

**HYDROGEOLOGICAL INVESTIGATION
IN THE AREA OF THE PROPOSED
CONTAMINANT ATTENUATION ZONE**

**Waste Management
Richmond Landfill Site**

Submitted to:



WASTE MANAGEMENT OF CANADA CORPORATION

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1. INTRODUCTION

The purpose of this report is to present the observations and findings from a hydrogeologic investigation completed in areas south of the Waste Management (WM) Richmond Landfill site (Site). The principal objective of this work was to provide additional characterization of groundwater flow and groundwater quality in areas south of the Site, and to establish the boundaries for a Contaminant Attenuation Zone (CAZ), beyond the furthest extent of observed groundwater impacts from the landfill. For this investigation, 34 new monitoring wells were installed on properties south and southeast of the landfill. Following the approach developed for the Site Conceptual Model¹ investigation in 2009, target intervals for screening the bedrock monitoring wells were identified based on the hydraulic properties of the bedrock (i.e., straddle packer testing in individual boreholes, and hydraulic interference testing with data collected from several boreholes and monitoring wells). Several rounds of water level measurements were collected to examine the transient groundwater flow conditions in the intermediate bedrock zone south of the landfill. Following the installation and development of the new monitoring wells, groundwater samples were collected to assess the groundwater quality in the investigation area.

2. DESCRIPTION OF FIELD PROGRAM

2.1 BOREHOLE DRILLING

A total of 40 boreholes were drilled south and southeast of the landfill footprint (M120 through M125, and M166 through M191) between May 2012 and August 2015. Boreholes M120 through M123 were drilled May 16 – 23, 2012; boreholes M124 and M125 were drilled July 16 – 18, 2012; boreholes M166 through M172 were drilled March 6 – 18, 2013; boreholes M173 through M183 were drilled between November 11 and December 9, 2013; boreholes M184 through M186 were drilled between June 17 and 19, 2014; boreholes M187 through M191 were drilled between January 27 and February 6, 2015; and boreholes M178R-1, M178R-2, M178R-3 and M178R-4 were drilled between August 10 and 24, 2015. The locations of the new boreholes and existing monitoring wells are shown on Figure A.1.

Drilling of boreholes M120 through M125, as well as M178R-1, M178R-2, M178R-3 and M178R-4, was completed by Aardvark Drilling Inc. of Guelph, ON, while drilling of boreholes M166 through M191 was completed by GET Drilling Ltd. of Napanee, ON, using air-rotary techniques. After drilling through the overburden, steel casing was installed from ground surface

¹ Site Conceptual Model Report, WM Richmond Landfill, WESA Project No. KB5691-11, October 2009.



and set into the upper portion of the bedrock. Supervising BluMetric staff made notes regarding rock lithology and water encountered during drilling. The borehole logs are found in Appendix A.1.

DGI Geoscience Inc. of Toronto, ON conducted downhole geophysical surveys on all boreholes except M182 and M183; optical and acoustic televiewer logs are provided as Appendix A.2 (on CD).

2.2 FORMATION HYDRAULIC TESTING (PACKER TESTING)

Hydraulic testing was conducted to obtain direct measurements of the bulk rock transmissivity (T) as a function of depth. Transmissivity values were used to calculate the bulk rock hydraulic conductivity (K) for the tested intervals. Testing was carried out using a straddle packer injection system designed to measure bulk rock transmissivities in the range between approximately $10^{-4} \text{ m}^2/\text{s}$ to $10^{-10} \text{ m}^2/\text{s}$ based on a 3 m test section.

Discrete bedrock intervals in each borehole were isolated using a pair of pneumatically inflated packers and then hydraulically tested using a falling head injection system. The methodology used for these field investigations was consistent with that described in the Groundwater Action Plan Investigation Report (October 2012) and the Site Conceptual Model Report (October 2009). Water was injected using a series of manometers of varying diameters at ground surface, hydraulically connected via polyethylene tubing to the isolated zone in the borehole. The rate of decline of the water level in the manometer was monitored and recorded to obtain a measurement of the volumetric flow rate of the injected water. This provided a quantitative measurement of the bulk rock transmissivity of the test interval. The range of bulk rock transmissivities was measured using either the large diameter tubing for the higher transmissivities or the smaller diameter tubing for the lower transmissivity test intervals. Water level measurements were recorded for a minimum of 20 minutes or until the level had dropped below the manometer. Down-hole pressure transducer readings were also recorded and logged in the field to provide information on the static head of the injection interval. Transducer data were logged electronically on a portable computer.

Boreholes were tested sequentially from bottom to top to provide a continuous profile of bulk rock transmissivity with depth. To interpret the hydraulic testing data collected during the packer testing described above, the transmissivity was estimated for each of the tested intervals using the Thiem equation modified for single well injection tests.

Seven boreholes on the proposed CAZ south of Beechwood Road were not packer tested because they did not encounter sufficient water-bearing fractures to allow enough water into the borehole to test (M120, M124, M173, M174, M175, M181), or because the static water level was



too deep (M187). A borehole north of Beechwood Road (M172) located adjacent to M10-1 was also not packer tested as the purpose of this borehole was simply to install a larger-diameter monitoring well at the same elevation as M10-1.

Formation hydraulic testing results are provided in Appendix A.3 and are discussed in Section 3.2 below.

2.3 HYDRAULIC INTERFERENCE TESTING (PUMPING TESTS)

Ten wells, 1252 Beechwood Rd., M108, M167, M168, M170, M174, M178 (two tests), M178R-3, M179, and M187, were selected as pumping wells for 11 long-term constant discharge hydraulic interference tests. MOECC hydrogeologists were consulted during the planning stage for each test regarding the pumping well locations, the intervals to be monitored in the new boreholes, and the network of adjacent existing monitoring wells where the water levels were to be observed during pumping based on previously established hydraulic responsiveness of monitoring wells in the vicinity of the pumping well. Prior to conducting a long-term constant discharge test, an appropriate pumping rate was selected by completing a step-discharge pumping test.

In all cases except the initial pumping test at M178 (beginning March 4, 2014), the selected flow rate for each test was enough to create sufficient drawdown response in the pumping well. The flow rate necessary to obtain sufficient drawdown in M178 was significant, and a second test was therefore performed at this well. The selected pumping rates for the long-term discharge tests, as determined from the step test observations, are listed in Table A.1. All pumping wells were pumped as open holes.

Table A.1: Long Term Pumping Test Program Summary

Pumping Well	Test Start Date	Ave. Flow Rate		Duration (hrs)	Max. Drawdown in pumping well (m)
		L/min	USgpm		
1252 Beechwood Rd.	Dec. 13, 2012	60	16	21.5	5.15
M170	May 27, 2013	3.8	1	53	12.5
M168	June 10, 2013	32	8.5	54	6.23
M178	Mar. 4, 2014	132 ¹	35 ¹	52	1.7
M174	Mar. 17, 2014	21.6	5.7	48	7.42
M179	Mar. 24, 2014	60	15.9	66	5.41
M178	July 22, 2014	185 ²	49 ²	71	3.03
M167	Aug. 5, 2014	24.6	6.5	50	2.86
M178R-3	Sept. 21, 2015	157	41.6	88	6.87
M187	Sept. 30, 2015	106	27.8 ³	50.5	1.045
M108	Oct. 6, 2015	27	7.1	47	1.465

¹ Decreased during the course of the pumping test from 38 to 32 USgpm

² Decreased during the course of the pumping test from 58 to 40 USgpm

³ Decreased to 15 USgpm for the final 7 hours of the test to maintain water level



Inflatable packers were used to isolate vertical intervals in open boreholes for testing purposes. Water level measurements were taken above and below the isolated zones in selected boreholes, determined based on the packer testing results and geophysical log observations. Appendix A.4 summarizes the selected monitoring well networks used for each pumping test, while Figures A.2 through A.6 illustrate the location of the observation wells with respect to the pumping wells.

Groundwater was pumped from each pumping well using a Grundfos three inch SQE pump. For pumping tests performed on wells where contamination was known or suspected (1252 Beechwood Rd., M108, M167, M168, M170, M178 and M178R-3), groundwater was discharged through a four inch 'lay flat' hose to a temporary water storage tank which was routinely pumped out by Sutcliffe Sanitation Services Ltd. of Napanee, ON. Collected discharge water was disposed of at the Napanee Waste Water Treatment Plant. The flow rate was monitored by an inline Lake displacement gauge and flow rate was controlled by adjustment of a gate valve at the well head.

Solinst Levelloggers (pressure transducers) were installed in all observation wells and set to acquire groundwater level readings on five minute intervals. The Solinst Levelloggers were hung below the water level in the well using optical connection cables that allowed data to be checked and downloaded from the surface without removing the logger from the well. Loggers were installed at least 24 hours prior to the start of the step test or long term constant discharge test to collect background data. Atmospheric pressure was also recorded during the testing period to allow for barometric compensation of the Solinst Levellogger data. In addition to the Solinst Levellogger data, manual water levels were collected using an electronic water level tape prior to and several times during the pumping and recovery phases of the tests.

During the long term constant discharge tests, BluMetric staff collected manual water level readings and were responsible for maintaining the generators to power the pump, maintaining a constant flow rate, and monitoring discharge lines to the storage tank.

On completion of the pumping and recovery components of a constant discharge test, the water level measurements collected by the data loggers were retrieved and the Solinst Levelloggers removed from the wells (or reset for the next test). Table A.1 summarizes the flow rate and maximum observed drawdown in the pumping wells for the completed tests.

Water level data from the Solinst Levelloggers was corrected for barometric pressure changes using the Solinst Levellogger 3.3.0 software and results were exported for plotting and analysis in Microsoft Excel. Water level measurements were normalized to a zero point coinciding with the start of the pumping phase of the constant discharge test to facilitate recognition of the extent of drawdown and recovery.



For each testing event the behaviour of the water level at each monitoring well was characterized as either responsive or non-responsive to pumping. Hydraulic interference testing results are provided in Appendix A.5 and are discussed in detail in Section 3.3 below.

2.4 MONITORING WELL INSTALLATION

Monitoring well screen intervals were determined by downhole geophysics results, packer test data (Section 3.2) and hydraulic interference results (Section 3.3). The proposed monitoring well screen elevations were discussed with MOECC hydrogeologists prior to installation. A summary of monitoring well construction details is provided in Table A.2. Complete borehole logs and monitoring well installation details are provided in Appendix A.1.

Table A. 2: Summary of Monitoring Well Construction Details

Monitoring Well	Easting	Northing	Ground Surface Elevation (masl)	Bedrock Elevation (masl)	Screened Interval(s) (masl)
M120	335322	4902276	119.47	119.01	N/A
M121	335529	4902337	120.97	119.75	92.9 – 98.2
M122	335742	4902433	123.52	123.06	95.9 – 101.1
M123	335905	4902479	122.92	122.46	97.1 – 101.8
M124	335484	4902337	120.82	119.75	N/A
M125	335561	4902368	121.43	120.36	93.4 – 97.9
M166	336069	4902589	122.29	121.83	97.9 – 100.9
M167	336266	4902624	119.98	119.60	93.9 – 96.9
M168	336063	4902714	125.29	124.22	97.2 – 100.3
M169	336278	4902900	128.40	124.24	N/A
M170	335889	4902865	127.51	125.17	101.1 – 104.1
M171	335759	4903206	129.56	124.13	N/A
M172	335490	4902593	126.48	123.69	96.6 – 99.6
M173	335661	4901812	119.57	110.43	82.57 – 85.57
M174	335961	4901879	124.08	114.33	87.08 – 90.08
M175	336324	4901927	116.65	116.50	N/A
M176	336613	4902308	112.05	111.64	101.55 – 107.54
M177	335784	4902084	115.90	115.75	109.9 – 112.92
M178-1	336032	4902203	116.08	114.79	84.01 – 87.01
M178-2	336032	4902206	115.96	114.69	101.42 – 104.41
M178-3	336035	4902209	115.99	114.44	109.44 – 112.44
M178R-1	336008	4902236	116.65	114.21	87.05 – 90.05
M178R-2	336008	4902233	116.52	114.89	96.72 – 102.82
M178R-3	336005	4902233	116.54	114.79	103.96 – 106.96
M178R-4	336002	4902232	116.54	114.86	111.04 – 112.94
M179	336338	4902357	117.04	116.89	99.06 – 102.1
M180	336801	4902677	112.98	111.91	102.98 – 105.98
M181-1	335911	4901491	116.41	115.70	93.91 – 96.91
M181-2	335911	4901491	116.38	115.65	103.38 – 106.38
M182	336402	4901643	109.84	109.03	81.84 – 84.84



Monitoring Well	Easting	Northing	Ground Surface Elevation (masl)	Bedrock Elevation (masl)	Screened Interval(s) (masl)
M183	336953	4901770	113.31	112.65	82.31 – 85.31
M184	336176	4901998	113.31	111.76	N/A
M185-1	336175	4902152	116.57	116.14	84.59 – 87.59
M185-2	336175	4902152	116.68	116.00	100.18 – 103.18
M186	336502	4902641	120.58	120.38	108.08 – 111.08
M187	335607	4901972	115.76	115.25	87.53 – 90.53
M188	335979	4902069	115.81	115.05	83.81 – 86.81
M189	335479	4902099	119.83	118.51	103.61 – 106.61
M190	336274	4902275	117.32	116.56	100.24 – 103.24
M191	336332	4902802	122.81	121.95	91.29 – 94.29

Monitoring well screens were not installed in six boreholes, M120, M124, M169, M171, M175 and M184, because they did not encounter sufficient water-bearing fractures to allow for enough water into the borehole to test. Four of these boreholes were sealed by a licensed well drilling contractor in accordance with Ontario Regulation 903 (M120, M124, M169 and M171), while two remain as open boreholes (M175 and M184). Monitoring well nest M178 has been replaced by well nest M178R and will be decommissioned in 2016.

2.5 WATER LEVEL MEASUREMENTS

As the investigation progressed, water level measurements were collected to determine the groundwater elevations at the various new and existing monitoring well locations. Measurements were collected using an electronic water level meter on October 19, 2012, April 19, August 13 and October 16, 2013, September 10, 2014, and November 20, 2015. Water levels were measured in the new monitoring wells in addition to the Intermediate Bedrock Groundwater Flow Zone monitoring wells used in the routine environmental monitoring program for the landfill. This allowed the groundwater levels between the existing and new monitoring wells to be evaluated, and for groundwater contours to be interpreted further south of Beechwood Road.

2.6 GROUNDWATER SAMPLING

Groundwater samples were collected from the monitoring wells within the proposed CAZ, and from selected additional monitoring wells adjacent to the proposed CAZ properties, on February 21, May 1, August 13 and October 17 – 21, 2013, August 8 and September 4 – 9, 2014, November 11 – 18, and November 30 – December 1, 2015 using dedicated Waterra inertial lift pumps connected to dedicated polyethylene tubing. Between one and three casing volumes of water were removed 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.

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, except those for tritium analyses, were analysed by Maxxam Analytics Inc. of Mississauga, ON, which is accredited by the Canadian Association for Laboratory Accreditation Inc. (CALA).

The samples were analyzed for general/inorganic and VOCs as shown in Table A.3, as well as for tritium and 1,4-dioxane in selected monitor locations. The parameters reported in November, 2015 were adjusted compared to previous sampling events to align with the latest list of analytical parameters prescribed by the Environmental Monitoring Plan² implemented on an interim basis as of September 1, 2015.

In addition, samples were collected and submitted for tritium analyses on May 1, 2013 (M121, M122, M123 and M125), August 13, 2013 (M166, M167, M168, M170 and M172), and October 17, 2013 (M121, M122, M123, M125, M166, M167, M168 and M170). Tritium analyses for samples collected in May and October, 2013, were performed by the University of Waterloo Environmental Isotope Laboratory; tritium analyses for samples collected in August, 2013, were performed by Isotech Laboratories Inc., of Champaign, Illinois.

² Revised Interim Environmental Monitoring Plan v. 04, WM Richmond Landfill, Town of Greater Napanee, Ontario, August 2015.



Table A. 3: Groundwater Quality Analytical Parameter Suites

Inorganic and General Parameter List	Total Dissolved Solids (TDS), Conductivity, Alkalinity, <i>pH</i> , <i>Hardness</i> , Calcium, Magnesium, Sodium, Potassium, <i>Arsenic</i> , <i>Barium</i> , Boron, <i>Cadmium</i> , <i>Chromium (total)</i> , <i>Copper</i> , Iron, <i>Lead</i> , Manganese, <i>Mercury</i> , <i>Zinc</i> , Ammonia (total), <i>Total Kjeldahl Nitrogen (TKN)</i> , Nitrate, Nitrite, Chloride, Sulphate, <i>Total phosphorus</i> , <i>Phenols</i> , <i>Biological Oxygen Demand (BOD)</i> , <i>Chemical Oxygen Demand (COD)</i> , Dissolved Organic Carbon (DOC), <i>Naphthalene</i>
Volatile Organic Compound (VOC) List	1,4-Dioxane**, Benzene, Toluene, Ethylbenzene, m&p-Xylene, o-Xylene, Styrene, 1,3,5-Trimethylbenzene, Chlorobenzene, 1,2-Dichlorobenzene, 1,3-Dichlorobenzene, 1,4-Dichlorobenzene, <i>Carbon tetrachloride</i> , Chloromethane, <i>Chloroform</i> , <i>Bromodichloromethane</i> , <i>Bromomethane</i> , <i>Bromoform</i> , <i>Dibromochloromethane</i> , <i>1,2-Dibromoethane</i> , <i>1,2-Dichloropropane</i> , <i>Cis-1,3-Dichloropropylene</i> , <i>Trans-1,3-Dichloropropylene</i> , <i>Trichlorofluoromethane</i> , 1,1,2,2-Tetrachloroethane, 1,1,1,2-Tetrachloroethane, 1,1,1-Trichloroethane, 1,1,2-Trichloroethane, 1,1-Dichloroethane, 1,2-Dichloroethane, Chloroethane, 1,1-Dichloroethylene, Cis-1,2-Dichloroethylene, Trans-1,2-Dichloroethylene, Trichloroethylene, Tetrachloroethylene, Vinyl chloride

* Parameters in bold italics are not included in the EMP dated August 2015

** 1,4 Dioxane has been added to the VOC List from the EMP dated August 2015

2.7 GROUNDWATER SEEPAGE AND SURFACE WATER SAMPLING

Groundwater is observed to be naturally discharging to ground surface in a diffuse wet area located in the central portion of the proposed CAZ. This area is approximately 500 m east-west by up to 100 m north-south, and extends from approximately Quarry Road (east of monitoring well locations M178/M178R) to the vicinity of monitoring well M187 to the west. Groundwater discharge has been observed in various locations within this area, with individual discharge locations found to flow intermittently depending on the conditions.

A local water course is present to the south and downgradient of the groundwater discharge area. This surface water feature originates from a small man made pond located directly to the east of Quarry Road. Surface water flows westerly from this pond over a distance of approximately 600 m along a topographically low area, to a second pond located about 25 m southeast of monitoring well M187, and finally to a local topographic depression located about 75 m farther west, where surface water enters into the ground in what appears to be a near-surface local karstic feature.

Surface water locations were sampled to assess the water quality of the groundwater discharge to surface water, and assess any potential impacts to surface water along the local water course. The monitoring locations, shown on Figure A.1, were selected to include samples representative of the groundwater where it discharges to surface water, a location upgradient of the discharge area in the upstream pond (SW3-15), a point approximately mid-way along the water course (SW2-15) and the downstream pond located near monitoring well M187 (SW4-15). The



groundwater seepage samples (identified as “M178-Seep”) were collected in the vicinity of well nests M178/M178R at locations where groundwater was observed to actively discharge to surface at the time of sampling.

Four surface water samples were collected on November 13 and on December 3, 2015, and submitted for analysis of 1,4-dioxane as well as groundwater general and inorganic parameters from Table 3 of the latest EMP (alkalinity, ammonia (total), boron, calcium, chloride, conductivity, dissolved organic carbon, iron, magnesium, manganese, nitrate, nitrite, potassium, sodium, sulphate and total dissolved solids).

3. RESULTS

3.1 GEOLOGY

The conditions encountered in the boreholes drilled for the proposed CAZ field investigation are consistent with the previous interpretations of the local geology. Stratigraphic cross-sections illustrating the observed conditions on the properties south of Beechwood Road are presented on Figures A.7(a) and A.7(b), while the locations of the cross-sections in plan view are shown on Figure A.1. Bedrock elevations obtained from boreholes drilled as part of the current investigation (M121 to M191) were used, in conjunction with information from previous investigations, provincial water well database for nearby water supply wells and latest available ground surface topographic data, to prepare overburden thickness and bedrock surface maps, respectively presented as Figures A.8 and A.9.

South of Beechwood Road, the ground surface slopes gently in a southerly direction at grades ranging from approximately 1 to 3%. The overburden thickness in the new boreholes ranged from 0.2 to 9.8 metres, with the thicker sequence of overburden found south of Beechwood Road, north of the abandoned MNR quarry at M173 and M174. The thinnest overburden cover, approximately 0.2 metres, was found to the southeast, at M175, M177 and M179. In the area of the investigations, the overburden consisted of a grey-brown to brown, silty clay containing sand and gravel to the south and southeast, and brown clay till to the east of the landfill.

Limestone bedrock was encountered in the new boreholes at elevations ranging from 109.8 masl (at M182) to 125.2 masl (at M170). The bedrock surface slopes in a general southerly orientation, consistent with the ground surface topography. Bedrock consists of a light grey fossiliferous limestone with thin undulating shaley partings, stylolites and calcite stringers. Horizontal and sub-horizontal fractures were identified in the boreholes from the geophysical logging profiles, with occasional high-angle fractures also apparent in some boreholes.



The target zone in the bedrock for the groundwater investigations was the intermediate bedrock groundwater flow zone. As defined in the Site Conceptual Model, the intermediate flow zone extends from one to two metres below the top of bedrock to a depth of approximately 30 m below the top of bedrock. Because of the significant anisotropy exerted by the dominance of horizontal and sub-horizontal oriented fractures in bedrock (mostly bedding plane partings), the primary groundwater flow direction in bedrock is horizontal. This does not rule out vertical components of flow in intermediate bedrock, but simply recognizes that the dominant path for groundwater flow is through horizontal and sub-horizontal fractures. The dominance of horizontal and sub-horizontal fractures compared to vertical and sub-vertical fractures stems from the fact that the various limestone formations and associated beds at the site are flat lying.

3.2 HYDRAULIC CONDUCTIVITY PROFILES

The hydraulic conductivity profiles developed from the packer testing results are presented in Appendix A.3. While the depth of increased permeability is variable between boreholes and cannot be correlated laterally across the study area, the majority of boreholes (M121, M122, M123, M125, M166, M167, M168, M170, M176, M178, M178R-2, M178R-3, M179, M180, M182, M185, M189 and M190) show increased bulk rock hydraulic conductivity between elevations of approximately 95 to 106 metres above sea level (masl). The higher hydraulic conductivity at these depths ranged from 7×10^{-7} m/s (at M170; relatively low K compared to other boreholes) to 2.5×10^{-2} m/s (at M178R-2). These increased hydraulic conductivities are consistent with the zone of increased hydraulic conductivity identified in the hydraulically responsive boreholes completed for the Groundwater Action Plan Investigation.

Some boreholes (M170, M176, M177, M178, M178R-4, M189 and M190) also exhibited an increase in hydraulic conductivity ranging from 5×10^{-6} to 6×10^{-3} m/s at shallower elevations between approximately 108 and 115 masl. Similarly, a deeper zone of increased hydraulic conductivities (7×10^{-7} to 1×10^{-3} m/s) was identified between 82 and 90 masl in boreholes M176, M178, M182, M183 and M187 (at M187, although hydraulic testing could not be performed because of the deep static water level, a highly productive water bearing fracture was identified at approximately 90 masl).

In all cases, the higher permeability depth intervals identified above correspond to horizontal to sub-horizontal fractures and bedding planes identified on the downhole geophysics logs.

Two boreholes located east of the landfill, M169 and M171, exhibited low hydraulic conductivity throughout the borehole profile, without evidence of significant fracturing or increased hydraulic conductivity. The hydraulic conductivities in these boreholes ranged from 4×10^{-10} m/s



to 9×10^{-8} m/s, with the relatively higher hydraulic conductivities being observed between 110 and 115 masl.

3.3 INTERFERENCE PUMPING TESTS

Eleven pumping interference tests were conducted as part of the field investigations reported in this document; the methodology, pumping well locations and monitoring network details of these tests are described in Section 2.3.

The pumping test conducted at the well at 1252 Beechwood Road identified response in monitoring wells shown on Figure A.10, with response curves presented in Appendix A.5. Figure A.10 shows the pumping well in red and all of the responding monitoring wells in yellow. A total of 21 monitoring wells showed response to the pumping well during the test. The responsive locations included existing monitoring wells previously shown to be hydraulically responsive, such as M10-1, M71, M109-1, M115-1, etc., along with packered intervals in the newly-drilled boreholes M121, M122, M123 and M125, which corresponded to the higher K zones in these boreholes.

The pumping test conducted at M168 identified response in 21 monitoring wells shown on Figure A.11, with response curves presented in Appendix A.5. As with the test at 1252 Beechwood Road, existing monitoring well locations known to be hydraulically responsive also responded to the test at M168. The packered intervals in new boreholes M166, M167 and M172 also showed a drawdown and recovery response to the pumping test. The packered interval in borehole M170 showed a slight response to pumping, which is consistent with the much lower hydraulic conductivity in this borehole. Water levels in boreholes M169 and M171 did not respond to the pumping test.

During the M168 pumping test, a precipitation event occurred with 23 mm of rainfall over a period of 22 hours. The hydraulically responsive monitoring wells and packered intervals responded to the infiltration with a rise in the water level, overcoming the drawdown from the pumping test. This observed response is consistent with the interpretation presented in the Groundwater Action Plan for the area south of the landfill and east of the access road, in that the intermediate bedrock zone monitoring wells are interconnected by a series of fractures (well-connected bedding planes, sub-horizontal fractures) that appear to be connected vertically to recharge/discharge areas, which respond to surface infiltration.

A pumping test was also conducted at borehole M170. However, the well could only sustain a pumping rate of 3.8 L/min (1.0 USGPM) and although considerable drawdown was achieved in the pumping well (12.5 m); there was insufficient drawdown response in other observation wells



to provide conclusive results about the hydraulic response. A pumping test was therefore completed at M168 as described above.

The pumping test at M178 in March 2014 identified responsiveness in existing wells further north as shown on Figure A.12, with response curves presented in Appendix A.5. None of the new boreholes (i.e., boreholes M173 to M183) appeared to respond so pumping tests were conducted further downgradient at M174 and M179.

There were three groupings of water level behaviour during the M174 pumping test. None of the wells appeared to respond to pumping; however, several groups of monitors shared patterns which appeared to relate to changes in the water pressure environment. The groupings included the following:

- Group 1: M117, M121, M122, M123, M166, M167 and M178 (these wells that show a similar pattern of increasing water levels);
- Group 2: M173, M176, M179, M181, M182 (all exhibited a distinct inflection in the water level response curves);
- Group 3: Others not related in patterns – M175, M180.

Similarly, distinct patterns were noted among the monitoring wells during the M179 pumping test:

- Group 1: M117, M121, M122, M123, M166, M167, M178 (all responded to the straddle packer system being re-set in M178 prior to the test);
- Group 2: M174, M181, M182 (exhibited uniformly decreasing water levels);
- Group 2b: M173, M177, M180 (similar pattern to Group 2 but with a different magnitude);
- Group 3: M175, M176 (no responses, with different water level behaviour than the other wells).

A second pumping test was conducted at M178 in July 2014 to assess hydraulic response at newly constructed boreholes M184, M185 and M186. Borehole M185 was responsive to pumping at M178; however, M184 and M186 were not responsive.

A pumping test was also conducted at M167, with response at monitoring well M166, but there was no response at M186 or M179.

A pumping test at M178R-3 was conducted in September 2015 to monitor response in the existing monitoring well nest M178 and the newly constructed boreholes M187 through M191. The isolated intervals at M188 and M190 were responsive to pumping (as well as monitoring



wells M122, M123, M166, M178-2, M178-3, M178R-2, M178R-4 and M185-2 as shown on Figure A.13 and in Appendix A.5), but there was no noticeable response at M187, M189 or M191.

A pumping test conducted at M187 in September 2015 revealed that monitoring wells M64-2, M173, M179, M185-1 and M185-2 were responsive to pumping but there was no response at any of the other newly constructed wells (M188 through M191), as shown on Figure A.14, with response curves presented in Appendix A.5.

Similarly, there was no response at M190 or M191 to a pumping test conducted at M108 in October 2015, while several other monitoring wells responded to pumping (M105, M107, M122, M123, M166, M167, M168, M170, M172, M178-2, M178-3, M178R-2, M178R-3 and M178R-4), as shown on Figure A.15, with response curves presented in Appendix A.5.

The results of the hydraulic interference tests were used in combination with the geophysical logging and packer testing to select the screen intervals for the new monitoring wells installed as part of the field investigations.

3.4 WATER LEVELS

Groundwater levels were measured across the WM Richmond Landfill site and the proposed CAZ area on October 19, 2012; April 19, August 13 and October 16, 2013; May 5 and September 10, 2014; and November 20, 2015. Maps showing the intermediate bedrock groundwater elevations and the potentiometric contours interpreted from the data are presented in Appendix A.6. The groundwater contour maps cover the proposed CAZ investigation area as well as the landfill property to the north.

The groundwater in the intermediate bedrock generally flows to the north, west, and south relative to the landfill. South of the landfill footprint, the groundwater flow orientation is to the south and southeast. This flow orientation continues onto the proposed CAZ properties south of Beechwood Road. The most recent groundwater contour map from November 2015 (Figure A.6.7) shows that the water levels in the monitoring wells within the area south of the landfill and east of the access road are very similar. This is indicative of an area of rock with a higher bulk hydraulic conductivity, and with a well-connected fracture network resulting in low hydraulic gradient.

3.5 GROUNDWATER CHEMISTRY

Groundwater chemistry results are presented in Table A.4. The results summarized are for samples collected between February 2013 and December 1, 2015 for monitoring wells located



within the proposed CAZ and for selected monitoring wells adjacent to the proposed CAZ properties.

Background concentrations of leachate indicator parameters in the intermediate bedrock at the WM Richmond Landfill site are presented in Table 1 of the main body of this report, along with the calculated Guideline B-7 Reasonable Use Limits (RULs) for those parameters that have Ontario Drinking Water Standards. A comparison of the proposed CAZ investigation results to background concentrations reveals that several indicator parameters exceed background in some of the monitoring wells on the proposed CAZ. In particular, groundwater samples from several monitoring wells within and immediately upgradient from the proposed CAZ area revealed detectable concentrations of 1,4 dioxane, which is a primary leachate indicator at this site. The alkalinity and DOC concentrations in these monitoring wells are typically elevated as well. A list of monitoring wells on the proposed CAZ with detectable 1,4 dioxane concentrations is as follows:

- M114-1
- M115-1
- M116
- M117
- M121
- M122
- M123
- M125
- M166
- M167
- M168
- M178-1
- M178-2
- M178-3
- M178R-2
- M178R-3
- M178R-4
- M64-2

In addition, several intermediate bedrock monitoring wells on the landfill property north of Beechwood Road and south of the landfill footprint exhibit detectable concentrations of 1,4 dioxane and elevated concentrations of alkalinity and DOC. These include the following:

- M9R-1
- M9-2
- M9-3
- M10-1
- M53-2
- M71
- M105
- M107
- M108
- M109-1
- M110-1
- M170
- M172

The distribution of 1,4 dioxane and the other indicator parameters is consistent with a groundwater flow orientation to the south and southeast, as well as the seasonal variations in flow patterns during periods of higher and lower groundwater heads. The observed impacts extend onto the proposed CAZ properties south of Beechwood Road. As described in the main



body of this report, the extent of impacts observed in the monitoring wells south of Beechwood Road is contained within the proposed boundaries of the CAZ.

3.6 SEEP AND SURFACE WATER CHEMISTRY

1,4-dioxane was detected in the groundwater discharge samples identified as M178-seep, at a concentration of 0.0015 mg/L on November 13, 2015 and 0.004 mg/L on December 3, 2015, but was below the detection limit of 0.001 mg/L in all three surface water samples collected from the nearby receiving surface water course during both sampling rounds (Table A.5). Several general and inorganic parameters analyzed showed increased concentrations in downstream surface water samples (SW2-15 and SW4-15) relative to upstream location SW3-15, indicating mineralization of the surface water from the groundwater seepage in this area of the CAZ. All parameters from the surface water samples were below their respective PWQO.

Respectfully submitted,
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TABLES



Table A.4
Summary of Groundwater Chemistry Results for Monitoring Wells on the Proposed CAZ and Selected Adjacent Monitoring Wells

Name	Date	General and Inorganic Parameters																																			
		Alkalinity mg/L	Ammonia mg/L	Arsenic mg/L	Barium mg/L	Biochemical Oxygen Demand mg/L	Boron mg/L	Cadmium mg/L	Calcium mg/L	Chemical Oxygen Demand mg/L	Chloride mg/L	Chromium (Total) mg/L	Cobalt mg/L	Conductivity µS/cm	Copper mg/L	Dissolved Organic Carbon mg/L	Hardness mg/L	Iron mg/L	Lead mg/L	Magnesium mg/L	Manganese mg/L	Mercury mg/L	Naphthalene mg/L	Nickel mg/L	Nitrate mg/L	Nitrite mg/L	pH (Lab) unitless	Phenols mg/L	Phosphorus (total) mg/L	Potassium mg/L	Sodium mg/L	Sulphate mg/L	Total Dissolved Solids mg/L	Total Kjeldahl Nitrogen mg/L	Zinc mg/L		
M9R-1	30/04/2013																																				
M9-2	30/04/2013																																				
M9-2	18/10/2013												1615														6.94										
M9-2	24/11/2015	570	0.72				0.35		170		170		1570		9.7		11		47	0.39						< 0.1	< 0.01					6.5	130	< 1	920		
M9-3	24/04/2013	290	1.21	< 0.001	0.047	< 2	0.49	< 0.0001	44	4.5	76	< 0.005	834	< 0.001	2.9	220	0.34	< 0.0005	26	0.033	< 0.0002	< 0.0005			< 0.1	< 0.01	8.03	0.0022	0.04	18	80	17	446	1.3	< 0.005		
M9-3	30/04/2013																																				
M9-3	20/06/2013																																				
M9-3	22/10/2013	260	1.18	< 0.001	0.043	< 2	0.56	< 0.0001	43	4.5	72	< 0.005	< 0.0005	747	0.0096	2.5	220	0.12	< 0.0005	27	0.018	< 0.0002	< 0.0005	< 0.001	< 0.1	< 0.01	8.08	< 0.001	< 0.03	15	65	11	396	1.7	< 0.005		
M9-3	06/05/2014	270	1.18	< 0.001	0.043	2	0.84	< 0.0001	35	< 4	69	< 0.005	< 0.0005	731	< 0.001	1.5	180	0.27	< 0.0005	23	0.024	< 0.0002	< 0.0013	< 0.001	< 0.1	< 0.01	8.13	< 0.001	0.05	14	77	5	358	1.2	< 0.005		
M9-3	23/10/2014	260	1.2	< 0.001	0.04	3	0.62	< 0.0001	33	< 4	75	< 0.005	< 0.0005	748	< 0.001	2.9	180	0.1	< 0.0005	23	0.014	< 0.0002	< 0.0005	< 0.001	< 0.1	0.01	8.15	< 0.001	0.05	12	77	9	376	1.1	< 0.005		
M9-3	24/04/2015	260	1.09	< 0.001	0.046	< 2	0.54	< 0.0001	43	4.6	89	< 0.005	< 0.0005	777	< 0.001	2.6	230	0.11	< 0.0005	29	0.027	< 0.0002	< 0.01	< 0.001	< 0.1	< 0.01	8	0.019	< 0.03	15	78	8	416	1.2	< 0.005		
M9-3	24/11/2015	250	1.2				0.61		40		96		806		9.1		0.27		26	0.029					< 0.1	< 0.01				14	85	3.1	422				
M10-1	24/04/2013	480	0.78	0.002	0.23	< 2	0.32	< 0.0001	130	36	120	< 0.005		1290	< 0.001	7.4	460	18	< 0.0005	32	0.72	< 0.0002	< 0.0005		< 0.1	< 0.01	7.42	< 0.001	< 0.15	5.3	94	14	690	2	< 0.005		
M10-1	30/04/2013																																				
M10-1	21/10/2013	560	0.74	0.0019	0.29	< 2	0.39	< 0.0001	170	28	170	< 0.005	< 0.0005	1580	< 0.001	7.8	610	21	< 0.0005	44	0.88	< 0.0002	< 0.0005	0.0053	< 0.1	< 0.01	7.44	< 0.001	< 0.06	6.8	94	11	874	1.5	< 0.005		
M10-1	08/05/2014	360	0.63	0.0012	0.14	< 2	0.23	< 0.0001	86	8.6	45	< 0.005	< 0.0005	814	< 0.001	5.1	300	11	< 0.0005	21	0.4	< 0.0002	< 0.0005	0.0024	< 0.1	< 0.01	7.85	< 0.001	0.06	4.4	54	8	406	1	< 0.005		
M10-1	04/09/2014	510	0.8	0.0014	0.27	2	0.2	< 0.0001	150	25	140	< 0.005	< 0.0005	1410	< 0.001	6.6	530	19	< 0.0005	37	0.75	< 0.0002		0.0045	< 0.1	< 0.01	7.6	< 0.001	0.05	5	73	11	856	1.1	0.0061		
M10-1	21/10/2014	540	0.8	0.001	0.28	< 2	0.31	< 0.0001	180	17	160	< 0.005	< 0.0005	1580	< 0.001	7.2	620	20	< 0.0005	44	0.77	< 0.0002	< 0.0005	0.0051	< 0.1	< 0.01	7.5	< 0.001	0.07	5.9	84	27	912	1.2	0.0071		
M10-1	23/04/2015	470	0.72	0.0011	0.26	< 2	0.22	< 0.0001	140	19	140	< 0.005	< 0.0005	1270	< 0.001	7.9	500	20	< 0.0005	34	0.65	< 0.0002	< 0.0005	0.0045	< 0.1	< 0.01	7.32	< 0.001	< 0.03	5.5	91	9	760	1.6	< 0.005		
M49-1	24/04/2013	380	1.02	< 0.001	0.054	< 2	0.93	< 0.0001	13	9.1	400	< 0.005		2190	< 0.001	2.3	56	< 0.1	< 0.0005	5.9	0.026	< 0.0002	< 0.0005		< 0.1	< 0.01	8.17	< 0.001	0.06	8.3	440	33	1160	1.2	< 0.005		
M49-1	21/10/2013	400	0.94	< 0.001	0.04	2	0.94	< 0.0001	9	21	340	< 0.005	< 0.0005	1920	< 0.001	3.1	38	< 0.1	< 0.0005	3.8	0.013	< 0.0002	< 0.0005	0.0018	< 0.5	< 0.05	8.13	0.0082	0.15	7.3	400	31	1010	2.3	< 0.005		
M49-1	08/05/2014	400	0.9	< 0.001	0.054	3	0.95	< 0.0001	12	9.1	340	< 0.005	< 0.0005	1940	< 0.002	4.2	53	< 0.1	< 0.0005	5.4	0.01	< 0.0002	< 0.0005	0.0012	< 0.1	< 0.01	8.49	< 0.001	0.06	7.4	400	32	1030	1.1	< 0.005		
M49-1	21/10/2014	390	0.78	< 0.001	0.043	< 2	1.1	< 0.0001	11	7.3	320	< 0.005	< 0.0005	1880	< 0.002	4.2	51	< 0.1	< 0.0005	5.5	0.011	< 0.0002	< 0.0005	0.0011	< 0.1	< 0.01	8.26	< 0.001	< 0.15	7.2	370	27	1190	1.1	< 0.005		
M49-1	23/04/2015	360	0.87	< 0.001	0.041	< 2	1	< 0.0001	13	6.6	290	< 0.005	< 0.0005	1740	< 0.001	2.5	58	< 0.1	< 0.0005	6.2	0.0099	< 0.0002	< 0.0005	< 0.001	< 0.1	< 0.01	8.19	< 0.001	0.09	8.2	340	27	940	1	< 0.005		
M49-2	24/04/2013	700	1.45	< 0.001	0.043	38	2.3	< 0.0001	11	49	220	< 0.005		2180	< 0.001	4	59	< 0.1	< 0.0005	7.7	0.0041	< 0.0002	< 0.0005		< 0.1	< 0.01	8.6	0.077	0.15	11	490	94	1260	5	< 0.005		
M49-2	01/05/2013																																				
M49-2	21/10/2013	740	1.39	< 0.001	0.054	46	2.4	< 0.0001	13	69	280	< 0.005	< 0.0005	2290	< 0.001	1.4	68	< 0.1	< 0.0005																		

Table A.4
Summary of Groundwater Chemistry Results for Monitoring Wells on the Proposed CAZ and Selected Adjacent Monitoring Wells

Name	Date	Volatile Organic Compounds (VOC)																														
		1,1,1,2-Tetrachloroethane mg/L	1,1,1-Trichloroethane mg/L	1,1,2,2-Tetrachloroethane mg/L	1,1,2-Trichloroethane mg/L	1,1-Dichloroethane mg/L	1,1-Dichloroethylene mg/L	1,2-Dibromoethane mg/L	1,2-Dichlorobenzene (o) mg/L	1,2-Dichloroethane mg/L	1,2-Dichloropropane mg/L	1,3,5-Trimethylbenzene mg/L	1,3-Dichlorobenzene (m) mg/L	1,4-Dichlorobenzene (p) mg/L	Acetone mg/L	Benzene mg/L	Bromodichloromethane mg/L	Bromoform mg/L	Bromomethane mg/L	Carbon Tetrachloride mg/L	Chlorobenzene mg/L	Chloroethane mg/L	Chloroform mg/L	Chloromethane mg/L	Cis-1,2-Dichloroethylene mg/L	Cis-1,3-Dichloropropylene mg/L	Dibromochloromethane mg/L	Dichlorodifluoromethane mg/L	Dichloromethane mg/L		Ethylbenzene mg/L	m+p-Xylene mg/L
M9R-1	30/04/2013																															
M9-2	30/04/2013																															
M9-2	18/10/2013																															
M9-2	24/11/2015	< 0.0002	< 0.0001	< 0.0002	< 0.0002	0.00058	0.00012		< 0.0002	< 0.0002		< 0.0002	< 0.0002		0.00093						< 0.0001	0.042		< 0.0005	< 0.0001	< 0.0002			< 0.0005	< 0.0001	< 0.0001	
M9-3	24/04/2013	< 0.0002	< 0.0001	< 0.0002	< 0.0002	0.00021	< 0.0001	< 0.0002	< 0.0002	< 0.0002	< 0.0001	< 0.0002	< 0.0002	< 0.01	0.00044	< 0.0001	< 0.0002	< 0.0005	< 0.0001	< 0.0001	0.0038	< 0.0001	< 0.0005	< 0.0001	< 0.0002	< 0.0002			< 0.0005	< 0.0001	< 0.0001	< 0.005
M9-3	30/04/2013																															
M9-3	20/06/2013																															
M9-3	22/10/2013	< 0.0002	< 0.0001	< 0.0002	< 0.0002	< 0.0001	< 0.0001		< 0.0002	< 0.0002	< 0.0001		< 0.0002	< 0.0002	< 0.01	0.0002	< 0.0001	< 0.0002	< 0.0005	< 0.0001	< 0.0001	< 0.002	< 0.0001	< 0.0005	< 0.0001	< 0.0002	< 0.0002		< 0.0005	< 0.0001	< 0.0001	< 0.005
M9-3	06/05/2014	< 0.0005	< 0.00025	< 0.0005	< 0.0005	< 0.00025	< 0.00025	< 0.0005	< 0.0005	< 0.0005	< 0.00025	< 0.0005	< 0.0005	< 0.025	< 0.00025	< 0.00025	< 0.0005	< 0.0013	< 0.00025	< 0.00025	< 0.0005	< 0.00025	< 0.0005	< 0.0013	< 0.00025	< 0.0005	< 0.0005		< 0.0013	< 0.00025	< 0.00025	< 0.013
M9-3	23/10/2014																															
M9-3	24/04/2015	< 0.004	< 0.002	< 0.004	< 0.004	< 0.002	< 0.002	< 0.004	< 0.004	< 0.004	< 0.002	< 0.004	< 0.004	< 0.004		< 0.002	< 0.002	< 0.004	< 0.01	< 0.002	< 0.002	< 0.02	< 0.002	< 0.01	< 0.002	< 0.004	< 0.004		< 0.01	< 0.002	< 0.002	
M9-3	24/11/2015	< 0.002	< 0.001	< 0.002	< 0.002	< 0.001	< 0.001		< 0.002	< 0.002		< 0.002	< 0.002	< 0.002		< 0.001					< 0.001	< 0.002		< 0.005	< 0.001	< 0.002			< 0.005	< 0.001	< 0.001	
M10-1	24/04/2013	< 0.0002	< 0.0001	< 0.0002	< 0.0002	0.003	0.00023	< 0.0002	< 0.0002	< 0.0002	< 0.0001	< 0.0002	< 0.0002	< 0.0002	< 0.01	0.0001	< 0.0001	< 0.0002	< 0.0005	< 0.0001	< 0.0001	0.0091	< 0.0001	< 0.0005	< 0.0001	< 0.0002	< 0.0002		< 0.0005	< 0.0001	< 0.0001	< 0.005
M10-1	30/04/2013																															
M10-1	21/10/2013	< 0.0002	< 0.0001	< 0.0002	< 0.0002	0.002	0.00025		< 0.0002	< 0.0002	< 0.0001		< 0.0002	< 0.0002	< 0.01	< 0.0001	< 0.0001	< 0.0002	< 0.0005	< 0.0001	< 0.0001	0.011	< 0.0001	< 0.0005	< 0.0001	< 0.0002	< 0.0002		< 0.0005	< 0.0001	< 0.0001	< 0.005
M10-1	08/05/2014	< 0.0002	< 0.0001	< 0.0002	< 0.0002	0.002	0.00018	< 0.0002	< 0.0002	< 0.0002	< 0.0001	< 0.0002	< 0.0002	< 0.0002	< 0.01	0.00011	< 0.0001	< 0.0002	< 0.0005	< 0.0001	< 0.0001	0.0075	< 0.0001	< 0.0005	0.0001	< 0.0002	< 0.0002		< 0.0005	< 0.0001	< 0.0001	< 0.005
M10-1	04/09/2014	< 0.0002	< 0.0001	< 0.0002	< 0.0002	0.0026	0.00025	< 0.0002	< 0.0002	< 0.0002	< 0.0001	< 0.0002	< 0.0002	< 0.0002		< 0.0001	< 0.0001	< 0.0002	< 0.0005	< 0.0001	< 0.0001	0.009	< 0.0001	< 0.0005	0.00011	< 0.0002	< 0.0002		< 0.0005	< 0.0001	< 0.0001	
M10-1	21/10/2014																															
M10-1	23/04/2015	< 0.0002	< 0.0001	< 0.0002	< 0.0002	0.0027	0.00028	< 0.0002	< 0.0002	< 0.0002	< 0.0001	< 0.0002	< 0.0002	< 0.0002		0.00011	< 0.0001	< 0.0002	< 0.0005	< 0.0001	< 0.0001	0.011	< 0.0001	< 0.0005	0.00012	< 0.0002	< 0.0002		< 0.0005	< 0.0001	< 0.0001	
M49-1	24/04/2013	< 0.0002	< 0.0001	< 0.0002	< 0.0002	< 0.0001	< 0.0001	< 0.0002	< 0.0002	< 0.0002	< 0.0001	< 0.0002	< 0.0002	< 0.0002	< 0.01	< 0.0001	< 0.0001	< 0.0002	< 0.0005	< 0.0001	< 0.0001	< 0.0002	< 0.0001	< 0.0005	< 0.0001	< 0.0002	< 0.0002		< 0.0005	< 0.0001	< 0.0001	< 0.005
M49-1	21/10/2013	< 0.0002	< 0.0001	< 0.0002	< 0.0002	< 0.0001	< 0.0001		< 0.0002	< 0.0002	< 0.0001		< 0.0002	< 0.0002	< 0.01	< 0.0001	< 0.0001	< 0.0002	< 0.0005	< 0.0001	< 0.0001	< 0.002	< 0.0001	< 0.0005	< 0.0001	< 0.0002	< 0.0002		< 0.0005	< 0.0001	< 0.0001	< 0.005
M49-1	08/05/2014	< 0.0002	< 0.0001	< 0.0002	< 0.0002	< 0.0001	< 0.0001	< 0.0002	< 0.0002	< 0.0002	< 0.0001	< 0.0002	< 0.0002	< 0.0002	< 0.01	< 0.0001	< 0.0001	< 0.0002	< 0.0005	< 0.0001	< 0.0001	< 0.0002	< 0.0001	< 0.0005	< 0.0001	< 0.0002	< 0.0002		< 0.0005	< 0.0001	< 0.0001	< 0.005
M49-1	21/10/2014																															
M49-1	23/04/2015	< 0.0002	< 0.0001	< 0.0002	< 0.0002	< 0.0001	< 0.0001	< 0.0002	< 0.0002	< 0.0002	< 0.0001	< 0.0002	< 0.0002	< 0.0002		< 0.0001	< 0.0001	< 0.0002	< 0.0005	< 0.0001	< 0.0001	< 0.0002	< 0.0001	< 0.0005	< 0.0001	< 0.0002	< 0.0002		< 0.0005	< 0.0001	< 0.0001	
M49-2	24/04/2013	< 0.0002	< 0.0001	< 0.0002	< 0.0002	< 0.0																										

Table A.4
Summary of Groundwater Chemistry Results for Monitoring Wells on the Proposed CAZ and Selected Adjacent Monitoring Wells

Name	Date	Volatile Organic Compounds (VOC)												1,4-Dioxane	
		Methyl Isobutyl Ketone mg/L	Methyl Tert Butyl Ether mg/L	o-Xylene mg/L	Styrene mg/L	Tetrachloroethylene mg/L	Toluene mg/L	Total Xylenes mg/L	Trans-1,2-dichloroethylene mg/L	Trans-1,3-dichloropropylene mg/L	Trichloroethylene mg/L	Trichlorofluoromethane mg/L	Vinyl Chloride mg/L	1,4-Dioxane mg/L	3H TU
M9R-1	30/04/2013													0.0221	49.9
M9-2	30/04/2013													0.0291	32.6
M9-2	18/10/2013													0.0355	45.1
M9-2	24/11/2015			< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0001		< 0.0001		0.00089	0.026	
M9-3	24/04/2013		< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0002		
M9-3	30/04/2013														8.3
M9-3	20/06/2013													< 0.001	
M9-3	22/10/2013		< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0002	< 0.001	6.7
M9-3	06/05/2014		< 0.0005	< 0.00025	< 0.0005	< 0.00025	< 0.0005	< 0.00025	< 0.00025	< 0.0005	< 0.00025	< 0.0005	< 0.0005		
M9-3	23/10/2014														
M9-3	24/04/2015			< 0.002	< 0.004	< 0.002	0.1	< 0.002	< 0.002	< 0.004	< 0.002	< 0.004	< 0.004		
M9-3	24/11/2015			< 0.001	< 0.002	< 0.001	0.087	< 0.001	< 0.001		< 0.001		< 0.002	0.0013	
M10-1	24/04/2013		< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0001	< 0.0002	< 0.0001	< 0.0002	0.00037		
M10-1	30/04/2013													0.0157	26.4
M10-1	21/10/2013		< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0001	< 0.0002	< 0.0001	< 0.0002	0.00035	0.0219	33.7
M10-1	08/05/2014		< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0001	< 0.0002	< 0.0001	< 0.0002	0.00023		
M10-1	04/09/2014			< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0001	< 0.0002	< 0.0001	< 0.0002	0.00033	0.0102	
M10-1	21/10/2014														
M10-1	23/04/2015			< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0001	< 0.0002	< 0.0001	< 0.0002	0.00061		
M49-1	24/04/2013		< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0002		
M49-1	21/10/2013		< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0002	< 0.0002	
M49-1	08/05/2014		< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0002		
M49-1	21/10/2014														
M49-1	23/04/2015			< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0002		
M49-2	24/04/2013		< 0.0002	< 0.0001	< 0.0002	< 0.0001	0.00022	0.00014	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0002	< 0.0002	
M49-2	01/05/2013													< 0.001	< 0.8
M49-2	21/10/2013		< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0002	< 0.001	3
M49-2	07/05/2014		< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0002	0.00012	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0002		
M49-2	21/10/2014														
M49-2	23/04/2015			< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0002		
M52-1	25/04/2013	< 0.025	< 0.001	0.0014	< 0.001	< 0.0005	< 0.001	0.0042	< 0.0005	< 0.001	< 0.0005	< 0.001	< 0.001		
M52-1	01/05/2013													< 0.001	0.9
M52-1	23/10/2013		< 0.0004	0.00079	< 0.0004	< 0.0002	< 0.0004	0.0028	< 0.0002	< 0.0004	< 0.0002	< 0.0004	< 0.0004	< 0.001	1.6
M52-1	08/05/2014		< 0.0004	0.00056	< 0.0004	< 0.0002	< 0.0004	0.0016	< 0.0002	< 0.0004	< 0.0002	< 0.0004	< 0.0004		
M52-1	23/10/2014														
M52-1	23/04/2015			0.0005	< 0.0002	< 0.0001	0.00028	0.0017	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0002		
M53-2	01/05/2013													0.00462	17.5
M53-2	18/10/2013													0.0202	39.6
M63-2	20/06/2013	< 0.01	< 0.0004	< 0.0002	< 0.0004	< 0.0002	< 0.0004	< 0.0002	< 0.0002	< 0.0004	< 0.0002	< 0.0004	< 0.0004		4.4
M63-2	12/01/2015													< 0.001	
M64-2	20/06/2013	< 0.005	< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0002		4.5
M64-2	05/09/2014			< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0002	0.0022	
M64-2	26/11/2015			< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0001		< 0.0001		< 0.0002	0.0027	
M71	24/04/2013		< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0001	< 0.0002	< 0.0001	< 0.0002	0.00024		
M71	01/05/2013													0.0274	37.2
M71	22/10/2013		< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0001	< 0.0002	< 0.0001	< 0.0002	0.00028	0.0326	40.1
M71	06/05/2014		< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0001	< 0.0002	< 0.0001	< 0.0002	0.00022		
M71	04/09/2014			< 0.0005	< 0.001	< 0.0005	< 0.001	< 0.0005	< 0.0005	< 0.001	< 0.0005	< 0.0005	< 0.001	< 0.001	0.00156
M105	23/04/2013		< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0002		
M105	30/04/2013													0.0138	32.3
M105	21/10/2013		< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0002	0.022	30.8
M105	06/05/2014		< 0.0005	< 0.00025	< 0.0005	< 0.00025	< 0.0005	< 0.00025	< 0.00025	< 0.0005	< 0.00025	< 0.0005	< 0.0005	< 0.0005	
M105	04/09/2014			< 0.00025	< 0.0005	< 0.00025	< 0.0005	< 0.00025	< 0.00025	< 0.0005	< 0.00025	< 0.0005	< 0.0005	0.0184	
M105	22/10/2014														
M105	21/04/2015			< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0002		
M107	30/04/2013													0.0166	30.2
M107	20/06/2013	< 0.005	< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0001	< 0.0002	< 0.0001	< 0.0002	0.00022		

Table A.4
Summary of Groundwater Chemistry Results for Monitoring Wells on the Proposed CAZ and Selected Adjacent Monitoring Wells

