FALL 2012 SEMI-ANNUAL MONITORING REPORT

K-B10300-00-04

January 2013

Submitted to:

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

WESA
A Better Environment for Business

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FALL 2012 SEMI-ANNUAL MONITORING REPORT

WASTE MANAGEMENT OF CANADA
RICHMOND LANDFILL
TOWN OF GREATER NAPANEE, ONTARIO

Prepared for:

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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 fall 2012 semi-annual monitoring event 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. MONITORING PROGRAM

2.1 PROGRAM METHODOLOGY

The fall 2012 semi-annual monitoring event was conducted in accordance to the updated Environmental Monitoring Plan for the site dated June 29, 2010 (herein referred to as the "EMP"). The amended Environmental Compliance Approval (ECA) number A371203, issued by MOE January 9, 2012 stipulates (Condition 8.5(a)) that the monitoring programs shall be carried out for groundwater, surface water and landfill gas on an interim basis in accordance with the June 29, 2010 EMP, until a new monitoring program has been approved.

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

The fall monitoring event was conducted between October 19 and October 24, 2012. The activities completed included:

- Water levels were recorded on October 19, 2012, except from groundwater monitors M18, M31, and M39 (all dry), and M19 and OW57 (both damaged);
- Seven (7) off-site domestic water supply wells were sampled on October 24, 2012. Water samples from private supply wells were analyzed for groundwater inorganic and general parameters. The supply well at 1097 Beechwood Road could not be sampled as no residents were onsite during the sampling event;
- A total of 42 groundwater monitors were sampled on October 22 and 23, 2012. Monitoring wells M57 and M75 were sampled despite integrity concerns related to the presence of bentonite fines in the purge water. Three (3) groundwater monitoring wells could not be sampled because they (a) had insufficient recovery for sampling after purging (M29 and M39), or (b) were damaged (the standpipe in M58-4 was broken

below the ground surface and contained bentonite). Samples were analyzed for the suite of groundwater inorganic and general parameters;

- Surface water sampling was conducted on October 24, 2012 from locations S2, S3, S6 and S7 from Marysville Creek, while sampling at S4R, S5 and S8R from Beechwood Ditch were not collected as it was dry. Surface water samples were analyzed for the surface water inorganic and general parameters;
- Landfill gas migration monitoring was conducted on October 24, 2012. Field measurements were made with a RKI Eagle probe calibrated to methane gas response at six (6) gas monitors (GM1, GM3, GM4-1, GM4-2, GM5 and GM6); and
- Additionally, five (5) field duplicate samples, two (2) field blanks, and one (1) trip blank were collected during the fall sampling event, for a total of eight (8) Quality Assurance/Quality Control (QA/QC) samples. Deionised 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

Prior to collecting groundwater samples, water levels were recorded to the nearest 0.01 m using an electronic water level meter. Table 3 presents groundwater elevation monitoring locations.

3. MONITORING RESULTS AND DISCUSSION

Background information concerning the site geology and hydrogeology was described in detail in the Site Conceptual Model (SCM) report[1], and is summarized here. The SCM report describes the groundwater flow conditions at the Richmond Landfill. Based on the results from extensive studies 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 metres 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 metres below top of bedrock;
- groundwater flows through a well-connected network of fractures in the upper 30 metres 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);

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

- intermediate bedrock flownets show that groundwater generally flows to the west from the western edge of the landfill, to the south-southeast from the southern edge of the landfill, to the southwest from the southwest corner of the landfill and north to northwest from the northwest portion 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
- flow directions in the intermediate bedrock zone are variable with season.

3.1 GROUNDWATER RESULTS

3.1.1 Groundwater Elevations

Groundwater elevations from program monitoring wells were measured on October 19, 2012 and are presented in Table 4. The groundwater flow direction within the shallow and intermediate bedrock groundwater flow zones are shown on Figures 2 and 3, respectively. The groundwater flow directions were inferred by interpolating the hydraulically responsive wells screened within the corresponding groundwater flow zone, and are consistent with historical results.

The fall 2012 shallow groundwater flownet (Figure 2) is consistent with historical results and shows 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. The northerly flowing groundwater is oriented toward Marysville Creek, while shallow groundwater to the south flows towards Beechwood Ditch. Shallow groundwater south of Beechwood Road flows locally to the north-northwest, towards an area of lower hydraulic head that may be influenced by the pond system in the south part of the site (see Figure 2). 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 while groundwater south of M96 flows to the west-southwest.

The fall 2012 intermediate bedrock zone flownet is presented on Figure 3. Water levels from four (4) intermediate bedrock monitors identified as “responsive” in the 2009 SCM report were not used to prepare the fall 2012 flownet. The wells were excluded from the interpolation on the basis of: (a) integrity concerns with the bentonite seal (M57); and (b) water levels were not static, believed to be recovering from past sampling events (M57, M70-1 and M82-1). Groundwater in the intermediate bedrock flow zone generally flows to the north, west, and south relative to the landfill, while in the southeastern portion of the site and beyond to the south-southeast, the direction of groundwater flow within the intermediate flow zone is variable as a result of changing recharge conditions (transient flow regime). During this monitoring event, the groundwater contours show that flow in the southeast part of the site is generally towards the east, while south of Beechwood Road flow returns to a southerly direction.

3.1.2 Groundwater Analytical Results

Results from the groundwater monitoring wells sampled in fall 2012 are presented in Table 5a. Groundwater quality data for the fall 2012 monitoring event are similar to historical results, and are discussed in this section.

Slightly elevated concentrations of a number of water quality parameters (e.g., alkalinity, chloride, conductivity, DOC, iron, manganese, sodium and/or TDS) were observed in some shallow groundwater zone monitoring wells located in close proximity to the landfill footprint (M41, M66-2, M101, M102 and M103). 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.

Analytical results from intermediate bedrock groundwater monitors sampled in fall 2012 show that groundwater quality in this groundwater flow zone is highly variable across the site. Additional investigative work related to the observed chemistry south of the landfill has been documented in the Groundwater Action Plan Investigation Report (Draft for Review dated October 2012), which has been submitted under separate cover to MOE. The results of the additional investigation lead to the conclusion that leachate impacts are evident in selected monitoring wells northwest and immediately south of the landfill footprint. There is no evidence of landfill leachate impacts in any of the monitoring wells that are located south of the landfill footprint and west of the site entrance road.

Based on the new physical and chemical hydrogeologic information provided in the Action Plan Report, WESA has interpreted that monitoring wells near the south boundary of the landfill site (at Beechwood Road), and east of the landfill entrance road, are impacted by groundwater flowing north and northeast from south of Beechwood Road, and not from the landfill. However, the MOE has interpreted that these monitoring wells south of the landfill, close to Beechwood Road (e.g., M10-1 and M107) are impacted by leachate from the landfill. As described below in Section 3.1.3, Waste Management is taking action in 2013 to resolve the Ministry's interpretation of non-compliance.

Continued monitoring of the groundwater chemistry in the monitoring wells around the landfill and in the low head areas is warranted to assess any temporal trends in the groundwater conditions.

3.1.3 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 Flow Zones are compared to the RULs derived from laboratory analytical results (Table 5b). Proposed RULs for leachate indicator parameters and trigger monitors were presented in the EMP dated June 29, 2010. These will be re-examined during the development of an updated EMP, but are used here on an interim basis.

Slightly elevated concentrations of a number of inorganic or general water quality parameters (e.g., alkalinity, boron, chloride, chromium, DOC, iron, manganese, sodium and/or TDS) were observed in shallow groundwater zone monitoring wells (M54-4, M66-2, M67-2, M80-2 and M87-2). However, there are no indications of leachate impacts in the shallow groundwater zone at the landfill property boundaries.

Slightly elevated concentrations of a number of water quality parameters (e.g alkalinity, boron, chloride, DOC, iron, manganese, sodium and/or TDS) were observed in some intermediate groundwater zone monitoring wells (M10-1, M49-1, M56-2, M57, M70-1, M82-1, M82-2 and M107). The elevated concentrations observed at M49-1, M57 and M70-1 are interpreted to be from groundwater mixing with deeper saline water, as indicated by the high sodium, chloride and TDS levels. At M82-1 and M82-2 (west boundary of the site at Marysville Creek), the TDS levels are only slightly elevated, and the observed concentrations do not indicate leachate impacts. At M56-2 (background monitor along the western boundary), manganese is the only parameter above the RUL, and the water quality does not reflect any leachate impacts.

As noted in the preceding section, the MOE has interpreted that the RUL exceedances south of the landfill close to Beechwood Road are caused by the landfill (e.g., M10-1 and M107), and the exceedances place the landfill in non-compliance with Environmental Compliance Approval No. A371203 issued for the site.

Waste Management is currently addressing this non-compliance with MOE.

3.1.4 Status of Monitoring Wells and Compliance with Ontario Regulation 903

During the fall 2012 monitoring event, the conditions of monitoring wells were inspected. Any repairs, such as new locks, labels or well caps, etc. were made as necessary. Watertight casings and seals remain in place at all monitors to ensure that surface water or foreign materials do not infiltrate the wells. The monitoring wells comply with the applicable sections of Ontario Regulation 903 relevant to "test holes" as defined in the regulation, as well as the overall intent of the regulation to protect groundwater supplies. With the exception of monitors M19, M58-4 and OW57 (damaged) as well as M57 and M75 (integrity of the bentonite seals in monitors suspect due to the presence of bentonite in purge water), all of the monitoring wells included in the EMP are currently active. The wells identified above as damaged or with suspect integrity will be addressed as part of the updated EMP, anticipated to be completed in 2013 or 2014.

3.1.5 Off-Site Domestic Water Supply Well Results

Results from off-site private water supply wells sampled in fall 2012 are presented in Table 6.

Comparison with Ontario Drinking Water Quality Objectives and Guidelines (ODWSOG, 2006) revealed all parameters were below their respective maximum acceptable concentrations (MAC) or interim maximum acceptable concentrations (IMAC) as specified in Table 2 of the ODWSOG, with the exception of lead (MAC 0.01 mg/L) with measured levels of 0.014 mg/L and 0.011 mg/L, at 1181 and 1206 Beechwood Road, respectively. Some inorganic parameters (general chemistry and dissolved metals) were measured at concentrations exceeding their respective aesthetic objective (AO) or operational guideline (OG) from Table 4 of the ODWSOG.

As was the case in previous sampling events, most volatile organic compounds (VOCs) in off-site supply wells were reported below the laboratory reporting limit (RL) at all locations, with the exception of some VOCs that were detected in measurable quantities above the RL at some locations. In all cases, VOC concentrations were below the MAC or AO.

The moderate mineralization observed at the private water supply wells sampled (elevated hardness, TDS and sodium) is consistent with the local hydrogeological setting (carbonate aquifer with documented saline groundwater at depth). The origin of the elevated concentration in some dissolved metals (iron, manganese) and DOC at some locations is unknown. The low levels of VOCs observed at some locations adjacent to 1252 Beechwood Road are likely attributable to the historical release of VOCs at this location (former abattoir).

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

An evaluation of the QA/QC data (from duplicate and blank samples) is included in Appendix A, 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 two exceptions as summarized in Appendix A. Of these two that had RPD greater than 20%, one (chemical oxygen demand at OW54-D) was measured at a low concentration (less than 5 times the RDL) and was therefore within acceptable margin of error. All parameters were near or below the RDL in equipment and field blanks.

