REPORT

FALL 2015 SEMI-ANNUAL MONITORING REPORT

Waste Management of Canada
Richmond Landfill
Town of Greater Napanee, Ontario

Submitted to:

WASTE MANAGEMENT OF CANADA
1271 Beechwood Road
Napanee, ON K7R 3L1

Submitted by:

BluMetric Environmental Inc.
The Tower, The Woolen Mill
4 Cataraqui Street
Kingston, ON K7K 1Z7

BluMetric File No.: K-B13060-00-05

January 2016

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1. INTRODUCTION

The purpose of this document is to present results and to provide an interpretation of the data that were collected during the summer and fall 2015 monitoring events at the Waste Management of Canada Corporation (WM) Richmond Landfill.

The WM Richmond Landfill is approved as a 16.2 hectare waste disposal (landfilling) facility within a total site area of 138 hectares, located on parts of Lots 1, 2 and 3, Concession IV of the former Township of Richmond, now in the Town of Greater Napanee, Ontario.

2. METHODOLOGY

2.1 PROGRAM SUMMARY

The summer and fall 2015 monitoring events were conducted in accordance with the requirements outlined in the revised interim Environmental Monitoring Plan (EMP; Revision No. 04) dated August 2015, as specified in the Environmental Compliance Approval (ECA) number A371203, issued by MOE January 9, 2012 and amended by Notice No. 1 dated May 3, 2013 and Environmental Review Tribunal (ERT) Order dated July 21, 2015.

The site layout and monitoring locations are shown on Figure 1. The monitoring programs for groundwater, surface water, leachate and landfill gas are summarized in Table 1.

For the summer 2015 monitoring event, the following activities were completed:

- Water levels were recorded on August 4, 2015 at groundwater monitoring wells (36 installed within the shallow groundwater flow zone and 33 from the intermediate bedrock flow zone), and at the three ponds located on site between the landfill and Beechwood Road. No water levels were recorded at monitoring wells M15, M18 and M39 because they were dry, or at M19 and OW57 because they are damaged.
- Surface water sampling was conducted on September 14, 2015 (after a rainfall event of greater than 25 mm) from locations S2, S3, S6 and S7. No samples were collected from locations S4R, S5 and S8R because they were dry.

The fall monitoring event was conducted between November 20 and December 10, 2015. The activities completed included the following:

- Water levels were recorded at groundwater monitoring wells on November 20, 2015 (41 installed within the shallow groundwater flow zone and 64 from the intermediate bedrock flow zone). No water levels were recorded at groundwater monitors M167, M178R-2 and

M178R-3 because they were flowing, M19 because it was damaged, and M178R-1 and M189 because they were not under static conditions;

- Pond water levels were measured on November 20, 2015 from staff gauges at the three ponds located on the south side of the landfill;
- Liquid levels were measured in landfill leachate wells on November 20, 2015;
- Seven off-site domestic water supply wells were sampled between November 23 and December 10, 2015. Water samples from private supply wells were analyzed for 1,4-dioxane;
- A total of 51 groundwater monitoring wells were sampled between November 23 and 26, 2015. Samples were analyzed for the suite of groundwater inorganic and general parameters and Volatile Organic Compounds (VOCs) listed in Table 2;
- In addition to the aforementioned sampling, monitoring well M82-2 was sampled two additional times during fall 2015 (on September 30 and November 3) over and above the twice yearly sampling required by the EMP as per amended ECA Condition No. 8.5(c)iv included in the ERT Order dated July 21, 2015;
- Surface water sampling was conducted on November 23, 2015 from locations S2, S3, S5, S6, S7 and S8R. No sample was collected from location S4R because it was dry. Surface water samples were analyzed for the surface water inorganic and general parameters and for 1,4 dioxane, as listed in Table 2;
- Landfill gas monitoring was conducted on November 24, 2015. Field measurements were made with a RKI Eagle probe calibrated to methane gas response at six gas monitors (GM1, GM3, GM4-1, GM4-2, GM5 and GM6); and
- A total of 13 Quality Assurance/Quality Control (QA/QC) samples were collected during the fall sampling event, including seven field duplicate samples, three field blanks, and three trip blanks. De-ionised water for analysis of blank samples was supplied by the laboratory.

2.2 Water Sample Collection and Laboratory Analysis

Groundwater and surface water samples were collected in accordance with accepted industry protocols. Groundwater samples were collected using dedicated Waterra inertial lift pumps connected to dedicated polyethylene tubing. Three casing volumes of water were purged from each monitoring well prior to the collection of groundwater samples. During purging, readings for pH, conductivity and temperature were recorded on a regular basis. The stabilization of the parameters was used to assess when well purging was complete. Low producing wells were purged dry and allowed to recover prior to sampling. If the monitoring well had not recovered sufficiently for sampling within 24 hours, the monitor was considered dry and a sample was not collected.

Domestic supply wells were sampled at an access point before any treatment system. A typical sampling location was a tap or access located near the pressure tank or when access to the treatment system was not available, the sample was collected from the kitchen tap (with the aerator screen removed). Prior to collecting the water sample, the water was allowed to run for a minimum of five but more typically closer to 10 minutes to ensure the volume of the pressure tank and supply line was purged and that the sample would be representative of well water conditions.

Surface water samples were collected using a clean bottle where water depth was sufficient; at sampling locations where water depth was an issue, a 50 cc syringe was used to carefully collect the surface water as not to disturb the bottom sediments. Surface water sampling locations were sampled from downstream to upstream to prevent any re-suspension of sediment impacting the downstream sampling locations. The pH, temperature, and conductivity of the surface water were obtained in the field at all surface water sampling points while minimizing disturbance of the bottom sediment.

All water samples were placed in bottles supplied and prepared by the laboratory. The samples were packed in coolers with ice and shipped by courier to the laboratory. All samples were analysed by Maxxam Analytics Inc. of Mississauga, ON, which is accredited by the *Canadian Association for Laboratory Accreditation Inc. (CALA).* Table 2 presents a summary of groundwater, surface water and leachate analytical parameters.

2.3 Groundwater Elevations

Water levels were recorded to the nearest 0.01 m using an electronic water level meter. Tables 3a and 3b present groundwater elevation monitoring locations for summer and fall monitoring events, respectively. The list of monitoring wells used to record groundwater elevations was different during the summer and fall events since a revised EMP (dated August 2015) was implemented on September 1, 2015 and used to conduct the fall monitoring event.

3. RESULTS AND DISCUSSION

Background information concerning the site geology and hydrogeology was described in detail in the Site Conceptual Model (SCM) report[1] and updated based on results from subsequent hydrogeological investigations[2], and is summarized here. The SCM report describes the groundwater flow conditions at the Richmond Landfill. Based on the results from extensive studies

[1] *Site Conceptual Model Report, WM Richmond Landfill*, prepared by Dr. B.H. Kueper and WESA Inc., October 2009

[2] *Supporting Document, Application to Amend Environmental Compliance Appproval No. A371203, Waste Management Richmond Landfill Site*, prepared by BluMetric Environmental Inc., March 2015

conducted previously at the site, the basic hydrogeological framework for the facility has been defined as follows:

- the active groundwater flow zone at the site extends to a depth of approximately 30 m below the top of bedrock;
- the shallow groundwater flow zone is conceptualized as the overburden, the overburden-bedrock contact and the upper one to two metres of bedrock;
- the direction of groundwater flow in the shallow flow zone is strongly influenced by topography;
- the intermediate bedrock flow zone extends from one to two metres below top of bedrock to a depth of approximately 30 m below top of bedrock;
- groundwater flows through a well-connected network of fractures in the upper 30 m of bedrock;
- the dominant fracture orientation is horizontal to sub-horizontal; however, vertical to subvertical fractures are present providing hydraulic connection between horizontal fractures;
- hydraulic connection of fractures exists in the intermediate bedrock flow zone to the west, south and east of the site (horizontal and vertical connections);
- intermediate bedrock flownets show that groundwater generally flows to the west from the western edge of the landfill, to the southeast from the southern edge of the landfill, to the south along the eastern edge of the landfill, and north to northwest from the northern limit of the landfill;
- the hydraulic conductivity of the intermediate bedrock is lower to the north and east of the landfill compared to other areas of the site, implying that the rate of groundwater flow is lower than in areas south, southeast and west of the landfill; and
- groundwater flow directions in the intermediate bedrock zone are variable with season.

3.1 LIQUID LEVELS IN LEACHATE WELLS

Liquid levels were measured in the two landfill leachate wells on August 4 and November 20, 2015 and provided the following:

- The liquid level at LW-P1 was 149.75 m above sea level (masl) on August 4, 2015 and 149.72 masl on November 20, 2015; and,
- The liquid level at LW-P2 was 153.38 masl on August 4, 2015 and 152.59 masl on November 20, 2015.

3.2 GROUNDWATER RESULTS

3.2.1 Groundwater Elevations

Groundwater elevations from program monitoring wells listed in Tables 3a and 3b were measured on August 4 and November 20, 2015 and are presented in Tables 4a and 4b, respectively. An inventory of monitoring well locations is provided in Appendix A. Groundwater elevation contours within the shallow groundwater flow zone are shown on Figures 2a (summer) and 2b (fall), while Figures 3a (summer) and 3b (fall) show the groundwater elevation contours for the intermediate bedrock flow zone. Groundwater flow directions were inferred by interpolating the water elevations from wells screened within the corresponding groundwater flow zone, and are consistent with historical results.

The summer and fall 2015 shallow groundwater contours (Figures 2a and 2b, respectively) are consistent with historical results and show that the Empey Hill drumlin southwest from the landfill creates a flow divide, with shallow groundwater being directed both to the north and the south towards areas of lower hydraulic heads. North of the landfill, shallow groundwater converges towards Marysville Creek in the area immediately east of County Road 10 (Deseronto Road), while shallow flow in the southern portion of the site converges on Beechwood Ditch and the southern pond system. Shallow groundwater east of the landfill is influenced by a local zone of higher water levels in the vicinity of monitoring well M96; shallow groundwater north of M96 flows to the north-northwest and ultimately Marysville Creek, while groundwater south of M96 flows to the south-southwest, towards Beechwood Ditch and the ponds.

The summer and fall 2015 intermediate bedrock zone contours are presented on Figures 3a and 3b, respectively. On the landfill property, groundwater in this hydrostratigraphic unit generally flows to the north, west, and south-southeast relative to the landfill. Water levels from some intermediate bedrock monitors (e.g., M71, M170, M178R-1, M185-1 and M191) were not used in the interpolation to prepare the fall 2015 groundwater contours, as the water levels at these locations were not static, believed to be influenced from past sampling or recent hydraulic testing events. Additional intermediate bedrock zone monitoring wells located farther to the south (e.g., M173, M174, M179, M181, M182, M188 and M189) were also excluded from the fall 2015 groundwater contours because they exhibit much lower hydraulic heads, and appear to be part of a separate group of hydraulically responsive wells within the intermediate bedrock flow zone. Additional details on the ongoing hydrogeological investigation in the area south and southeast of the Site are provided under separate cover[3].

[3] *Site Conceptual Model Update and Contaminant Attenuation Zone Delineation, Waste Management Richmond Landfill Site*, prepared by BluMetric Environmental Inc., January 2016

3.2.2 Groundwater Analytical Results

Results from the groundwater monitoring wells sampled in fall 2015 are presented in Table 5a. Groundwater quality data for the fall 2015 monitoring event are similar to historical results, and include results for analytical parameters (e.g., 1,4 dioxane) and locations (monitoring wells M108 to M191), recently introduced into the Interim EMP implemented as required by ERT Order dated July 21, 2015.

3.2.2.1 Shallow Groundwater Flow Zone

Slightly elevated concentrations of a number of water quality parameters (e.g., alkalinity, boron, chloride, conductivity, DOC, sodium and/or TDS) were observed in some shallow groundwater zone monitoring wells located in close proximity to the landfill footprint (M6-3, M66-2, M85, M86, M101, M103 and M104), north and northwest from the unlined portion of the landfill. 1,4 dioxane was also detected in monitors M101 (as well as 1,1 dichloroethane), M103 and M104. M54-4, located approximately 200 m south of the landfill footprint, also exhibited slightly elevated alkalinity and conductivity and low but detectable concentrations for some VOCs. Detectable concentrations of toluene were measured at M67-2 and M87-2, located to the northwest and southwest of the landfill, respectively.

In other areas of the site, there is no evidence of groundwater impacts away from the landfill footprint in the shallow groundwater flow zone. Isolated occurrences of elevated concentrations of water quality parameters (i.e., one or two parameters per sample) are seen elsewhere on the Site. No indications of elevated concentrations related to impacts are identified at the property boundary in the shallow flow zone.

3.2.2.2 Intermediate Groundwater Flow Zone

Analytical results from intermediate bedrock groundwater monitors sampled in fall 2015 are generally consistent with historical results. North of the landfill, elevated concentrations of water quality parameters and detectable 1,4 dioxane are noted at M6-3 and OW4, which are in close proximity to the footprint. These results indicate the presence of leachate impacts at these locations. However, the concentrations are lower and impacts from the landfill are not evident further north of the footprint and along Marysville Creek (e.g., at M5-3, M75, M82-1, M82-2 and OW1).

South of the landfill, the presence of 1,4 dioxane and elevated concentrations of alkalinity (typically greater than 400 mg/L where 1,4 dioxane is present), DOC, chloride and TDS indicate groundwater impacts from the landfill at monitoring well locations (M9-2, M9-3, M64-2, M108, M109-1, M110-1, M114-1, M121, M123, M167, M168, M170, M172, M178R-2, M178R-3 and M178R-4).

Monitoring well M80-1 exhibited low concentrations reflective of background conditions for all parameters with the exception of detectable BTEX concentrations. Other locations south and southeast of the landfill with elevated concentrations of chloride, sodium, TDS and/or BTEX compounds (M106, M178R-1, M185-1, M186 and M188) represent areas where the deeper connate (and often saline) groundwater is naturally affecting the water quality. These pockets of naturally poor quality groundwater are isolated and do not reflect any widespread or significant upwelling of saline groundwater.

To the west of the landfill (M72 and M74), the concentrations of water quality parameters are relatively low and continue to reflect background conditions.

Alkalinity and 1,4-dioxane results are shown for the shallow and intermediate bedrock flow zones on Figures 4 and 5, respectively.

3.2.3 Guideline B-7 Reasonable Use Limits (RULs)

Selected monitoring wells within the low-head areas of the WM Richmond Landfill in both the Shallow and Intermediate Bedrock Groundwater Flow Zones are compared to the RULs derived from laboratory analytical results (Table 5b). The proposed RULs reported in Table 5b for leachate indicator parameters and trigger wells were presented in the interim EMP (Revision No. 04) dated August 2015, with the exception of 1,4 dioxane for which the site-specific RUL of 0.001 mg/L was used as required by the ERT Order dated December 24, 2015.

All results for 1,4 dioxane at trigger wells in the shallow and intermediate bedrock flow zones were below the laboratory's reportable detection limit (RDL) of 0.001 mg/L.

In the shallow groundwater zone, slightly elevated concentrations of a number of inorganic or general water quality parameters above their respective RUL (e.g., alkalinity, DOC, iron, manganese, sodium and/or TDS) were observed in monitoring wells (M54-4, M66-2, M67-2, M80-2, M85, M86, M87-2 and OW37-s).

Slightly elevated concentrations of a number of water quality parameters above their respective RUL (e.g alkalinity, chloride, DOC, iron, manganese, sodium, and/or TDS) were also observed in some intermediate groundwater flow zone monitoring wells (M82-1, M82-2, M106, M179, M185-1, M186, M187 and M188). Benzene and toluene concentrations were above RUL at M80-1 and M185-1, respectively.

As specified in the EMP, any new exceedance of the groundwater RULs in a groundwater trigger well (as specified in Table 12 of the EMP) triggers the evaluation procedures detailed in

Section 7.1 of the EMP. Step 2 of this procedure requires that confirmation sampling be conducted within 7 days of the determination of a new RUL exceedance in a groundwater trigger well. Confirmation samples were collected on December 21 and 22, 2015 from groundwater monitoring locations M85, M179, M185-1 and M186, where new RUL exceedances were measured for non-health related parameters. The confirmation samples were analyzed for parameters specified in Table 3 and/or Table 4 of the EMP as appropriate depending on the first time RULs exceedances that triggered the re-sampling step. Results from the confirmation re-sampling event are summarized in Table 5c. Results were generally similar to the initial sampling. The initial RUL exceedances were confirmed in all cases, with the exception of iron at M185-1 (< 0.1 mg/L compared to 0.35 mg/L), DOC at M186 (3.5 mg/L compared to 3.7 mg/L), and sodium at M188 (100 mg/L compared to 110 mg/L).

3.2.4 Status of Monitoring Wells and Compliance with Ontario Regulation 903

During the fall 2015 monitoring event, the conditions of groundwater monitoring wells included in the EMP were inspected. Any repairs, such as new locks, labels or well caps, were made as necessary. Watertight casings and seals remain in place at all monitors to ensure that surface water or foreign materials cannot enter groundwater monitoring wells. Where the outer protective casing was deemed to be part of the well construction by MOECC, the protective casing was fitted with a vermin proof cap to meet the requirements of O. Reg 903. All groundwater monitoring wells are locked to provide protection against vandalism as per Waste Management standard operating procedure and in line with industry best practices.

With the exception of monitor M19 (damaged), all of the monitoring wells listed in the EMP were monitored. It is recommended that M19 be decommissioned when a revised EMP is approved as it cannot be repaired. A replacement well is considered unnecessary because groundwater flow in the shallow groundwater flow zone can be adequately assessed without this well.

3.2.5 Off-Site Domestic Water Supply Well Results

The following off-site domestic water supply wells were sampled between November 23 and December 10, 2015:

Address	Well Type	Water Treatment Information
614 Belleville Road	Drilled	Water softener – not operating
696 Belleville Road	Drilled	Water softener; sample collected pre-treatment
1441 County Road 1 West	Drilled	No water treatment
1654 County Road 1 West	Drilled	Water softener; sample collected pre-treatment
1680 County Road 1 West	Drilled	No water treatment
1695 County Road 1 West	Drilled	No water treatment

Letters were sent in advance of the fall monitoring event to residents at all 13 addresses specified in the EMP (also listed in Table 1 of this report). Where no response had been received after a few weeks, BluMetric staff attempted to contact the residents in person by going door to door. A last attempt was made to contact the remaining addresses where no response had been received. Despite several attempts to obtain permission from the owners, the remaining domestic wells could not be sampled. Sampling will be conducted as soon as practical should additional responses be received from the remaining domestic water supply well owners listed in Table 1, upon confirmation that they are drilled wells used to supply water for domestic use.

Results from off-site private water supply wells sampled in fall 2015 are presented in Table 6. All 1,4 dioxane concentrations were below the laboratory's RDL of 0.001 mg/L.

3.2.6 Groundwater Chemistry Quality Assurance / Quality Control (QA/QC)

An evaluation of the QA/QC data (from duplicate and blank samples) is included in Appendix B, where analytical results are compared between regular samples and their corresponding field duplicate samples, submitted to the laboratory without identifying the location they were collected from. A standard margin of error of 20% (relative percent difference (RPD) between regular sample and duplicate) was deemed acceptable for field duplicates. In general, the comparison between samples and duplicates shows very good correlation for the majority of analyzed constituents. All parameters for groundwater duplicate QA/QC sampling were well within the 20% margin of error with the three exceptions as summarized in Appendix B. All parameters that had RPD greater than 20% were measured at low concentrations (less than 5 times the RDL) and are therefore within acceptable margin of error. All parameters were near or below the RDL in equipment and field blanks.

3.3 SURFACE WATER RESULTS

3.3.1 Pond Elevations

Staff gauges are installed in the three ponds on the south side of the landfill labeled SG1, SG2 and SG3. Staff gauge locations and pond elevations measured on August 4 and November 20, 2015 are shown on Figures 2a and 2b.

3.3.2 Surface Water Monitoring Locations

The two water courses that may receive surface water/storm water runoff from the Richmond Landfill site are Marysville Creek to the north of the waste mound and Beechwood Ditch to the south (Figure 1). The Beechwood Ditch is a man-made surface water course that flows from the east onto WM property. It then flows west across a portion of the site before again crossing Beechwood Road and travelling southwest to cross County Road 10, and joins Marysville Creek east of Highway 49 and north of Highway 401. Both the Beechwood Ditch and Marysville Creek flow intermittently in the vicinity of the landfill. Marysville Creek has some base flow locally, and flows on a continuous basis west of County Road 10 (Deseronto Road). Marysville Creek eventually discharges into the Bay of Quinte at Hungry Bay.

Surface water monitoring locations are shown on Figure 1. Sampling locations S4R, S5 and S8R were not sampled in September 2015 because they were dry, despite conducting the sampling event following a rainfall event of greater than 25 mm (total rainfall over the previous 48 hours was approximately 46 mm). Similarly, sampling location S4R was not sampled in November 2015 because it was dry.

