

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	4214821	N/A	2015/10/02	Surinder Rai
Carbonate, Bicarbonate and Hydroxide	CALC	4211151	N/A	2015/10/05	Automated Statchk
Chloride by Automated Colourimetry	KONE	4215041	N/A	2015/10/05	Deonarine Ramnarine
Conductivity	AT	4214840	N/A	2015/10/02	Surinder Rai
Dissolved Organic Carbon (DOC)	TOCV/NDIR	4213259	N/A	2015/10/01	Anastasia Hamanov
Hardness (calculated as CaCO3)		4211907	N/A	2015/10/06	Automated Statchk
Dissolved Metals by ICPMS	ICP/MS	4218446	N/A	2015/10/06	Cristina Petran
Ion Balance (% Difference)	CALC	4210924	N/A	2015/10/06	Automated Statchk
Anion and Cation Sum	CALC	4211153	N/A	2015/10/06	Automated Statchk
Total Ammonia-N	LACH/NH4	4216954	N/A	2015/10/06	Charles Opoku-Ware
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	4214908	N/A	2015/10/05	Chandra Nandlal
pH	AT	4214835	N/A	2015/10/02	Surinder Rai
Orthophosphate	KONE	4215045	N/A	2015/10/05	Alina Dobreanu
Sat. pH and Langelier Index (@ 20C)	CALC	4211154	N/A	2015/10/06	Automated Statchk
Sat. pH and Langelier Index (@ 4C)	CALC	4211155	N/A	2015/10/06	Automated Statchk

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Maxxam Job #: B5J8856
Report Date: 2015/10/07

Stantec Consulting Ltd
Client Project #: 160310875
Sampler Initials: AV

TEST SUMMARY

Maxxam ID: BBU089
Sample ID: WG-160310875-20150928-AV04
Matrix: Water

Collected: 2015/09/28
Shipped:
Received: 2015/09/30

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Sulphate by Automated Colourimetry	KONE	4215046	N/A	2015/10/05	Alina Dobreanu
Total Dissolved Solids (TDS calc)	CALC	4211156	N/A	2015/10/06	Automated Statchk

Maxxam ID: BBU089 Dup
Sample ID: WG-160310875-20150928-AV04
Matrix: Water

Collected: 2015/09/28
Shipped:
Received: 2015/09/30

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	4214821	N/A	2015/10/02	Surinder Rai
Chloride by Automated Colourimetry	KONE	4215041	N/A	2015/10/05	Deonarine Ramnarine
Conductivity	AT	4214840	N/A	2015/10/02	Surinder Rai
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	4214908	N/A	2015/10/05	Chandra Nandlal
pH	AT	4214835	N/A	2015/10/02	Surinder Rai
Orthophosphate	KONE	4215045	N/A	2015/10/05	Alina Dobreanu
Sulphate by Automated Colourimetry	KONE	4215046	N/A	2015/10/05	Alina Dobreanu

Maxxam ID: BBU090
Sample ID: WG-160310875-20150928-AV05
Matrix: Water

Collected: 2015/09/28
Shipped:
Received: 2015/09/30

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	4214752	N/A	2015/10/02	Surinder Rai
Carbonate, Bicarbonate and Hydroxide	CALC	4211151	N/A	2015/10/05	Automated Statchk
Chloride by Automated Colourimetry	KONE	4216362	N/A	2015/10/05	Deonarine Ramnarine
Conductivity	AT	4214763	N/A	2015/10/02	Surinder Rai
Dissolved Organic Carbon (DOC)	TOCV/NDIR	4213259	N/A	2015/10/01	Anastasia Hamanov
Hardness (calculated as CaCO3)		4211907	N/A	2015/10/06	Automated Statchk
Dissolved Metals by ICPMS	ICP/MS	4218446	N/A	2015/10/06	Cristina Petran
Ion Balance (% Difference)	CALC	4210924	N/A	2015/10/06	Automated Statchk
Anion and Cation Sum	CALC	4211153	N/A	2015/10/06	Automated Statchk
Total Ammonia-N	LACH/NH4	4216954	N/A	2015/10/06	Charles Opoku-Ware
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	4214720	N/A	2015/10/05	Chandra Nandlal
pH	AT	4214762	N/A	2015/10/02	Surinder Rai
Orthophosphate	KONE	4216363	N/A	2015/10/05	Alina Dobreanu
Sat. pH and Langelier Index (@ 20C)	CALC	4211154	N/A	2015/10/06	Automated Statchk
Sat. pH and Langelier Index (@ 4C)	CALC	4211155	N/A	2015/10/06	Automated Statchk
Sulphate by Automated Colourimetry	KONE	4216369	N/A	2015/10/05	Deonarine Ramnarine
Total Dissolved Solids (TDS calc)	CALC	4211156	N/A	2015/10/06	Automated Statchk