Name	Date	General and Inorganic Parameters																																		
		Alkalinity mg/L	Ammonia mg/L	Arsenic mg/L	Barium mg/L	Biochemical Oxygen Demand mg/L	Boron mg/L	Cadmium mg/L	Calcium mg/L	Chemical Oxygen Demand mg/L	Chloride mg/L	Chromium (Total) mg/L	Cobalt mg/L	Conductivity µS/cm	Copper mg/L	Dissolved Organic Carbon mg/L	Hardness mg/L	Iron mg/L	Lead mg/L	Magnesium mg/L	Manganese mg/L	Mercury mg/L	Naphthalene mg/L	Nickel mg/L	Nitrate mg/L	Nitrite mg/L	pH (Lab) unitless	Phenols mg/L	Phosphorus (total) mg/L	Potassium mg/L	Sodium mg/L	Sulphate mg/L	Total Dissolved Solids mg/L	Total Kjeldahl Nitrogen mg/L	Zinc mg/L	
M107	21/10/2013	540	0.2	< 0.001	0.14	< 2	0.18	< 0.0001	180	14	140	< 0.005	< 0.0005	1460	< 0.001	6.5	630	7.3	< 0.0005	43	0.47	< 0.0002	< 0.0005	0.0044	< 0.1	< 0.01	7.44	0.0015	< 0.03	4.2	78	13	794	< 0.7	< 0.005	
M107	06/05/2014	370	0.24	< 0.001	0.089	< 2	0.14	< 0.0001	98	11	48	< 0.005	< 0.0005	862	< 0.001	4.8	340	5	< 0.0005	24	0.28	< 0.0002	< 0.0005	0.0023	< 0.1	< 0.01	7.57	< 0.001	< 0.03	3.1	53	8	456	< 0.7	< 0.005	
M107	04/09/2014	440	0.18	< 0.001	0.12	< 2	0.14	< 0.0001	120	18	100	< 0.005	< 0.0005	1110	< 0.001	5.1	430	8	< 0.0005	30	0.43	< 0.0002		0.0027	< 0.1	< 0.01	7.66	< 0.001	< 0.03	3.4	53	9	650	< 0.7	< 0.005	
M107	22/10/2014	480	0.24	< 0.001	0.14	< 2	0.15	< 0.0001	160	16	130	< 0.005	< 0.0005	1290	< 0.001	6	550	9.5	< 0.0005	38	0.5	< 0.0002	< 0.0005	0.0039	< 0.1	< 0.01	7.67	< 0.001	< 0.03	3.7	63	9	694	0.7	< 0.005	
M107	21/04/2015	480	0.28	< 0.001	0.14	< 2	0.2	< 0.0001	130	17	98	< 0.005	< 0.0005	1180	< 0.001	6.7	460	9	< 0.0005	34	0.43	< 0.0002	< 0.0005	0.0043	< 0.1	< 0.01	7.76	0.0014	< 0.03	4.1	79	12	668	1.2	< 0.005	
M108	30/04/2013																																			
M108	18/10/2013													974																						
M108	05/09/2014	510	0.98	< 0.001	0.058	2	0.29	< 0.0001	140	14	140	< 0.005	< 0.0005	1340	< 0.001	5.6	520	0.44	< 0.0005	42	0.053	< 0.0002		0.0035	< 0.1	< 0.01	7.83	0.0013	0.03	7.6	88	7	794	1.4	< 0.005	
M108	25/11/2015	560	1				0.32		160		140			1480		6.3		0.8		50	0.082				< 0.1	< 0.01					9	97	3.2	820		
M109-1	30/04/2013																																			
M109-1	17/10/2013																																			
M109-1	18/10/2013													1816																						
M109-1	04/09/2014	620	0.86	< 0.001	0.34	5	0.44	< 0.0001	150	41	200	< 0.005	< 0.0005	1770	< 0.001	10	580	12	< 0.0005	47	0.37	< 0.0002		0.0092	< 0.1	< 0.01	7.43	0.0012	0.05	6.5	140	< 1	1010	1.7	< 0.005	
M109-1	26/11/2015	620	1.05				0.49		190		250			1970		13		14		62	0.43				< 0.1	< 0.01					8.2	160	< 1	1050		
M110-1	30/04/2013																																			
M110-1	18/10/2013													2005																						
M110-1	04/09/2014	650	0.74	< 0.001	0.3	3	0.52	< 0.0001	210	34	340	< 0.005	< 0.0005	2250	< 0.001	10	810	0.11	< 0.0005	71	0.016	< 0.0002		0.01	< 0.1	< 0.01	7.6	< 0.001	0.04	8.4	160	< 1	1490	1.6	< 0.005	
M110-1	26/11/2015	650	0.66				0.44		170		200			1820		10		< 0.1		59	0.015				< 0.1	< 0.01					8	150	< 1	992		
M114-1	30/04/2013																																			
M114-1	18/10/2013													969																						
M114-1	04/09/2014	450	0.51	< 0.001	0.079	< 2	0.25	< 0.0001	130	18	130	< 0.005	< 0.0005	1230	< 0.001	5.7	440	9.1	< 0.0005	29	0.48	< 0.0002		0.0029	< 0.1	< 0.01	7.75	0.0012	< 0.03	5.1	81	8	666	1	< 0.005	
M114-1	24/11/2015	580	0.38				0.26		190		160			1590		7.3		14		47	0.69				< 0.1	< 0.01					6.9	100	5.1	942		
M115-1	30/04/2013																																			
M115-1	22/10/2013													1658																						
M116	01/05/2013																																			
M116	17/10/2013													1151																						
M116	04/09/2014	420	0.67	< 0.001	0.21	< 2	0.14	< 0.0001	140	14	160	< 0.005	< 0.0005	1330	< 0.001	3.9	500	9.9	< 0.0005	34	0.66	< 0.0002		0.0023	< 0.1	< 0.01	7.73	< 0.001	0.03	4.3	81	30	900	1	< 0.005	
M117	01/05/2013																																			
M117	17/10/2013													765																						
M117	04/09/2014	420	0.46	< 0.001	0.32	< 2	0.27	< 0.0001	110	15	100	< 0.005	< 0.0005	1100	< 0.001	4.5	400	< 0.1	< 0.0005	31	0.022	< 0.0002		0.0012	< 0.1	< 0.01	7.87	0.0078	< 0.03	5.5	58	30	642	0.8	< 0.005	
M121	21/02/2013	570	1.48	< 0.001	0.017	< 2	0.42	< 0.0001	140	23	150	0.007		1520	< 0.001	6.4	600	< 0.1	< 0.0005	63	0.013	< 0.0002	< 0.0005		< 0.1	< 0.01	7.32	< 0.001	< 0.03	14	120	20	818	1.9	< 0.005	
M121	01/05/2013																																			

Table A.4
Summary of Groundwater Chemistry Results for Monitoring Wells on the Proposed CAZ and Selected Adjacent Monitoring Wells

Name	Date	Volatile Organic Compounds (VOC)																															
		1,1,1,2-Tetrachloroethane mg/L	1,1,1-Trichloroethane mg/L	1,1,2,2-Tetrachloroethane mg/L	1,1,2-Trichloroethane mg/L	1,1-Dichloroethane mg/L	1,1-Dichloroethylene mg/L	1,2-Dibromoethane mg/L	1,2-Dichlorobenzene (o) mg/L	1,2-Dichloroethane mg/L	1,2-Dichloropropane mg/L	1,3,5-Trimethylbenzene mg/L	1,3-Dichlorobenzene (m) mg/L	1,4-Dichlorobenzene (p) mg/L	Acetone mg/L	Benzene mg/L	Bromodichloromethane mg/L	Bromoform mg/L	Bromomethane mg/L	Carbon Tetrachloride mg/L	Chlorobenzene mg/L	Chloroethane mg/L	Chloroform mg/L	Chloromethane mg/L	Cis-1,2-Dichloroethylene mg/L	Cis-1,3-Dichloropropylene mg/L	Dibromochloromethane mg/L	Dichlorodifluoromethane mg/L	Dichloromethane mg/L		Ethylbenzene mg/L	m-p-Xylene mg/L	Methyl Ethyl Ketone mg/L
M107	21/10/2013	< 0.0002	< 0.0001	< 0.0002	< 0.0002	0.001	0.00017		< 0.0002	< 0.0002	< 0.0001		< 0.0002	< 0.0002	< 0.01	< 0.0001	< 0.0001	< 0.0002	< 0.0005	< 0.0001	< 0.0001	0.0083	< 0.0001	< 0.0005	< 0.0001	< 0.0002	< 0.0002		< 0.0005	< 0.0001	< 0.0001	< 0.005	
M107	06/05/2014	< 0.0002	< 0.0001	< 0.0002	< 0.0002	0.00099	0.00013	< 0.0002	< 0.0002	< 0.0002	< 0.0001	< 0.0002	< 0.0002	< 0.0002	< 0.01	< 0.0001	< 0.0001	< 0.0002	< 0.0005	< 0.0001	< 0.0001	0.0044	< 0.0001	< 0.0005	< 0.0001	< 0.0002	< 0.0002		< 0.0005	< 0.0001	< 0.0001	< 0.005	
M107	04/09/2014	< 0.0002	< 0.0001	< 0.0002	< 0.0002	0.00076	0.00011	< 0.0002	< 0.0002	< 0.0002	< 0.0001	< 0.0002	< 0.0002	< 0.0002		< 0.0001	< 0.0001	< 0.0002	< 0.0005	< 0.0001	< 0.0001	0.0044	< 0.0001	< 0.0005	< 0.0001	< 0.0002	< 0.0002		< 0.0005	< 0.0001	< 0.0001		
M107	22/10/2014																																
M107	21/04/2015	< 0.0002	< 0.0001	< 0.0002	< 0.0002	0.0011	0.00016	< 0.0002	< 0.0002	< 0.0002	< 0.0001	< 0.0002	< 0.0002	< 0.0002		< 0.0001	< 0.0001	< 0.0002	< 0.0005	< 0.0001	< 0.0001	0.0072	< 0.0001	< 0.0005	< 0.0001	< 0.0002	< 0.0002		< 0.0005	< 0.0001	< 0.0001		
M108	30/04/2013																																
M108	18/10/2013																																
M108	05/09/2014	< 0.0002	< 0.0001	< 0.0002	< 0.0002	0.00034	< 0.0001	< 0.0002	< 0.0002	< 0.0002	< 0.0001	< 0.0002	< 0.0002	< 0.0002		< 0.0001	< 0.0001	< 0.0002	< 0.0005	< 0.0001	< 0.0001	0.0054	< 0.0001	< 0.0005	< 0.0001	< 0.0002	< 0.0002		0.0034	< 0.0001	< 0.0001		
M108	25/11/2015	< 0.0002	< 0.0001	< 0.0002	< 0.0002	0.00037	< 0.0001		< 0.0002	< 0.0002		< 0.0002	< 0.0002	< 0.0002		< 0.0001				< 0.0001		0.0058		< 0.0005	< 0.0001	< 0.0002			< 0.0005	< 0.0001	< 0.0001		
M109-1	30/04/2013														< 0.01																		< 0.005
M109-1	17/10/2013	< 0.005	< 0.0025	< 0.005	< 0.005	< 0.0025	< 0.0025		< 0.005	< 0.005	< 0.0025		< 0.005	< 0.005	< 0.25	< 0.0025	< 0.0025	< 0.005	< 0.013	< 0.0025	< 0.0025	0.017	< 0.0025	< 0.013	< 0.0025	< 0.005	< 0.005	< 0.013	< 0.013	< 0.0025	< 0.0025	< 0.13	
M109-1	18/10/2013																																
M109-1	04/09/2014	< 0.0002	< 0.0001	< 0.0002	< 0.0002	0.0002	0.00017	< 0.0002	< 0.0002	< 0.0002	< 0.0001	< 0.0002	< 0.0002	< 0.0002		0.00031	< 0.0001	< 0.0002	< 0.0005	< 0.0001	< 0.0001	0.018	< 0.0001	< 0.0005	< 0.0001	< 0.0002	< 0.0002		< 0.0005	< 0.0001	0.00018		
M109-1	26/11/2015	< 0.0002	< 0.0001	< 0.0002	< 0.0002	< 0.0001	< 0.0001		< 0.0002	< 0.0002		< 0.0002	< 0.0002	< 0.0002		0.00011				< 0.0001		0.015		< 0.0005	< 0.0001	< 0.0002			< 0.0005	< 0.0001	< 0.0001		
M110-1	30/04/2013														< 0.01																		< 0.005
M110-1	18/10/2013	< 0.0002	< 0.0001	< 0.0002	< 0.0002	0.00016	< 0.0001		< 0.0002	< 0.0002	< 0.0001		< 0.0002	< 0.0002	< 0.01	< 0.0001	< 0.0001	< 0.0002	< 0.0005	< 0.0001	< 0.0001	0.0076	< 0.0001	< 0.0005	< 0.0001	< 0.0002	< 0.0002	< 0.0005	0.0083	< 0.0001	< 0.0001	< 0.005	
M110-1	04/09/2014	< 0.0002	< 0.0001	< 0.0002	< 0.0002	0.00031	< 0.0001	< 0.0002	< 0.0002	< 0.0002	< 0.0001	< 0.0002	< 0.0002	< 0.0002		0.0012	< 0.0001	< 0.0002	< 0.0005	< 0.0001	< 0.0001	0.012	< 0.0001	< 0.0005	< 0.0001	< 0.0002	< 0.0002		< 0.0005	< 0.0001	0.00055		
M110-1	26/11/2015	< 0.0002	< 0.0001	< 0.0002	< 0.0002	0.00071	< 0.0001		< 0.0002	< 0.0002		< 0.0002	< 0.0002	< 0.0002		0.0011				< 0.0001		0.023		< 0.0005	< 0.0001	< 0.0002			< 0.0005	< 0.0001	0.00049		
M114-1	30/04/2013																																
M114-1	18/10/2013																																
M114-1	04/09/2014	< 0.0002	< 0.0001	< 0.0002	< 0.0002	0.00025	0.00032	< 0.0002	< 0.0002	< 0.0002	< 0.0001	< 0.0002	< 0.0002	< 0.0002		< 0.0001	< 0.0001	< 0.0002	< 0.0005	< 0.0001	< 0.0001	0.012	< 0.0001	< 0.0005	< 0.0001	< 0.0002	< 0.0002		< 0.0005	< 0.0001	< 0.0001		
M114-1	24/11/2015	< 0.0002	< 0.0001	< 0.0002	< 0.0002	0.00067	0.00034		< 0.0002	< 0.0002		< 0.0002	< 0.0002	< 0.0002		< 0.0001				< 0.0001		0.016		< 0.0005	< 0.0001	< 0.0002			< 0.0005	< 0.0001	< 0.0001		
M115-1	30/04/2013																																
M115-1	22/10/2013																																
M116	01/05/2013																																
M116	17/10/2013																																
M116	04/09/2014	< 0																															

Table A.4
Summary of Groundwater Chemistry Results for Monitoring Wells on the Proposed CAZ and Selected Adjacent Monitoring Wells

Name	Date	Volatile Organic Compounds (VOC)												1,4-Dioxane	
		Methyl Isobutyl Ketone mg/L	Methyl Tert Butyl Ether mg/L	o-Xylene mg/L	Styrene mg/L	Tetrachloroethylene mg/L	Toluene mg/L	Total Xylenes mg/L	Trans-1,2-dichloroethylene mg/L	Trans-1,3-dichloropropylene mg/L	Trichloroethylene mg/L	Trichlorofluoromethane mg/L	Vinyl Chloride mg/L	1,4-Dioxane mg/L	3H TU
M107	21/10/2013		< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0001	< 0.0002	< 0.0001	< 0.0002	0.00025	0.014	26.8
M107	06/05/2014		< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0001	< 0.0002	< 0.0001	< 0.0002	0.00028		
M107	04/09/2014			< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0002	0.00819	
M107	22/10/2014														
M107	21/04/2015			< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0001	< 0.0002	< 0.0001	< 0.0002	0.00041		
M108	30/04/2013													0.0198	39.7
M108	18/10/2013													0.0165	29.4
M108	05/09/2014			< 0.0001	< 0.0002	< 0.0001	0.00062	< 0.0001	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0002	0.0128	
M108	25/11/2015			< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0001			< 0.0001		< 0.0002	0.014	
M109-1	30/04/2013		< 0.0002											0.0353	47.5
M109-1	17/10/2013		< 0.005	< 0.0025	< 0.005	< 0.0025	< 0.005	< 0.0025	< 0.0025	< 0.005	< 0.0025	< 0.005	< 0.005	0.0474	
M109-1	18/10/2013														43.2
M109-1	04/09/2014			< 0.0001	< 0.0002	< 0.0001	< 0.0002	0.00018	< 0.0001	< 0.0002	< 0.0001	< 0.0002	0.00033	0.0399	
M109-1	26/11/2015			< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0001			< 0.0001		0.00028	0.043	
M110-1	30/04/2013		< 0.0002											0.0356	47.8
M110-1	18/10/2013		< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0002	0.0534	46.6
M110-1	04/09/2014			0.00011	< 0.0002	< 0.0001	0.00022	0.00066	< 0.0001	< 0.0002	< 0.0001	< 0.0002	0.00021	0.0455	
M110-1	26/11/2015			< 0.0001	< 0.0002	< 0.0001	< 0.0002	0.00049			< 0.0001		0.00033	0.044	
M114-1	30/04/2013													0.0147	27
M114-1	18/10/2013													0.0119	29.2
M114-1	04/09/2014			< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0001	< 0.0002	< 0.0001	< 0.0002	0.00026	0.00719	
M114-1	24/11/2015			< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0001		< 0.0001		0.00031	0.013	
M115-1	30/04/2013													0.0133	29
M115-1	22/10/2013													0.0197	33
M116	01/05/2013													0.0121	25.8
M116	17/10/2013													0.0112	30.8
M116	04/09/2014			0.00012	< 0.0002	< 0.0001	< 0.0002	0.001	< 0.0001	< 0.0002	< 0.0001	< 0.0002	0.00022	0.00469	
M117	01/05/2013													0.00987	30.7
M117	17/10/2013													0.0083	20.6
M117	04/09/2014			< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0002	0.00634	
M121	21/02/2013	< 0.005	< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0002	0.0011	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0002		
M121	01/05/2013													0.0136	28.2
M121	17/10/2013		< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0002	0.0015	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0002	0.0135	28.2
M121	04/09/2014			< 0.0001	< 0.0002	< 0.0001	< 0.0002	0.00013	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0002	0.0112	
M121	24/11/2015			0.00065	< 0.001	< 0.0005	< 0.001	0.014	< 0.0005		< 0.0005		< 0.001	0.0098	
M122	21/02/2013	< 0.005	< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0002		
M122	01/05/2013													0.0131	28.7
M122	17/10/2013		< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0002	0.0116	26.2
M122	05/09/2014			< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0002	0.00983	
M123	21/02/2013	< 0.005	< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0002	0.00011	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0002		
M123	01/05/2013													0.00653	20.1
M123	17/10/2013		< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0002	0.00726	21.9
M123	05/09/2014			< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0002	0.0049	
M123	25/11/2015			< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0001		< 0.0001		< 0.0002	0.0074	
M125	21/02/2013	< 0.005	< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0001	< 0.0002	< 0.0001	< 0.0002	0.00033		
M125	01/05/2013													0.0159	32
M125	17/10/2013		< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0001	< 0.0002	< 0.0001	< 0.0002	0.00023	0.0131	24.8
M125	04/09/2014			< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0001	< 0.0002	< 0.0001	< 0.0002	0.0003	0.00616	
M166	13/08/2013		< 0.0005	< 0.00025	< 0.0005	< 0.00025	< 0.0005	< 0.00025	< 0.00025	< 0.0005	< 0.00025	< 0.0005	< 0.0005	0.019	35
M166	18/10/2013		< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0002	0.019	32.9
M166	05/09/2014			< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0002	0.0106	
M167	13/08/2013		< 0.0005	< 0.00025	< 0.0005	< 0.00025	< 0.0005	< 0.00025	< 0.00025	< 0.0005	< 0.00025	< 0.0005	< 0.0005	0.00722	26.5
M167	18/10/2013		< 0.0002	< 0.0001	< 0.0002	< 0.0001	0.00022	0.00025	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0002	0.00768	22
M167	08/08/2014													0.00886	
M167	05/09/2014			0.00011	< 0.0002	< 0.0001	0.00097	0.00024	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0002	0.00895	
M167	26/11/2015			< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0001			< 0.0001		< 0.0002	0.0051	
M168	13/08/2013		< 0.0005	< 0.00025	< 0.0005	< 0.00025	< 0.0005	< 0.00025	< 0.00025	< 0.0005	< 0.00025	< 0.0005	< 0.0005	0.0126	28.4
M168	21/10/2013		< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0002	0.0137	28.6
M168	05/09/2014			< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0002	0.00529	
M168	26/11/2015			< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0001			< 0.0001		< 0.0002	0.0075	

Table A.4
Summary of Groundwater Chemistry Results for Monitoring Wells on the Proposed CAZ and Selected Adjacent Monitoring Wells

Name	Date	General and Inorganic Parameters																																	
		Alkalinity mg/L	Ammonia mg/L	Arsenic mg/L	Barium mg/L	Biochemical Oxygen Demand mg/L	Boron mg/L	Cadmium mg/L	Calcium mg/L	Chemical Oxygen Demand mg/L	Chloride mg/L	Chromium (Total) mg/L	Cobalt mg/L	Conductivity µS/cm	Copper mg/L	Dissolved Organic Carbon mg/L	Hardness mg/L	Iron mg/L	Lead mg/L	Magnesium mg/L	Manganese mg/L	Mercury mg/L	Naphthalene mg/L	Nickel mg/L	Nitrate mg/L	Nitrite mg/L	pH (Lab) unitless	Phenols mg/L	Phosphorus (total) mg/L	Potassium mg/L	Sodium mg/L	Sulphate mg/L	Total Dissolved Solids mg/L	Total Kjeldahl Nitrogen mg/L	Zinc mg/L
M170	13/08/2013	430	1.91	< 0.001	0.15	5	1.9	0.00011	52	26	850	< 0.005	< 0.0005	3520	< 0.001	2.8	290	1.1	0.0052	38	0.037	< 0.0002	< 0.0013	0.0049	< 0.1	< 0.01	8	0.037	0.06	15	630	29	1880	2.4	0.085
M170	21/10/2013	500	1.88	< 0.002	0.071	7	2	< 0.0001	60	20	940	< 0.005	< 0.0005	4030	< 0.001	3.4	340	< 0.1	< 0.0005	46	0.025	< 0.0002	< 0.0005	0.0041	< 0.1	< 0.01	8.04	0.032	< 0.3	16	720	23	2040	2.3	< 0.005
M170	05/09/2014	460	2.66	< 0.001	0.12	11	2.3	< 0.0001	110	38	1700	< 0.005	< 0.0005	5840	< 0.005	2.6	620	< 0.1	< 0.0005	87	0.0059	< 0.0002		0.003	< 0.1	< 0.01	8.03	0.067	< 0.15	24	1000	22	3490	2.9	< 0.005
M170	26/11/2015	620	1.52				2.3		38		620			3220		5		< 0.1		32	< 0.002				< 0.1	< 0.01				15	640	12	1750		
M172	13/08/2013	520	0.68	0.0024	0.25	< 2	0.33	< 0.0001	160	20	130	< 0.005	< 0.0005	1380	< 0.001	6.7	540	19	0.0005	37	0.89	< 0.0002	< 0.0013	0.0051	< 0.1	< 0.01	7.55	< 0.001	< 0.03	5.1	98	14	776	1.4	0.0069
M172	24/11/2015	580	0.87				0.26		190		190			1730		8.9		27		46	0.91				< 0.1	< 0.01				6	110	4.1	1020		
M173	05/09/2014	250	0.18	< 0.001	0.13	< 2	0.055	< 0.0001	100	< 4	16	< 0.005	< 0.0005	512	< 0.001	2.1	290	< 0.1	< 0.0005	7.2	0.01	< 0.0002		0.0014	< 0.1	0.016	8.03	0.0011	< 0.15	1.6	8.3	23	434	< 0.7	< 0.005
M176	04/09/2014	250	1	< 0.001	0.12	< 2	0.34	< 0.0001	93	13	400	< 0.005	< 0.0005	1870	< 0.001	2.4	350	< 0.1	< 0.0005	29	0.019	< 0.0002		< 0.001	< 0.1	< 0.01	8.02	0.003	0.06	6.3	210	38	1140	1.2	< 0.005
M177	04/09/2014	250	0.6	< 0.001	0.13	< 2	0.32	< 0.0001	58	5.8	4	< 0.005	< 0.0005	528	< 0.001	1.3	200	< 0.1	< 0.0005	13	0.027	< 0.0002		< 0.001	< 0.1	< 0.01	8.07	0.011	< 0.03	4.7	27	28	320	1.1	< 0.005
M177	25/11/2015	240	0.58				0.4		71		7.6			528		1.6		< 0.1		17	0.008				< 0.1	< 0.01				6.5	13	23	304		
M178-1	14/05/2015	1200	4.86				0.048		160		55			5660		3.7		< 0.1		0.35	< 0.002				0.78	< 0.01				100	160	28	1870		
M178-1	28/05/2015	630	2.84				0.043		96		44			3020		4.8		< 0.1		0.17	< 0.002				1.36	< 0.01	12			87	130	18	716		
M178-1	21/08/2015	1900																																	
M178-2	09/09/2014	360	0.3	< 0.001	0.12	< 2	0.15	< 0.0001	110	5.9	46	< 0.005	< 0.0005	851	< 0.001	3.8	350	0.42	< 0.0005	22	0.038	< 0.0002	< 0.0005	0.0013	< 0.1	< 0.01	7.72	< 0.001	< 0.03	4.5	42	19	464	< 0.7	< 0.005
M178-2	14/05/2015	500	0.42				0.23		160		130			1310		5.5		< 0.1		41	0.029				< 0.1	< 0.01				6.9	79	17	820		
M178-2	28/05/2015	500	0.39				0.26		160		130			1250		5.1		0.13		37	0.03				< 0.1	< 0.01	7.25			6.3	69	17	734		
M178-2	19/08/2015	500																							< 0.1	< 0.01	7.25			6.3	69	17	734		
M178-3	05/09/2014	350	0.26	0.0022	0.15	< 2	0.14	< 0.0001	110	9.9	46	< 0.005	< 0.0005	790	< 0.001	3.4	370	0.59	< 0.0005	22	0.069	< 0.0002		0.0016	< 0.1	< 0.01	7.96	0.0015	0.03	4.5	39	19	468	< 0.7	< 0.005
M178-3	14/05/2015	490	0.41				0.24		170		120			1310		5.5		< 0.1		42	0.032				< 0.1	< 0.01				6.9	80	17	836		
M178-3	28/05/2015	490	0.39				0.26		170		120			1280		6.3		0.11		37	0.03				< 0.1	< 0.01	7.06			6.3	69	18	744		
M178-3	19/08/2015	490																																	
M178R-1	18/11/2015	420	5.79				4		220		4700			14800		7.6		< 0.5		140	0.22				< 0.1	< 0.01				44	2800	350	8340		
M178R-1	25/11/2015	340	5.47				4.2		240		4400			15100		4.5		< 0.5		140	0.18				< 0.1	< 0.01				43	2700	380	8670		
M178R-1	30/11/2015	460	5.58				4.2		230		4400			15400		2.2		< 0.1		130	0.1				< 0.5	< 0.05				42	2700	380	8460		
M178R-2	17/11/2015	450	0.3				0.24		140		87			1110		5.1		1.1		32	0.061				< 0.1	< 0.01				5.8	63	21	618		
M178R-2	25/11/2015	440	0.27				0.23		140		79			1090		5.3		1.1		29	0.055				< 0.1	< 0.01				5.7	60	21	594		
M178R-2	30/11/2015	430	0.27				0.23		130		75			1070		4.6		1		28	0.053				< 0.1	< 0.01				5.6	55	21	614		
M178R-3	17/11/2015	440	0.33				0.23		140		85			1100		4.8		0.96		31	0.063				< 0.1	< 0.01				5.9	62	22	606		
M178R-3	25/11/2015	450	0.31				0.23		140		86			1110		4.7		0.97		31	0.059				< 0.1	< 0.01				6.1	63	21	626		
M178R-3	30/11/2015	440	0.31				0.23		140		87			1120		4.8																			

Table A.4
Summary of Groundwater Chemistry Results for Monitoring Wells on the Proposed CAZ and Selected Adjacent Monitoring Wells

Name	Date	Volatile Organic Compounds (VOC)												1,4-Dioxane	
		Methyl Isobutyl Ketone mg/L	Methyl Tert Butyl Ether mg/L	o-Xylene mg/L	Styrene mg/L	Tetrachloroethylene mg/L	Toluene mg/L	Total Xylenes mg/L	Trans-1,2-dichloroethylene mg/L	Trans-1,3-dichloropropylene mg/L	Trichloroethylene mg/L	Trichlorofluoromethane mg/L	Vinyl Chloride mg/L	1,4-Dioxane mg/L	3H TU
M170	13/08/2013		< 0.0005	< 0.00025	< 0.0005	< 0.00025	0.0018	< 0.00025	< 0.00025	< 0.0005	< 0.00025	< 0.0005	< 0.0005	< 0.001	14
M170	21/10/2013		< 0.0002	0.00013	< 0.0002	< 0.0001	0.0012	0.00054	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0002	0.00137	17.4
M170	05/09/2014			< 0.0001	< 0.0002	< 0.0001	0.00059	< 0.0001	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0002	0.00197	
M170	26/11/2015			< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0001		< 0.0001		< 0.0002	0.0063	
M172	13/08/2013		< 0.0005	< 0.00025	< 0.0005	< 0.00025	< 0.0005	< 0.00025	< 0.00025	< 0.0005	< 0.00025	< 0.0005	< 0.0005	0.0146	30
M172	24/11/2015			< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0001		< 0.0001		0.00054	0.021	
M173	05/09/2014			< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0002	< 0.001	
M176	04/09/2014			0.00071	< 0.0005	< 0.00025	0.0051	0.0045	< 0.00025	< 0.0005	< 0.00025	< 0.0005	< 0.0005	< 0.001	
M177	04/09/2014			< 0.0001	< 0.0002	< 0.0001	0.0005	< 0.0001	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0002	< 0.001	
M177	25/11/2015			< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0001			< 0.0001		< 0.0002	< 0.001	
M178-1	14/05/2015			0.00017	< 0.0002	< 0.0001	0.0023	0.0007			< 0.0001		< 0.0002	0.00268	
M178-1	28/05/2015			0.00021	< 0.0002	< 0.0001	0.0037	0.00083			< 0.0001		< 0.0002	0.00153	
M178-1	21/08/2015													0.0045	
M178-2	09/09/2014			< 0.0001	< 0.0002	< 0.0001	0.00057	< 0.0001	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0002	0.00339	
M178-2	14/05/2015			< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0001			< 0.0001		< 0.0002	0.00815	
M178-2	28/05/2015			< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0001			< 0.0001		< 0.0002	0.00866	
M178-2	19/08/2015													0.0083	
M178-3	05/09/2014			< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0002	0.00342	
M178-3	14/05/2015			< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0001			< 0.0001		< 0.0002	0.00823	
M178-3	28/05/2015			< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0001			< 0.0001		< 0.0002	0.00757	
M178-3	19/08/2015													0.0084	
M178R-1	18/11/2015			< 0.001	< 0.002	< 0.001	0.0049		< 0.001		< 0.001		< 0.002	< 0.001	
M178R-1	25/11/2015			< 0.0005	< 0.001	< 0.0005	0.0024	0.00053			< 0.0005		< 0.001	< 0.001	
M178R-1	30/11/2015			0.00017	< 0.0002	< 0.0001	0.0015		< 0.0001		< 0.0001		< 0.0002	< 0.009	
M178R-2	17/11/2015			< 0.0001	< 0.0002	< 0.0001	0.00027		< 0.0001		< 0.0001		< 0.0002	0.007	
M178R-2	25/11/2015			< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0001			< 0.0001		< 0.0002	0.0064	
M178R-2	30/11/2015			< 0.0001	< 0.0002	< 0.0001	< 0.0002		< 0.0001		< 0.0001		< 0.0002	0.0062	
M178R-3	17/11/2015			< 0.0001	< 0.0002	< 0.0001	0.00029		< 0.0001		< 0.0001		< 0.0002	0.0067	
M178R-3	25/11/2015			< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0001			< 0.0001		< 0.0002	0.0073	
M178R-3	30/11/2015			< 0.0001	< 0.0002	< 0.0001	< 0.0002		< 0.0001		< 0.0001		< 0.0002	0.0062	
M178R-4	13/11/2015			< 0.0001	< 0.0002	< 0.0001	< 0.0002		< 0.0001		< 0.0001		< 0.0002	0.007	
M178R-4	25/11/2015			< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0001			< 0.0001		< 0.0002	0.007	
M178R-4	30/11/2015			< 0.0001	< 0.0002	< 0.0001	< 0.0002		< 0.0001		< 0.0001		< 0.0002	0.007	
M179	04/09/2014			< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0002	< 0.001	
M179	25/11/2015			< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0001			< 0.0001		< 0.0002	< 0.001	
M180	04/09/2014			< 0.0001	< 0.0002	< 0.0001	< 0.0002	0.00022	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0002	< 0.001	
M181-1	04/09/2014			< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0002	< 0.001	
M181-2	04/09/2014			< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0002	< 0.001	
M182	04/09/2014			< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0002	< 0.001	
M183	04/09/2014			< 0.00025	< 0.0005	< 0.00025	< 0.0005	< 0.00025	< 0.00025	< 0.0005	< 0.00025	< 0.0005	< 0.0005	< 0.001	
M185-1	26/11/2015			< 0.0005	< 0.001	< 0.0005	0.048	< 0.0005	< 0.0005		< 0.0005		< 0.001	< 0.001	
M185-2	04/09/2014			< 0.0001	< 0.0002	< 0.0001	0.00034	0.00016	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0002	< 0.001	
M185-2	25/11/2015			< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0001			< 0.0001		< 0.0002	< 0.001	
M186	05/09/2014			< 0.0001	< 0.0002	< 0.0001	0.01	0.00033	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0002	< 0.001	
M186	26/11/2015			0.00051	< 0.0002	< 0.0001	0.0017	0.0023			< 0.0001		< 0.0002	< 0.001	
M187	11/11/2015			< 0.0001	< 0.0002	< 0.0001	< 0.0002		< 0.0001		< 0.0001		< 0.0002	< 0.001	
M187	25/11/2015			< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0001			< 0.0001		< 0.0002	< 0.001	
M187	30/11/2015			< 0.0001	< 0.0002	< 0.0001	< 0.0002		< 0.0001		< 0.0001		< 0.0002	< 0.001	
M188	13/11/2015			< 0.0001	< 0.0002	< 0.0001	0.00059		< 0.0001		< 0.0001		< 0.0002	< 0.001	
M188	25/11/2015			< 0.0002	< 0.0004	< 0.0002	0.00056	< 0.0002			< 0.0002		< 0.0004	< 0.001	
M188	30/11/2015			< 0.0001	< 0.0002	< 0.0001	0.00034		< 0.0001		< 0.0001		< 0.0002	< 0.001	
M189	11/11/2015			< 0.0001	< 0.0002	< 0.0001	0.00032		< 0.0001		< 0.0001		< 0.0002	< 0.001	
M189	01/12/2015			< 0.0001	< 0.0002	< 0.0001	0.00021		< 0.0001		< 0.0001		< 0.0002	< 0.001	
M190	11/11/2015			< 0.0001	< 0.0002	< 0.0001	< 0.0002		< 0.0001		< 0.0001		< 0.0002	< 0.001	
M190	25/11/2015			< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0001			< 0.0001		< 0.0002	< 0.001	
M190	30/11/2015			< 0.0001	< 0.0002	< 0.0001	< 0.0002		< 0.0001		< 0.0001		< 0.0002	< 0.001	
M191	17/11/2015			< 0.01	< 0.02	< 0.01	0.052		< 0.01		< 0.01		< 0.02	< 0.001	
M191	01/12/2015			< 0.01	< 0.02	< 0.01	0.022		< 0.01		< 0.01		< 0.02	< 0.001	

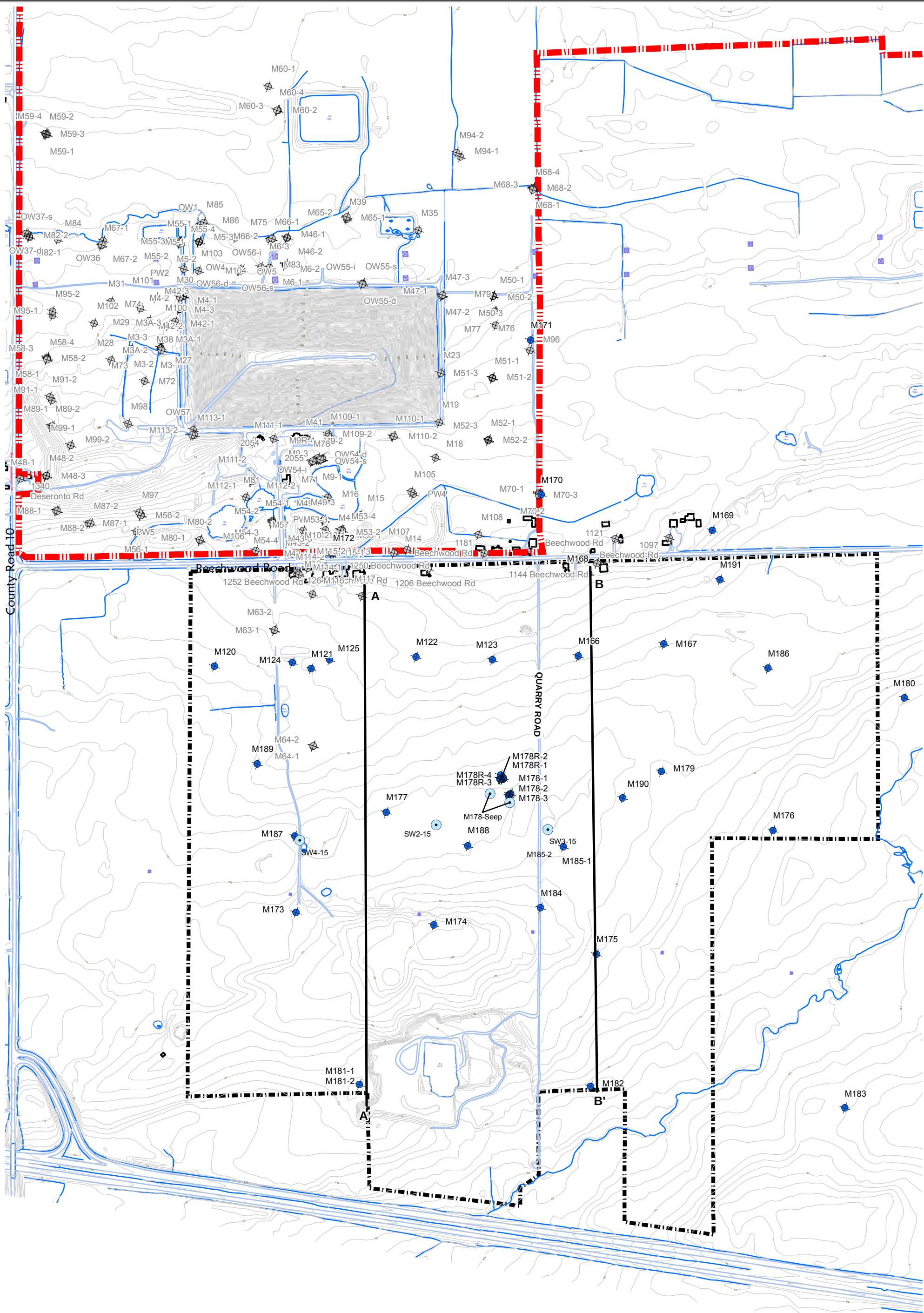
Table A.5

Summary of Groundwater Seep and Surface Water Chemistry Results in the Vicinity of M178

Parameter	Units	Position Relative to Groundwater Seep Near M178/M178R							
		M178-Seep 2015-11-13	M178-Seep 2015-12-03	Upstream		Downstream			
				SW3-15 2015-11-13	SW3-15 2015-12-03	SW2-15 2015-11-13	SW2-15 2015-12-03	SW4-15 2015-11-13	SW4-15 2015-12-03
1,4-Dioxane	mg/L	0.0015	0.004	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Alkalinity	mg/L	290	360	140	170	260	270	250	240
Ammonia	mg/L	< 0.15	< 0.15	< 0.15	< 0.15	< 0.15	< 0.15	< 0.15	< 0.15
Boron	mg/L	0.082	0.13	0.016	0.01	0.037	0.031	0.033	0.029
Calcium	mg/L	99	130	51	68	92	110	96	97
Chloride	mg/L	48	68	10	12	30	33	30	33
Conductivity	µS/cm	773	922	315	370	616	649	603	606
Dissolved Organic Carbon	mg/L	4.4	4.3	8.6	9.7	6.2	4.6	7.1	5.1
Iron	mg/L	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Magnesium	mg/L	18	26	3.3	5	9.4	13	11	12
Manganese	mg/L	< 0.002	0.0025	0.06	0.026	0.0029	< 0.002	0.016	0.0044
Nitrate	mg/L	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Nitrite	mg/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Nitrite + Nitrate	mg/L	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Potassium	mg/L	4.7	5.7	6.5	7.7	4.4	3.3	4.5	3
Sodium	mg/L	31	48	3.5	5	14	21	17	21
Sulphate	mg/L	39	23	7.3	7.3	25	22	20	20
Total Dissolved Solids	mg/L	440	540	200	254	346	392	328	354

FIGURES



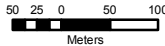


WASTE MANAGEMENT
RICHMOND LANDFILL

Figure A1:
Site Plan and Monitoring Well Locations

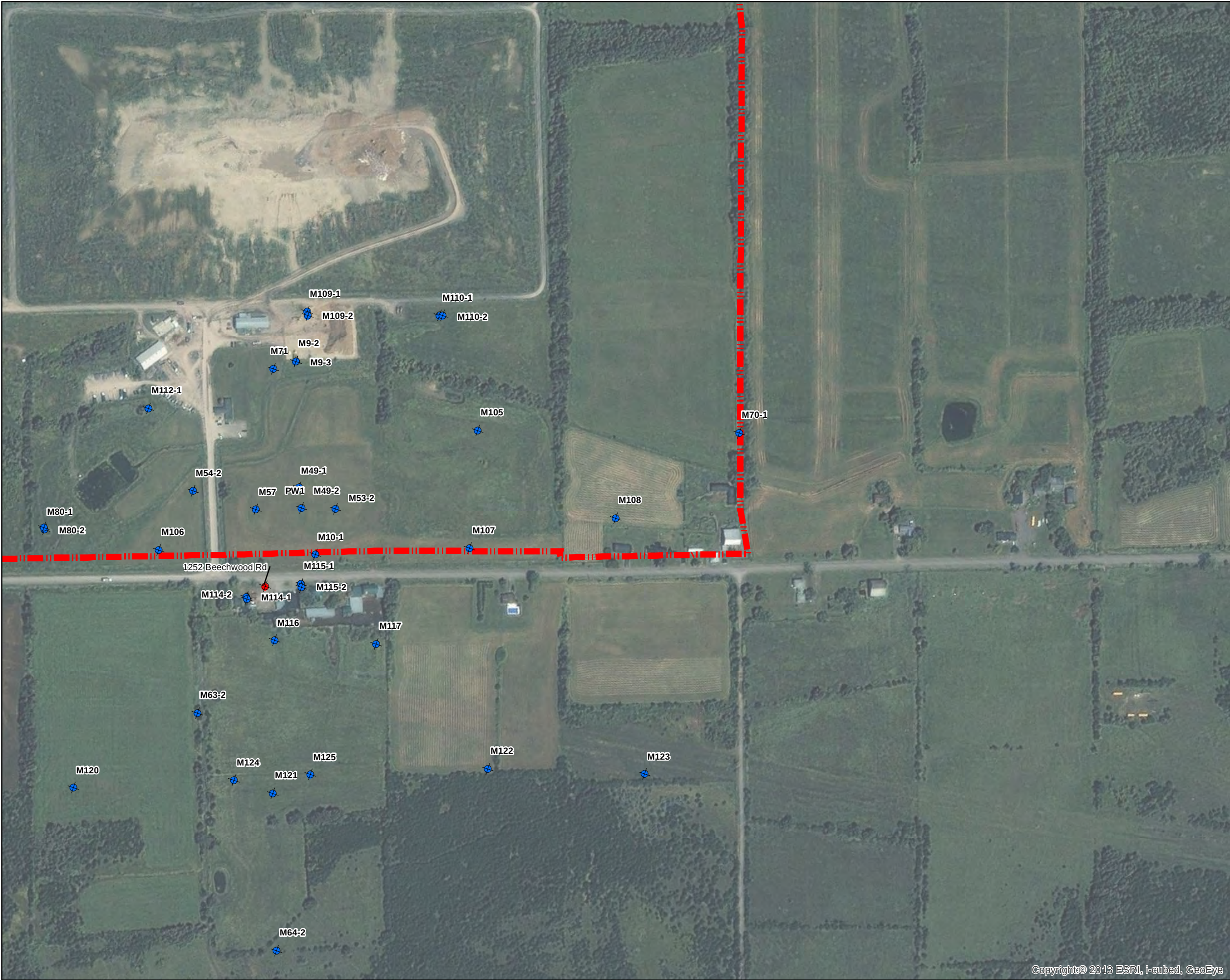
- Previously Existing Monitoring Wells
- Boreholes Drilled May 2012 – August 2015
- Seep/Surface Water Sampling Locations
- Property Boundary
- Proposed CAZ Boundary

Project : K-B9504-00-16
Data Source: WM Canada, WESA,
HPA Ltd. Base Mapping 2009
Date: January 2016



Units:
UTM NAD 83 Zone 18
Scale: 1:7800



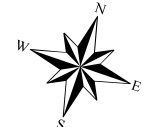


LEGEND

-  Pumping Well
-  Observation Well
-  Property Boundary

1				
REV.	DESCRIPTION	YY/MM/DD	BY	CHK

REFERENCES
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CLIENT
WASTE MANAGEMENT OF CANADA

PROJECT
CAZ Investigation

TITLE
1252 Beechwood Pumping Test Monitoring Well Network



The Tower - The Woolen Mill,
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Ottawa, Ontario K0A 1L0
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PROJECT # K-B9504-00-16		DATE January 2016	
DRAWN KC	CHECKED MM/PT	FIG NO. A2	REV 0

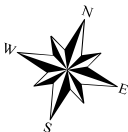
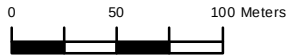


LEGEND

-  Pumping Well
-  Observation Well
-  Property Boundary

1				
REV.	DESCRIPTION	YY/MM/DD	BY	CHK

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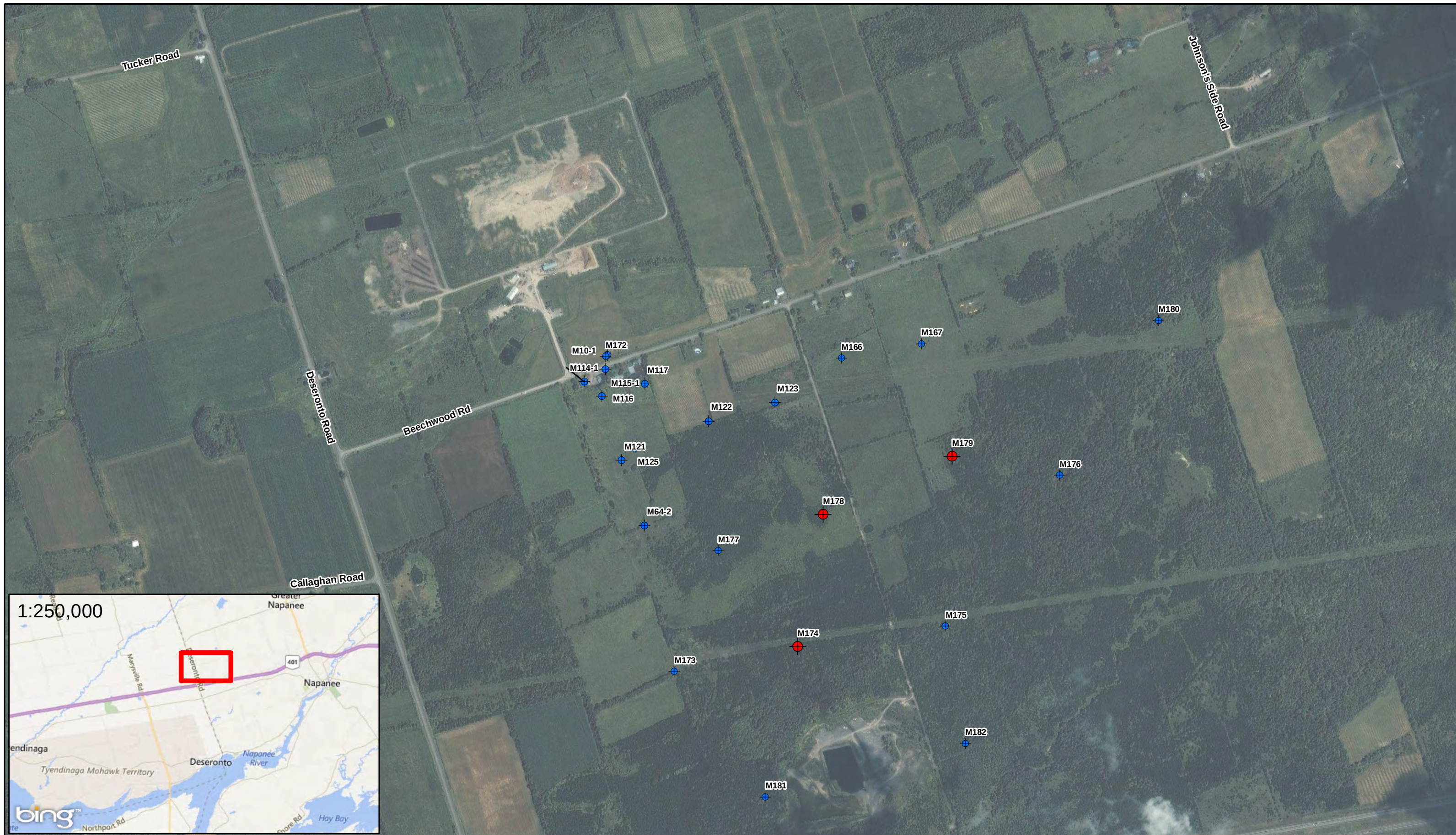
PROJECT
CAZ Investigation

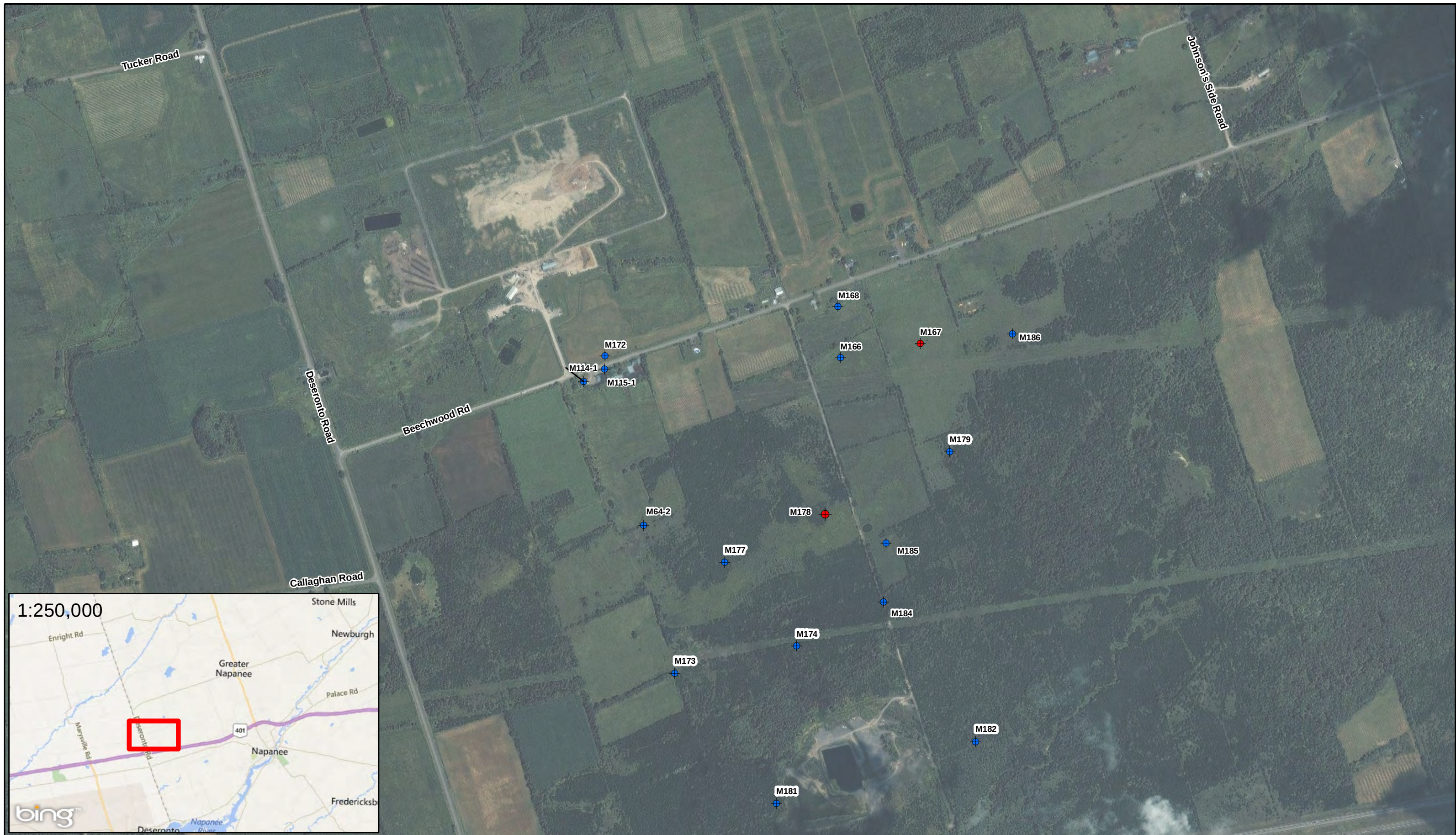
TITLE
M170 & M168 Pumping Tests
Monitoring Well Network

 The Tower - The Woolen Mill,
4 Cataraqui St.,
Ottawa, Ontario K0A 1L0
TEL: (613) 531-2725
FAX: (613) 531-1852
Email: info@blumetric.ca
Web: <http://www.blumetric.ca>

PROJECT # K-B9504-00-16	DATE January 2016
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DRAWN KC	CHECKED MM/PT	FIG NO. A3	REV 0
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WASTE MANAGEMENT
RICHMOND LANDFILL

- LEGEND
- Pumping Well
 - Monitoring Wells

Project : K-B9504-00-16

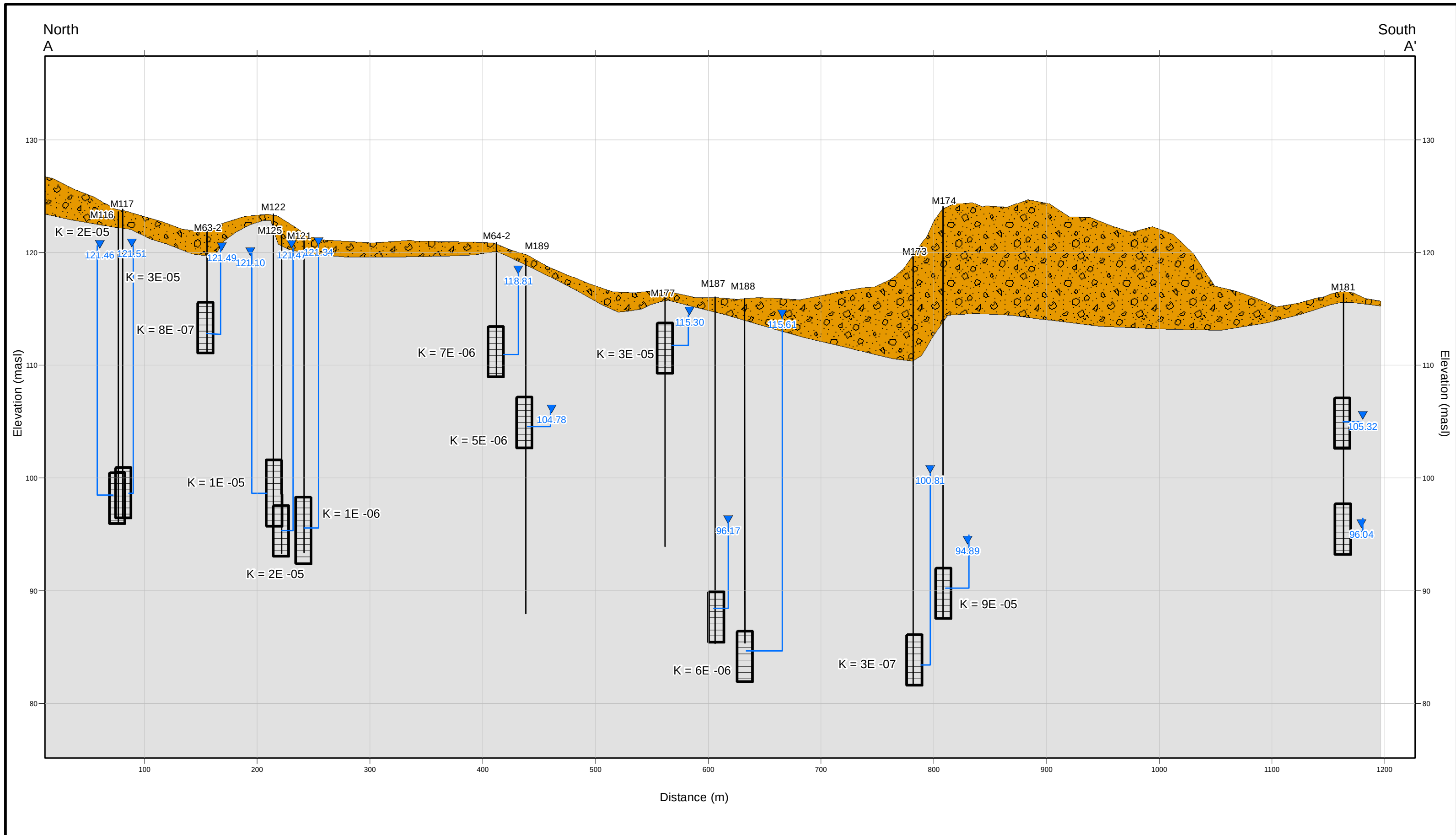
0 65 130 260 Meters

1:7,500

Date: January 2016



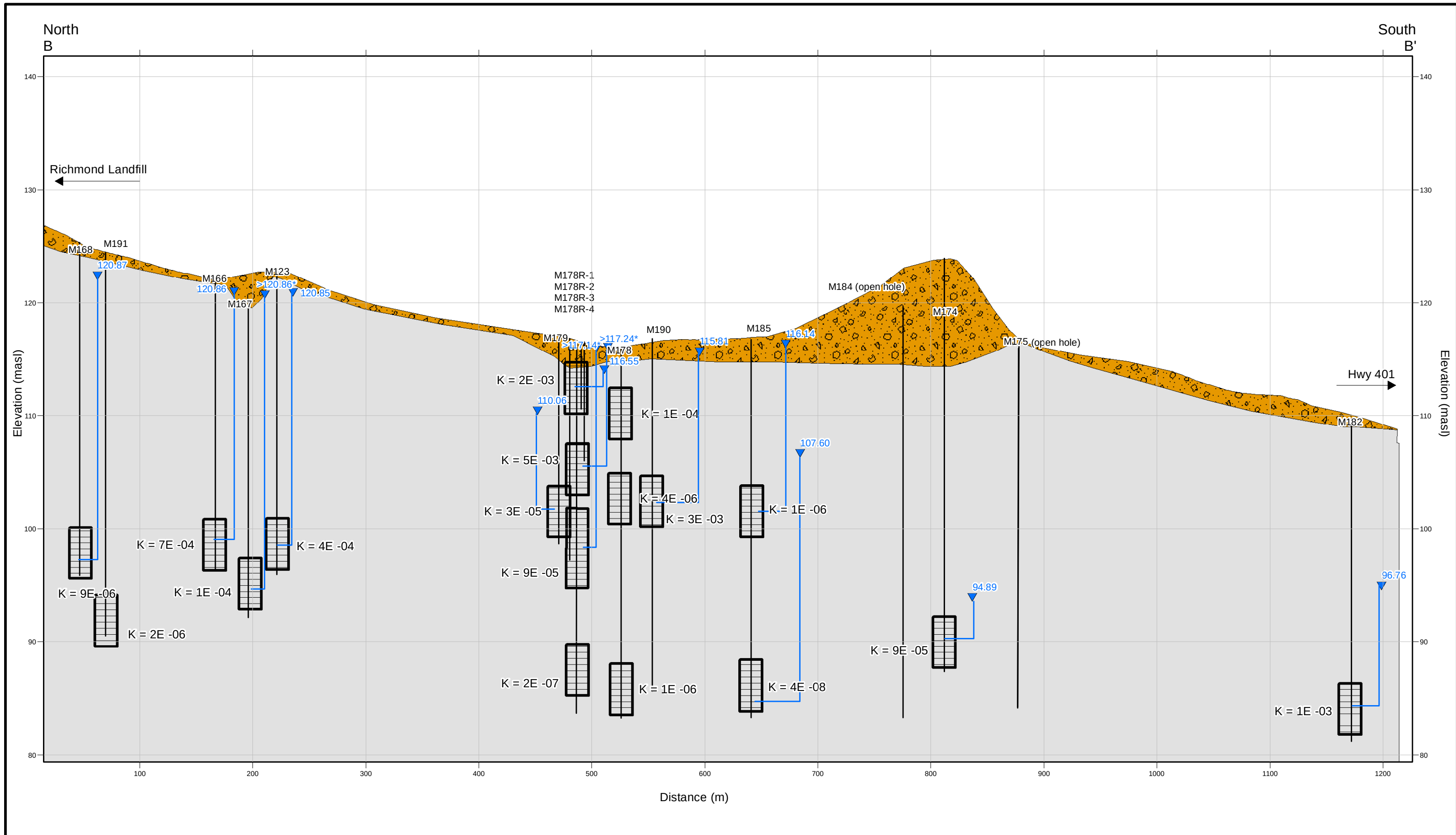
Figure A6: Pumping Test Monitoring Well Network - M108, M187 & M178R-3