3.3.3 Surface Water Flow

Visual observations of surface water flow and general water characteristics for the summer and fall sampling programs are summarized in Tables 7a and 7b, respectively. During both monitoring events, surface water flow velocity was measured between no flow (dry) and 0.23 m/s, giving estimated flow rates between no flow and 0.04 m^3/s.

3.3.4 Surface Water Analytical Results

The results from surface water locations sampled during the summer and fall sampling events are presented in Tables 8a and 8b, respectively.

Surface water quality was compared to the Provincial Water Quality Objectives (PWQO). Background surface water quality was monitored from upstream station S2 for Marysville Creek and station S5 for Beechwood Ditch. Storm water runoff from the existing landfill area flows to one of three storm water sedimentation retention ponds, located to the northeast, northwest and south of the landfill footprint. Sampling location S8R is located along Beechwood Ditch near the downstream property boundary.

Constituents analysed in surface water samples collected during the summer sampling event were below their respective PWQO, with the exception of total phosphorous at all sampling locations along Marysville Creek, including upstream (S2) and downstream (S3, S6 and S7) locations, copper at location S2 and iron at location S3. Parameters analyzed in surface water samples collected during the fall sampling event were all below PWQO, with the exception of total phosphorous at sampling locations along Beechwood Ditch, including S5 (upstream) and S8R (downstream). 1,4 dioxane was detected at a low concentration (1.8 μg/L) slightly above the RDL of 1 μg/L at location S8R, well below the PWQO of 20 μg/L for this parameter.

Results from summer and fall 2015 indicate that the landfill is not causing adverse impacts to surface water quality.

3.3.5 Surface Water Quality Assurance / Quality Control (QA/QC)

An evaluation of the QA/QC data (from duplicate and blank samples) is included in Appendix B, where analytical results are compared between regular samples and their corresponding field duplicate samples, submitted to the laboratory without identifying the location they were collected from. A standard margin of error of 20% was deemed acceptable for field duplicates. In general, the comparison between samples and duplicates shows very good correlation for the majority of analyzed constituents. All parameters for the surface water duplicate QA/QC sample (location S2) were well within the 20% margin of error, with the exception of potassium which was measured at low concentrations (less than 5 times the RDL) and is therefore within acceptable margin of error.

During compilation of the QA/QC data, it was revealed that a 1,4 dioxane concentration of 2.1 μg/L was detected in the field duplicate sample from location S3, where the regular sample result was below the laboratory's RDL for this parameter (< 1 μg/L). Despite being within the acceptable margin of error (concentration less than 5 times the RDL), a data quality review was immediately initiated with the laboratory to evaluate the discrepancy between the regular sample and corresponding field duplicate from sampling location S3. The evaluation conducted by the laboratory ruled out possible laboratory interference or other analytical errors and confirmed the result. It should be noted that the 1,4 dioxane of 2.1 μg/L is well below the PWQO of 20 μg/L.

3.4 Subsurface Gas Sampling

On November 24, 2015, BluMetric inspected the subsurface gas monitoring probes and obtained measurements at all locations. The location of the gas monitors and the measurement results are shown in Table 9. Measurements of gas wells were all non-detect.

3.5 Annual Summary

A comparative review of groundwater quality results between this and previous sampling events indicates that constituent concentrations vary over time but for the most part have remained relatively consistent over the current calendar year and over the past 10 years or more. Depending on which monitoring point and more importantly the time scale considered, conflicting trends in concentrations can occur sporadically. However since implementing the revised EMP dated June 29, 2010, the majority of the patterns have been observed to be seasonally variable but relatively similar.

Where sufficient historical data are available, alkalinity, chloride, dissolved organic carbon (DOC), iron, manganese, sodium and total dissolved solids (TDS) concentration data were reviewed for all groundwater trigger wells listed in Table 12 of the EMP. Over the past five years (from the spring of 2011 to the fall of 2015), the vast majority of the analytical results show stabilized and/or variable/oscillating concentrations for almost all parameters. Exceptions to this generalization include:

- For the shallow groundwater monitors:
  - M54-4 for alkalinity and chloride (increasing trend);
  - M66-2 for chloride, sodium and TDS (downward trend);
  - M80-2 for alkalinity, chloride and TDS (increasing trend)
  - M101 for alkalinity (increasing trend); and,
  - M103 for chloride (increasing trend), alkalinity and manganese (downward trend).
- For the intermediate bedrock groundwater monitors:
  - M6-3 for alkalinity and TDS (downward trend) and chloride (increasing);
  - M106 for alkalinity (downward trend), and chloride, sodium and TDS (increasing trend);
  - OW1 for TDS (increasing trend), and manganese (downward trend).

The observed trends in groundwater geochemistry outlined here are not necessarily indicative of landfill leachate impacts, and should be interpreted with caution. With the recent implementation of the updated EMP (in effect since September 1, 2015 and used for the first time in 2015 to conduct the summer surface water sampling and fall monitoring events), 1,4 dioxane has been added to the environmental monitoring program as a primary leachate indicator parameter. Any changes over time for this and other parameters will be used in future environmental monitoring events in the comparative review of groundwater quality results and the evaluation of temporal trends that may be indicative of potential impacts to groundwater from landfill leachate.

3.6 Additional Investigations

Work outside of the scope of the EMP program was performed throughout the year at the Richmond Landfill Site. Table 10 describes activities performed in 2015.

4. SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

The summer and fall 2015 monitoring programs included the collection of groundwater and surface water samples, as well as landfill gas monitoring, in accordance with the site monitoring requirements outlined in the revised interim EMP (Revision No. 04) dated August 31, 2015, as specified in the Environmental Compliance Approval (ECA) issued on January 9, 2012 and amended May 3, 2013, and Environmental Review Tribunal (ERT) Order dated July 21, 2015. Condition 8.5 (b) of the ECA requires that WM carry out monitoring in accordance with the interim EMP until such time as further amendments to the ECA and EMP are directed by the Tribunal.

For the summer 2015 monitoring event, water levels were recorded on August 5, 2015 at 69 groundwater monitoring wells (36 installed within the shallow groundwater flow zone and 33 from the intermediate bedrock flow zone), at the two leachate wells, and at the three ponds located on site between the landfill and Beechwood Road. Surface water samples were collected from four surface water locations on September 14, 2015 after a rainfall event of more than 25 mm.

The following were completed as part of the fall 2015 monitoring event between November 20 and December 10, 2015:

- Water levels were measured from 105 groundwater monitoring wells: 41 in the shallow groundwater flow zone and 64 in the intermediate bedrock flow zone.
- 51 groundwater monitors (14 completed in the shallow flow zone and 37 in the intermediate bedrock flow zone) were sampled for analytical testing.
- Six surface water locations were sampled for analytical testing.
- A total of 13 Quality Assurance/Quality Control (QA/QC) samples were collected (six field duplicates, three field blanks and three trip blanks).
- Subsurface gas concentrations were recorded from six on-site gas monitoring wells.

- Six off-site domestic water supply wells located along County Road 1 West and Belleville Road were sampled for analytical testing for 1,4 dioxane between November 23 and December 10, 2015.

In addition to the aforementioned sampling, monitoring well M82-2 was sampled two additional times during fall 2015 (on September 30 and November 3), as per amended ECA Condition No. 8.5(c)iv.

4.1 GROUNDWATER

- Groundwater flow directions interpreted from water elevations measured in monitors were consistent with historical flownets:
  - Shallow groundwater flow is influenced by local topographic highs in the southwestern (Empey Hill Drumlin) and eastern (groundwater monitor M96 area) portions of the site, and is characterized by a flow divide with shallow groundwater being directed both to the north (toward Marysville Creek) and the south (toward Beechwood Ditch).
  - Groundwater in the intermediate bedrock flow zone generally flows to the north, west, and south-southeast relative to the landfill.
- Groundwater quality data from fall 2015 are generally consistent with historical results.
- Slightly elevated concentrations of a number of water quality parameters are seen in the shallow groundwater zone northwest and north of the Phase 1 landfill footprint. In other areas of the site, there is no evidence of groundwater impact away from the landfill footprint in the shallow groundwater flow zone.
- The geochemical results for the intermediate bedrock groundwater flow zone indicate higher concentrations of water quality parameters south and immediately north of the landfill relative to the concentrations west and east of the landfill.
- A comparative review of groundwater quality results between this and previous sampling events indicates that constituent concentrations vary over time but for the most part have remained relatively consistent over the current calendar year and over the past 5 years or more.
- Further investigation of the groundwater conditions south of the landfill is underway in order to better define and delineate impacts from the landfill and to define the extent of a contaminant attenuation zone.
- Continued groundwater monitoring within the shallow and intermediate bedrock groundwater flow zones between the landfill footprint and the low-head areas is warranted in order to further examine groundwater quality and any trends over time.

- It is recommended that groundwater monitoring well M74 be replaced, upgraded or removed from the monitoring program because of integrity concerns with the bentonite seal (presence of bentonite in purge water), as this well may be unreliable for water level and/or quality monitoring as a result of this issue.

4.2 SURFACE WATER

- The concentrations observed during the summer and fall 2015 monitoring events are within the range of historical monitoring results and indicate that the landfill is not causing adverse impacts to surface water quality;
- The concentrations of total phosphorous at all sampling locations along Marysville Creek, including upstream (S2) and downstream (S3, S6 and S7) locations, copper at location S2 and iron at location S3, were above PWQO during the summer sampling event;
- During the fall sampling event, the concentration of phosphorous at locations S5 and S8R were above PWQO, while 1,4 dioxane was detected at a low concentration (1.8 μg/L) slightly above the RDL of 1 μg/L at location S8R, well below the PWQO of 20 μg/L for this parameter.
- 1,4 dioxane was also detected at a low concentration (2.1 μg/L) in a field duplicate sample collected at location S3 during the fall sampling event, where the regular sample results were below the laboratory RDL of 1 μg/L for this parameter.

4.3 SUBSURFACE GAS

Measurements for methane gas were all non-detect.

4.4 LEACHATE GENERATION

An estimate of the amount of leachate generated at the site is provided by the site records of the volume of leachate hauled to the Napanee municipal sewer system and treated at the wastewater treatment plant. For the 2015 calendar year, the site records show that 13,772 tonnes of leachate were generated and hauled for discharge to the municipal sewer system.

5. LIMITING CONDITIONS

The summer and fall 2015 monitoring programs involved the collection of groundwater (from on-site and off-site monitoring wells as well as off-site domestic supply wells) and surface water for analyses at the site monitoring locations. The data collected during this investigation represent the conditions at the sampled locations only.

The conclusions presented in this report represent our professional opinion and are based on the conditions observed on the dates set out in the report, the information available at the time this report was prepared, the scope of work, and any limiting conditions noted herein.

BluMetric Environmental Inc. provides no assurances regarding changes to conditions subsequent to the time of the assessment. BluMetric Environmental Inc. makes no warranty as to the accuracy or completeness of the information provided by others or of the conclusions and recommendations predicated on the accuracy of that information.

This report has been prepared for Waste Management of Canada. Any use a third party makes of this report, any reliance on the report, or decisions based upon the report, are the responsibility of those third parties unless authorization is received from BluMetric Environmental Inc. in writing. BluMetric Environmental Inc. accepts no responsibility for any loss or damages suffered by any unauthorized third party as a result of decisions made or actions taken based on this report.

Respectfully submitted,
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TABLES

Table 1: Summary of Environmental Monitoring Program

<table>
<tr><th colspan="2">Monitoring Locations</th><th>Parameter Suite</th><th>Monitoring Frequency</th></tr>
<tr><td colspan="4">Shallow Groundwater Flow Zone Monitors</td></tr>
<tr><td colspan="2" rowspan="2">M58-4, M68-4, M70-3, M96, M99-2</td><td>Groundwater Inorganic & General</td><td rowspan="2">Once each year, in spring</td></tr>
<tr><td>VOCs</td></tr>
<tr><td colspan="2" rowspan="2">M53-4, M54-4, M66-2, M67-2, M80-2, M81, M85, M86, M87-2, M101, M103, M104, M114-2, OW37-s</td><td>Groundwater Inorganic & General</td><td rowspan="2">Twice each year, in spring and fall</td></tr>
<tr><td>VOCs</td></tr>
<tr><td colspan="4">Intermediate Bedrock Groundwater Flow Zone Monitors</td></tr>
<tr><td colspan="2" rowspan="2">M56-2, M58-3, M59-2, M59-4, M91-1, M95-1</td><td>Groundwater Inorganic & General</td><td rowspan="2">Once each year, in spring</td></tr>
<tr><td>VOCs</td></tr>
<tr><td colspan="2" rowspan="2">M5-3, M6-3, M9-2, M9-3, M52-2, M64-2, M72, M74, M75, M80-1, M82-1, M82-2, M106, M108, M109-1, M110-1, M114-1, M121, M123, M167, M168, M170, M172, M177, M178R-1, M178R-2, M178R-3, M178R-4, M179, M185-1, M185-2, M186, M187, M188, M190, OW1, OW4</td><td>Groundwater Inorganic & General</td><td rowspan="2">Twice each year, in spring and fall</td></tr>
<tr><td>VOCs</td></tr>
<tr><td colspan="4">Surface Water Sampling Locations</td></tr>
<tr><td>Beechwood Ditch</td><td>S4R, S5 and S8R</td><td rowspan="2">Surface Water Inorganic and General</td><td rowspan="2">Three times each year, in spring, summer[1] and fall.</td></tr>
<tr><td>Marysville Creek</td><td>S2, S3, S6 and S7</td></tr>
<tr><td colspan="4">Leachate Monitoring Locations</td></tr>
<tr><td colspan="2" rowspan="2">North Chamber, South Chamber, LW-P1 and LW-P2</td><td>Leachate Inorganic & General</td><td rowspan="2">Once each year, in spring</td></tr>
<tr><td>VOCs</td></tr>
<tr><td colspan="4">Landfill Gas Monitoring Wells</td></tr>
<tr><td colspan="2">GM1, GM3, GM4-1, GM4-2, GM5, GM6</td><td>% methane by volume</td><td>Twice each year, in spring and fall</td></tr>
<tr><td colspan="4">Off-site Domestic Water Supply Wells</td></tr>
<tr><td colspan="2">1441 County Road 1 West
1483 County Road 1 West
1494 County Road 1 West (UNKN)[2]
1499 County Road 1 West (UNKN)[2]
1556 County Road 1 West (UNKN)[2]
1561 County Road 1 West (UNKN)[2]
1614 County Road 1 West (UNKN)[2]
1654 County Road 1 West
1680 County Road 1 West
1695 County Road 1 West
1866 County Road 1 West
614 Belleville Road
696 Belleville Road</td><td>1,4 dioxane</td><td>Once every two years, starting in 2015</td></tr>
</table>

[1] The summer monitoring event shall be scheduled after a rainfall of more than 25 mm

[2] The final list of domestic well locations will depend on confirmation of which addresses have drilled wells (locations where well construction is unknown are denoted UNKN). A residential survey will be completed in order to determine which of these locations are to be sampled. Only those residences with drilled bedrock wells that supply water for domestic use will be sampled; residences that use shallow dug wells or cisterns for water supplies are not included in the program.

Table 2. Analytical Parameters for Water and Leachate Samples

Groundwater Inorganic and General Parameters		
Total dissolved solids	Magnesium	Manganese
Alkalinity	Sodium	Ammonia (total)
Conductivity	Potassium	Nitrate
Dissolved organic carbon	Boron	Nitrite
Calcium	Iron	Chloride
		Sulphate
Volatile Organic Compounds (VOCs)		
1,4 Dioxane	1,2-Dichlorobenzene	1,1,2-Trichloroethane
Benzene	1,3-Dichlorobenzene	1,1-Dichloroethane
Toluene	1,4-Dichlorobenzene	1,2-Dichloroethane
Ethylbenzene	Methylene chloride	1,1-Dichloroethylene
m&p-Xylene	Chloromethane	Cis-1,2-Dichloroethylene
o-Xylene	Chloroethane	Trans-1,2-Dichloroethylene
Styrene	1,1,2,2-Tetrachloroethane	Trichloroethylene
1,3,5-Trimethylbenzene	1,1,1,2-Tetrachloroethane	Tetrachloroethylene
Chlorobenzene	1,1,1-Trichloroethane	Vinyl chloride
Surface Water Inorganic and General Parameters		
1,4 Dioxane	Potassium	Nitrate
Total suspended solids	Boron	Nitrite
Total dissolved solids	Cadmium	Chloride
Biological oxygen demand	Chromium (total, Cr6+, Cr3+)	Sulphate
Chemical oxygen demand	Cobalt	Phenols
Alkalinity	Copper	Total phosphorous
Conductivity	Iron	Naphthalene
Hardness	Lead	
Calcium	Nickel	*Field measurements:*
Magnesium	Zinc	*pH, temperature, conductivity, dissolved*
Sodium	Ammonia (total & un-ionized)	*oxygen, estimated flow rate*

Table 3a. Groundwater Elevation Monitoring Locations - Summer Monitoring Event

Location	Shallow Groundwater Flow Zone			Intermediate Groundwater Flow Zone		
West of landfill footprint	M27	M58-4	M98	M3A-3	M59-4	M82-1
	M28	M67-2	M99-2	M56-2	M72	M82-2
	M29	M87-2	M100	M58-3	M73	M91-1
	M30	M88-2	M101	M59-2	M74	M95-1
	M31	M89-2	M102	M59-3		
	M38	M97	OW37-s			
North of landfill footprint	M35	M66-2		M60-1		
	M39	M103		OW1		
	M60-4			OW4		
South of landfill footprint	M12	M18	M80-2	M9-3	M64-2	M105
	M14	M41	M81	M10-1	M71	M106
	M15	M53-4	OW57	M49-1	M80-1	M107
	M16	M54-4		M49-2	OW54-i	
				M63-2	OW54-d	
East of landfill footprint	M19	M68-4	M96	M50-3	M108	
	M23	M70-3		M52-1		
	M47-3	M77		M70-1		

Table 3b. Groundwater Elevation Monitoring Locations - Fall Monitoring Event

Location	Shallow Groundwater Flow Zone	Intermediate Groundwater Flow Zone
West of landfill footprint	M27, M58-4, M67-2, M84, M87-2, M88-2, M89-2, M97, M98, M99-2, M100, M101, M102, OW37-s	M3A-3, M56-2, M58-3, M59-2, M59-3, M59-4, M72, M73, M74, M82-1, M82-2, M91-1, M95-1
East of landfill footprint	M19, M23, M47-3, M68-4, M70-3, M77, M94-2, M96	M50-3, M52-2, M70-2, M108, M170
North of landfill footprint	M35, M60-4, M65-2, M66-2, M83, M85, M86, M103, M104	M46-2, M60-1, OW1
South of landfill footprint; north of Beechwood Road	M12, M14, M15, M18, M41, M53-4, M54-4, M80-2, M81	M9-2, M9-3, M10-1, M49-1, M53-2, M71, M80-1, M105, M106, M107, M109-1, M109-2, M110-1, M111-1, M112-1, M113-1
South of landfill footprint; south of Beechwood Road	M114-2, M115-2	M63-2, M64-2, M114-1, M116, M121, M122, M123, M125, M166, M167, M168, M173, M174, M176, M177, M178R-1, M178R-2, M178R-3, M178R-4, M179, M180, M181-1, M181-2, M182, M185-1, M185-2, M186, M187, M188, M189, M190, M191

Table 4a: Groundwater Elevations - August 4, 2015

Monitoring Well	Water Level (masl)	Monitoring Well	Water Level (masl)	Monitoring Well	Water Level (masl)	Monitoring Well	Water Level (masl)
Shallow Groundwater Flow Zone							
M12	124.97	M31	123.30	M67-2	122.45	M98	129.27
M14	125.78	M35	124.15	M68-4	123.51	M99-2	129.41
M15	dry	M38	124.22	M70-3	126.28	M100	124.18
M16	124.24	M39	dry	M77	125.37	M101	123.29
M18	dry	M41	124.98	M80-2	123.30	M102	123.20
M19	damaged	M47-3	124.15	M81	124.36	M103	122.91
M23	126.20	M53-4	124.40	M87-2	123.50	OW37-s	121.87
M27	125.48	M54-4	124.11	M88-2	127.52	OW57	damaged
M28	125.49	M58-4	123.75	M89-2	128.61		
M29	123.65	M60-4	124.05	M96	127.89		
M30	123.35	M66-2	122.41	M97	124.39		
Intermediate Bedrock Groundwater Flow Zone							
M3A-3	124.65	M58-3	122.40	M72	122.56	M105	119.88
M9-3	120.10	M59-2	122.80	M73	122.62	M106	122.71
M10-1	119.66	M59-3	122.76	M74	123.45	M107	119.85
M49-1	119.49	M59-4	122.77	M80-1	122.83	M108	119.53
M49-2	118.48	M60-1	122.62	M82-1	122.67	OW1	122.87
M50-3	124.25	M63-2	121.10	M82-2	122.43	OW4	122.98
M52-1	111.62	M64-2	118.83	M91-1	122.77	OW54-d	119.50
M56-2	122.77	M70-1	119.64	M95-1	122.66	OW54-i	119.49
		M71	122.91				

Table 4b: Groundwater Elevations - November 20, 2015

Monitoring Well	Water Level (masl)	Monitoring Well	Water Level (masl)	Monitoring Well	Water Level (masl)	Monitoring Well	Water Level (masl)
Shallow Groundwater Flow Zone							
M12	125.55	M54-4	124.27	M83	123.54	M98	130.16
M14	126.48	M58-4	124.80	M84	121.92	M99-2	130.41
M15	125.32	M60-4	124.28	M85	123.18	M100	125.16
M18	127.12	M65-2	123.57	M86	123.60	M101	124.08
M19	damaged	M66-2	123.29	M87-2	124.23	M102	124.19
M23	126.87	M67-2	122.53	M88-2	128.11	M103	123.76
M27	126.40	M68-4	124.24	M89-2	129.48	M104	123.32
M35	124.35	M70-3	127.32	M94-2	124.10	M114-2	123.73
M41	124.97	M77	126.11	M96	128.76	M115-2	124.65
M47-3	124.73	M80-2	123.50	M97	124.98	OW37-s	122.166
M53-4	125.17	M81	124.50				
Intermediate Bedrock Groundwater Flow Zone							
M3A-3	124.93	M70-2	120.65	M111-1	123.32	M178R-1	*
M9-2	121.93	M71	124.08	M112-1	123.36	M178R-2	flowing
M9-3	122.12	M72	123.19	M113-1	123.35	M178R-3	flowing
M10-1	121.55	M73	123.26	M114-1	121.45	M178R-4	116.55
M46-2	123.24	M74	123.93	M116	121.46	M179	110.06
M49-1	121.53	M80-1	123.46	M121	121.34	M180	112.13
M50-3	124.31	M82-1	122.85	M122	121.10	M181-1	96.04
M52-2	120.83	M82-2	123.04	M123	120.85	M181-2	105.32
M53-2	121.33	M91-1	123.36	M125	121.47	M182	96.76
M56-2	123.39	M95-1	123.27	M166	120.86	M185-1	107.60
M58-3	123.41	M105	121.94	M167	flowing	M185-2	116.14
M59-2	123.49	M106	123.33	M168	120.87	M186	114.57
M59-3	123.45	M107	121.88	M170	121.82	M187	96.17
M59-4	123.46	M108	120.92	M173	100.81	M188	115.61
M60-1	122.20	M109-1	121.92	M174	94.89	M189	104.78
M63-2	121.49	M109-2	121.99	M176	109.64	M190	115.81
M64-2	118.81	M110-1	121.94	M177	115.30	M191	*
						OW1	122.77

* Well recently purged and sampled; water level not fully recovered.