Maxxam ID: BBU090 Dup
Sample ID: WG-160310875-20150928-AV05
Matrix: Water

Collected: 2015/09/28
Shipped:
Received: 2015/09/30

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Chloride by Automated Colourimetry	KONE	4216362	N/A	2015/10/05	Deonarine Ramnarine
Orthophosphate	KONE	4216363	N/A	2015/10/05	Alina Dobreanu

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Maxxam Job #: B5J8856
Report Date: 2015/10/07

Stantec Consulting Ltd
Client Project #: 160310875
Sampler Initials: AV

TEST SUMMARY

Maxxam ID: BBU090 Dup
Sample ID: WG-160310875-20150928-AV05
Matrix: Water

Collected: 2015/09/28
Shipped:
Received: 2015/09/30

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Sulphate by Automated Colourimetry	KONE	4216369	N/A	2015/10/05	Deonarine Ramnarine

Maxxam ID: BBU091
Sample ID: WG-160310875-20150929-AV06
Matrix: Water

Collected: 2015/09/29
Shipped:
Received: 2015/09/30

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	4214752	N/A	2015/10/02	Surinder Rai
Carbonate, Bicarbonate and Hydroxide	CALC	4211151	N/A	2015/10/05	Automated Statchk
Chloride by Automated Colourimetry	KONE	4215041	N/A	2015/10/05	Deonarine Ramnarine
Conductivity	AT	4214763	N/A	2015/10/02	Surinder Rai
Dissolved Organic Carbon (DOC)	TOCV/NDIR	4213259	N/A	2015/10/01	Anastasia Hamanov
Hardness (calculated as CaCO3)		4211907	N/A	2015/10/06	Automated Statchk
Dissolved Metals by ICPMS	ICP/MS	4218446	N/A	2015/10/06	Cristina Petran
Ion Balance (% Difference)	CALC	4210924	N/A	2015/10/06	Automated Statchk
Anion and Cation Sum	CALC	4211153	N/A	2015/10/06	Automated Statchk
Total Ammonia-N	LACH/NH4	4216954	N/A	2015/10/06	Charles Opoku-Ware
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	4214717	N/A	2015/10/05	Chandra Nandlal
pH	AT	4214762	N/A	2015/10/02	Surinder Rai
Orthophosphate	KONE	4215045	N/A	2015/10/05	Alina Dobreanu
Sat. pH and Langelier Index (@ 20C)	CALC	4211154	N/A	2015/10/06	Automated Statchk
Sat. pH and Langelier Index (@ 4C)	CALC	4211155	N/A	2015/10/06	Automated Statchk
Sulphate by Automated Colourimetry	KONE	4215046	N/A	2015/10/05	Alina Dobreanu
Total Dissolved Solids (TDS calc)	CALC	4211156	N/A	2015/10/06	Automated Statchk