3.2 SURFACE WATER RESULTS

The two water courses that may receive surface water/storm water runoff from the Richmond Landfill 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.

All surface water monitoring locations are shown on Figure 1.

3.2.1 Surface Water Flow Rates

Visual observations of surface water flow and general water characteristics for the fall sampling program are summarized in Table 7. In general, surface water flow rates were variable, ranging from non-existent (dry) at the Beechwood Ditch (S5, S4R, S8R) to negligible (at S2, S3, S6 and S7) where flow velocity was too low to be measurable.

3.2.2 Surface Water Analytical Results

The results from the surface water locations sampled in fall 2012 are presented in Table 8, and were similar to historical results.

Surface water quality from samples collected in fall 2012 was compared to the Provincial Water Quality Objectives (PWQO) (see Table 8).

No samples were collected from Beechwood Ditch as it was dry during the sampling event. Background surface water quality was monitored from a location 4 m upstream from station S2

for Marysville Creek as minimal flows were observed at the usual location. 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.
All constituents analysed in surface water samples were below their respective PWQO, with the exception of (a) phenols which were detected at concentrations slightly exceeding the PWQO of 0.001 mg/L at the upstream location S2 and the downstream location of S7, with the respective concentrations of 0.0028 and 0.0013 mg/L; (b) phosphorus which was detected at concentrations slightly exceeding the PWQO of 0.03 mg/L at all upstream and downstream locations, ranging between 0.052 mg/L and 0.12 mg/L; and (c) iron which was detected at concentrations exceeding the PWQO of 0.3 mg/L at the and downstream locations S3 and S7, having the respective concentrations of 0.81 and 1.2 mg/L.

Results from fall 2012 indicate that the landfill is not causing adverse impacts to surface water quality.

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

An evaluation of the QA/QC data (from duplicate and blank samples) is included in Appendix A, 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. Most of the parameters for the surface water duplicate QA/QC sample (location S3) were well within the 20% margin of error, with the exception of some constituents (aluminum, COD, iron, manganese, total phosphorus, titanium, TKN, TSS and vanadium); of these, some (titanium, TKN and vanadium) were measured at low concentration (less than ~5 times the laboratory reportable detection limit), while the others may result from the low flow conditions observed and possibly higher margin of error related to the sampling activities themselves.

3.3 Subsurface Gas Sampling

On October 24, 2012, WESA inspected the subsurface gas monitoring probes and obtained measurements at all locations. Measurements were made using a RKI Eagle probe calibrated to methane gas response. The location and condition of the gas monitors and the measurement results are shown in Table 9. Readings were 0 ppm at all locations except GM3 (15 ppm), GM4-2 (5 ppm) and GM6 (5 ppm), well below the lower explosive limit (LEL) of 5% or 50,000 ppm).

3.4 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 at which time scale is reviewed, conflicting trends in concentrations can occur sporadically. However since the revised EMP dated June 29, 2010 the majority of the patterns are seasonally variable but relatively similar.

Alkalinity, chloride, iron, manganese, and total dissolved solids (TDS) concentration data were reviewed in detail for shallow monitoring wells M41, M66-2, M101, M102 and M103 and intermediate monitoring wells M6-3, M10-1, M49-1, M57, M59-2, M70-1, M105 and M106 from the spring of 2011 to the fall of 2012. Over this time period the vast majority of the intervals show stabilized concentrations for almost all parameters analyzed. Exceptions to this generalization include M6-3 for chloride (variable/oscillating pattern) and TDS (downward trend), M70-1 for chloride, iron and TDS (variable/oscillating pattern), M57 for manganese (variable/oscillating).

4. SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

The fall 2012 monitoring program included the monitoring of groundwater, surface water, and landfill gas migration, in accordance with the site groundwater monitoring requirements outlined in the revised EMP dated June 29, 2010, as specified in the Amended Environmental Compliance Approval (ECA) issued on January 9, 2012.

The following were completed between October 19 and 24, 2012:

- Water levels were measured from 66 groundwater monitoring wells thirty-six (36) in the shallow groundwater flow zone and thirty (30) in the intermediate bedrock flow zone).
- Fourty-two (42) groundwater monitors (seventeen (17) completed in the shallow zone and twenty-five (25) in the intermediate bedrock) were sampled for analytical testing.
- Seven (7) off-site domestic water supply wells located along Beechwood Road were sampled for analytical testing. 1097 Beechwood road could not be sampled as no residents were onsite during the sampling event.
- Four (4) surface water locations were sampled for analytical testing while some sampling stations were dry and therefore not sampled.
- A total of eight (8) Quality Assurance/Quality Control (QA/QC) samples were collected (5 field duplicates, two (2) field blanks and one (1) trip blank).
- Subsurface gas concentrations were recorded from six (6) on-site gas monitoring wells.

4.1 GROUNDWATER

- Groundwater flow directions interpreted from monitors known to be hydraulically active were consistent with historical flownets:
  - o 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).
  - o Groundwater in the intermediate bedrock flow zone generally flows to the north, west, and south relative to the landfill, while in the southeastern portion of the site and beyond to the south-southeast, the direction of groundwater flow within the intermediate flow zone is variable as a result of changing recharge conditions (transient flow regime).
- Groundwater quality data from fall 2012 are generally consistent for the current calendar year and 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 of the landfill relative to the concentrations west and north of the landfill. The higher concentrations are downgradient from the landfill footprint and occur in monitoring wells that are known to be hydraulically connected to each other. These concentrations may reflect minor groundwater impacts from site activities.
- The moderate mineralization observed at the off-site private water supply wells along Beechwood Road (elevated hardness, TDS and sodium) is consistent with the local hydrogeological setting (carbonate aquifer with documented saline groundwater at depth). The origin of the elevated concentration in some dissolved metals (iron, manganese) and DOC at some locations is unknown.
- 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 the following groundwater monitoring wells be replaced, upgraded or removed from the monitoring program for the reasons stated below, as these wells have become unreliable for water level and/or quality monitoring as a result of these issues:

- M29 and M39: low recovery small diameter (2.54 cm) overburden monitors that are often dry and/or cannot be sampled after being purged dry;
- M57 and M75: integrity concerns with the bentonite seals (presence of bentonite in purge water); and
- M19, M58-4 and OW57: damaged monitors.

Repair, upgrade or replacement of these wells will be subject to the outcome of the updated EMP (as per Condition 8.5(b) of the Amended ECA.

4.2 SURFACE WATER

- No samples were collected in Beechwood Ditch as it was dry.
- The concentrations observed are within the range of historical monitoring results.
- Concentrations of total phosphorus exceeded the PWQO during the fall 2012 sampling event for all upstream and downstream locations sampled. Concentrations of phenols exceeded the PWQO at the upstream location of S2 and the downstream location of S7. Concentrations of iron were above the PWQO at the downstream locations S3 and S7.
- The results indicate that surface water runoff from the site or discharge of contaminated groundwater is not affecting Marysville Creek.

4.3 SUBSURFACE GAS

- All measurements for methane gas were below the LEL of 5%, or 50,000 ppm.

5. LIMITING CONDITIONS

The fall 2012 monitoring program involved the collection of groundwater (from on-site monitoring wells and 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.

WESA provides no assurances regarding changes to conditions subsequent to the time of the assessment. WESA 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 WESA in writing. WESA 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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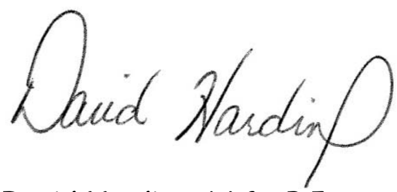

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TABLES

Table 1: Summary of Environmental Monitoring Program

Monitoring Locations		Parameter Suite	Monitoring Frequency
Shallow Groundwater Flow Zone Monitors			
M12, M14, M15, M16, M18, M19, M23, M27, M28, M29, M30, M31, M35, M38, M39, M41, M47-3, M53-4, M54-4, M58-4, M60-4, M66-2, M67-2, M68-4, M70-3, M77, M80-2, M81, M87-2, M88-2, M89-2, M96, M97, M98, M99-2, M100, M101, M102, M103, OW37-s, OW57		Groundwater Elevations	Semi-annual: Spring and Fall
M29, M39, M41, M53-4, M54-4, M58-4, M66-2, M67-2, M68-4, M70-3, M80-2, M81, M87-2, M96, M97, M99-2, M101, M102, M103, OW37-s		Groundwater Inorganic & General	Semi-annual: Spring and Fall
M41, M58-4, M96, M97, M53-4, M54-4, M66-2, M67-2, M70-3, M80-2, M87-2, M101, M102, M103, OW37-s		VOCs	Annual: Spring
Intermediate Bedrock Groundwater Flow Zone Monitors			
M3A-3, M9-3, M10-1, M49-1, M50-3, M56-2, M57, M58-3, M59-2, M59-3, M59-4, M60-1, M63-2, M64-2, M70-1, M71, M72, M73, M74, M80-1, M82-1, M82-2, M91-1, M95-1, M105, M107*, OW54-i, OW54-d		Groundwater Elevations	Semi-annual: Spring and Fall
M5-3, M6-3, M9-3, M10-1, M49-1, M56-2, M57, M58-3, M59-2, M59-3, M59-4, M70-1, M71, M72, M74, M75, M80-1, M82-1, M82-2, M91-1, M95-1, M105, M107*, OW54-d		Groundwater Inorganic & General	Semi-annual: Spring and Fall
M5-3, M6-3, M9-3, M10-1, M49-1, M56-2, M57, M59-3, M70-1, M74, M75, M80-1, M82-1, M82-2, M91-1, M95-1		VOCs	Annual: Spring
Surface Water Sampling Locations			
Beechwood Ditch	S5, S4R and S8R	Surface Water Inorganic and General	Semi-annual: Spring and Fall
	S8R	VOCs	Annual: Spring
Marysville Creek	S2, S3, S6 and S7	Surface Water Inorganic and General	Semi-annual: Spring and Fall
	S2 and S3	VOCs	Annual: Spring
Leachate Monitoring Locations			
North Chamber and South Chamber		Groundwater Inorganic & General VOCs	Annual: Spring
Landfill Gas Monitoring Wells			
GM1, GM3, GM4-1, GM4-2, GM5, GM6		% methane by volume	Semi-annual: Spring and Fall
Off-site Domestic Water Supply Wells			
1097 Beechwood Road 1121 Beechwood Road 1144 Beechwood Road 1181 Beechwood Road	1206 Beechwood Road 1250 Beechwood Road 1252 Beechwood Road 1264 Beechwood Road	Groundwater Inorganic & General, VOCs	Semi-annual: Spring and Fall