Table 5a: Groundwater Quality Results - November 23 - 26, 2015

Name	Date	Alkalinity	Ammonia	Boron	Calcium	Chloride	Conductivity	Dissolved Organic Carbon	Iron	Magnesium	Manganese	Nitrate	Nitrite + Nitrate	Nitrite	Potassium	Sodium	Sulphate	Total Dissolved Solids	1,1,1,2-Tetrachloroethane	1,1,1-Trichloroethane	1,1,2,2-Tetrachloroethane	1,1,2-Trichloroethane	1,1-Dichloroethane	1,1-Dichloroethylene	1,2-Dichlorobenzene (o)
		mg/L	mg/L	mg/L	mg/L	mg/L	mS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Shallow Groundwater Flow Zone																									
M53-4	24/11/2015	390	< 0.15	< 0.01	150	2	886	2.5	< 0.1	30	0.0053	< 0.1	< 0.1	< 0.01	0.27	47	96	626	< 0.0002	< 0.0001	< 0.0002	< 0.0002	< 0.0001	< 0.0001	< 0.0002
M54-4	23/11/2015	410	< 0.15	0.046	150	89	1120	3.4	< 0.1	30	0.017	< 0.1	< 0.1	< 0.01	1.9	66	64	662	< 0.0002	0.0029	< 0.0002	< 0.0002	0.0018	0.00012	< 0.0002
M66-2	24/11/2015	330	< 0.15	0.78	100	95	1290	1.6	0.49	40	0.018	< 0.1	< 0.1	< 0.01	6.2	140	220	800	< 0.0002	< 0.0001	< 0.0002	< 0.0002	< 0.0001	< 0.0001	< 0.0002
M67-2	25/11/2015	350	0.56	0.85	49	5.8	662	1.8	< 0.1	27	0.098	< 0.1	< 0.1	< 0.01	8.7	56	4.9	370	< 0.0002	< 0.0001	< 0.0002	< 0.0002	< 0.0001	< 0.0001	< 0.0002
M80-2	23/11/2015	330	< 0.15	0.048	96	85	938	2	< 0.1	51	0.018	< 0.1	< 0.1	< 0.01	4.2	16	40	520	< 0.0002	< 0.0001	< 0.0002	< 0.0002	< 0.0001	< 0.0001	< 0.0002
M81	23/11/2015	350	< 0.15	0.034	110	83	965	1.7	< 0.1	53	0.013	< 0.1	< 0.1	< 0.01	2.5	13	39	506	< 0.0002	< 0.0001	< 0.0002	< 0.0002	< 0.0001	< 0.0001	< 0.0002
M85	25/11/2015	320	0.85	2.1	110	46	2440	5.3	2.7	68	0.073	< 0.1	< 0.1	0.02	25	360	850	1740	< 0.0002	< 0.0001	< 0.0002	< 0.0002	< 0.0001	< 0.0001	< 0.0002
M86	26/11/2015	290	< 0.15	1.5	110	54	1510	2.7	0.34	62	0.021	0.12	0.12	< 0.01	23	150	400	1000	< 0.0002	< 0.0001	< 0.0002	< 0.0002	< 0.0001	< 0.0001	< 0.0002
M87-2	24/11/2015	230	0.23	0.05	58	27	613	1.7	< 0.1	39	0.084	< 0.1	< 0.1	< 0.01	2.4	14	50	370	< 0.0002	< 0.0001	< 0.0002	< 0.0002	< 0.0001	< 0.0001	< 0.0002
M101	25/11/2015	490	< 0.15	0.086	170	77	1210	2.9	< 0.1	55	0.0037	< 0.1	< 0.1	< 0.01	4.6	17	60	796	< 0.0002	< 0.0001	< 0.0002	< 0.0002	0.00068	< 0.0001	< 0.0002
M103	24/11/2015	740	< 0.15	0.32	150	170	1920	5.1	< 0.1	99	0.019	< 0.1	< 0.1	< 0.01	7.4	160	41	1120	< 0.0002	< 0.0001	< 0.0002	< 0.0002	< 0.0001	< 0.0001	< 0.0002
M104	26/11/2015	1300	1.26	2.8	130	810	4730	86	3.9	130	0.6	< 0.1	< 0.1	0.055	14	840	35	2820	< 0.001	< 0.0005	< 0.001	< 0.001	< 0.0005	< 0.0005	< 0.001
M114-2	24/11/2015	300	< 0.15	0.021	110	110	992	1.6	< 0.1	17	< 0.002	1.2	1.2	< 0.01	0.92	81	39	612	< 0.0002	< 0.0001	< 0.0002	< 0.0002	< 0.0001	< 0.0001	< 0.0002
OW37-s	25/11/2015	200	< 0.15	0.1	56	47	599	1.8	< 0.1	18	0.24	< 0.1	< 0.1	< 0.01	9.7	36	25	310	< 0.0002	< 0.0001	< 0.0002	< 0.0002	< 0.0001	< 0.0001	< 0.0002
Intermediate BedrockGroundwater Flow Zone																									
M5-3	25/11/2015	440	1.36	1.2	35	45	964	1.3	< 0.1	27	0.0022	< 0.1	< 0.1	< 0.01	14	150	1.1	556	< 0.0005	< 0.00025	< 0.0005	< 0.0005	< 0.00025	< 0.00025	< 0.0005
M6-3	24/11/2015	1300	4.98	0.17	930	1300	9230	44	< 0.5	< 0.25	< 0.01	< 0.1	0.14	0.16	56	750	39	4300	< 0.0004	< 0.0002	< 0.0004	< 0.0004	< 0.0002	< 0.0002	< 0.0004
M9-2	24/11/2015	570	0.72	0.35	170	170	1570	9.7	11	47	0.39	< 0.1	< 0.1	< 0.01	6.5	130	< 1	920	< 0.0002	< 0.0001	< 0.0002	< 0.0002	0.00058	0.00012	< 0.0002
M9-3	24/11/2015	250	1.2	0.61	40	96	806	9.1	0.27	26	0.029	< 0.1	< 0.1	< 0.01	14	85	3.1	422	< 0.002	< 0.001	< 0.002	< 0.002	< 0.001	< 0.001	< 0.002
M52-2	26/11/2015	360	1.44	1.2	22	240	1540	1.3	0.22	16	0.006	< 0.1	< 0.1	< 0.01	13	310	13	736	< 0.0002	< 0.0001	< 0.0002	< 0.0002	< 0.0001	< 0.0001	< 0.0002
M64-2	26/11/2015	290	0.94	1	53	110	962	0.9	< 0.1	30	0.0085	< 0.1	< 0.1	< 0.01	10	95	1.2	520	< 0.0002	< 0.0001	< 0.0002	< 0.0002	< 0.0001	< 0.0001	< 0.0002
M72	24/11/2015	270	0.55	0.41	58	32	631	1.4	< 0.1	35	0.0029	< 0.1	< 0.1	< 0.01	8	18	27	354	< 0.0002	< 0.0001	< 0.0002	< 0.0002	< 0.0001	< 0.0001	< 0.0002
M74	24/11/2015	370	3.47	1.1	31	43	943	1.9	< 0.1	18	0.032	< 0.1	< 0.1	< 0.01	16	130	54	662	< 0.0004	< 0.0002	< 0.0004	< 0.0004	< 0.0002	< 0.0002	< 0.0004
M75	24/11/2015	430	1.56	1.3	36	59	1130	1.3	< 0.1	25	0.0099	< 0.1	< 0.1	< 0.01	17	180	75	708	< 0.0002	< 0.0001	< 0.0002	< 0.0002	< 0.0001	< 0.0001	< 0.0002
M80-1	23/11/2015	150	0.44	0.41	23	28	382	0.9	< 0.1	13	0.0048	< 0.1	< 0.1	< 0.01	4.7	37	12	204	< 0.0002	< 0.0001	< 0.0002	< 0.0002	< 0.0001	< 0.0001	< 0.0002
M82-1	23/11/2015	330	0.98	1.1	53	44	901	2.5	< 0.1	27	0.0054	< 0.1	< 0.1	< 0.01	10	100	63	502	< 0.0002	< 0.0001	< 0.0002	< 0.0002	< 0.0001	< 0.0001	< 0.0002
M82-2[1]	30/09/2015	320	0.26	0.12	110	23	795	2.9	< 0.1	28	0.02	< 0.1	< 0.1	< 0.01	4	18	66	478	< 0.0002	< 0.0001	< 0.0002	< 0.0002	< 0.0001	< 0.0001	< 0.0002
M82-2[1, 2]	03/11/2015	330	0.27	0.18	110	32	841	3	< 0.1	30	0.019	< 0.1	< 0.1	< 0.01	4.2	22	67	510	< 0.0002	< 0.0001	< 0.0002	< 0.0002	< 0.0001	< 0.0001	< 0.0002
M82-2	23/11/2015	330	0.3	0.18	110	30	833	2.8	< 0.1	30	0.017	< 0.1	< 0.1	< 0.01	4.2	21	67	492	< 0.0002	< 0.0001	< 0.0002	< 0.0002	< 0.0001	< 0.0001	< 0.0002
M106	23/11/2015	320	2.78	2	120	1600	5460	1.1	< 0.5	80	< 0.01	< 0.1	< 0.1	< 0.01	24	970	2	3020	< 0.0002	< 0.0001	< 0.0002	< 0.0002	0.0018	0.00059	< 0.0002
M108	25/11/2015	560	1	0.32	160	140	1480	6.3	0.8	50	0.082	< 0.1	< 0.1	< 0.01	9	97	3.2	820	< 0.0002	< 0.0001	< 0.0002	< 0.0002	0.00037	< 0.0001	< 0.0002
M109-1	26/11/2015	620	1.05	0.49	190	250	1970	13	14	62	0.43	< 0.1	< 0.1	< 0.01	8.2	160	< 1	1050	< 0.0002	< 0.0001	< 0.0002	< 0.0002	< 0.0001	< 0.0001	< 0.0002
M110-1	26/11/2015	650	0.66	0.44	170	200	1820	10	< 0.1	59	0.015	< 0.1	< 0.1	< 0.01	8	150	< 1	992	< 0.0002	< 0.0001	< 0.0002	< 0.0002	0.00071	< 0.0001	< 0.0002
M114-1	24/11/2015	580	0.38	0.26	190	160	1590	7.3	14	47	0.69	< 0.1	< 0.1	< 0.01	6.9	100	5.1	942	< 0.0002	< 0.0001	< 0.0002	< 0.0002	0.00067	0.00034	< 0.0002
M121	24/11/2015	510	1.72	0.53	130	510	2580	4.8	< 0.1	76	0.0044	< 0.1	< 0.1	< 0.01	16	320	15	1560	< 0.001	< 0.0005	< 0.001	< 0.001	< 0.0005	< 0.0005	< 0.001
M123	25/11/2015	450	0.3	0.16	140	75	1050	4.1	< 0.1	28	0.016	< 0.1	< 0.1	< 0.01	4.3	51	7.9	582	< 0.0002	< 0.0001	< 0.0002	< 0.0002	< 0.0001	< 0.0001	< 0.0002
M167	26/11/2015	420	1.74	0.91	82	230	1580	3.5	< 0.1	51	0.0027	< 0.1	< 0.1	< 0.01	17	180	11	802	< 0.0002	< 0.0001	< 0.0002	< 0.0002	< 0.0001	< 0.0001	< 0.0002
M168	26/11/2015	390	1.51	0.38	150	330	1850	3.6	< 0.1	60	0.0045	< 0.1	< 0.1	< 0.01	16	130	15	1020	< 0.0002	< 0.0001	< 0.0002	< 0.0002	< 0.0001	< 0.0001	< 0.0002
M170	26/11/2015	620	1.52	2.3	38	620	3220	5	< 0.1	32	< 0.002	< 0.1	< 0.1	< 0.01	15	640	12	1750	< 0.0002	< 0.0001	< 0.0002	< 0.0002	< 0.0001	< 0.0001	< 0.0002
M172	24/11/2015	580	0.87	0.26	190	190	1730	8.9	27	46	0.91	< 0.1	< 0.1	< 0.01	6	110	4.1	1020	< 0.0002	< 0.0001	< 0.0002	< 0.0002	0.0037	0.00028	< 0.0002
M177	25/11/2015	240	0.58	0.4	71	7.6	528	1.6	< 0.1	17	0.008	< 0.1	< 0.1	< 0.01	6.5	13	23	304	< 0.0002	< 0.0001	< 0.0002	< 0.0002	< 0.0001	< 0.0001	< 0.0002
M178R-1	25/11/2015	340	5.47	4.2	240	4400	15100	4.5	< 0.5	140	0.18	< 0.1	< 0.1	< 0.01	43	2700	380	8670	< 0.001	< 0.0005	< 0.001	< 0.001	< 0.0005	< 0.0005	< 0.001
M178R-2	25/11/2015	440	0.27	0.23	140	79	1090	5.3	1.1	29	0.055	< 0.1	< 0.1	< 0.01	5.7	60	21	594	< 0.0002	< 0.0001	< 0.0002	< 0.0002	0.0013	< 0.0001	< 0.0002
M178R-3	25/11/2015	450	0.31	0.23	140	86	1110	4.7	0.97	31	0.059	< 0.1	< 0.1	< 0.01	6.1	63	21	626	< 0.0002	< 0.0001	< 0.0002	< 0.0002	0.0011	< 0.0001	< 0.0002
M178R-4	25/11/2015	440	0.36	0.24	140	87	1100	4.4	< 0.1	29	0.013	< 0.1	< 0.1	< 0.01	4.6	59	19	632	< 0.0002	< 0.0001	< 0.0002	< 0.0002	0.00011	< 0.0001	< 0.0002
M179	25/11/2015	260	0.15	0.12	100	39	701	3.7	0.95	12	0.031	< 0.1	< 0.1	< 0.01	3.6	26	37	420	< 0.0002	< 0.0001	< 0.0002	< 0.0002	< 0.0001	< 0.0001	< 0.0002
M185-1	26/11/2015	410	1.13	1.2	42	260	1970	29	0.35	11	0.034	< 0.1	< 0.1	0.015	10	410	130	1090	< 0.001	< 0.0005	< 0.001	< 0.001	< 0.0005	< 0.0005	< 0.001
M185-2	25/11/2015	310	< 0.15	0.12	120	2.6	603	2.1	< 0.1	8.5	0.012	< 0.1	< 0.1	< 0.01	2.4	4.5	20	340	< 0.0002	< 0.0001	< 0.0002	< 0.0002	< 0.0001	< 0.0001	< 0.0002
M186	26/11/2015	300	2.47	1.5	120	1300	4690	3.7	1.4	64	0.43	< 0.1	< 0.1	< 0.01	22	770	51	2480	< 0.0002	< 0.0001	< 0.0002	< 0.0002	< 0.0001	< 0.0001	< 0.0002
M187	25/11/2015	260	< 0.15	0.11	130	36	770	2	< 0.1	10	0.0024	0.45	0.45	< 0.01	2.6	25	81	484	< 0.0002	< 0.0001	< 0.0002	< 0.0002	< 0.0001	< 0.0001	< 0.0002
M188	25/11/2015	330	0.68	0.74	57	81	895	2	< 0.1	24	0.011	< 0.1	< 0.1	< 0.01	7.2	110	15	504	< 0.0004	< 0.0002	< 0.0004	< 0.0004	< 0.0002	< 0.0002	< 0.0004
M190	25/11/2015	280	< 0.15	0.081	120	48	776	3.3	< 0.1	13	0.01	< 0.1	< 0.1	< 0.01	3.4	20	39	460	< 0.0002	< 0.0001	< 0.0002	< 0.0002	< 0.0001	< 0.0001	< 0.0002
OW1	25/11/2015	410	1.67	1.1	44	55	1030	1.6	< 0.1	31	0.0073	< 0.1	< 0.1	< 0.01	13	140	59	604	< 0.0005	< 0.00025	< 0.0005	< 0.0005	< 0.00025	< 0.00025	< 0.0005
OW4	26/11/2015	980	1.34	1	150	420	3140	39	6.8	100	0.17	< 0.1	< 0.1	< 0.01	13	470	37	1830	< 0.0002	< 0.0001	< 0.0002	< 0.0002	< 0.0001	< 0.0001	< 0.0002

[1] Monitoring well M82-2 was sampled two additional times in fall 2015 as per amended ECA Condition No. 8.5(c)iv

[2] This sampling event initially occurred on Oct. 22; however, the incorrect EMP list was used for analyses. The well was re-sampled on Nov. 3 and analyzed for the new EMP list, with the exception of 1,4 dioxane considering the short time span between sampling events. Therefore, the result presented here for 1,4-dioxane is from Oct. 22.