Maxxam ID: BBU092
Sample ID: WG-160310875-20150929-AV07
Matrix: Water

Collected: 2015/09/29
Shipped:
Received: 2015/09/30

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	4214752	N/A	2015/10/02	Surinder Rai
Carbonate, Bicarbonate and Hydroxide	CALC	4211151	N/A	2015/10/05	Automated Statchk
Chloride by Automated Colourimetry	KONE	4215041	N/A	2015/10/05	Deonarine Ramnarine
Conductivity	AT	4214763	N/A	2015/10/02	Surinder Rai
Dissolved Organic Carbon (DOC)	TOCV/NDIR	4213259	N/A	2015/10/01	Anastasia Hamanov
Hardness (calculated as CaCO3)		4211907	N/A	2015/10/06	Automated Statchk
Dissolved Metals by ICPMS	ICP/MS	4218446	N/A	2015/10/06	Cristina Petran
Ion Balance (% Difference)	CALC	4210924	N/A	2015/10/06	Automated Statchk
Anion and Cation Sum	CALC	4211153	N/A	2015/10/06	Automated Statchk
Total Ammonia-N	LACH/NH4	4216954	N/A	2015/10/06	Charles Opoku-Ware
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	4214717	N/A	2015/10/05	Chandra Nandlal
pH	AT	4214762	N/A	2015/10/02	Surinder Rai
Orthophosphate	KONE	4215045	N/A	2015/10/05	Alina Dobreanu
Sat. pH and Langelier Index (@ 20C)	CALC	4211154	N/A	2015/10/06	Automated Statchk
Sat. pH and Langelier Index (@ 4C)	CALC	4211155	N/A	2015/10/06	Automated Statchk

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Maxxam Job #: B5J8856
Report Date: 2015/10/07

Stantec Consulting Ltd
Client Project #: 160310875
Sampler Initials: AV

TEST SUMMARY

Maxxam ID: BBU092 **Collected:** 2015/09/29
Sample ID: WG-160310875-20150929-AV07 **Shipped:**
Matrix: Water **Received:** 2015/09/30

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Sulphate by Automated Colourimetry	KONE	4215046	N/A	2015/10/05	Alina Dobreanu
Total Dissolved Solids (TDS calc)	CALC	4211156	N/A	2015/10/06	Automated Statchk

Maxxam ID: BBU093 **Collected:** 2015/09/29
Sample ID: WG-160310875-20150929-AV08 **Shipped:**
Matrix: Water **Received:** 2015/09/30

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	4214821	N/A	2015/10/02	Surinder Rai
Carbonate, Bicarbonate and Hydroxide	CALC	4211151	N/A	2015/10/05	Automated Statchk
Chloride by Automated Colourimetry	KONE	4215041	N/A	2015/10/05	Deonarine Ramnarine
Conductivity	AT	4214840	N/A	2015/10/02	Surinder Rai
Dissolved Organic Carbon (DOC)	TOCV/NDIR	4213259	N/A	2015/10/01	Anastasia Hamanov
Hardness (calculated as CaCO3)		4211907	N/A	2015/10/06	Automated Statchk
Dissolved Metals by ICPMS	ICP/MS	4218446	N/A	2015/10/06	Cristina Petran
Ion Balance (% Difference)	CALC	4210924	N/A	2015/10/06	Automated Statchk
Anion and Cation Sum	CALC	4211153	N/A	2015/10/06	Automated Statchk
Total Ammonia-N	LACH/NH4	4216954	N/A	2015/10/06	Charles Opoku-Ware
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	4214908	N/A	2015/10/05	Chandra Nandlal
pH	AT	4214835	N/A	2015/10/02	Surinder Rai
Orthophosphate	KONE	4215045	N/A	2015/10/05	Alina Dobreanu
Sat. pH and Langelier Index (@ 20C)	CALC	4211154	N/A	2015/10/06	Automated Statchk
Sat. pH and Langelier Index (@ 4C)	CALC	4211155	N/A	2015/10/06	Automated Statchk
Sulphate by Automated Colourimetry	KONE	4215046	N/A	2015/10/05	Alina Dobreanu
Total Dissolved Solids (TDS calc)	CALC	4211156	N/A	2015/10/06	Automated Statchk

Maxxam ID: BBU093 Dup **Collected:** 2015/09/29
Sample ID: WG-160310875-20150929-AV08 **Shipped:**
Matrix: Water **Received:** 2015/09/30

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Total Ammonia-N	LACH/NH4	4216954	N/A	2015/10/06	Charles Opoku-Ware

Maxxam ID: BBU094 **Collected:** 2015/09/29
Sample ID: WG-160310875-20150929-AV09 **Shipped:**
Matrix: Water **Received:** 2015/09/30