WASTE MANAGEMENT
RICHMOND LANDFILL

Figure A7(a): Cross-Section A-A' South of Richmond Landfill (10x Vertical Exaggeration)

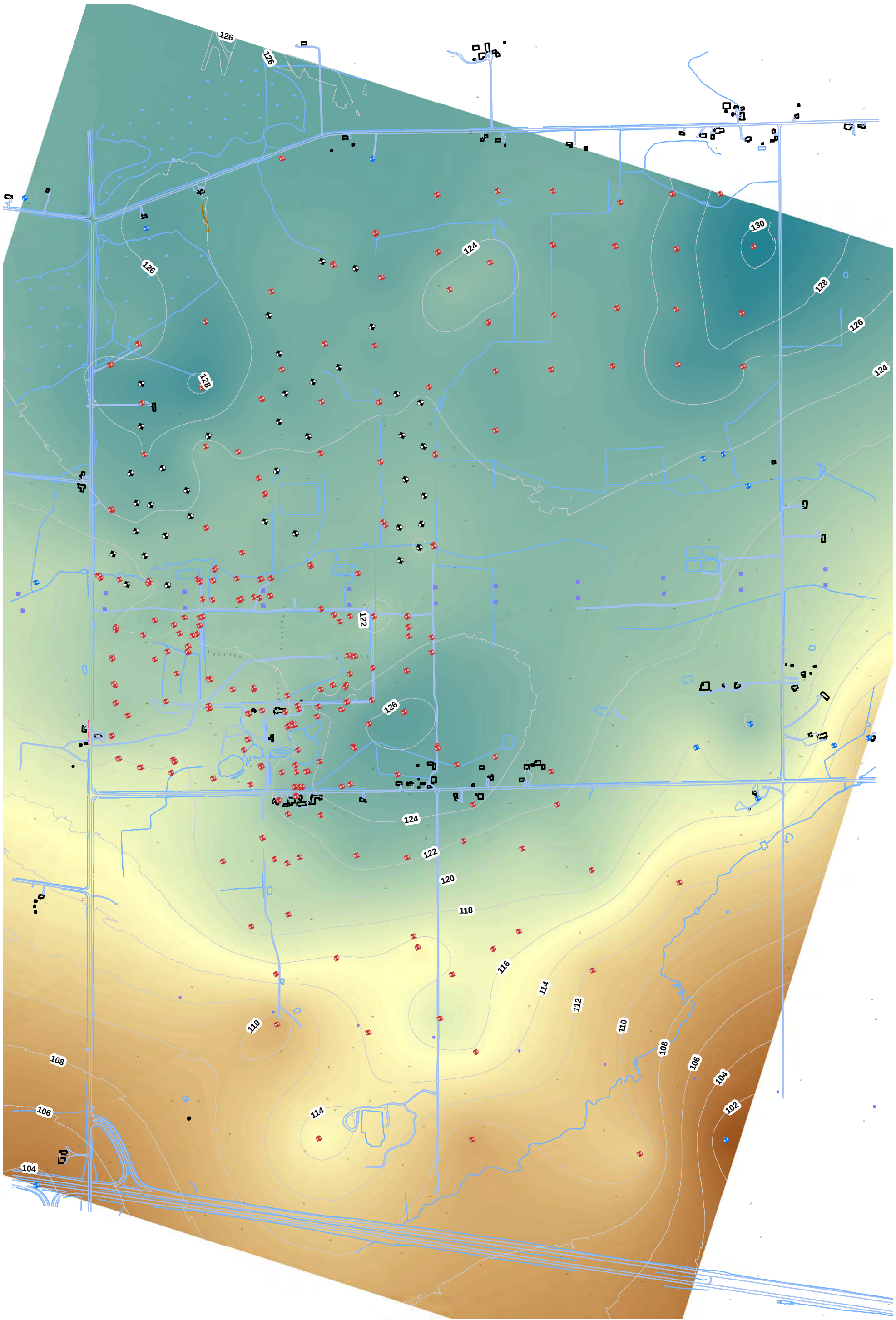
Date: December 15, 2015



WASTE MANAGEMENT
RICHMOND LANDFILL

Figure A7(b): Cross-Section B-B' South of Richmond Landfill (10x Vertical Exaggeration)

Date: December 15, 2015



WASTE MANAGEMENT
RICHMOND LANDFILL

Figure A8:
Bedrock Surface

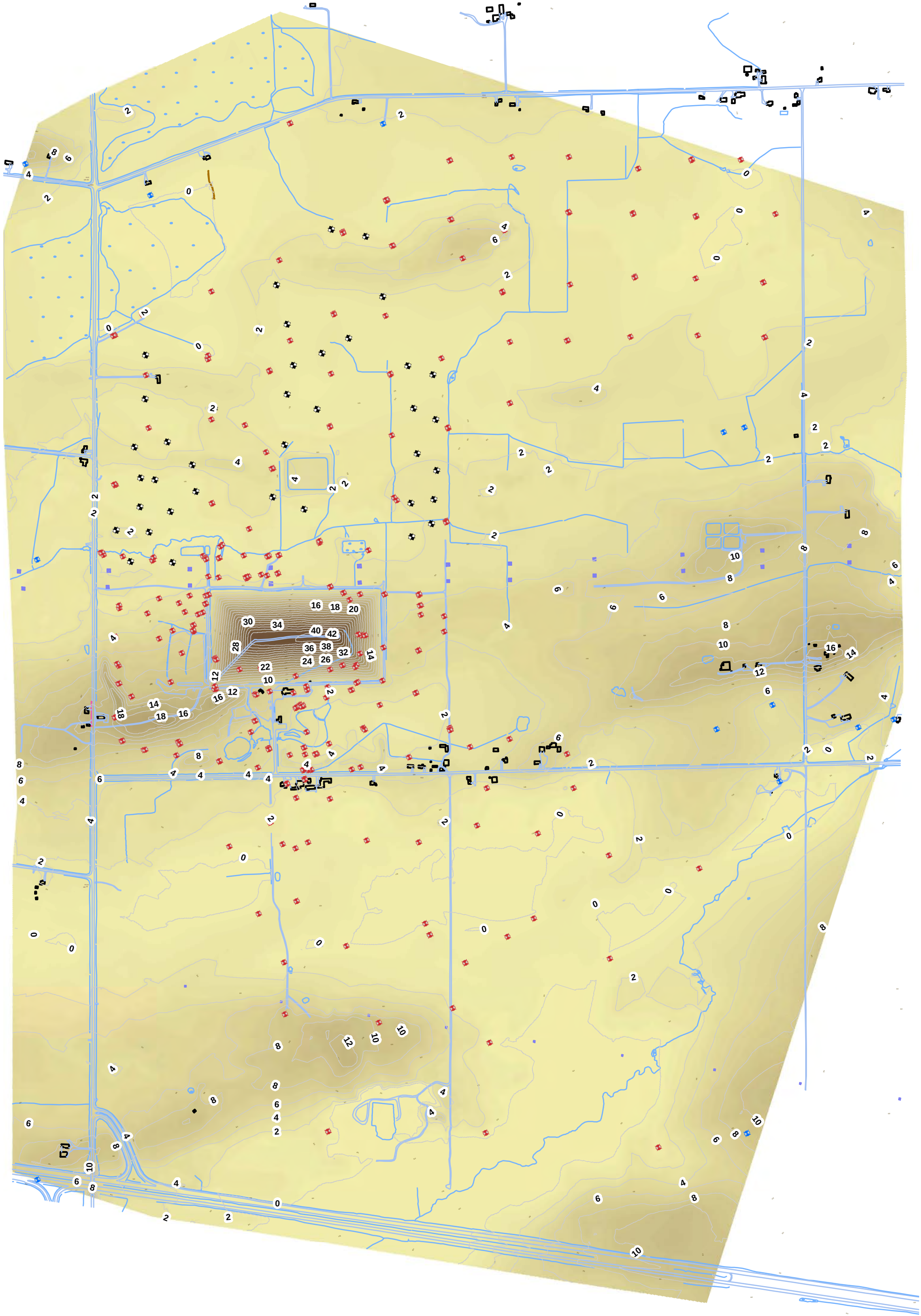
- MOE Well
- Monitoring Well
- Test Pit
- Bedrock Elevation Contour Lines (masl)
- Ditches, Shoreline, Streams

Bedrock Elevation (masl)
High : 130.5
Low : 100.16

Project : K-B13060-00-16
Data Source: WM Canada, WESA,
HPA Ltd. Base Mapping 2009
Date: January 2016

Units:
UTM NAD 83 Zone 18
Scale: 1:11500





WASTE MANAGEMENT
RICHMOND LANDFILL

Figure A9:
Overburden Thickness

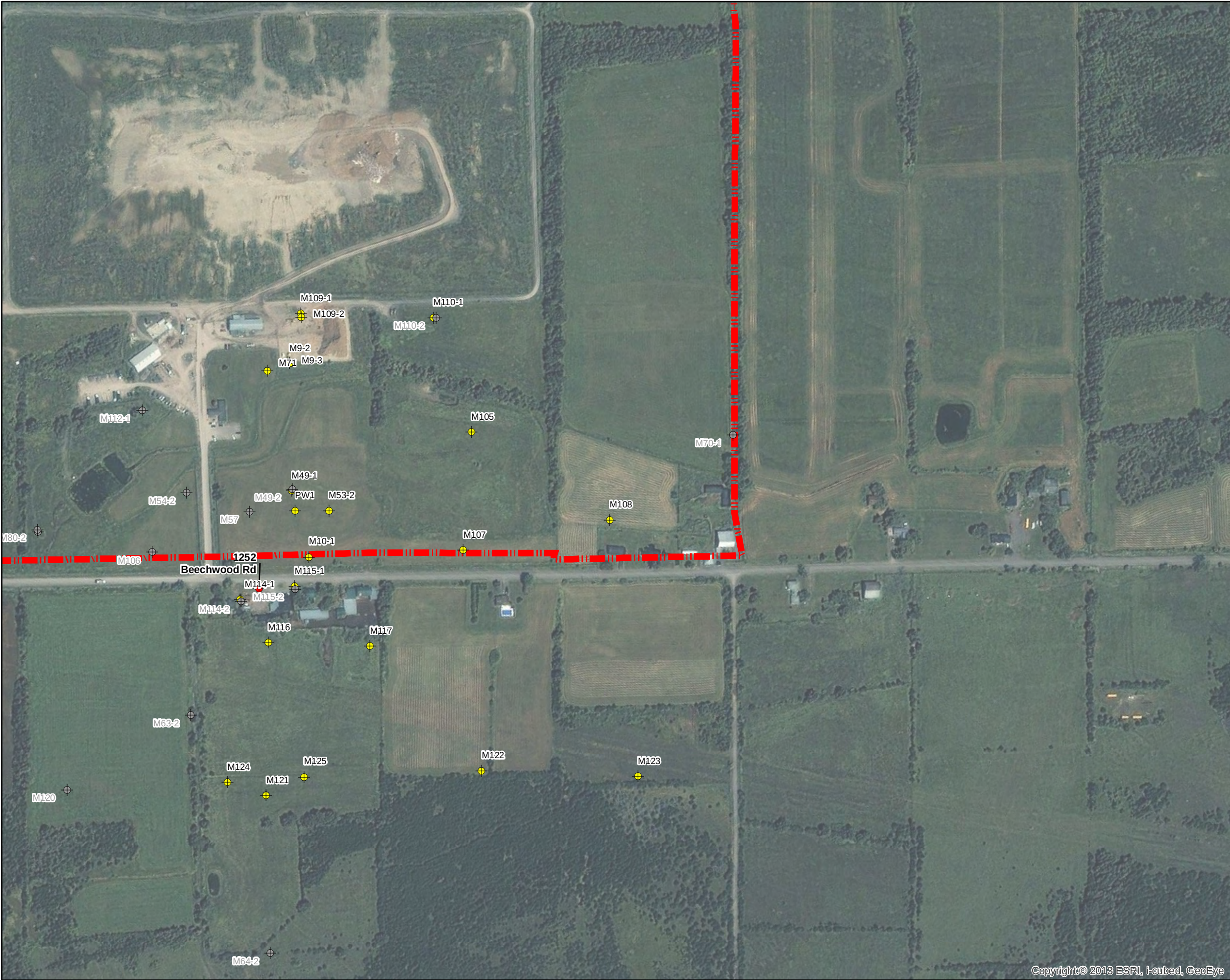
- MOE Well
- Monitoring Well
- Test Pit
- Overburden Thickness Contour Lines (m)
- Ditches, Shoreline, Streams

Overburden Thickness (m)
High : 45
Low : 0

Project : K-B9504-16
Data Source: WM Canada, WESA,
HPA Ltd. Base Mapping 2009
Date: January 2016

Units:
UTM NAD 83 Zone 18
Scale: 1:11500





LEGEND

- Pumping Well
- Responsive
- Non-Responsive
- Property Boundary

1				
REV.	DESCRIPTION	YY/MM/DD	BY	CHK

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WASTE MANAGEMENT OF CANADA

PROJECT

CAZ Investigation

TITLE

Response in Monitoring Well Network for 1252 Beechwood Road Pumping Test

The Tower - The Woolen Mill,
4 Cataraqui St.,
Ottawa, Ontario K0A 1L0
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PROJECT # K-B9504-00-16		DATE January 2016	
DRAWN KC	CHECKED MM/PT	FIG NO. A10	REV 0



LEGEND

-  Pumping Well
-  Responsive
-  Non-Responsive
-  Property Boundary

1				
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PROJECT

CAZ Investigation

TITLE

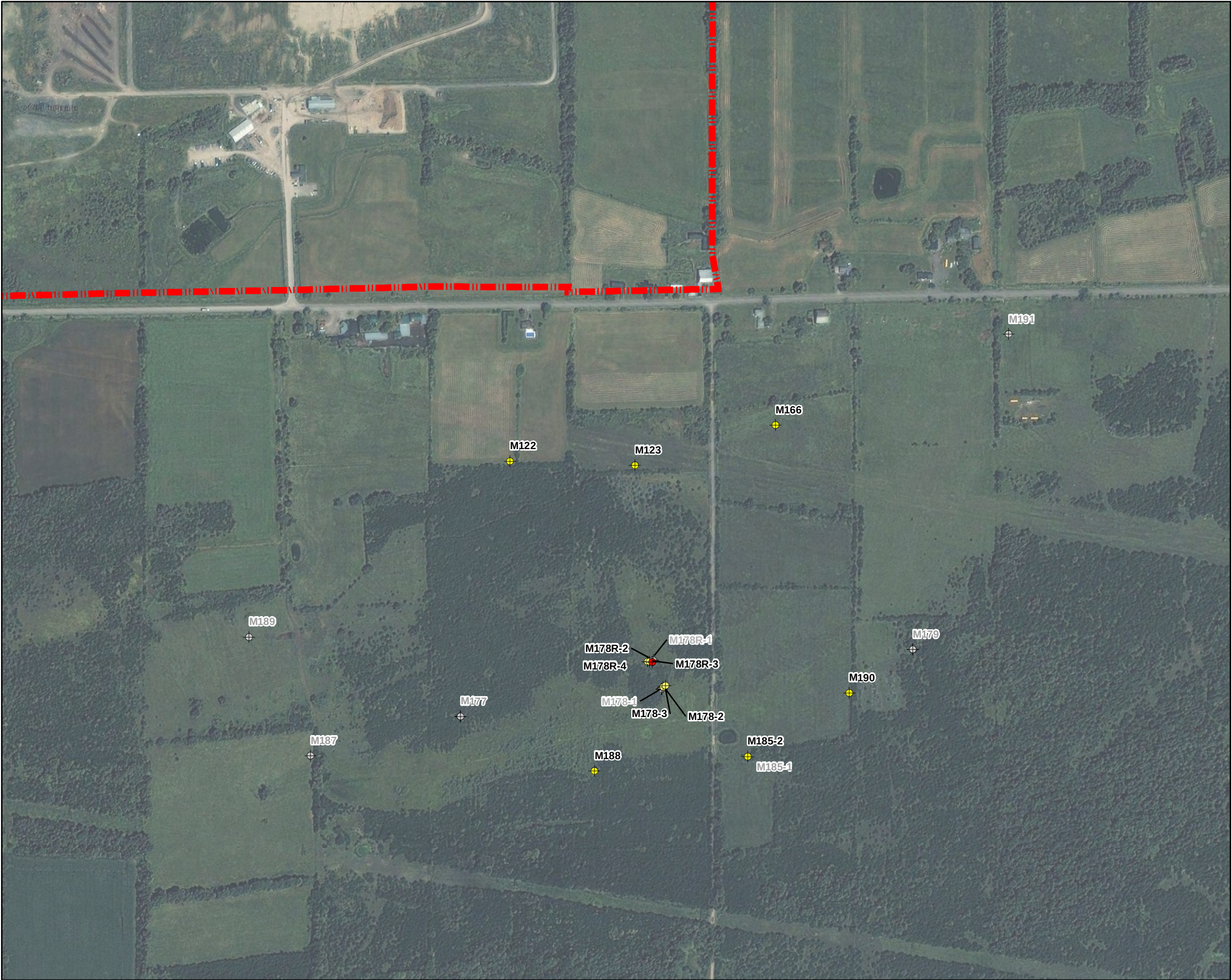
Response in Monitoring Well Network for M168 Pumping Test



*The Tower - The Woolen Mill,
4 Cataraqui St.,
Ottawa, Ontario K0A 1L0*
TEL: (613) 531-2725
FAX: (613) 531-1852
Email: info@blumetric.ca
Web: <http://www.blumetric.ca>

PROJECT # K-B9504-00-16		DATE January 2016	
DRAWN KC	CHECKED MM/PT	FIG NO. A11	REV 0



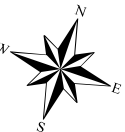


LEGEND

- Pumping Well
- Responsive
- Non-Responsive
- Property Boundary

1				
REV.	DESCRIPTION	YY/MM/DD	BY	CHK

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CAZ Investigation

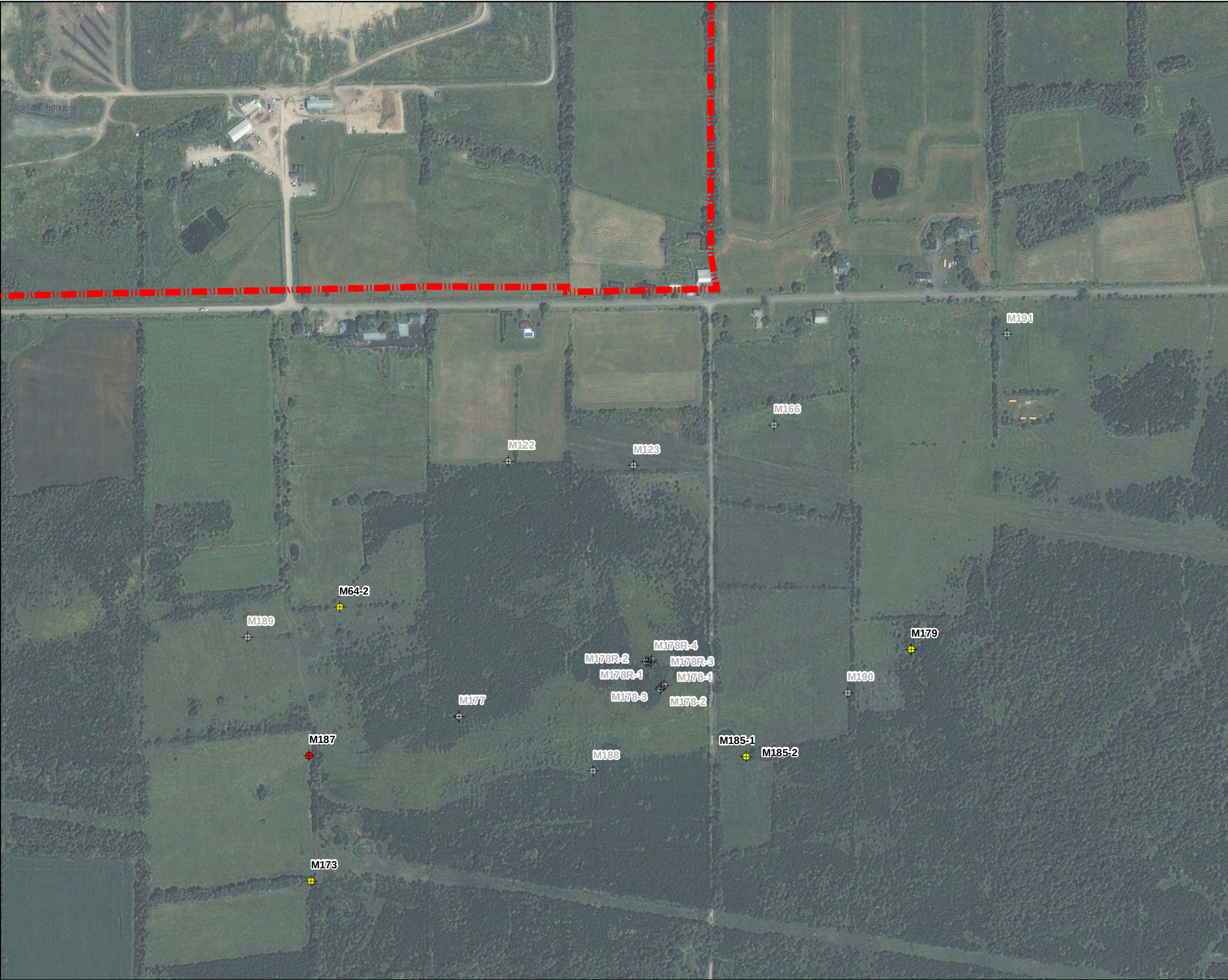
TITLE

Response in Monitoring Well Network
for M178R-3 Pumping Test



The Tower - The Woolen Mill,
4 Cataraqui St.,
Ottawa, Ontario K0A 1L0
TEL: (613) 531-2725
FAX: (613) 531-1852
Email: info@blumetric.ca
Web: <http://www.blumetric.ca>

PROJECT # K-B9504-00-16		DATE January 2016		
DRAWN KC	CHECKED MM/PT	FIG NO. A13	REV 0	

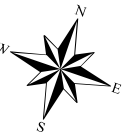


LEGEND

- Pumping Well
- Responsive
- Non-Responsive
- Property Boundary

1				
REV.	DESCRIPTION	YY/MM/DD	BY	CHK

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PROJECT

CAZ Investigation

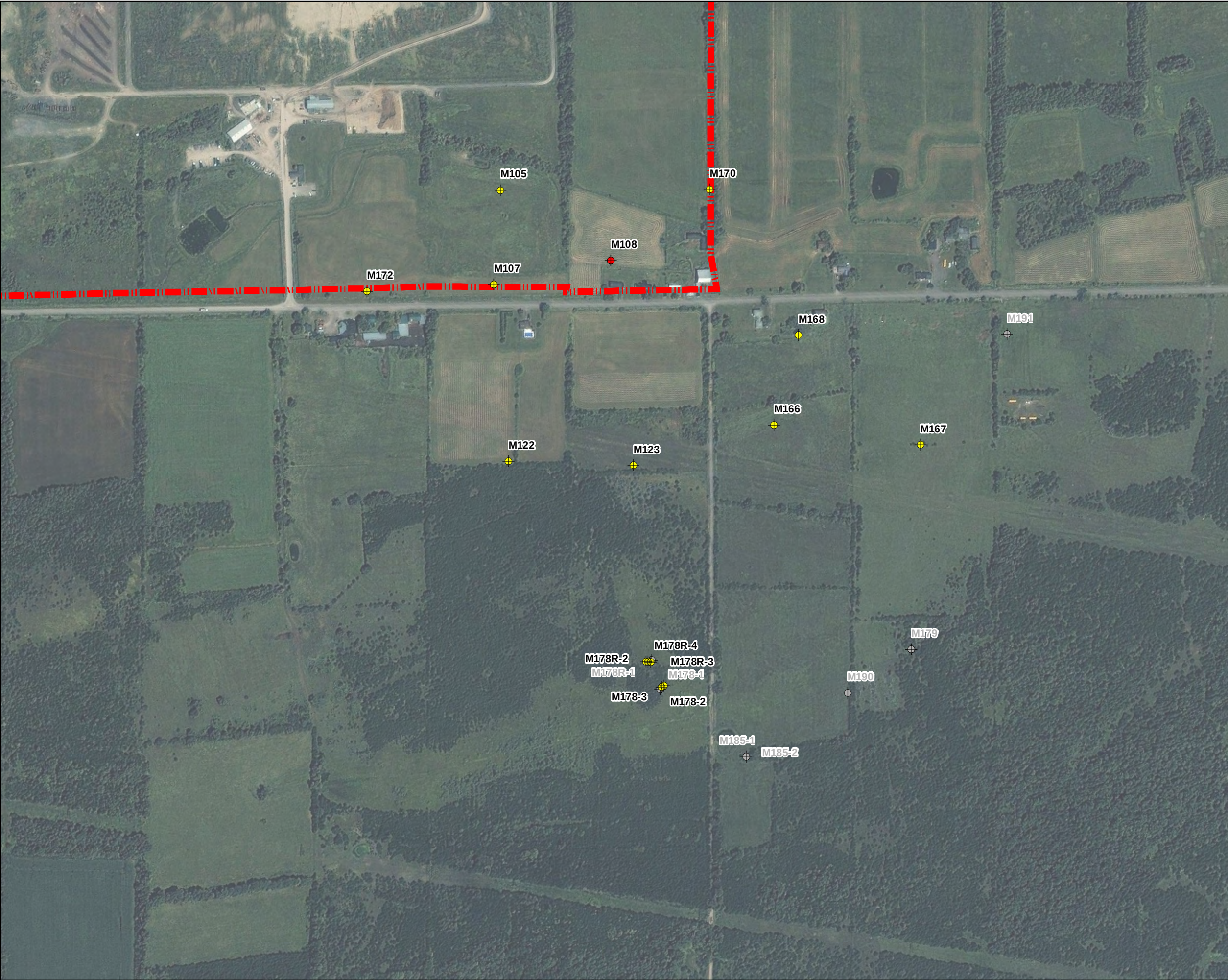
TITLE

Response in Monitoring Well Network
for M187 Pumping Test



The Tower - The Woolen Mill,
4 Cataraqui St.,
Ottawa, Ontario K0A 1L0
TEL: (613) 531-2725
FAX: (613) 531-1852
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Web: http://www.blumetric.ca

PROJECT # K-B9504-00-16		DATE January 2016		
DRAWN KC	CHECKED MM/PT	FIG NO. A14	REV 0	



LEGEND

- Pumping Well
- Responsive
- Non-Responsive
- Property Boundary

1				
REV.	DESCRIPTION	YY/MM/DD	BY	CHK

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WASTE MANAGEMENT OF CANADA

PROJECT
CAZ Investigation

TITLE
Response in Monitoring Well Network
for M108 Pumping Test

The Tower - The Woolen Mill,
4 Cataraqui St.,
Ottawa, Ontario K0A 1L0
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FAX: (613) 531-1852
Email: info@blumetric.ca
Web: http://www.blumetric.ca

PROJECT # K-B9504-00-16		DATE January 2016		
DRAWN KC	CHECKED MM/PT	FIG NO. A15	REV 0	

APPENDIX A.1

Borehole Logs



APPENDIX A.1

Borehole Logs



Project No: K-B9504-00-08

Project: South Property Investigation

Client: Waste Management

Location: Richmond Landfill, Napanee, ON

Well ID: M121

Easting: 335529

Northing: 4902337

Field Personnel: B.M.

SUBSURFACE PROFILE				Well Construction	Rock Quality Designation % 20 60	Fracture Frequency/Run	Comments	K (m/sec)
Depth	Stratigraphy	Description	Elevation (m)					
ft -4 -2 0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 m		Ground Surface	120.97 121.86				MOE Well tag #A130074 - Elev. M121 121.78m TOC - Elev.121 121.73m TPVC - TOC (HW) s/u 0.81m	
		Brown, sandy silty Clay.	120.00				- Hollow stem auger refusal 4' (1.22m)	
			119.00				- HW casing pressure grouted with cement to 9' (2.74m)	
			118.00					
			117.00					
			116.00					
			115.00					
			114.00					
		Limestone Light grey, lithographic fossiliferous limestone with undulating shale partings. Stylolites are common. Numerous calcite stringers throughout. Occasional coarse crystalline zones.	113.00				- Bentonite pressure grouted to surface.	
			112.00					
			111.00					
			110.00					
			109.00					
			108.00					
			107.00					
			106.00					3.E-08

Drilled By: Aardvark Drilling Inc.
Drill Method: Rotary Tri-cone
Hole Size: 3.78" (96mm)
Drill Date: May 17, 2012

Drill Angle: Vertical
Azimuth: n.a.
Datum: NAD 83 Zone 18
Checked By: P.T.

Sheet: 1 of 2

Project No: K-B9504-00-08

Project: South Property Investigation

Client: Waste Management

Location: Richmond Landfill, Napanee, ON

Well ID: M121

Easting: 335529

Northing: 4902337

Field Personnel: B.M.

SUBSURFACE PROFILE				Well Construction	Rock Quality Designation	Fracture Frequency/Run	Comments	K (m/sec)
Depth	Stratigraphy	Description	Elevation (m)					
53			105.00					9.E-08
55	17		104.00					
57			103.00					
59			102.00					3.E-08
61	19		101.00					
63			100.00					
65			99.00					
67			98.00					9.E-08
69	21		97.00					
71			96.00					
73			95.00					
75	23	Limestone Light grey, lithographic fossiliferous limestone with undulating shale partings. Stylolites are common. Numerous calcite stringers throughout. Occasional coarse crystalline zones.	94.00					
77			93.00					
79			92.00					
81	25		91.00					
83			90.00				- 10ft. (3.0m) slot 10 PVC screen within 3m silica sand pack.	1.E-06
85								
87								
89	27							2.E-07
91								
93								
95	29							
97							- Bentonite gravel seal.	7.E-08
99								
101								
103	31							
105		End of Borehole	89.00					

Drilled By: Aardvark Drilling Inc.
Drill Method: Rotary Tri-cone
Hole Size: 3.78" (96mm)
Drill Date: May 17, 2012

Drill Angle: Vertical
Azimuth: n.a.
Datum: NAD 83 Zone 18
Checked By: P.T.

Sheet: 2 of 2

Project No: K-B9504-00-08

Project: South Property Investigation

Client: Waste Management

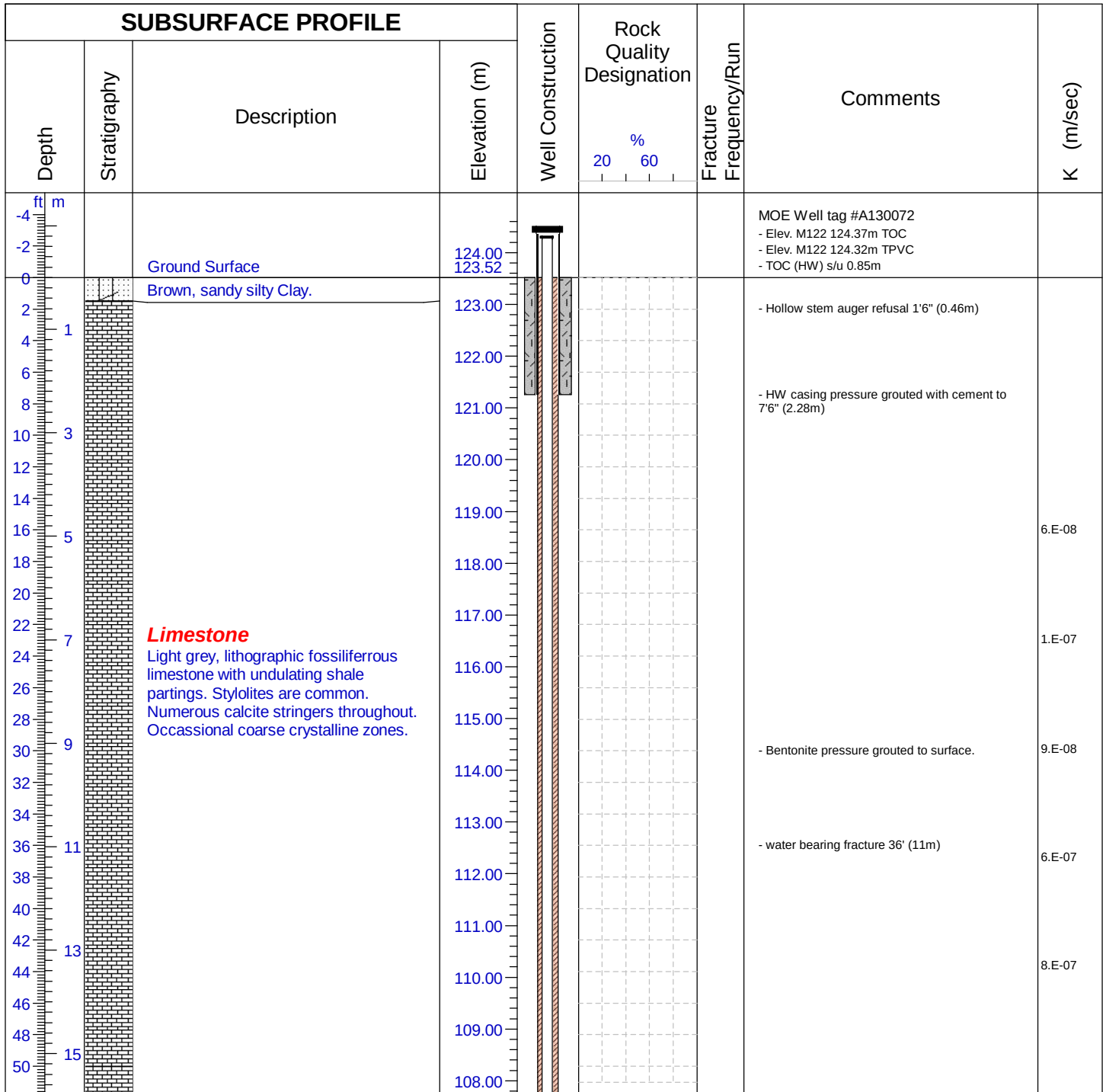
Location: Richmond Landfill, Napanee, ON

Well ID: M122

Easting: 335742

Northing: 4902433

Field Personnel: B.M.



Drilled By: Aardvark Drilling Inc.
Drill Method: Rotary Tri-cone
Hole Size: 3.78" (96mm)
Drill Date: May 18, 2012

Drill Angle: Vertical
Azimuth: n.a.
Datum: NAD 83 Zone 18
Checked By: P.T.

Sheet: 1 of 2

Project No: K-B9504-00-08

Project: South Property Investigation

Client: Waste Management

Location: Richmond Landfill, Napanee, ON

Well ID: M122

Easting: 335742

Northing: 4902433

Field Personnel: B.M.

SUBSURFACE PROFILE				Well Construction	Rock Quality Designation	Fracture Frequency/Run	Comments	K (m/sec)
Depth	Stratigraphy	Description	Elevation (m)					
53			107.00					3.E-07
55	17		106.00					
57			105.00					1.E-07
59			104.00					
61	19		103.00					6.E-07
63			102.00					
65			101.00					1.E-07
67	21		100.00					
69			99.00				- 10ft. (3.0m) slot 10 PVC screen within 3M silica sand pack.	
71			98.00				- water bearing fracture 82'6" (25.1m)	5.E-06
73			97.00					
75	23		96.00					1.E-05
77			95.00					
79			94.00					
81	25		93.00					
83								
85								
87								
89	27							
91								
93								
95	29							
97								
99								
101	31							
103		End of Borehole	92.00					
105								

Drilled By: Aardvark Drilling Inc.
Drill Method: Rotary Tri-cone
Hole Size: 3.78" (96mm)
Drill Date: May 18, 2012

Drill Angle: Vertical
Azimuth: n.a.
Datum: NAD 83 Zone 18
Checked By: P.T.

Sheet: 2 of 2

Project No: K-B9504-00-08

Project: South Property Investigation

Client: Waste Management

Location: Richmond Landfill, Napanee, ON

Well ID: M123

Easting: 335905

Northing: 4902479

Field Personnel: B.M.

SUBSURFACE PROFILE				Well Construction	Rock Quality Designation	Fracture Frequency/Run	Comments	K (m/sec)
Depth	Stratigraphy	Description	Elevation (m)					
ft -4 -2 0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 m					20 60 %			
		Ground Surface	123.86				MOE Well tag #A130073 - Elev. M123 123.60m TOC - Elev. M123 123.54m TPVC - TOC (HW) s/u 0.68m	
		Brown, sandy silty Clay.					- Hollow stem auger refusal 1'6" (0.46m)	
	1		122.00					
	3		121.00					
	5		120.00				- HW casing pressure grouted with cement to 8' (2.44m)	8.9E-09
	7	Limestone Light grey, lithographic fossiliferous limestone with undulating shale partings. Stylolites are common. Numerous calcite stringers throughout. Occasional coarse crystalline zones.	119.00					2.3E-08
	9		118.00					
	11		117.00					
	13		116.00					
	15		115.00					
			114.00				- Bentonite pressure grouted seal.	2.4E-08
			113.00					
			112.00					
			111.00					3.5E-07
			110.00					
			109.00					4.7E-08
			108.00					

Drilled By: Aardvark Drilling Inc.

Drill Method: Rotary Tri-cone

Hole Size: 3.78" (96mm)

Drill Date: May 23, 2012

Drill Angle: Vertical

Azimuth: n.a.

Datum: NAD 83 Zone 18

Checked By: P.T.

Sheet: 1 of 2

WESA

a BluMetric™ company

Project No: K-B9504-00-08

Project: South Property Investigation

Client: Waste Management

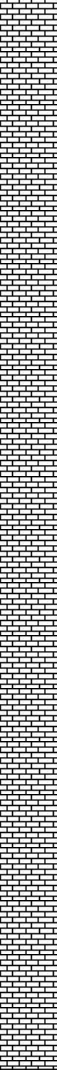
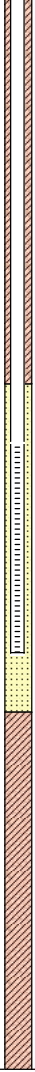
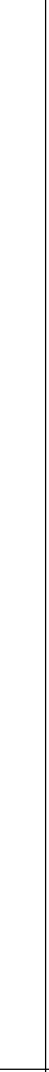
Location: Richmond Landfill, Napanee, ON

Well ID: M123

Easting: 335905

Northing: 4902479

Field Personnel: B.M.

SUBSURFACE PROFILE				Well Construction	Rock Quality Designation	Fracture Frequency/Run	Comments	K (m/sec)
Depth	Stratigraphy	Description	Elevation (m)					
53		Limestone Light grey, lithographic fossiliferous limestone with undulating shale partings. Stylolites are common. Numerous calcite stringers throughout. Occasional coarse crystalline zones.	107.00				- water bearing fracture 63'4" (19.32m) - 10ft. (3.0m) slot 10 PVC screen within 3M silica sand pack. - water bearing fracture 87'9" (26.75m) - Bentonite gravel seal.	7.3E-07
55			106.00					1.0E-06
57			105.00					1.8E-07
59			104.00					2.2E-07
61			103.00					4.2E-04
63			102.00					1.3E-07
65			101.00					3.7E-07
67			100.00					2.3E-06
69			99.00					
71			98.00					
73			97.00					
75			96.00					
77			95.00					
79			94.00					
81			93.00					
83			92.00					
85			91.00					
87								
89								
91								
93								
95								
97								
99								
101								
103		End of Borehole						
105								

Drilled By: Aardvark Drilling Inc.
Drill Method: Rotary Tri-cone
Hole Size: 3.78" (96mm)
Drill Date: May 23, 2012

Drill Angle: Vertical
Azimuth: n.a.
Datum: NAD 83 Zone 18
Checked By: P.T.

Sheet: 2 of 2

Project No: K-B9504-00-08

Project: South Property Investigation

Client: Waste Management

Location: Richmond Landfill, Napanee, ON

Well ID: M125

Easting: 335561

Northing: 4902368

Field Personnel: B.M.

SUBSURFACE PROFILE				Well Construction	Rock Quality Designation	Fracture Frequency/Run	Comments	K (m/sec)
Depth	Stratigraphy	Description	Elevation (m)					
ft -4 -2 0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 m					20 60 %			
		Ground Surface	121.43				MOE Well tag #A130077 - Elev. M125 122.29m TOC - Elev M125 122.25 m TPVC - TOC (HW) s/u 0.86m	
		Brown, sandy silty Clay.	121.00				- Hollow stem auger refusal 3'6" (1.07m)	
	1		120.00					
	3		119.00				- HW casing pressure grouted with cement to 7'6" (2.28m)	2.E-08
	5		118.00					2.E-08
	7		117.00					
	9		116.00					
	11		115.00					
	13		114.00					
	15		113.00					1.E-08
		Limestone Light grey, lithographic fossiliferous limestone with undulating shale partings. Stylolites are common. Numerous calcite stringers throughout. Occasional coarse crystalline zones.	112.00					
			111.00					
			110.00				- Bentonite pressure grouted to surface.	2.E-08
			109.00					
			108.00					
			107.00					2.E-08
			106.00					

Drilled By: Aardvark Drilling Inc.
Drill Method: Rotary Tri-cone
Hole Size: 3.78" (96mm)
Drill Date: July 16,17, 2012

Drill Angle: Vertical
Azimuth: n.a.
Datum: NAD 83 Zone 18
Checked By: P.T.

Sheet: 1 of 2

Project No: K-B9504-00-08

Project: South Property Investigation

Client: Waste Management

Location: Richmond Landfill, Napanee, ON

Well ID: M125

Easting: 335561

Northing: 4902368

Field Personnel: B.M.

SUBSURFACE PROFILE				Well Construction	Rock Quality Designation	Fracture Frequency/Run	Comments	K (m/sec)
Depth	Stratigraphy	Description	Elevation (m)					
53			105.00					
55	17		104.00					4.E-08
57			103.00					
59			102.00					
61	19		101.00					7.E-08
63			100.00					
65			99.00					
67	21		98.00					4.E-07
69			97.00					4.E-07
71			96.00					
73	23	Limestone Light grey, lithographic fossiliferous limestone with undulating shale partings. Stylolites are common. Numerous calcite stringers throughout. Occasional coarse crystalline zones.	95.00					
75			94.00					
77	25		93.00					
79			92.00					
81	27		91.00					
83			90.00					
85							- 10ft. (3.0) slot 10 PVC screen within 3M silica sand pack.	2.E-05
87							- water bearing fracture 89ft. (27.1m)	
89	29							
91								
93	31							
95								
97								
99								
101								
103								
105		End of Borehole						

Drilled By: Aardvark Drilling Inc.
Drill Method: Rotary Tri-cone
Hole Size: 3.78" (96mm)
Drill Date: July 16,17, 2012

Drill Angle: Vertical
Azimuth: n.a.
Datum: NAD 83 Zone 18
Checked By: P.T.

Sheet: 2 of 2

Project No: K-B9504-11

Project: South Property Investigation

Client: Waste Management

Location: Richmond Landfill, Napanee, ON

Well ID: M166

Easting: 336069

Northing: 4902589

Field Personnel: B.M.

SUBSURFACE PROFILE				Well Construction	Rock Quality Designation	Fracture Frequency/Run	Comments	K (m/sec)
Depth	Stratigraphy	Description	Elevation (m)					
ft -4 -2 0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 m								
		Ground Surface	122.29				MOE Well tag #A146353 - Elev. M166 123.19m TOC - Elev. M166 123.15m TPVC - TOC s/u 0.90m	
		Brown-grey, wet, silty Clay with gravel.	122.00				- Hollow stem auger refusal 1'6" (0.46m)	
			121.00				- 4" (100mm) steel casing pressure grouted with cement to 4'6" (1.37m)	
			120.00				- fractures 9', 10.5', 11' and 14' (2.74, 3.2, 3.35 and 4.26m)	1.E-08
			119.00				- moderately wide fracture 14.5' (4.42m)	
			118.00					
			117.00					
			116.00				- fracture 20' (6.1m)	
			115.00				- fracture 24' (7.3m)	2.E-06
			114.00				- fracture 26' (7.9m)	
			113.00				- moderately wide fracture 29' (8.8m) - fracture 29'6" (9m)	
			112.00				- fracture 34' (10.3m)	5.E-09
			111.00				- 20% solids bentonite grout seal	
			110.00					
			109.00				- fracture 43' (13.1m)	4.E-09
			108.00				- fracture 46' (14m)	
			107.00					

Drilled By: GET Drilling Ltd.
Drill Method: Rotary Tri-cone
Hole Size: 3.87" (98mm)
Drill Date: March 7, 13, 2013

Drill Angle: Vertical
Azimuth: n.a.
Datum: NAD 83 Zone 18
Checked By: P.T.

Sheet: 1 of 2

Project No: K-B9504-11

Project: South Property Investigation

Client: Waste Management

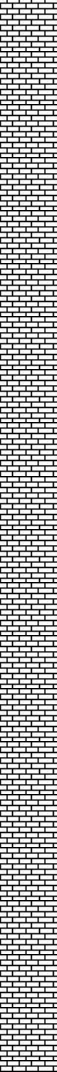
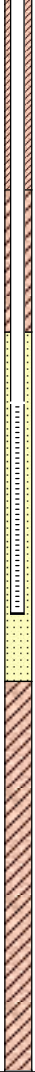
Location: Richmond Landfill, Napanee, ON

Well ID: M166

Easting: 336069

Northing: 4902589

Field Personnel: B.M.

SUBSURFACE PROFILE				Well Construction	Rock Quality Designation % 20 60	Fracture Frequency/Run	Comments	K (m/sec)
Depth	Stratigraphy	Description	Elevation (m)					
53		Limestone Light grey, lithographic fossiliferous limestone with undulating shale partings. Stylolites are common. Numerous calcite stringers throughout. Occasional coarse crystalline zones.	106.00				- moderately wide fracture 55' (16.7m) water encountered	8.E-09
55			105.00					
57			104.00					
59			103.00				- Bentonite gravel seal	
61			102.00				- fracture 67' (20.4m)	2.E-07
63			101.00				- fracture 70' (21.33m)	
65			100.00					7.E-04 6.E-04
67			99.00				- 3.0m (10ft.) slot 10 PVC screen within 3M silica sand pack	
69			98.00				- moderately wide water bearing fracture 77' (23.5m)	
71			97.00					
73			96.00					1.E-07 1.E-06
75			95.00				- Bentonite gravel seal	
77			94.00					
79			93.00					
81			92.00					
83								
85								
87								
89								
91								
93								
95								
97								
99								
101								
103								
105								
		End of Borehole	91.00					
			90.00					

Drilled By: GET Drilling Ltd.
Drill Method: Rotary Tri-cone
Hole Size: 3.87" (98mm)
Drill Date: March 7, 13, 2013

Drill Angle: Vertical
Azimuth: n.a.
Datum: NAD 83 Zone 18
Checked By: P.T.

Sheet: 2 of 2

Project No: K-B9504-11

Project: South Property Investigation

Client: Waste Management

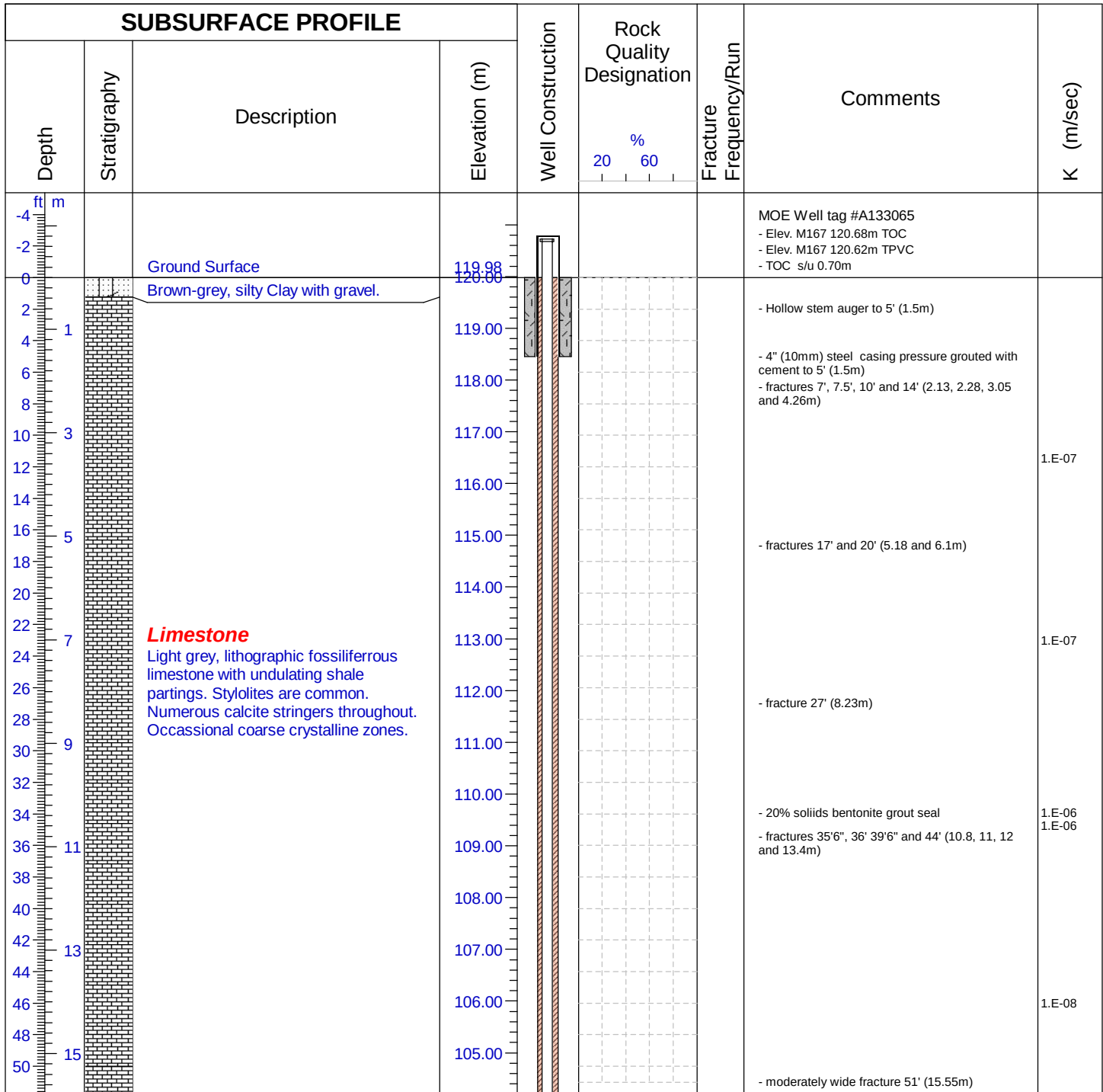
Location: Richmond Landfill, Napanee, ON

Well ID: M167

Easting: 336266

Northing: 4902624

Field Personnel: B.M.



Drilled By: GET Drilling Ltd.
Drill Method: Rotary Tri-cone
Hole Size: 3.87" (98mm)
Drill Date: March 6, 11, 2013

Drill Angle: Vertical
Azimuth: n.a.
Datum: NAD 83 Zone 18
Checked By: P.T.

Sheet: 1 of 2



Project No: K-B9504-11

Project: South Property Investigation

Client: Waste Management

Location: Richmond Landfill, Napanee, ON

Well ID: M168

Easting: 336063

Northing: 4902714

Field Personnel: B.M.

SUBSURFACE PROFILE				Well Construction	Rock Quality Designation	Fracture Frequency/Run	Comments	K (m/sec)
Depth	Stratigraphy	Description	Elevation (m)					
53			109.00					
55	17		108.00				- moderately wide fracture 58'6" (17.83m)	4.E-09
57			107.00					
59			106.00					
61	19		105.00					
63			104.00					
65			103.00					
67			102.00				- fracture 68' (20.72m)	7.E-08
69	21		101.00					
71			100.00					
73			99.00					
75	23	Limestone Light grey, lithographic fossiliferous limestone with undulating shale partings. Stylolites are common. Numerous calcite stringers throughout. Occasional coarse crystalline zones.	98.00				- fracture 75' (22.86m)	
77			97.00				- Bentonite gravel seal	
79			96.00					
81	25		95.00				- fracture 84' (25.6m)	9.E-06 8.E-06
83			94.00					
85			93.00					
87								
89	27						- 3.0m (10ft) slot 10 PVC screen within 3M silica sand pack	
91								
93								
95	29							3.E-08 6.E-08
97								
99							- moderately wide fracture 99' (30.17m)	
101							- Bentonite gravel seal	
103	31							
105		End of Borehole						

Drilled By: GET Drilling Ltd.
Drill Method: Rotary Tri-cone
Hole Size: 3.87" (98mm)
Drill Date: March 6, 12, 2013

Drill Angle: Vertical
Azimuth: n.a.
Datum: NAD 83 Zone 18
Checked By: P.T.

Sheet: 2 of 2

Project No: K-B9504-11

Project: South Property Investigation

Client: Waste Management

Location: Richmond Landfill, Napanee, ON

Well ID: M170

Easting: 335889

Northing: 4902865

Field Personnel: B.M.

SUBSURFACE PROFILE				Well Construction	Rock Quality Designation	Fracture Frequency/Run	Comments	K (m/sec)
Depth	Stratigraphy	Description	Elevation (m)					
ft -4 -2 0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52	m -4 -2 0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52							
		Ground Surface	127.51				MOE Well tag #A077021 - Elev. M170 128.21m TOC - Elev M170 elev. 128.14m TPVC - TOC s/u 0.70m	
		Brown, wet, clay till.	127.00				- Hollow stem auger to 9'9" (2.97m)	
			126.00					
			125.00				- 4" (100mm) steel casing pressure grouted with cement to 9' 9" (2.97m)	
			124.00				- fracture 14' (4.27m)	
			123.00					
			122.00				- moderately wide fracture 20'6" (6.24m)	2.E-09
			121.00				- fractures 23' and 24' (7.01 and 7.32m)	
			120.00					
			119.00				- fractures 28' and 30' (8.53 and 9.14m)	1.E-09
			118.00				- 20% solids bentonmnite gravel seal	
			117.00				- moderately wide fracture 33'6" (10.21m)	
			116.00					
			115.00					
			114.00				- moderately wide water bearing fracture 44' (13.41m)	1.E-05
			113.00				- moderately wide fracture 46' (14.02m)	
			112.00				- fracture 50' (15.24m)	2.E-09

Drilled By: GET Drilling Ltd.
Drill Method: Rotary Tri-cone
Hole Size: 3.87" (98mm)
Drill Date: March 7, 14, 2013

Drill Angle: Vertical
Azimuth: n.a.
Datum: NAD 83 Zone 18
Checked By: P.T.