Table 5a: Groundwater Quality Results - November 23 - 26, 2015

Name	Date	1,2-Dichloroethane	1,3,5-Trimethylbenzene	1,3-Dichlorobenzene (m)	1,4-Dichlorobenzene (p)	1,4-Dioxane	Benzene	Chlorobenzene	Chloroethane	Chloromethane	Cis-1,2-Dichloroethylene	Dichloromethane	Ethylbenzene	m+p-Xylene	o-Xylene	Styrene	Tetrachloroethylene	Toluene	Trans-1,2-dichloroethylene	Trichloroethylene	Vinyl Chloride
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Shallow Groundwater Flow Zone																					
M53-4	24/11/2015	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.001	< 0.0001	< 0.0001	< 0.0002	< 0.0005	< 0.0001	< 0.0005	< 0.0001	< 0.0001	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0001	< 0.0002
M54-4	23/11/2015	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.001	< 0.0001	< 0.0001	< 0.0002	< 0.0005	0.002	< 0.0005	< 0.0001	< 0.0001	< 0.0001	< 0.0002	0.0052	< 0.0002	< 0.0001	0.001	0.00066
M66-2	24/11/2015	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.001	< 0.0001	< 0.0001	< 0.0002	< 0.0005	< 0.0001	< 0.0005	< 0.0001	< 0.0001	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0001	< 0.0002
M67-2	25/11/2015	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.001	< 0.0001	< 0.0001	< 0.0002	< 0.0005	< 0.0001	< 0.0005	< 0.0001	< 0.0001	< 0.0001	< 0.0002	< 0.0001	0.00042	< 0.0001	< 0.0001	< 0.0002
M80-2	23/11/2015	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.001	< 0.0001	< 0.0001	< 0.0002	< 0.0005	< 0.0001	< 0.0005	< 0.0001	< 0.0001	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0001	< 0.0002
M81	23/11/2015	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.001	< 0.0001	< 0.0001	< 0.0002	< 0.0005	< 0.0001	< 0.0005	< 0.0001	< 0.0001	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0001	< 0.0002
M85	25/11/2015	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.001	< 0.0001	< 0.0001	< 0.0002	< 0.0005	< 0.0001	< 0.0005	< 0.0001	< 0.0001	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0001	< 0.0002
M86	26/11/2015	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.001	< 0.0001	< 0.0001	< 0.0002	< 0.0005	< 0.0001	< 0.0005	< 0.0001	< 0.0001	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0001	< 0.0002
M87-2	24/11/2015	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.001	< 0.0001	< 0.0001	< 0.0002	< 0.0005	< 0.0001	< 0.0005	< 0.0001	< 0.0001	< 0.0001	< 0.0002	< 0.0001	0.0048	< 0.0001	< 0.0001	< 0.0002
M101	25/11/2015	< 0.0002	< 0.0002	< 0.0002	< 0.0002	0.0087	< 0.0001	< 0.0001	< 0.0002	< 0.0005	< 0.0001	< 0.0005	< 0.0001	< 0.0001	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0001	< 0.0002
M103	24/11/2015	< 0.0002	< 0.0002	< 0.0002	< 0.0002	0.02	< 0.0001	< 0.0001	< 0.0002	< 0.0005	< 0.0001	< 0.0005	< 0.0001	< 0.0001	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0001	< 0.0002
M104	26/11/2015	< 0.001	< 0.001	< 0.001	< 0.001	0.16	< 0.0005	< 0.0005	< 0.001	< 0.0025	< 0.0005	< 0.0025	< 0.0005	< 0.0005	< 0.0005	< 0.001	< 0.0005	< 0.001	< 0.0005	< 0.0005	< 0.001
M114-2	24/11/2015	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.001	< 0.0001	< 0.0001	< 0.0002	< 0.0005	< 0.0001	< 0.0005	< 0.0001	< 0.0001	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0001	< 0.0002
OW37-s	25/11/2015	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.001	< 0.0001	< 0.0001	< 0.0002	< 0.0005	< 0.0001	< 0.0005	< 0.0001	< 0.0001	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0001	< 0.0002
Intermediate BedrockGroundwater Flow Zone																					
M5-3	25/11/2015	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.001	< 0.00025	< 0.00025	< 0.0005	< 0.0013	< 0.00025	< 0.0013	< 0.00025	0.00026	< 0.00025	< 0.0005	< 0.00025	< 0.0005	< 0.00025	< 0.00025	< 0.0005
M6-3	24/11/2015	< 0.0004	< 0.0004	< 0.0004	< 0.0004	0.32	0.00099	< 0.0002	< 0.0004	< 0.001	< 0.0002	< 0.001	0.00021	0.0015	0.00046	< 0.0004	< 0.0002	0.0097	< 0.0002	< 0.0002	< 0.0004
M9-2	24/11/2015	< 0.0002	< 0.0002	< 0.0002	< 0.0002	0.026	0.00093	< 0.0001	0.042	< 0.0005	< 0.0001	< 0.0005	< 0.0001	< 0.0001	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0001	0.00089
M9-3	24/11/2015	< 0.002	< 0.002	< 0.002	< 0.002	0.0013	< 0.001	< 0.001	< 0.002	< 0.005	< 0.001	< 0.005	< 0.001	< 0.001	< 0.001	< 0.002	< 0.001	0.087	< 0.001	< 0.001	< 0.002
M52-2	26/11/2015	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.001	< 0.0001	< 0.0001	< 0.0002	< 0.0005	< 0.0001	< 0.0005	< 0.0001	< 0.0001	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0001	< 0.0002
M64-2	26/11/2015	< 0.0002	< 0.0002	< 0.0002	< 0.0002	0.0027	< 0.0001	< 0.0001	< 0.0002	< 0.0005	< 0.0001	< 0.0005	< 0.0001	< 0.0001	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0001	< 0.0002
M72	24/11/2015	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.001	< 0.0001	< 0.0001	< 0.0002	< 0.0005	< 0.0001	< 0.0005	< 0.0001	< 0.0001	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0001	< 0.0002
M74	24/11/2015	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.001	< 0.0002	< 0.0002	< 0.0004	< 0.001	< 0.0002	< 0.001	< 0.0002	< 0.0002	< 0.0002	< 0.0004	< 0.0002	< 0.0004	< 0.0002	< 0.0002	< 0.0004
M75	24/11/2015	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.001	< 0.0001	< 0.0001	< 0.0002	< 0.0005	< 0.0001	< 0.0005	< 0.0001	< 0.0001	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0001	< 0.0002
M80-1	23/11/2015	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.001	0.0023	< 0.0001	< 0.0002	< 0.0005	< 0.0001	< 0.0005	0.00021	0.00064	0.00029	< 0.0002	< 0.0001	0.00057	< 0.0001	< 0.0001	< 0.0002
M82-1	23/11/2015	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.001	0.00012	< 0.0001	< 0.0002	< 0.0005	< 0.0001	< 0.0005	< 0.0001	< 0.0001	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0001	< 0.0002
M82-2[1]	30/09/2015	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.001	< 0.0001	< 0.0001	< 0.0002	< 0.0005	< 0.0001	< 0.0005	< 0.0001	< 0.0001	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0001	< 0.0002
M82-2[1, 2]	03/11/2015	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.001	< 0.0001	< 0.0001	< 0.0002	< 0.0005	< 0.0001	< 0.0005	< 0.0001	< 0.0001	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0001	< 0.0002
M82-2	23/11/2015	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.001	< 0.0001	< 0.0001	< 0.0002	< 0.0005	< 0.0001	< 0.0005	< 0.0001	< 0.0001	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0001	< 0.0002
M106	23/11/2015	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.001	0.00036	< 0.0001	< 0.0002	< 0.0005	< 0.0001	< 0.0005	< 0.0001	0.00016	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0001	< 0.0002
M108	25/11/2015	< 0.0002	< 0.0002	< 0.0002	< 0.0002	0.014	< 0.0001	< 0.0001	0.0058	< 0.0005	< 0.0001	< 0.0005	< 0.0001	< 0.0001	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0001	< 0.0002
M109-1	26/11/2015	< 0.0002	< 0.0002	< 0.0002	< 0.0002	0.043	0.00011	< 0.0001	0.015	< 0.0005	< 0.0001	< 0.0005	< 0.0001	< 0.0001	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0001	0.00028
M110-1	26/11/2015	< 0.0002	< 0.0002	< 0.0002	< 0.0002	0.044	0.0011	< 0.0001	0.023	< 0.0005	< 0.0001	< 0.0005	< 0.0001	0.00049	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0001	0.00033
M114-1	24/11/2015	< 0.0002	< 0.0002	< 0.0002	< 0.0002	0.013	< 0.0001	< 0.0001	0.016	< 0.0005	< 0.0001	< 0.0005	< 0.0001	< 0.0001	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0001	0.00031
M121	24/11/2015	< 0.001	< 0.001	< 0.001	< 0.001	0.0098	0.045	< 0.0005	0.0039	< 0.0025	< 0.0005	< 0.0025	0.0011	0.013	0.00065	< 0.001	< 0.0005	< 0.001	< 0.0005	< 0.0005	< 0.001
M123	25/11/2015	< 0.0002	< 0.0002	< 0.0002	< 0.0002	0.0074	< 0.0001	< 0.0001	0.0037	< 0.0005	< 0.0001	< 0.0005	< 0.0001	< 0.0001	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0001	< 0.0002
M167	26/11/2015	< 0.0002	< 0.0002	< 0.0002	< 0.0002	0.0051	0.00038	< 0.0001	< 0.0002	< 0.0005	< 0.0001	< 0.0005	< 0.0001	< 0.0001	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0001	< 0.0002
M168	26/11/2015	< 0.0002	< 0.0002	< 0.0002	< 0.0002	0.0075	< 0.0001	< 0.0001	< 0.0002	< 0.0005	< 0.0001	< 0.0005	< 0.0001	< 0.0001	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0001	< 0.0002
M170	26/11/2015	< 0.0002	< 0.0002	< 0.0002	< 0.0002	0.0063	< 0.0001	< 0.0001	< 0.0002	< 0.0005	< 0.0001	< 0.0005	< 0.0001	< 0.0001	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0001	< 0.0002
M172	24/11/2015	< 0.0002	< 0.0002	< 0.0002	< 0.0002	0.021	0.00013	< 0.0001	0.011	< 0.0005	0.00014	< 0.0005	< 0.0001	< 0.0001	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0001	0.00054
M177	25/11/2015	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.001	< 0.0001	< 0.0001	< 0.0002	< 0.0005	< 0.0001	< 0.0005	< 0.0001	< 0.0001	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0001	< 0.0002
M178R-1	25/11/2015	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.00069	< 0.0005	< 0.001	< 0.0025	< 0.0005	< 0.0025	< 0.0005	0.00053	< 0.0005	< 0.001	< 0.0005	0.0024	< 0.0005	< 0.0005	< 0.001
M178R-2	25/11/2015	< 0.0002	< 0.0002	< 0.0002	< 0.0002	0.0064	< 0.0001	< 0.0001	0.0016	< 0.0005	< 0.0001	< 0.0005	< 0.0001	< 0.0001	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0001	< 0.0002
M178R-3	25/11/2015	< 0.0002	< 0.0002	< 0.0002	< 0.0002	0.0073	< 0.0001	< 0.0001	0.002	< 0.0005	< 0.0001	< 0.0005	< 0.0001	< 0.0001	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0001	< 0.0002
M178R-4	25/11/2015	< 0.0002	< 0.0002	< 0.0002	< 0.0002	0.007	< 0.0001	< 0.0001	< 0.01	< 0.0005	< 0.0001	< 0.0005	< 0.0001	< 0.0001	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0001	< 0.0002
M179	25/11/2015	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.001	< 0.0001	< 0.0001	< 0.0002	< 0.0005	< 0.0001	< 0.0005	< 0.0001	< 0.0001	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0001	< 0.0002
M185-1	26/11/2015	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.0005	< 0.0005	< 0.001	< 0.0025	< 0.0005	< 0.0025	< 0.0005	< 0.0005	< 0.0005	< 0.001	< 0.0005	0.048	< 0.0005	< 0.0005	< 0.001
M185-2	25/11/2015	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.001	< 0.0001	< 0.0001	< 0.0002	< 0.0005	< 0.0001	< 0.0005	< 0.0001	< 0.0001	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0001	< 0.0002
M186	26/11/2015	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.001	0.00065	< 0.0001	< 0.0002	< 0.0005	< 0.0001	< 0.0005	0.00018	0.0018	0.00051	< 0.0002	< 0.0001	0.0017	< 0.0001	< 0.0001	< 0.0002
M187	25/11/2015	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.001	< 0.0001	< 0.0001	< 0.0002	< 0.0005	< 0.0001	< 0.0005	< 0.0001	< 0.0001	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0001	< 0.0002
M188	25/11/2015	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.001	< 0.0002	< 0.0002	< 0.0004	< 0.001	< 0.0002	< 0.001	< 0.0002	< 0.0002	< 0.0002	< 0.0004	< 0.0002	0.00056	< 0.0001	< 0.0002	< 0.0004
M190	25/11/2015	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.001	< 0.0001	< 0.0001	< 0.0002	< 0.0005	< 0.0001	< 0.0005	< 0.0001	< 0.0001	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0001	< 0.0002
OW1	25/11/2015	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.001	< 0.00025	< 0.00025	< 0.0005	< 0.0013	< 0.00025	< 0.0013	0.0018	< 0.00025	< 0.00025	< 0.0005	< 0.00025	< 0.0005	< 0.00025	< 0.00025	< 0.0005
OW4	26/11/2015	< 0.0002	< 0.0002	< 0.0002	< 0.0002	0.074	0.0004	0.00095	< 0.0002	< 0.0005	< 0.0001	< 0.0005	0.0043	0.00015	0.00011	< 0.0002	< 0.0001	0.00032	< 0.0001	< 0.0001	< 0.0002

[1] Monitoring well M82-2 was sampled two additional times in fall 2015 as per amended ECA Condition No. 8.5(c)iv

[2] This sampling event initially occurred on Oct. 22; however, the incorrect EMP list was used for analyses. The well was re-sampled on Nov. 3 and analyzed for the new EMP list, with the exception of 1,4 dioxane considering the short time span between sampling events. Therefore, the result presented here for 1,4-dioxane is from Oct. 22.

Table 5b: Groundwater Quality Results and Reasonable Use Limits - November 23 - 26, 2015

Name	Date	1,4-dioxane	Alkalinity	Chloride	Dissolved Organic Carbon	Iron	Manganese	Sodium	Total Dissolved Solids	1,1-dichloroethylene	Benzene	Ethylbenzene	Xylenes (total)	Toluene
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Shallow Groundwater Flow Zone														
RUL		*0.001**	*390*	*130*	*3.6*	*0.18*	*0.034*	*109*	*452*	*0.0035*	*0.0014*	*0.0013*	*0.15*	*0.0121*
M54-4	23/11/2015	< 0.001	410	89	3.4	< 0.1	0.017	66	662	0.00012	< 0.0001	< 0.0001	< 0.0001	< 0.0002
M66-2	24/11/2015	< 0.001	330	95	1.6	0.49	0.018	140	800	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0002
M67-2	25/11/2015	< 0.001	350	5.8	1.8	< 0.1	0.098	56	370	< 0.0001	< 0.0001	< 0.0001	< 0.0001	0.00042
M85	25/11/2015	< 0.001	320	46	5.3	2.7	0.073	360	1740	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0002
M86	26/11/2015	< 0.001	290	54	2.7	0.34	0.021	150	1000	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0002
75% RUL †		*n/a*	*293*	*98*	*2.7*	*0.14*	*0.026*	*82*	*339*	*0.002625*	*0.00105*	*0.000975*	*0.11*	*0.009075*
M80-2	23/11/2015	< 0.001	330	85	2.0	< 0.1	0.018	16	520	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0002
M87-2	24/11/2015	< 0.001	230	27	1.7	< 0.1	0.084	14	370	< 0.0001	< 0.0001	< 0.0001	< 0.0001	0.0048
OW37-s	25/11/2015	< 0.001	200	47	1.8	<0.1	0.24	36	310	<0.0001	<0.0001	<0.0001	<0.0001	<0.0002
Intermediate BedrockGroundwater Flow Zone														
RUL		*0.001**	*400*	*132*	*3.5*	*0.18*	*0.032*	*106*	*465*	*0.0035*	*0.0014*	*0.0013*	*0.15*	*0.0121*
M177	25/11/2015	< 0.001	240	7.6	1.6	< 0.1	0.008	13	304	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0002
M179	25/11/2015	< 0.001	260	39	3.7	0.95	0.031	26	420	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0002
M185-1	26/11/2015	< 0.001	410	260	29	0.35	0.034	410	1090	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.048
M185-2	25/11/2015	< 0.001	310	2.6	2.1	< 0.1	0.012	4.5	340	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0002
M186	26/11/2015	< 0.001	300	1300	3.7	1.4	0.43	770	2480	< 0.0001	0.00065	0.00018	0.0023	0.0017
M187	25/11/2015	< 0.001	260	36	2	< 0.1	0.0024	25	484	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0002
M188	25/11/2015	< 0.001	330	81	2	< 0.1	0.011	110	504	< 0.0002	< 0.0002	< 0.0002	< 0.0002	0.00056
M190	25/11/2015	< 0.001	280	48	3.3	< 0.1	0.01	20	460	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0002
75% RUL †		*n/a*	*300*	*99*	*2.6*	*0.14*	*0.024*	*80*	*349*	*0.002625*	*0.00105*	*0.000975*	*0.11*	*0.009075*
M80-1	23/11/2015	< 0.001	150	28	0.9	< 0.1	0.0048	37	204	< 0.0001	0.0023	0.00021	0.00093	0.00057
M82-1	23/11/2015	< 0.001	330	44	2.5	< 0.1	0.0054	100	502	< 0.0001	0.00012	< 0.0001	< 0.0001	< 0.0002
M82-2	23/11/2015	< 0.001	330	30	2.8	< 0.1	0.017	21	492	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0002
M106	23/11/2015	< 0.001	320	1600	1.1	< 0.5	< 0.01	970	3020	0.00059	0.00036	< 0.0001	0.00016	< 0.0002

* Site-specific RUL for 1,4 dioxane set by ERT Order dated December 24, 2015

† Wells located on the boundary of WM property, including the CAZ boundary, are compared to 75% of RUL concentrations

Groundwater results exceed Reasonable Use Limits (*0.05*

Table 5c: Groundwater Quality Results from Verification Re-sampling

Name	Date	1,4-Dioxane mg/L	Alkalinity mg/L	Chloride mg/L	Dissolved Organic Carbon mg/L	Iron mg/L	Manganese mg/L	Sodium mg/L	Total Dissolved Solids mg/L	1,1-Dichloroethylene mg/L	Benzene mg/L	Ethylbenzene mg/L	Total Xylenes mg/L	Toluene mg/L
Shallow Groundwater Flow Zone														
RUL		*0.001*	*390*	*130*	*3.6*	*0.18*	*0.034*	*109*	*452*	*0.0035*	*0.0014*	*0.0013*	*0.15*	*0.0121*
M85	25/11/2015	< 0.001	320	46	5.3	2.7	0.073	360	1740	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0002
M85*	22/12/2015		280	47	7.7	1.8	0.041	370	1980					
Intermedate Bedrock Groundwater Flow Zone														
RUL		*0.001*	*400*	*132*	*3.5*	*0.18*	*0.032*	*106*	*465*	*0.0035*	*0.0014*	*0.0013*	*0.15*	*0.0121*
M179	25/11/2015	< 0.001	260	39	3.7	0.95	0.031	26	420	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0002
M179*	21/12/2015		270	48	3.4	0.91	0.027	29	396					
M185-1	26/11/2015	< 0.001	410	260	29	0.35	0.034	410	1090	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.048
M185-1*	22/12/2015	< 0.009	430	350	4.3	< 0.1	0.057	440	1400	< 0.0002	0.00021	< 0.0002	0.00035	0.012
M186	26/11/2015	< 0.001	300	1300	3.7	1.4	0.43	770	2480	< 0.0001	0.00065	0.00018	0.0023	0.0017
M186*	21/12/2015		320	1100	3.5	13	0.34	870	2390					
M187	25/11/2015	< 0.001	260	36	2	< 0.1	0.0024	25	484	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0002
M187*	30/11/2015	< 0.001	260	38	2.1	< 0.1	0.0022	25	476	< 0.0001	< 0.0001	< 0.0001		< 0.0002
M188	25/11/2015	< 0.001	330	81	2	< 0.1	0.011	110	504	< 0.0002	< 0.0002	< 0.0002	< 0.0002	0.00056
M188*	30/11/2015	< 0.001	330	80	2.1	< 0.1	0.0094	100	504	< 0.0001	< 0.0001	< 0.0001		0.00034

* Verification re-sampling results for parameters exceeding RUL for the first time in Fall 2015

5.3 Fall 2015 results exceeding Reasonable Use Limits (RUL)

Table 6: Water Quality Results from Off-Site Domestic Supply Wells
 - November 23 - December 10, 2015

Address	Date	1,4-dioxane (mg/L)
1441 County Road 1 West	10/12/2015	< 0.001
1654 County Road 1 West	23/11/2015	< 0.001
1680 County Road 1 West	26/11/2015	< 0.001
1695 County Road 1 West	26/11/2015	< 0.001
614 Belleville Road	10/12/2015	< 0.001
696 Belleville Road	23/11/2015	< 0.001

Table 7a: Surface Water Characteristics - September 14, 2015

Date	Parameter		Surface Water Station						
			S2	S3	S4R	S5	S6	S7	S8R
14-Sep-15	Velocity:	m/s	NM	NM	dry	dry	0.20	0.15	dry
	Depth:	m	0.24	0.08	dry	dry	0.17	0.06	dry
	Width:	m	2.05	0.68	dry	dry	0.50	0.60	dry
	Estimated Flow Rate:	m^3/s	NM	NM	dry	dry	0.02	0.01	dry

NM: Not Measured (flow was insufficient to register on the flow meter - very small flow observed)