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	4214752	N/A	2015/10/02	Surinder Rai
Carbonate, Bicarbonate and Hydroxide	CALC	4211151	N/A	2015/10/05	Automated Statchk
Chloride by Automated Colourimetry	KONE	4215041	N/A	2015/10/05	Deonarine Ramnarine
Conductivity	AT	4214763	N/A	2015/10/02	Surinder Rai
Dissolved Organic Carbon (DOC)	TOCV/NDIR	4213259	N/A	2015/10/01	Anastasia Hamanov
Hardness (calculated as CaCO3)		4211907	N/A	2015/10/06	Automated Statchk
Dissolved Metals by ICPMS	ICP/MS	4218446	N/A	2015/10/06	Cristina Petran
Ion Balance (% Difference)	CALC	4210924	N/A	2015/10/06	Automated Statchk

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Maxxam Job #: B5J8856
Report Date: 2015/10/07

Stantec Consulting Ltd
Client Project #: 160310875
Sampler Initials: AV

TEST SUMMARY

Maxxam ID: BBU094
Sample ID: WG-160310875-20150929-AV09
Matrix: Water

Collected: 2015/09/29
Shipped:
Received: 2015/09/30

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Anion and Cation Sum	CALC	4211153	N/A	2015/10/06	Automated Statchk
Total Ammonia-N	LACH/NH4	4216954	N/A	2015/10/06	Charles Opoku-Ware
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	4214720	N/A	2015/10/05	Chandra Nandlal
pH	AT	4214762	N/A	2015/10/02	Surinder Rai
Orthophosphate	KONE	4215045	N/A	2015/10/05	Alina Dobreanu
Sat. pH and Langelier Index (@ 20C)	CALC	4211154	N/A	2015/10/06	Automated Statchk
Sat. pH and Langelier Index (@ 4C)	CALC	4211155	N/A	2015/10/06	Automated Statchk
Sulphate by Automated Colourimetry	KONE	4215046	N/A	2015/10/05	Alina Dobreanu
Total Dissolved Solids (TDS calc)	CALC	4211156	N/A	2015/10/06	Automated Statchk

Maxxam ID: BBU095
Sample ID: WG-160310875-20150929-AV010
Matrix: Water

Collected: 2015/09/29
Shipped:
Received: 2015/09/30

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	4214821	N/A	2015/10/02	Surinder Rai
Carbonate, Bicarbonate and Hydroxide	CALC	4211151	N/A	2015/10/05	Automated Statchk
Chloride by Automated Colourimetry	KONE	4215041	N/A	2015/10/05	Deonarine Ramnarine
Conductivity	AT	4214840	N/A	2015/10/02	Surinder Rai
Dissolved Organic Carbon (DOC)	TOCV/NDIR	4213259	N/A	2015/10/01	Anastasia Hamanov
Hardness (calculated as CaCO3)		4211907	N/A	2015/10/06	Automated Statchk
Dissolved Metals by ICPMS	ICP/MS	4218446	N/A	2015/10/06	Cristina Petran
Ion Balance (% Difference)	CALC	4210924	N/A	2015/10/06	Automated Statchk
Anion and Cation Sum	CALC	4211153	N/A	2015/10/06	Automated Statchk
Total Ammonia-N	LACH/NH4	4216954	N/A	2015/10/06	Charles Opoku-Ware
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	4214908	N/A	2015/10/05	Chandra Nandlal
pH	AT	4214835	N/A	2015/10/02	Surinder Rai
Orthophosphate	KONE	4215045	N/A	2015/10/05	Alina Dobreanu
Sat. pH and Langelier Index (@ 20C)	CALC	4211154	N/A	2015/10/06	Automated Statchk
Sat. pH and Langelier Index (@ 4C)	CALC	4211155	N/A	2015/10/06	Automated Statchk
Sulphate by Automated Colourimetry	KONE	4215046	N/A	2015/10/05	Alina Dobreanu
Total Dissolved Solids (TDS calc)	CALC	4211156	N/A	2015/10/06	Automated Statchk

Maxxam ID: BBU096
Sample ID: WG-160310875-20150929-AV011
Matrix: Water

Collected: 2015/09/29
Shipped:
Received: 2015/09/30

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	4214752	N/A	2015/10/02	Surinder Rai
Carbonate, Bicarbonate and Hydroxide	CALC	4211151	N/A	2015/10/05	Automated Statchk
Chloride by Automated Colourimetry	KONE	4215041	N/A	2015/10/05	Deonarine Ramnarine
Conductivity	AT	4214763	N/A	2015/10/02	Surinder Rai
Dissolved Organic Carbon (DOC)	TOCV/NDIR	4213259	N/A	2015/10/01	Anastasia Hamanov
Hardness (calculated as CaCO3)		4211907	N/A	2015/10/06	Automated Statchk
Dissolved Metals by ICPMS	ICP/MS	4218446	N/A	2015/10/06	Cristina Petran