* M107: Originally labelled as M106 in EMP dated June 29, 2010

Table 2. Analytical Parameters for Water and Leachate Samples

Groundwater Inorganic and General Parameters		
Alkalinity	Conductivity	Nitrite
Ammonia (total)	Copper	pH
Arsenic	Dissolved organic carbon	Phenols
Barium	Hardness	Phosphorus (total)
Biological oxygen demand	Iron	Potassium
Boron	Lead	Sodium
Cadmium	Magnesium	Sulphate
Calcium	Manganese	Total dissolved solids
Chemical oxygen demand	Mercury	Total Kjeldahl Nitrogen
Chloride	Naphthalene	Zinc
Chromium (total)	Nitrate	
Surface Water Inorganic and General Parameters		
Alkalinity	Cyanide (free)	Total dissolved solids
Ammonia (total)	Hardness	Total kjeldahl nitrogen
Arsenic	Iron	Total phosphorus
Barium	Lead	Total suspended solids
Biological oxygen demand	Magnesium	Zinc
Boron	Mercury	
Cadmium	Naphthalene	
Calcium	Nitrate	*Field measured:*
Chemical oxygen demand	Nitrite	conductivity
Chloride	Phenols	dissolved oxygen
Chromium (total)	Potassium	estimated flow rate
Conductivity	Sodium	pH
Copper	Sulphate	temperature
Volatile Organic Compounds (VOCs)		
1,1,1,2-Tetrachloroethane	Benzene	Ethylbenzene
1,1,1-Trichloroethane	Bromodichloromethane	m&p-Xylene
1,1,2,2-Tetrachloroethane	Bromoform	o-Xylene
1,1,2-Trichloroethane	Bromomethane	Styrene
1,1-Dichloroethane	Carbon tetrachloride	Toluene
1,1-Dichloroethylene	Chlorobenzene	Trans-1,2-Dichloroethylene
1,2-Dibromoethane	Chloroethane	Trans-1,3-Dichloropropylene
1,2-Dichlorobenzene	Chloroform	Tetrachloroethylene
1,2-Dichloroethane	Chloromethane	Trichloroethylene
1,2-Dichloropropane	Cis-1,2-Dichloroethylene	Trichlorofluoromethane
1,3,5-Trimethylbenzene	Cis-1,3-Dichloropropylene	Vinyl chloride
1,3-Dichlorobenzene	Dichloromethane (methylene chloride)	
1,4-Dichlorobenzene	Dibromochloromethane	

Table 3. Groundwater Elevation Monitoring Locations

Location	Shallow Groundwater Flow Zone			Intermediate Groundwater Flow Zone		
West of landfill footprint	M27 M28 M29 M30 M31 M38	M58-4 M67-2 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
North of landfill footprint	M35 M39 M60-4	M66-2 M103		M60-1		
South of landfill footprint	M12 M14 M15 M16	M18 M41 M53-4 M54-4	M80-2 M81 OW57	M9-3 M10-1 M49-1 M57 M63-2	M64-2 M71 M80-1 OW54-i OW54-d	M105 M107*
East of landfill footprint	M19 M23 M47-3	M68-4 M70-3 M77	M96	M50-3 M70-1		

* M107: Originally labelled as M106 in EMP dated June 29, 2010

Table 4: Groundwater Elevations - October 19, 2012

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	125.21	M31	DRY	M67-2	122.25	M98	129.49
M14	125.72	M35	124.04	M68-4	123.67	M99-2	129.39
M15	125.00	M38	124.79	M70-3	126.78	M100	124.84
M16	124.15	M39	DRY	M77	123.68	M101	123.80
M18	DRY	M41	124.65	M80-2	123.36	M102	124.13
M19	DAMAGED	M47-3	124.12	M81	124.31	M103	123.21
M23	125.29	M53-4	124.76	M87-2	122.85	OW37-s	121.99
M27	126.20	M54-4	124.10	M88-2	126.51	OW57	DAMAGED
M28	126.41	M58-4	123.00	M89-2	128.43		
M29	123.51	M60-4	123.84	M96	127.02		
M30	123.58	M66-2	122.12	M97	123.62		
Intermediate Bedrock Groundwater Flow Zone							
M3A-3	124.44	M59-2	123.03	M72	122.76	M105	120.18
M9-3	120.58	M59-3	123.00	M73	122.82	M106	122.91
M10-1	120.14	M59-4	123.00	M74	123.50	M107	120.17
M49-1	119.79	M60-1	122.63	M80-1	123.00	M108	119.97
M50-3	124.41	M63-2	121.20	M82-1	120.91	OW54-d	119.97
M56-2	122.94	M64-2	118.73	M82-2	122.72	OW54-i	119.97
M57	108.67	M70-1	113.99	M91-1	122.92		
M58-3	122.96	M71	120.14	M95-1	122.83		