Sheet: 1 of 2

Project No: K-B9504-11

Project: South Property Investigation

Client: Waste Management

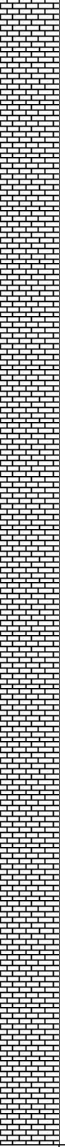
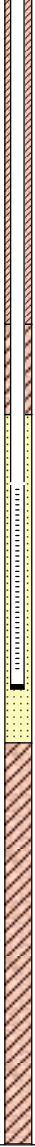
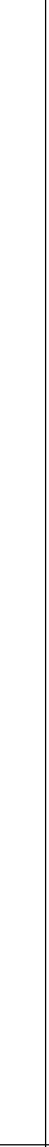
Location: Richmond Landfill, Napanee, ON

Well ID: M170

Easting: 335889

Northing: 4902865

Field Personnel: B.M.

SUBSURFACE PROFILE				Well Construction	Rock Quality Designation	Fracture Frequency/Run	Comments	K (m/sec)
Depth	Stratigraphy	Description	Elevation (m)					
55		Limestone Light grey, lithographic fossiliferous limestone with undulating shale partings. Stylolites are common. Numerous calcite stringers throughout. Occasional coarse crystalline zones.	111.00				- moderately wide water bearing fracture 64' (19.5m) - Bentonite gravel seal - fracture 72' (21.95m) - fracture 80' (24.38m) - 3.0m (10ft) slot 10 PVC screen within 3M silica sand pack - moderately wide fracture 85' (25.9m) - fracture 93' (28.3m) - Bentonite gravel seal - fracture 102' (31.08m)	3.E-08 1.E-09 6.E-07 7.E-07 3.E-08 3.E-08
57			110.00					
59			109.00					
61			108.00					
63			107.00					
65			106.00					
67			105.00					
69			104.00					
71			103.00					
73			102.00					
75			101.00					
77			100.00					
79			99.00					
81			98.00					
83			97.00					
85			96.00					
87			95.00					
89			94.00					
91			93.00					
93			92.00					
95			91.00					
97			90.00					
99			89.00					
101			88.00					
103			87.00					
105			86.00					
107			85.00					
109			84.00					
End of Borehole			94.00					

Drilled By: GET Drilling Ltd.
Drill Method: Rotary Tri-cone
Hole Size: 3.87" (98mm)
Drill Date: March 7, 14, 2013

Drill Angle: Vertical
Azimuth: n.a.
Datum: NAD 83 Zone 18
Checked By: P.T.

Sheet: 2 of 2

Project No: K-B9504-11

Project: South Property Investigation

Client: Waste Management

Location: Richmond Landfill, Napanee, ON

Well ID: M172

Easting: 335490

Northing: 4902593

Field Personnel: B.M.

SUBSURFACE PROFILE				Well Construction	Rock Quality Designation	Fracture Frequency/Run	Comments	K (m/sec)
Depth	Stratigraphy	Description	Elevation (m)					
ft -4 -2 0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54	m -1.2 -0.6 0 0.6 1.2 1.8 2.4 3.0 3.6 4.2 4.8 5.4 6.0 6.6 7.2 7.8 8.4 9.0 9.6 10.2 10.8 11.4 12.0 12.6 13.2 13.8 14.4 15.0 15.6 16.2 16.8 17.4 18.0 18.6 19.2 19.8 20.4 21.0 21.6 22.2 22.8 23.4 24.0 24.6 25.2 25.8 26.4 27.0 27.6 28.2 28.8 29.4 30.0 30.6 31.2 31.8 32.4 33.0 33.6 34.2 34.8 35.4 36.0 36.6 37.2 37.8 38.4 39.0 39.6 40.2 40.8 41.4 42.0 42.6 43.2 43.8 44.4 45.0 45.6 46.2 46.8 47.4 48.0 48.6 49.2 49.8 50.4 51.0 51.6 52.2 52.8 53.4 54.0							
		Ground Surface	126.48				MOE Well tag #A146354 - Elev. M172 127.18 m TOC - Elev. M172 127.14m TPVC - TOC s/u 0.70m	
		Brown, clay till.	126.00 125.00 124.00				- Hollow stem auger to 12' (3.65m)	
		Limestone Light grey, lithographic fossiliferous limestone with undulating shale partings. Stylolites are common. Numerous calcite stringers throughout. Occasional coarse crystalline zones.	123.00 122.00 121.00 120.00 119.00 118.00 117.00 116.00 115.00 114.00 113.00 112.00 111.00 110.00				- 4" (100mm) steel casing pressure grouted with cement to 12' (3.65m) - moderately wide fracture 14' (4.26m) - fracture 15' (4.57m) - fracture 22' (7.6m) - fracture 27' (8.23m) - moderately wide fracture 39' (11.89m) - 20% solids bentonite grout seal - fracture 43' (13.1m) - moderately wide fracture 48' (14.63m) - fracture 55' (16.7m)	

Drilled By: GET Drilling Ltd.
Drill Method: Rotary Tri-cone
Hole Size: 3.87" (98mm)
Drill Date: March 7, 15, 2013

Drill Angle: Vertical
Azimuth: n.a.
Datum: NAD 83 Zone 18
Checked By: P.T.

Sheet: 1 of 2

Project No: K-B9504-11

Project: South Property Investigation

Client: Waste Management

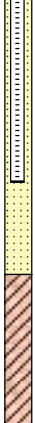
Location: Richmond Landfill, Napanee, ON

Well ID: M172

Easting: 335490

Northing: 4902593

Field Personnel: B.M.

SUBSURFACE PROFILE				Well Construction	Rock Quality Designation	Fracture Frequency/Run	Comments	K (m/sec)
Depth	Stratigraphy	Description	Elevation (m)					
57	18	Limestone Light grey, lithographic fossiliferous limestone with undulating shale partings. Stylolites are common. Numerous calcite stringers throughout. Occasional coarse crystalline zones.	109.00		% 20 60		- fracture 60' (18.29m)	
59			108.00				- moderately wide fracture 67' (20.42m)	
61			107.00					
63			106.00					
65	20		105.00					
67			104.00					
69			103.00					
71	22		102.00				- Bentonite gravel seal	
73			101.00					
75			100.00					
77			99.00					
79	24		98.00				- 3.0m (10ft) slot 10 PVC screen with 3M silica sand pack	
81			97.00				- moderately wide fracture 95' (29m)	
83			96.00					
85	26		95.00		% 20 60		- Bentonite gravel seal	
87			94.00					
89			93.00					
91	28		92.00					
93								
95								
97								
99	30							
101								
103								
105	32							
107								
109								
111	34	End of Borehole						
113								

Drilled By: GET Drilling Ltd.
Drill Method: Rotary Tri-cone
Hole Size: 3.87" (98mm)
Drill Date: March 7, 15, 2013

Drill Angle: Vertical
Azimuth: n.a.
Datum: NAD 83 Zone 18
Checked By: P.T.

Sheet: 2 of 2

Project No: K-B9504-11

Project: South Property Investigation

Client: Waste Management

Location: Richmond Landfill, Napanee, ON

Well ID: M173

Easting: 335661

Northing: 4901811

Field Personnel: B.M.

SUBSURFACE PROFILE				Well Construction	Rock Quality Designation	Fracture Frequency/Run	Comments	K (m/sec)
Depth	Stratigraphy	Description	Elevation (m)					
ft m					% 20 60			
-4 -2 0		Ground Surface	119.57				MOE Well tag #146397 - Elev. M173 120.28m TOC - TOC s/u 0.71m	
2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64	1 3 5 7 9 11 13 15 17 19	Sand and Gravel Brown, dry.	119.00 118.00 117.00 116.00 115.00 114.00 113.00 112.00 111.00 110.00 109.00 108.00 107.00 106.00 105.00 104.00 103.00 102.00 101.00 100.00				- Hollow stem auger to 32' 9.75m	
		Till Greyish brown, dense, silty Sand and Gravel.					- 4" (100mm) steel casing pressure grouted with cement to 32' (9.75m)	7.E-09
		Limestone Light grey, lithographic fossiliferous limestone with undulating shale partings. Stylolites are common. Numerous calcite stringers throughout. Occasional coarse crystalline zones.					- fractures 33' and 35' (10 and 10.67m) - fracture 39' and 40' (11.89 and 12.19m) - water bearing fracture 43' (13.1m) - fracture 44' (13.4m) - fractures 47', 49', 51' and 52' (14.3, 14.9, 15.5 and 15.8m) - fracture 54' (16.5m) - water bearing fracture 61' (18.6m)	4.E-10 5.E-08 3.E-09

Drilled By: GET Drilling Ltd.
Drill Method: Rotary Tri-cone
Hole Size: 3.87" (98mm)
Drill Date: Nov. 14, 18, 2013

Drill Angle: Vertical
Azimuth: n.a.
Datum: NAD 83 Zone 18
Checked By: P.T.

Sheet: 1 of 2

Project No: K-B9504-11

Project: South Property Investigation

Client: Waste Management

Location: Richmond Landfill, Napanee, ON

Well ID: M173

Easting: 335661

Northing: 4901811

Field Personnel: B.M.

SUBSURFACE PROFILE				Well Construction	Rock Quality Designation % 20 60	Fracture Frequency/Run	Comments	K (m/sec)
Depth	Stratigraphy	Description	Elevation (m)					
66			99.00					
68	21		98.00					
70			97.00				- fracture 73' (22.25m)	1.E-09
72			96.00				- fracture 78' (23.7m)	
74	23		95.00					
76			94.00					
78			93.00				-fracture 87' (26.5m)	1.E-09
80	25		92.00					
82			91.00				- fractures 95' and 96' (28.96 and 29.26m)	3.E-09
84	27		90.00				- fracture 99' (30.17m)	
86			89.00				- fracture 102' (31.09m)	
88			88.00				- fracture 106' (32.3m)	3.E-09
90	29		87.00				- fracture 108' (32.9m)	3.E-09
92			86.00					4.E-08
94	31		85.00				- 3m x 50mm dia. slot 10 PVC screen within #3 silica sand pack	
96			84.00				- water bearing fracture 117' (35.66m)	
98	33		83.00					
100			82.00					
102	35		81.00				- bentonite gravel plug	
104			80.00					
106	37							
108								
110	39							
112								
114								
116								
118								
120								
122								
124								
126								
128								
130								
132		End of Borehole						

Drilled By: GET Drilling Ltd.
Drill Method: Rotary Tri-cone
Hole Size: 3.87" (98mm)
Drill Date: Nov. 14, 18, 2013

Drill Angle: Vertical
Azimuth: n.a.
Datum: NAD 83 Zone 18
Checked By: P.T.

Sheet: 2 of 2

Project No: K-B9504-12

Well ID: M174

Project: South Property Investigation

Client: Waste Management

Location: Richmond Landfill, Napanee, ON

Easting: 335937

Northing: 4901884

Field Personnel: B.M.

SUBSURFACE PROFILE				Well Construction	Rock Quality Designation % 20 60	Fracture Frequency/Run	Comments	K (m/sec)
Depth	Stratigraphy	Description	Elevation (m)					
ft -4 -2 0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60	m -1.2 -0.6 0 0.6 1.2 1.8 2.4 3.0 3.6 4.2 4.8 5.4 6.0 6.6 7.2 7.8 8.4 9.0 9.6 10.2 10.8 11.4 12.0 12.6 13.2 13.8 14.4 15.0 15.6 16.2 16.8 17.4 18.0 18.6 19.2 19.8 20.4 21.0 21.6 22.2 22.8 23.4 24.0 24.6 25.2 25.8 26.4 27.0 27.6 28.2 28.8 29.4 30.0 30.6 31.2 31.8 32.4 33.0 33.6 34.2 34.8 35.4 36.0 36.6 37.2 37.8 38.4 39.0 39.6 40.2 40.8 41.4 42.0 42.6 43.2 43.8 44.4 45.0 45.6 46.2 46.8 47.4 48.0 48.6 49.2 49.8 50.4 51.0 51.6 52.2 52.8 53.4 54.0 54.6 55.2 55.8 56.4 57.0 57.6 58.2 58.8 59.4 60.0							
		Ground Surface	124.08				MOE Well tag #A146384 - Elev. M174 124.91m TOC - TOC s/u 0.83m	
			124.00					
		Sand and Gravel Brown, damp.	123.00					
			122.00					
			121.00				- Solid stem auger to 33'6" (10.2m)	
			120.00					
			119.00					
		Till Grey - brown, sand and gravel till with some cobbles and boulders. Water encountered 8.53m.	118.00				- 4" (100mm) steel casing grouted with cement to 33'6" (10.2m)	
			117.00					
			116.00					
			115.00					
			114.00					
		Limestone Light grey, lithographic fossiliferous limestone with undulating shale partings. Stylolites are common. Numerous calcite stringers throughout. Occasional coarse crystalline zones.	113.00					
			112.00					
			111.00				- fracture 43' (13.1m)	
			110.00					
			109.00					
			108.00					
			107.00				- bentonite gravel seal	
			106.00					

Drilled By: GET Drilling Ltd.
Drill Method: Rotary Tri-cone
Hole Size: 3.87" (98mm)
Drill Date: December 6, 2013

Drill Angle: Vertical
Azimuth: n.a.
Datum: NAD 83 Zone 18
Checked By: P.T.

Sheet: 1 of 2

Project No: K-B9504-12

Project: South Property Investigation

Client: Waste Management

Location: Richmond Landfill, Napanee, ON

Well ID: M174

Easting: 335937

Northing: 4901884

Field Personnel: B.M.

SUBSURFACE PROFILE				Well Construction	Rock Quality Designation		Fracture Frequency/Run	Comments	K (m/sec)
Depth	Stratigraphy	Description	Elevation (m)		20	60			
63			105.00					- fracture 63' (19.2m)	
65	20		104.00						
67			103.00						
69			102.00					- fracture 72' (21.9m)	
71	22		101.00						
73			100.00						
75			99.00						
77			98.00					- fracture 86' (26.2m)	
79	24		97.00						
81			96.00					- bentonite gravel seal	
83			95.00						
85	26		94.00					- fracture 100' (30.5m)	
87			93.00						
89		Limestone	92.00					- fracture 106' (32.3m)	
91		Light grey, lithographic fossiliferous	91.00						
93	28	limestone with undulating shale	90.00					- 3m x 50mm dia. slot 10 PVC screen within #3	
95		partings. Stylolites are common.	89.00					silica sand pack	
97		Numerous calcite stringers throughout.	88.00						
99	30	Occasional coarse crystalline zones.	87.00					- water bearing fracture 118' (36m)	
101			86.00						
103									
105	32								
107									
109									
111	34								
113									
115									
117	36								
119									
121									
123									
125	38	End of Borehole							

Drilled By: GET Drilling Ltd.
Drill Method: Rotary Tri-cone
Hole Size: 3.87" (98mm)
Drill Date: December 6, 2013

Drill Angle: Vertical
Azimuth: n.a.
Datum: NAD 83 Zone 18
Checked By: P.T.

Sheet: 2 of 2

Project No: K-B9504-12

Project: South Property Investigation

Client: Waste Management

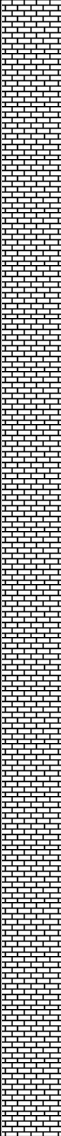
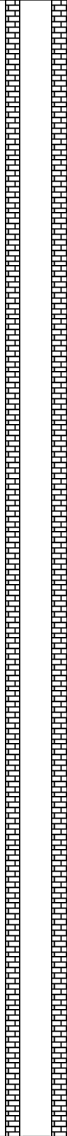
Location: Richmond Landfill, Napanee, ON

Well ID: M175

Easting: 336324

Northing: 4901927

Field Personnel: B.M.

SUBSURFACE PROFILE				Well Construction	Rock Quality Designation		Fracture Frequency/Run	Comments	K (m/sec)
Depth	Stratigraphy	Description	Elevation (m)		%				
					20	60			
55		Limestone Light grey, lithographic fossiliferous limestone with undulating shale partings. Stylolites are common. Numerous calcite stringers throughout. Occasional coarse crystalline zones.	100.00					- fracture 57' (17.4m)	
57			99.00						
59			98.00						
61			97.00						
63			96.00						
65			95.00						
67			94.00						
69			93.00						
71			92.00						
73			91.00						
75			90.00						
77			89.00						
79			88.00						
81			87.00						
83			86.00						
85			85.00						
87			84.00						
89									
91									
93									
95									
97									
99									
101									
103									
105									
107									
109		End of Borehole							

Drilled By: GET Drilling Ltd.
Drill Method: Rotary Tri-cone
Hole Size: 3.87" (98mm)
Drill Date: November 13, 15, 2013

Drill Angle: Vertical
Azimuth: n.a.
Datum: NAD 83 Zone 18
Checked By: P.T.

Sheet: 2 of 2

a  **Blumetric™** company

Project No: K-B9504-12

Project: South Property Investigation

Client: Waste Management

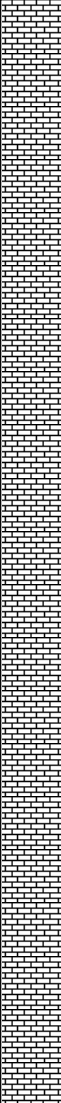
Location: Richmond Landfill, Napanee, ON

Well ID: M176

Easting: 336613

Northing: 4902307

Field Personnel: B.M.

SUBSURFACE PROFILE				Well Construction	Rock Quality Designation	Fracture Frequency/Run	Comments	K (m/sec)
Depth	Stratigraphy	Description	Elevation (m)					
54		Limestone Light grey, lithographic fossiliferous limestone with undulating shale partings. Stylolites are common. Numerous calcite stringers throughout. Occasional coarse crystalline zones.	95.00				- fracture 60' (18.3m)	8.E-09
56			94.00					3.E-09
58			93.00					
60			92.00				- bentonite gravel seal	7.E-07
62			91.00					
64			90.00				- fractures 71', 72' and 73'6" (21.6, 21.9 and 22.4m)	4.E-07
66			89.00					
68			88.00				- fracture 79' (24.1m)	7.E-09
70			87.00					
72			86.00				- fracture possible water bearing 80'6" (24.5m)	1.E-08
74			85.00					
76			84.00				- fractures 86'6" and 88' (26.4 and 26.8m)	2.E-08
78			83.00					
80			82.00				- fracture possible water bearing 90' (27.4m)	1.E-08
82			81.00					
84			80.00				- fracture possible water bearing 98' (29.9m)	1.E-08
86								
88	27							
90								
92	29							
94								
96	31							
98								
100	31							
102								
104	31							
106								
108	31							
110								
112	31							
114								
116	31							
118								
120	31							
122								
124	31							
126								
128	31							
130								
132	31							
134								
136	31							
138								
140	31							
142								
144	31							
146								
148	31							
150								
152	31							
154								
156	31							
158								
160	31							
162								
164	31							
166								
168	31							
170								
172	31							
174								
176	31							
178								
180	31							
182								
184	31							
186								
188	31							
190								
192	31							
194								
196	31							
198								
200	31					</td>		

Project No: K-B9504-12

Project: South Property Investigation

Client: Waste Management

Location: Richmond Landfill, Napanee, ON

Well ID: M177

Easting: 335784

Northing: 4902084

Field Personnel: M.L.

SUBSURFACE PROFILE				Well Construction	Rock Quality Designation	Fracture Frequency/Run	Comments	K (m/sec)
Depth	Stratigraphy	Description	Elevation (m)					
57								
59	18		98.00					
61			97.00				- fracture 61' (18.6m)	5.E-09
63								
65	20		96.00				- bentonite gravel seal	
67			95.00					1.E-08
69								
71	22		94.00					
73			93.00					1.E-08
75								
77	24		92.00					
79		Limestone	91.00				- fracture 81' (24.7m)	
81		Light grey, lithographic fossiliferous limestone with undulating shale partings. Stylolites are common.	90.00				- fracture 82'6" (25.1m)	2.E-08
83		Numerous calcite stringers throughout.	89.00					
85	26	Occassional coarse crystalline zones.	88.00					4.E-08
87			87.00					4.E-08
89			86.00					
91	28		85.00					
93			84.00					
95	30		83.00				- bentonite gravel seal	6.E-08
97								6.E-08
99								
101								
103								
105	32							
107								
109								
111	34	End of Borehole	82.00					
113								

Drilled By: GET Drilling Ltd.

Drill Method: Rotary Tri-cone

Hole Size: 3.87" (98mm)

Drill Date: November 13, December 5, 2013

Drill Angle: Vertical

Azimuth: n.a.

Datum: NAD 83 Zone 18

Checked By: P.T.

Sheet: 2 of 2

WESA™

a BluMetric™ company

Project No: K-B9504-12

Project: South Property Investigation

Client: Waste Management

Location: Richmond Landfill, Napanee, ON

Well ID: M178-1

Easting: 336031

Northing: 4902202

Field Personnel: M.L.

SUBSURFACE PROFILE				Well Construction	Rock Quality Designation % 20 60	Fracture Frequency/Run	Comments	K (m/sec)
Depth	Stratigraphy	Description	Elevation (m)					
ft -4 -2 0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 m		Ground Surface	116.01 116.00				MOE Well tag #A146386 - Elev. M178 116.65m TOC - TOC s/u 0.64m	
		Brown sandy clay, wet 3' (0.91m)	115.00				- Solid stem auger to 6' (1.83m) - 5" (127mm) tri-cone to depth 6' (1.83m) - 4" (100mm) steel casing grouted with cement to 6' (1.83m) - cement pressure grout	
			114.00					
			113.00				- fracture 12' (3.65m)	
			112.00				- fracture 14' (4.26m) - water bearing fracture 15' (4.57m)	1.E-04
			111.00				- fracture 16'6" (5m)	
			110.00				- fracture 20' (6.1m)	
			109.00				- fracture 24' (7.31m)	2.E-07
			108.00				- fracture 28'3" (8.61m)	
			107.00				- cement pressure grout	
			106.00					2.E-08
			105.00				- fracture 39' (11.9m)	
			104.00				- fracture 42' (12.8m)	
			103.00				- water bearing fracture 45' (13.7m)	4.E-06
			102.00					
			101.00				- fracture 50' (15.24m)	

Drilled By: GET Drilling Ltd.
Drill Method: Rotary Tri-cone
Hole Size: 3.87" (98mm)
Drill Date: December 4, 5, 2013

Drill Angle: Vertical
Azimuth: n.a.
Datum: NAD 83 Zone 18
Checked By: P.T.

Sheet: 1 of 2

Project No: K-B9504-12

Project: South Property Investigation

Client: Waste Management

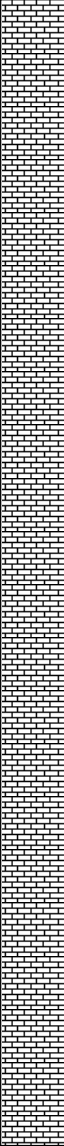
Location: Richmond Landfill, Napanee, ON

Well ID: M178-1

Easting: 336031

Northing: 4902202

Field Personnel: M.L.

SUBSURFACE PROFILE				Well Construction	Rock Quality Designation		Fracture Frequency/Run	Comments	K (m/sec)			
Depth	Stratigraphy	Description	Elevation (m)		%							
					20	60						
53		Limestone Light grey, lithographic fossiliferous limestone with undulating shale partings. Stylolites are common. Numerous calcite stringers throughout. Occassional coarse crystalline zones.	100.00					- fracture 54' (16.5m)	2.E-08			
55			99.00									
57			98.00									
59			97.00					- fracture 61' (18.6m)				
61			96.00					- cement pressure grout	2.E-09			
63			95.00					- fracture 67' (20.4m)				
65			94.00									
67			93.00					- fracture 72m (21.9m)	7.E-08			
69			92.00									
71			91.00					- fracture 79' (24m)				
73			90.00					- fracture 81' (24.7m)	1.E-07 9.E-08			
75			89.00									
77			88.00					- fracture 85' (25.9m)				
79			87.00					- bentonite gravel seal	3.E-07			
81			86.00									
83			85.00					- fracture 92' (28m)				
85			84.00					- 3m x 50mm dia. slot 10 PVC screen within #3 silica sand pack	1.E-06			
87												
89												
91												
93												
95												
97												
99												
101												
103												
105												
		End of Borehole										

Drilled By: GET Drilling Ltd.
Drill Method: Rotary Tri-cone
Hole Size: 3.87" (98mm)
Drill Date: December 4, 5, 2013

Drill Angle: Vertical
Azimuth: n.a.
Datum: NAD 83 Zone 18
Checked By: P.T.

Sheet: 2 of 2

Project No: K-B9504-12

Project: South Property Investigation

Client: Waste Management

Location: Richmond Landfill, Napanee, ON

Well ID: M178-2

Easting: 336031

Northing: 4902202

Field Personnel: M.L.

SUBSURFACE PROFILE				Well Construction	Rock Quality Designation % 20 60	Fracture Frequency/Run	Comments	K (m/sec)
Depth	Stratigraphy	Description	Elevation (m)					
ft -4 -2 0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 m		Ground Surface	115.86				MOE Well tag #A163305 - Elev. M178 116.56m TOC - TOC s/u 0.60m	
		Brown sandy clay, wet 3' (0.91m)	115.00				- Solid stem auger to 4'2" (1.26m) - 5" (127mm) tri-cone to depth 6' (1.83m) - 4" (100mm) steel casing grouted with cement to 10' (3m)	
		Limestone Light grey, lithographic fossiliferous limestone with undulating shale partings. Stylolites are common. Numerous calcite stringers throughout. Occasional coarse crystalline zones.	114.00					
			113.00					
			112.00					
			111.00				- water bearing fracture 14' (4.2m)	
			110.00					
			109.00					
			108.00				- bentonite gravel seal	
			107.00					
			106.00					
			105.00					
			104.00				- 3m x 50mm dia. slot 10 PVC screen within #3 silica sand pack	
			103.00					
			102.00				- water bearing fracture (artesian) 42'6" (13m)	
		End of Borehole	101.00					

Drilled By: GET Drilling Ltd.
Drill Method: Rotary Tri-cone
Hole Size: 3.87" (98mm)
Drill Date: September 4, 8, 2014

Drill Angle: Vertical
Azimuth: n.a.
Datum: NAD 83 Zone 18
Checked By: P.T.

Sheet: 1 of 1

Project No: K-B9504-12

Project: South Property Investigation

Client: Waste Management

Location: Richmond Landfill, Napanee, ON

Well ID: M178-3

Easting: 336031

Northing: 4902202

Field Personnel: M.L.

SUBSURFACE PROFILE				Well Construction	Rock Quality Designation % 20 60	Fracture Frequency/Run	Comments	K (m/sec)
Depth	Stratigraphy	Description	Elevation (m)					
-4 ft m							MOE Well tag #A163306	
-2							- Elev. M178 116.54m TOC	
0		Ground Surface	115.99 116.00				- TOC s/u 0.55m	
2		Brown sandy clay, wet 3' (0.91m)	115.00				- Solid stem auger to 5.1' (1.55m)	
4	1						- 5" (127mm) tri-cone to depth 7.2" (2.19m)	
6			114.00				- 4" (100mm) steel casing grouted with cement to 7.2" (2.19m)	
8							- bentonite gravel seal	
10	3		113.00					
12		Limestone	112.00					
14		Light grey, lithographic fossiliferous limestone with undulating shale partings. Stylolites are common. Numerous calcite stringers throughout. Occasional coarse crystalline zones.					- water bearing fracture 14' (4.2m)	
16	5		111.00				- 3m x 50mm dia. slot 10 PVC screen within #3 silica sand pack	
18								
20			110.00					
22								
24	7		109.00					
26		End of Borehole						

Drilled By: GET Drilling Ltd.
Drill Method: Rotary Tri-cone
Hole Size: 3.87" (98mm)
Drill Date: September 4, 5, 2014

Drill Angle: Vertical
Azimuth: n.a.
Datum: NAD 83 Zone 18
Checked By: P.T.

Sheet: 1 of 1

Project No: K-B9504-19

Project: South Property Investigation

Client: Waste Management

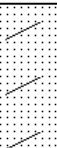
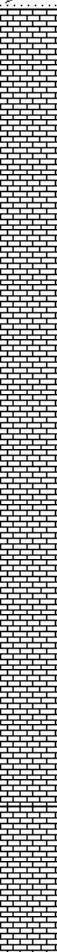
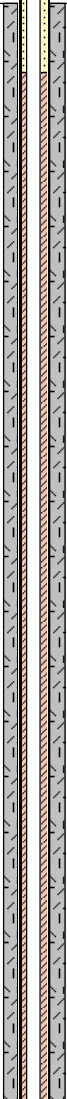
Location: Richmond Landfill, Napanee, ON

Well ID: M178R-1

Easting: 336008

Northing: 4902236

Field Personnel: B.McC.

SUBSURFACE PROFILE				Well Construction	Rock Quality Designation % 20 60	Fracture Frequency/Run	Comments	K (m/sec)
Depth	Stratigraphy	Description	Elevation (m)					
-3 ft -1 m		Ground Surface	116.65				MOE Well tag # A175232 - Elev. M178R-1 117.27 m TOC - Elev. M178R-1 117.20 m TPVC - TOC s/u 0.62m	
1 3 5 7 9 11 13 15 17 19 21 23 25 27 29 31 33 35 37 39 41 43 45 47 49 51 53 55 57	 	Sandy Clay Brown, cobbles at bedrock surface Limestone Light grey, lithographic fossiliferous limestone with undulating shale partings. Stylolites are common. Numerous calcite stringers throughout. Occasional coarse crystalline zones.	116.00 115.00 114.00 113.00 112.00 111.00 110.00 109.00 108.00 107.00 106.00 105.00 104.00 103.00 102.00 101.00 100.00				- 6" dia. (152mm) tri-cone to depth 71' (21.64m) - 4" dia. (100mm) steel casing grouted with cement to 71' (21.64m) - bentonite gravel seal - fracture 27' (8.23m) - fracture 34'6" (10.51m) - fracture 42'6" (12.95m)	

Drilled By: Aardvark Drilling Ltd.
Drill Method: Mud Rotary Tri-cone
Hole Size: 6" (152mm)
Drill Date: Aug. 20, 21, 2015

Drill Angle: Vertical
Azimuth: n.a.
Datum: NAD83
Checked By: P.T.

Sheet: 1 of 2



Project No: K-B9504-19

Project: South Property Investigation

Client: Waste Management

Location: Richmond Landfill, Napanee, ON

Well ID: M178R-1

Easting: 336008

Northing: 4902236

Field Personnel: B.McC.

SUBSURFACE PROFILE				Well Construction	Rock Quality Designation	Fracture Frequency/Run	Comments	K (m/sec)
Depth	Stratigraphy	Description	Elevation (m)					
59							- bentonite gravel seal	
61	19		98.00				- fracture 62'6" (19m)	
63							- fracture 63'6" (19.4m)	
65			97.00					
67			96.00					
69	21		95.00					
71								
73			94.00					1.5E-07
75	23		93.00					
77								
79			92.00					
81	25	Limestone Light grey, lithographic fossiliferous limestone with undulating shale partings. Stylolites are common. Numerous calcite stringers throughout. Occasional coarse crystalline zones.	91.00				- #1 Silica sand pack	5.9E-08
83			90.00					
85								
87	27		89.00				3.0m x 50mm Slot 10 PVC screen within #3 silica sand pack.	1.7E-07
89			88.00				- Water level elev. 87.72m recorded Aug 27, 2015	
91	29		87.00					1.2E-07
93			86.00					
95								
97			85.00					4.0E-08
99	31		84.00				- bentonite gravel seal	
101								
103	33		83.00					
105								
107								
109								
111		End of Borehole						
113			82.00					
115	35		81.00					
117								

Drilled By: Aardvark Drilling Ltd.
Drill Method: Mud Rotary Tri-cone
Hole Size: 6" (152mm)
Drill Date: Aug. 20, 21, 2015

Drill Angle: Vertical
Azimuth: n.a.
Datum: NAD83
Checked By: P.T.

Sheet: 2 of 2



Project No: K-B9504-19

Project: South Property Investigation

Client: Waste Management

Location: Richmond Landfill, Napanee, ON

Well ID: M178R-2

Easting: 336008

Northing: 4902233

Field Personnel: B.McC.

SUBSURFACE PROFILE				Well Construction	Rock Quality Designation %	Fracture Frequency/Run	Comments	K (m/sec)
Depth	Stratigraphy	Description	Elevation (m)					
ft -4 -2 0							MOE Well tag # A175231 - Elev. M178R-2 117.24 m TOC - Elev. M178R-2 117.20 m TPVC - TOC s/u 0.72m	
m 0		Ground Surface	117.00 116.52					
2	1	Sandy Clay Brown, cobbles at bedrock surface	116.00				-10" dia. (254mm) tri-cone to depth 43'6" (13.25m) - 6" dia. (152mm) steel casing grouted with cement to 43'6" (13.25m)	
4			115.00					
6								
8			114.00					
10	3		113.00				- water bearing fractures 11'6", 12' (3.5, 3.65m)	
12								
14			112.00				- fracture 14' (4.26m)	
16	5		111.00				- bentonite gravel seal	
18								
20		Limestone Light grey, lithographic fossiliferous limestone with undulating shale partings. Stylolites are common. Numerous calcite stringers throughout. Occasional coarse crystalline zones.	110.00					
22	7		109.00					
24								
26			108.00				- fracture 28' (8.53m)	
28								
30	9		107.00					
32								
34			106.00					
36								

Drilled By: Aardvark Drilling Ltd.
Drill Method: Mud Rotary Tri-cone
Hole Size: 6" (152mm)
Drill Date: Aug. 19, 21, 2015

Drill Angle: Vertical
Azimuth: n.a.
Datum: NAD83
Checked By: P.T.

Sheet: 1 of 2



Project No: K-B9504-19

Project: South Property Investigation

Client: Waste Management

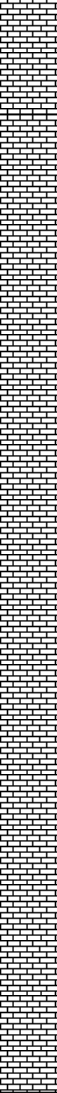
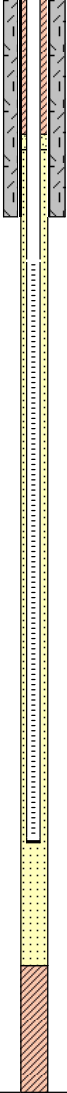
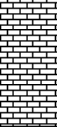
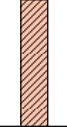
Location: Richmond Landfill, Napanee, ON

Well ID: M178R-2

Easting: 336008

Northing: 4902233

Field Personnel: B.McC.

SUBSURFACE PROFILE				Well Construction	Rock Quality Designation		Fracture Frequency/Run	Comments	K (m/sec)
Depth	Stratigraphy	Description	Elevation (m)		20	60			
38		Limestone Light grey, lithographic fossiliferous limestone with undulating shale partings. Stylolites are common. Numerous calcite stringers throughout. Occasional coarse crystalline zones.	105.00					- fracture 37' (11.28m)	
40			104.00					- #1 Silica sand pack	
42									
44			103.00						
46			102.00					- water bearing fracture 47' (14.3m)	4.5E-06
48									
50			101.00						
52			100.00					- water bearing fracture 52' (15.8m)	8.5E-05
54								3.0m x 50mm Slot 10 PVC screen within #3 silica sand pack.	
56			99.00						
58			98.00						
60									
62			97.00					- water bearing fracture 64' (19.5m)	
64								- fracture, artesian, sulfur odour present 65'6" (20m)	2.5E-02
66			96.00						2.0E-03
68									
70			95.00					- bentonite gravel seal	
72									
74			94.00						
76									
		End of Borehole							

Drilled By: Aardvark Drilling Ltd.
Drill Method: Mud Rotary Tri-cone
Hole Size: 6" (152mm)
Drill Date: Aug. 19, 21, 2015

Drill Angle: Vertical
Azimuth: n.a.
Datum: NAD83
Checked By: P.T.

Sheet: 2 of 2





Project No: K-B9504-19

Project: South Property Investigation

Client: Waste Management

Location: Richmond Landfill, Napanee, ON

Well ID: M178R-4

Easting: 336002

Northing: 4902232

Field Personnel: B.McC.

SUBSURFACE PROFILE				Well Construction	Rock Quality Designation	Fracture Frequency/Run	Comments	K (m/sec)
Depth	Stratigraphy	Description	Elevation (m)					
ft -4 -2 0 2 4 6 8 10 12 14 16 18 20 22 7					% 20 60			
		Ground Surface	117.00 116.52				MOE Well tag # A175229 - Elev. M178R-4 117.34 m TOC - Elev. M178R-4 117.30 m TPVC - TOC s/u 0.80m - Water level elev. 116.55m recorded Nov. 20, 2015	
		Sandy Clay Brown, cobbles at bedrock surface	116.00 115.00				-10" dia. (254mm) tri-cone to depth 8'8" (2.64m) - 6" dia.(152mm) steel casing grouted with cement to 8'8" (2.64m)	
		Limestone Light grey, lithographic fossiliferous limestone with undulating shale partings. Stylolites are common. Numerous calcite stringers throughout. Occasional coarse crystalline zones.	114.00 113.00 112.00 111.00 110.00				- bentonite gravel seal - #1 Silica sand pack - water bearing fractures 10'6", 11' (3.2, 3.35m) 1.9m x 50mm Slot 10 PVC screen within #3 silica sand pack. - water bearing fracture 16' (4.9m) - fracture 18' (5.5m) - fracture 20' 9 (6.1m)	6.2E-03 2.3E-03 1.4E-03
		End of Borehole						

Drilled By: Aardvark Drilling Ltd.
Drill Method: Rotary Tri-cone
Hole Size: 6" (152mm)
Drill Date: Aug. 15,17, 2015

Drill Angle: Vertical
Azimuth: n.a.
Datum: NAD83
Checked By: P.T.

Sheet: 1 of 1



WESA™
a **BluMetric™** company

Project No: K-B9504-12

Project: South Property Investigation

Client: Waste Management

Location: Richmond Landfill, Napanee, ON

Well ID: M179

Easting: 336338

Northing: 4902356

Field Personnel: B.M.

SUBSURFACE PROFILE				Well Construction	Rock Quality Designation	Fracture Frequency/Run	Comments	K (m/sec)
Depth	Stratigraphy	Description	Elevation (m)					
53			101.00				- fractures 53' and 53'6" (16.2 and 16.3m)	
55	17		100.00				- 3m x50mm dia. slot 10 PVC screen within #3 silica sand pack	
57							- fracture 57' (17.4m)	3.E-05
59			99.00					
61								
63	19		98.00				- fracture possible water bearing, sulphur odour	
65							- fracture 64' (19.5m)	9.E-06
67			97.00					
69	21		96.00					
71								
73			95.00					2.E-07
75	23	Limestone Light grey, lithographic fossiliferous limestone with undulating shale partings. Stylolites are common. Numerous calcite stringers throughout. Occasional coarse crystalline zones.	94.00				- fracture 75' (22.9m)	
77								
79			93.00					
81							- fracture 81' (24.7m)	4.E-08 3.E-08
83	25		92.00					
85							- bentonite gravel seal	
87			91.00					
89	27		90.00					4.E-08
91							- fracture 91' (27.7m)	
93			89.00					
95	29		88.00				- fracture 95' (29m)	4.E-08 3.E-08
97								
99			87.00					
101								
103	31		86.00					
105		End of Borehole	85.00					

Drilled By: GET Drilling Ltd.
Drill Method: Rotary Tri-cone
Hole Size: 3.87" (98mm)
Drill Date: November 11, 13, 2013

Drill Angle: Vertical
Azimuth: n.a.
Datum: NAD 83 Zone 18
Checked By: P.T.

Sheet: 2 of 2

Project No: K-B9504-12

Project: South Property Investigation

Client: Waste Management

Location: Richmond Landfill, Napanee, ON

Well ID: M180

Easting: 336809

Northing: 4902680

Field Personnel: B.M.

SUBSURFACE PROFILE				Well Construction	Rock Quality Designation	Fracture Frequency/Run	Comments	K (m/sec)
Depth	Stratigraphy	Description	Elevation (m)					
ft m								
-4							MOE Well tag #A146389	
-2							- Elev. M180 113.67m TOC	
0		Ground Surface	112.98				- TOC s/u 0.69m	
2		Sandy Clay	113.00					
4	1	Brown, moist.	112.00				- Solid stem auger to 4'6" (1.37m)	
6			111.00				- 5" (127mm) tri-cone to depth 6' 9" (2.05m.)	
8			110.00				- 4" (100mm) steel casing grouted with cement to 6'9" (2.05m)	
10	3		110.00				- fractures 9' and 9'6" (2.74 and 2.9m)	
12			109.00				- water bearing fracture 13' (3.96m)	1.E-05
14			108.00				- fracture 16' (4.88m)	
16	5		107.00				- fracture 19' (5.79m)	
18			106.00				- fracture possible water bearing 23' (7m)	4.E-04
20			105.00				- water bearing fracture 28' (8.53m)	
22	7	Limestone	104.00				- 3m x50mm dia. slot 10 PVC screen within #3 silica sand pack	9.E-04 5.E-04
24		Light grey, lithographic fossiliferous limestone with undulating shale partings. Stylolites are common. Numerous calcite stringers throughout. Occassional coarse crystalline zones.	103.00					
26			102.00					
28	9		101.00					2.E-08
30			100.00				- water bearing fracture 42' (12.8m)	
32			99.00				- water bearing fracture 46' (14m)	1.E-08
34			98.00				- bentonite gravel seal	
36	11		97.00					
38								
40								
42	13							
44								
46								
48	15							
50								
52								

Project No: K-B9504-12

Project: South Property Investigation

Client: Waste Management

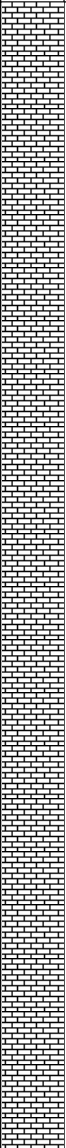
Location: Richmond Landfill, Napanee, ON

Well ID: M180

Easting: 336809

Northing: 4902680

Field Personnel: B.M.

SUBSURFACE PROFILE				Well Construction	Rock Quality Designation		Fracture Frequency/Run	Comments	K (m/sec)					
Depth	Stratigraphy	Description	Elevation (m)		%									
					20	60								
55		Limestone Light grey, lithographic fossiliferous limestone with undulating shale partings. Stylolites are common. Numerous calcite stringers throughout. Occassional coarse crystalline zones.	96.00				- water bearing fracture 65' (19.8m)	1.E-08						
57														
59			18					95.00						
61													2.E-08	
63								94.00						
65			20					93.00						
67														
69								92.00					4.E-08	
71														
73			22					91.00					- water bearing fracture 72' (21.9m)	
75														
77								90.00					- bentonite gravel seal	6.E-08
79			24					89.00						
81														
83								88.00						
85			26					87.00					- water bearing fracture 84' (25.6m)	6.E-08
87														
89								86.00						
91														
93			28					85.00						8.E-08
95													- water bearing fracture 94' (28.65m)	
97								84.00						
99			30					83.00						
101														8.E-08
103								82.00						8.E-08
105			32					81.00						1.E-06
107													- water bearing fracture 105' (32m)	
109								80.00						
								End of Borehole						

Drilled By: GET Drilling Ltd.
Drill Method: Rotary Tri-cone
Hole Size: 3.87" (98mm)
Drill Date: November 13, 14, 2013

Drill Angle: Vertical
Azimuth: n.a.
Datum: NAD 83 Zone 18
Checked By: P.T.

Sheet: 2 of 2

Project No: K-B9504-12

Project: South Property Investigation

Client: Waste Management

Location: Richmond Landfill, Napanee, ON

Well ID: M181-2

Easting: 335911

Northing: 4901491

Field Personnel: M.L.

SUBSURFACE PROFILE				Well Construction	Rock Quality Designation % 20 60	Fracture Frequency/Run	Comments	K (m/sec)
Depth	Stratigraphy	Description	Elevation (m)					
-4 ft -2 m							MOE Well tag #163303 - Elev. M181 117.08m TOC - TOC s/u 0.70m	
0		Ground Surface	116.38					
2		Topsoil	116.00					
4	1		115.00				- 5" (127mm) tri-cone to depth 6'9" (2.06.) - 4" (100mm) steel casing grouted with cement to 6'9" (2.06m)	
6			114.00					
8			113.00					
10	3		112.00				- bentonite gravel seal	
12			111.00					
14			110.00					
16	5		109.00					
18			108.00					
20			107.00					
22			106.00					
24	7	Limestone Light grey, lithographic fossiliferous limestone with undulating shale partings. Stylolites are common. Numerous calcite stringers throughout. Occasional coarse crystalline zones.	105.00				- water bearing fracture 32' 6" (9.9m)) - 3m x 50mm dia. slot 10 PVC screen within #3 silica sand pack - water bearing fracture 37' - 38' (11.2 - 11.5m)	
26			104.00					
28			103.00				- water bearing fracture 40' (12.19m)	
30	9							
32								
34								
36	11							
38								
40								
42	13							
44								
46		End of Borehole	102.00					
48								

Drilled By: GET Drilling Ltd.
Drill Method: Rotary Tri-cone
Hole Size: 3.87" (98mm)
Drill Date: August 28,29, 2014

Drill Angle: Vertical
Azimuth: n.a.
Datum: M181-1 Elev 116.97m TOC
Checked By: P.T.

Sheet: 1 of 1

Project No: K-B9504-12

Project: South Property Investigation

Client: Waste Management

Location: Richmond Landfill, Napanee, ON

Well ID: M182

Easting: 336401

Northing: 4901643

Field Personnel: M.L.

SUBSURFACE PROFILE				Well Construction	Rock Quality Designation % 20 60	Fracture Frequency/Run	Comments	K (m/sec)
Depth	Stratigraphy	Description	Elevation (m)					
-4 ft -2 m							MOE Well tag #A146394 - Elev. M182 110.56m TOC - TOC s/u 0.72m	
0		Ground Surface	109.84					
2		Topsoil	109.00					
4	1		108.00				- 5" (127mm) tri-cone to depth 5' 9" (1.75m) - 4" (100mm) steel casing grouted with cement to 5' 9" (1.75m)	
6			107.00					
8			106.00					
10	3		105.00					
12			104.00					
14			103.00					
16	5		102.00				- pressure grouted bentonite seal	
18			101.00					
20			100.00					
22	7	Limestone Light grey, lithographic fossiliferous limestone with undulating shale partings. Stylolites are common. Numerous calcite stringers throughout. Occasional coarse crystalline zones.	99.00					1.E-07
24			98.00					
26			97.00					
28	9		96.00				- fracture 231' (9.45m)	
30			95.00					
32			94.00				- fracture 34' (10.36m)	5.E-05
34			93.00					
36	11						- fracture 38' (11.6m)	
38							- fracture 40' (12.2m)	
40								
42	13						- fracture 43' (13.1m)	2.E-06
44								
46								
48	15							6.E-06
50								
52							- fracture 52' (15.85m)	
54								
56	17							

Drilled By: GET Drilling Ltd.
Drill Method: Rotary Tri-cone
Hole Size: 3.87" (98mm)
Drill Date: December 9, 16, 17, 2013

Drill Angle: Vertical
Azimuth: n.a.
Datum: NAD 83 Zone 18
Checked By: P.T.

Sheet: 1 of 2

Project No: K-B9504-12

Project: South Property Investigation

Client: Waste Management

Location: Richmond Landfill, Napanee, ON

Well ID: M182

Easting: 336401

Northing: 4901643

Field Personnel: M.L.

SUBSURFACE PROFILE				Well Construction	Rock Quality Designation %	Fracture Frequency/Run	Comments	K (m/sec)
Depth	Stratigraphy	Description	Elevation (m)					
58			92.00					4.E-08
60								
62	19		91.00					
64								
66			90.00				- pressure grouted bentonite seal	7.E-07
68								
70	21		89.00					
72								
74			88.00					1.E-07
76	23		87.00				- fracture 76' (23.16m)	
78							- water bearing fracture 78' (23.77m)	
80			86.00					
82	25	Limestone Light grey, lithographic fossiliferous limestone with undulating shale partings. Stylolites are common. Numerous calcite stringers throughout. Occasional coarse crystalline zones.	85.00					1.E-03
84								
86			84.00				- water bearing fracture 86' (26.2m)	
88	27		83.00				- 3m x 50mm dia. slot 10 PVC screen within #3 silica sand pack	1.E-03 1.E-03
90								
92			82.00					
94	29		81.00					
96								
98			80.00					1.E-07
100								
102	31		79.00					
104								
106			78.00				- bentonite gravel seal	4.E-08
108	33		77.00					6.E-08
110								
112			76.00					
114	35	End of Borehole	75.00					
116								

Drilled By: GET Drilling Ltd.
 Drill Method: Rotary Tri-cone
 Hole Size: 3.87" (98mm)
 Drill Date: December 9, 16, 17, 2013

Drill Angle: Vertical
 Azimuth: n.a.
 Datum: NAD 83 Zone 18
 Checked By: P.T.

Sheet: 2 of 2

Project No: K-B9504-12

Project: South Property Investigation

Client: Waste Management

Location: Richmond Landfill, Napanee, ON

Well ID: M183

Easting: 336953

Northing: 4901770

Field Personnel: M.L.

SUBSURFACE PROFILE				Well Construction	Rock Quality Designation % 20 60	Fracture Frequency/Run	Comments	K (m/sec)
Depth	Stratigraphy	Description	Elevation (m)					
-4 ft -2 m							MOE Well tag #146382 - Elev. M183 114.04m TOC - TOC s/u 0.73m	
0		Ground Surface	113.31					
2		Topsoil	113.00					
4	1		112.00				- 5" (127mm) tri-cone to depth 5' 6" (1.67m) - 4" (100mm) steel casing grouted with cement to 5' 6" (1.67m)	
6			111.00					
8			110.00					2.E-08
10	3		109.00				- fracture 13' (3.96m)	
12			108.00				- fracture 16' (4.88m)	
14			107.00				- fracture 21' (6.4m)	
16	5		106.00				- fracture 26' (7.92m)	1.E-08
18			105.00					
20			104.00					
22	7		103.00					5.E-09
24			102.00					
26			101.00				- pressure grout bentonite seal	4.E-09
28	9		100.00					
30			99.00					3.E-08
32			98.00					
34	11		97.00					
36								
38								
40								
42	13							
44								
46								
48	15							
50								
52								
54								
56	17							

Drilled By: GET Drilling Ltd.
Drill Method: Rotary Tri-cone
Hole Size: 3.87" (98mm)
Drill Date: December 9, 12, 2013

Drill Angle: Vertical
Azimuth: n.a.
Datum: NAD 83 Zone 18
Checked By: P.T.

Sheet: 1 of 2

Project No: K-B9504-12

Project: South Property Investigation

Client: Waste Management

Location: Richmond Landfill, Napanee, ON

Well ID: M183

Easting: 336953

Northing: 4901770

Field Personnel: M.L.

SUBSURFACE PROFILE				Well Construction	Rock Quality Designation	Fracture Frequency/Run	Comments	K (m/sec)
Depth	Stratigraphy	Description	Elevation (m)					
58								3.E-09
60			95.00					
62	19		94.00					
64							- fracture 65' (19.8m)	3.E-08
66			93.00					
68	21		92.00				- pressure grout bentonite seal	
70			91.00					1.E-08
72								
74	23		90.00				- fracture 76' (23.16m)	
76			89.00					
78							- fracture 81' (24.69m)	4.E-07
80			88.00					
82	25	Limestone	87.00					
84		Light grey, lithographic fossiliferous limestone with undulating shale partings. Stylolites are common. Numerous calcite stringers throughout. Occasional coarse crystalline zones.	86.00					5.E-08
86			85.00					9.E-08
88	27		84.00				- fracture 95' (28.96m)	
90			83.00				- 3m x 50mm dia. slot 10 PVC screen within #3 silica sand pack	3.E-06
92	29		82.00					
94			81.00				- fracture 103' (31.39m)	2.E-08
96	31		80.00					
98			79.00				- water bearing fracture 108' (32.9m)	1.E-08
100							- bentonite gravel seal	
102	33							
104								
106	35							
108								
110								
112								
114								
116		End of Borehole	78.00					

Drilled By: GET Drilling Ltd.
 Drill Method: Rotary Tri-cone
 Hole Size: 3.87" (98mm)
 Drill Date: December 9, 12, 2013

Drill Angle: Vertical
 Azimuth: n.a.
 Datum: NAD 83 Zone 18
 Checked By: P.T.

Sheet: 2 of 2



Project No: K-B9504-14

Well ID: M184

Project: South Property Investigation

Client: Waste Management

Location: Richmond Landfill, Napanee, ON

Easting: 336176

Northing: 4901998

Field Personnel: B.McC.

SUBSURFACE PROFILE				Well Construction	Rock Quality Designation % 20 60	Fracture Frequency/Run	Comments	K (m/sec)
Depth	Stratigraphy	Description	Elevation (m)					
-4 ft -2 m							MOE Well tag # A163299 - Elev. M184 m TOC - TOC s/u 0.43m	
0		Ground Surface	113.31					
2		Topsoil overlaying brown clay.	113.00					
4	1		112.00				- 5.75" (146mm) tri-cone to depth 10' (3.05m) - 4" (100mm) steel casing grouted with cement to 10' (3.05m)	
6			111.00					
8			110.00					
10	3		109.00					
12			108.00					
14			107.00					
16	5		106.00					
18			105.00				- fracture 18'4" (5.66m)	1.E-08
20			104.00					
22			103.00				- fracture 22' (6.7m) - fracture 23' (7m)	
24	7		102.00					
26			101.00					
28			100.00				- fracture 27'3" (8.3m) - fracture 28'10" (8.8m)	1.E-08
30	9		99.00					
32			98.00					
34			97.00					
36	11		96.00				- fracture 36' (11m)	1.E-08
38								
40							- fracture 40'4" (12.3m)	1.E-08
42	13							
44								
46								
48								
50	15							1.E-08
52								
54								
56	17							
58							- fracture 58' (17.7m)	

Drilled By: GET Drilling Ltd.
Drill Method: Rotary Tri-cone
Hole Size: 3.87" (98mm)
Drill Date: June 19, 20, 2014

Drill Angle: Vertical
Azimuth: n.a.
Datum: M178-1 Elev. 116.65m TOC
Checked By: P.T.

Sheet: 1 of 2



Project No: K-B9504-14

Project: South Property Investigation

Client: Waste Management

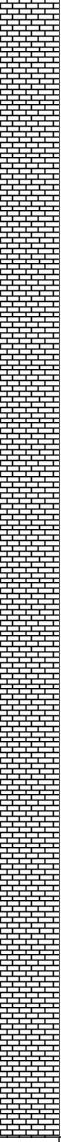
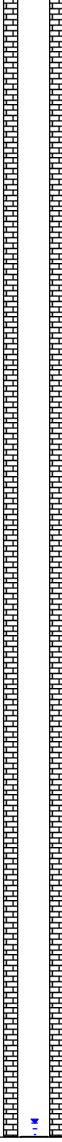
Location: Richmond Landfill, Napanee, ON

Well ID: M184

Easting: 336176

Northing: 4901998

Field Personnel: B.McC.

SUBSURFACE PROFILE				Well Construction	Rock Quality Designation		Fracture Frequency/Run	Comments	K (m/sec)
Depth	Stratigraphy	Description	Elevation (m)		20	60			
60		Limestone Light grey, lithographic fossiliferous limestone with undulating shale partings. Stylolites are common. Numerous calcite stringers throughout. Occasional coarse crystalline zones.	95.00					- fracture 60'8" (18.5m)	1.E-08
62			94.00						
64									
66			93.00						
68			92.00						1.E-08
70			91.00						
72			90.00						
74			89.00						
76			88.00					- fracture 83'6" (25.5m)	1.E-08
78			87.00						
80			86.00						
82			85.00					- fracture 91'9" (28m)	4.E-09
84			84.00					- fracture 93'6" (28.5m)	
86			83.00						6.E-09
88			82.00						
90			81.00						
92			80.00						1.E-08
94			79.00						2.E-08
96			78.00						
98			77.00						
100		End of Borehole							

Drilled By: GET Drilling Ltd.
Drill Method: Rotary Tri-cone
Hole Size: 3.87" (98mm)
Drill Date: June 19, 20, 2014

Drill Angle: Vertical
Azimuth: n.a.
Datum: M178-1 Elev. 116.65m TOC
Checked By: P.T.