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Maxxam Job #: B5J8856
Report Date: 2015/10/07

Stantec Consulting Ltd
Client Project #: 160310875
Sampler Initials: AV

TEST SUMMARY

Maxxam ID: BBU096
Sample ID: WG-160310875-20150929-AV011
Matrix: Water

Collected: 2015/09/29
Shipped:
Received: 2015/09/30

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Ion Balance (% Difference)	CALC	4210924	N/A	2015/10/06	Automated Statchk
Anion and Cation Sum	CALC	4211153	N/A	2015/10/06	Automated Statchk
Total Ammonia-N	LACH/NH4	4216954	N/A	2015/10/06	Charles Opoku-Ware
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	4214717	N/A	2015/10/05	Chandra Nandlal
pH	AT	4214762	N/A	2015/10/02	Surinder Rai
Orthophosphate	KONE	4215045	N/A	2015/10/05	Alina Dobreanu
Sat. pH and Langelier Index (@ 20C)	CALC	4211154	N/A	2015/10/06	Automated Statchk
Sat. pH and Langelier Index (@ 4C)	CALC	4211155	N/A	2015/10/06	Automated Statchk
Sulphate by Automated Colourimetry	KONE	4215046	N/A	2015/10/05	Alina Dobreanu
Total Dissolved Solids (TDS calc)	CALC	4211156	N/A	2015/10/06	Automated Statchk

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Maxxam Job #: B5J8856
Report Date: 2015/10/07

Stantec Consulting Ltd
Client Project #: 160310875
Sampler Initials: AV

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	7.0°C

Results relate only to the items tested.

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Maxxam Job #: B5J8856
Report Date: 2015/10/07

QUALITY ASSURANCE REPORT

Stantec Consulting Ltd
Client Project #: 160310875
Sampler Initials: AV

			Matrix Spike		SPIKED BLANK		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
4213259	Dissolved Organic Carbon	2015/10/01	102	80 - 120	102	80 - 120	<0.20	mg/L	1.3	20
4214717	Nitrate (N)	2015/10/05	98	80 - 120	94	80 - 120	<0.10	mg/L	NC	25
4214717	Nitrite (N)	2015/10/05	107	80 - 120	104	80 - 120	<0.010	mg/L	NC	25
4214720	Nitrate (N)	2015/10/05	95	80 - 120	94	80 - 120	<0.10	mg/L	2.0	25
4214720	Nitrite (N)	2015/10/05	105	80 - 120	105	80 - 120	<0.010	mg/L	NC	25
4214752	Alkalinity (Total as CaCO3)	2015/10/02			97	85 - 115	<1.0	mg/L	0.70	25
4214762	pH	2015/10/02			101	98 - 103			0.35	N/A
4214763	Conductivity	2015/10/02			100	85 - 115	<1.0	umho/cm	0	25
4214821	Alkalinity (Total as CaCO3)	2015/10/02			97	85 - 115	<1.0	mg/L	0.35	25
4214835	pH	2015/10/02			101	98 - 103			0.48	N/A
4214840	Conductivity	2015/10/02			100	85 - 115	<1.0	umho/cm	0.22	25
4214908	Nitrate (N)	2015/10/05	NC	80 - 120	102	80 - 120	<0.10	mg/L	0.19	25
4214908	Nitrite (N)	2015/10/05	103	80 - 120	102	80 - 120	<0.010	mg/L	NC	25
4215041	Dissolved Chloride (Cl)	2015/10/05	110	80 - 120	104	80 - 120	<1.0	mg/L	NC	20
4215045	Orthophosphate (P)	2015/10/05	106	75 - 125	100	80 - 120	<0.010	mg/L	NC	25
4215046	Dissolved Sulphate (SO4)	2015/10/05	112	75 - 125	101	80 - 120	<1.0	mg/L	NC	20
4216362	Dissolved Chloride (Cl)	2015/10/05	NC	80 - 120	104	80 - 120	<1.0	mg/L	0.65	20
4216363	Orthophosphate (P)	2015/10/05	104	75 - 125	100	80 - 120	<0.010	mg/L	NC	25
4216369	Dissolved Sulphate (SO4)	2015/10/05	116	75 - 125	101	80 - 120	<1.0	mg/L	0.083	20
4216954	Total Ammonia-N	2015/10/06	97	80 - 120	102	85 - 115	<0.050	mg/L	NC	20
4218446	Dissolved Aluminum (Al)	2015/10/06	98	80 - 120	95	80 - 120	<0.0050	mg/L	NC	20
4218446	Dissolved Antimony (Sb)	2015/10/06	100	80 - 120	98	80 - 120	<0.00050	mg/L	NC	20
4218446	Dissolved Arsenic (As)	2015/10/06	97	80 - 120	99	80 - 120	<0.0010	mg/L	NC	20
4218446	Dissolved Barium (Ba)	2015/10/06	96	80 - 120	97	80 - 120	<0.0020	mg/L	3.6	20
4218446	Dissolved Beryllium (Be)	2015/10/06	100	80 - 120	101	80 - 120	<0.00050	mg/L	NC	20
4218446	Dissolved Boron (B)	2015/10/06	100	80 - 120	100	80 - 120	<0.010	mg/L	NC	20
4218446	Dissolved Cadmium (Cd)	2015/10/06	97	80 - 120	97	80 - 120	<0.00010	mg/L	NC	20
4218446	Dissolved Calcium (Ca)	2015/10/06	NC	80 - 120	97	80 - 120	<0.20	mg/L	0.27	20
4218446	Dissolved Chromium (Cr)	2015/10/06	96	80 - 120	96	80 - 120	<0.0050	mg/L	NC	20
4218446	Dissolved Cobalt (Co)	2015/10/06	98	80 - 120	99	80 - 120	<0.00050	mg/L	NC	20
4218446	Dissolved Copper (Cu)	2015/10/06	96	80 - 120	97	80 - 120	<0.0010	mg/L	NC	20