Table 7b: Surface Water Characteristics – November 23, 2015

Date	Parameter		Surface Water Station						
			S2	S3	S4R	S5	S6	S7	S8R
23-Nov-15	Velocity:	m/s	0.019	0.15	dry	NM	0.05	0.23	NM
	Depth:	m	0.17	0.27	dry	0.15	1.42	1.16	0.05
	Width:	m	2.05	0.90	dry	2.00	0.11	0.14	0.3
	Estimated Flow Rate:	m^3/s	0.01	0.04	dry	NM	0.01	0.04	NM

NM: Not Measured (flow was insufficient to register on the flow meter - very small flow observed)

Table 8a: Surface Water Quality Results – September 14, 2015

			Marysville Creek			
			S2	S3	S6	S7
			(upstream)	(downstream)	(downstream)	(downstream)
		Date	14/09/2015	14/09/2015	14/09/2015	14/09/2015
Reading Name	Units	PWQO				
Inorganic and General Parameters						
Alkalinity	µg/L		150000	150000	170000	140000
Ammonia	µg/L		< 150	590	350	560
Ammonia (unionized)	µg/L	20	< 3.3	4.1	6	1.8
Biochemical Oxygen Demand	µg/L		< 2000	< 2000	< 2000	< 2000
Chemical Oxygen Demand	µg/L		54000	26000	31000	36000
Chloride	µg/L		11000	33000	19000	22000
Conductivity	µS/cm		400	530	516	430
Hardness	µg/L		190000	210000	230000	180000
Nitrate	µg/L		830	< 100	210	370
Nitrite	µg/L		41	< 10	< 10	< 10
Nitrate + Nitrite	µg/L		870	< 100	210	370
Phenols	µg/L	1	< 1	< 1	< 1	< 1
Phosphorus (total)	µg/L	30	*240*	*110*	*110*	*180*
Sulphate	µg/L		42000	58000	61000	42000
Total Dissolved Solids	µg/L		320000	368000	368000	292000
Total Suspended Solids	µg/L		3000	3000	3000	< 1000
Metals						
Arsenic	µg/L	100	< 1	< 1	< 1	< 1
Barium	µg/L		48	61	78	53
Boron	µg/L	200	27	52	29	33
Cadmium	µg/L	0.2	< 0.1	< 0.1	< 0.1	< 0.1
Calcium	µg/L		62000	69000	72000	58000
Chromium (III)	µg/L	8.9	< 5	< 5	< 5	< 5
Chromium (VI)	µg/L	1	< 2.5	< 0.5	< 0.5	< 0.5
Chromium (Total)	µg/L	100	< 5	< 5	< 5	< 5
Cobalt	µg/L	0.9	< 0.5	< 0.5	< 0.5	< 0.5
Copper	µg/L	5	*7*	2	2	3
Iron	µg/L	300	110	*630*	180	140
Lead	µg/L	5	< 0.5	< 0.5	< 0.5	< 0.5
Magnesium	µg/L		8900	9400	11000	8000
Nickel	µg/L	25	2	1	< 1	< 1
Potassium	µg/L		4000	6000	5000	8000
Sodium	µg/L		7400	22000	15000	13000
Zinc	µg/L	20	< 10	< 10	< 10	< 10
VOCs						
1,4-dioxane	µg/L	20	< 1	< 1	< 1	< 1
Naphthalene	µg/L	7	< 0.5	< 0.5	< 0.5	< 0.5
Field Measured						
pH (Field)	unitless	6.5-8.5	7.85	7.32	7.65	6.97
Conductivity (Field)	µS/cm		450	560	550	500
Dissoved Oxygen (Field)	µg/L					
Temperature (Field)	°C		16.8	15.1	16.1	15.4

Table 8b: Surface Water Quality Results – November 23, 2015

			Marysville Creek				Beechwood Ditch	
			S2	S3	S6	S7	S5	S8R
			(upstream)	(downstream)	(downstream)	(downstream)	(upstream)	(downstream)
		Date	23/11/2015	23/11/2015	23/11/2015	23/11/2015	23/11/2015	23/11/2015
Reading Name	Units	PWQO						
Inorganic and General Parameters								
Alkalinity	µg/L		190000	200000	210000	200000	290000	240000
Ammonia	µg/L		<150	280	160	<150	<150	510
Ammonia (unionized)	µg/L	20	<0.5	1.1	0.87	<0.5	<0.67	3.7
Biochemical Oxygen Demand	µg/L		<2000	<2000	<2000	<2000	<2000	<2000
Chemical Oxygen Demand	µg/L		28000	21000	27000	23000	14000	46000
Chloride	µg/L		27000	24000	24000	23000	2900	22000
Conductivity	µS/cm		474	484	487	489	562	554
Hardness	µg/L		220000	230000	230000	220000	290000	250000
Nitrate	µg/L		<100	<100	<100	<100	<100	<100
Nitrite	µg/L		<10	<10	<10	<10	<10	<10
Nitrate + Nitrite	µg/L		<100	<100	<100	<100	<100	<100
Phenols	µg/L	1	<1	<1	<1	<1	<1	<1
Phosphorus (total)	µg/L	30	19	19	21	19	*34*	*49*
Sulphate	µg/L		<1000	14000	13000	13000	15000	20000
Total Dissolved Solids	µg/L		284000	270000	284000	284000	316000	290000
Total Suspended Solids	µg/L		<2000	<1000	2000	<1000	1000	75000
Metals								
Boron	µg/L	200	<20	<20	<20	<20	<20	<20
Cadmium	µg/L		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Calcium	µg/L		72000	76000	75000	74000	91000	76000
Chromium (III)	µg/L	8.9	<5	<5	<5	<5	<5	<5
Chromium (VI)	µg/L	1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Chromium (Total)	µg/L		<5	<5	<5	<5	<5	<5
Cobalt	µg/L	0.9	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Copper	µg/L	5	<2	<2	<2	<2	<2	<2
Iron	µg/L	300	90	70	170	60	50	370
Lead	µg/L	5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Magnesium	µg/L		8900	10000	9700	9600	17000	16000
Nickel	µg/L	25	<1	<1	<1	<1	<1	<1
Potassium	µg/L		4000	3000	3000	3000	2000	4000
Sodium	µg/L		14000	13000	13000	12000	6000	20000
Zinc	µg/L	20	<10	<10	<10	<10	<10	<10
VOCs								
1,4-dioxane	µg/L	20	<1	<1	<1	<1	<1	1.8
Naphthalene	µg/L	7	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Field Measured								
pH (Field)	unitless	6.5-8.5	7.48	7.54	7.69	7.55	7.68	7.76
Conductivity (Field)	µS/cm		416	430	428	429	497	493
Dissoved Oxygen (Field)	µg/L		12.66	4.27	15.73	19.22	13.13	13.85
Temperature (Field)	°C		2.3	1.1	1.5	1.6	1.5	2.7

Exceeds PWQO

* Location S4R not sampled - dry

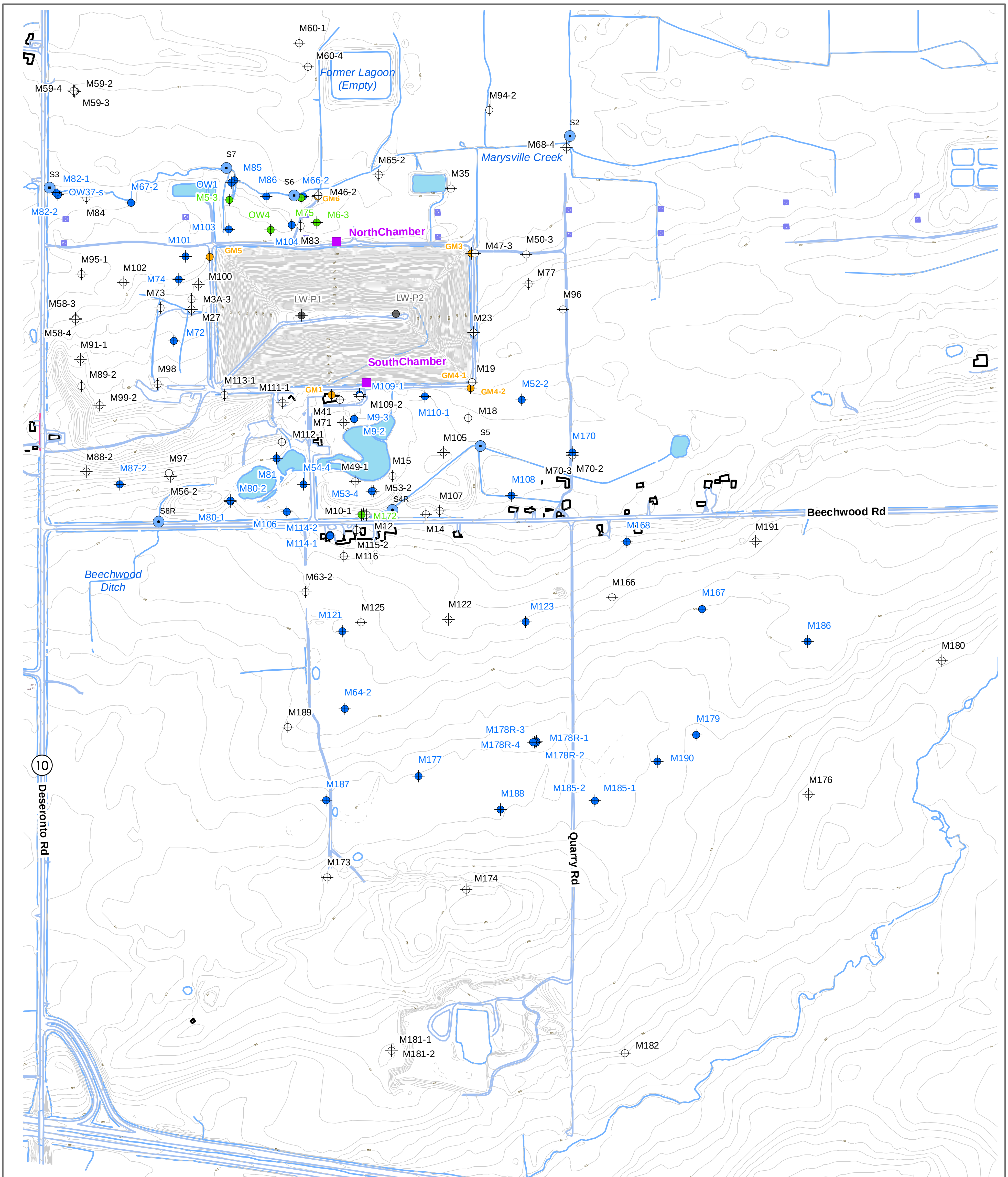
Table 9: Subsurface Gas Monitoring Results - November 24, 2015

Gas Monitor	Location	Reading (ppm)
GM1	North of garage area, south of waste mound	0
GM3	Northeast corner of waste mound	0
GM4-1	Southeast corner of waste mound	0
GM4-2		0
GM5	Northwest corner of waste mound	0
GM6	North of waste mound	0

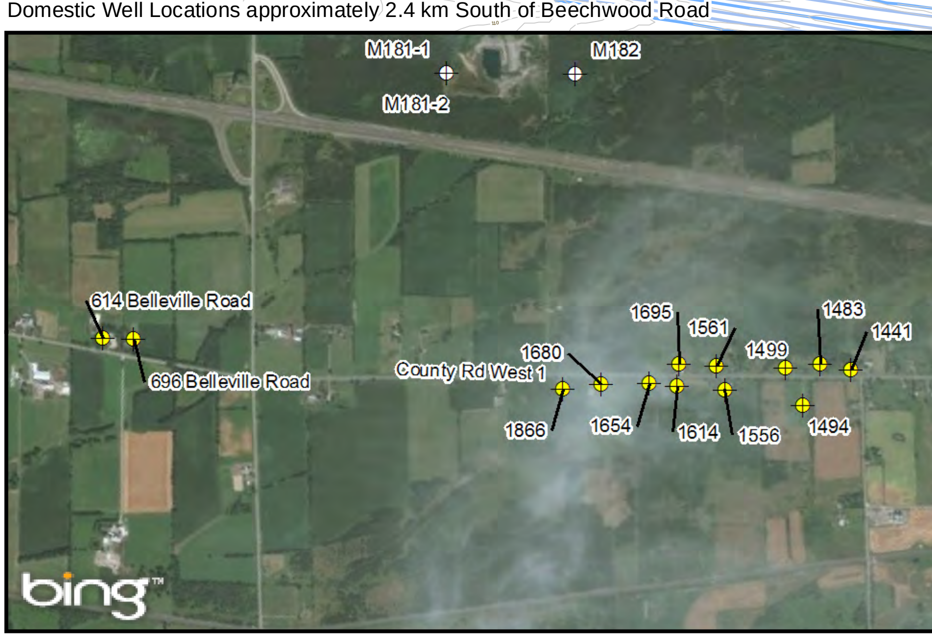
Table 10: Additional Investigations

Description of Activities	Reporting Completed in 2015	Ongoing Work in 2016
CAZ Hydrogeological Investigation: • Multiple long duration pumping tests at selected borehole locations to characterize formation response in the proposed CAZ monitoring network • Drilling, Downhole Geophysics, Packer Testing, Monitoring well installation, Well Development and Surveying of additional boreholes in the proposed CAZ • Groundwater sampling in support of the CAZ hydrogeological investigation technical documents • Additional sampling events conducted to obtain information for the CAZ application technical documents, including: 1,4 dioxane sampling in shallow groundwater and surface water south of the landfill; re-sampling of CAZ wells	- Revised Technical Supporting Document for CAZ Application (March 2015) - Revised Report, Hydrogeologic Investigation in the Area of the Proposed CAZ (March 2015) - Revised Interim Environmental Monitoring Plan v. 04 (August 2015)	- Continuing investigation of the proposed CAZ area to further delineate the extent of leachate impacts to groundwater - Update Site Conceptual Model and CAZ Delineation report to be submitted in January 2016 - Revised EMP to be prepared on completion of further groundwater investigations
Town of Greater Napanee Requirements: • Monthly North/South Chambers combined leachate sampling (Jan-Dec)	- Monthly reports prepared for the Town of Greater Napanee	- Monitoring and reporting to continue in 2016
ECA Monitoring Requirements - Storm Water Ponds and Leachate: • Storm Water Ponds ❖Monthly sampling for inorganic and general chemistry parameter lists (March, April, May, and October, November, December) ❖Quarterly Sampling of the ECA Storm water ponds for Toxicity (March, June, September, December) • Leachate (North Chamber) ❖Quarterly sampling list (March, July, September, December) ❖Annual sampling chemistry list (May)	- Monitoring results from the 2014 calendar year for the stormwater ponds and leachate locations were reported in the 2014 Annual Report, prepared by WSP Canada Inc. and dated March 2015 - Monitoring results from the 2015 calendar year will be reported in the 2015 Annual Report, to be prepared in March 2016.	- Monitoring and reporting to continue in 2016
WMCC Wildlife Learning Centre: • Quarterly sampling of water supply (Bacteria parameters) (March, June, September, December)	- No reporting applicable; monitoring is for WM internal use.	- Monitoring to continue in 2016
Supplementary work related to ERT Order dated July 21, 2015: • Test monitoring well M82-2 two times over and above the twice yearly sampling required by Table 2 of the EMP		- Results to be reported in Fall 2015 Semi-Annual Monitoring Report, dated January 2016
Data Logger Study: • Download, process and plotting of data from levelogger equipment, Stingray flow monitoring device and meteroological data, radar derived precipitation data		- Report to be prepared summarizing results of the study

FIGURES



Domestic Well Locations approximately 2.4 km South of Beechwood Road



This Figure represents the monitoring program outlined in the new EMP (dated August 2015); note that a previous list of monitoring wells was used to record groundwater elevations during the summer monitoring event.

WASTE MANAGEMENT
RICHMOND LANDFILL
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Figure 1:
Site Plan and Monitoring Locations

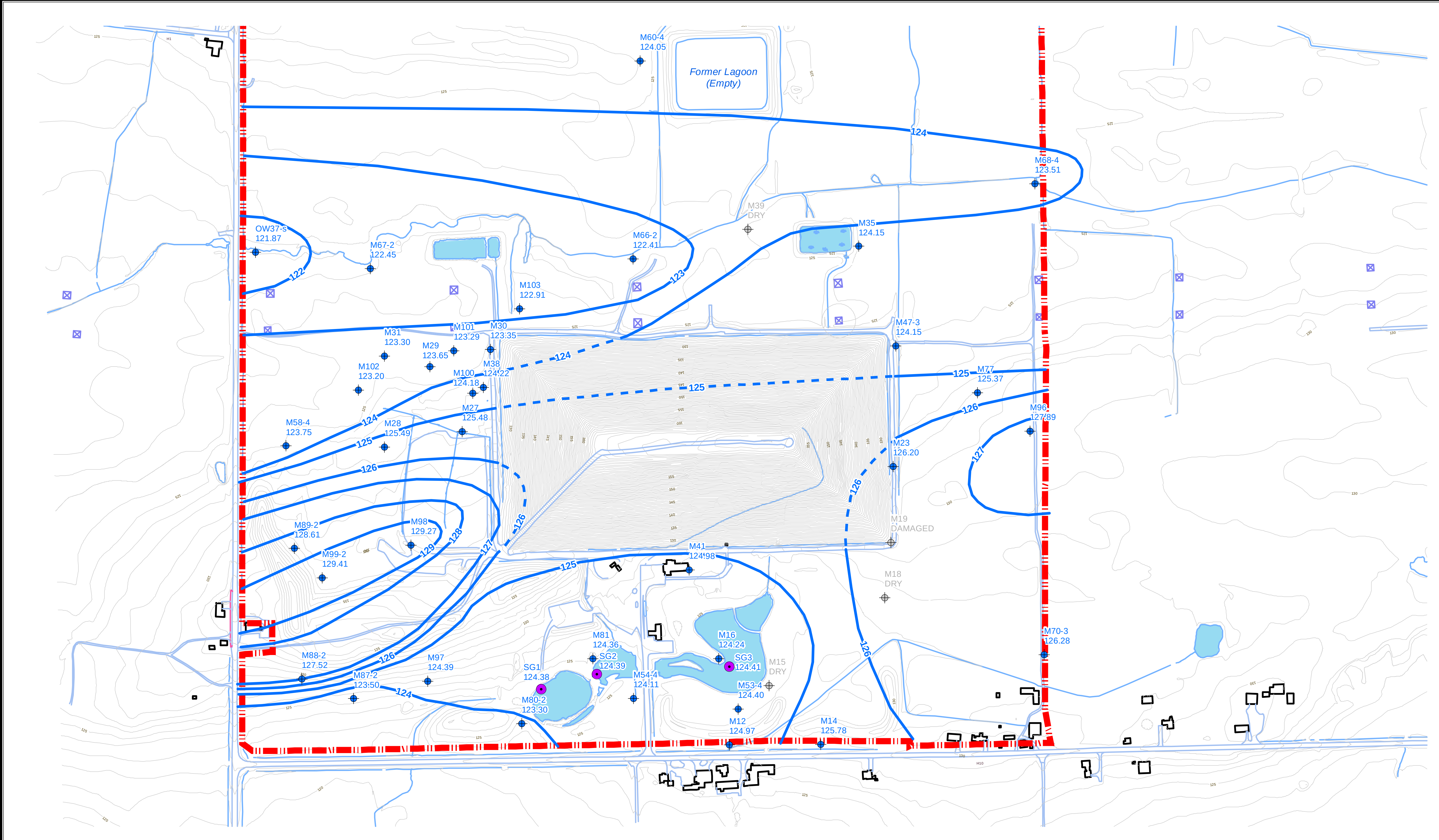
M35	Monitoring Well Used to Measure Water Level (Not Sampled)
M53-4	Monitoring Well Used to Measure Water Level and Sampled for Chemistry
M5-3	Monitoring Well Sampled for Chemistry (Not used for Water Levels)
1441 County Road 1 West	Domestic Water Supply Well Sampled for 1,4 Dioxane
GM1	Gas Monitoring Well
	Property Boundary
	Leachate Chambers
LW-P1	Lechate Monitoring Well
S2	Surface Water Monitoring Location

Project : K-B13060-00-03
Data Source: WM Canada, WESA, HPA Ltd. Base Mapping 2009
Date: January 2016

Units: UTM NAD 83 Zone 18
Scale: 1:6000

0 12.25 50 75 100 Metres

BluMetric Environmental
WM WASTE MANAGEMENT



WASTE MANAGEMENT
RICHMOND LANDFILL
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Figure 2a:
Shallow Groundwater Flow Zone Potentiometric Surface - August 4, 2015