Sheet: 2 of 2

Project No: K-B9504-14

Project: South Property Investigation

Client: Waste Management

Location: Richmond Landfill, Napanee, ON

Well ID: M185-1

Easting: 336175

Northing: 4902152

Field Personnel: B.McC.

SUBSURFACE PROFILE				Well Construction	Rock Quality Designation % 20 60	Fracture Frequency/Run	Comments	K (m/sec)
Depth	Stratigraphy	Description	Elevation (m)					
ft -4 -2 0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52	m						MOE Well tag # A163300 - Elev. M185 117.33 m TOC - TOC s/u 0.76m	
		Ground Surface	117.09					
		Topsoil overlaying brown clay.	116.97					
			116.00				- 5.75" (146mm) tri-cone to depth 6'6" (1.98m) - 4" (100mm) steel casing grouted with cement to 6'6" (1.98m)	
			115.00					
			114.00					
			113.00					
			112.00					
			111.00				- fracture 16'5" (5m)	2.E-08
			110.00				- bentonite gravel seal	
			109.00					
			108.00				- fracture 26'2" (8m)	1.E-09
			107.00					
			106.00				- fracture 32'9" (10m) - fracture 34'5" (10.5m) - fracture 36' (11m)	
			105.00				- fracture 39'5" (12m)	7.E-09
			104.00					
			103.00					
			102.00					
			101.00				- fracture trace water 49'2" (15m) - fracture 50'9" (15.5m)	1.E-06

Drilled By: GET Drilling Ltd.
Drill Method: Rotary Tri-cone
Hole Size: 3.87" (98mm)
Drill Date: June 17, 18, 2014

Drill Angle: Vertical
Azimuth: n.a.
Datum: M178-1 Elev. 116.65m TOC
Checked By: P.T.

Sheet: 1 of 2

Project No: K-B9504-14

Project: South Property Investigation

Client: Waste Management

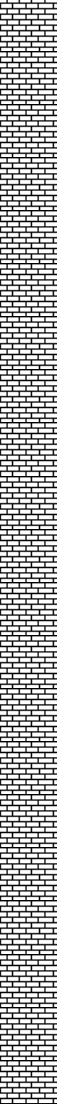
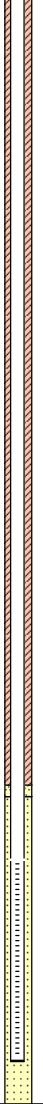
Location: Richmond Landfill, Napanee, ON

Well ID: M185-1

Easting: 336175

Northing: 4902152

Field Personnel: B.McC.

SUBSURFACE PROFILE				Well Construction	Rock Quality Designation	Fracture Frequency/Run	Comments	K (m/sec)
Depth	Stratigraphy	Description	Elevation (m)					
55		Limestone Light grey, lithographic fossiliferous limestone with undulating shale partings. Stylolites are common. Numerous calcite stringers throughout. Occasional coarse crystalline zones.	100.00				- bentonite gravel seal	1.E-06
57			99.00					
59			98.00					
61			97.00					
63			96.00					
65			95.00				- water bearing fracture 64'7" (19.7m) - fracture 65'7" (20m)	1.E-07 1.E-07
67			94.00					
69			93.00					
71			92.00					
73			91.00					
75			90.00				- fracture 75'6" (23m)	3.E-08
77			89.00					
79			88.00					
81			87.00					
83			86.00					
85			85.00					
87			84.00				- fracture 94'9" (28.9m)	4.E-08 2.E-08
89								
91								
93								
95								
97								
99								
101								
103								
105								
107								
109		End of Borehole						

Drilled By: GET Drilling Ltd.
Drill Method: Rotary Tri-cone
Hole Size: 3.87" (98mm)
Drill Date: June 17, 18, 2014

Drill Angle: Vertical
Azimuth: n.a.
Datum: M178-1 Elev. 116.65m TOC
Checked By: P.T.

Sheet: 2 of 2

Project No: K-B9504-14

Project: South Property Investigation

Client: Waste Management

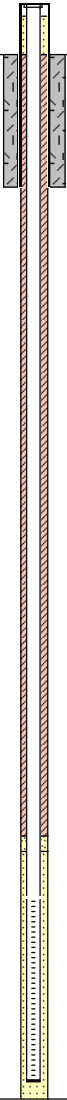
Location: Richmond Landfill, Napanee, ON

Well ID: M185-2

Easting: 336175

Northing: 4902152

Field Personnel: B.McC.

SUBSURFACE PROFILE				Well Construction	Rock Quality Designation % 20 60	Fracture Frequency/Run	Comments	K (m/sec)
Depth	Stratigraphy	Description	Elevation (m)					
ft -4 -2 0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56	m -1.2 -0.6 0 0.6 1.2 1.8 2.4 3.0 3.6 4.2 4.8 5.4 6.0 6.6 7.2 7.8 8.4 9.0 9.6 10.2 10.8 11.4 12.0 12.6 13.2 13.8 14.4 15.0 15.6 16.2 16.8	Ground Surface Topsoil overlaying brown clay.	117.68 116.00 115.00 114.00 113.00 112.00 111.00 110.00 109.00 108.00 107.00 106.00 105.00 104.00 103.00 102.00 101.00 100.00				MOE Well tag # A163304 - Elev. M185 117.38 m TOC - TOC s/u 0.70m - 5.75" (146mm) tri-cone to depth 7' (2.11m) - 4" (100mm) steel casing grouted with cement to 7' (2.11m) - bentonite gravel seal - water bearing fracture 20' (6.1m) - water bearing fracture 23' (6.1m) - fracture 32'9" (10m) - water bearing fracture 47' (14.3m) - 3m x 50mm dia. slot 10 PVC screen within #3 silica sand pack	
17		End of Borehole						

Drilled By: GET Drilling Ltd.
Drill Method: Rotary Tri-cone
Hole Size: 3.87" (98mm)
Drill Date: August 28, 29, 2014

Drill Angle: Vertical
Azimuth: n.a.
Datum: M178-1 Elev. 116.65m TOC
Checked By: P.T.

Sheet: 1 of 1

Project No: K-B9504-14

Project: South Property Investigation

Client: Waste Management

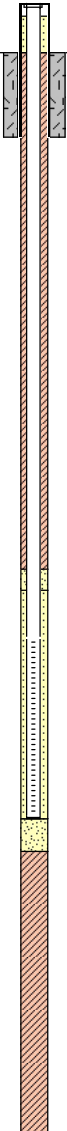
Location: Richmond Landfill, Napanee, ON

Well ID: M186

Easting: 336502

Northing: 4902641

Field Personnel: B.McC.

SUBSURFACE PROFILE				Well Construction	Rock Quality Designation % 20 60	Fracture Frequency/Run	Comments	K (m/sec)
Depth	Stratigraphy	Description	Elevation (m)					
ft -4 -2 0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 m		Ground Surface Topsoil with brown clay.	121.99 120.58				MOE Well tag # A163301 - Elev. M186 121.34 m TOC - TOC s/u 0.76m	
			120.00				- 5.75" (146mm) tri-cone to depth 4'6" (1.37m) - 4" (100mm) steel casing grouted with cement to 4'6" (1.37m)	
			119.00					
			118.00				- bentonite gravel seal	1.E-09
			117.00					
			116.00					
			115.00					
			114.00					
			113.00				- fracture 24'7" (7.5m) - fracture 25'3" (7.7m)	1.E-09
			112.00					
			111.00				- fracture trace water 31'1" (9.5m)	
			110.00				- 3m x 50mm dia. slot 10 PVC screen within #3 silica sand pack	1.E-07
			109.00					
			108.00				- fracture 39'5" (12m)	
			107.00					
			106.00					
			105.00				- fracture 49'2" (15m)	4.E-09 2.E-08
			104.00				- fracture 54'6" (16.6m)	4.E-08

Drilled By: GET Drilling Ltd.
Drill Method: Rotary Tri-cone
Hole Size: 3.87" (98mm)
Drill Date: June 17, 19, 2014

Drill Angle: Vertical
Azimuth: n.a.
Datum: M166 Elev. 123.19m TOC
Checked By: P.T.

Sheet: 1 of 2

Project No: K-B9504-14

Project: South Property Investigation

Client: Waste Management

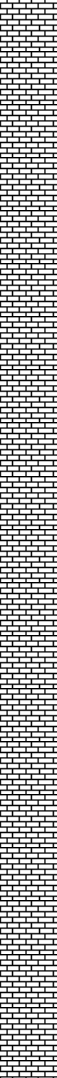
Location: Richmond Landfill, Napanee, ON

Well ID: M186

Easting: 336502

Northing: 4902641

Field Personnel: B.McC.

SUBSURFACE PROFILE				Well Construction	Rock Quality Designation % 20 60	Fracture Frequency/Run	Comments	K (m/sec)
Depth	Stratigraphy	Description	Elevation (m)					
59		Limestone Light grey, lithographic fossiliferous limestone with undulating shale partings. Stylolites are common. Numerous calcite stringers throughout. Occasional coarse crystalline zones.	102.00				- bentonite gravel seal	7.E-09
61			101.00					
63			100.00					
65			99.00					
67			98.00					
69			97.00					
71			96.00					
73			95.00					
75			94.00					
77			93.00					
79			92.00					
81			91.00					
83			90.00					
85			89.00					
87	29		88.00				- bentonite gravel seal	6.E-09 1.E-08
89			87.00					
91			86.00					
93			85.00					
95	31							
97								
99	33							
101								
103	35	End of Borehole						
105								
107								
109								
111								
113								
115								
117								

Drilled By: GET Drilling Ltd.
Drill Method: Rotary Tri-cone
Hole Size: 3.87" (98mm)
Drill Date: June 17, 19, 2014

Drill Angle: Vertical
Azimuth: n.a.
Datum: M166 Elev. 123.19m TOC
Checked By: P.T.

Sheet: 2 of 2

Project No: K-B9504-18

Project: South Property Investigation

Client: Waste Management

Location: Richmond Landfill, Napanee, ON

Well ID: M187

Easting: 335607

Northing: 4901972

Field Personnel: B.McC.

SUBSURFACE PROFILE				Well Construction	Rock Quality Designation	Fracture Frequency/Run	Comments	K (m/sec)
Depth	Stratigraphy	Description	Elevation (m)					
-3 ft -1 m		Ground Surface	115.76				MOE Well tag # A163222 - Elev. M187 116.31 m TOC - Elev. M187 116.20 m TPVC - TOC s/u 0.55m	
1	Clay	Brown, some silt and gravel. - 0.5m gravel till.	115.00				- 5.75" dia. (146mm) tri-cone to depth 8'6"	
3			114.00				- 4" dia. (100mm) steel casing grouted with cement to 8'6" (2.59m)	
5			113.00				- fracture 10'6" (3.2m)	
7			112.00				- fractures 13'6", 14', 15' (4.1,4.3, 4.6m)	
9			111.00				- fracture 16'5" (5m)	
11			110.00				- fracture 21' (6.4m)	
13			109.00				- bentonite gravel seal	
15			108.00				- fractures 33'6", 37', 37'8", 38'4" (10.2,11.3, 11.5, 11.7m)	
17			107.00				- fractures 39'5", 40'8", 41'8" (12,12.4, 12.7m)	
19			106.00				- fracture 47'7" (14.5m)	
21			105.00				- fractures 50'6", 51'9", 52'6" (15.4, 15.8, 16m)	
23			104.00					
25			103.00					
27			102.00					
29			101.00					
31			100.00					

Drilled By: GET Drilling Ltd.
Drill Method: Rotary Tri-cone
Hole Size: 3.87" (98mm)
Drill Date: Jan 27, Feb. 2, 2015

Drill Angle: Vertical
Azimuth: n.a.
Datum: NAD83
Checked By: P.T.

Sheet: 1 of 2



Project No: K-B9504-18

Project: South Property Investigation

Client: Waste Management

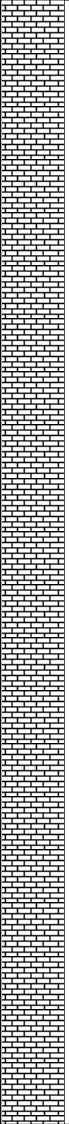
Location: Richmond Landfill, Napanee, ON

Well ID: M187

Easting: 335607

Northing: 4901972

Field Personnel: B.McC.

SUBSURFACE PROFILE				Well Construction	Rock Quality Designation	Fracture Frequency/Run	Comments	K (m/sec)
Depth	Stratigraphy	Description	Elevation (m)					
54		Limestone Light grey, lithographic fossiliferous limestone with undulating shale partings. Stylolites are common. Numerous calcite stringers throughout. Occasional coarse crystalline zones.	99.00				- fracture 57'5" (17.5m)	
56			98.00					
58			97.00					
60			96.00				- bentonite gravel seal - Water level elev. 96.17m recorded Nov. 20, 2015	
62			95.00					
64			94.00					
66			93.00					
68			92.00					
70			91.00				- #1 Silica sand pack	
72			90.00					
74			89.00				- water bearing fracture 86'3" (26.3m)	
76			88.00				3.0m x 38mm Slot 10 PVC screen within #3 silica sand pack.	
78			87.00				- fracture 92'6" 28.2m)	
80			86.00					
82			85.00					
84			84.00				- bentonite gravel seal	
106		End of Borehole						

Drilled By: GET Drilling Ltd.
Drill Method: Rotary Tri-cone
Hole Size: 3.87" (98mm)
Drill Date: Jan 27, Feb. 2, 2015

Drill Angle: Vertical
Azimuth: n.a.
Datum: NAD83
Checked By: P.T.

Sheet: 2 of 2





Project No: K-B9504-18

Project: South Property Investigation

Client: Waste Management

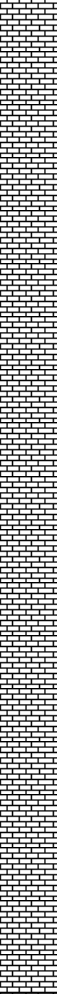
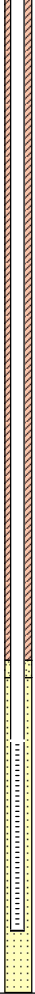
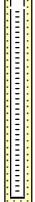
Location: Richmond Landfill, Napanee, ON

Well ID: M188

Easting: 335979

Northing: 4902069

Field Personnel: B.McC.

SUBSURFACE PROFILE				Well Construction	Rock Quality Designation	Fracture Frequency/Run	Comments	K (m/sec)
Depth	Stratigraphy	Description	Elevation (m)					
59		Limestone Light grey, lithographic fossiliferous limestone with undulating shale partings. Stylolites are common. Numerous calcite stringers throughout. Occasional coarse crystalline zones.	98.00		% 2060		- fracture 60'4" (18.4m)	4.1E-09
61			97.00				- bentonite gravel seal	
63			96.00					
65			95.00					
67			94.00					
69			93.00				- fracture 70'11" (21.6m)	6.5E-09
71			92.00					
73			91.00					
75			90.00					
77			89.00					
79			88.00				- #1 Silica sand pack	3.8E-09
81			87.00					
83			86.00					
85			85.00					
87			84.00					
89			83.00				- #1 silica sand	2.2E-08
91								
93								
95								
97								
99								
101	31		85.00				- water bearing fracture 100' (30.5m) 3.0m x 38mm Slot 10 PVC screen within #3 silica sand pack.	7.1E-06 4.8E-06
103			84.00					
105	33		83.00					
107								
109	35	End of Borehole	82.00					
111			81.00					
113								
115								
117			80.00					

Drilled By: GET Drilling Ltd.
Drill Method: Rotary Tri-cone
Hole Size: 3.87" (98mm)
Drill Date: Jan 28, Feb. 4, 2015

Drill Angle: Vertical
Azimuth: n.a.
Datum: NAD83
Checked By: P.T.

Sheet: 2 of 2





Project No: K-B9504-18

Project: South Property Investigation

Client: Waste Management

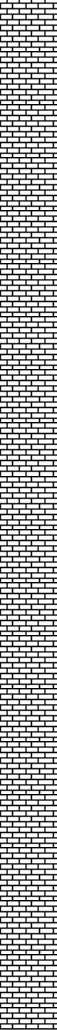
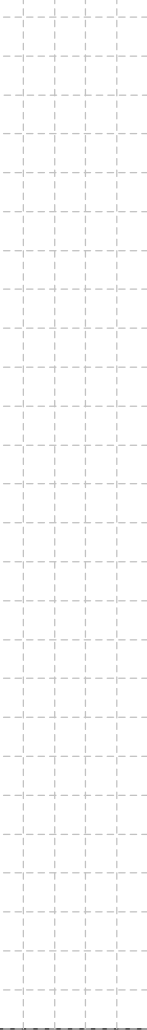
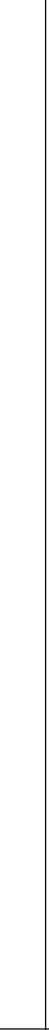
Location: Richmond Landfill, Napanee, ON

Well ID: M189

Easting: 335479

Northing: 4902099

Field Personnel: B.McC.

SUBSURFACE PROFILE				Well Construction	Rock Quality Designation %	Fracture Frequency/Run	Comments	K (m/sec)
Depth	Stratigraphy	Description	Elevation (m)					
59		Limestone Light grey, lithographic fossiliferous limestone with undulating shale partings. Stylolites are common. Numerous calcite stringers throughout. Occasional coarse crystalline zones.	102.00				- fractures 63' (19.2m)	3.4E-09
61			101.00					
63			100.00					
65			99.00					
67			98.00					
69			97.00					
71			96.00					
73			95.00					
75			94.00					
77			93.00					
79			92.00					
81			91.00					
83			90.00					
85			89.00					
87			88.00					
89			87.00					
91								
93								
95								
97								
99								
101	31		89.00				- fracture 97'10" (29.8m)	3.7E-11
103			88.00				- fracture 101'8" (31m)	1.3E-08
105								
107	33		87.00					
109								
111								
113	35	End of Borehole	86.00					
115			85.00					
117								

Drilled By: GET Drilling Ltd.
Drill Method: Rotary Tri-cone
Hole Size: 3.87" (98mm)
Drill Date: Jan 28, Feb. 3, 2015

Drill Angle: Vertical
Azimuth: n.a.
Datum: NAD83
Checked By: P.T.

Sheet: 2 of 2



Project No: K-B9504-18

Project: South Property Investigation

Client: Waste Management

Location: Richmond Landfill, Napanee, ON

Well ID: M190

Easting: 336274

Northing: 4902275

Field Personnel: B.McC.

SUBSURFACE PROFILE				Well Construction	Rock Quality Designation	Fracture Frequency/Run	Comments	K (m/sec)
Depth	Stratigraphy	Description	Elevation (m)					
ft -4 -2 0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52	m -1.2 -0.6 0 0.6 1.2 1.8 2.4 3.0 3.6 4.2 4.8 5.4 6.0 6.6 7.2 7.8 8.4 9.0 9.6 10.2 10.8 11.4 12.0 12.6 13.2 13.8 14.4 15.0 15.6 16.2 16.8 17.4 18.0 18.6 19.2 19.8 20.4 21.0 21.6 22.2 22.8 23.4 24.0 24.6 25.2 25.8 26.4 27.0 27.6 28.2 28.8 29.4 30.0 30.6 31.2 31.8 32.4 33.0 33.6 34.2 34.8 35.4 36.0 36.6 37.2 37.8 38.4 39.0 39.6 40.2 40.8 41.4 42.0 42.6 43.2 43.8 44.4 45.0 45.6 46.2 46.8 47.4 48.0 48.6 49.2 49.8 50.4 51.0 51.6 52.2 52.8 53.4 54.0 54.6 55.2 55.8 56.4 57.0 57.6 58.2 58.8 59.4 60.0 60.6 61.2 61.8 62.4 63.0 63.6 64.2 64.8 65.4 66.0 66.6 67.2 67.8 68.4 69.0 69.6 70.2 70.8 71.4 72.0 72.6 73.2 73.8 74.4 75.0 75.6 76.2 76.8 77.4 78.0 78.6 79.2 79.8 80.4 81.0 81.6 82.2 82.8 83.4 84.0 84.6 85.2 85.8 86.4 87.0 87.6 88.2 88.8 89.4 90.0 90.6 91.2 91.8 92.4 93.0 93.6 94.2 94.8 95.4 96.0 96.6 97.2 97.8 98.4 99.0 99.6 100.2 100.8 101.4 102.0							
		Ground Surface	117.90				MOE Well tag # A163225 - Elev. M190 118.00 m TOC - Elev. M190 117.90m TPVC - TOC s/u 0.68m	
		Clay Brown, some silt.	117.00				- Surface elev. 117.90m	
		Sand Till Grey, some gravel.	116.00				- Water level elev. 115.81m recorded Nov. 20, - 5.75" dia. (146mm) dia. tri-cone to depth 8'6" - 4" dia. (100mm) steel casing grouted with cement to 8'6" (2.59m)	
			115.00					
			114.00				- fracture 13'1" (4m)	
			113.00				- fracture 14'10" (4.5m) Centralizer	
			112.00					1.1E-09
			111.00				- fracture 22'7" (6.9m)	
		Limestone Light grey, lithographic fossiliferous limestone with undulating shale partings. Stylolites are common. Numerous calcite stringers throughout. Occasional coarse crystalline zones.	110.00					
			109.00				- bentonite gravel seal	
			108.00				- fracture 29'6" (9m)	2.9E-08
			107.00					
			106.00					2.4E-05
			105.00				- #1 Silica sand pack	
			104.00				- water bearing fracture 44'4" (13.5m) Centralizer	
			103.00					
			102.00				3.0m x 38mm Slot 10 PVC screen within #3 silica sand pack. - water bearing fracture 51'6" (15.7m)	2.5E-03

Drilled By: GET Drilling Ltd.
Drill Method: Rotary Tri-cone
Hole Size: 3.87" (98mm)
Drill Date: Jan. 27, Feb.5, 2015

Drill Angle: Vertical
Azimuth: n.a.
Datum: NAD83
Checked By: P.T.

Sheet: 1 of 2



Project No: K-B9504-18

Project: South Property Investigation

Client: Waste Management

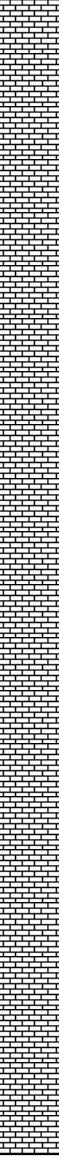
Location: Richmond Landfill, Napanee, ON

Well ID: M190

Easting: 336274

Northing: 4902275

Field Personnel: B.McC.

SUBSURFACE PROFILE				Well Construction	Rock Quality Designation	Fracture Frequency/Run	Comments	K (m/sec)	
Depth	Stratigraphy	Description	Elevation (m)		%				
					20				60
54		Limestone Light grey, lithographic fossiliferous limestone with undulating shale partings. Stylolites are common. Numerous calcite stringers throughout. Occassional coarse crystalline zones.					- fracture 61'5" (18.7m)	3.1E-06	
56			101.00						
58									
60									
62			19		99.00				
64									
66					98.00				
68			21						
70					97.00				
72									
74					96.00				
76			23						
78					95.00				
80									
82			25		94.00				
84									
86					93.00				
88			27						
90					92.00				
92									
94			29		91.00				
96									
98					90.00				
100									
102			31		89.00				
104									
106					88.00				
108		End of Borehole	87.00				- bentonite gravel seal	7.9E-09	
			86.00					1.3E-08	
			85.00						

Drilled By: GET Drilling Ltd.
Drill Method: Rotary Tri-cone
Hole Size: 3.87" (98mm)
Drill Date: Jan. 27, Feb.5, 2015

Drill Angle: Vertical
Azimuth: n.a.
Datum: NAD83
Checked By: P.T.

Sheet: 2 of 2



Project No: K-B9504-18

Project: South Property Investigation

Client: Waste Management

Location: Richmond Landfill, Napanee, ON

Well ID: M191

Easting: 336332

Northing: 4902802

Field Personnel: B.McC.

SUBSURFACE PROFILE				Well Construction	Rock Quality Designation	Fracture Frequency/Run	Comments	K (m/sec)
Depth	Stratigraphy	Description	Elevation (m)					
-3 ft -1 m		Ground Surface	122.81				MOE Well tag # A163226 - Elev. M191 123.31 m TOC - Elev. M191 123.21m TPVC - TOC s/u 0.50m	
1 3 5 7 9 11 13 15 17 19 21 23 25 27 29 31 33 35 37 39 41 43 45 47 49 51 53 55 57		Clay Dark to light brown, some silt trace organics.	122.00 121.00 120.00 119.00 118.00 117.00 116.00 115.00 114.00 113.00 112.00 111.00 110.00 109.00 108.00 107.00 106.00				- 5.75" dia. (146mm) tri-cone to depth 8'9" - 4" dia. (100mm) steel casing grouted with cement to 8'9" (2.67m) - fracture trace water 13' (4m) - fractures 16'9", 17'8" (5.1, 5.4m) - weaker bedrock 19' - 19'8" (5.8 - 6m) - fracture 22' (6.7m) - bentonite gravel seal - fracture 44' (13.4m) - fracture 52'2" (15.9m)	4.5E-07 4.0E-07 3.5E-08 3.5E-09 4.8E-09 3.7E-09 3.7E-11
		Limestone Light grey, lithographic fossiliferous limestone with undulating shale partings. Stylolites are common. Numerous calcite stringers throughout. Occasional coarse crystalline zones.						

Drilled By: GET Drilling Ltd.
Drill Method: Rotary Tri-cone
Hole Size: 3.87" (98mm)
Drill Date: Jan. 27, Feb. 6, 2015

Drill Angle: Vertical
Azimuth: n.a.
Datum: NAD83
Checked By: P.T.

Sheet: 1 of 2



Project No: K-B9504-18

Project: South Property Investigation

Client: Waste Management

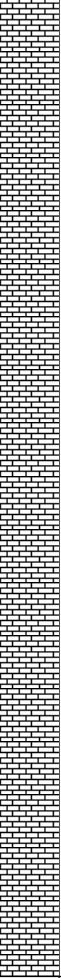
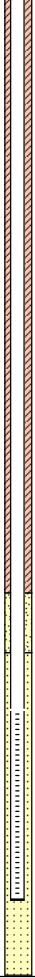
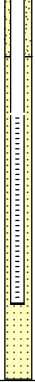
Location: Richmond Landfill, Napanee, ON

Well ID: M191

Easting: 336332

Northing: 4902802

Field Personnel: B.McC.

SUBSURFACE PROFILE				Well Construction	Rock Quality Designation % 20 60	Fracture Frequency/Run	Comments	K (m/sec)
Depth	Stratigraphy	Description	Elevation (m)					
59		Limestone Light grey, lithographic fossiliferous limestone with undulating shale partings. Stylolites are common. Numerous calcite stringers throughout. Occasional coarse crystalline zones.	105.00				- bentonite gravel seal	3.4E-09
61			104.00					
63			103.00					
65			102.00					
67			101.00					
69			100.00					
71			99.00					
73			98.00					
75			97.00					
77			96.00					
79			95.00					
81			94.00					
83			93.00					
85			92.00					
87			91.00					
89			90.00					
91			89.00					
93			88.00					
95								
97								
99								
101	31		92.00				3.0m x 38mm Slot 10 PVC screen within #3 silica sand pack.	2.0E-06 8.3E-07
103			91.00					
105			90.00					
107	33	End of Borehole	89.00					
109			88.00					
111								
113	35							
115								
117								

Drilled By: GET Drilling Ltd.
Drill Method: Rotary Tri-cone
Hole Size: 3.87" (98mm)
Drill Date: Jan. 27, Feb. 6, 2015

Drill Angle: Vertical
Azimuth: n.a.
Datum: NAD83
Checked By: P.T.

Sheet: 2 of 2



Project No: K-B9504-00-08

Project: South Property Investigation

Client: Waste Management

Location: Richmond Landfill, Napanee, ON

Well ID: M120 Abandoned July 15, 2013

Easting: 335322

Northing: 4902276

Field Personnel: B.M.

SUBSURFACE PROFILE				Well Construction	Rock Quality Designation % 20 60	Fracture Frequency/Run	Comments	K (m/sec)
Depth	Stratigraphy	Description	Elevation (m)					
ft -4 -2 0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 m		Ground Surface Brown, sandy silty Clay.	119.47 119.00 118.00 117.00 116.00 115.00 114.00 113.00 112.00 111.00 110.00 109.00 108.00 107.00 106.00 105.00 104.00				MOE Well tag #A130071 - Elev. M120 120.14m TOC - TOC (HW) s/u 0.67m - Hollow stem auger refusal 1'6" (0.46m) - HW casing pressure grouted with cement to 8' (2.43m)	

Limestone

Light grey, lithographic fossiliferous limestone with undulating shale partings. Stylolites are common. Numerous calcite stringers throughout. Occasional coarse crystalline zones.

Drilled By: Aardvark Drilling Inc.
Drill Method: Rotary Tri-cone
Hole Size: 3.78" (96mm)
Drill Date: May 16, 2012

Drill Angle: Vertical
Azimuth: n.a.
Datum: NAD 83 Zone 18
Checked By: P.T.

Sheet: 1 of 2

Project No: K-B9504-00-08

Project: South Property Investigation

Client: Waste Management

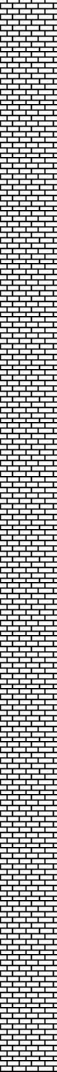
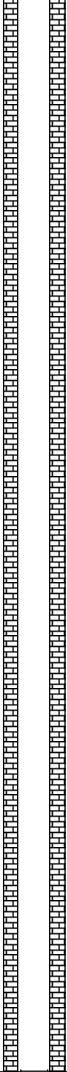
Location: Richmond Landfill, Napanee, ON

Well ID: M120 Abandoned July 15, 2013

Easting: 335322

Northing: 4902276

Field Personnel: B.M.

SUBSURFACE PROFILE				Well Construction	Rock Quality Designation	Fracture Frequency/Run	Comments	K (m/sec)
Depth	Stratigraphy	Description	Elevation (m)					
53		Limestone Light grey, lithographic fossiliferous limestone with undulating shale partings. Stylolites are common. Numerous calcite stringers throughout. Occasional coarse crystalline zones.	103.00					
55			102.00					
57			101.00					
59			100.00					
61			99.00					
63			98.00					
65			97.00					
67			96.00					
69			95.00					
71			94.00					
73			93.00					
75			92.00					
77			91.00					
79			90.00					
81			89.00					
83								
85								
87								
89								
91								
93								
95								
97								
99								
101								
103		End of Borehole	88.00					
105								

Drilled By: Aardvark Drilling Inc.

Drill Method: Rotary Tri-cone

Hole Size: 3.78" (96mm)

Drill Date: May 16, 2012

Drill Angle: Vertical

Azimuth: n.a.

Datum: NAD 83 Zone 18

Checked By: P.T.

Sheet: 2 of 2

Project No: K-B9504-00-08

Project: South Property Investigation

Client: Waste Management

Location: Richmond Landfill, Napanee, ON

Well ID: M124 Abandoned July 15, 2013

Easting: 335484

Northing: 4902337

Field Personnel: B.M.

SUBSURFACE PROFILE				Well Construction	Rock Quality Designation % 20 60	Fracture Frequency/Run	Comments	K (m/sec)
Depth	Stratigraphy	Description	Elevation (m)					
ft -4 -2 0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 m		Ground Surface	120.00				MOE Well tag #A130058 - Elev. M124 121.68m TOC - TOC (HW) s/u 0.86m	
		Brown, sandy silty Clay.	120.00				- Hollow stem auger refusal 3'6" (1.07m)	
			119.00					
			118.00				- HW casing pressure grouted with cement to 7'6" (2.28m)	
			117.00					
			116.00					
			115.00					
			114.00					
			113.00					
			112.00					
			111.00					
			110.00					
			109.00					
			108.00					
			107.00					
			106.00					

Drilled By: Aardvark Drilling Inc.

Drill Method: Rotary Tri-cone

Hole Size: 3.78" (96mm)

Drill Date: July 16, 17, 2012

Drill Angle: Vertical

Azimuth: n.a.

Datum: NAD 83 Zone 18

Checked By: P.T.

Sheet: 1 of 2

WESA

a BluMetric™ company

Project No: K-B9504-00-08

Project: South Property Investigation

Client: Waste Management

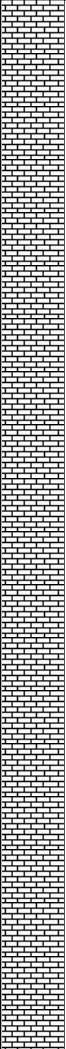
Location: Richmond Landfill, Napanee, ON

Well ID: M124 Abandoned July 15, 2013

Easting: 335484

Northing: 4902337

Field Personnel: B.M.

SUBSURFACE PROFILE				Well Construction	Rock Quality Designation		Fracture Frequency/Run	Comments	K (m/sec)
Depth	Stratigraphy	Description	Elevation (m)		%				
					20	60			
53		Limestone Light grey, lithographic fossiliferous limestone with undulating shale partings. Stylolites are common. Numerous calcite stringers throughout. Occassional coarse crystalline zones.							
55			17	104.00					
57				103.00					
59				102.00					
61			19	101.00					
63				100.00					
65				99.00					
67				98.00					
69			21	97.00					
71				96.00					
73				95.00					
75			23	94.00					
77				93.00					
79				92.00					
81			25	91.00					
83									
85									
87			27						
89									
91									
93									
95	29								
97									
99									
101	31	End of Borehole	90.00						
103									
105			89.00						

Drilled By: Aardvark Drilling Inc.

Drill Method: Rotary Tri-cone

Hole Size: 3.78" (96mm)

Drill Date: July 16, 17, 2012

Drill Angle: Vertical

Azimuth: n.a.

Datum: NAD 83 Zone 18

Checked By: P.T.

Sheet: 2 of 2

WESATM

a BluMetricTM company

a  BluMetric™ company

Project No: K-B9504-11

Project: South Property Investigation

Client: Waste Management

Location: Richmond Landfill, Napanee, ON

Well ID: M169 Abandoned July 15, 2013

Easting: 336278

Northing: 4902900

Field Personnel: B.M.

SUBSURFACE PROFILE				Well Construction	Rock Quality Designation		Fracture Frequency/Run	Comments	K (m/sec)
Depth	Stratigraphy	Description	Elevation (m)		%				
					20	60			
60		Limestone Light grey, lithographic fossiliferous limestone with undulating shale partings. Stylolites are common. Numerous calcite stringers throughout. Occasional coarse crystalline zones.	110.00				- fracture 59' (18m)	9.E-08	
62			109.00						
64			108.00						
66			107.00						
68			106.00						
70			105.00						
72			104.00						
74			103.00						
76			102.00						
78			101.00						
80			100.00						
82			99.00						
84			98.00						
86			97.00						
88			96.00						
90			95.00						
92			94.00						
94			93.00						
96			92.00						
98									
100									
102									
104									
106									
108									
110									
112									
114									
116									
118									
120									

Drilled By: GET Drilling Ltd.
Drill Method: Rotary Tri-cone
Hole Size: 3.87" (98mm)
Drill Date: March 6, 8, 2013

Drill Angle: Vertical
Azimuth: n.a.
Datum: NAD 83 Zone 18
Checked By: P.T.

Sheet: 2 of 2

Project No: K-B9504-11

Project: South Property Investigation

Client: Waste Management

Location: Richmond Landfill, Napanee, ON

Well ID: M171 Abandoned July 15, 2013

Easting: 335759

Northing: 4903206

Field Personnel: B.M.

SUBSURFACE PROFILE				Well Construction	Rock Quality Designation	Fracture Frequency/Run	Comments	K (m/sec)
Depth	Stratigraphy	Description	Elevation (m)					
ft -4 -2 0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58	m -1.2 -0.6 0 0.6 1.2 1.8 2.4 3.0 3.6 4.2 4.8 5.4 6.0 6.6 7.2 7.8 8.4 9.0 9.6 10.2 10.8 11.4 12.0 12.6 13.2 13.8 14.4 15.0 15.6 16.2 16.8 17.4 18.0							
		Ground Surface	129.56				MOE Well tag #A146355 - Elev. M171 130.32m TOC - TOC s/u 0.76m	
		Brown, clay till.	129.00 128.00 127.00 126.00 125.00				- Hollow stem auger to 19'6" (5.94m)	
		Gravel	124.00				- 4" (100mm) steel casing pressure grouted with cement to 19'6" (5.94m) - fractures 20', 23' and 25' (6.09, 7.01 and 7.62m)	
		Limestone Light grey, lithographic fossiliferous limestone with undulating shale partings. Stylolites are common. Numerous calcite stringers throughout. Occasional coarse crystalline zones.	123.00 122.00 121.00 120.00 119.00 118.00 117.00 116.00 115.00 114.00 113.00 112.00				- moderately wide fracture 28' (8.53m) - fracture 34' (10.36m) - moderately wide fracture 37' (11.27m) - moderately wide fracture 47' (14.32m) - fracture 50' (15.24m) - fracture 56' (17.07m)	7.E-09 4.E-10 5.E-08

Drilled By: GET Drilling Ltd.
Drill Method: Rotary Tri-cone
Hole Size: 3.87" (98mm)
Drill Date: March 7, 18, 2013

Drill Angle: Vertical
Azimuth: n.a.
Datum: NAD 83 Zone 18
Checked By: P.T.

Sheet: 1 of 2

Project No: K-B9504-11

Project: South Property Investigation

Client: Waste Management

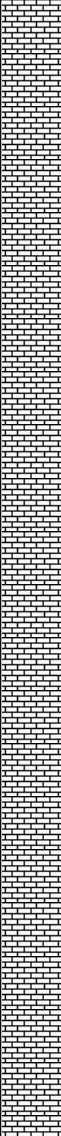
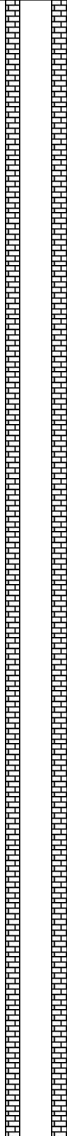
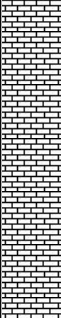
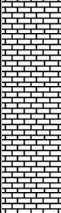
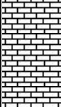
Location: Richmond Landfill, Napanee, ON

Well ID: M171 Abandoned July 15, 2013

Easting: 335759

Northing: 4903206

Field Personnel: B.M.

SUBSURFACE PROFILE				Well Construction	Rock Quality Designation		Fracture Frequency/Run	Comments	K (m/sec)
Depth	Stratigraphy	Description	Elevation (m)						
					20	60			
60		Limestone Light grey, lithographic fossiliferous limestone with undulating shale partings. Stylolites are common. Numerous calcite stringers throughout. Occasional coarse crystalline zones.	111.00					- fracture 62' (18.9m)	3.E-09
62			110.00						
64			109.00						
66			108.00						
68			107.00						
70			106.00						
72			105.00						
74			104.00						
76			103.00						
78			102.00						
80			101.00						
82			100.00						
84			99.00						
86			98.00						
88			97.00						
90			96.00						
92			95.00						
94			94.00						
96			93.00						
98									
100									
102									
104									
106									
108									
110									
112									
114									
116									
118									
120			End of Borehole	93.00					

Drilled By: GET Drilling Ltd.
Drill Method: Rotary Tri-cone
Hole Size: 3.87" (98mm)
Drill Date: March 7, 18, 2013

Drill Angle: Vertical
Azimuth: n.a.
Datum: NAD 83 Zone 18
Checked By: P.T.

Sheet: 2 of 2

APPENDIX A.2

DGI Geoscience Logs (on CD)



APPENDIX A.3

Packer Test Results

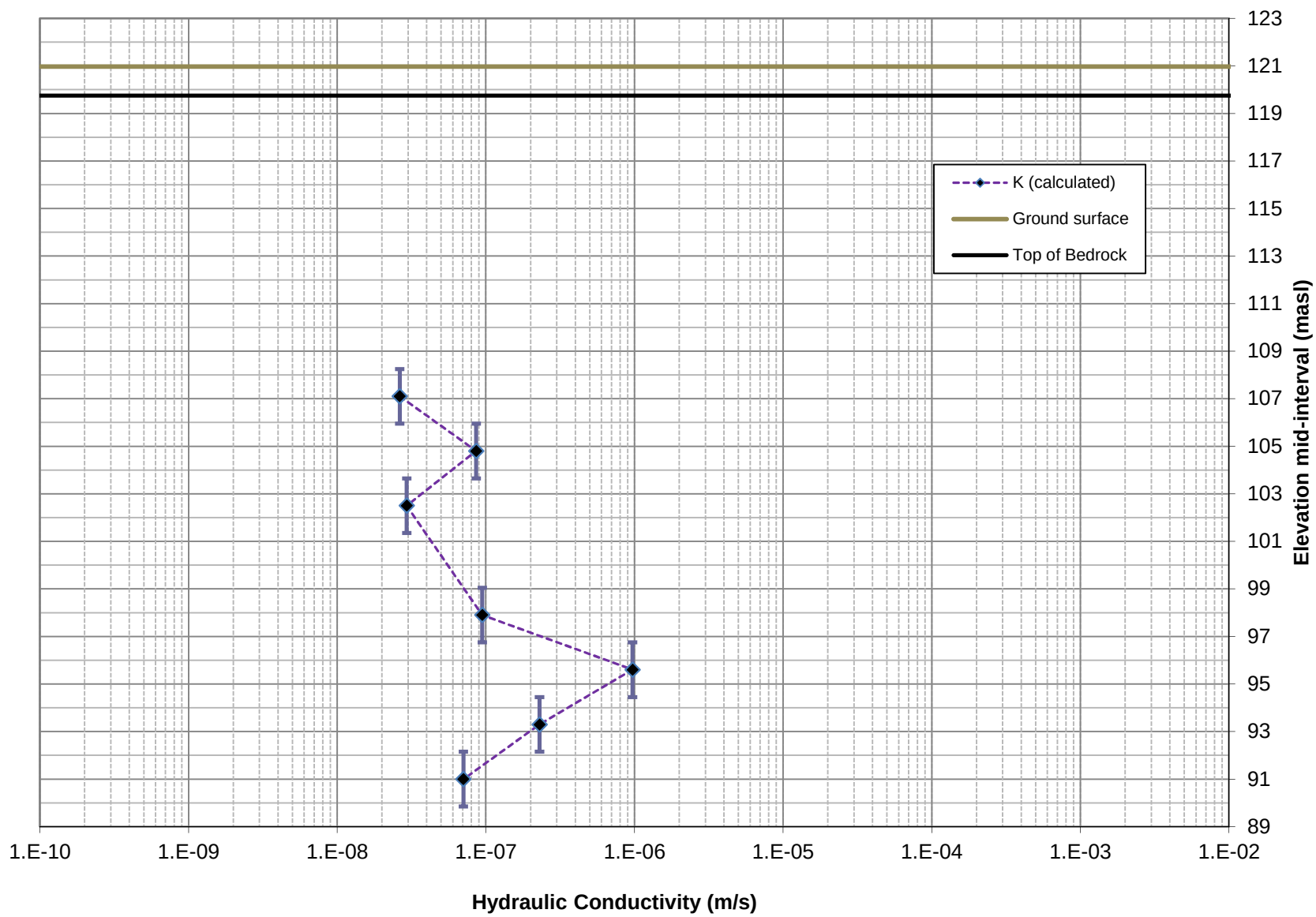


APPENDIX A.3

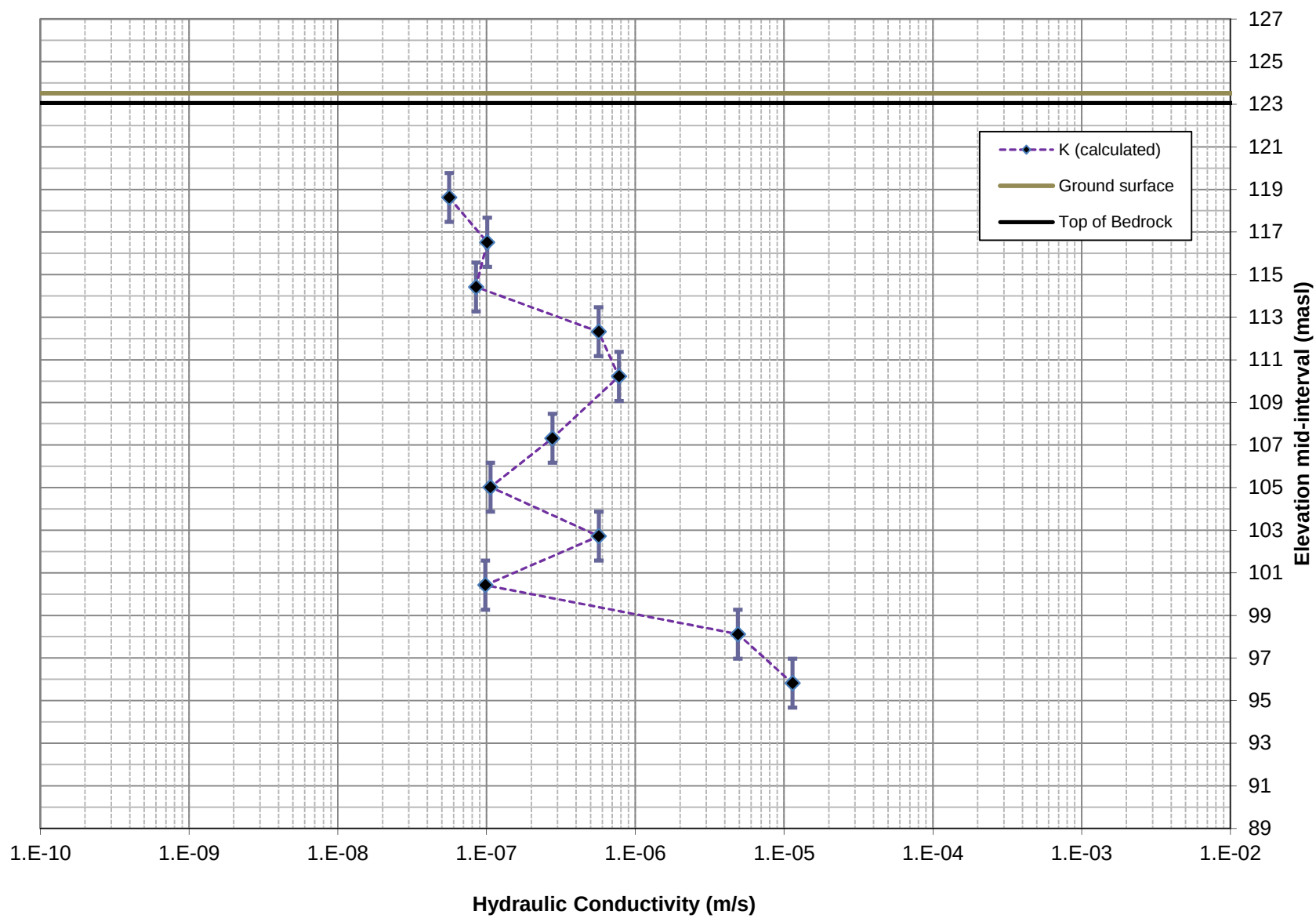
Packer Test Results



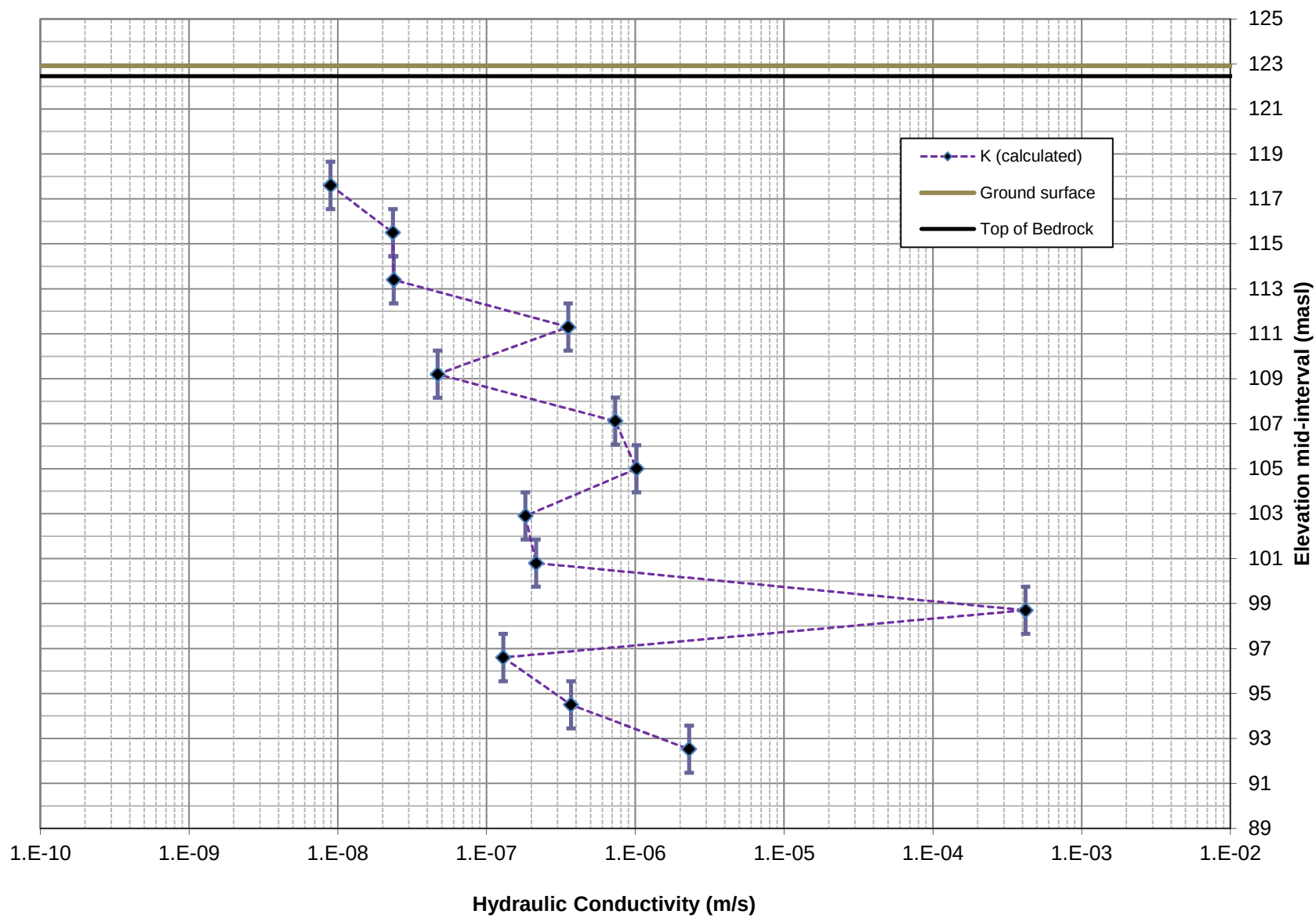
M121 - Hydraulic Conductivity (K) Profile



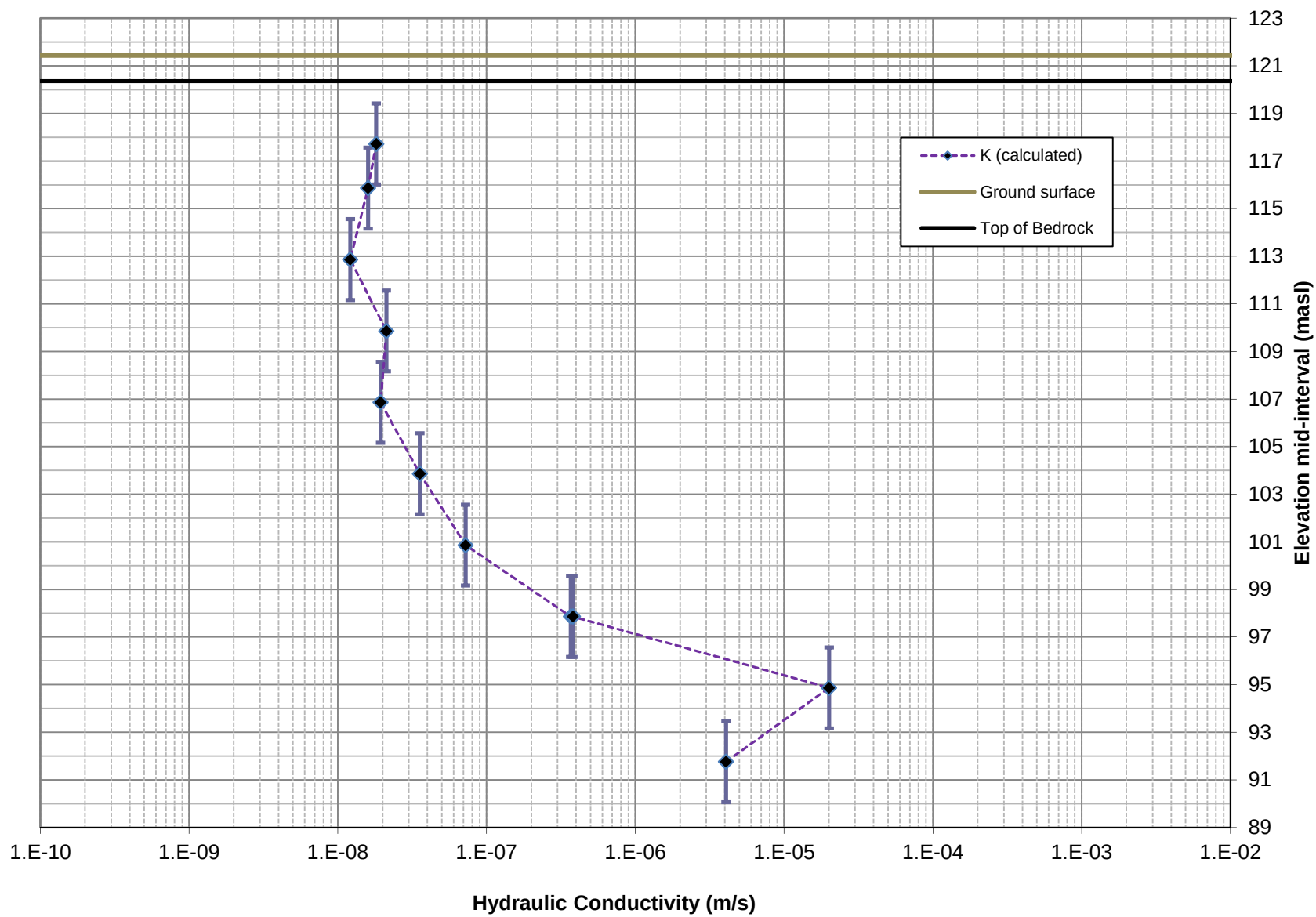
M122 - Hydraulic Conductivity (K) Profile



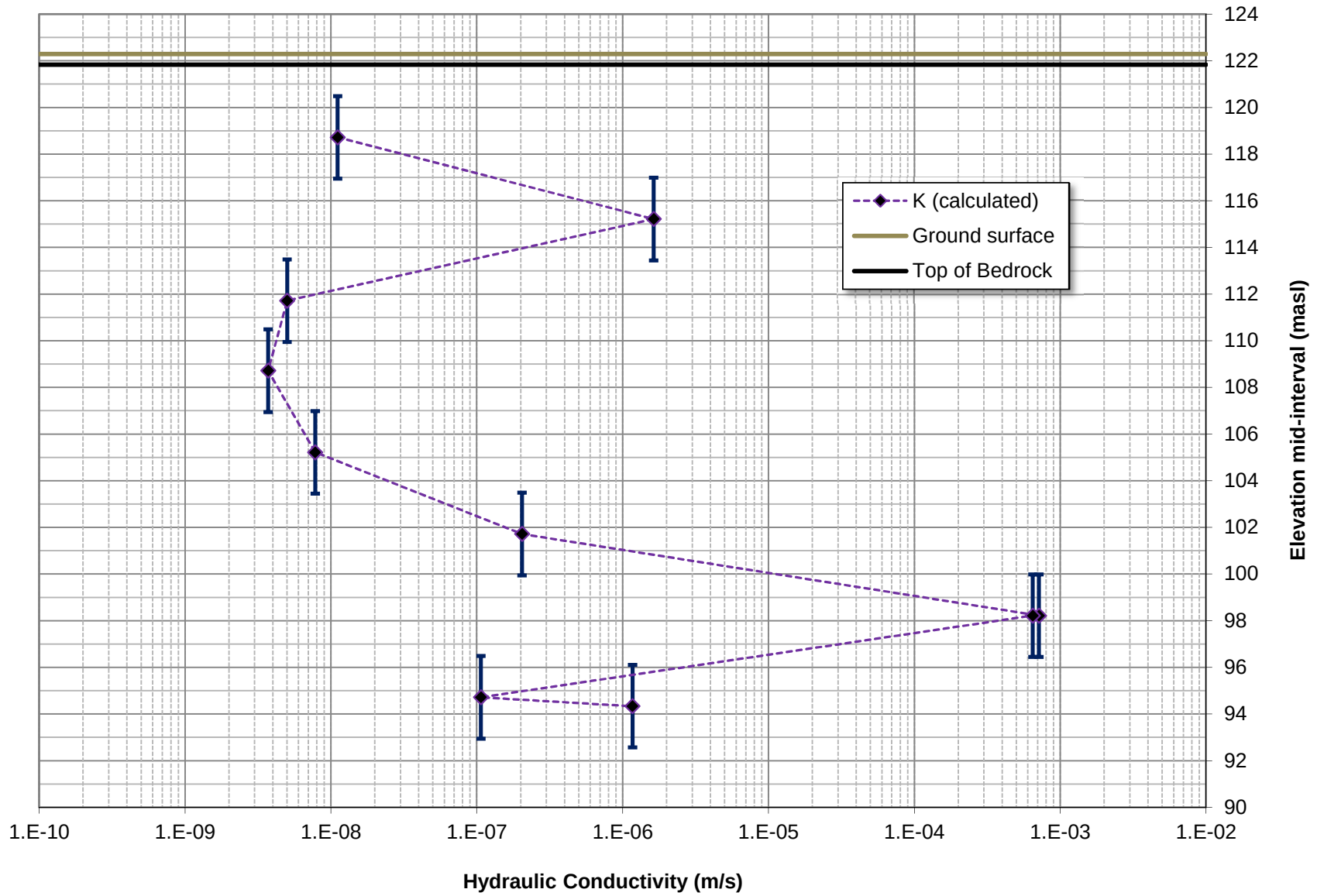
M123 - Hydraulic Conductivity (K) Profile