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QUALITY ASSURANCE REPORT(CONT'D)

			Matrix Spike		SPIKED BLANK		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
4218446	Dissolved Iron (Fe)	2015/10/06	98	80 - 120	100	80 - 120	<0.10	mg/L	NC	20
4218446	Dissolved Lead (Pb)	2015/10/06	92	80 - 120	93	80 - 120	<0.00050	mg/L	NC	20
4218446	Dissolved Magnesium (Mg)	2015/10/06	NC	80 - 120	99	80 - 120	<0.050	mg/L	2.2	20
4218446	Dissolved Manganese (Mn)	2015/10/06	97	80 - 120	99	80 - 120	<0.0020	mg/L	NC	20
4218446	Dissolved Molybdenum (Mo)	2015/10/06	99	80 - 120	99	80 - 120	<0.00050	mg/L	NC	20
4218446	Dissolved Nickel (Ni)	2015/10/06	99	80 - 120	99	80 - 120	<0.0010	mg/L	NC	20
4218446	Dissolved Phosphorus (P)	2015/10/06	104	80 - 120	107	80 - 120	<0.10	mg/L	NC	20
4218446	Dissolved Potassium (K)	2015/10/06	101	80 - 120	101	80 - 120	<0.20	mg/L	NC	20
4218446	Dissolved Selenium (Se)	2015/10/06	95	80 - 120	93	80 - 120	<0.0020	mg/L	NC	20
4218446	Dissolved Silicon (Si)	2015/10/06	99	80 - 120	96	80 - 120	<0.050	mg/L	0.45	20
4218446	Dissolved Silver (Ag)	2015/10/06	95	80 - 120	95	80 - 120	<0.00010	mg/L	NC	20
4218446	Dissolved Sodium (Na)	2015/10/06	99	80 - 120	99	80 - 120	<0.10	mg/L	1.2	20
4218446	Dissolved Strontium (Sr)	2015/10/06	98	80 - 120	97	80 - 120	<0.0010	mg/L	0.91	20
4218446	Dissolved Thallium (Tl)	2015/10/06	92	80 - 120	93	80 - 120	<0.000050	mg/L	NC	20
4218446	Dissolved Titanium (Ti)	2015/10/06	98	80 - 120	94	80 - 120	<0.0050	mg/L	NC	20
4218446	Dissolved Uranium (U)	2015/10/06	93	80 - 120	94	80 - 120	<0.00010	mg/L	NC	20
4218446	Dissolved Vanadium (V)	2015/10/06	97	80 - 120	96	80 - 120	<0.00050	mg/L	NC	20
4218446	Dissolved Zinc (Zn)	2015/10/06	94	80 - 120	97	80 - 120	<0.0050	mg/L	NC	20

N/A = Not Applicable

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spiked amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than 2x that of the native sample concentration).