Table 5a: Groundwater Quality Results - October 22-23, 2012

Name	Date	Alkalinity	Ammonia	Arsenic	Barium	Biochemical Oxygen Demand	Boron	Cadmium	Calcium	Chemical Oxygen Demand	Chloride	Chromium	Conductivity	Copper	Dissolved Organic Carbon	Hardness	Iron	Lead	Magnesium	Manganese	Mercury	Naphthalene	Nitrate	Nitrite	pH (Lab)	Phenols	Phosphorus (total)	Potassium	Sodium	Sulphate	Total Dissolved Solids	Total Kjeldahl Nitrogen	Zinc
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	unitless	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Shallow Groundwater Flow Zone*																																	
M41	22/10/2012	460	< 0.15	< 0.001	0.094	< 2	0.061	< 0.0001	170	16	180	< 0.005	1590	0.0016	3.3	760	< 0.1	< 0.0005	83	0.048	< 0.0002	< 0.0005	< 0.1	< 0.01	7.87	< 0.001	< 0.03	14	41	83	1040	0.8	< 0.005
M53-4	23/10/2012	310	< 0.15	< 0.001	0.055	< 2	< 0.01	< 0.0001	110	17	4	< 0.005	847	< 0.001	2.8	380	< 0.1	< 0.0005	24	< 0.002	< 0.0002	< 0.0005	< 0.1	< 0.01	7.88	< 0.001	< 0.03	0.43	51	130	540	< 0.7	0.0067
M54-4	23/10/2012	410	< 0.15	< 0.001	0.18	< 2	0.034	< 0.0001	130	10	67	< 0.005	1000	< 0.001	2	430	< 0.1	< 0.0005	26	0.0074	< 0.0002	< 0.0005	< 0.1	< 0.01	7.56	< 0.001	0.12	1.4	53	41	564	< 0.7	0.0081
M66-2	23/10/2012	380	0.53	0.0028	0.029	< 2	1.4	< 0.0001	83	< 4	140	< 0.005	1680	< 0.001	5	370	1.6	< 0.0005	40	0.036	< 0.0002	< 0.0005	< 0.1	< 0.01	8.08	< 0.001	0.03	10	230	250	960	0.7	0.0082
M67-2	23/10/2012	360	0.98	0.0029	0.24	< 2	0.83	< 0.0001	51	8	5	0.022	724	< 0.001	2.5	250	0.4	< 0.0005	29	0.047	< 0.0002	< 0.0005	< 0.1	0.021	8.03	< 0.001	0.14	9.4	82	27	384	1.8	< 0.005
M68-4	23/10/2012	320	< 0.15	< 0.001	0.086	< 2	< 0.01	< 0.0001	120	7.7	22	0.067	751	0.0011	2.5	370	< 0.1	< 0.0005	19	0.0063	< 0.0002	< 0.0005	< 0.1	< 0.01	7.67	< 0.001	3.2	0.37	21	50	450	3.4	< 0.005
M70-3	22/10/2012	320	0.19	< 0.001	0.026	< 2	< 0.01	< 0.0001	160	11	30	< 0.005	1030	0.0014	3.5	540	< 0.1	< 0.0005	32	< 0.002	< 0.0002	< 0.0005	< 0.1	< 0.01	7.8	< 0.001	0.04	0.52	23	190	714	< 0.7	< 0.005
M80-2	22/10/2012	270	0.19	0.0012	0.059	< 2	0.096	< 0.0001	74	8.4	40	0.008	736	< 0.001	1.6	350	0.73	< 0.0005	41	0.033	< 0.0002	< 0.0005	< 0.1	< 0.01	7.98	< 0.001	0.47	4.4	22	40	448	0.7	< 0.005
M81	23/10/2012	340	< 0.15	< 0.001	0.22	< 2	0.038	< 0.0001	100	7.7	61	< 0.005	888	< 0.001	1.5	460	< 0.1	< 0.0005	50	0.028	< 0.0002	< 0.0005	< 0.1	< 0.01	7.73	< 0.001	0.06	2.6	12	42	514	< 0.7	< 0.005
M87-2	23/10/2012	230	< 0.15	0.0013	0.058	< 2	0.035	< 0.0001	55	15	25	0.026	619	< 0.001	1.8	300	< 0.1	< 0.0005	38	0.0084	< 0.0002	< 0.0005	< 0.1	< 0.01	7.89	< 0.001	1.3	2.3	17	55	386	< 0.7	< 0.005
M96	22/10/2012	310	< 0.15	< 0.001	0.098	< 2	0.17	< 0.0001	68	20	5	< 0.005	668	< 0.001	1.4	330	< 0.1	< 0.0005	39	0.0062	< 0.0002	< 0.0005	0.64	< 0.01	7.93	< 0.001	1.2	6.1	20	41	372	< 0.7	< 0.005
M97	23/10/2012	220	< 0.15	0.0015	0.075	< 2	0.072	< 0.0001	33	6.1	6	0.012	517	< 0.001	2.8	220	< 0.1	< 0.0005	33	0.048	< 0.0002	< 0.0005	< 0.1	< 0.01	8.03	< 0.001	0.57	2	26	53	294	< 0.7	< 0.005
M99-2	22/10/2012	280	0.28	0.002	0.043	< 2	0.08	< 0.0001	66	6.6	28	< 0.005	830	< 0.001	2.2	430	0.75	< 0.0005	64	0.018	< 0.0002	< 0.0005	< 0.1	< 0.01	8.24	< 0.001	0.82	2.6	19	120	522	< 0.7	< 0.005
M101	22/10/2012	420	0.18	0.0012	0.16	< 2	0.099	< 0.0001	150	16	78	< 0.005	1170	< 0.001	3.4	590	< 0.1	< 0.0005	54	0.022	< 0.0002	< 0.0005	< 0.1	< 0.01	7.74	< 0.001	0.12	4.9	18	86	720	0.9	< 0.005
M102	22/10/2012	400	0.2	< 0.001	0.12	< 2	0.047	< 0.0001	150	9.9	36	< 0.005	979	< 0.001	2.9	490	0.56	< 0.0005	30	0.084	< 0.0002	< 0.0005	< 0.1	< 0.01	7.63	< 0.001	0.11	2.6	27	67	566	< 0.7	< 0.005
M103	22/10/2012	770	0.29	0.0019	0.18	< 2	0.35	< 0.0001	140	17	130	< 0.005	1790	0.0015	5.2	770	0.28	< 0.0005	100	0.021	< 0.0002	< 0.0005	< 0.1	< 0.01	7.72	< 0.001	0.13	8.8	150	42	1020	0.9	0.0083
OW37-s	22/10/2012	170	0.17	< 0.001	0.11	< 2	0.095	< 0.0001	38	8.7	67	< 0.005	558	< 0.001	1.4	180	0.14	< 0.0005	20	0.21	< 0.0002	< 0.0005	< 0.1	< 0.01	7.72	< 0.001	< 0.03	9.8	43	8	274	< 0.7	0.0078
Intermediate BedrockGroundwater Flow Zone																																	
M5-3	22/10/2012	430	1.42	< 0.001	0.19	12	1.1	< 0.0001	36	18	38	< 0.005	982	< 0.001	1.4	200	< 0.1	< 0.0005	26	0.0023	< 0.0002	< 0.0005	< 0.1	< 0.01	7.99	0.055	< 0.03	13	140	19	538	1.6	< 0.005
M6-3	22/10/2012	2000	6.1	< 0.002	1.8	< 2	0.057	< 0.0001	990	170	1200	0.021	11600	0.0074	35	2500	< 0.1	0.0014	0.094	< 0.002	< 0.0002	< 0.0013	< 0.1	< 0.01	12.5	0.015	1.1	61	570	< 1	4590	18	< 0.005
M9-3	23/10/2012	250	1.72	< 0.001	0.039	5	0.52	< 0.0001	40	12	69	< 0.005	716	< 0.001	1.8	210	< 0.1	< 0.0005	26	0.022	< 0.0002	< 0.0005	< 0.1	< 0.01	7.96	0.0054	< 0.03	14	72	15	378	1.8	< 0.005
M10-1	23/10/2012	510	0.7	0.0016	0.24	< 2	0.34	< 0.0001	150	28	150	< 0.005	1400	< 0.001	6.7	550	18	< 0.0005	40	0.84	< 0.0002	< 0.0005	< 0.1	< 0.01	7.32	< 0.001	< 0.03	6	76	15	810	1.3	< 0.005
M49-1	23/10/2012	390	1.12	< 0.001	0.05	3	0.89	< 0.0001	12	25	400	< 0.005	2140	< 0.001	2.5	59	< 0.1	< 0.0005	6.8	0.0087	< 0.0002	< 0.0005	< 0.1	< 0.01	8.19	0.0012	0.19	8.2	450	17	1150	1.5	< 0.005
M56-2	23/10/2012	280	0.21	< 0.001	0.18	< 2	0.074	< 0.0001	74	< 4	21	< 0.005	754	< 0.001	2	370	< 0.1	< 0.0005	45	0.055	< 0.0002	< 0.0005	< 0.1	< 0.01	7.86	< 0.001	< 0.03	3	12	93	448	< 0.7	< 0.005
M57	23/10/2012	140	5.3	0.0062	0.017	7	1.1	< 0.0001	14	18	600	< 0.005	2590	< 0.001	4.2	45	< 0.1	< 0.0005	2.3	< 0.002	< 0.0002	< 0.0005	< 0.1	0.012	8.55	0.0011	0.08	14	500	120	1380	6	< 0.005
M58-3	23/10/2012	330	< 0.15	< 0.001	0.19	< 2	0.015	< 0.0001	110	6	10	< 0.005	744	< 0.001	2.9	380	< 0.1	< 0.0005	27	< 0.002	< 0.0002	< 0.0005	0.16	< 0.01	7.67	< 0.001	< 0.03	1.8	6.6	64	438	< 0.7	< 0.005
M59-2	22/10/2012	410	3.41	< 0.001	0.21	< 2	0.22	< 0.0001	130	43	61	< 0.005	1020	< 0.001	7	480	< 0.1	< 0.0005	38	0.017	< 0.0002	< 0.0005	< 0.1	< 0.01	7.74	0.0069	< 0.03	5.4	34	39	590	0.9	0.0059
M59-3	22/10/2012	230	< 0.15	< 0.001	0.075	< 2	0.023	< 0.0001	110	7.4	21	< 0.005	651	< 0.001	2.6	330	< 0.1	< 0.0005	12	0.0065	< 0.0002	< 0.0005	9.8	< 0.01	7.75	< 0.001	< 0.03	1.2	7.5	33	398	< 0.7	< 0.005
M59-4	22/10/2012	280	0.77	0.0049	0.11	< 2	0.46	< 0.0001	67	8.8	6	< 0.005	611	< 0.001	2	300	1.9	< 0.0005	33	0.022	< 0.0002	< 0.0005	0.15	0.14	7.95	0.0013	0.07	6.6	16	34	340	1	< 0.005
M70-1	22/10/2012	330	2.97	0.0055	0.13	3	2.6	< 0.0005	320	62	3300	< 0.005	11100	< 0.005	2	1700	7.5	< 0.0025	220	0.087	< 0.0002	< 0.0005	< 0.1	< 0.01	7.61	< 0.001	0.05	40	2000	360	6840	4	< 0.025
M71	23/10/2012	560	1.75	< 0.001	0.067	10	0.51	< 0.0001	140	40	170	< 0.005	1600	< 0.001	7.1	540	< 0.1	< 0.0005	46	0.015	< 0.0002	< 0.0005	< 0.1	< 0.01	7.47	0.0031	0.14	12	130	11	846	2.5	< 0.005
M72	23/10/2012	270	0.62	< 0.001	0.15	9	0.38	< 0.0001	54	15	31	< 0.005	604	< 0.001	1.1	270	< 0.1	< 0.0005	33	0.0027	< 0.0002	< 0.0005	< 0.1	< 0.01	8.12	0.055	< 0.03	7.3	17	15	332	0.9	< 0.005
M74	23/10/2012	300	1.05	< 0.001	0.11	5	0.96	< 0.0001	34	11	13	< 0.005	648	< 0.001	1.3	180	< 0.1	< 0.0005	23	0.021	< 0.0002	< 0.0005	< 0.1	< 0.01	7.99	0.0026	0.13	11	69	28	346	1.4	< 0.005
M75	23/10/2012	440	2.14	< 0.001	0.068	9	1.4	< 0.0001	31	87	82	0.015	1170	< 0.001	4.5	170	< 0.1	< 0.0005	22	0.016	< 0.0002	< 0.0005	< 0.1	< 0.01	8.03	0.055	1.2	17	200	55	634	3	< 0.005
M80-1	22/10/2012	140	0.48	< 0.001	0.038	9	0.36	< 0.0001	22	23	7	< 0.005	359	< 0.001	0.8	110	< 0.1	< 0.0005	13	0.0049	< 0.0002	< 0.0005	< 0.1	< 0.01	7.42	0.041	< 0.03	4.5	32	32	192	< 0.7	< 0.005
M82-1	22/10/2012	320	0.87	< 0.001	0.18	< 2	0.97	< 0.0001	59	14	44	< 0.005	916	< 0.001	3.1	260	0.18	< 0.0005	28	0.0066	< 0.0002	< 0.0005	< 0.1	< 0.01	8.04	0.01	< 0.03	10	97	67	518	1.2	< 0.005
M82-2	22/10/2012	320	0.39	< 0.001	0.13	< 2	0.15	< 0.0001	110	15	32	< 0.005	816	< 0.001	3.7	380	< 0.1	< 0.0005	28	0.019	< 0.0002	< 0.0005	< 0.1	< 0.01	7.86	0.0044	< 0.03	4.1	21	65	484	1	< 0.005
M91-1	22/10/2012	290	0.78	< 0.001	0.084	3	0.78	< 0.0001	46	6	15	< 0.005	669	< 0.001	1.1	210	< 0.1	< 0.0005	23	0.0057	< 0.0002	< 0.0005	< 0.1	< 0.01	8	< 0.001	< 0.03	7.6	62	40	318	1	< 0.005
M95-1	22/10/2012	320	< 0.15	< 0.001	0.14	< 2	0.02	< 0.0001	120	5.9	9	< 0.005	755	< 0.001	1.9	410	0.11	< 0.0005	28	0.0033	< 0.0002	< 0.0005	< 0.1	< 0.01	7.86	< 0.001	0.03	2.3	7.3	66	446	< 0.7	< 0.005
M105	23/10/2012	510	0.9	< 0.001	0.23	3	0.37	< 0.0001	140	28	190	< 0.005	1560	< 0.001	6.9	600	< 0.1	< 0.0005	60	0.0092	< 0.0002	< 0.0005	< 0.1	< 0.01	7.59	0.012	0.03	8.8	94	15	870	1.6	< 0.005
M106	22/10/2012	340	2.45	< 0.002	0.11	31	1.5	< 0.0001	110	27	1100	< 0.005	4340	< 0.001	1	590	< 0.1	< 0.0005	75	0.0024	< 0.0002	< 0.0005	< 0.1	< 0.01	7.99	0.063	< 0.03	22	730	27	2460	2.7	< 0.005
M107**	23/10/2012	440	0.24	< 0.001	0.096	< 2	0.15	< 0.0001	140	23	110	< 0.005	1150	< 0.001	5.8	490	4.4	< 0.0005	35	0.33	< 0.0002	< 0.005	< 0.1	< 0.01	7.46	< 0.001	< 0.03	3.5	61	15	640	0.9	< 0.005
OW54-d	23/10/2012	270	1.23	< 0.001	0.051	< 2	0.6	< 0.0001	41	5.2	91	< 0.005	823	< 0.001	1.2	220	< 0.1	< 0.0005	28	0.031	< 0.0002	< 0.0005	< 0.1	< 0.01	7.98	< 0.001	< 0.03	12	87	18	458	1.5	< 0.005

* Shallow groundwater monitoring wells not sampled: M29 (purged dry), M39 (dry), M58-4 (damaged below ground surface) [see text for details]

** M107: Originally labelled as M106 in EMP dated June 29, 2010

Table 5b: Groundwater Quality Results and Reasonable Use Limits - October 22-23, 2012

Name	Date	Alkalinity	Ammonia	Biochemical Oxygen Demand	Boron	Chemical Oxygen Demand	Chloride	Chromium	Conductivity	Dissolved Organic Carbon	Iron	Manganese	Naphthalene	Phenols	Phosphorus (total)	Potassium	Sodium	Total Dissolved Solids	Total Kjeldahl Nitrogen	Zinc
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µS/cm	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		386	-	-	1.27	-	128	0.014	-	3.1	0.18	0.028	-	-	-	-	104	415	-	-
M54-4	23/10/2012	410	< 0.15	< 2	0.034	10	67	< 0.005	1000	2	< 0.1	0.0074	< 0.0005	< 0.001	0.12	1.4	53	564	< 0.7	0.0081
M66-2	23/10/2012	380	0.53	< 2	1.4	< 4	140	< 0.005	1680	5	1.6	0.036	< 0.0005	< 0.001	0.03	10	230	960	0.7	0.0082
M67-2	23/10/2012	360	0.98	< 2	0.83	8	5	0.022	724	2.5	0.4	0.047	< 0.0005	< 0.001	0.14	9.4	82	384	1.8	< 0.005
M80-2	22/10/2012	270	0.19	< 2	0.096	8.4	40	0.008	736	1.6	0.73	0.033	< 0.0005	< 0.001	0.47	4.4	22	448	0.7	< 0.005
M87-2	23/10/2012	230	< 0.15	< 2	0.035	15	25	0.026	619	1.8	< 0.1	0.0084	< 0.0005	< 0.001	1.3	2.3	17	386	< 0.7	< 0.005
OW37-s	22/10/2012	170	0.17	< 2	0.095	8.7	67	< 0.005	558	1.4	0.14	0.21	< 0.0005	< 0.001	< 0.03	9.8	43	274	< 0.7	0.0078
Intermediate BedrockGroundwater Flow Zone																				
RUL		403	-	-	1.3	-	130	0.014	-	3.4	0.18	0.037	-	-	-	-	106	478	-	-
M10-1	23/10/2012	510	0.7	< 2	0.34	28	150	< 0.005	1400	6.7	18	0.84	< 0.0005	< 0.001	< 0.03	6	76	810	1.3	< 0.005
M49-1	23/10/2012	390	1.12	3	0.89	25	400	< 0.005	2140	2.5	< 0.1	0.0087	< 0.0005	0.0012	0.19	8.2	450	1150	1.5	< 0.005
M56-2	23/10/2012	280	0.21	< 2	0.074	< 4	21	< 0.005	754	2	< 0.1	0.055	< 0.0005	< 0.001	< 0.03	3	12	448	< 0.7	< 0.005
M57	23/10/2012	140	5.3	7	1.1	18	600	< 0.005	2590	4.2	< 0.1	< 0.002	< 0.0005	0.0011	0.08	14	500	1380	6	< 0.005
M58-3	23/10/2012	330	< 0.15	< 2	0.015	6	10	< 0.005	744	2.9	< 0.1	< 0.002	< 0.0005	< 0.001	< 0.03	1.8	6.6	438	< 0.7	< 0.005
M70-1	22/10/2012	330	2.97	3	2.6	62	3300	< 0.005	11100	2	7.5	0.087	< 0.0005	< 0.001	0.05	40	2000	6840	4	< 0.025
M80-1	22/10/2012	140	0.48	9	0.36	23	7	< 0.005	359	0.8	< 0.1	0.0049	< 0.0005	0.041	< 0.03	4.5	32	192	< 0.7	< 0.005
M82-1	22/10/2012	320	0.87	< 2	0.97	14	44	< 0.005	916	3.1	0.18	0.0066	< 0.0005	0.01	< 0.03	10	97	518	1.2	< 0.005
M82-2	22/10/2012	320	0.39	< 2	0.15	15	32	< 0.005	816	3.7	< 0.1	0.019	< 0.0005	0.0044	< 0.03	4.1	21	484	1	< 0.005
M91-1	22/10/2012	290	0.78	3	0.78	6	15	< 0.005	669	1.1	< 0.1	0.0057	< 0.0005	< 0.001	< 0.03	7.6	62	318	1	< 0.005
M95-1	22/10/2012	320	< 0.15	< 2	0.02	5.9	9	< 0.005	755	1.9	0.11	0.0033	< 0.0005	< 0.001	0.03	2.3	7.3	446	< 0.7	< 0.005
M107**	23/10/2012	440	0.24	< 2	0.15	23	110	< 0.005	1150	5.8	4.4	0.33	< 0.005	< 0.001	< 0.03	3.5	61	640	0.9	< 0.005