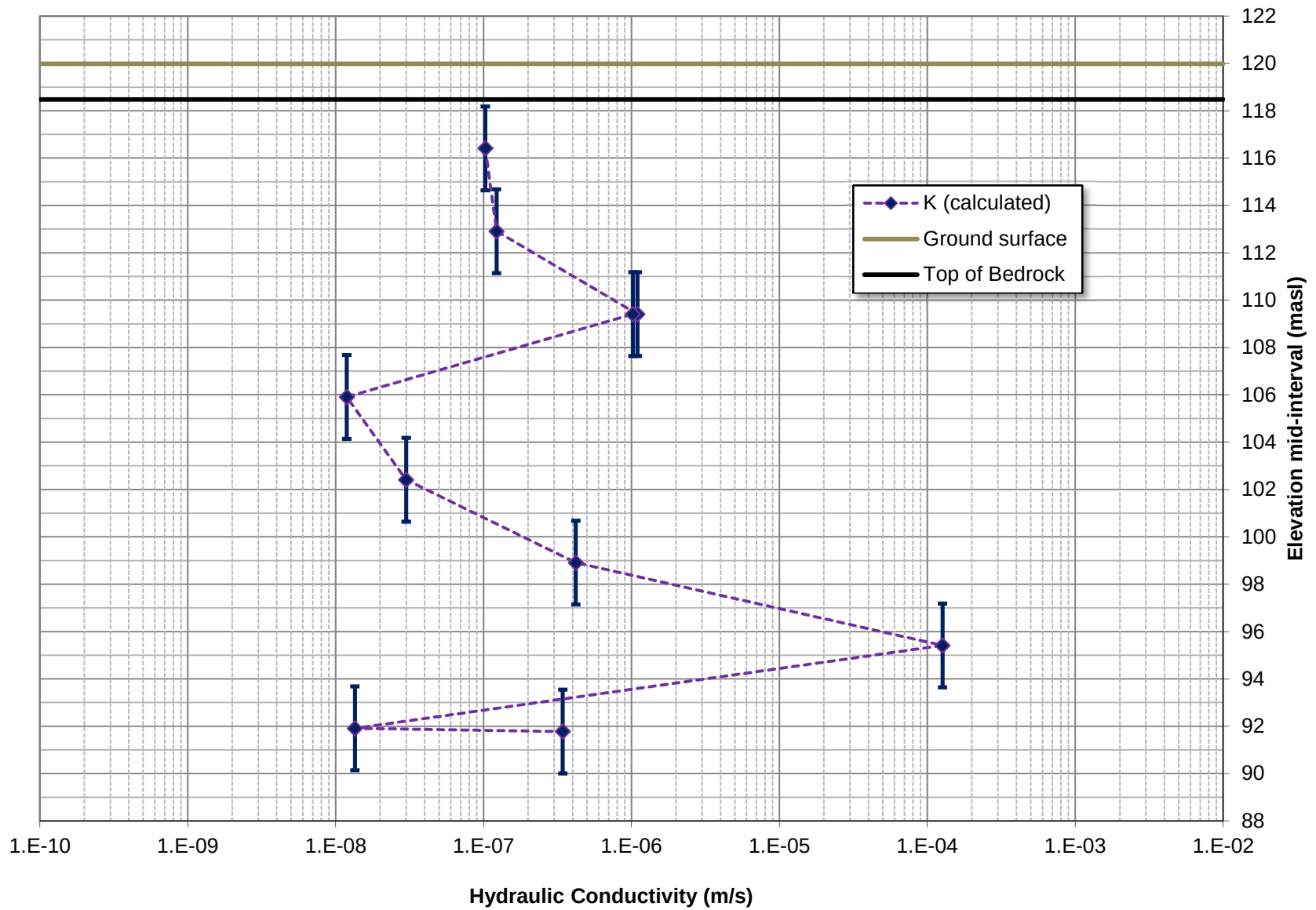
M125 - Hydraulic Conductivity (K) Profile



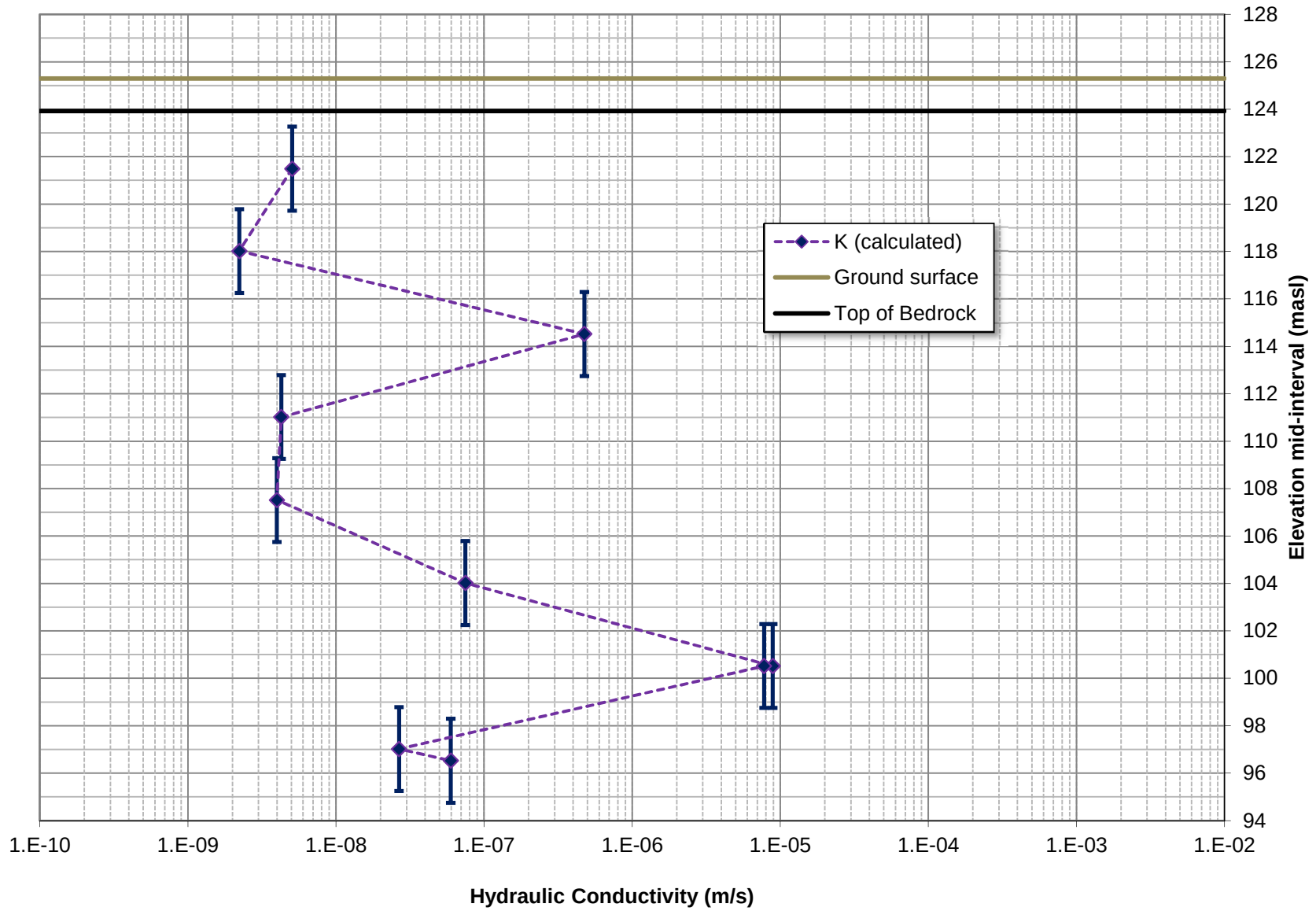
M166 - Hydraulic Conductivity (K) Profile



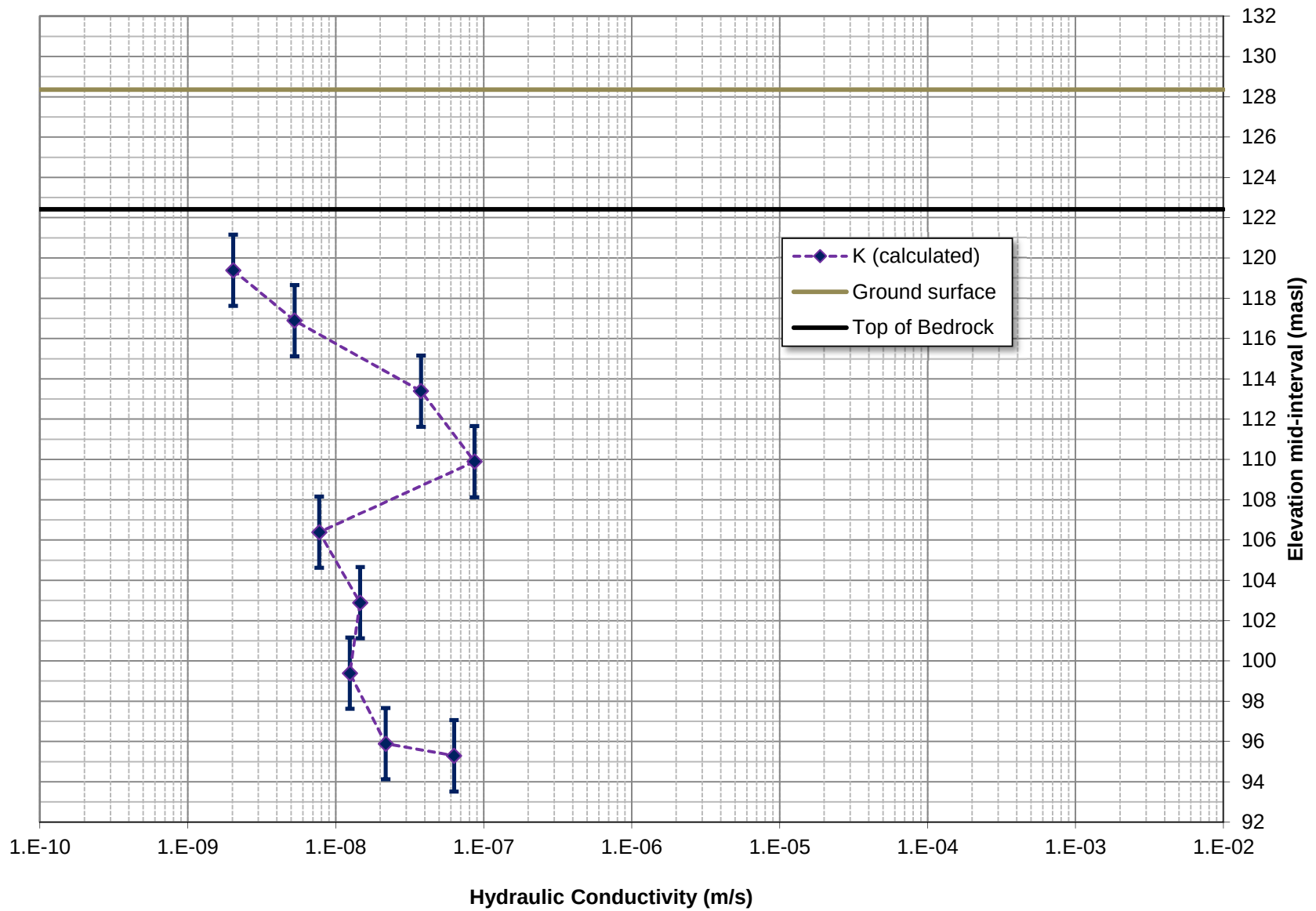
M167 - Hydraulic Conductivity (K) Profile



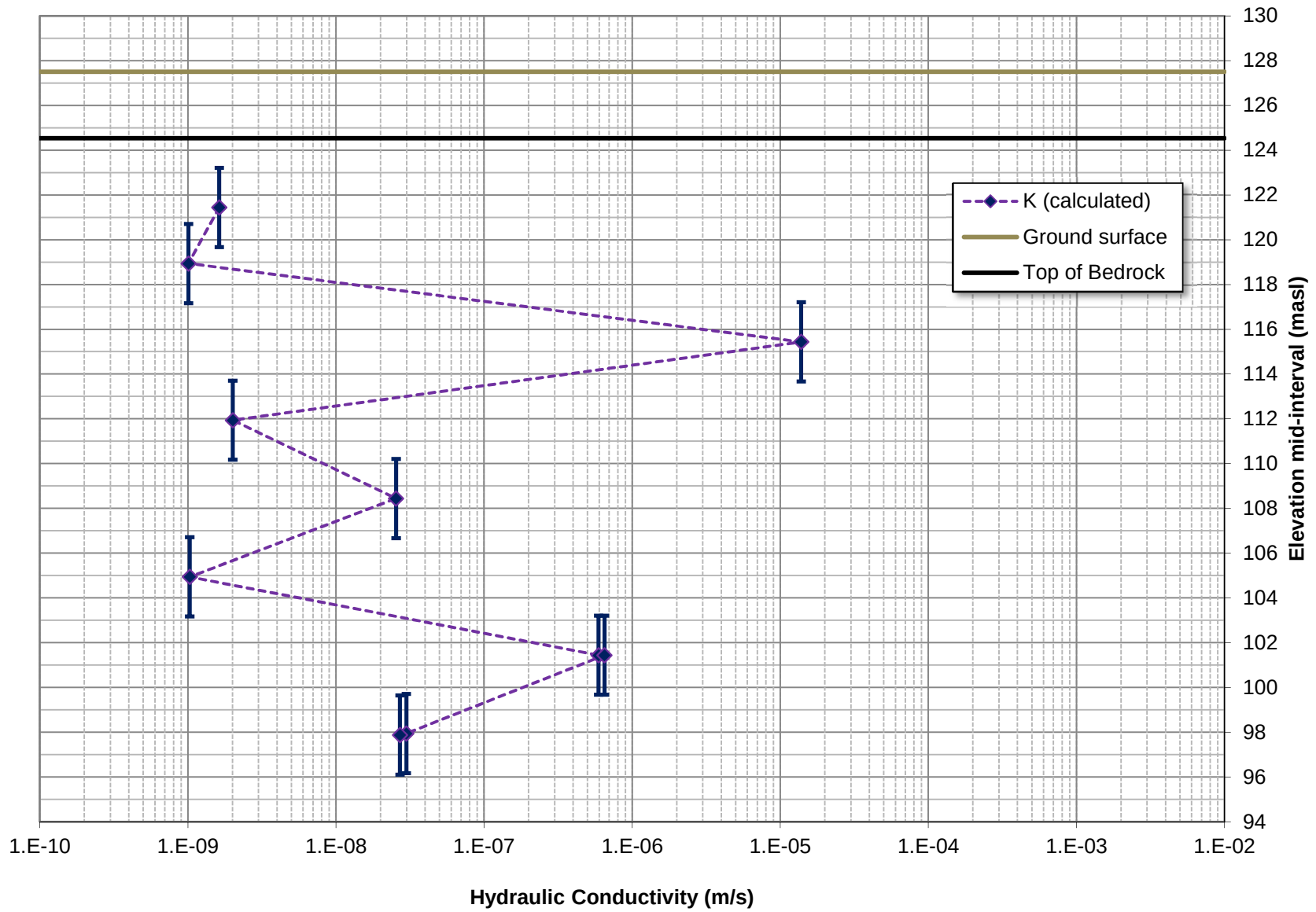
M168 - Hydraulic Conductivity (K) Profile



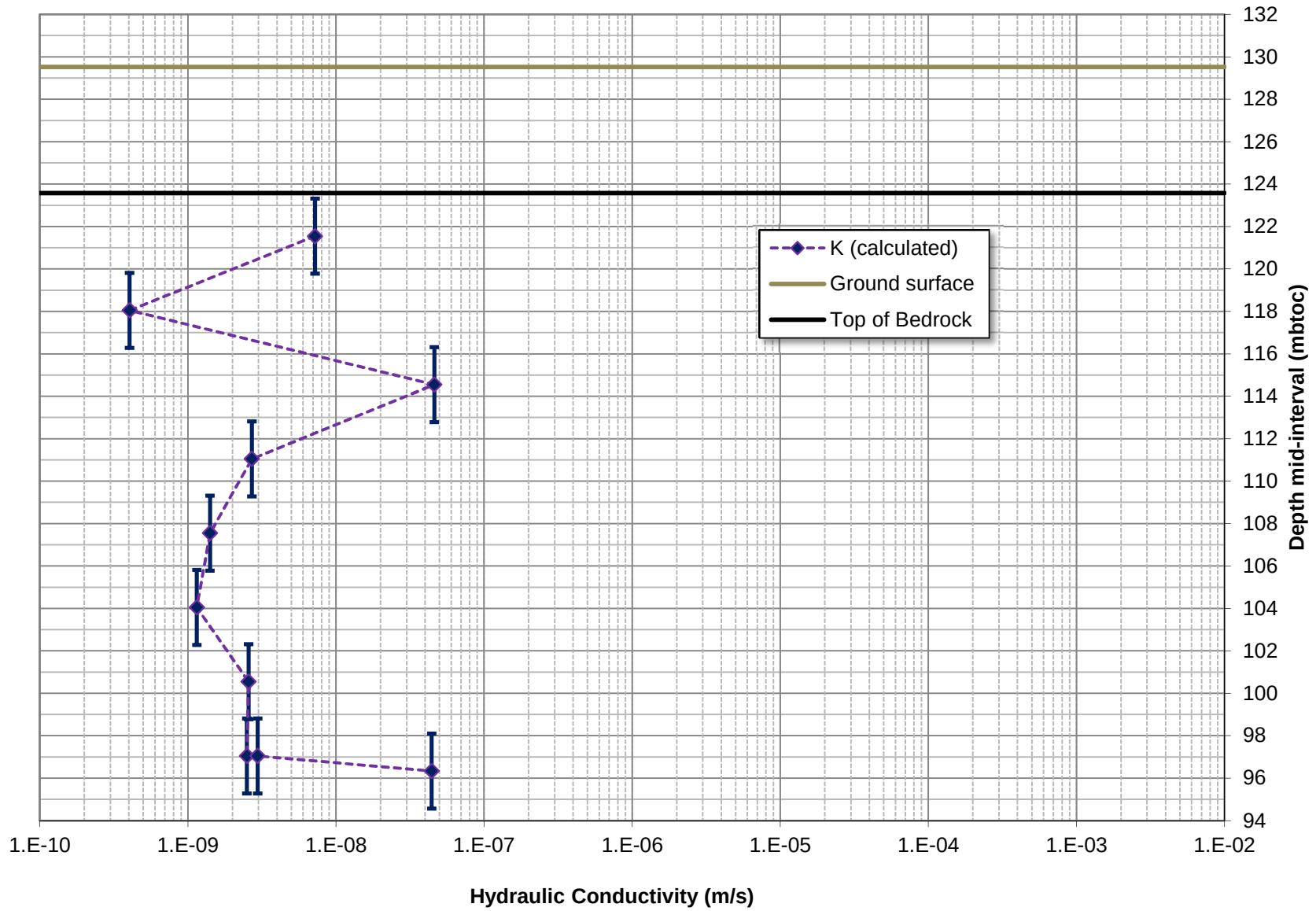
M169 - Hydraulic Conductivity (K) Profile



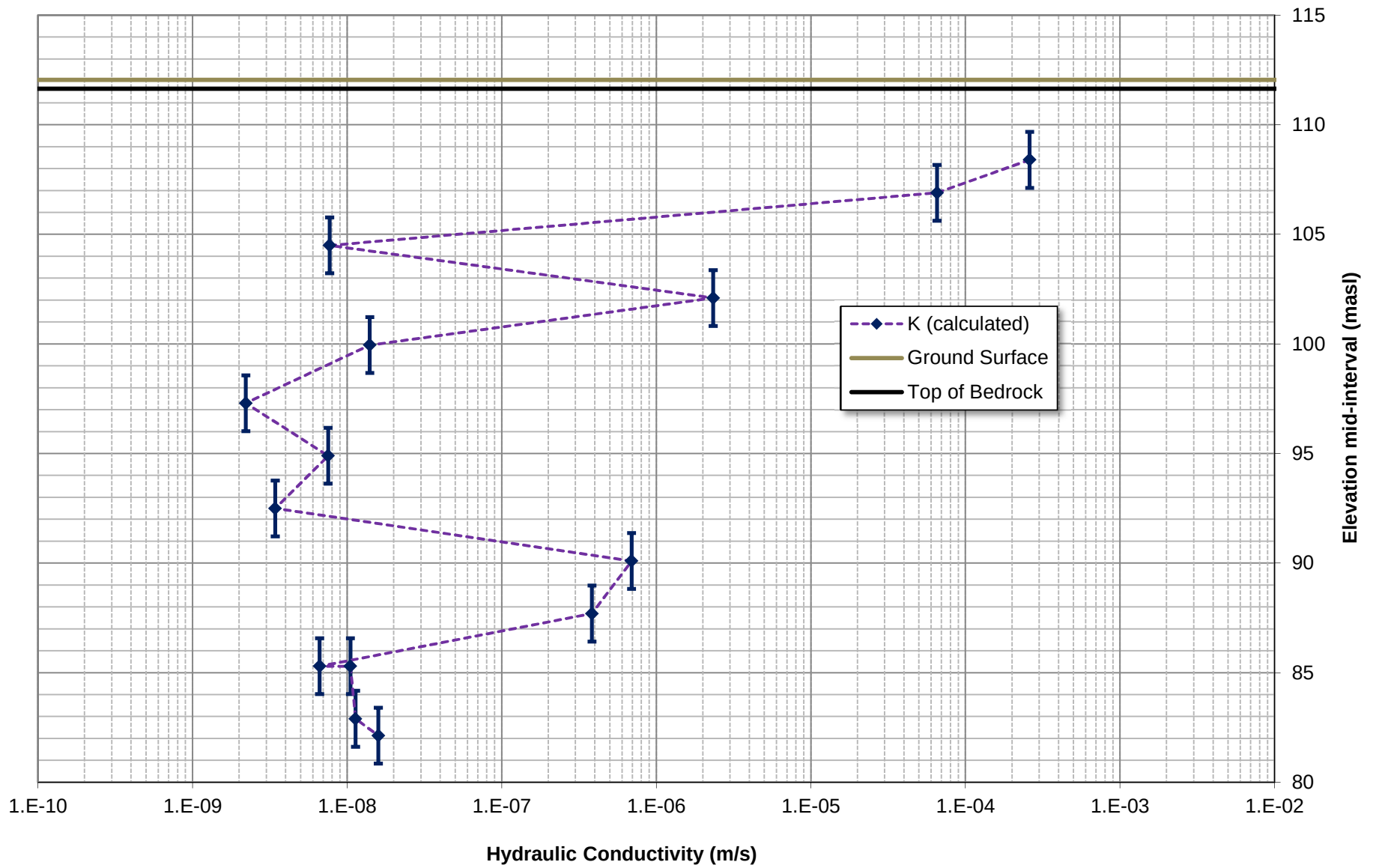
M170 - Hydraulic Conductivity (K) Profile



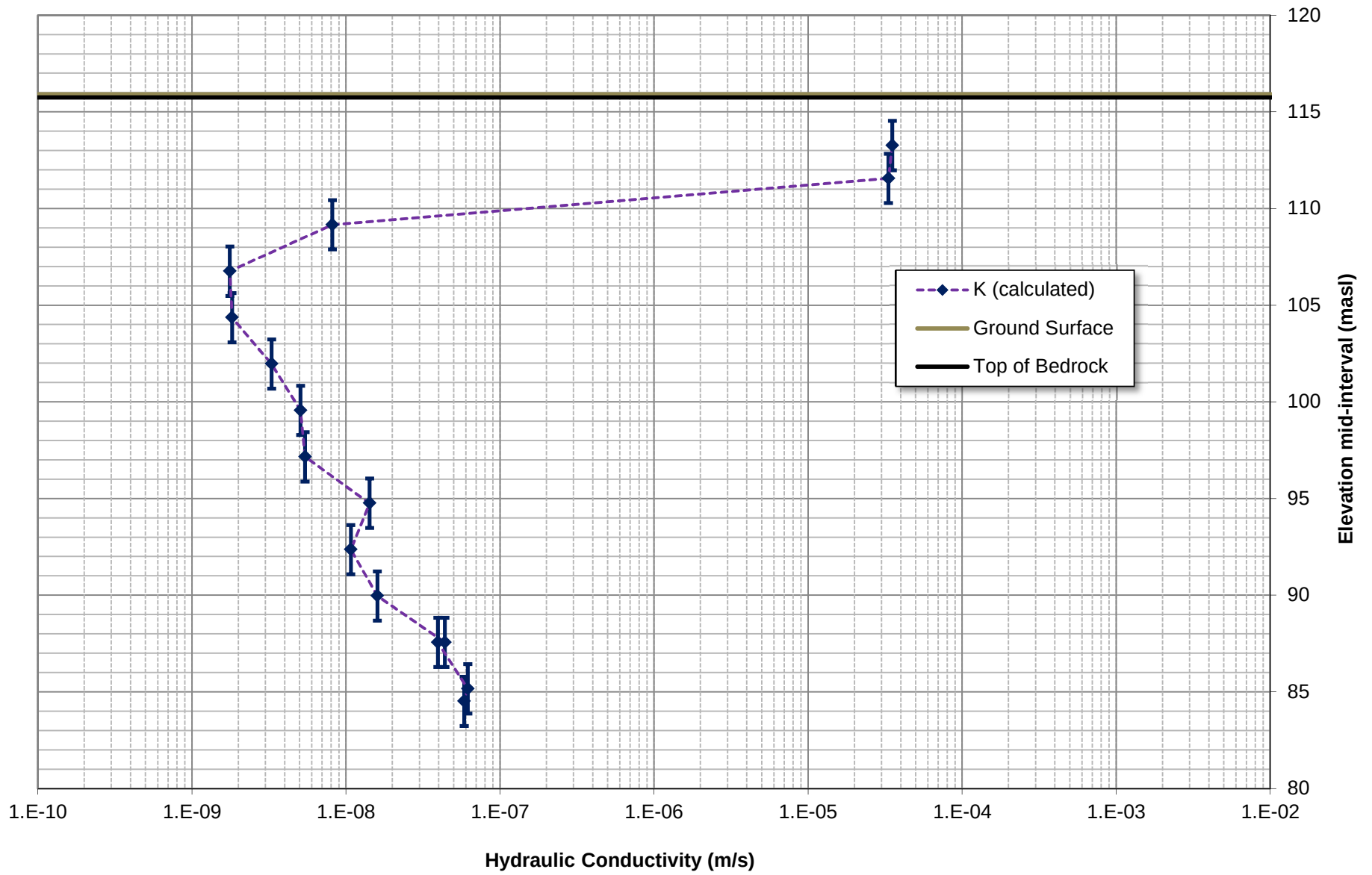
M171 - Hydraulic Conductivity vs Depth



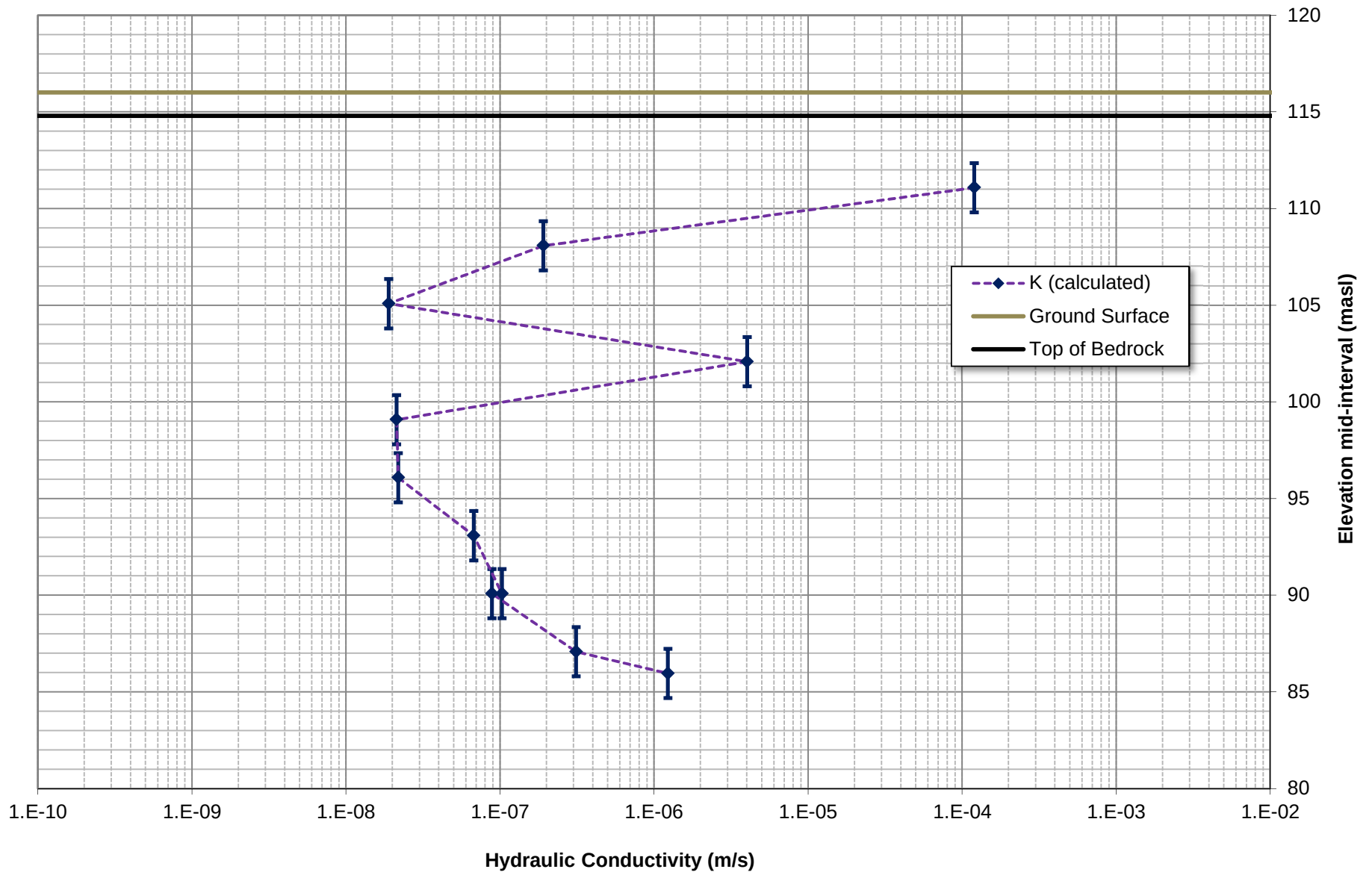
M176 - Hydraulic Conductivity (K) Profile



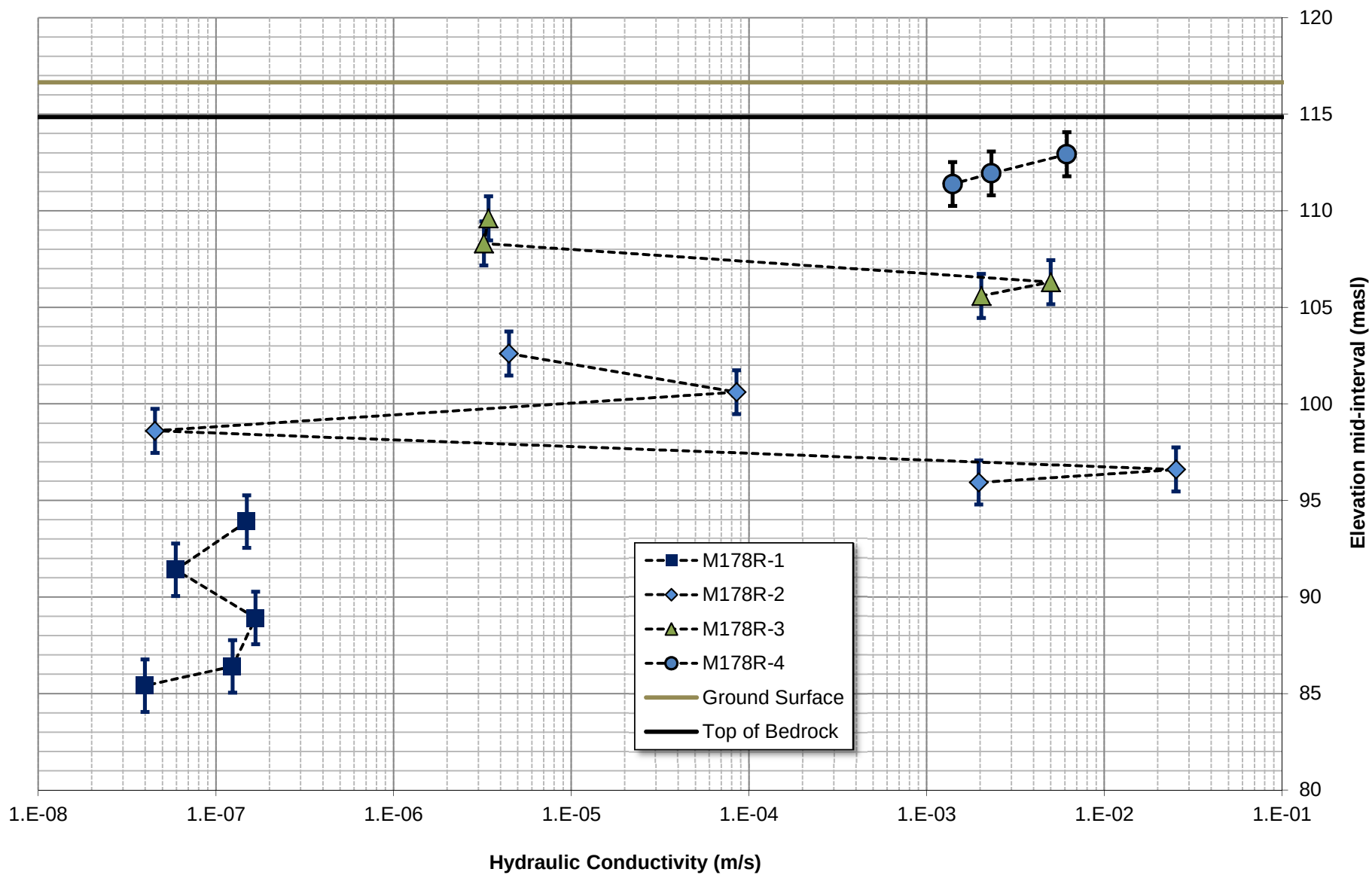
M177 - Hydraulic Conductivity (K) Profile



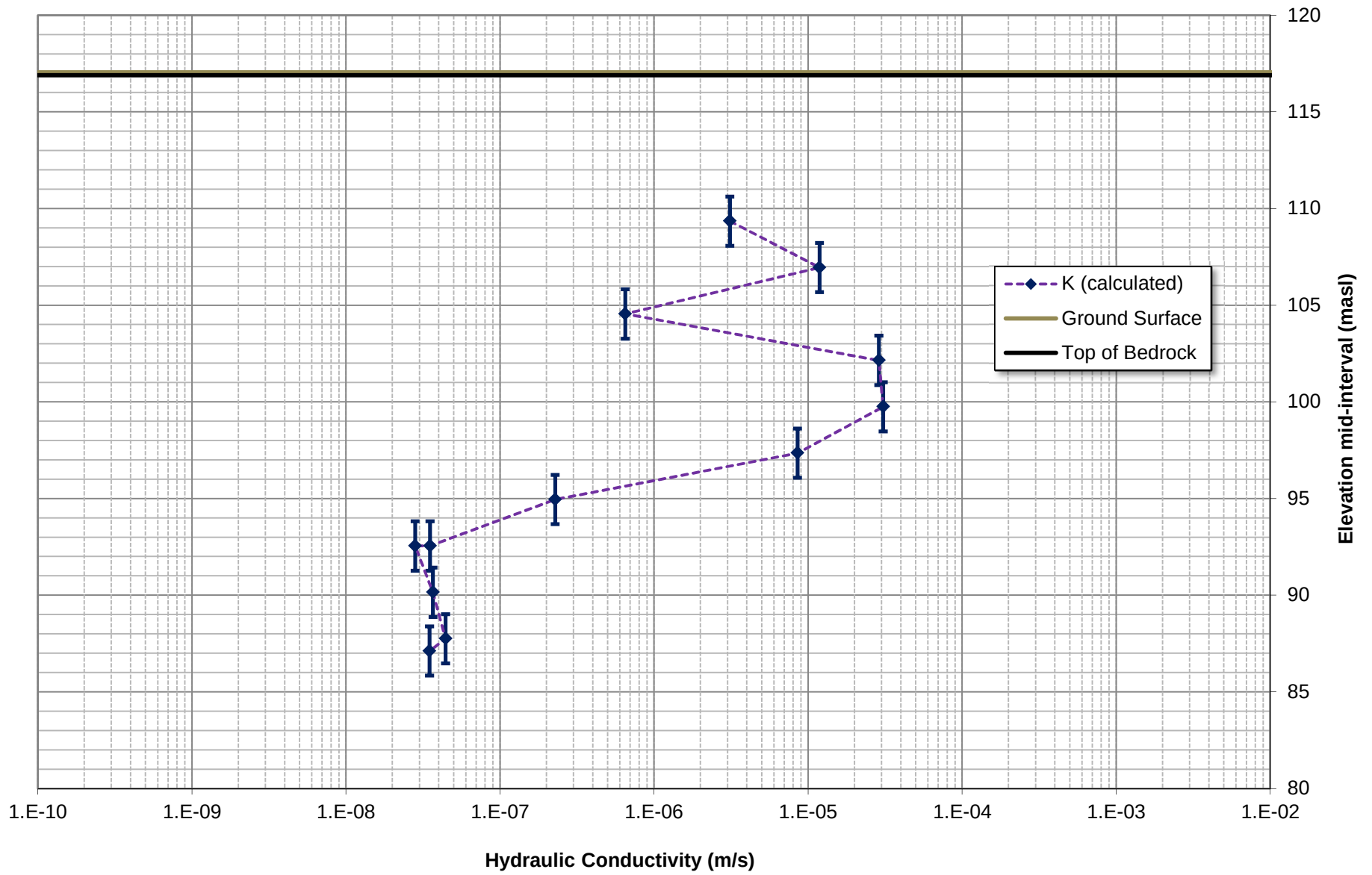
M178 - Hydraulic Conductivity (K) Profile



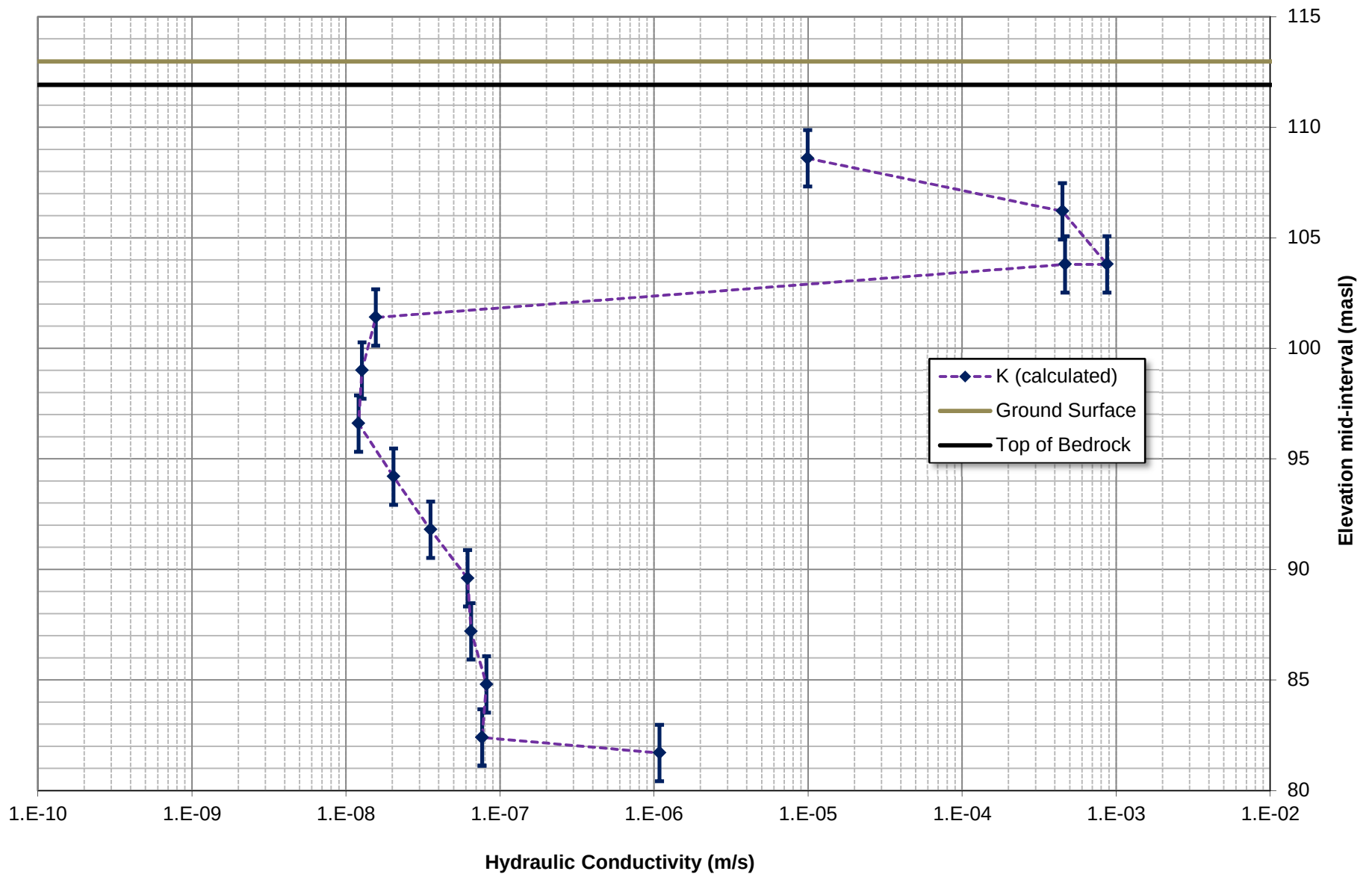
M178R - Composite Hydraulic Conductivity (K) Profile
(combined results from M178R-1, M178R-2, M178R-3 and M178R-4)



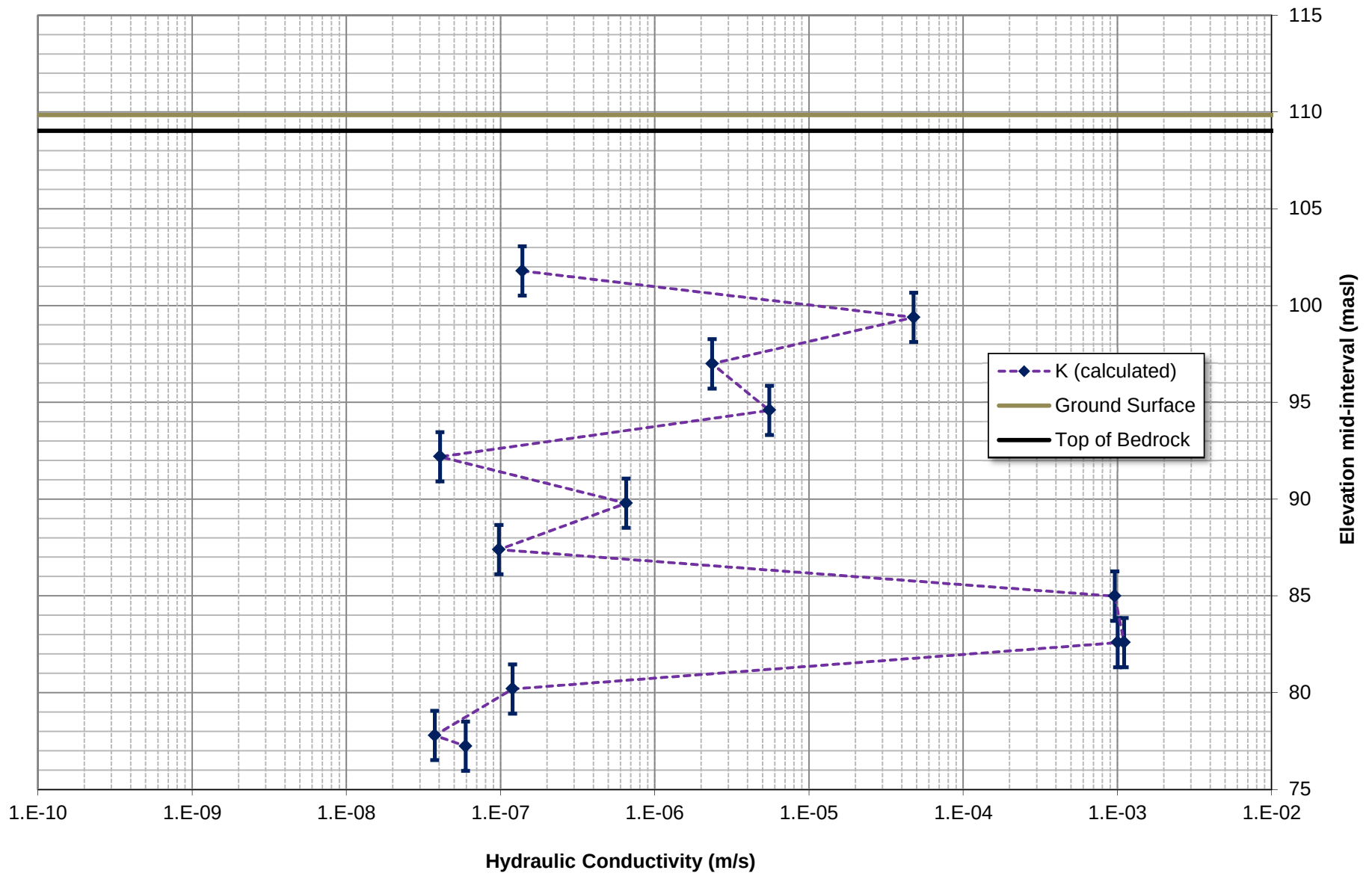
M179 - Hydraulic Conductivity (K) profile



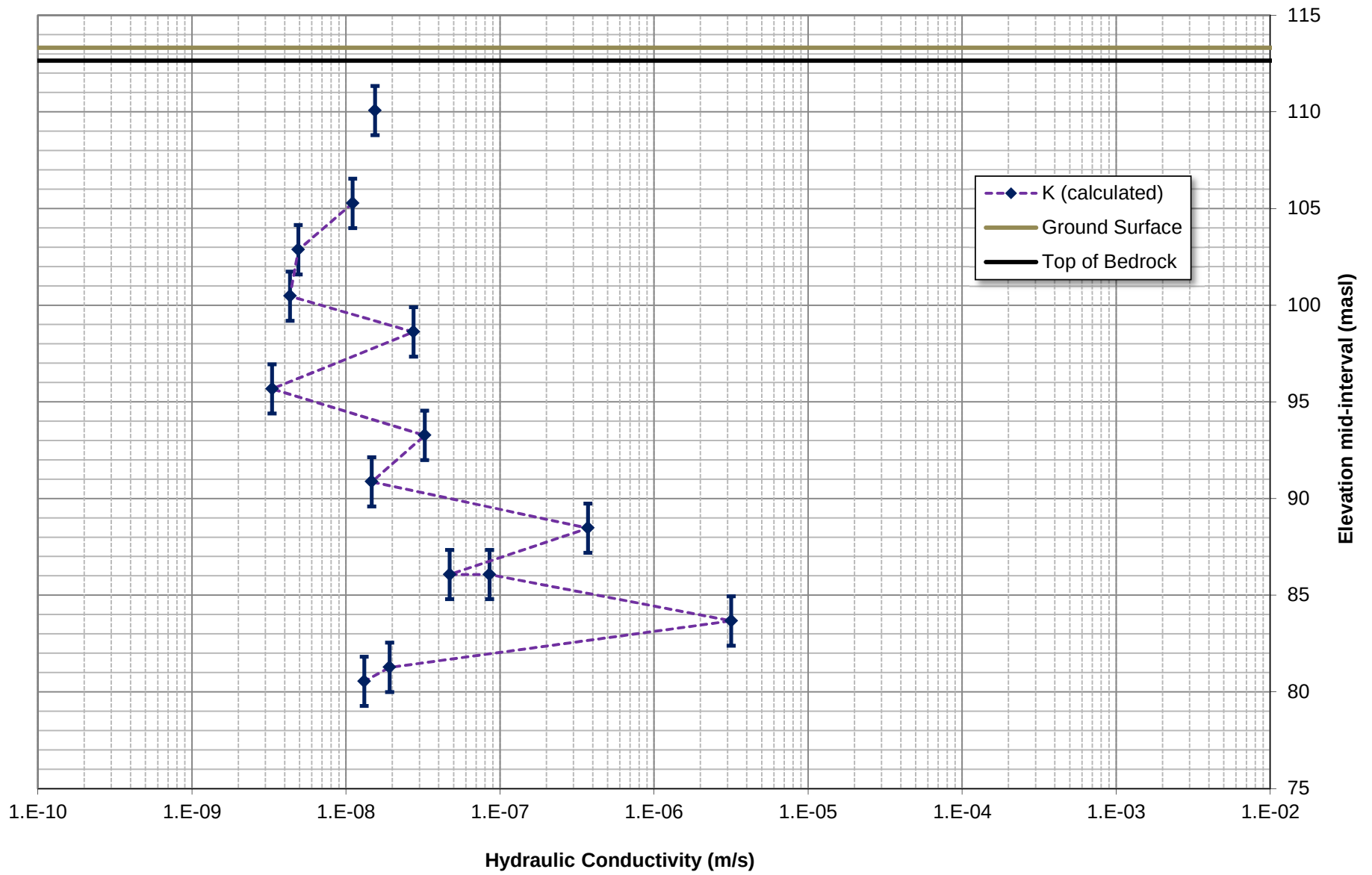
M180 - Hydraulic Conductivity (K) profile



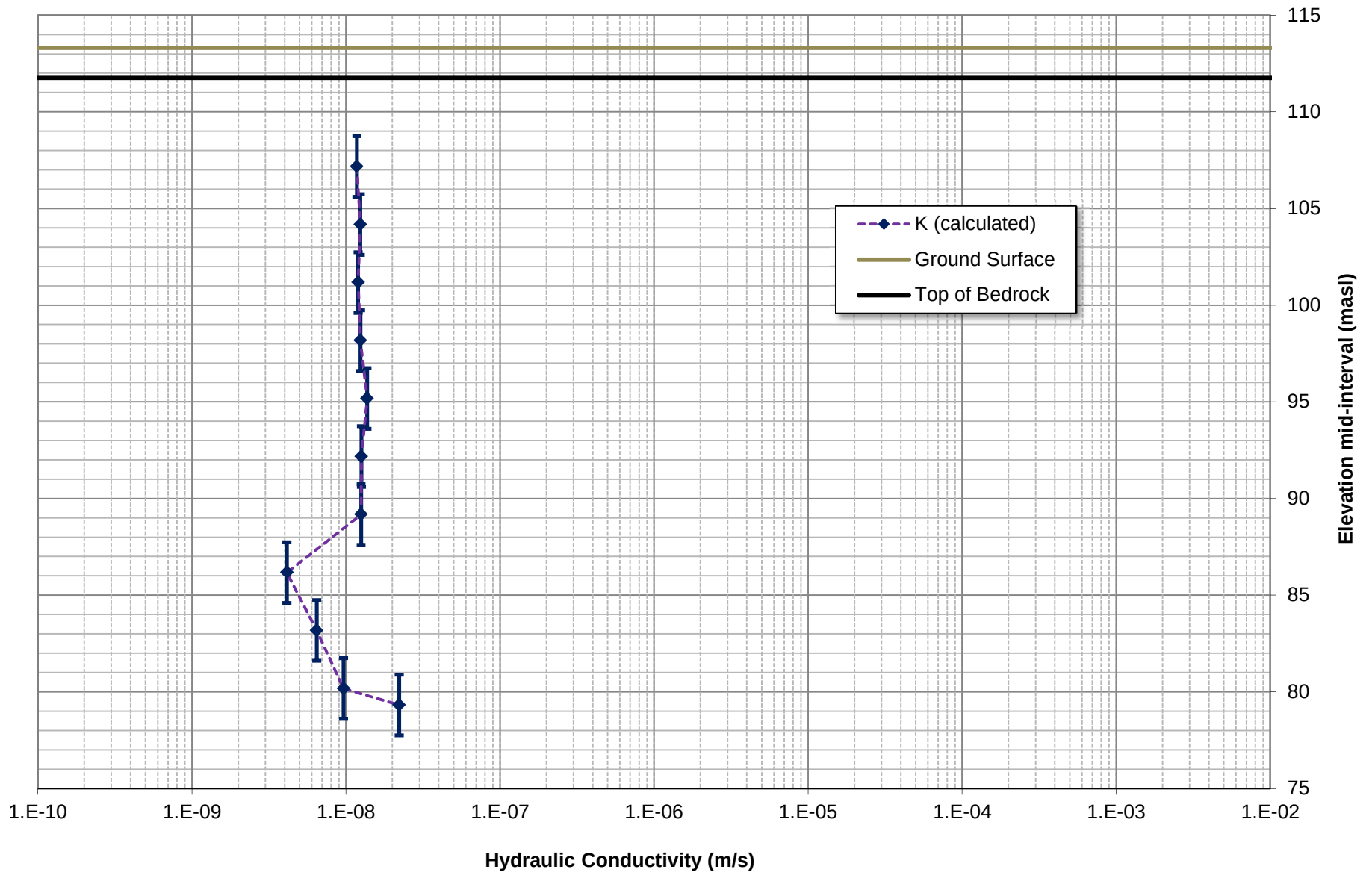
M182 - Hydraulic Conductivity (K) profile



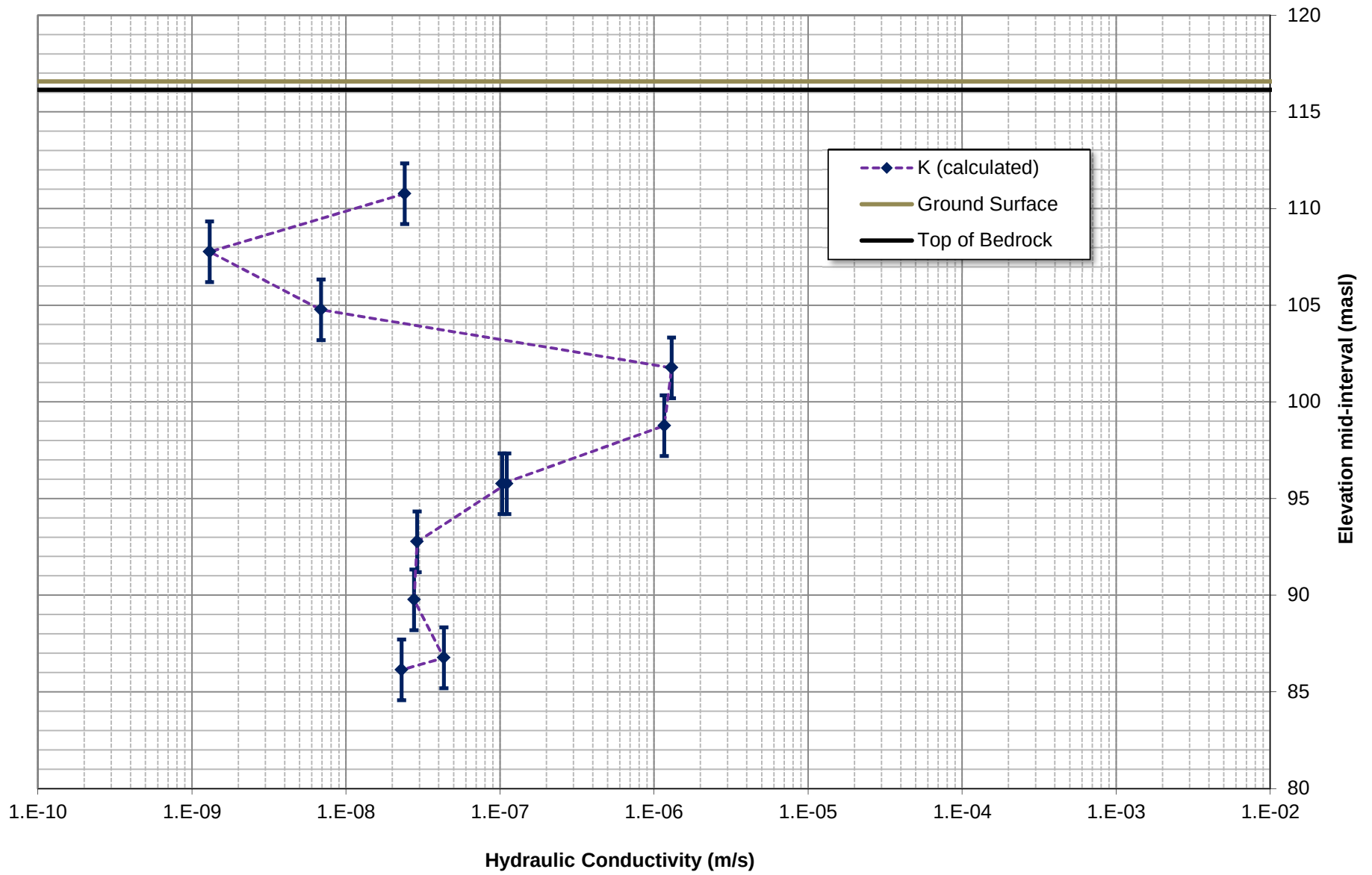
M183 - Hydraulic Conductivity (K) profile