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (one or both samples < 5x RDL).

Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

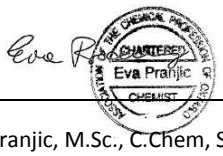
Maxxam Job #: B5J8856
Report Date: 2015/10/07

Stantec Consulting Ltd
Client Project #: 160310875
Sampler Initials: AV

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

Cristina Carriere, Scientific Services



Ewa Pranjic, M.Sc., C.Chem, Scientific Specialist

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

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STANTEC CHAIN OF CUSTODY RECORD

Page 1 of 2

INVOICE INFORMATION:		REPORT INFORMATION(if differs from invoice):		PROJECT INFORMATION:		Laboratory Use Only:	
Company Name:	#9197 Stantec Consulting Ltd	Company Name:		Quotation #:	B52646	Maxxam Job #:	Bottle Order #:
Contact Name:	~~Aaron Vandenhoff~~ LESLEY VEALE	Contact Name:	~~Aaron Vandenhoff~~	Task #:			526923
Address:	49 Frederick St Kitchener ON N2H 6M7	Address:	LESLEY.VEALE@STANTEC.COM EDD@STANTEC.COM	Project #:	160310875	COC #:	Project Manager:
Phone:	(519) 579-4410 Fax: (519) 579-6733	Phone:	Fax:	Profit Centre:	1609	C#526923-01-01	Shaun Nowickyj
Email:	accounts.payable.invoices@stantec.com	Email:	~~Aaron.Vandenhoff@stantec.com~~	Site #:			
				Sampled By:	A.VANDENHOFF		

MOE REGULATED DRINKING WATER OR WATER INTENDED FOR HUMAN CONSUMPTION MUST BE SUBMITTED ON THE MAXXAM DRINKING WATER CHAIN OF CUSTODY

Regulation 153 (2011)	Other Regulations	Special Instructions
☐ Table 1 ☐ Res/Park ☐ Medium/Fine ☐ Table 2 ☐ Ind/Comm ☐ Coarse ☐ Table 3 ☐ Agri/Other ☐ For RSC ☐ Table ___	☐ CCME ☐ Sanitary Sewer Bylaw ☐ Reg 558 ☐ Storm Sewer Bylaw ☐ MISA Municipality ___ ☐ PWQO ☑ Other CCWS	

Include Criteria on Certificate of Analysis (Y/N)? ___

ANALYSIS REQUESTED (PLEASE BE SPECIFIC)

Turnaround Time (TAT) Required:
Please provide advance notice for rush projects

Regular (Standard) TAT: ☑
(will be applied if Rush TAT is not specified):
Standard TAT = 5-7 Working days for most tests.
Please note: Standard TAT for certain tests such as BOD and Dioxins/Furans are > 5 days - contact your Project Manager for details.

Job Specific Rush TAT (if applies to entire submission)
Date Required: ___ Time Required: ___ ☐
Rush Confirmation Number: ___ *(call lab for #)*

	Sample Barcode Label	Sample (Location) Identification	Date Sampled	Time Sampled	Matrix	Field Filtered (please circle): Metals / Hg / Cr VI	RCAp - Comprehensive	# of Bottles	Comments
1		WG-160310875-20150928-AV01	28-SEP	12:09	GW	✓	✓	4	
2		-AV02		16:37		✓	✓	4	
3		-AV03		15:59		✓	✓	4	
4		-AV04		15:43		✓	✓	4	
5		-AV05		16:49		✓	✓	4	
6		20150929-AV06	29-SEP	9:56		✓	✓	4	
7		-AV07		11:07		✓	✓	4	
8		-AV08		13:24		✓	✓	4	
9		-AV09		14:58		✓	✓	4	
10		-AV10		15:46		✓	✓	4	