* Shallow groundwater monitoring wells not sampled: M29 (purged dry), M39 (dry), M58-4 (damaged below ground surface) [see text for details]

** M107: Originally labelled as M106 in EMP dated June 29, 2010

Groundwater results exceed Reasonable Use Limits (RUL)

Table 6: Water Quality Results for Off-Site Domestic Supply Wells - October 24, 2012

		ODWSOG		1121 Beechwood Rd	1144 Beechwood Rd	1181 Beechwood Rd	1206 Beechwood Rd	1250 Beechwood Rd	1252 Beechwood Rd	1264 Beechwood Rd
Inorganic and General Parameters										
Alkalinity (as CaCO3)	mg/L	30-500	OG	280	500	330	440	*530*	360	450
Ammonia	mg/L			< 0.15	1.08	2.94	0.23	0.55	0.29	0.94
Arsenic	mg/L	0.025	IMAC	< 0.001	< 0.001	< 0.001	0.0011	0.0023	< 0.001	< 0.001
Barium	mg/L	1	MAC	0.08	0.03	0.12	0.12	0.28	0.19	0.12
Biochemical Oxygen Demand	mg/L			< 2	3	10	< 2	< 2	< 2	3
Boron	mg/L	5	IMAC	0.033	0.38	1.1	0.06	0.14	0.15	0.55
Cadmium	mg/L	0.005	IMAC	0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Calcium	mg/L			96	150	96	190	200	130	150
Chemical Oxygen Demand	mg/L			9.3	25	34	16	27	13	25
Chloride	mg/L	250	AO	25	120	*460*	100	150	65	*350*
Chromium	mg/L	0.05	MAC	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Conductivity	µS/cm			738	1310	2180	1190	1470	950	2000
Copper	mg/L	1	AO	0.0025	< 0.001	0.24	0.13	0.0026	0.0081	0.0045
Dissolved Organic Carbon	mg/L	5	AO	1.3	*5.3*	2.5	3.9	*7.1*	2.1	4.9
Hardness (as CaCO3)	mg/L	80-100	OG	*370*	*530*	*440*	*520*	*630*	*420*	*590*
Iron	mg/L	0.3	AO	0.13	0.2	*1.3*	*3.6*	*22*	*8.8*	*6.9*
Lead	mg/L	0.01	MAC	< 0.0005	< 0.0005	*0.014*	*0.011*	< 0.0005	0.0018	< 0.0005
Magnesium	mg/L			38	48	59	30	39	34	55
Manganese	mg/L	0.05	AO	0.044	0.0038	0.01	*0.65*	*1.5*	*0.29*	*0.37*
Mercury	mg/L	0.001	MAC	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Naphthalene	mg/L	10	MAC	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0025	< 0.0005
Nitrate	mg/L	10	MAC	1	< 0.1	< 0.1	0.65	< 0.1	0.23	< 0.1
Nitrite	mg/L	1	MAC	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.015	< 0.01
pH (Lab)	unitless	6.5-8.5	OG	7.89	7.66	7.75	7.67	7.33	7.65	7.66
Phenols	mg/L			< 0.001	0.005	0.024	< 0.001	< 0.001	< 0.001	< 0.001
Phosphorus (total)	mg/L			< 0.06	< 0.03	0.12	0.33	< 0.03	< 0.03	< 0.06
Potassium	mg/L			2.8	12	20	6.6	4.7	4	10
Sodium	mg/L	200 20	AO (see note)	18	*94*	*280*	*56*	*69*	*51*	*330*
Sulphate	mg/L	500	AO	71	22	21	36	17	46	7
Total Dissolved Solids	mg/L	500	AO	436	*722*	*1190*	*674*	*796*	*478*	*1090*
Total Kjeldahl Nitrogen	mg/L			< 0.7	1.7	3.4	0.7	1.1	< 0.7	1.6
Zinc	mg/L	5	AO	0.049	< 0.005	0.036	0.096	0.057	0.021	0.066

Table 6: Water Quality Results for Off-Site Domestic Supply Wells - October 24, 2012

		ODWSOG		1121 Beechwood Rd	1144 Beechwood Rd	1181 Beechwood Rd	1206 Beechwood Rd	1250 Beechwood Rd	1252 Beechwood Rd	1264 Beechwood Rd
Volatile Organic Compounds (VOC)										
1,1,1,2-Tetrachloroethane	mg/L			< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.001	< 0.0002
1,1,1-Trichloroethane	mg/L			< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	0.031	< 0.0001
1,1,2,2-Tetrachloroethane	mg/L			< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.001	< 0.0002
1,1,2-Trichloroethane	mg/L			< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.001	< 0.0002
1,1-Dichloroethane	mg/L			< 0.0001	< 0.0001	< 0.0001	0.00011	0.0042	0.071	< 0.0001
1,1-Dichloroethylene	mg/L	0.014	MAC	< 0.0001	< 0.0001	< 0.0001	< 0.0001	0.00019	0.0088	0.00027
1,2-Dibromoethane	mg/L			< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.001	< 0.0002
1,2-Dichlorobenzene (o)	mg/L	0.2 0.003	MAC AO	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.001	< 0.0002
1,2-Dichloroethane	mg/L	0.005	IMAC	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.001	< 0.0002
1,2-Dichloropropane	mg/L			< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0005	< 0.0001
1,3,5-Trimethylbenzene	mg/L			< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.001	< 0.0002
1,3-Dichlorobenzene (m)	mg/L			< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.001	< 0.0002
1,4-Dichlorobenzene (p)	mg/L	0.005 0.001	MAC AO	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.001	< 0.0002
Benzene	mg/L	0.005	MAC	< 0.0001	< 0.0001	0.00017	< 0.0001	< 0.0001	< 0.0005	0.00092
Bromodichloromethane	mg/L			< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0005	< 0.0001
Bromoform	mg/L			< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.001	< 0.0002
Bromomethane	mg/L			< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0025	< 0.0005
Carbon Tetrachloride	mg/L	0.005	MAC	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0005	< 0.0001
Chlorobenzene	mg/L			< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0005	< 0.0001
Chloroethane	mg/L			< 0.0002	0.00039	< 0.0002	< 0.0002	0.0031	0.013	0.01
Chloroform	mg/L			0.00042	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0005	< 0.0001
Chloromethane	mg/L			< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0025	< 0.0005
Cis-1,2-Dichloroethylene	mg/L			< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0005	< 0.0001
Cis-1,3-Dichloropropylene	mg/L			< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.001	< 0.0002
Dichloromethane	mg/L	0.05	MAC	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0025	< 0.0005
Ethylbenzene	mg/L	0.0024	AO	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0005	< 0.0001
m+p-Xylene	mg/L			< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0005	< 0.0001
o-Xylene	mg/L			< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0005	< 0.0001
Styrene	mg/L			< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.001	< 0.0002
Tetrachloroethylene	mg/L	0.03	MAC	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0005	< 0.0001
Toluene	mg/L	0.024	AO	< 0.0002	< 0.0002	0.0004	< 0.0002	< 0.0002	< 0.001	< 0.0002
Total Xylenes	mg/L	0.3	AO	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0005	< 0.0001
Trans-1,2-dichloroethylene	mg/L			< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0005	< 0.0001
Trans-1,3-dichloropropene	mg/L			< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.001	< 0.0002
Trichloroethylene	mg/L	0.005	MAC	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0005	< 0.0001
Trichlorofluoromethane	mg/L			< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.001	< 0.0002
Vinyl Chloride	mg/L	0.002	MAC	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.001	< 0.0002

Below Reportable Detection Limit
Exceeds PWQO

ODWSOG: Ontario Drinking Water Objective Standards and Guidelines
OG: Operational Guidelines
MAC: Maximum Acceptable Concentration
IMAC: Interim Maximum Acceptable Concentration
AO: Asthetic Objectives

Note: The aesthetic objective for sodium in drinking water is 200 mg/L. The local Medical Officer of Health should be notified when the sodium concentration exceeds 20 mg/L so that this information may be communicated to local physicians for their use with patients on sodium restricted diets.