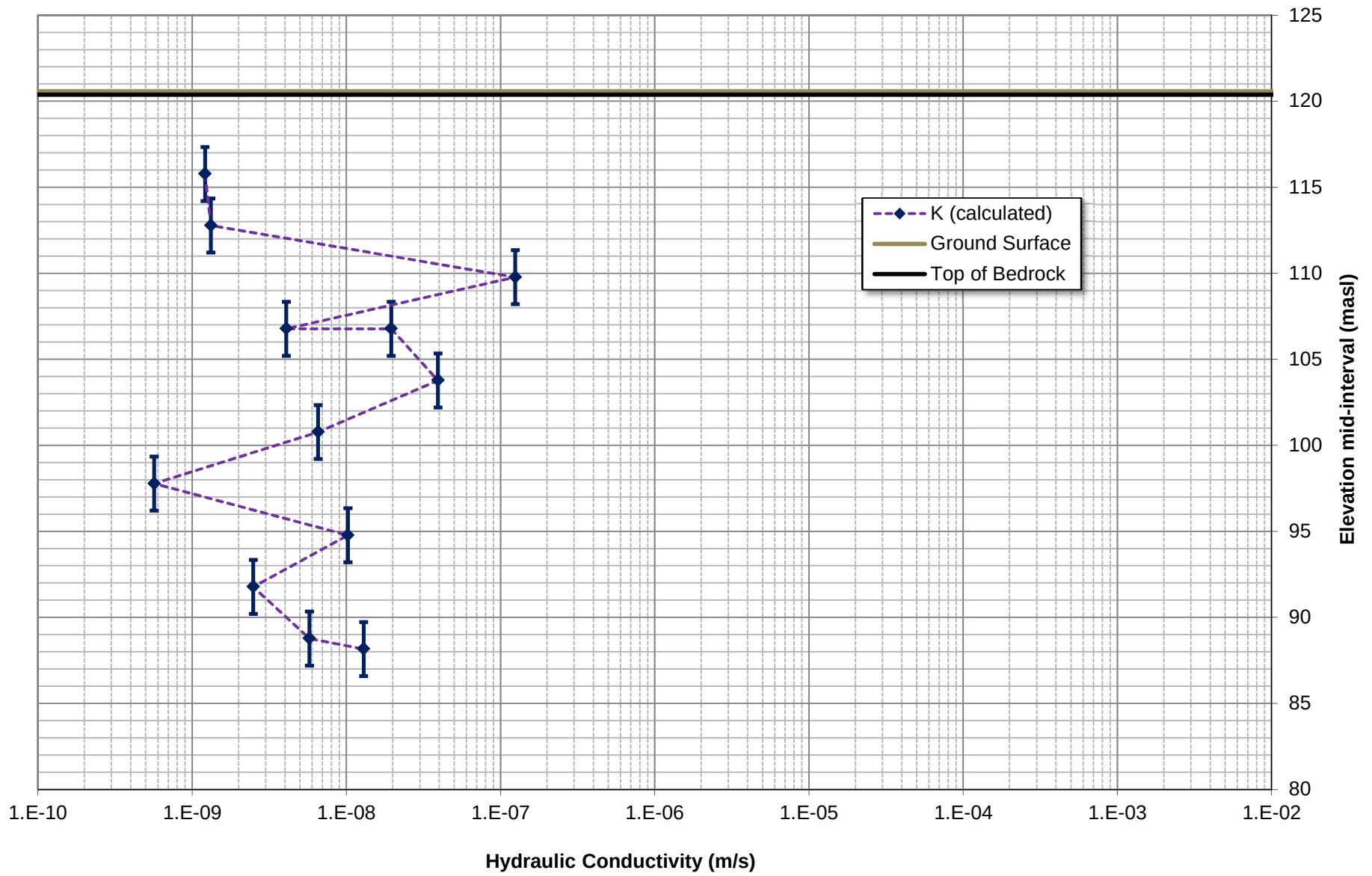
M184 - Hydraulic Conductivity (K) Profile



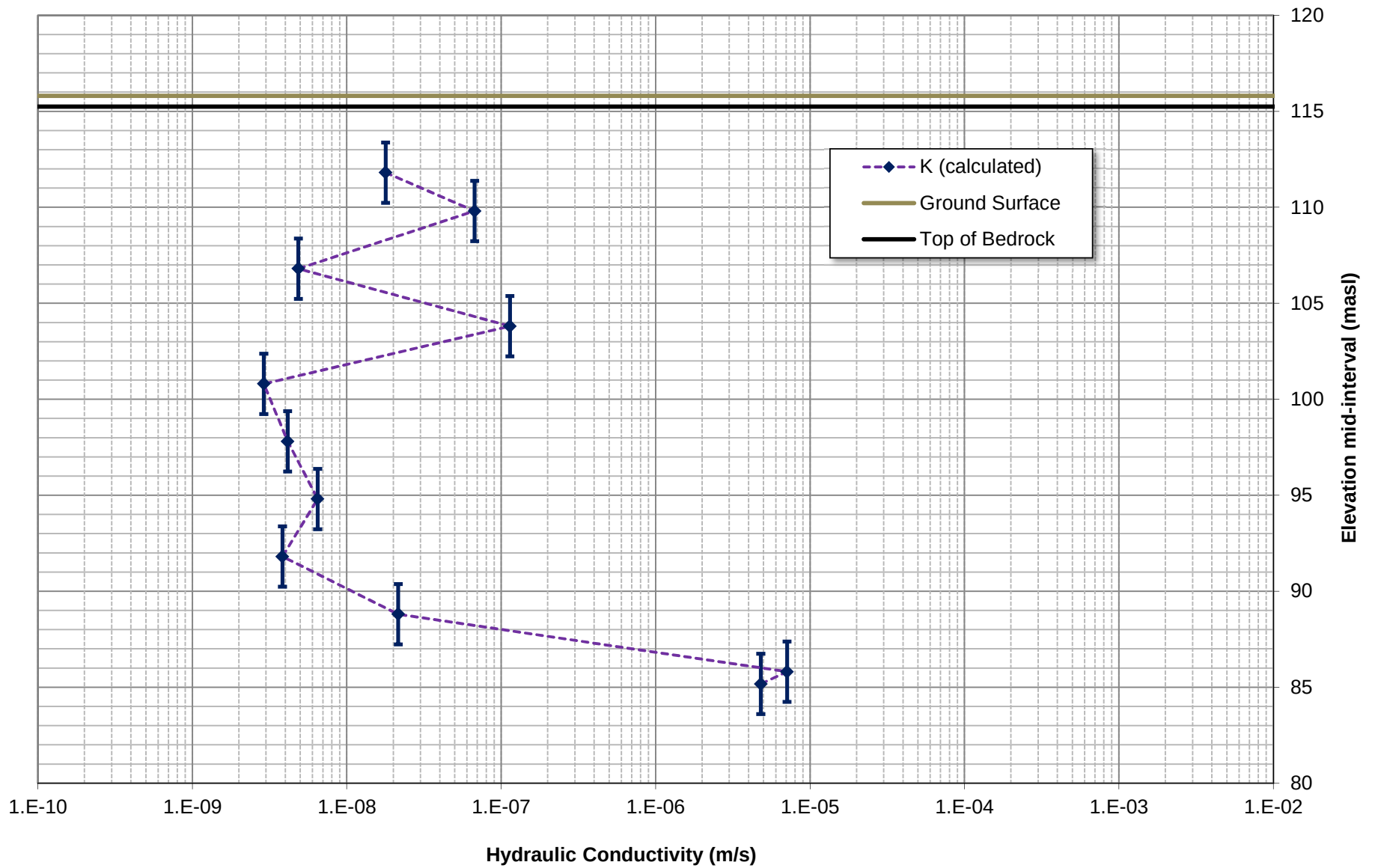
M185 - Hydraulic Conductivity (K) Profile



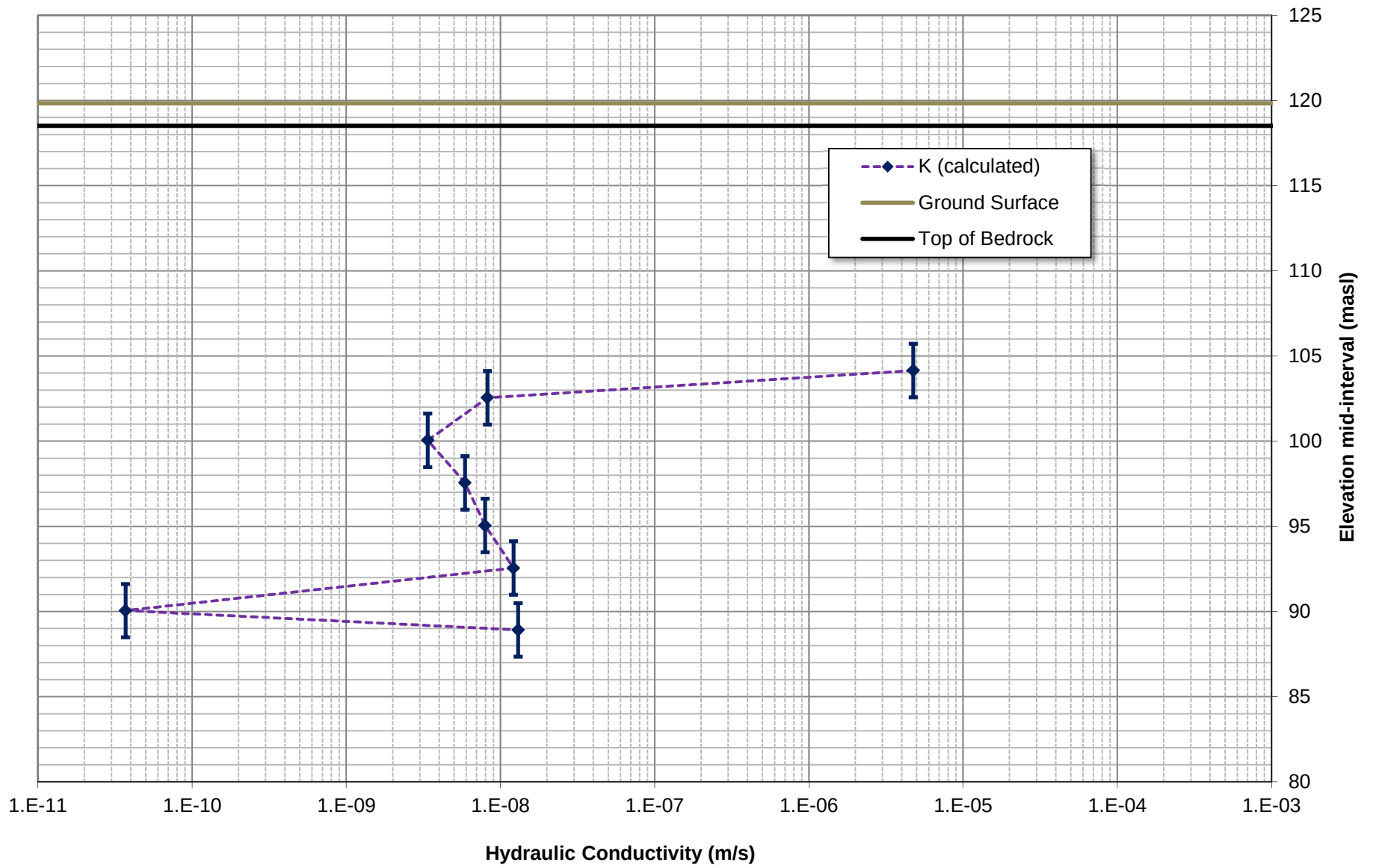
M186 - Hydraulic Conductivity (K) Profile



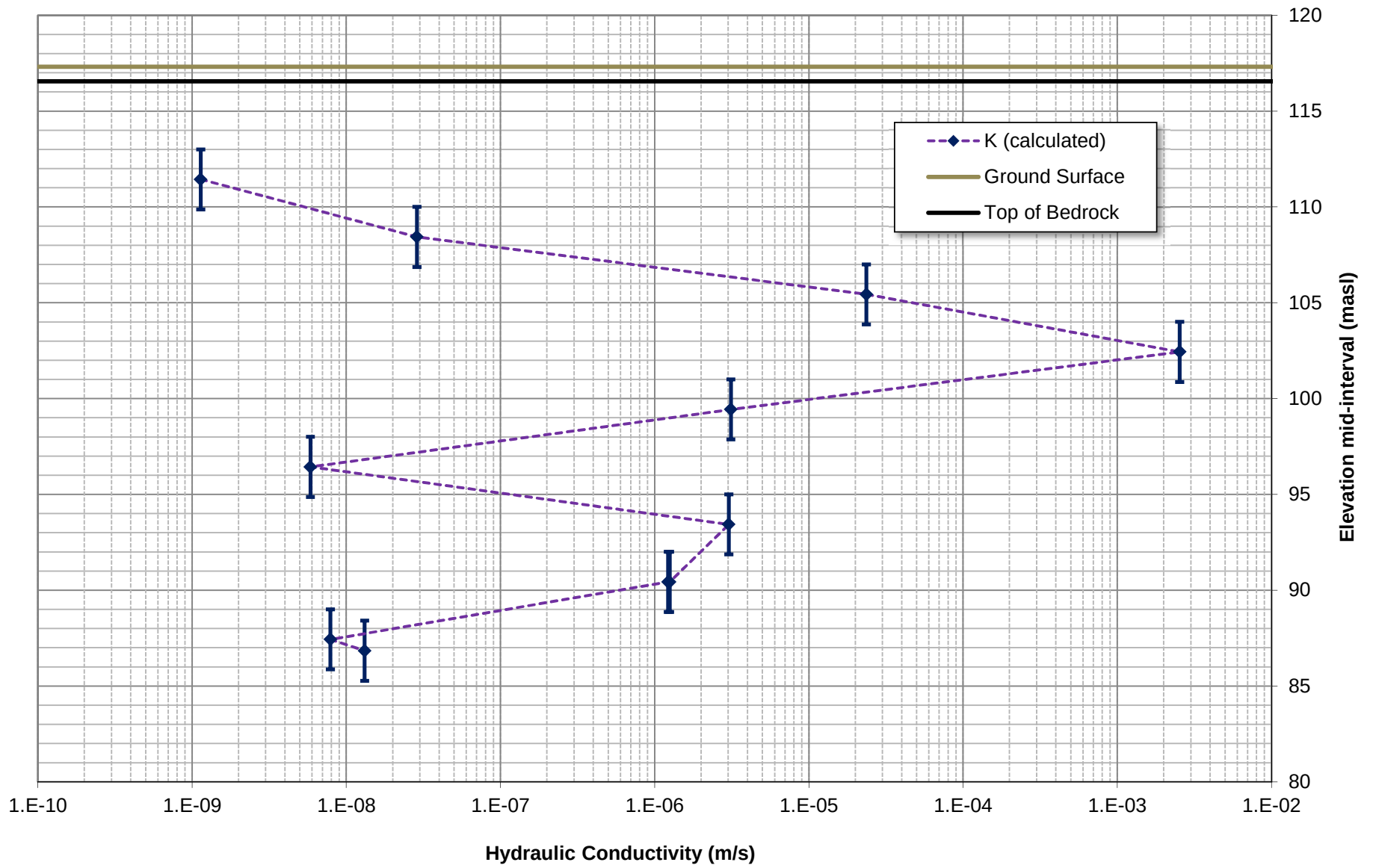
M188 - Hydraulic Conductivity (K) Profile



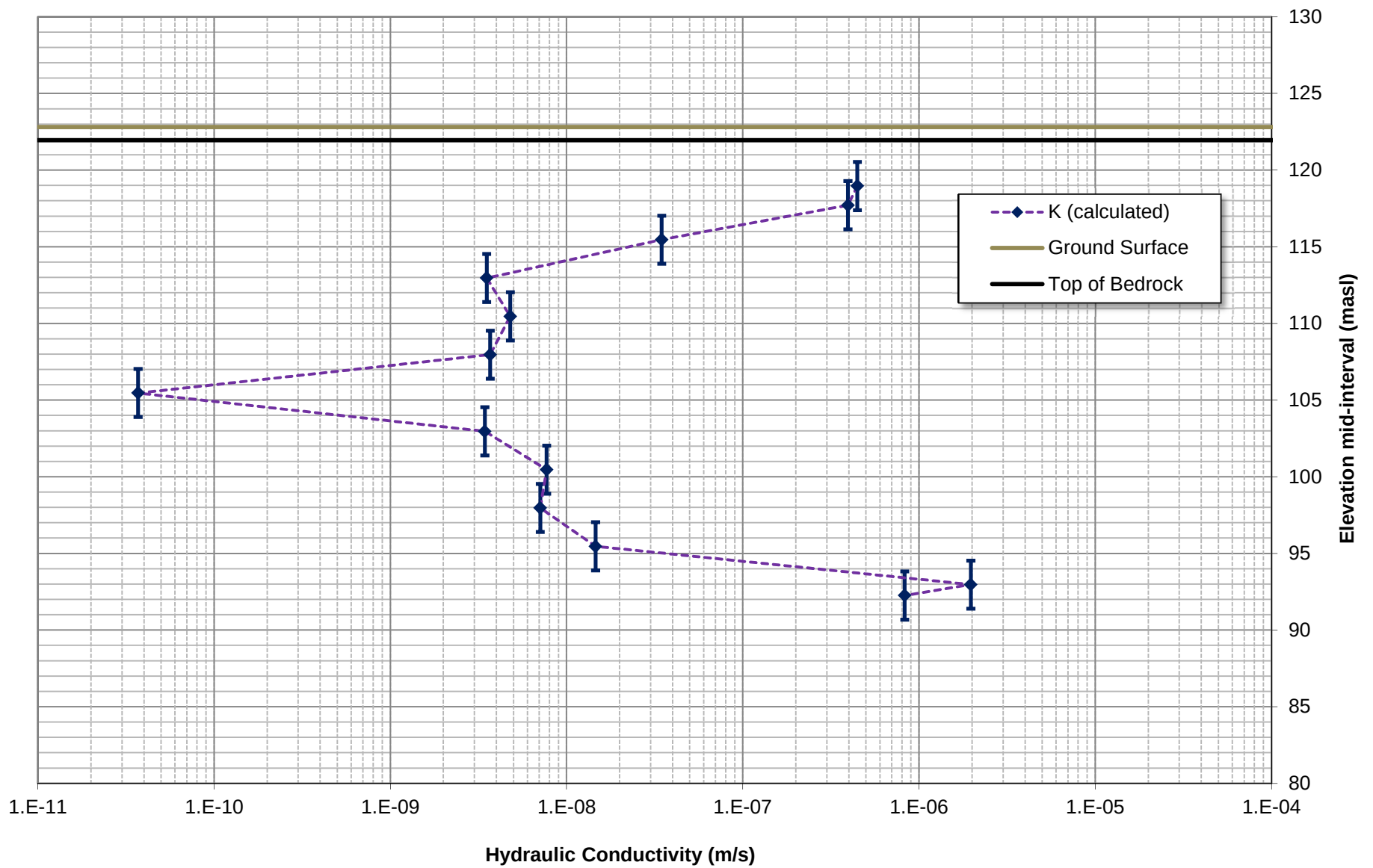
M189 - Hydraulic Conductivity (K) Profile



M190 - Hydraulic Conductivity (K) Profile



M191 - Hydraulic Conductivity (K) Profile



APPENDIX A.4

Pumping Test Monitoring Network Summary



APPENDIX A.4

Pumping Test Monitoring Network Summary



1252 Beechwood Road Pumping Test Monitoring Well Network
December 13, 2012

Monitor	Distance to Pumping Well (m)	Midpoint of Isolated Interval (masl)	Monitored Above/Below Isolated Interval
M9-2	245	104.05	
M9-3	245	114.75	
M10-1	64	97.37	
M49-1	111	99.17	
M49-2	113	113.82	
M53-2	113	97.42	
M54-2	130	95.5	
M57	84	102.02	
M63-2	155	112.71	
M64-2	394	111.2	
M70-1	538	98	
M71	235	107.5	
M80-1	247	105.47	
M80-2	247	118.25	
M105	285	107.81	
M106	122	98.11	
M107	225	100.85	
M108	386	101.17	
M109-1	300	107.02	
M109-2	296	111.89	
M110-1	348	106.31	
M110-2	350	109.05	
M112-1	230	98.04	
M114-1	23	95.71	
M114-2	24	122.13	
M115-1	39	98.05	
M115-2	39	122.26	
M116	59	96.99	
M117	135	97.63	
M120	300	105.11	
M121	224	92.8	above
M122	311	94.5	above
M123	457	99.5	above
M124	212	96.2	above
M125	209	97.7	above
PW1	93	108.99	

M170 Pumping Test Monitoring Well Network
May 27, 2013

Monitor	Distance to Pumping Well (m)	Midpoint of Isolated Interval (masl)	Monitored Above/Below Isolated Interval
M9-2	492	104.05	
M9-3	492	114.75	
M10-1	482	97.37	
M49-1	486	99.17	
M51-1	280	103.75	
M51-2	281	116.75	
M51-3	281	121.46	
M52-1	168	105.08	
M52-2	168	115.38	
M52-3	168	121.43	
M53-2	450	97.42	
M70-1	6.4	98.00	
M70-2	5.8	114.30	
M71	514	107.51	
M76	420	116.44	
M105	289	107.81	
M107	321	100.85	
M108	165	101.17	
M109-1	491	107.12	
M109-2	490	114.82	
M110-1	354	106.30	
M114-1	566	95.73	
M115-1	506	98.16	
M116	554	97.03	
M117	457	97.78	
M122	455	97.80	
M123	382	99.17	
M166	368	99.25*	above/below
M167	429	96.98*	above/below
M168	204	101.04*	above/below
M169	387	98.61*	above/below
M171	344	99.02*	above/below
M172	470	96.63*	above/below
OW54-d	496	107.17	
PW1	485	108.99	
PW4	284	120.44	

* Refers to midpoint between single packer and bottom of hole

M168 Pumping Test Monitoring Well Network

June 10, 2013

Monitor	Distance to Pumping Well (m)	Midpoint of Isolated Interval (masl)	Monitored Above/Below Isolated Interval
M9-2	643	104.05	
M9-3	643	114.75	
M10-1	571	97.37	
M49-1	599	99.17	
M51-1	483	103.75	
M51-2	484	116.75	
M51-3	484	121.46	
M52-1	370	105.08	
M52-2	370	115.38	
M52-3	370	121.43	
M53-2	556	97.42	
M70-1	210	98.00	
M70-2	208	114.30	
M71	662	107.51	
M76	618	116.44	
M105	433	107.81	
M107	406	100.85	
M108	259	101.17	
M109-1	655	107.12	
M109-2	653	114.82	
M110-1	531	106.30	
M114-1	643	95.73	
M115-1	585	98.16	
M116	615	97.03	
M117	506	97.78	
M122	425	97.80	
M123	286	99.17	
M166	185	99.25*	above/below
M167	229	96.98*	above/below
M169	290	98.61*	above/below
M170	204	102.51*	above/below
M171	534	99.02*	above/below
M172	559	96.63*	above/below
OW54-d	647	107.17	
PW1	592	108.99	
PW4	427	120.44	

* Refers to midpoint between single packer and bottom of hole

M178 Pumping Test Monitoring Well Network

March 4, 2014

Monitor	Distance to Pumping Well (m)	Midpoint of Isolated Interval (masl)	Monitored Above/Below Isolated Interval
M10-1	660	97.37	
M64-2	440	111.20	
M114-1	672	95.73	
M115-1	644	98.16	
M116	617	97.03	
M117	543	97.78	
M121	513	95.55	
M122	364	98.50	
M123	300	99.45	
M125	491	95.65	
M166	388	99.40	
M167	485	95.40	
M172	661	98.10	
M173	531	88.83*	above/below
M174	331	102.74**	
M175	407	100.11**	
M176	590	88.42	above/below
M177	273	92.05*	above/below
M179	348	100.29	above/below
M180	953	84.21*	above/below
M181	708	98.43**	
M182	662	92.47**	

* Refers to midpoint between single packer and bottom of hole

** Refers to midpoint of borehole (test conducted on open hole)

M174 Pumping Test Monitoring Well Network

March 17, 2014

Monitor	Distance to Pumping Well (m)	Midpoint of Isolated Interval (masl)	Monitored Above/Below Isolated Interval
M117	747	97.78	
M121	630	95.55	
M122	596	98.50	
M123	603	99.45	
M125	632	95.65	
M166	718	99.40	
M167	805	95.40	
M173	309	88.83*	above/below
M175	367	100.11**	
M176	770	88.42	above/below
M177	306	92.05*	above/below
M178	331	104.61	above/below
M179	602	100.29	above/below
M180	1197	84.21*	above/below
M181	378	98.43**	
M182	476	92.47**	

* Refers to midpoint between single packer and bottom of hole

** Refers to midpoint of borehole (test conducted on open hole)

M179 Pumping Test Monitoring Well Network

March 24, 2014

Monitor	Distance to Pumping Well (m)	Midpoint of Isolated Interval (masl)	Monitored Above/Below Isolated Interval
M117	776	97.78	
M121	813	95.55	
M122	605	98.50	
M123	456	99.45	
M166	365	99.40	
M167	288	95.40	
M173	863	88.83*	above/below
M174	602	102.74**	
M175	417	100.11**	
M176	268	88.42	above/below
M177	620	92.05*	above/below
M178	348	104.61	above/below
M180	608	84.21*	above/below
M181	954	98.43**	
M182	705	92.47**	

* Refers to midpoint between single packer and bottom of hole

** Refers to midpoint of borehole (test conducted on open hole)

M178 Pumping Test Monitoring Well Network

July 22, 2014

Monitor	Distance to Pumping Well (m)	Midpoint of Isolated Interval (masl)	Monitored Above/Below Isolated Interval
M64-2	440	111.20	
M114-1	672	95.73	
M115-1	644	98.16	
M166	388	99.40	
M167	485	95.40	
M168	512	98.75	
M172	661	98.10	
M173	531	88.83*	above/below
M174	331	102.74**	
M177	273	92.05*	above/below
M179	348	100.29	above/below
M181	708	98.43*	above/below
M182	662	92.47*	above/below
M184	258	95.10**	
M185	165	91.73*	above/below
M186	641	93.57*	above/below

* Refers to midpoint between single packer and bottom of hole

** Refers to midpoint of borehole (test conducted on open hole)

M167 Pumping Test Monitoring Well Network

August 5, 2014

Monitor	Distance to Pumping Well (m)	Midpoint of Isolated Interval (masl)	Monitored Above/Below Isolated Interval
M166	202	99.40	
M179	274	100.29	above/below
M186	229	93.57*	above/below

* Refers to midpoint between single packer and bottom of hole

M178R-3 Pumping Test Monitoring Well Network

September 21, 2015

Monitor	Distance to Pumping Well (m)	Midpoint of Isolated Interval (masl)	Monitored Above/Below Isolated Interval
M122	342	98.50	
M123	282	99.45	
M166	379	99.40	
M177	258	111.41	
M178-1	32	85.51	
M178-2	32	102.92	
M178-3	32	110.94	
M178R-1	0	99.78**	
M178R-2	0	96.35*	above
M178R-4	0	113.05**	
M179	360	100.58	
M185-1	176	86.09	
M185-2	176	101.68	
M187	467	99.76**	
M188	148	89.33*	above
M189	540	103.07**	
M190	275	90.95*	above
M191	671	98.46*	above

* Refers to midpoint between single packer and bottom of hole

** Refers to midpoint of borehole (test conducted on open hole)

M187 Pumping Test Monitoring Well Network

September 30, 2015

Monitor	Distance to Pumping Well (m)	Midpoint of Isolated Interval (masl)	Monitored Above/Below Isolated Interval
M64-2	205	111.20	
M122	480	98.50	
M123	588	99.45	
M166	771	99.40	
M173	169	84.07	
M177	210	111.41	
M178-1	480	85.51	
M178-2	480	102.92	
M178-3	480	110.94	
M178R-1	469	99.78**	
M178R-2	469	96.35*	above
M178R-3	469	110.21**	
M178R-4	469	113.05**	
M179	826	100.58	
M185-1	591	86.09	
M185-2	591	101.68	
M188	384	89.33*	above
M189	181	103.07**	
M190	733	90.95*	above
M191	1102	98.46*	above

* Refers to midpoint between single packer and bottom of hole

** Refers to midpoint of borehole (test conducted on open hole)

M108 Pumping Test Monitoring Well Network

October 6, 2015

Monitor	Distance to Pumping Well (m)	Midpoint of Isolated Interval (masl)	Monitored Above/Below Isolated Interval
M105	177	107.81	
M107	161	100.85	
M122	304	98.50	
M123	279	99.45	
M166	313	99.40	
M167	487	95.40	
M168	273	98.75	
M170	164	102.60	
M172	332	98.10	
M178-1	590	85.51	
M178-2	590	102.92	
M178-3	590	110.94	
M178R-1	559	99.78**	
M178R-2	559	96.35*	above
M178R-3	559	110.21**	
M178R-4	559	113.05**	
M179	663	100.58	
M185-1	694	86.09	
M185-2	694	101.68	
M190	666	90.95*	above
M191	545	98.46*	above

* Refers to midpoint between single packer and bottom of hole

** Refers to midpoint of borehole (test conducted on open hole)

APPENDIX A.5

Pumping Test Results

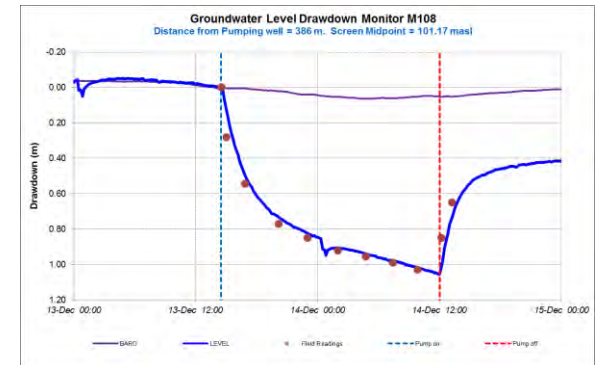
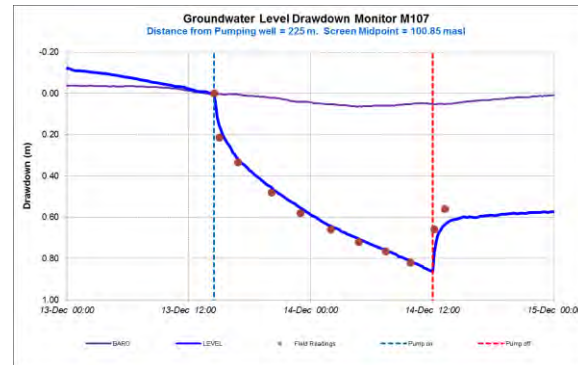
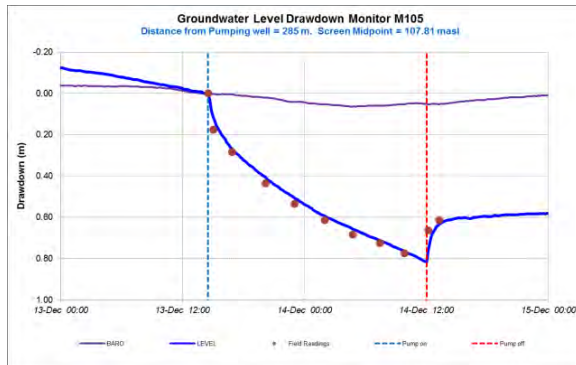
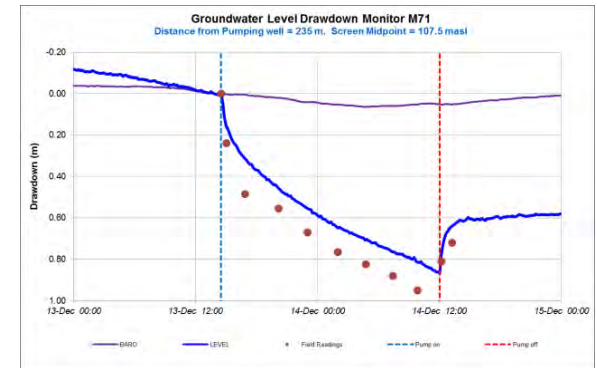
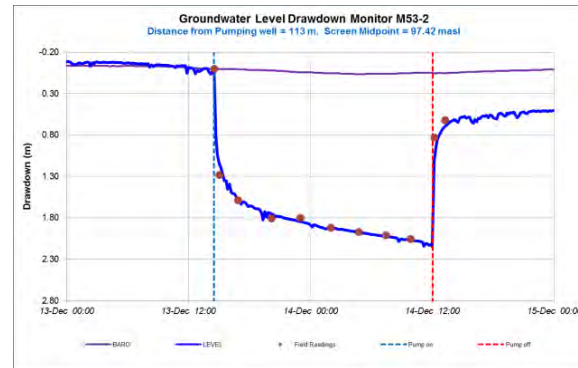
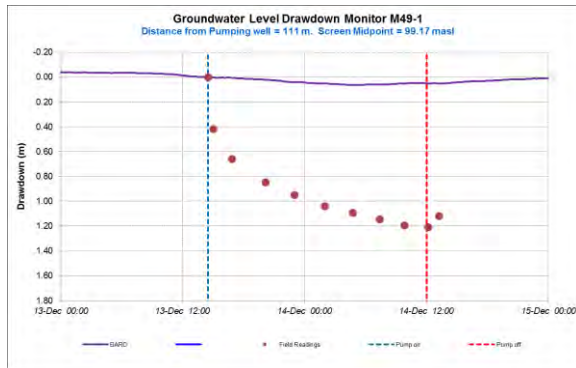
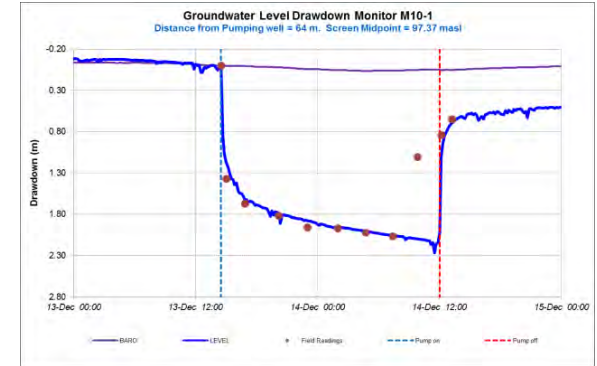
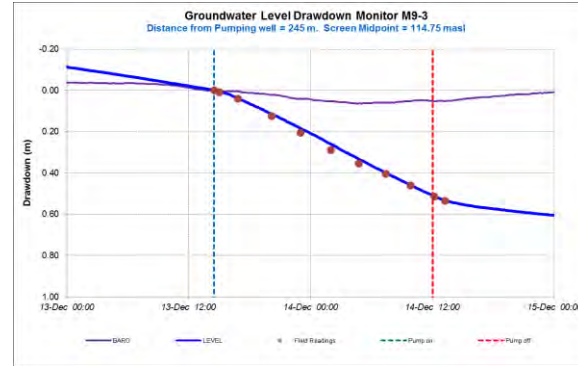
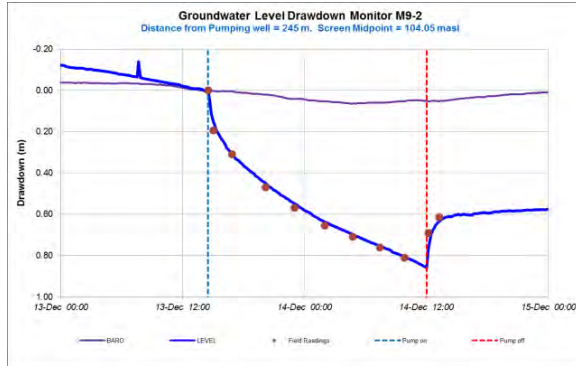


APPENDIX A.5

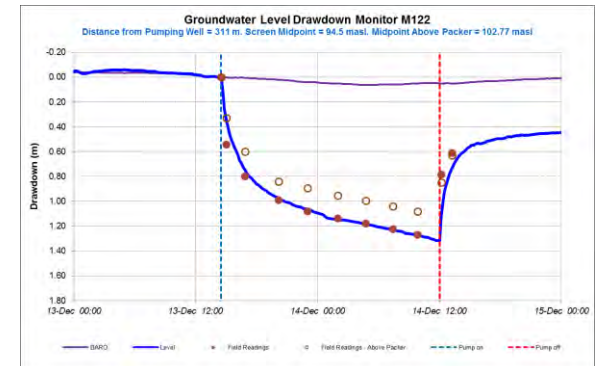
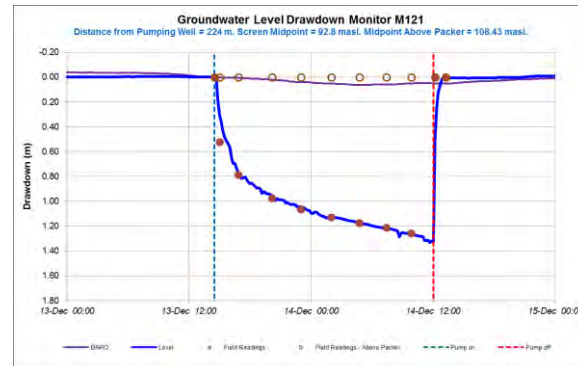
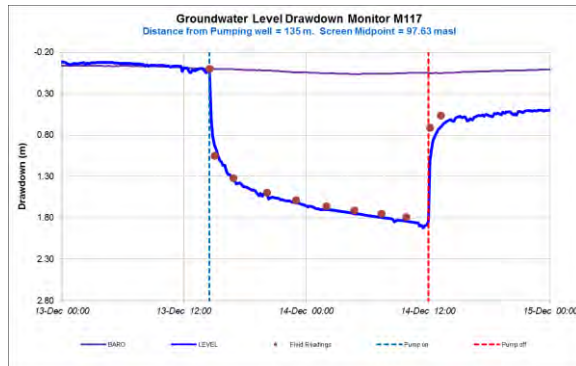
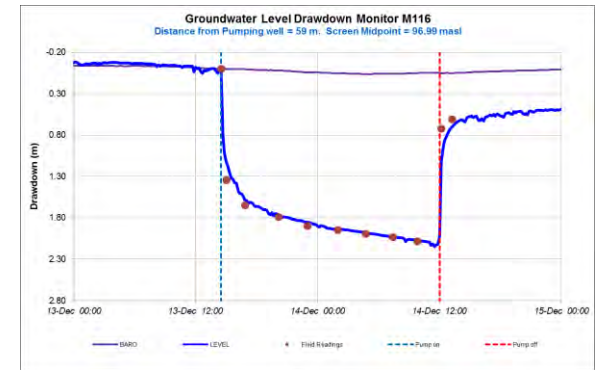
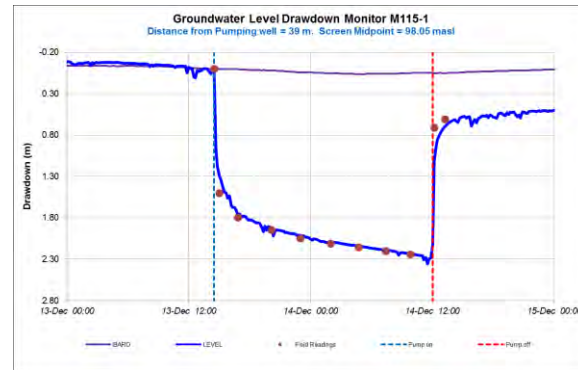
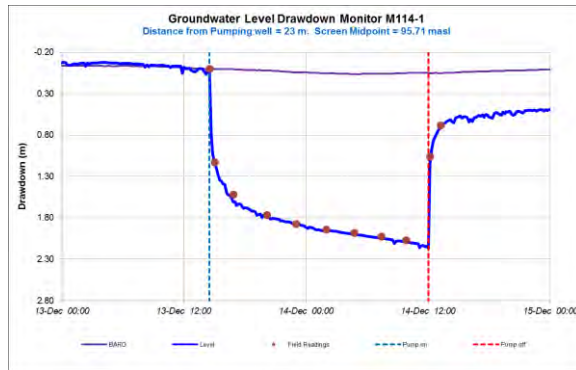
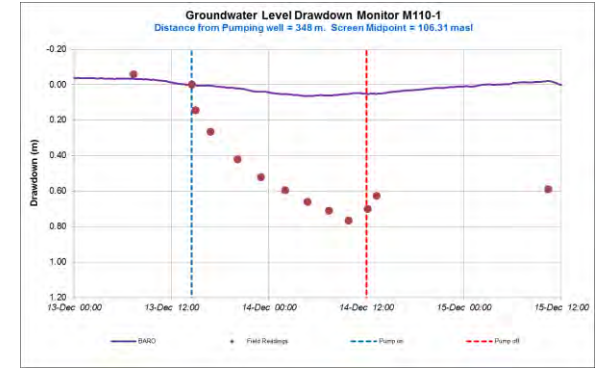
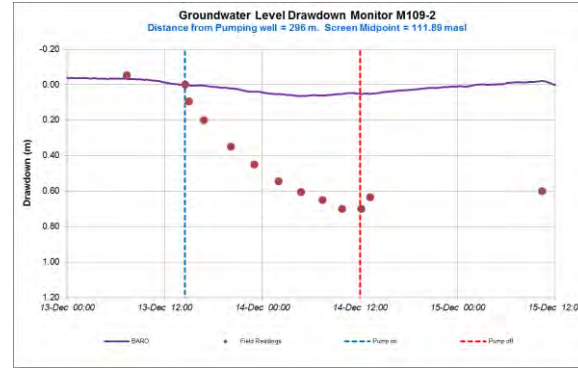
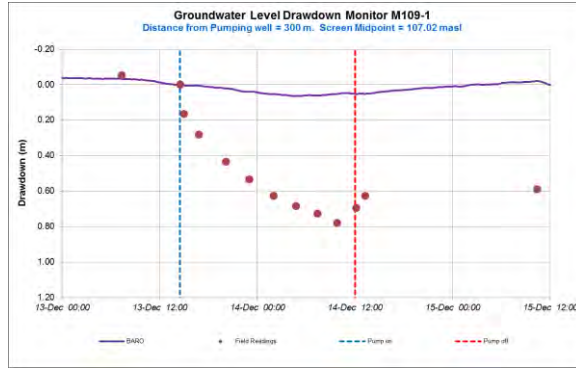
Pumping Test Results



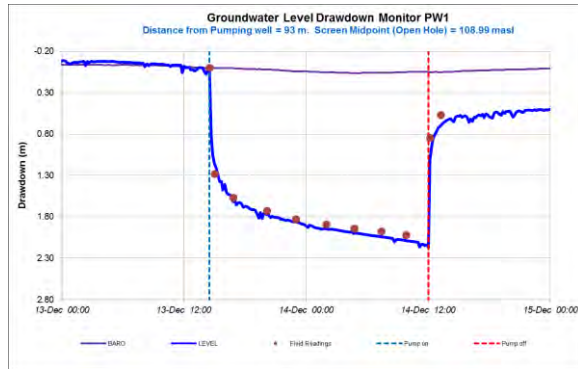
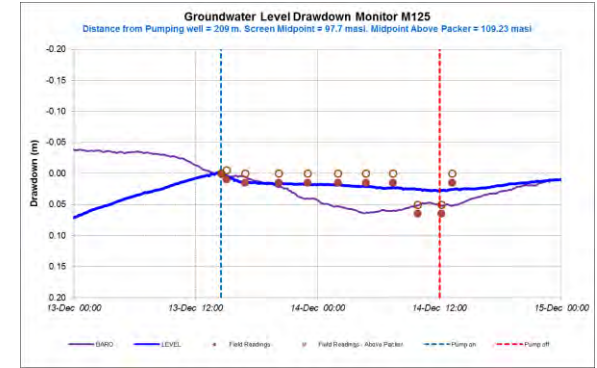
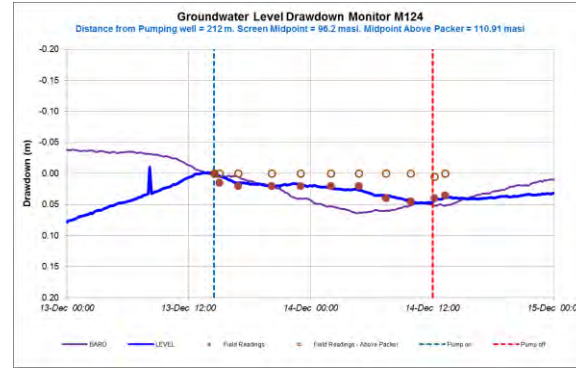
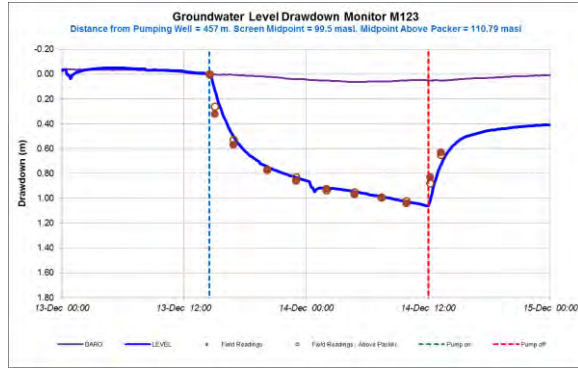
Responsive to pumping