30-Sep-15 10:13
Shaun Nowickyj
B5J8856
HGR ENV-674

REC'D IN WATERLOO

* RELINQUISHED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	RECEIVED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	# jars used and not submitted
AARON VANDENHOFF	15/09/30	10:17	[illegible] ROBERCAMPBELL DANIELLINI GRACIAN	2015/09/30 2015/09/30	1013 16100	

Laboratory Use Only				
Time Sensitive	Temperature (°C) on Receipt	Custody Seal	Yes	No
	8.8.5 Conic	Present		✓
	7.1.7	Intact		

* IT IS THE RESPONSIBILITY OF THE RELINQUISHER TO ENSURE THE ACCURACY OF THE CHAIN OF CUSTODY RECORD. AN INCOMPLETE CHAIN OF CUSTODY MAY RESULT IN ANALYTICAL TAT DELAYS

SAMPLES MUST BE KEPT COOL (< 10° C) FROM TIME OF SAMPLING UNTIL DELIVERY TO MAXXAM

White: Maxxam Yellow: Client

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STANTEC CHAIN OF CUSTODY RECORD

Page 2 of 2

INVOICE INFORMATION:	REPORT INFORMATION(if differs from invoice):	PROJECT INFORMATION:	Laboratory Use Only:
Company Name: #9197 Stantec Consulting Ltd	Company Name:	Quotation #: B52646	Maxxam Job #: / Bottle Order #: 526923
Contact Name: ~~Aaron Vandenhoff~~	Contact Name: ~~Aaron Vandenhoff~~	Task #:	
Address: 49 Frederick St, Kitchener ON N2H 6M7	Address: LESLEY.VEALE@STANTEC.COM, EDD@STANTEC.COM	Project #: 160310875	COC #: C#526923-02-01 / Project Manager: Shaun Nowicky
Phone: (519) 579-4410 Fax: (519) 579-6733	Phone: Fax:	Profit Centre: 1609	
Email: accounts.payable.invoices@stantec.com	Email: ~~Aaron.Vandenhoff@stantec.com~~	Site #: Sampled By: A.VANDENHOFF	

MOE REGULATED DRINKING WATER OR WATER INTENDED FOR HUMAN CONSUMPTION MUST BE SUBMITTED ON THE MAXXAM DRINKING WATER CHAIN OF CUSTODY

Regulation 153 (2011)	Other Regulations	Special Instructions
☐ Table 1 ☐ Res/Park ☐ Medium/Fine	☐ CCME ☐ Sanitary Sewer Bylaw	
☐ Table 2 ☐ Ind/Comm ☐ Coarse	☐ Reg 558 ☐ Storm Sewer Bylaw	
☐ Table 3 ☐ Agri/Other ☐ For RSC	☐ MISA Municipality	
☐ Table ___	☐ PWQO	
	☑ Other ODWS	

Include Criteria on Certificate of Analysis (Y/N)? ___

ANALYSIS REQUESTED (PLEASE BE SPECIFIC)

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	Sample Barcode Label	Sample (Location) Identification	Date Sampled	Time Sampled	Matrix	Field Filtered (please circle): Metals / Hg / Cr VI	RCAp - Comprehensive	# of Bottles	Comments
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2									
3									
4									
5									
6									
7									
8									
9									RECD IN WATERLOO
10									

* RELINQUISHED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	RECEIVED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	# jars used and not submitted
AARON VAN DENHOFF	2015/09/30	10:00	Amber Campbell / RONALYN GRACIAN	2015/09/30	1301 / 1610	

Laboratory Use Only

Time Sensitive	Temperature (°C) on Receipt	Custody Seal	Yes	No
	8.8 5 C / ice	Present		✓
		Intact		

* IT IS THE RESPONSIBILITY OF THE RELINQUISHER TO ENSURE THE ACCURACY OF THE CHAIN OF CUSTODY RECORD. AN INCOMPLETE CHAIN OF CUSTODY MAY RESULT IN ANALYTICAL TAT DELAYS.

SAMPLES MUST BE KEPT COOL (< 10° C) FROM TIME OF SAMPLING UNTIL DELIVERY TO MAXXAM

White: Maxxam Yellow: Client

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7/7/7