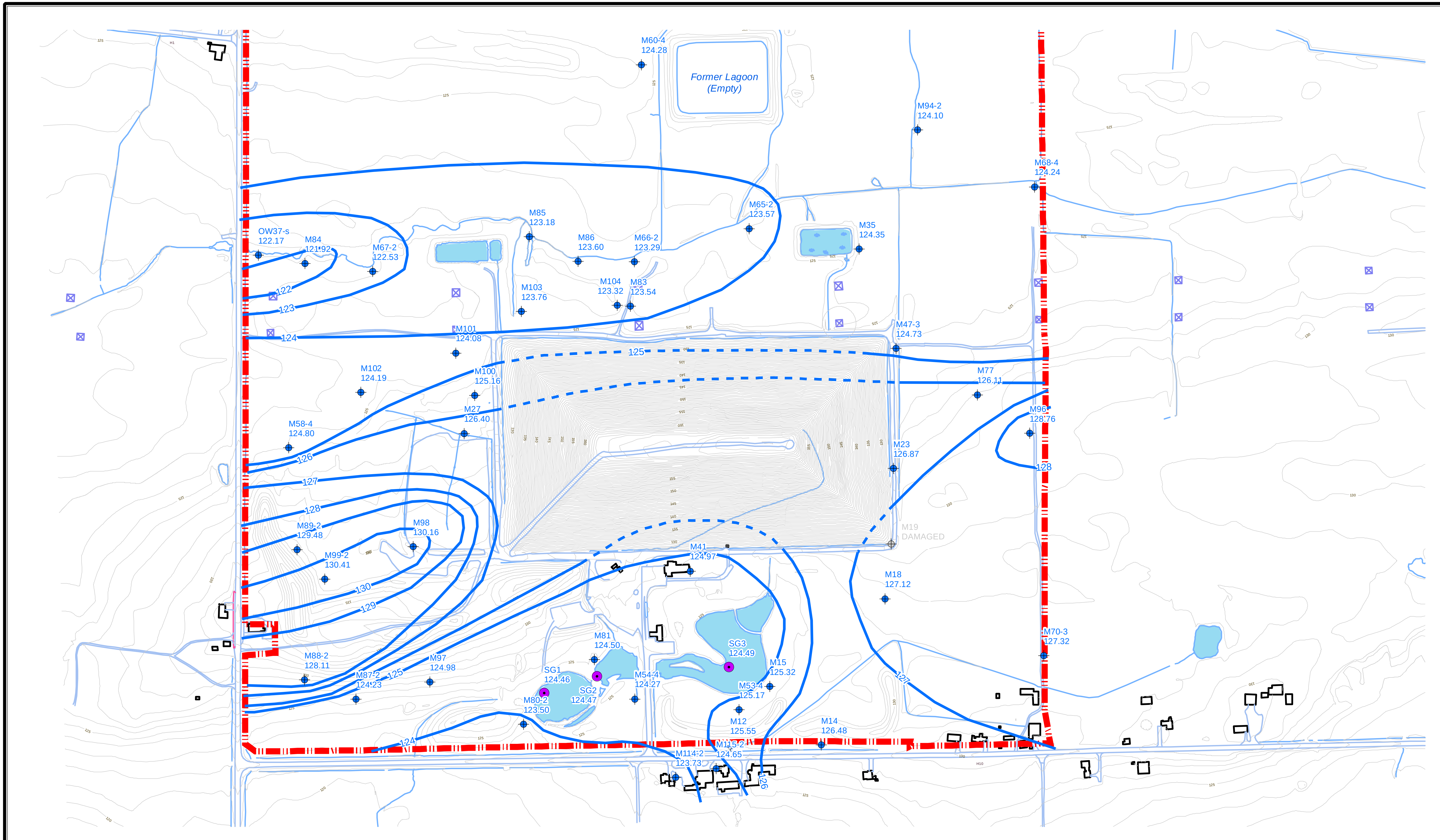
M58-4 Shallow Groundwater Zone Elevation Monitor
Topographic Contour Lines
Surface Water
Hydro Tower
Potentiometric Surface (masl)
Property Boundary
SG-1 Staff Gauge Location
Monitoring Well - No Water Level Measurement

Project : K-B13060-00-03
Data Source: WM Canada, WESA, HPA Ltd. Base Mapping 2009
Date: January 2016

Units:
UTM NAD 83 Zone 18

Scale: 1:5000

0 12.5 25 50 75 100 Meters



WASTE MANAGEMENT
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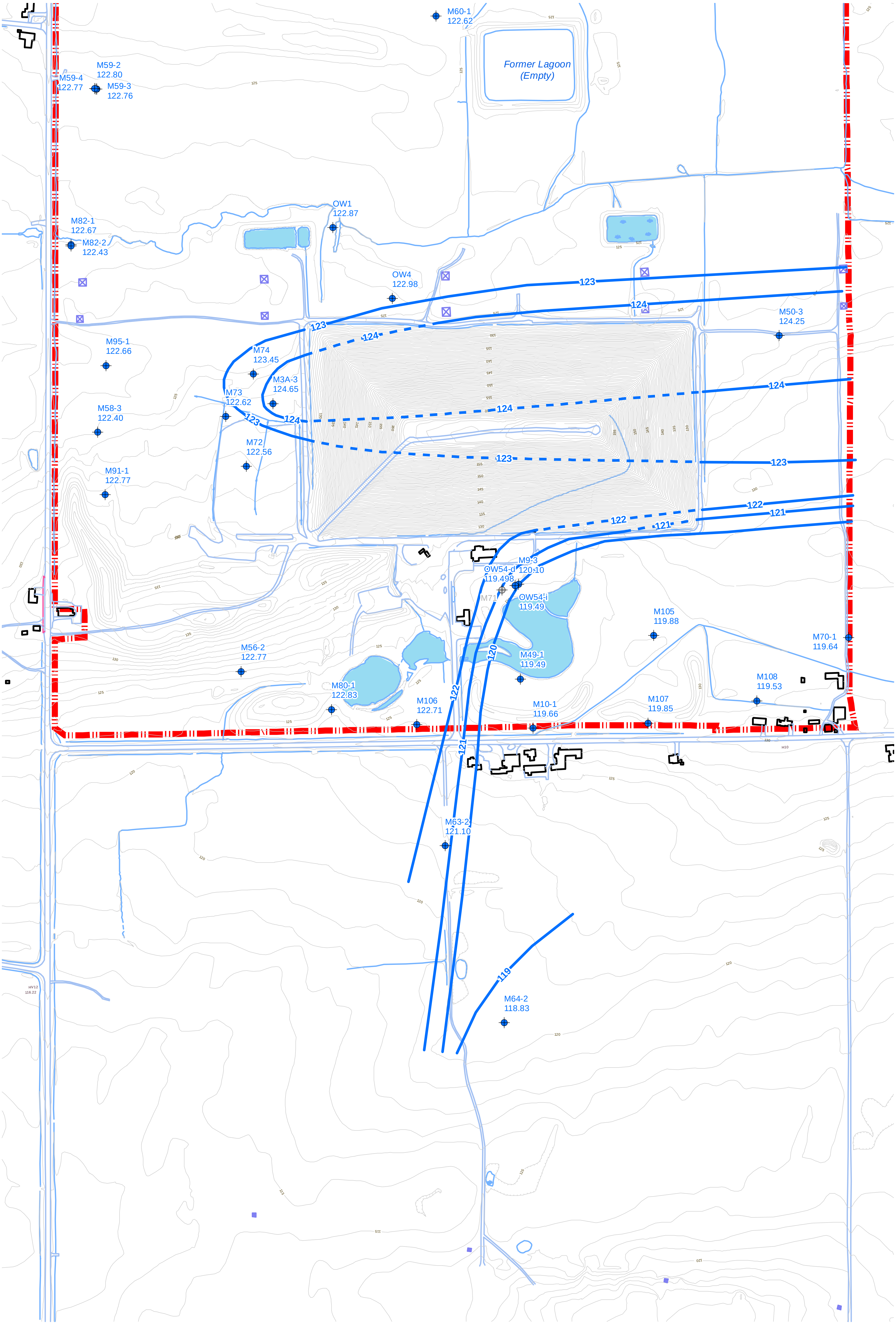
Figure 2b:
Shallow Groundwater Flow Zone Potentiometric Surface - November 20, 2015

M58-4 Shallow Groundwater Zone Elevation Monitor
Topographic Contour Lines
Surface Water
Hydro Tower
Potentiometric Surface (masl)
Property Boundary
SG-1 Staff Gauge Location
Monitoring Well - No Water Level Measurement

Project : K-B13060-00-03
Data Source: WM Canada, WESA, HPA Ltd. Base Mapping 2009
Date: January 2016
Units: UTM NAD 83 Zone 18
Scale: 1:5000



WASTE MANAGEMENT
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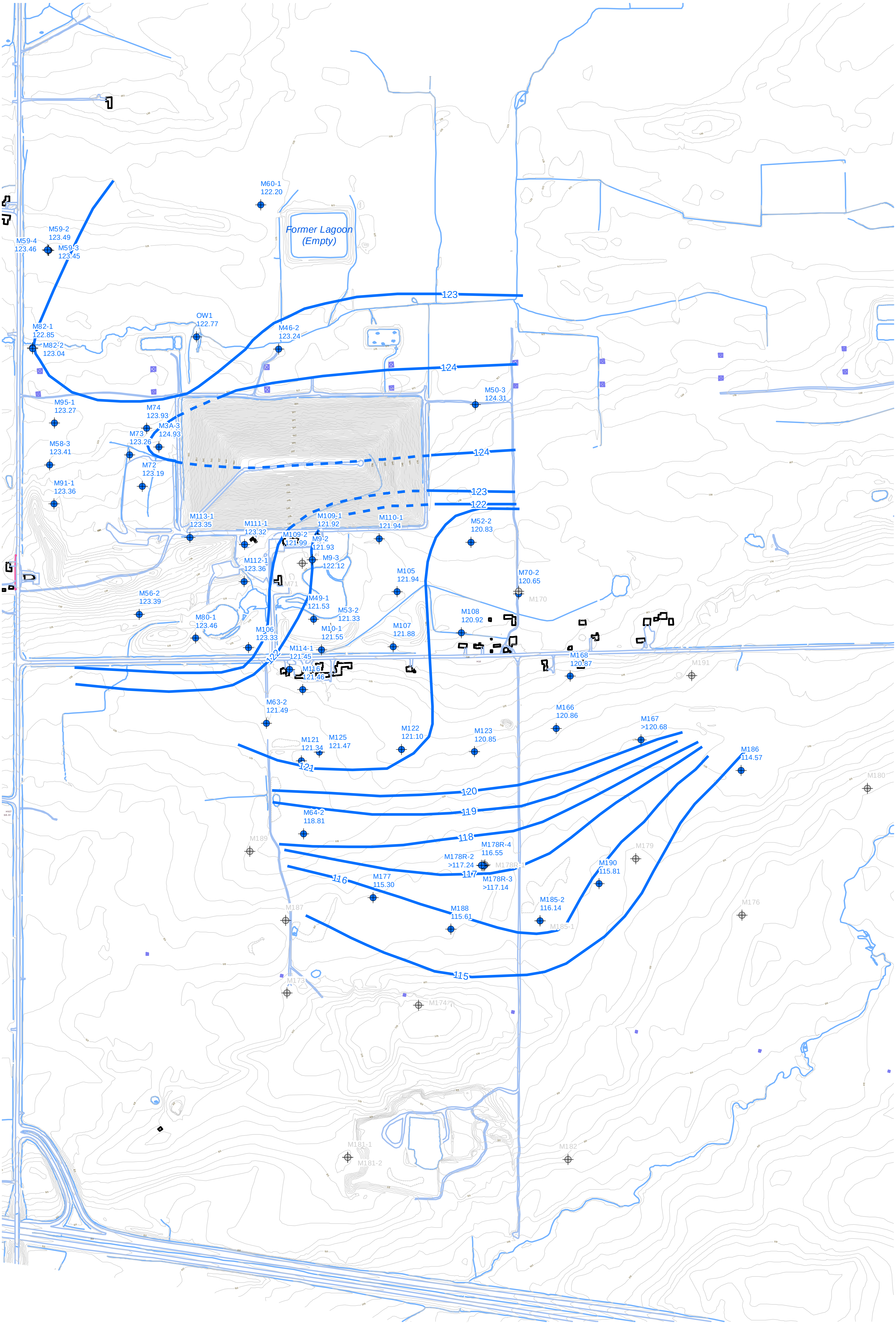
Figure 3a:
Intermediate Bedrock Groundwater Flow Zone Potentiometric Surface - August 4, 2015

M58-3 Intermediate Groundwater Zone Elevation Monitor
Monitor Not Used in Contouring
Topographic Contour Lines
Potentiometric Surface (masl)
Hydro Tower
Surface Water
Property Boundary

Project : K-B13060-00-03
Data Source: WM Canada, WESA, HPA Ltd. Base Mapping 2009
Date: January 2016

40 20 0 40 80
Meters

Units:
UTM NAD 83 Zone 18
Scale: 1:5000



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FALL 2015 SEMI-ANNUAL REPORT

Figure 3b:
Intermediate Bedrock Groundwater Flow Zone Potentiometric Surface - November 20, 2015

M58-3 Intermediate Groundwater Zone Elevation Monitor
Monitor Not Used in Contouring
Topographic Contour Lines
Potentiometric Surface (masl)
Hydro Tower
Surface Water
Property Boundary

Project : K-B13060-00-03
Data Source: WM Canada, WESA, HPA Ltd. Base Mapping 2009
Date: January 2016

75 37.5 0 75 150
Meters

Units:
UTM NAD 83 Zone 18

Scale: 1:8000

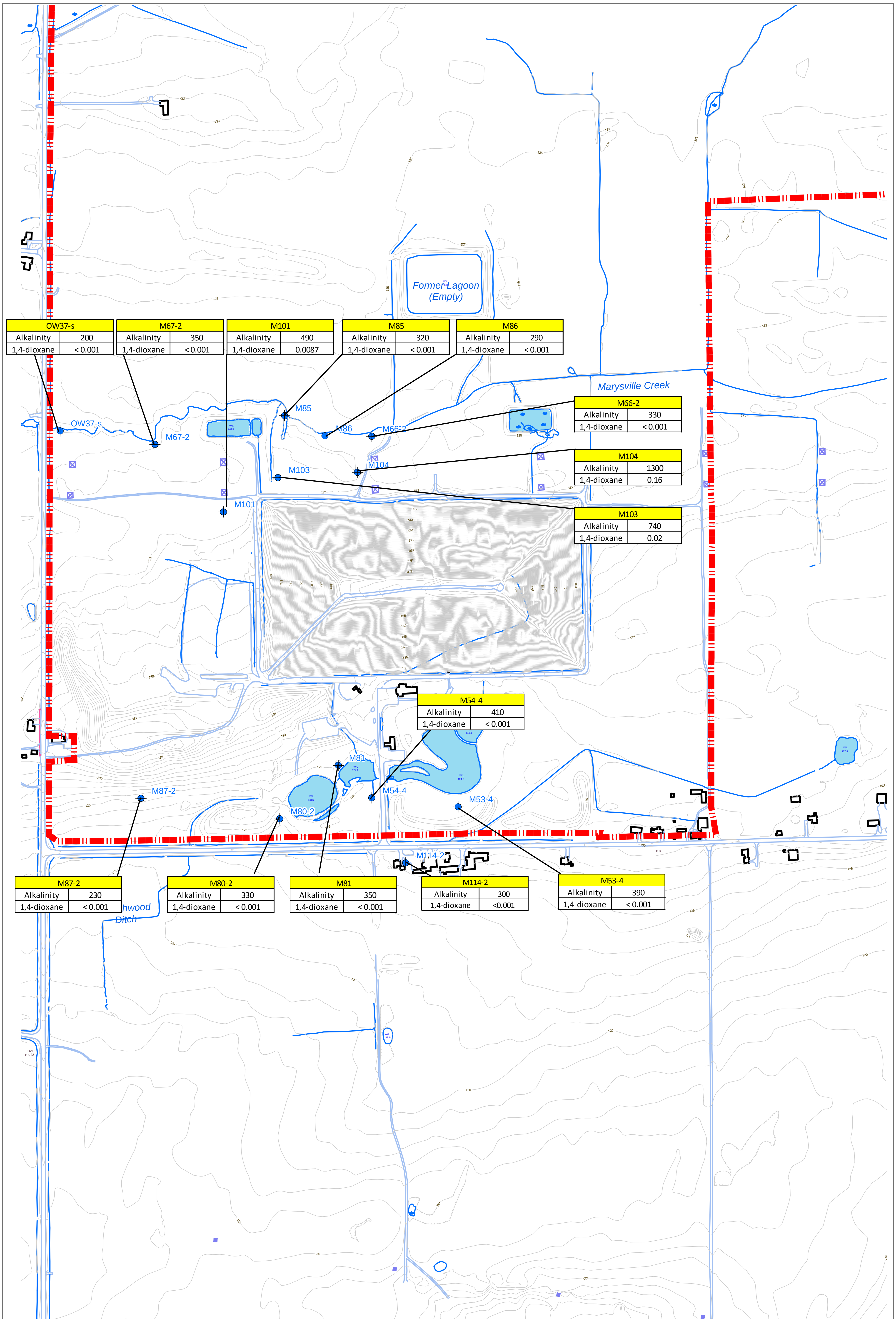

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Figure 4:
Shallow Flow Zone Concentrations

Groundwater samples were collected as part of the fall 2015 monitoring event between November 23 and 26, 2015

Legend

M53-4 Shallow Monitoring Well Sampled for Chemistry

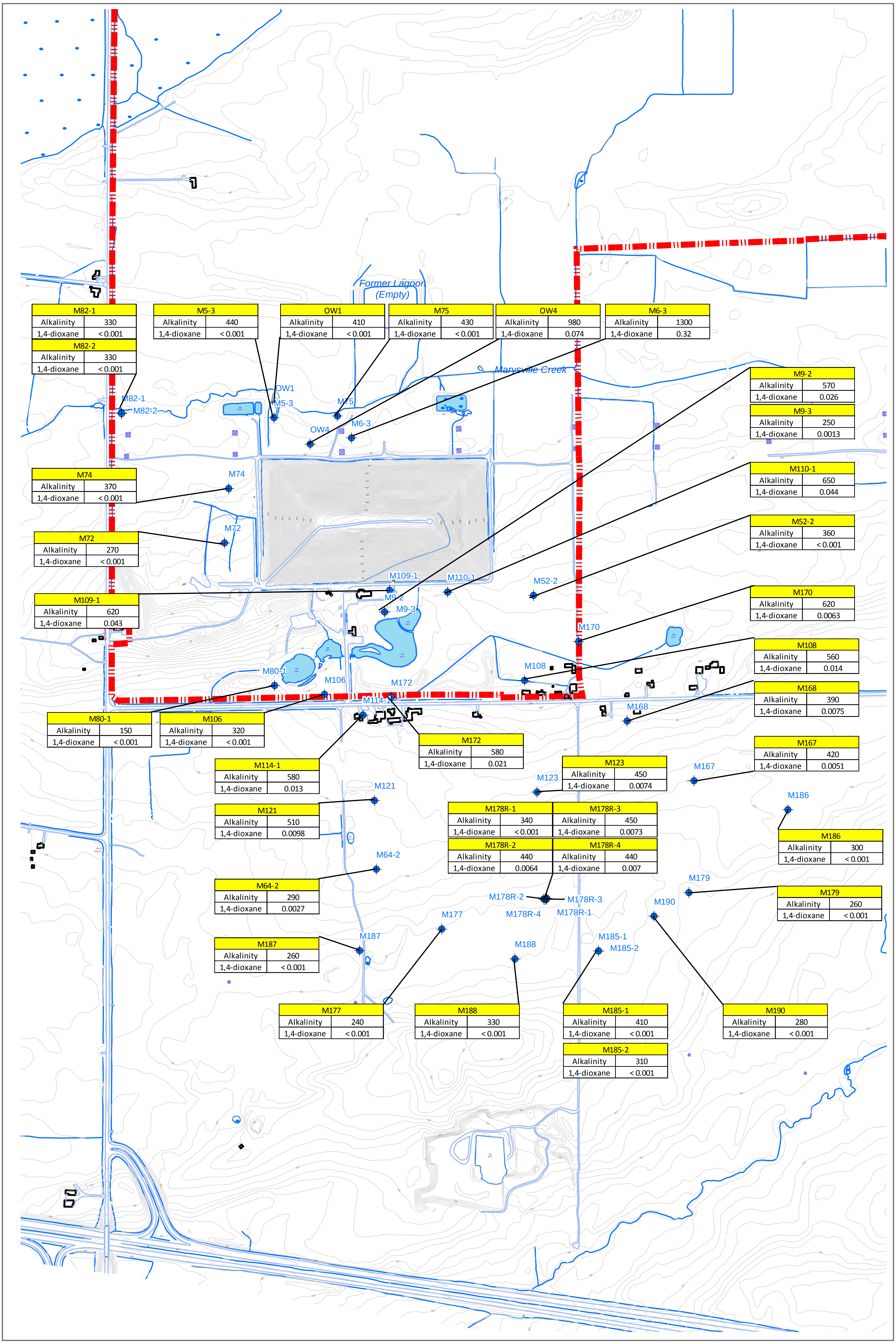
Property Boundary

Parameter	Units
Alkalinity	mg/L CaCO3
1,4-dioxane	mg/L

Project : K-B13060-00-03
Data Source: WM Canada, WESA, HPA Ltd. Base Mapping 2009
Date: January 2016