Table 7: Surface Water Characteristics - October 24, 2012

Date	Parameter		Surface Water Station						
			S2	S3	S4R	S5	S6	S7*	S8R
23-Apr-12	Velocity:	m/s	NM	NM	DRY	DRY	NM	NM	DRY
	Depth:	m	0.13	0.60	0.64	0.10	0.14	0.19	0.06
	Width:	m	1.53	0.12	1.15	2.00	1.50	3.50	0.74
	Estimated Flow Rate:	m^3/s	NM	NM	DRY	DRY	NM	NM	DRY

** S7: no flow observed (standing water)*

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

Table 8: Surface Water Quality Results - October 24, 2012

			Marysville Creek				Beechwood Ditch		
			S2	S3	S6	S7	S5	S4R	S8R
			(upstream)	(downstream)	(downstream)	(downstream)	(upstream)	(downstream)	(downstream)
		Date	24/10/2012	24/10/2012	24/10/2012	24/10/2012	24/10/2012	24/10/2012	24/10/2012
Reading Name	Units	PWQO					DRY	DRY	DRY
Inorganic and General Parameters									
Alkalinity	mg/L		230	200	130	170	--	--	--
Ammonia	mg/L		< 0.15	< 0.15	< 0.15	< 0.15	--	--	--
Ammonia (unionized)	mg/L	0.02	< 0.02	< 0.02	< 0.02	< 0.02	--	--	--
Arsenic	mg/L	0.1	< 0.001	< 0.001	< 0.001	< 0.001	--	--	--
Barium	mg/L		0.069	0.11	0.057	0.099	--	--	--
Biochemical Oxygen Demand	mg/L		8	< 2	2	< 2	--	--	--
Boron	mg/L	0.2	< 0.02	0.055	0.044	0.032	--	--	--
Cadmium	mg/L	0.0002	< 0.0001	< 0.0001	< 0.0001	< 0.0001	--	--	--
Calcium	mg/L		90	95	65	88	--	--	--
Chemical Oxygen Demand	mg/L		34	27	34	36	--	--	--
Chloride	mg/L		13	63	37	31	--	--	--
Chromium	mg/L	0.01	< 0.005	< 0.005	< 0.005	< 0.005	--	--	--
Conductivity	µS/cm		540	753	500	566	--	--	--
Copper	mg/L	0.005	0.002	0.003	0.004	0.004	--	--	--
Cyanide (free)	mg/L	0.005	< 0.002	< 0.002	< 0.002	< 0.002	--	--	--
Hardness	mg/L		270	310	200	270	--	--	--
Iron	mg/L	0.3	< 0.1	*0.81*	< 0.1	*1.2*	--	--	--
Lead	mg/L	0.025	< 0.0005	< 0.0005	< 0.0005	< 0.0005	--	--	--
Magnesium	mg/L		13	17	11	14	--	--	--
Mercury	mg/L	0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	--	--	--
Naphthalene	mg/L	0.007	< 0.0005	< 0.0005	< 0.0005	< 0.0005	--	--	--
Nitrate	mg/L		< 0.1	< 0.1	< 0.1	< 0.1	--	--	--
Nitrate + Nitrite	mg/L		< 0.1	< 0.1	< 0.1	< 0.1	--	--	--
Nitrite	mg/L		< 0.01	< 0.05	< 0.01	< 0.01	--	--	--
Phenols	mg/L	0.001	*0.0028*	< 0.001	< 0.001	*0.0013*	--	--	--
Phosphorus (total)	mg/L	0.03	*0.052*	*0.058*	*0.079*	*0.12*	--	--	--
Potassium	mg/L		2.9	8.3	5.3	5.6	--	--	--
Sodium	mg/L		9.7	41	19	15	--	--	--
Sulphate	mg/L		37	80	49	64	--	--	--
Total Dissolved Solids	mg/L		324	466	324	332	--	--	--
Total Kjeldahl Nitrogen	mg/L		1.5	1	1.3	1.6	--	--	--
Total Suspended Solids	mg/L		< 1	76	31	10	--	--	--
Zinc	mg/L	0.03	0.014	0.012	< 0.01	0.011	--	--	--
Field Measured									
Conductivity (Field)	µS/cm						--	--	--
Dissoved Oxygen (Field)	mg/L						--	--	--
pH (Field)	unitless	6.5-8.5	6.82	7.21	6.95	6.98	--	--	--
Temperature (Field)	°C		9.73	9.38	9.20	8.40	--	--	--

Below Reportable Detection Limit	(grey)
Exceeds PWQO	(yellow)

Table 9: Subsurface Gas Monitoring Results - October 24, 2012

Gas Monitor	Location	Reading (ppm)
GM1	North of garage area, south of waste mound	0
GM3	North-east corner of waste mound	15
GM4-1	South-east corner of waste mound	0
GM4-2		5
GM5	North-west corner of waste mound	0
GM6	North of waste mound	5

FIGURES

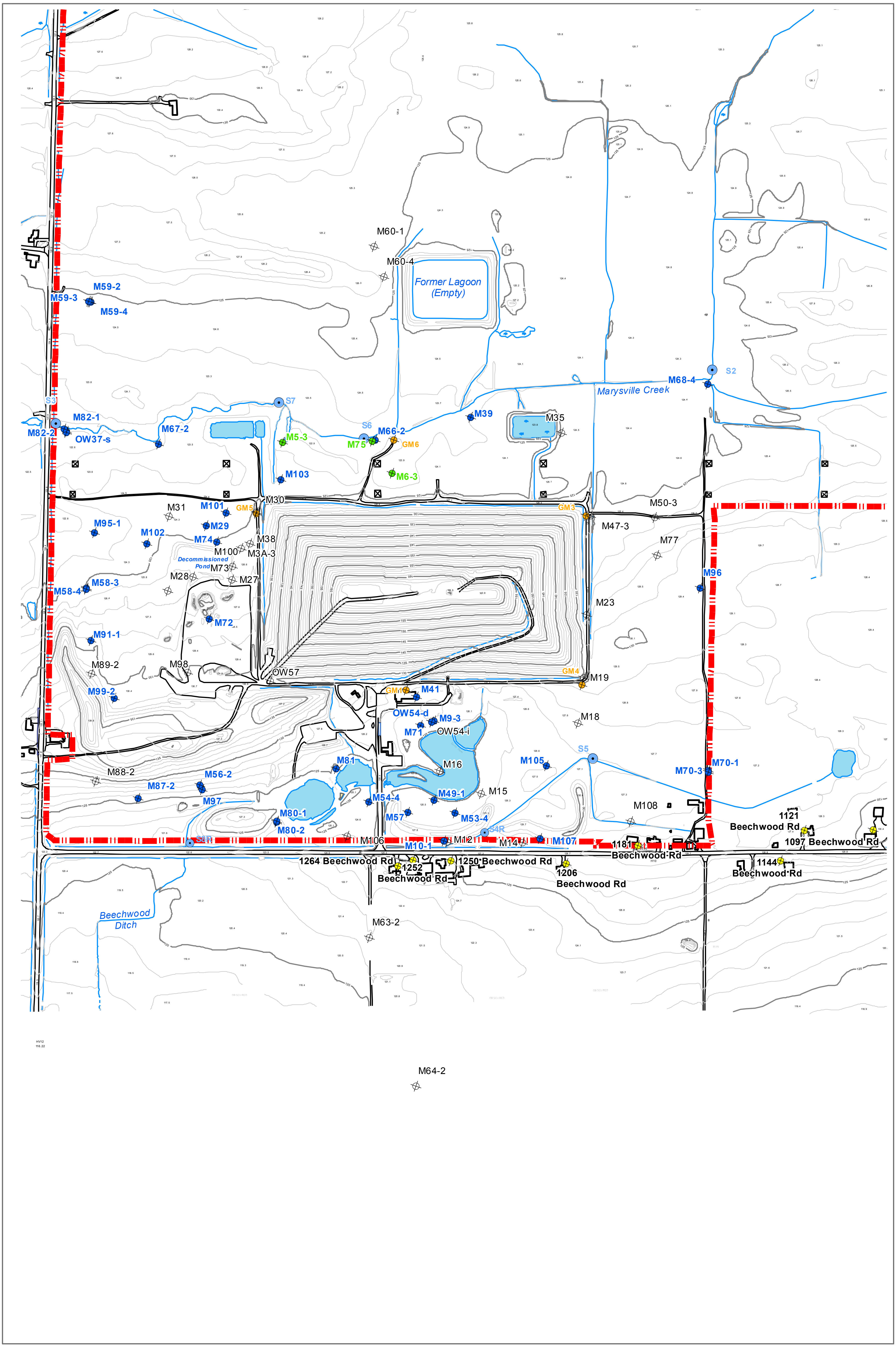

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Figure 1:
Site Plan and Monitoring Locations

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)
1097 Beechwood	Domestic Water Supply Well Sampled for Chemistry
GM1	Gas Monitoring Well
S2	Surface Water Monitoring Location
	Property Boundary

Project : K-B10300-00-04
Data Source: WM Canada, WESA, HPA Ltd. Base Mapping 2009
Date: November 2012

0 12.5 25 50 75 100
Metres

Prepared by:
WESA Geomatics

Units:
UTM NAD 83 Zone 18

Scale: 1:6000

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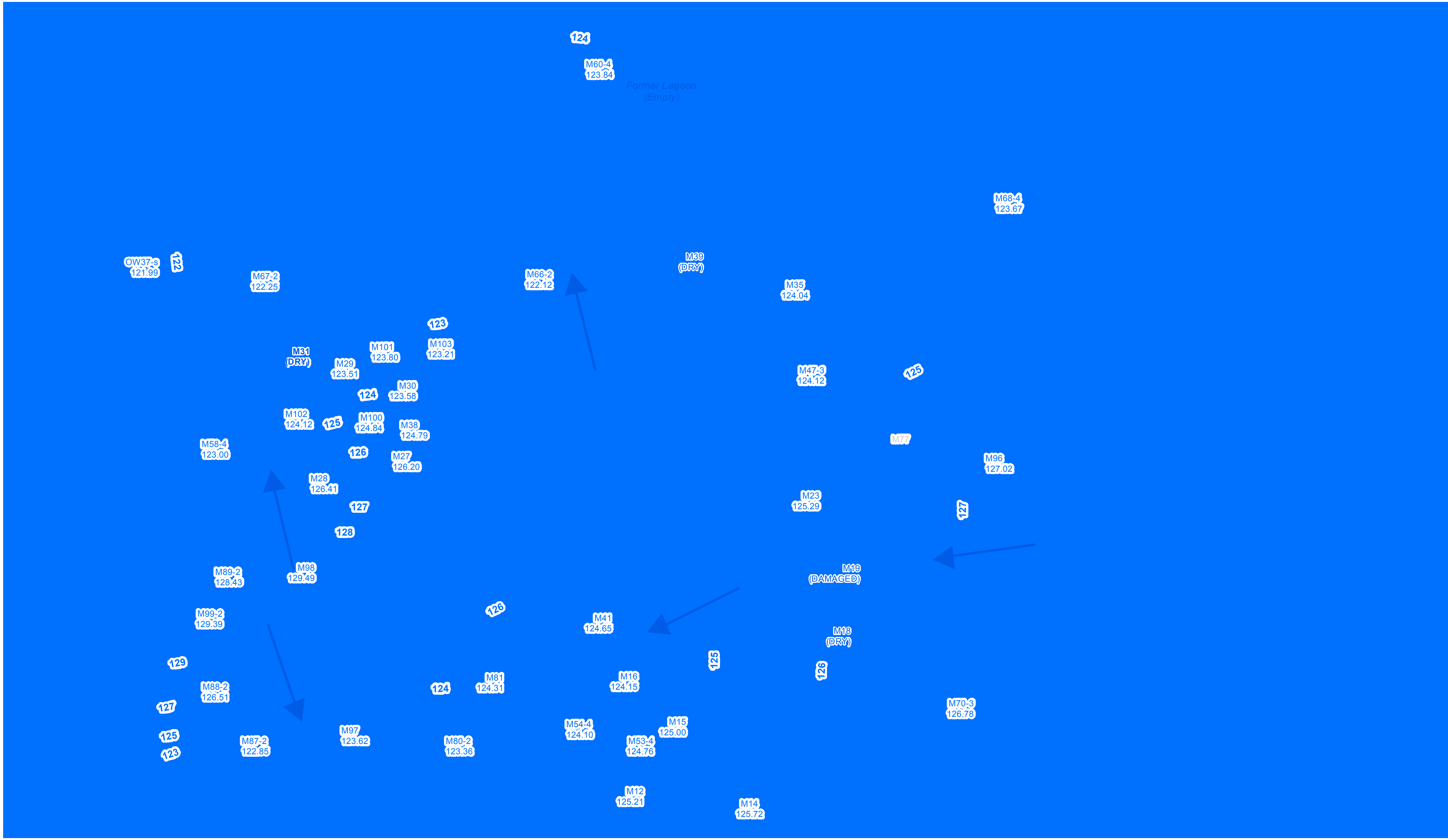