Units: UTM NAD 83 Zone 18
Scale: 1:6000

0 12.5 25 50 75 100
Metres



WASTE MANAGEMENT
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FALL 2015 SEMI-ANNUAL REPORT

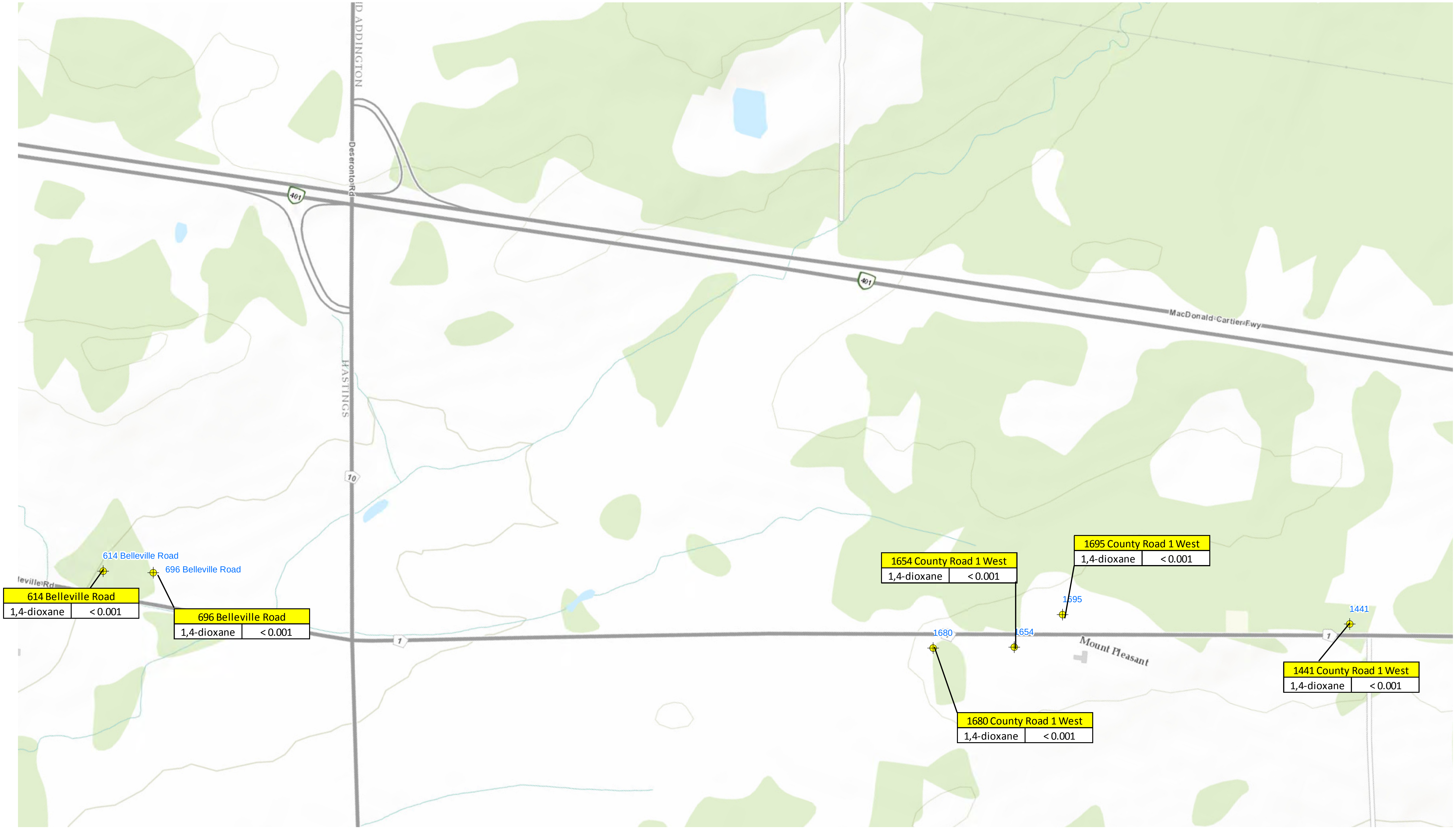
Figure 5:
Intermediate Flow Zone Concentrations
Groundwater samples were collected as part of the fall 2015 monitoring event between November 23 and 26, 2015

Legend
M53-4 Intermediate Monitoring Well Sampled for Chemistry
Property Boundary

Parameter	Units
Alkalinity	mg/L CaCO3
1,4-dioxane	mg/L

Project : K-B13060-00-03
Data Source: WM Canada, WESA, HPA Ltd. Base Mapping 2009
Date: January 2016
Units: UTM NAD 83 Zone 18
Scale: 1:8500

0 25 50 100 150 200 Metres



WASTE MANAGEMENT
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FALL 2015 SEMI-ANNUAL REPORT

Figure 6:
Domestic Well Concentrations

Groundwater samples were collected as part of the fall 2015 monitoring event between November 23 and December 10, 2015

1866 Domestic Well Sampled for Chemistry

Parameter	Units
1,4-dioxane	mg/L

Project : K-B13060-00-03
Data Source: WM Canada, WESA, HPA Ltd. Base Mapping 2009
Date: January 2016

0 25 50 100 150 200 Meters

Units:
UTM NAD 83 Zone 18
Scale: 1:8500

APPENDIX A

Monitoring Well Inventory

Monitoring Well	Easting	Northing
2054	335293	4902797
2055	335402	4902782
M3A-1	334990	4902928
M3A-2	334990	4902930
M3A-3	334990	4902930
M4-1	335006	4903036
M4-2	335006	4903038
M4-3	335006	4903038
M5-1	335003	4903162
M5-2	335003	4903163
M5-3	335003	4903163
M6-1	335200	4903172
M6-2	335201	4903174
M6-3	335201	4903174
M9-1	335410	4902787
M9-2	335410	4902789
M9-3	335410	4902789
M9R-1	335400	4902787
M10-1	335494	4902596
M10-2	335494	4902596
M10-3	335494	4902594
M12	335500	4902596
M14	335625	4902637
M15	335528	4902695
M16	335447	4902710
M18	335648	4902866
M19	335632	4902944
M23	335602	4903049
M27	334997	4902908
M28	334897	4902853
M29	334924	4902983
M30	334999	4903033
M31	334857	4902977
M35	335458	4903336
M38	335006	4902978
M39	335299	4903310
M41	335368	4902818
M42-1	335006	4903006
M42-2	335007	4903008
M42-3	335007	4903008
M43-1	335475	4902588
M43-2	335476	4902590
M43-3	335476	4902590
M45-1	334790	4904582
M45-2	334790	4904582
M45-3	334790	4904582
M46-1	335185	4903230
M46-2	335185	4903232
M47-1	335552	4903214
M47-2	335552	4903215
M47-3	335552	4903215
M48-1	334838	4902564
M48-2	334839	4902565
M48-3	334839	4902565

Monitoring Well	Easting	Northing
M49-1	335454	4902658
M49-2	335455	4902660
M49-3	335455	4902660
M50-1	335660	4903247
M50-2	335660	4903248
M50-3	335660	4903248
M51-1	335714	4903073
M51-2	335714	4903075
M51-3	335714	4903075
M52-1	335748	4902939
M52-2	335748	4902940
M52-3	335748	4902940
M53-1	335501	4902651
M53-2	335499	4902650
M53-3	335498	4902650
M53-4	335496	4902649
M54-1	335346	4902623
M54-2	335347	4902622
M54-3	335347	4902620
M54-4	335348	4902618
M55-1	334961	4903151
M55-2	334962	4903149
M55-3	334962	4903148
M55-4	334963	4903146
M56-1	335066	4902508
M56-2	335065	4902545
M57	335418	4902623
M58-1	334760	4902816
M58-2	334760	4902814
M58-3	334761	4902812
M58-4	334761	4902811
M59-1	334609	4903287
M59-2	334607	4903287
M59-3	334606	4903287
M59-4	334604	4903287
M60-1	335044	4903538
M60-3	335079	4903494
M60-4	335077	4903494
M61-1	334457	4903750
M61-2	334456	4903749
M61-3	334455	4903748
M61-4	334454	4903747
M62-1	335166	4904438
M62-2	335168	4904441
M62-3	335166	4904441
M62-4	335165	4904440
M63-1	335424	4902393
M63-2	335425	4902394
M64-1	335585	4902174
M64-2	335585	4902176
M65-1	335297	4903314
M65-2	335298	4903316
M66-1	335154	4903218
M66-2	335155	4903219

Appendix A: Monitoring Well Inventory

Monitoring Well	Easting	Northing
M67-1	334799	4903089
M67-2	334799	4903090
M68-1	335670	4903504
M68-2	335671	4903502
M68-3	335671	4903500
M68-4	335672	4903499
M69-1	335062	4904299
M69-2	335063	4904298
M69-3	335063	4904296
M69-4	335064	4904295
M70-1	335890	4902862
M70-2	335891	4902860
M70-3	335891	4902858
M71	335390	4902773
M72	334981	4902831
M73	334931	4902891
M74	334950	4902962
M75	335151	4903215
M76	335675	4903217
M77	335685	4903188
M78	335391	4902776
M79	335673	4903215
M80-1	335207	4902532
M80-2	335206	4902534
M81	335275	4902654
M82-1	334640	4903060
M82-2	334641	4903058
M83	335169	4903156
M84	334702	4903072
M85	334999	4903208
M86	335077	4903195
M87-1	334959	4902493
M87-2	334965	4902495
M88-1	334883	4902497
M88-2	334885	4902499
M89-1	334815	4902673
M89-2	334818	4902674
M90-1	334520	4903845
M90-2	334522	4903843
M91-1	334798	4902729
M91-2	334792	4902734
M93	335006	4903908
M94-1	335497	4903519
M94-2	335486	4903526
M95-1	334743	4902908
M95-2	334740	4902917
M96	335774	4903158
M97	335059	4902551
M98	334976	4902730
M99-1	334869	4902646
M99-2	334869	4902646
M100	334994	4902965
M101	334949	4903015
M102	334836	4902919

Appendix A: Monitoring Well Inventory

Monitoring Well	Easting	Northing
M103	335021	4903101
M104	335150	4903152
M105	335620	4902778
M106	335331	4902549
M107	335650	4902654
M108	335791	4902733
M109-1	335405	4902844
M109-2	335407	4902840
M110-1	335543	4902883
M110-2	335546	4902884
M111-1	335250	4902774
M111-2	335254	4902774
M112-1	335274	4902692
M112-2	335277	4902693
M113-1	335123	4902751
M113-2	335119	4902750
M114-1	335437	4902530
M114-2	335439	4902528
M115-1	335489	4902561
M115-2	335490	4902558
M116	335480	4902494
M117	335586	4902525
M121	335529	4902337
M122	335742	4902433
M123	335905	4902479
M125	335561	4902368
M166	336069	4902589
M167	336266	4902624
M168	336063	4902714
M170	335889	4902865
M171	335759	4903206
M172	335490	4902593
M173	335661	4901812
M174	335961	4901879
M176	336613	4902308
M177	335784	4902084
M178-1	336032	4902203
M178-2	336032	4902206
M178-3	336035	4902209
M178R-1	336008	4902236
M178R-2	336008	4902233
M178R-3	336005	4902233
M178R-4	336002	4902232
M179	336338	4902357
M180	336801	4902677
M181-1	335912	4901492
M181-2	335912	4901492
M182	336402	4901643
M183	336953	4901770
M184	336176	4901998
M185-1	336170	4902151
M185-2	336170	4902151
M186	336509	4902627
M187	335607	4901972

Appendix A: Monitoring Well Inventory

Monitoring Well	Easting	Northing
M188	335979	4902069
M189	335479	4902099
M190	336274	4902275
M191	336332	4902802
OW1	334995	4903200
OW4	335108	4903128
OW5	335113	4903134
OW36	334799	4903100
OW37-d	334630	4903063
OW37-s	334634	4903062
OW54-d	335406	4902785
OW54-i	335406	4902785
OW54-s	335406	4902785
OW55-d	335376	4903186
OW55-i	335376	4903186
OW55-s	335376	4903184
OW56-d	335106	4903131
OW56-i	335106	4903131
OW56-s	335106	4903129
OW57	335117	4902762
PW1	335465	4902639
PW2	334988	4903095
PW3	335620	4902778
PW4	335626	4902775
PW5	335066	4902547

APPENDIX B

Results from Analytical Quality Assurance / Quality Control (QA/QC) Program

Appendix B: Results from Quality Assurance / Quality Control (QA/QC) Program

Summary of Results with Relative Percent Difference (RPD [1]) greater than 20%

Location	Parameter	Unit	Regular Sample	Field Duplicate	RPD (%)	MDL[2]	Comment
S2	Total Suspended Solids	mg/L	3	2	40.00	1	Less than 5x MDL

Note 1: RPD (%) = 100 * ABS (Regular Sample - Duplicate Sample) / ([Regular Sample + Duplicate Sample] / 2)
Note 2: MDL = Laboratory Method Detection Limit

Detailed Results from Field Duplicate vs. Regular Samples

Reading Name	Units	M106 2015-11-23 Regular Sample	M106 2015-11-23 Field Duplicate	RPD (%)
Alkalinity	mg/L	320	330	3.08
Ammonia	mg/L	2.78	2.68	3.66
Boron	mg/L	2	2.1	4.88
Calcium	mg/L	120	120	0.00
Chloride	mg/L	1600	1600	0.00
Conductivity	µS/cm	5460	5460	0.00
Dissolved Organic Carbon	mg/L	1.1	1.1	0.00
Iron	mg/L	< 0.5	< 0.5	0.00
Magnesium	mg/L	80	78	2.53
Manganese	mg/L	< 0.01	< 0.01	0.00
Nitrate	mg/L	< 0.1	< 0.5	0.00
Nitrite	mg/L	< 0.01	< 0.05	0.00
Nitrite + Nitrate	mg/L	< 0.1	< 0.5	0.00
Potassium	mg/L	24	24	0.00
Sodium	mg/L	970	970	0.00
Sulphate	mg/L	2	1.7	16.22
Total Dissolved Solids	mg/L	3020	3050	0.99
1,1,1,2-Tetrachloroethane	mg/L	< 0.0002	< 0.0002	0.00
1,1,1-Trichloroethane	mg/L	< 0.0001	< 0.0001	0.00
1,1,2,2-Tetrachloroethane	mg/L	< 0.0002	< 0.0002	0.00
1,1,2-Trichloroethane	mg/L	< 0.0002	< 0.0002	0.00
1,1-Dichloroethane	mg/L	0.0018	0.0018	0.00
1,1-Dichloroethylene	mg/L	0.00059	0.0006	1.68
1,2-Dichlorobenzene (o)	mg/L	< 0.0002	< 0.0002	0.00
1,2-Dichloroethane	mg/L	< 0.0002	< 0.0002	0.00
1,3,5-Trimethylbenzene	mg/L	< 0.0002	< 0.0002	0.00
1,3-Dichlorobenzene (m)	mg/L	< 0.0002	< 0.0002	0.00
1,4-Dichlorobenzene (p)	mg/L	< 0.0002	< 0.0002	0.00
1,4-Dioxane	mg/L	< 0.001	< 0.001	0.00
Benzene	mg/L	0.00036	0.0004	10.53
Chlorobenzene	mg/L	< 0.0001	< 0.0001	0.00
Chloroethane	mg/L	< 0.0002	< 0.0002	0.00
Chloromethane	mg/L	< 0.0005	< 0.0005	0.00
Cis-1,2-Dichloroethylene	mg/L	< 0.0001	< 0.0001	0.00
Dichloromethane	mg/L	< 0.0005	< 0.0005	0.00
Ethylbenzene	mg/L	< 0.0001	< 0.0001	0.00
m+p-Xylene	mg/L	0.00016	0.00016	0.00
o-Xylene	mg/L	< 0.0001	< 0.0001	0.00
Styrene	mg/L	< 0.0002	< 0.0002	0.00
Tetrachloroethylene	mg/L	< 0.0001	< 0.0001	0.00
Toluene	mg/L	< 0.0002	< 0.0002	0.00
Trans-1,2-dichloroethylene	mg/L	< 0.0001	< 0.0001	0.00
Trichloroethylene	mg/L	< 0.0001	< 0.0001	0.00
Vinyl Chloride	mg/L	< 0.0002	< 0.0002	0.00

Detailed Results from Field Duplicate vs. Regular Samples

Reading Name	Units	M108 2015-11-25 Regular Sample	M108 2015-11-25 Field Duplicate	RPD (%)
Alkalinity	mg/L	560	560	0.00
Ammonia	mg/L	1	0.97	3.05
Boron	mg/L	0.32	0.31	3.17
Calcium	mg/L	160	150	6.45
Chloride	mg/L	140	140	0.00
Conductivity	µS/cm	1480	1470	0.68
Dissolved Organic Carbon	mg/L	6.3	5.8	8.26
Iron	mg/L	0.8	0.77	3.82
Magnesium	mg/L	50	49	2.02
Manganese	mg/L	0.082	0.079	3.73
Nitrate	mg/L	< 0.1	< 0.1	0.00
Nitrite	mg/L	< 0.01	< 0.01	0.00
Nitrite + Nitrate	mg/L	< 0.1	< 0.1	0.00
Potassium	mg/L	9	8.6	4.55
Sodium	mg/L	97	96	1.04
Sulphate	mg/L	3.2	3.6	11.76
Total Dissolved Solids	mg/L	820	840	2.41
1,1,1,2-Tetrachloroethane	mg/L	< 0.0002	< 0.0002	0.00
1,1,1-Trichloroethane	mg/L	< 0.0001	< 0.0001	0.00
1,1,2,2-Tetrachloroethane	mg/L	< 0.0002	< 0.0002	0.00
1,1,2-Trichloroethane	mg/L	< 0.0002	< 0.0002	0.00
1,1-Dichloroethane	mg/L	0.00037	0.00037	0.00
1,1-Dichloroethylene	mg/L	< 0.0001	< 0.0001	0.00
1,2-Dichlorobenzene (o)	mg/L	< 0.0002	< 0.0002	0.00
1,2-Dichloroethane	mg/L	< 0.0002	< 0.0002	0.00
1,3,5-Trimethylbenzene	mg/L	< 0.0002	< 0.0002	0.00
1,3-Dichlorobenzene (m)	mg/L	< 0.0002	< 0.0002	0.00
1,4-Dichlorobenzene (p)	mg/L	< 0.0002	< 0.0002	0.00
1,4-Dioxane	mg/L	0.014	0.014	0.00
Benzene	mg/L	< 0.0001	< 0.0001	0.00
Chlorobenzene	mg/L	< 0.0001	< 0.0001	0.00
Chloroethane	mg/L	0.0058	0.0059	1.71
Chloromethane	mg/L	< 0.0005	< 0.0005	0.00
Cis-1,2-Dichloroethylene	mg/L	< 0.0001	< 0.0001	0.00
Dichloromethane	mg/L	< 0.0005	< 0.0005	0.00
Ethylbenzene	mg/L	< 0.0001	< 0.0001	0.00
m+p-Xylene	mg/L	< 0.0001	< 0.0001	0.00
o-Xylene	mg/L	< 0.0001	< 0.0001	0.00
Styrene	mg/L	< 0.0002	< 0.0002	0.00
Tetrachloroethylene	mg/L	< 0.0001	< 0.0001	0.00
Toluene	mg/L	< 0.0002	< 0.0002	0.00
Total Xylenes	mg/L	< 0.0001	< 0.0001	0.00
Trans-1,2-dichloroethylene	mg/L	< 0.0001	< 0.0001	0.00
Trichloroethylene	mg/L	< 0.0001	< 0.0001	0.00
Vinyl Chloride	mg/L	< 0.0002	< 0.0002	0.00