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Figure 2:
Shallow Groundwater Flow Zone Potentiometric Surface - October 19, 2012

M58-4 Shallow Groundwater Zone Elevation Monitor
Topographic Contour Lines
Surface Water
Hydro Tower

Potentiometric Surface (masl)
Inferred Groundwater Flow Direction
Property Boundary
Note: M77: Not used in contouring

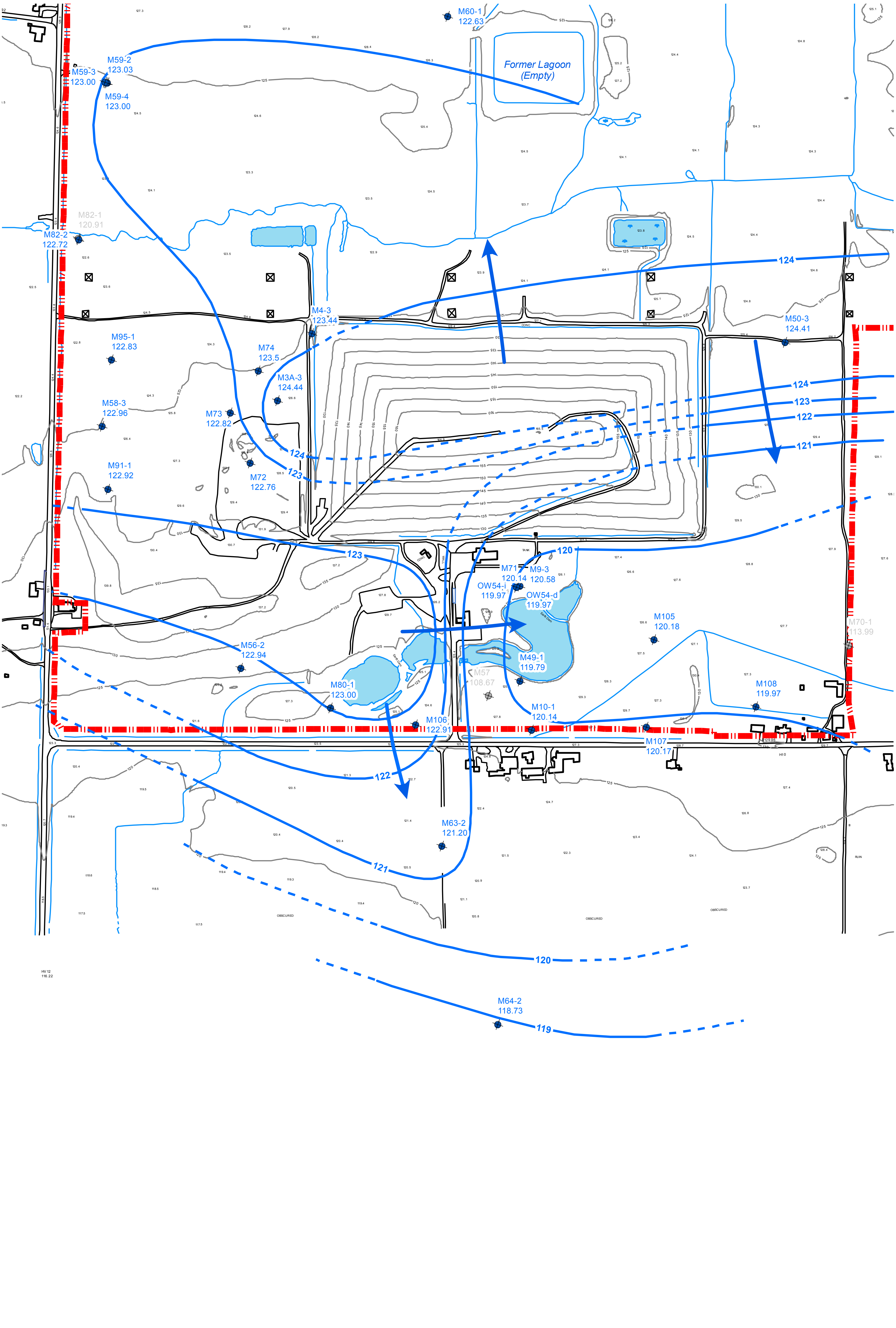
Project : K-B10300-00-04
Data Source: WM Canada, WESA, HPA Ltd. Base Mapping 2009
Date: November 2012

0 12.5 25 50 75 100
Meters

Prepared by:
WESA Geomatics

Units:
UTM NAD 83 Zone 18

Scale: 1:5000



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M58-3 Intermediate Groundwater Zone Elevation Monitor

Topographic Contour Lines

Potentiometric Surface (masl)

Inferred Groundwater Flow Direction

Hydro Tower

Surface Water

Property Boundary

Note: M57, M70-1, M82-1,: **Not used in contouring (see text for details)**

Project : K-B10300-00-04
Data Source: WM Canada, WESA, HPA Ltd. Base Mapping 2009
Date: November 2012

50 25 0 50 100
Meters

Prepared by:
WESA Geomatics

Units:
UTM NAD 83 Zone 18

Scale: 1:5000

WESA

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Figure 3:
Intermediate Bedrock Groundwater Flow Zone Potentiometric Surface - October 19, 2012

APPENDIX A

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

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

Well	Parameter	Unit	Regular Sample	Field Duplicate	RPD (%)	MDL[2]	Comment
OW54-D	Chemical Oxygen Demand	mg/L	5.2	12	79.07	4	Less than ~5 x MDL
OW54-D	Dissolved Organic Carbon	mg/L	1.2	1.9	45.16	0.2	
S3	Aluminum	mg/L	0.4	0.61	41.58	0.02	
S3	Chemical Oxygen Demand	mg/L	27	22	20.41	4	
S3	Iron	mg/L	0.81	1.2	38.81	0.1	
S3	Manganese	mg/L	0.16	0.25	43.90	0.002	
S3	Phosphorus (total)	mg/L	0.058	0.015	117.81	0.002	
S3	Titanium	mg/L	0.024	0.036	40.00	0.005	Less than ~5 x MDL
S3	Total Kjeldahl Nitrogen	mg/L	1	0.8	22.22	0.7	Less than ~5 x MDL
S3	Total Suspended Solids	mg/L	76	26	98.04	1	
S3	Vanadium	mg/L	0.004	0.002	66.67	0.001	Less than ~5 x 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 - Fall 2012

Parameter	Unit	M82-2 (Regular Sample)	DUP1-F12 (Field Duplicate)	RPD (%)
Alkalinity	mg/L	320	320	0.00
Ammonia	mg/L	0.39	0.39	0.00
Arsenic	mg/L	<0.001	<0.001	0.00
Barium	mg/L	0.13	0.14	7.41
Biochemical Oxygen Demand	mg/L	<2	<2	0.00
Boron	mg/L	0.15	0.16	6.45
Cadmium	mg/L	<0.0001	<0.0001	0.00
Calcium	mg/L	110	120	8.70
Chemical Oxygen Demand	mg/L	15	14	6.90
Chloride	mg/L	32	32	0.00
Chromium	mg/L	<0.005	<0.005	0.00
Conductivity	µS/cm	816	817	0.12
Copper	mg/L	<0.001	<0.001	0.00
Dissolved Organic Carbon	mg/L	3.7	3.5	5.56
Hardness	mg/L	380	410	7.59
Iron	mg/L	<0.1	<0.1	0.00
Lead	mg/L	<0.0005	<0.0005	0.00
Magnesium	mg/L	28	29	3.51
Manganese	mg/L	0.019	0.02	5.13
Mercury	mg/L	<0.0002	<0.0002	0.00
Naphthalene	mg/L	<0.0005	<0.0005	0.00
Nitrate	mg/L	<0.1	<0.1	0.00
Nitrite	mg/L	<0.01	<0.01	0.00
Phenols	mg/L	0.0044	0.0041	7.06
Phosphorus (total)	mg/L	<0.03	<0.03	0.00
Potassium	mg/L	4.1	4.3	4.76
Sodium	mg/L	21	23	9.09
Sulphate	mg/L	65	66	1.53
Total Dissolved Solids	mg/L	484	488	0.82
Total Kjeldahl Nitrogen	mg/L	1	<0.7	0.00
Zinc	mg/L	<0.005	<0.005	0.00

Note: Shaded value indicates RDP% higher than 20%

Detailed Results from Field Duplicate vs. Regular Samples - Fall 2012 (continued)

Parameter	Unit	M56-2 (Regular Sample)	DUP 2-F12 (Field Duplicate)	RPD (%)
Alkalinity	mg/L	280	280	0.00
Ammonia	mg/L	0.21	0.19	10.00
Arsenic	mg/L	<0.001	<0.001	0.00
Barium	mg/L	0.18	0.18	0.00
Biochemical Oxygen Demand	mg/L	<2	<2	0.00
Boron	mg/L	0.074	0.085	13.84
Cadmium	mg/L	<0.0001	<0.0001	0.00
Calcium	mg/L	74	75	1.34
Chemical Oxygen Demand	mg/L	<4	9.5	0.00
Chloride	mg/L	21	21	0.00
Chromium	mg/L	<0.005	<0.005	0.00
Conductivity	µS/cm	754	755	0.13
Copper	mg/L	<0.001	<0.001	0.00
Dissolved Organic Carbon	mg/L	2	1.8	10.53
Hardness	mg/L	370	370	0.00
Iron	mg/L	<0.1	<0.1	0.00
Lead	mg/L	<0.0005	<0.0005	0.00
Magnesium	mg/L	45	45	0.00
Manganese	mg/L	0.055	0.055	0.00
Mercury	mg/L	<0.0002	<0.0002	0.00
Naphthalene	mg/L	<0.0005	<0.0005	0.00
Nitrate	mg/L	<0.1	<0.1	0.00
Nitrite	mg/L	<0.01	<0.01	0.00
Phenols	mg/L	<0.001	<0.001	0.00
Phosphorus (total)	mg/L	<0.03	<0.03	0.00
Potassium	mg/L	3	3.1	3.28
Sodium	mg/L	12	12	0.00
Sulphate	mg/L	93	91	2.17
Total Dissolved Solids	mg/L	448	448	0.00
Total Kjeldahl Nitrogen	mg/L	<0.7	<0.7	0.00
Zinc	mg/L	<0.005	<0.005	0.00

Note: Shaded value indicates RDP% higher than 20%

Detailed Results from Field Duplicate vs. Regular Samples - Fall 2012 (continued)

Parameter	Unit	M107 (Regular Sample)	DUP 3-F12 (Field Duplicate)	RPD (%)
Alkalinity	mg/L	440	440	0.00
Ammonia	mg/L	0.24	0.23	4.26
Arsenic	mg/L	<0.001	<0.001	0.00
Barium	mg/L	0.096	0.094	2.11
Biochemical Oxygen Demand	mg/L	<2	<2	0.00
Boron	mg/L	0.15	0.15	0.00
Cadmium	mg/L	<0.0001	<0.0001	0.00
Calcium	mg/L	140	140	0.00
Chemical Oxygen Demand	mg/L	23	19	19.05
Chloride	mg/L	110	100	9.52
Chromium	mg/L	<0.005	<0.005	0.00
Conductivity	µS/cm	1150	1150	0.00
Copper	mg/L	<0.001	<0.001	0.00
Dissolved Organic Carbon	mg/L	5.8	5.9	1.71
Hardness	mg/L	490	480	2.06
Iron	mg/L	4.4	4.3	2.30
Lead	mg/L	<0.0005	<0.0005	0.00
Magnesium	mg/L	35	35	0.00
Manganese	mg/L	0.33	0.32	3.08
Mercury	mg/L	<0.0002	<0.0002	0.00
Naphthalene	mg/L	<0.005	<0.0005	0.00
Nitrate	mg/L	<0.1	<0.1	0.00
Nitrite	mg/L	<0.01	<0.01	0.00
Phenols	mg/L	<0.001	<0.001	0.00
Phosphorus (total)	mg/L	<0.03	<0.03	0.00
Potassium	mg/L	3.5	3.4	2.90
Sodium	mg/L	61	60	1.65
Sulphate	mg/L	15	16	6.45
Total Dissolved Solids	mg/L	640	638	0.31
Total Kjeldahl Nitrogen	mg/L	0.9	0.9	0.00
Zinc	mg/L	<0.005	<0.005	0.00

Note: Shaded value indicates RDP% higher than 20%

Detailed Results from Field Duplicate vs. Regular Samples - Fall 2012 (continued)

Parameter	Unit	OW54-D (Regular Sample)	DUP4-F12 (Field Duplicate)	RPD (%)
Alkalinity	mg/L	270	280	3.64
Ammonia	mg/L	1.23	1.25	1.61
Arsenic	mg/L	<0.001	<0.001	0.00
Barium	mg/L	0.051	0.048	6.06
Biochemical Oxygen Demand	mg/L	<2	<2	0.00
Boron	mg/L	0.6	0.59	1.68
Cadmium	mg/L	<0.0001	<0.0001	0.00
Calcium	mg/L	41	39	5.00
Chemical Oxygen Demand	mg/L	5.2	12	79.07
Chloride	mg/L	91	90	1.10
Chromium	mg/L	<0.005	<0.005	0.00
Conductivity	µS/cm	823	826	0.36
Copper	mg/L	<0.001	<0.001	0.00
Dissolved Organic Carbon	mg/L	1.2	1.9	45.16
Hardness	mg/L	220	210	4.65
Iron	mg/L	<0.1	<0.1	0.00
Lead	mg/L	<0.0005	<0.0005	0.00
Magnesium	mg/L	28	26	7.41
Manganese	mg/L	0.031	0.031	0.00
Mercury	mg/L	<0.0002	<0.0002	0.00
Naphthalene	mg/L	<0.0005	<0.0005	0.00
Nitrate	mg/L	<0.1	<0.1	0.00
Nitrite	mg/L	<0.01	<0.01	0.00
Phenols	mg/L	<0.001	<0.001	0.00
Phosphorus (total)	mg/L	<0.03	<0.03	0.00
Potassium	mg/L	12	12	0.00
Sodium	mg/L	87	84	3.51
Sulphate	mg/L	18	18	0.00
Total Dissolved Solids	mg/L	458	436	4.92
Total Kjeldahl Nitrogen	mg/L	1.5	1.6	6.45
Zinc	mg/L	<0.005	<0.005	0.00

Note: Shaded value indicates RDP% higher than 20%

Detailed Results from Field Duplicate vs. Regular Samples - Fall 2012 (continued)

Parameter	Unit	S3 (Regular Sample)	DUP5-F12 (Field Duplicate)	RPD (%)
Alkalinity	mg/L	200	210	4.88
Aluminum	mg/L	0.4	0.61	41.58
Ammonia	mg/L	<0.15	<0.15	0.00
Ammonia (unionized)	mg/L	<0.02	<0.02	0.00
Antimony	mg/L	<0.001	<0.001	0.00
Arsenic	mg/L	<0.001	<0.001	0.00
Barium	mg/L	0.11	0.12	8.70
Beryllium	mg/L	<0.0006	<0.0006	0.00
Biochemical Oxygen Demand	mg/L	<2	<2	0.00
Boron	mg/L	0.055	0.053	3.70
Cadmium	mg/L	<0.0001	<0.0001	0.00
Calcium	mg/L	95	96	1.05
Chemical Oxygen Demand	mg/L	27	22	20.41
Chloride	mg/L	63	64	1.57
Chromium	mg/L	<0.005	<0.005	0.00
Cobalt	mg/L	0.0005	0.0006	18.18
Conductivity	µS/cm	753	756	0.40
Copper	mg/L	0.003	0.003	0.00
Cyanide (free)	mg/L	<0.002	<0.002	0.00
Hardness	mg/L	310	310	0.00
Iron	mg/L	0.81	1.2	38.81
Lead	mg/L	<0.0005	0.0006	0.00
Magnesium	mg/L	17	17	0.00
Manganese	mg/L	0.16	0.25	43.90
Mercury	mg/L	<0.0002	<0.0002	0.00
Molybdenum	mg/L	<0.002	<0.002	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	<0.05	<0.01	0.00
Phenols	mg/L	<0.001	<0.001	0.00
Phosphorus (total)	mg/L	0.058	0.015	117.81
Potassium	mg/L	8.3	8.3	0.00
Selenium	mg/L	<0.005	<0.005	0.00
Silver	mg/L	<0.0004	<0.0004	0.00
Sodium	mg/L	41	41	0.00
Strontium	mg/L	0.78	0.78	0.00
Sulphate	mg/L	80	80	0.00
Thallium	mg/L	<0.0002	<0.0002	0.00
Tin	mg/L	<0.002	<0.002	0.00
Titanium	mg/L	0.024	0.036	40.00
Total Dissolved Solids	mg/L	466	472	1.28
Total Kjeldahl Nitrogen	mg/L	1	0.8	22.22
Total Suspended Solids	mg/L	76	26	98.04
Uranium	mg/L	0.0013	0.0012	8.00
Vanadium	mg/L	0.004	0.002	66.67
Zinc	mg/L	0.012	<0.01	0.00

Note: Shaded value indicates RDP% higher than 20%

Detailed Results from Field Blank Sample - Fall 2012

Reading Name	Units	Field Blank 2012-10-22
Alkalinity	mg/L	1.5
Ammonia	mg/L	< 0.15
Arsenic	mg/L	< 0.001
Barium	mg/L	< 0.002
Biochemical Oxygen Demand	mg/L	< 2
Boron	mg/L	< 0.01
Cadmium	mg/L	< 0.0001
Calcium	mg/L	< 0.2
Chemical Oxygen Demand	mg/L	5
Chloride	mg/L	< 1
Chromium	mg/L	< 0.005
Conductivity	µS/cm	1
Copper	mg/L	< 0.001
Dissolved Organic Carbon	mg/L	0.3
Hardness	mg/L	< 1
Iron	mg/L	< 0.1
Lead	mg/L	< 0.0005
Magnesium	mg/L	0.052
Manganese	mg/L	< 0.002
Mercury	mg/L	< 0.0002
Naphthalene	mg/L	< 0.0005
Nitrate	mg/L	< 0.1
Nitrate + Nitrite	mg/L	< 0.1
Nitrite	mg/L	< 0.01
pH (Lab)	unitless	6.26
Phenols	mg/L	< 0.001
Phosphorus (total)	mg/L	< 0.03
Potassium	mg/L	< 0.2
Sodium	mg/L	< 0.1
Sulphate	mg/L	< 1
Total Dissolved Solids	mg/L	< 10
Total Kjeldahl Nitrogen	mg/L	< 0.7
Zinc	mg/L	< 0.005

Detailed Results from Trip Blank Sample - Fall 2012

Reading Name	Units	Trip Blank 2012-10-23
Alkalinity	mg/L	1.4
Ammonia	mg/L	< 0.15
Arsenic	mg/L	< 0.001
Barium	mg/L	< 0.002
Biochemical Oxygen Demand	mg/L	< 2
Boron	mg/L	< 0.01
Cadmium	mg/L	< 0.0001
Calcium	mg/L	< 0.2
Chemical Oxygen Demand	mg/L	9
Chloride	mg/L	< 1
Chromium	mg/L	< 0.005
Conductivity	µS/cm	1
Copper	mg/L	< 0.001
Dissolved Organic Carbon	mg/L	< 0.2
Hardness	mg/L	< 1
Iron	mg/L	< 0.1
Lead	mg/L	< 0.0005
Magnesium	mg/L	< 0.05
Manganese	mg/L	< 0.002
Mercury	mg/L	< 0.0002
Naphthalene	mg/L	< 0.0005
Nitrate	mg/L	< 0.1
Nitrate + Nitrite	mg/L	< 0.1
Nitrite	mg/L	< 0.01
pH (Lab)	unitless	6.63
Phenols	mg/L	< 0.001
Phosphorus (total)	mg/L	< 0.03
Potassium	mg/L	< 0.2
Sodium	mg/L	< 0.1
Sulphate	mg/L	< 1
Total Dissolved Solids	mg/L	< 10
Total Kjeldahl Nitrogen	mg/L	< 0.7
Zinc	mg/L	< 0.005

Detailed Results from Field Blank Sample - Spring 2012

Reading Name	Units	Field Blank 2012-10-24
Alkalinity	mg/L	1.1
Aluminum	mg/L	< 0.02
Ammonia	mg/L	< 0.15
Antimony	mg/L	< 0.001
Arsenic	mg/L	< 0.001
Barium	mg/L	< 0.005
Beryllium	mg/L	< 0.0006
Biochemical Oxygen Demand	mg/L	< 2
Boron	mg/L	< 0.02
Cadmium	mg/L	< 0.0001
Calcium	mg/L	< 0.2
Chemical Oxygen Demand	mg/L	< 4
Chloride	mg/L	< 1
Chromium	mg/L	< 0.005
Cobalt	mg/L	< 0.0005
Conductivity	µS/cm	1
Copper	mg/L	< 0.002
Cyanide (free)	mg/L	< 0.002
Hardness	mg/L	< 1
Iron	mg/L	< 0.1
Lead	mg/L	< 0.0005
Magnesium	mg/L	< 0.05
Manganese	mg/L	< 0.002
Mercury	mg/L	< 0.0002
Molybdenum	mg/L	< 0.002
Nickel	mg/L	< 0.001
Nitrate	mg/L	< 0.1
Nitrate + Nitrite	mg/L	< 0.1
Nitrite	mg/L	< 0.01
Phenols	mg/L	< 0.001
Phosphorus (total)	mg/L	< 0.002
Potassium	mg/L	< 0.2
Selenium	mg/L	< 0.005
Silver	mg/L	< 0.0004
Sodium	mg/L	< 0.1
Strontium	mg/L	< 0.003
Sulphate	mg/L	< 1
Thallium	mg/L	< 0.0002
Tin	mg/L	< 0.002
Titanium	mg/L	< 0.005
Total Dissolved Solids	mg/L	< 10
Total Kjeldahl Nitrogen	mg/L	< 0.7
Total Suspended Solids	mg/L	< 1
Uranium	mg/L	< 0.0003
Vanadium	mg/L	< 0.001
Zinc	mg/L	< 0.01

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