Appendix B: Results from Quality Assurance / Quality Control (QA/QC) Program

Detailed Results from Field Duplicate vs. Regular Samples

Reading Name	Units	M109-1 2015-11-26 Regular Sample	M109-1 2015-11-26 Field Duplicate	RPD (%)
Alkalinity	mg/L	620	620	0.00
Ammonia	mg/L	1.05	1.04	0.96
Boron	mg/L	0.49	0.48	2.06
Calcium	mg/L	190	190	0.00
Chloride	mg/L	250	260	3.92
Conductivity	µS/cm	1970	1970	0.00
Dissolved Organic Carbon	mg/L	13	13	0.00
Iron	mg/L	14	15	6.90
Magnesium	mg/L	62	62	0.00
Manganese	mg/L	0.43	0.43	0.00
Nitrate	mg/L	< 0.1	< 0.1	0.00
Nitrite	mg/L	< 0.01	< 0.01	0.00
Nitrite + Nitrate	mg/L	< 0.1	< 0.1	0.00
Potassium	mg/L	8.2	8.4	2.41
Sodium	mg/L	160	150	6.45
Sulphate	mg/L	< 1	< 1	0.00
Total Dissolved Solids	mg/L	1050	1100	4.65
1,1,1,2-Tetrachloroethane	mg/L	< 0.0002	< 0.0002	0.00
1,1,1-Trichloroethane	mg/L	< 0.0001	< 0.0001	0.00
1,1,2,2-Tetrachloroethane	mg/L	< 0.0002	< 0.0002	0.00
1,1,2-Trichloroethane	mg/L	< 0.0002	< 0.0002	0.00
1,1-Dichloroethane	mg/L	< 0.0001	< 0.0001	0.00
1,1-Dichloroethylene	mg/L	< 0.0001	< 0.0001	0.00
1,2-Dichlorobenzene (o)	mg/L	< 0.0002	< 0.0002	0.00
1,2-Dichloroethane	mg/L	< 0.0002	< 0.0002	0.00
1,3,5-Trimethylbenzene	mg/L	< 0.0002	< 0.0002	0.00
1,3-Dichlorobenzene (m)	mg/L	< 0.0002	< 0.0002	0.00
1,4-Dichlorobenzene (p)	mg/L	< 0.0002	< 0.0002	0.00
1,4-Dioxane	mg/L	0.043	0.043	0.00
Benzene	mg/L	0.00011	0.00012	8.70
Chlorobenzene	mg/L	< 0.0001	< 0.0001	0.00
Chloroethane	mg/L	0.015	0.016	6.45
Chloromethane	mg/L	< 0.0005	< 0.0005	0.00
Cis-1,2-Dichloroethylene	mg/L	< 0.0001	< 0.0001	0.00
Dichloromethane	mg/L	< 0.0005	< 0.0005	0.00
Ethylbenzene	mg/L	< 0.0001	< 0.0001	0.00
m+p-Xylene	mg/L	< 0.0001	< 0.0001	0.00
o-Xylene	mg/L	< 0.0001	< 0.0001	0.00
Styrene	mg/L	< 0.0002	< 0.0002	0.00
Tetrachloroethylene	mg/L	< 0.0001	< 0.0001	0.00
Toluene	mg/L	< 0.0002	< 0.0002	0.00
Total Xylenes	mg/L	< 0.0001	< 0.0001	0.00
Trans-1,2-dichloroethylene	mg/L	< 0.0001	< 0.0001	0.00
Trichloroethylene	mg/L	< 0.0001	< 0.0001	0.00
Vinyl Chloride	mg/L	0.00028	0.00027	3.64

Appendix B: Results from Quality Assurance / Quality Control (QA/QC) Program

Detailed Results from Field Duplicate vs. Regular Samples

Reading Name	Units	M172 2015-11-24 Regular Sample	M172 2015-11-24 Field Duplicate	RPD (%)
Alkalinity	mg/L	580	580	0.00
Ammonia	mg/L	0.87	0.85	2.33
Boron	mg/L	0.26	0.26	0.00
Calcium	mg/L	190	200	5.13
Chloride	mg/L	190	200	5.13
Conductivity	μS/cm	1730	1730	0.00
Dissolved Organic Carbon	mg/L	8.9	9.1	2.22
Iron	mg/L	27	27	0.00
Magnesium	mg/L	46	46	0.00
Manganese	mg/L	0.91	0.9	1.10
Nitrate	mg/L	< 0.1	< 0.1	0.00
Nitrite	mg/L	< 0.01	< 0.01	0.00
Nitrite + Nitrate	mg/L	< 0.1	< 0.1	0.00
Potassium	mg/L	6	5.9	1.68
Sodium	mg/L	110	110	0.00
Sulphate	mg/L	4.1	3.8	7.59
Total Dissolved Solids	mg/L	1020	1030	0.98
1,1,1,2-Tetrachloroethane	mg/L	< 0.0002	< 0.0002	0.00
1,1,1-Trichloroethane	mg/L	< 0.0001	< 0.0001	0.00
1,1,2,2-Tetrachloroethane	mg/L	< 0.0002	< 0.0002	0.00
1,1,2-Trichloroethane	mg/L	< 0.0002	< 0.0002	0.00
1,1-Dichloroethane	mg/L	0.0037	0.0034	8.45
1,1-Dichloroethylene	mg/L	0.00028	0.00024	15.38
1,2-Dichlorobenzene (o)	mg/L	< 0.0002	< 0.0002	0.00
1,2-Dichloroethane	mg/L	< 0.0002	< 0.0002	0.00
1,3,5-Trimethylbenzene	mg/L	< 0.0002	< 0.0002	0.00
1,3-Dichlorobenzene (m)	mg/L	< 0.0002	< 0.0002	0.00
1,4-Dichlorobenzene (p)	mg/L	< 0.0002	< 0.0002	0.00
1,4-Dioxane	mg/L	0.021	0.021	0.00
Benzene	mg/L	0.00013	0.00013	0.00
Chlorobenzene	mg/L	< 0.0001	< 0.0001	0.00
Chloroethane	mg/L	0.011	0.0094	15.69
Chloromethane	mg/L	< 0.0005	< 0.0005	0.00
Cis-1,2-Dichloroethylene	mg/L	0.00014	0.00013	7.41
Dichloromethane	mg/L	< 0.0005	< 0.0005	0.00
Ethylbenzene	mg/L	< 0.0001	< 0.0001	0.00
m+p-Xylene	mg/L	< 0.0001	< 0.0001	0.00
o-Xylene	mg/L	< 0.0001	< 0.0001	0.00
Styrene	mg/L	< 0.0002	< 0.0002	0.00
Tetrachloroethylene	mg/L	< 0.0001	< 0.0001	0.00
Toluene	mg/L	< 0.0002	< 0.0002	0.00
Total Xylenes	mg/L	< 0.0001	< 0.0001	0.00
Trans-1,2-dichloroethylene	mg/L	< 0.0001	< 0.0001	0.00
Trichloroethylene	mg/L	< 0.0001	< 0.0001	0.00
Vinyl Chloride	mg/L	0.00054	0.00046	16.00

Appendix B: Results from Quality Assurance / Quality Control (QA/QC) Program

Detailed Results from Field Duplicate vs. Regular Samples

Reading Name	Units	M82-2 2015-11-23 Regular Sample	M82-2 2015-11-23 Field Duplicate	RPD (%)
Alkalinity	mg/L	330	330	0.00
Ammonia	mg/L	0.3	0.29	3.39
Boron	mg/L	0.18	0.18	0.00
Calcium	mg/L	110	110	0.00
Chloride	mg/L	30	31	3.28
Conductivity	µS/cm	833	825	0.97
Dissolved Organic Carbon	mg/L	2.8	2.9	3.51
Iron	mg/L	< 0.1	< 0.1	0.00
Magnesium	mg/L	30	30	0.00
Manganese	mg/L	0.017	0.018	5.71
Nitrate	mg/L	< 0.1	< 0.1	0.00
Nitrite	mg/L	< 0.01	< 0.01	0.00
Nitrite + Nitrate	mg/L	< 0.1	< 0.1	0.00
Potassium	mg/L	4.2	4.2	0.00
Sodium	mg/L	21	21	0.00
Sulphate	mg/L	67	67	0.00
Total Dissolved Solids	mg/L	492	498	1.21
1,1,1,2-Tetrachloroethane	mg/L	< 0.0002	< 0.0002	0.00
1,1,1-Trichloroethane	mg/L	< 0.0001	< 0.0001	0.00
1,1,2,2-Tetrachloroethane	mg/L	< 0.0002	< 0.0002	0.00
1,1,2-Trichloroethane	mg/L	< 0.0002	< 0.0002	0.00
1,1-Dichloroethane	mg/L	< 0.0001	< 0.0001	0.00
1,1-Dichloroethylene	mg/L	< 0.0001	< 0.0001	0.00
1,2-Dichlorobenzene (o)	mg/L	< 0.0002	< 0.0002	0.00
1,2-Dichloroethane	mg/L	< 0.0002	< 0.0002	0.00
1,3,5-Trimethylbenzene	mg/L	< 0.0002	< 0.0002	0.00
1,3-Dichlorobenzene (m)	mg/L	< 0.0002	< 0.0002	0.00
1,4-Dichlorobenzene (p)	mg/L	< 0.0002	< 0.0002	0.00
1,4-Dioxane	mg/L	< 0.001	< 0.001	0.00
Benzene	mg/L	< 0.0001	< 0.0001	0.00
Chlorobenzene	mg/L	< 0.0001	< 0.0001	0.00
Chloroethane	mg/L	< 0.0002	< 0.0002	0.00
Chloromethane	mg/L	< 0.0005	< 0.0005	0.00
Cis-1,2-Dichloroethylene	mg/L	< 0.0001	< 0.0001	0.00
Dichloromethane	mg/L	< 0.0005	< 0.0005	0.00
Ethylbenzene	mg/L	< 0.0001	< 0.0001	0.00
m+p-Xylene	mg/L	< 0.0001	< 0.0001	0.00
o-Xylene	mg/L	< 0.0001	< 0.0001	0.00
Styrene	mg/L	< 0.0002	< 0.0002	0.00
Tetrachloroethylene	mg/L	< 0.0001	< 0.0001	0.00
Toluene	mg/L	< 0.0002	< 0.0002	0.00
Total Xylenes	mg/L	< 0.0001	< 0.0001	0.00
Trans-1,2-dichloroethylene	mg/L	< 0.0001	< 0.0001	0.00
Trichloroethylene	mg/L	< 0.0001	< 0.0001	0.00
Vinyl Chloride	mg/L	< 0.0002	< 0.0002	0.00

Detailed Results from Field Duplicate vs. Regular Samples

Reading Name	Units	S2 2015-09-14 Regular Sample	S2 2015-09-14 Field Duplicate	RPD (%)
Alkalinity	mg/L	150	140	6.90
Ammonia	mg/L	< 0.15	0.26	0.00
Ammonia (unionized)	mg/L	< 0.0033	0.0068	0.00
Carbonaceous BOD (tot)	mg/L	< 2	3	0.00
Chemical Oxygen Demand	mg/L	54	59	8.85
Chloride	mg/L	11	11	0.00
Conductivity	µS/cm	400	403	0.75
Hardness	mg/L	190	190	0.00
Nitrate	mg/L	0.83	0.89	6.98
Nitrite	mg/L	0.041	0.045	9.30
Nitrite + Nitrate	mg/L	0.87	0.94	7.73
Phenols	mg/L	< 0.001	< 0.001	0.00
Phosphorus (total)	mg/L	0.24	0.25	4.08
Sulphate	mg/L	42	41	2.41
Total Dissolved Solids	mg/L	320	298	7.12
Total Suspended Solids	mg/L	3	2	40.00
Arsenic	mg/L	< 0.001	< 0.001	0.00
Barium	mg/L	0.048	0.048	0.00
Boron	mg/L	0.027	< 0.02	0.00
Cadmium	mg/L	< 0.0001	< 0.0001	0.00
Calcium	mg/L	62	59	4.96
Chromium (III)	mg/L	< 0.005	< 0.005	0.00
Chromium (VI)	mg/L	< 0.0025	< 0.0025	0.00
Chromium (Total)	mg/L	< 0.005	< 0.005	0.00
Cobalt	mg/L	< 0.0005	< 0.0005	0.00
Copper	mg/L	0.007	0.007	0.00
Iron	mg/L	0.11	0.11	0.00
Lead	mg/L	< 0.0005	< 0.0005	0.00
Magnesium	mg/L	8.9	8.4	5.78
Nickel	mg/L	0.002	0.002	0.00
Potassium	mg/L	4	4	0.00
Sodium	mg/L	7.4	7	5.56
Zinc	mg/L	< 0.01	< 0.01	0.00
1,4-Dioxane	mg/L	< 0.001	< 0.001	0.00
Naphthalene	mg/L	< 0.0005	< 0.0005	0.00

Appendix B: Results from Quality Assurance / Quality Control (QA/QC) Program

Detailed Results from Field Duplicate vs. Regular Samples

Reading Name	Units	S3 2015-11-23 Regular Sample	S3 2015-11-23 Field Duplicate	RPD (%)
1,4-Dioxane	mg/L	< 0.001	0.0021	0.00
Alkalinity	mg/L	200	200	0.00
Ammonia	mg/L	0.28	< 0.15	0.00
Ammonia (unionized)	mg/L	0.0011	< 0.0005	0.00
Boron	mg/L	< 0.02	< 0.02	0.00
Cadmium	mg/L	< 0.0001	< 0.0001	0.00
Calcium	mg/L	76	75	1.32
Carbonaceous BOD (tot)	mg/L	< 2	< 2	0.00
Chemical Oxygen Demand	mg/L	21	23	9.09
Chloride	mg/L	24	24	0.00
Chromium (III)	mg/L	< 0.005	< 0.005	0.00
Chromium (Total)	mg/L	< 0.005	< 0.005	0.00
Chromium (Total)	mg/L	< 0.005	< 0.005	0.00
Chromium (VI)	mg/L	< 0.0005	< 0.0005	0.00
Cobalt	mg/L	< 0.0005	< 0.0005	0.00
Conductivity	µS/cm	484	488	0.82
Copper	mg/L	< 0.002	< 0.002	0.00
Hardness	mg/L	230	230	0.00
Iron	mg/L	0.07	0.06	15.38
Lead	mg/L	< 0.0005	< 0.0005	0.00
Magnesium	mg/L	10	10	0.00
Naphthalene	mg/L	< 0.0005	< 0.0005	0.00
Nickel	mg/L	< 0.001	< 0.001	0.00
Nitrate	mg/L	< 0.1	< 0.1	0.00
Nitrite	mg/L	< 0.01	< 0.01	0.00
Nitrite + Nitrate	mg/L	< 0.1	< 0.1	0.00
Phenols	mg/L	< 0.001	< 0.001	0.00
Phosphorus (total)	mg/L	0.019	0.022	14.63
Potassium	mg/L	3	3	0.00
Sodium	mg/L	13	13	0.00
Sulphate	mg/L	14	14	0.00
Total Dissolved Solids	mg/L	270	262	3.01
Total Suspended Solids	mg/L	< 1	< 1	0.00
Zinc	mg/L	< 0.01	< 0.01	0.00

Appendix B: Results from Quality Assurance / Quality Control (QA/QC) Program

Detailed Results from Field Blank Samples - Fall 2015

Reading Name	Units	Blank - Field 2015-11-24	Blank - Field 2015-11-25	Blank - Field 2015-11-26
Alkalinity	mg/L	2.9	2.5	2.3
mg/L		< 0.15	< 0.15	< 0.15
mg/L		< 0.01	< 0.01	< 0.01
Calcium	mg/L	< 0.2	< 0.2	< 0.2
Chloride	mg/L	< 1	< 1	< 1
Conductivity	µS/cm	3	2	1
Dissolved Organic Carbon	mg/L	0.4	0.3	0.3
Iron	mg/L	< 0.1	< 0.1	< 0.1
Magnesium	mg/L	< 0.05	< 0.05	< 0.05
Manganese	mg/L	< 0.002	< 0.002	< 0.002
Nitrate	mg/L	< 0.1	< 0.1	< 0.1
Nitrite	mg/L	< 0.01	< 0.01	< 0.01
Nitrite + Nitrate	mg/L	< 0.1	< 0.1	< 0.1
Potassium	mg/L	< 0.2	< 0.2	< 0.2
Sodium	mg/L	< 0.1	< 0.1	< 0.1
Sulphate	mg/L	< 1	< 1	< 1
Total Dissolved Solids	mg/L	< 10	< 10	< 10
1,1,1,2-Tetrachloroethane	mg/L	< 0.0002	< 0.0002	< 0.0002
1,1,1-Trichloroethane	mg/L	< 0.0001	< 0.0001	< 0.0001
1,1,2,2-Tetrachloroethane	mg/L	< 0.0002	< 0.0002	< 0.0002
1,1,2-Trichloroethane	mg/L	< 0.0002	< 0.0002	< 0.0002
1,1-Dichloroethane	mg/L	< 0.0001	< 0.0001	< 0.0001
1,1-Dichloroethylene	mg/L	< 0.0001	< 0.0001	< 0.0001
1,2-Dichlorobenzene (o)	mg/L	< 0.0002	< 0.0002	< 0.0002
1,2-Dichloroethane	mg/L	< 0.0002	< 0.0002	< 0.0002
1,3,5-Trimethylbenzene	mg/L	< 0.0002	< 0.0002	< 0.0002
1,3-Dichlorobenzene (m)	mg/L	< 0.0002	< 0.0002	< 0.0002
1,4-Dichlorobenzene (p)	mg/L	< 0.0002	< 0.0002	< 0.0002
1,4-Dioxane	mg/L	< 0.001	< 0.001	< 0.001
Benzene	mg/L	< 0.0001	< 0.0001	< 0.0001
Chlorobenzene	mg/L	< 0.0001	< 0.0001	< 0.0001
Chloroethane	mg/L	< 0.0002	< 0.0002	< 0.0002
Chloromethane	mg/L	< 0.0005	< 0.0005	< 0.0005
Cis-1,2-Dichloroethylene	mg/L	< 0.0001	< 0.0001	< 0.0001
Dichloromethane	mg/L	< 0.0005	< 0.0005	< 0.0005
Ethylbenzene	mg/L	< 0.0001	< 0.0001	< 0.0001
m+p-Xylene	mg/L	< 0.0001	< 0.0001	< 0.0001
o-Xylene	mg/L	< 0.0001	< 0.0001	< 0.0001
Styrene	mg/L	< 0.0002	< 0.0002	< 0.0002
Tetrachloroethylene	mg/L	< 0.0001	< 0.0001	< 0.0001
Toluene	mg/L	< 0.0002	< 0.0002	< 0.0002
Total Xylenes	mg/L	< 0.0001	< 0.0001	< 0.0001
Trans-1,2-dichloroethylene	mg/L	< 0.0001	< 0.0001	< 0.0001
Trichloroethylene	mg/L	< 0.0001	< 0.0001	< 0.0001
Vinyl Chloride	mg/L	< 0.0002	< 0.0002	< 0.0002

Appendix B: Results from Quality Assurance / Quality Control (QA/QC) Program

Detailed Results from Trip Blank Sample - Fall 2015

Reading Name	Units	Blank - Trip 2015-11-24	Blank - Trip 2015-11-25	Blank - Trip 2015-11-26
1,1,1,2-Tetrachloroethane	mg/L	< 0.0002	< 0.0002	< 0.0002
1,1,1-Trichloroethane	mg/L	< 0.0001	< 0.0001	< 0.0001
1,1,2,2-Tetrachloroethane	mg/L	< 0.0002	< 0.0002	< 0.0002
Chloride	mg/L	< 1	< 1	< 1
1,1-Dichloroethane	mg/L	< 0.0001	< 0.0001	< 0.0001
1,1-Dichloroethylene	mg/L	< 0.0001	< 0.0001	< 0.0001
1,2-Dichlorobenzene (o)	mg/L	< 0.0002	< 0.0002	< 0.0002
1,2-Dichloroethane	mg/L	< 0.0002	< 0.0002	< 0.0002
1,3,5-Trimethylbenzene	mg/L	< 0.0002	< 0.0002	< 0.0002
1,3-Dichlorobenzene (m)	mg/L	< 0.0002	< 0.0002	< 0.0002
1,4-Dichlorobenzene (p)	mg/L	< 0.0002	< 0.0002	< 0.0002
Benzene	mg/L	< 0.0001	< 0.0001	< 0.0001
Chloroethane	mg/L	< 0.0002	< 0.0002	< 0.0002
Chloromethane	mg/L	< 0.0005	< 0.0005	< 0.0005
Cis-1,2-Dichloroethylene	mg/L	< 0.0001	< 0.0001	< 0.0001
Dichloromethane	mg/L	< 0.0005	< 0.0005	< 0.0005
Ethylbenzene	mg/L	< 0.0001	< 0.0001	< 0.0001
m+p-Xylene	mg/L	< 0.0001	< 0.0001	< 0.0001
o-Xylene	mg/L	< 0.0001	< 0.0001	< 0.0001
Styrene	mg/L	< 0.0002	< 0.0002	< 0.0002
Tetrachloroethylene	mg/L	< 0.0001	< 0.0001	< 0.0001
Toluene	mg/L	< 0.0002	< 0.0002	< 0.0002
Total Xylenes	mg/L	< 0.0001	< 0.0001	< 0.0001
Trans-1,2-dichloroethylene	mg/L	< 0.0001	< 0.0001	< 0.0001
Trichloroethylene	mg/L	< 0.0001	< 0.0001	< 0.0001
Vinyl Chloride	mg/L	< 0.0002	< 0.0002	< 0.0002

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