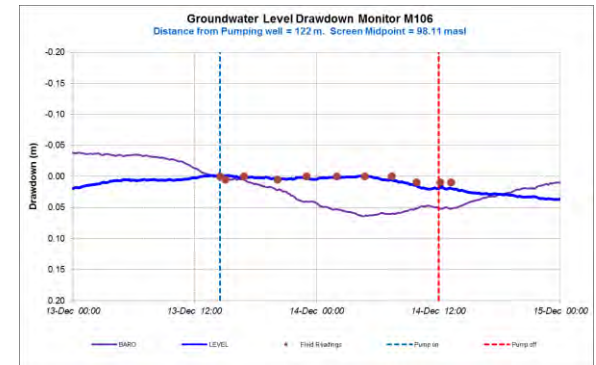
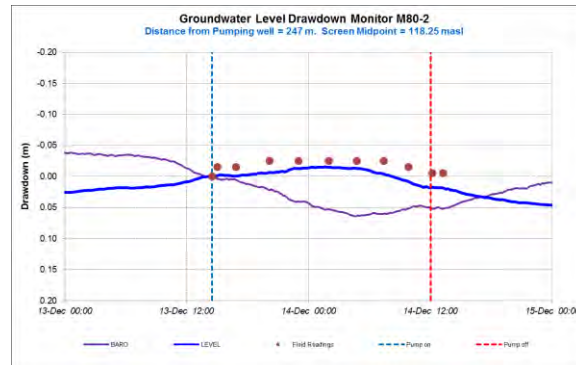
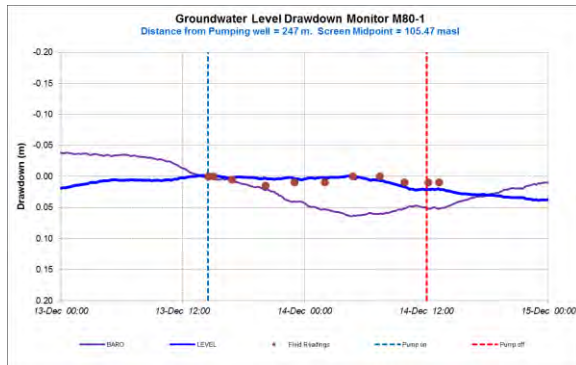
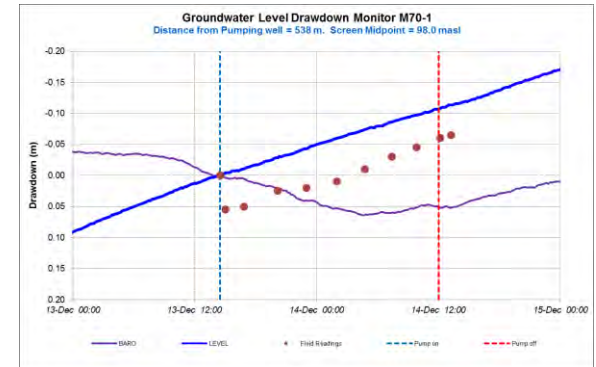
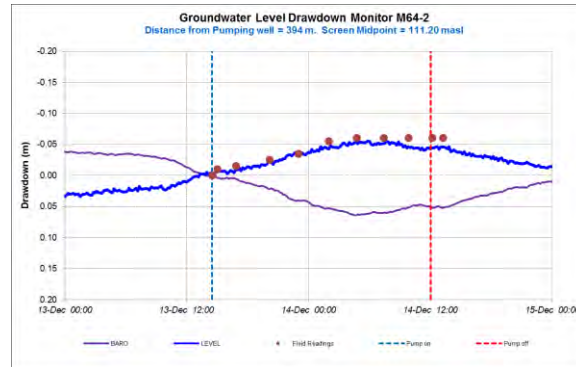
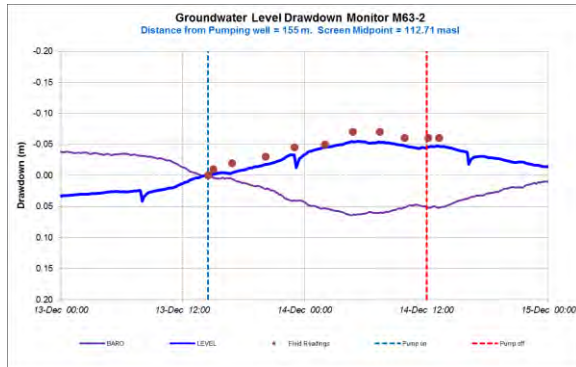
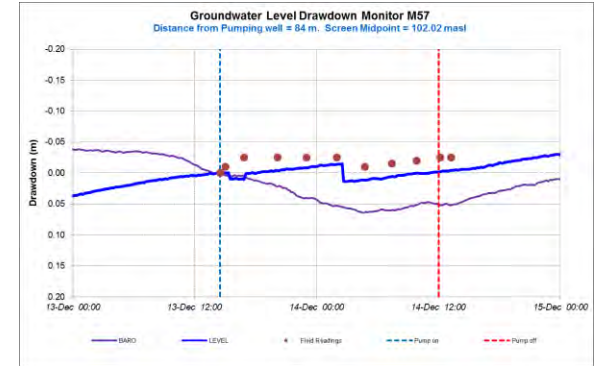
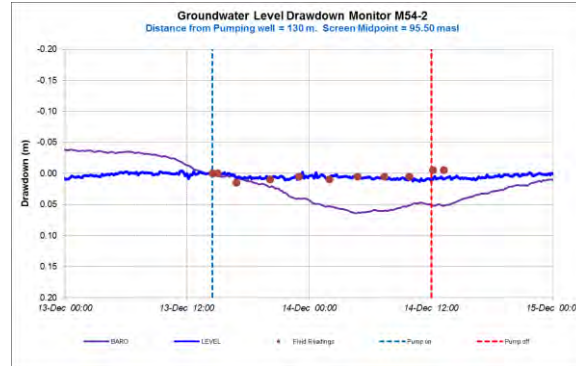
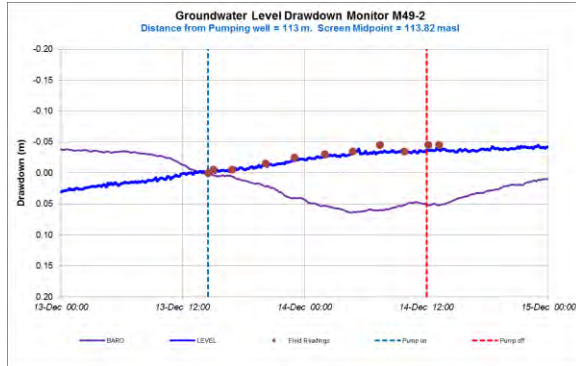
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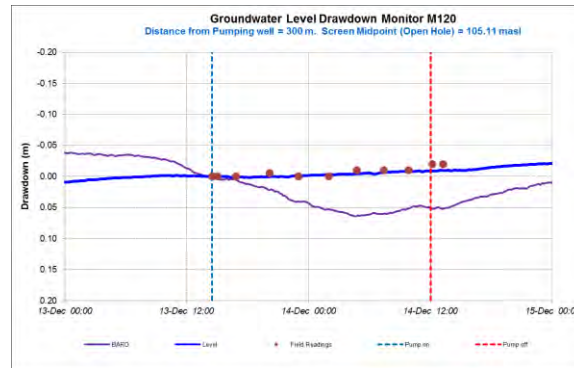
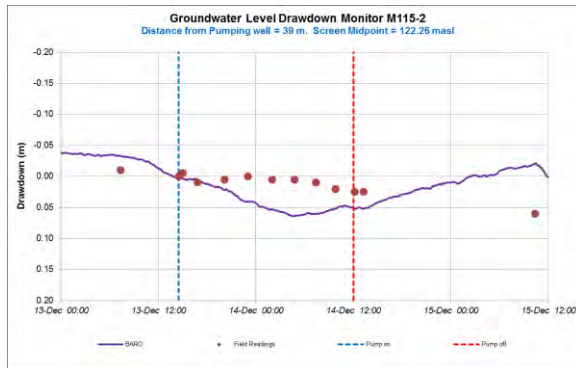
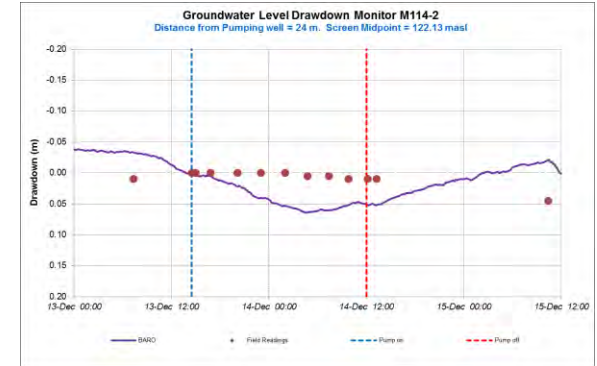
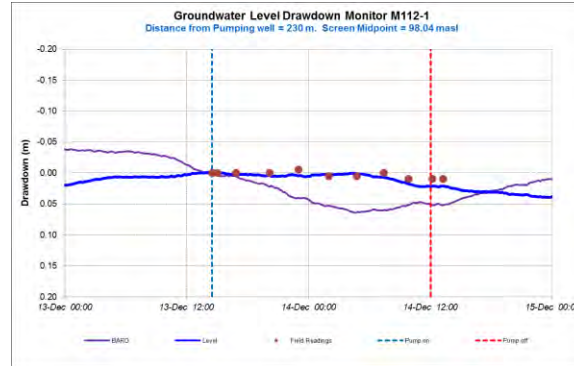
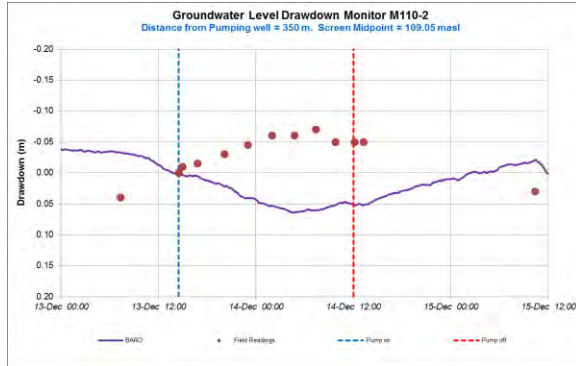
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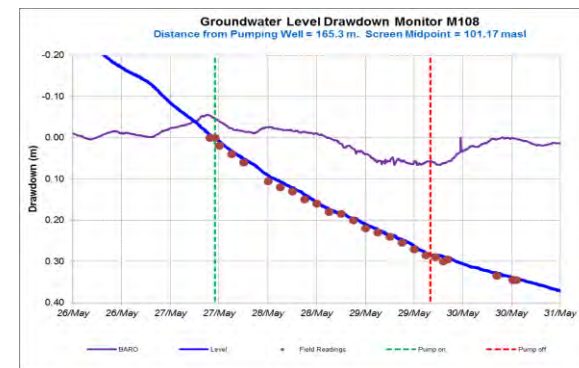
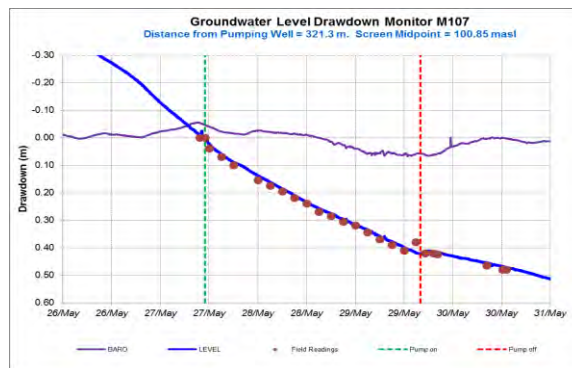
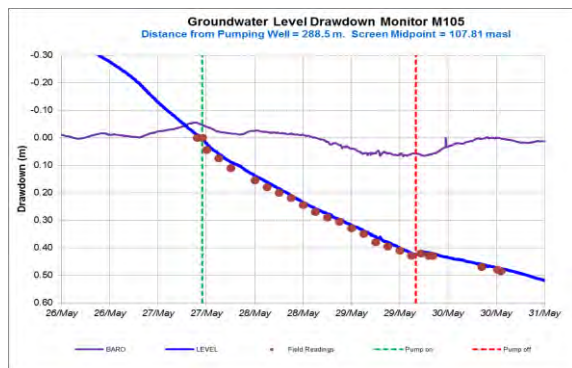
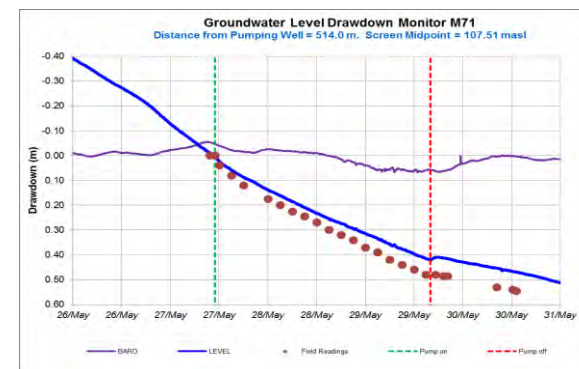
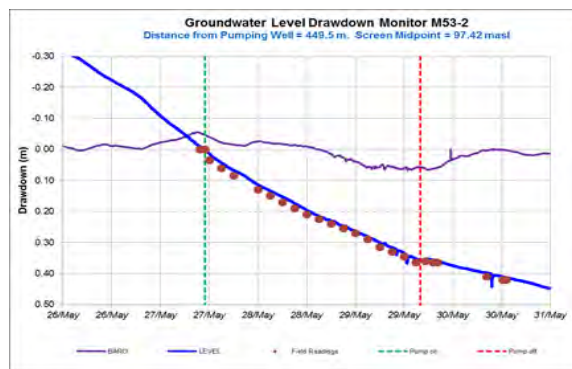
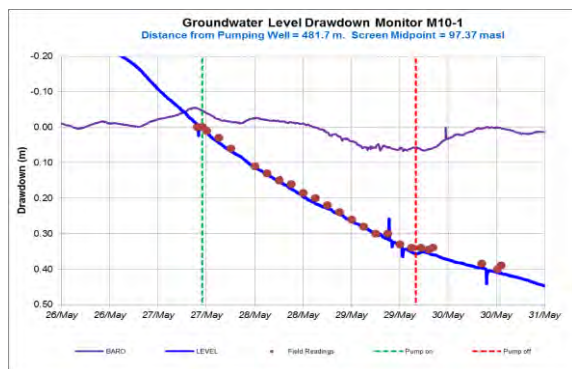
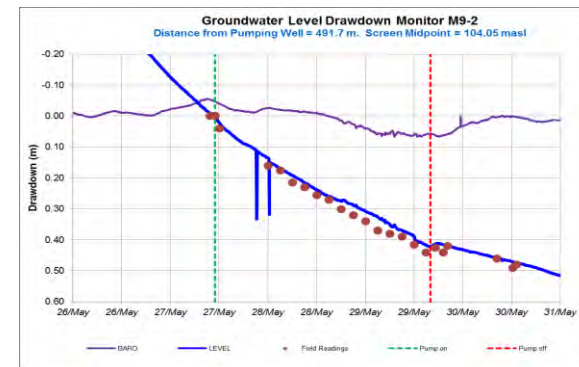
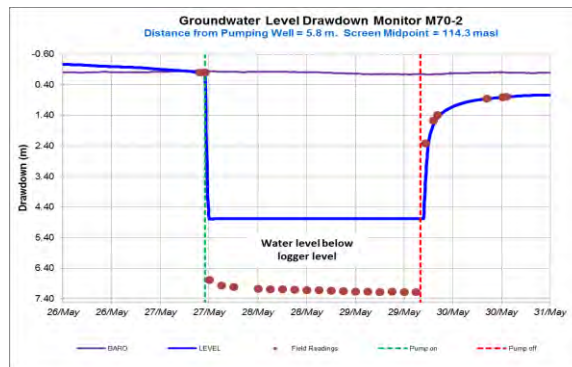
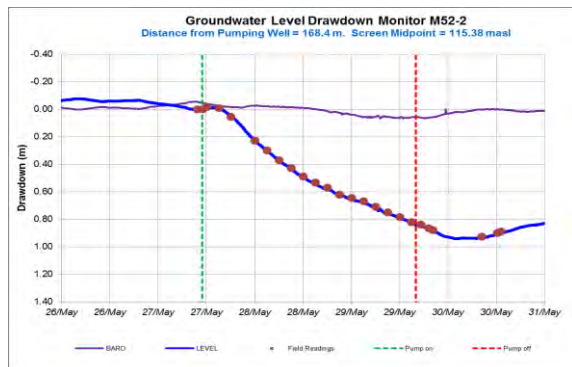
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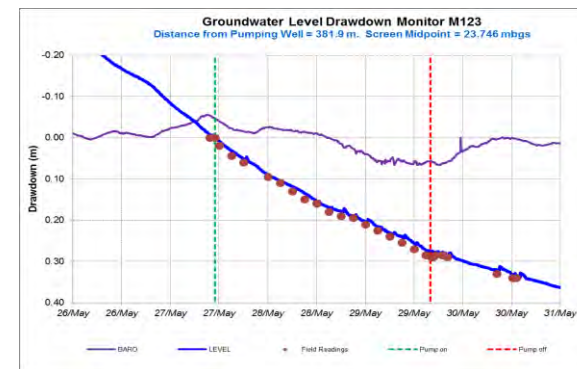
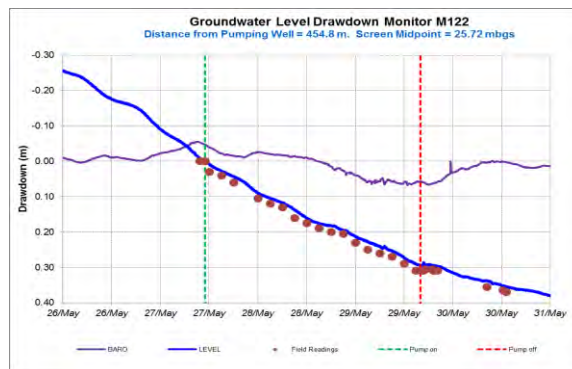
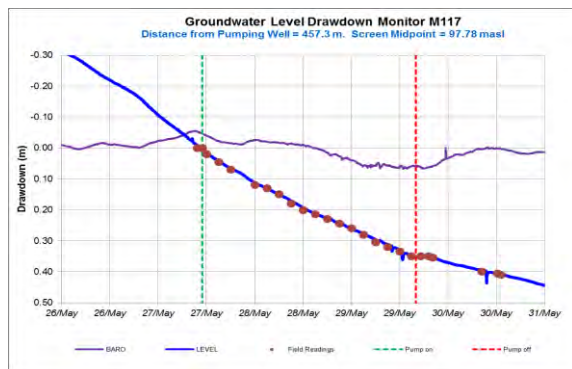
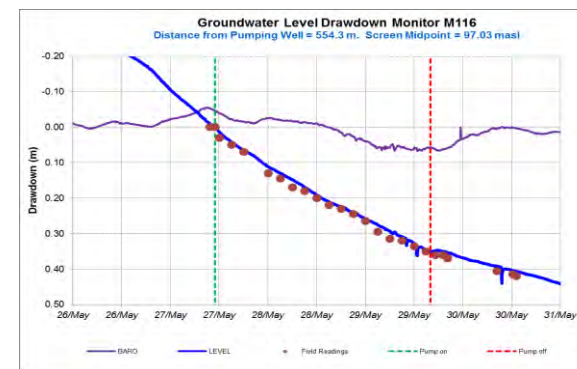
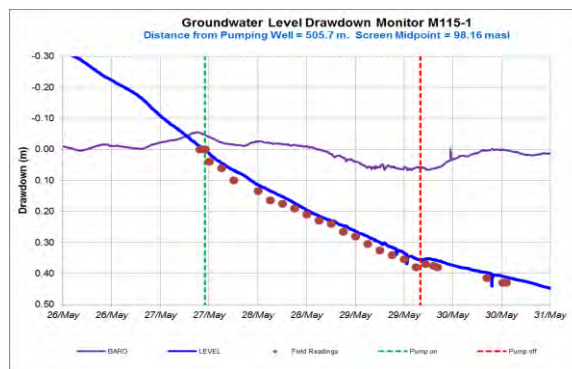
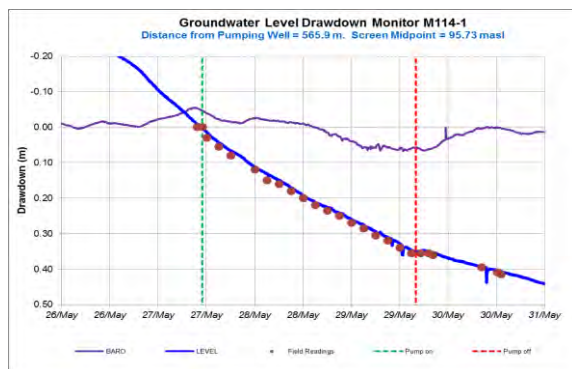
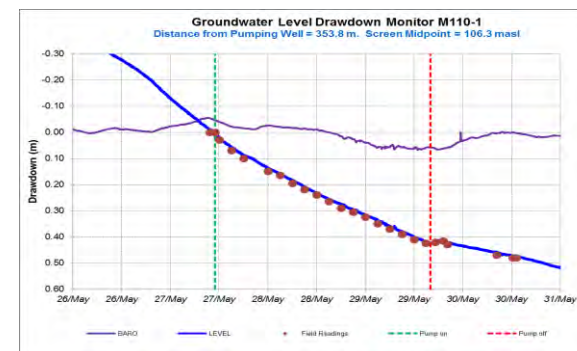
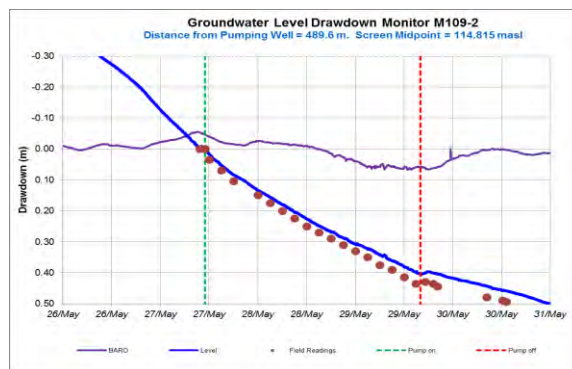
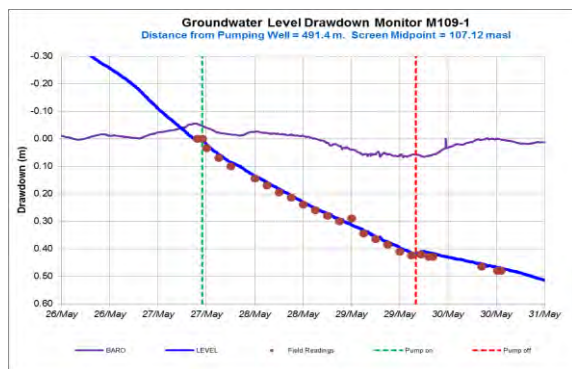
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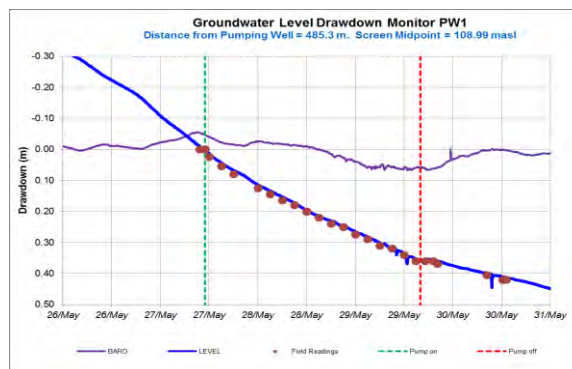
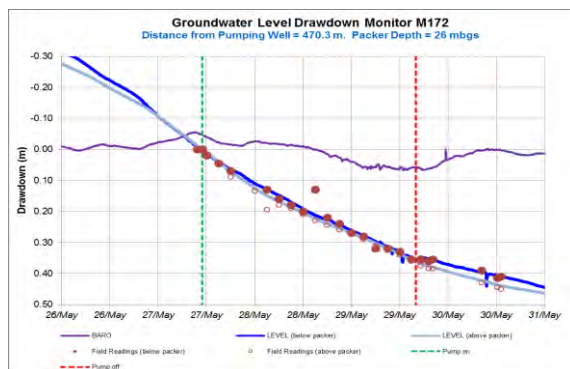
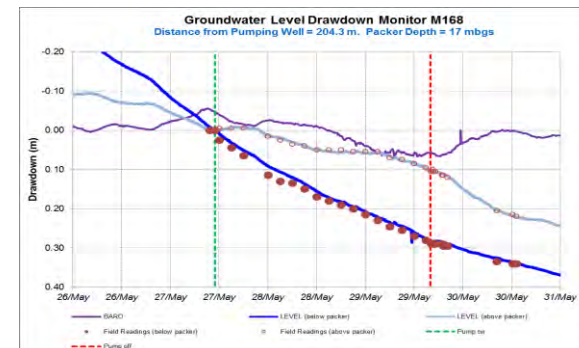
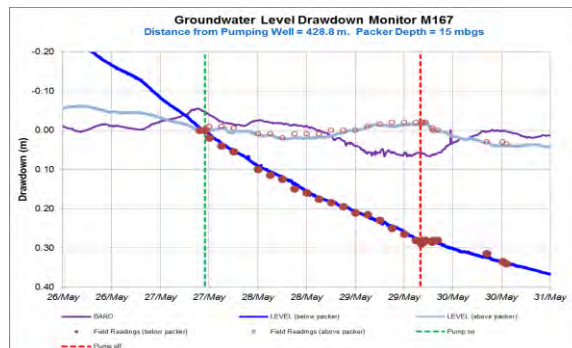
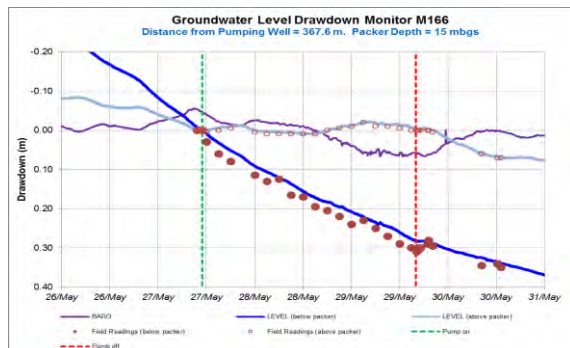
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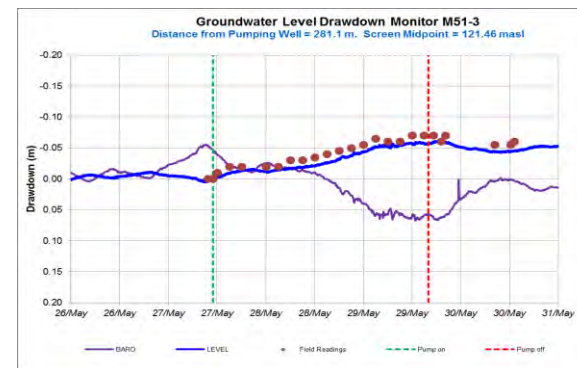
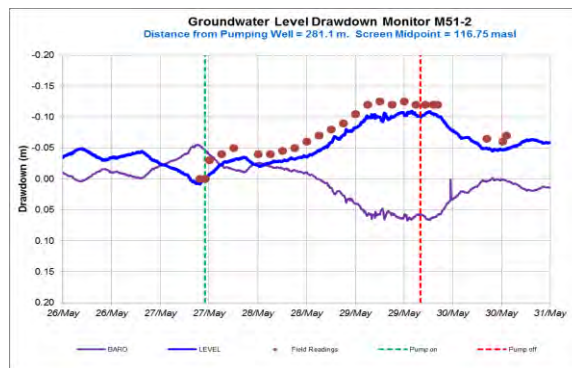
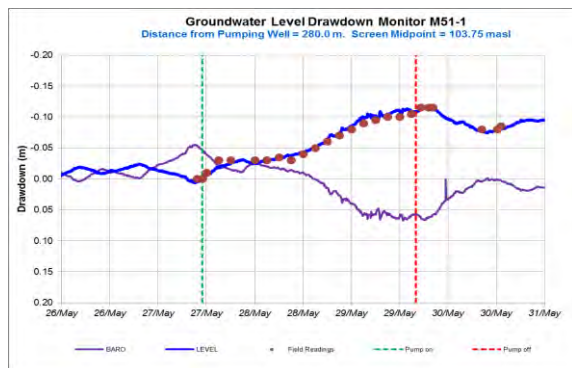
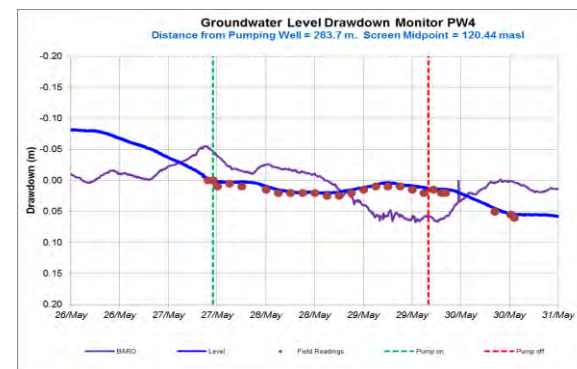
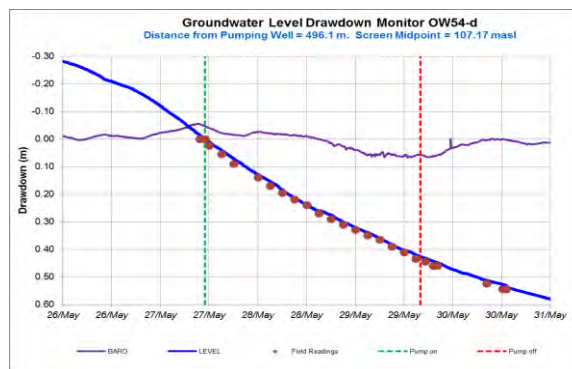
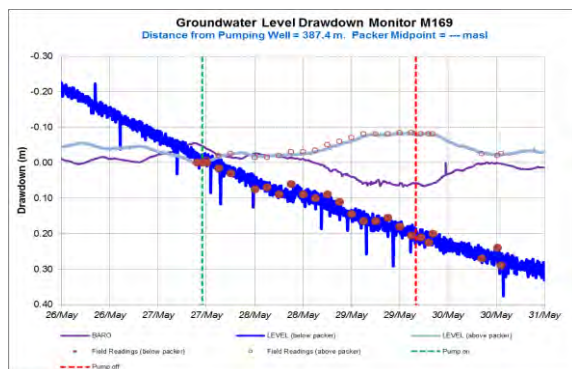
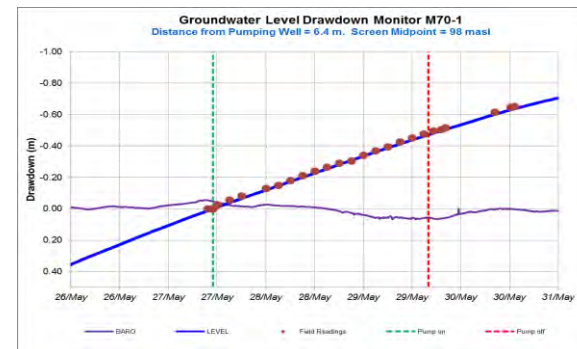
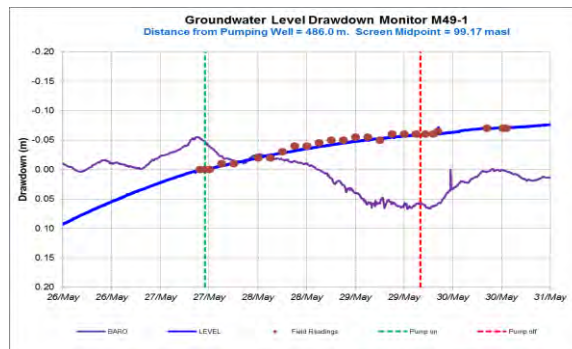
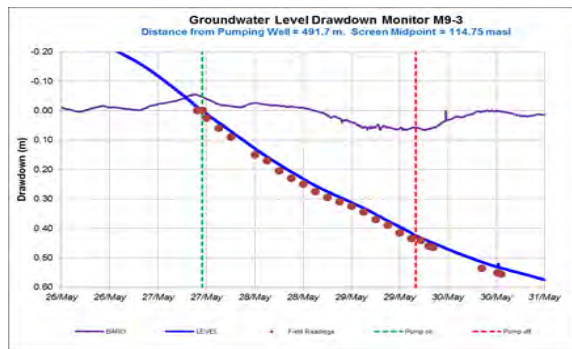
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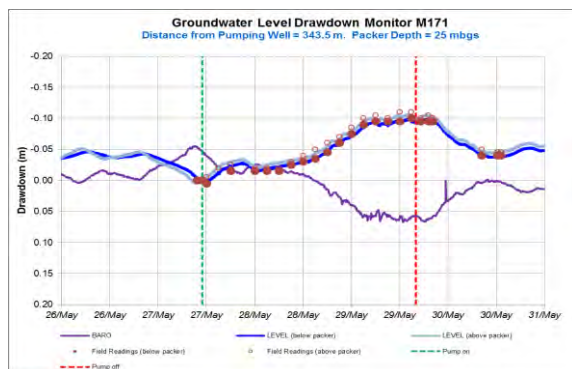
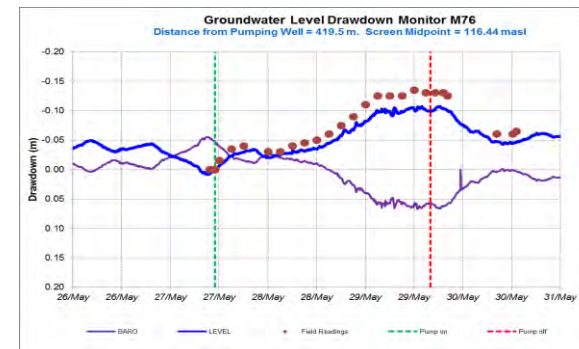
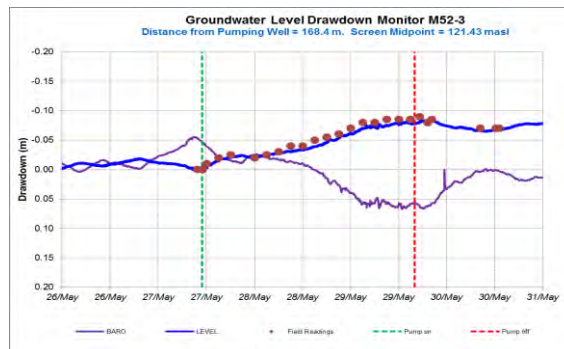
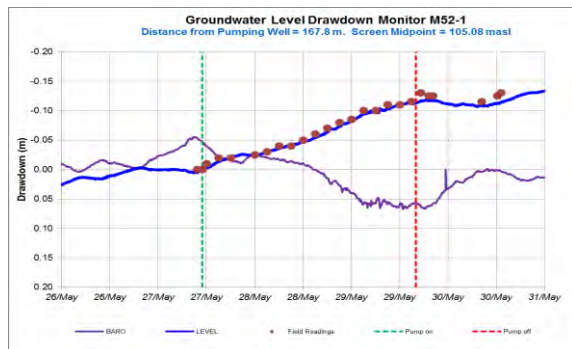
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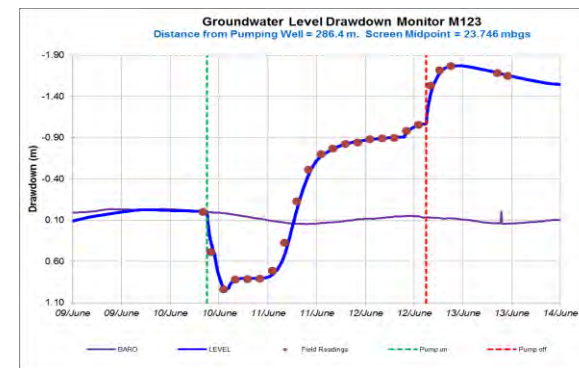
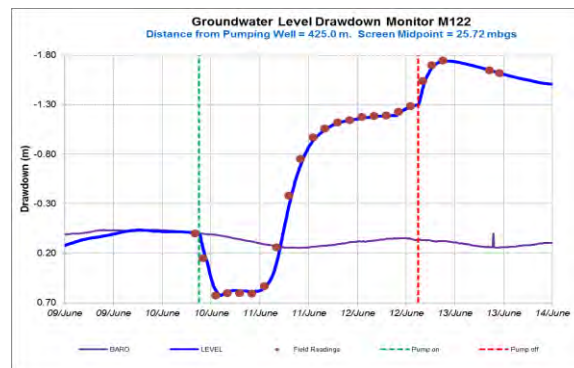
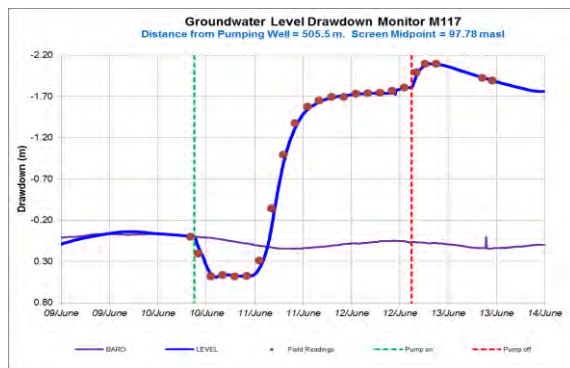
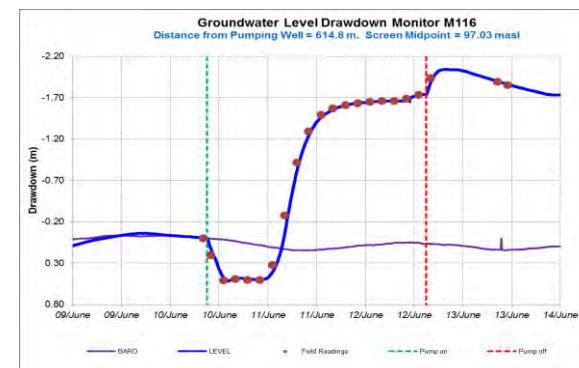
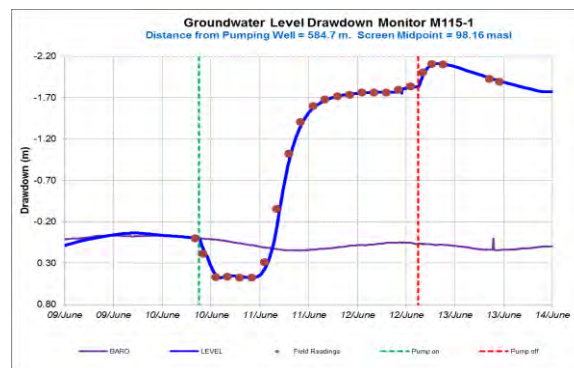
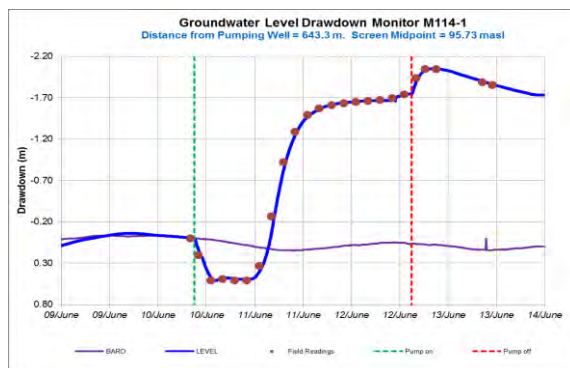
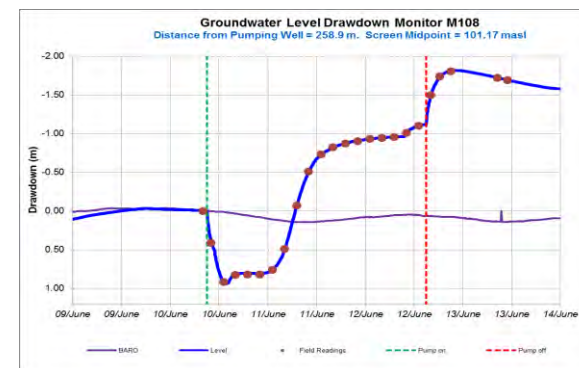
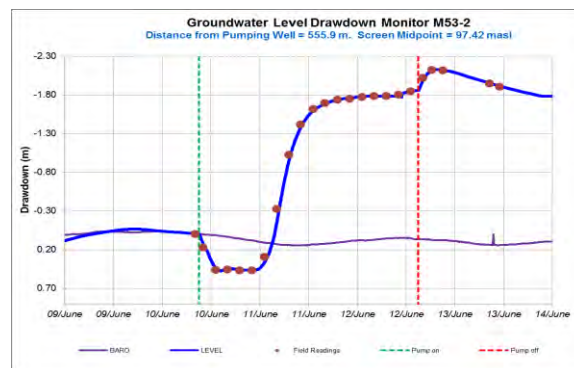
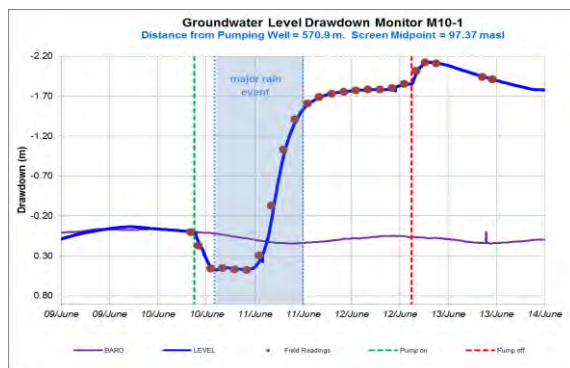
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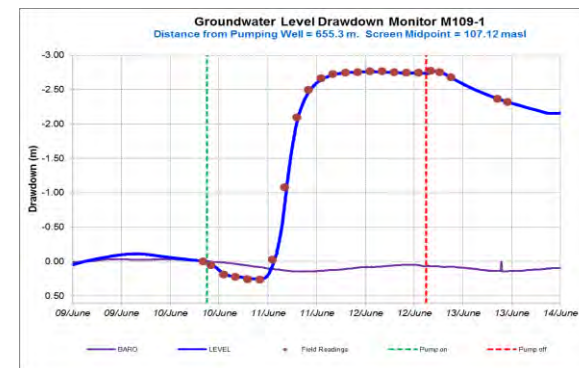
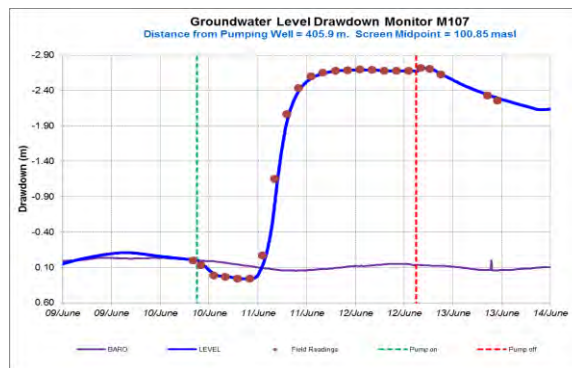
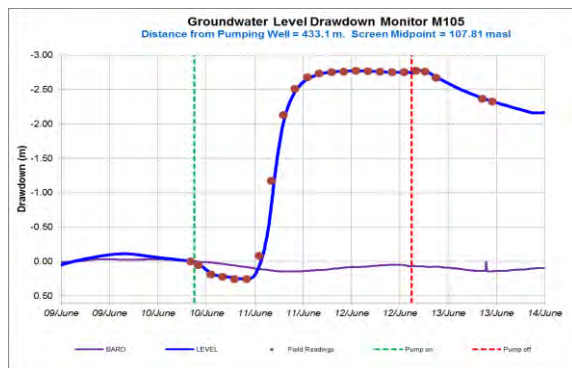
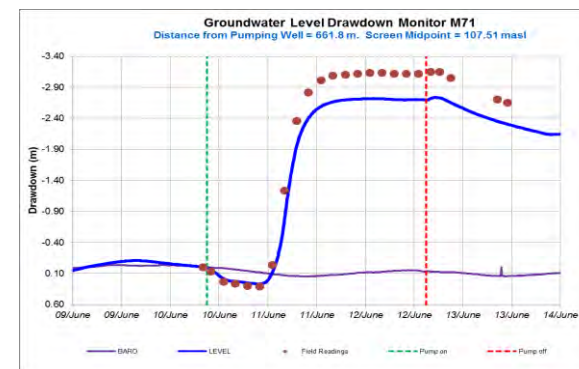
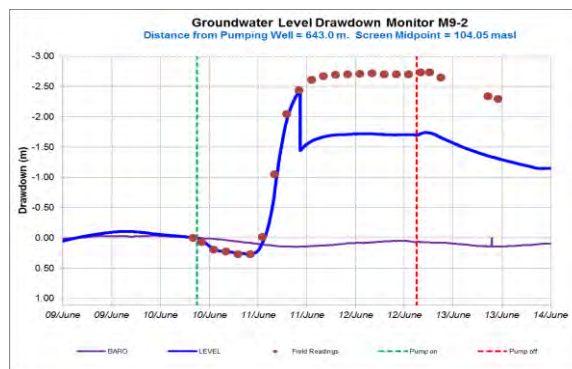
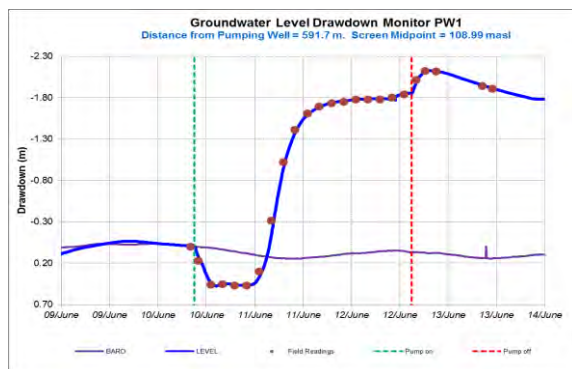
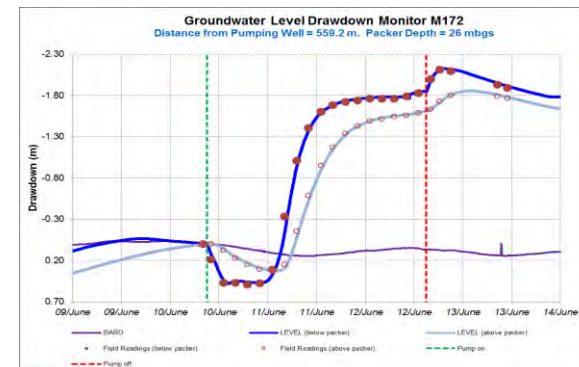
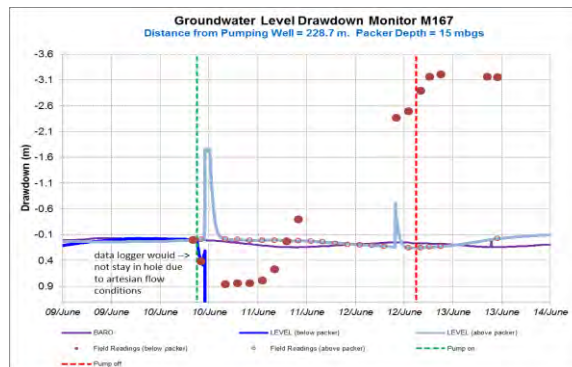
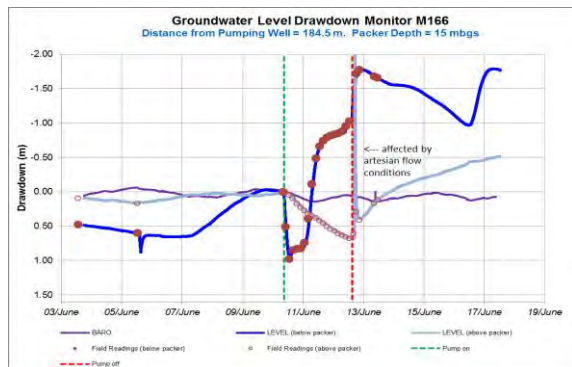
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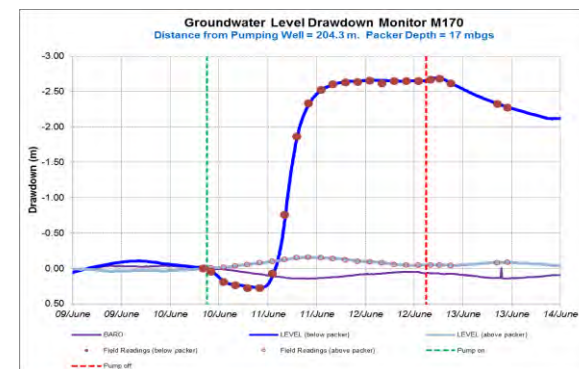
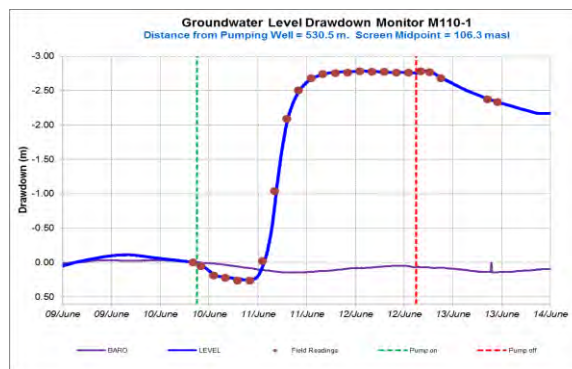
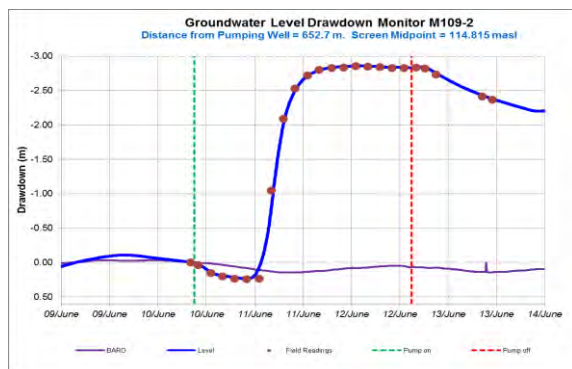
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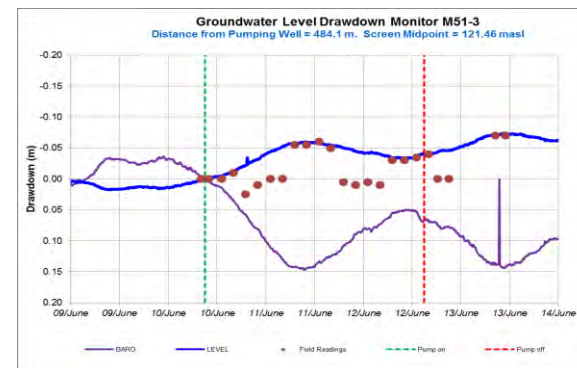
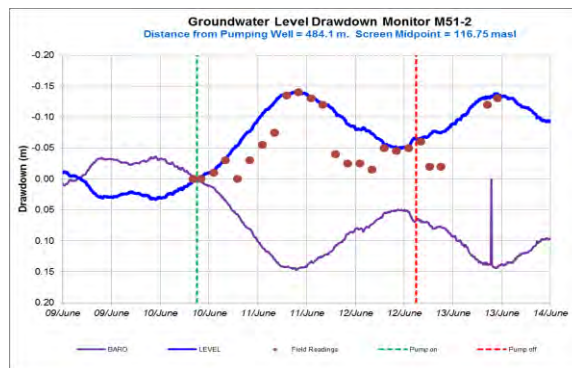
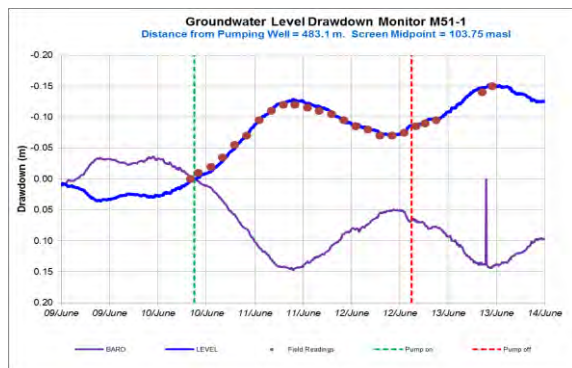
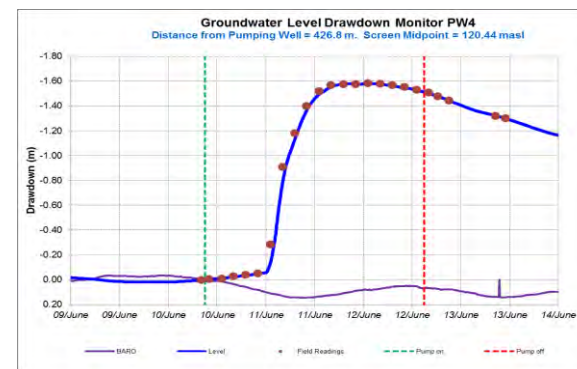
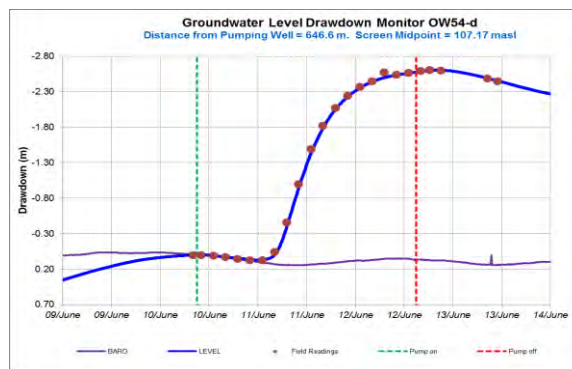
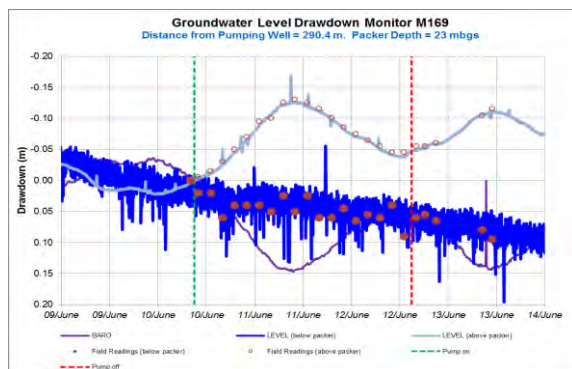
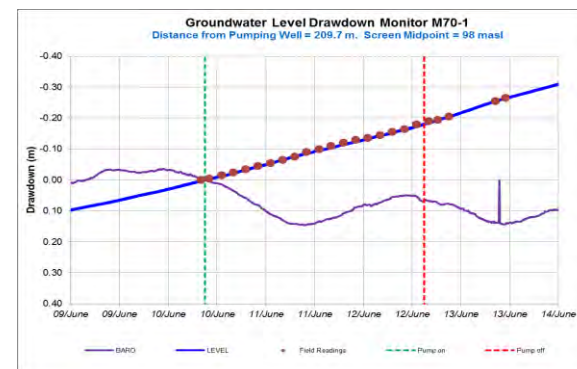
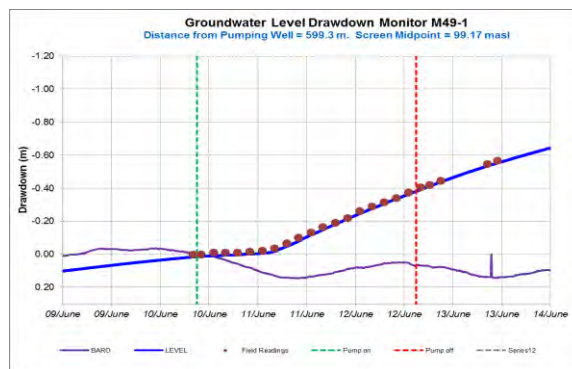
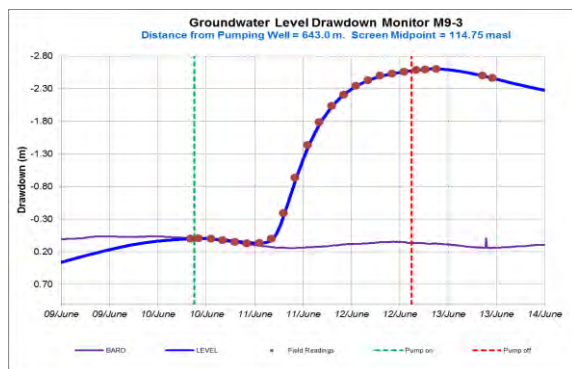
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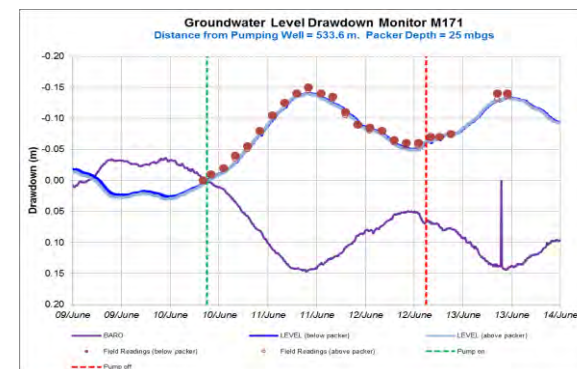
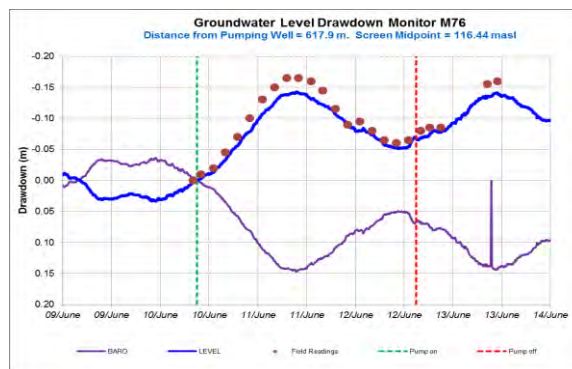
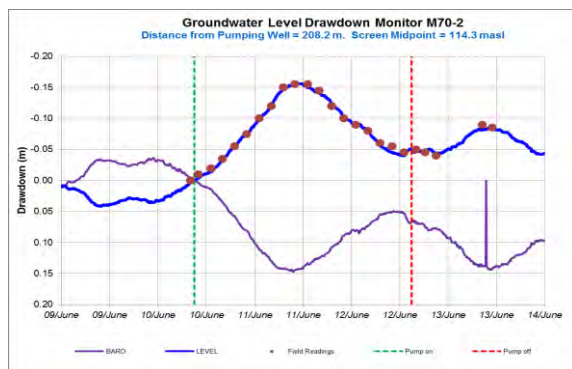
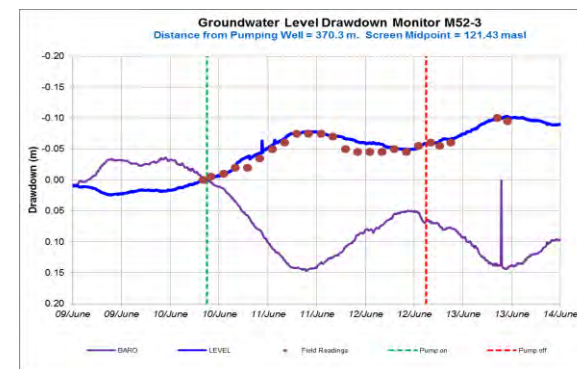
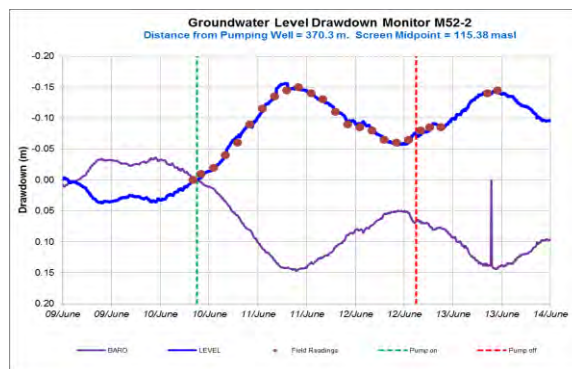
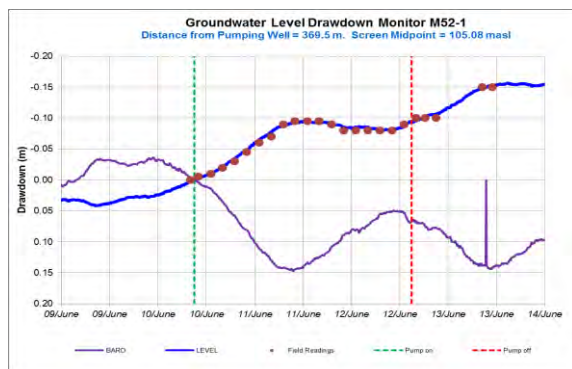
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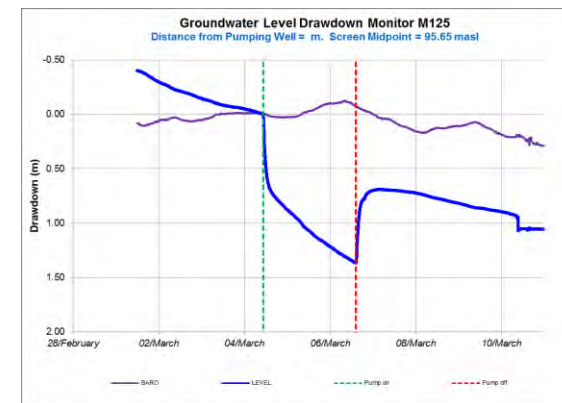
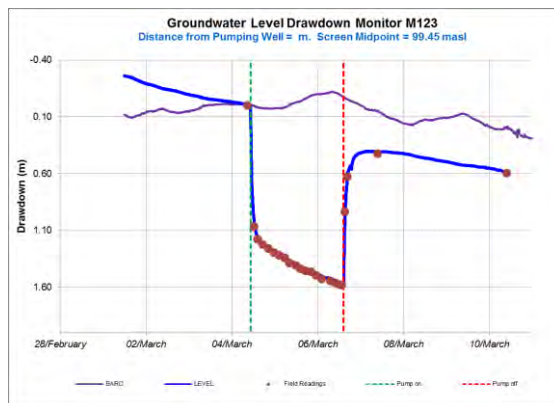
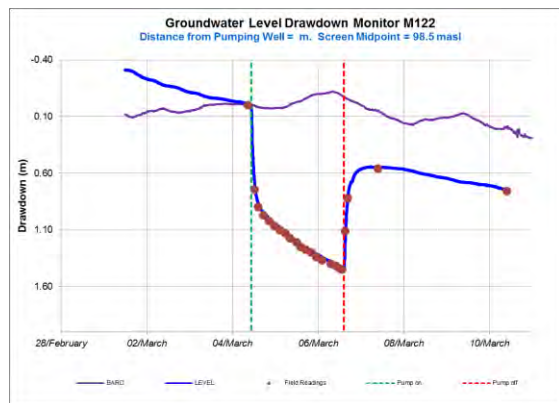
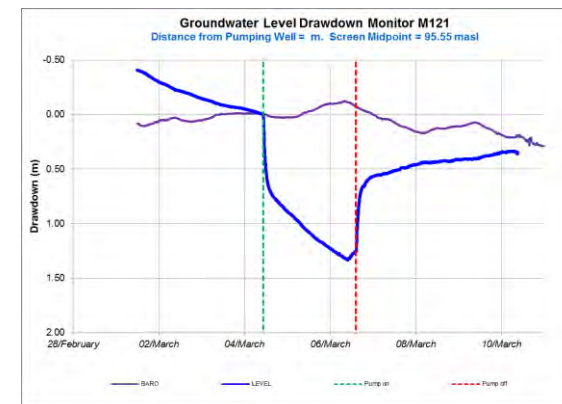
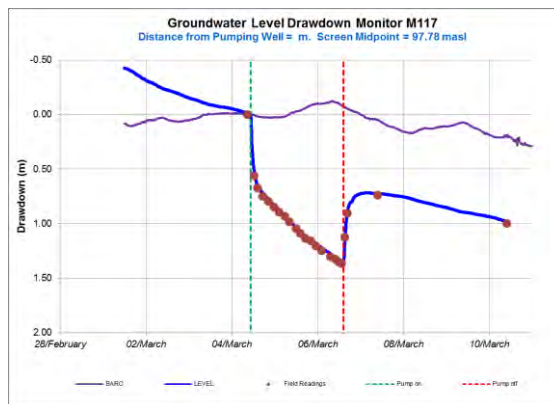
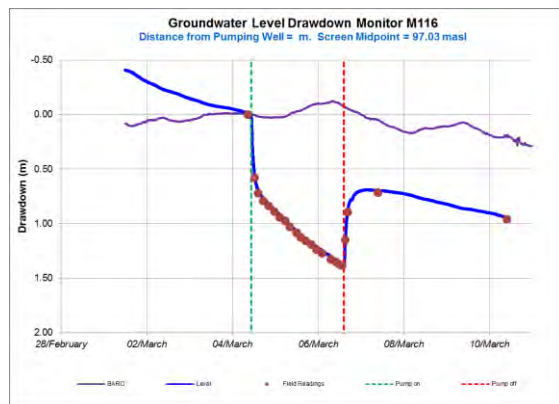
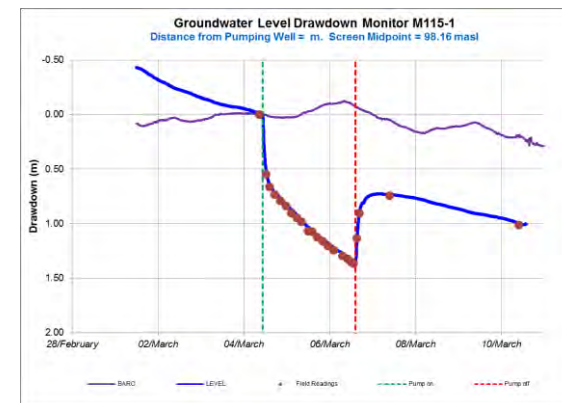
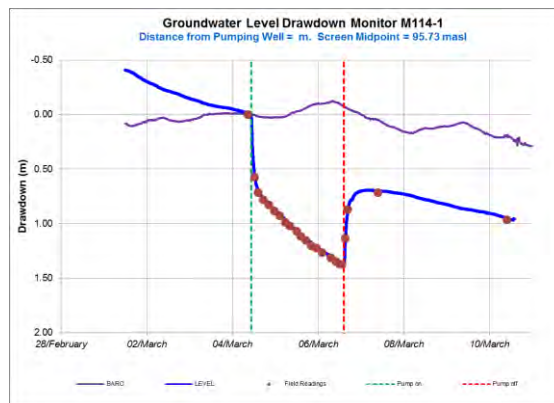
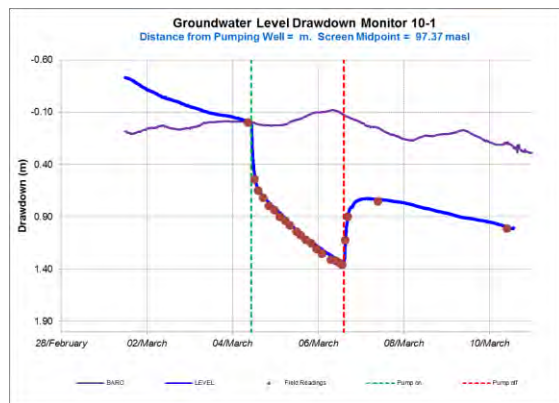
Not responsive to pumping



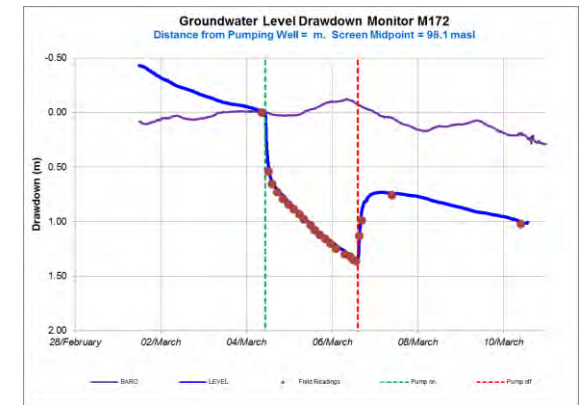
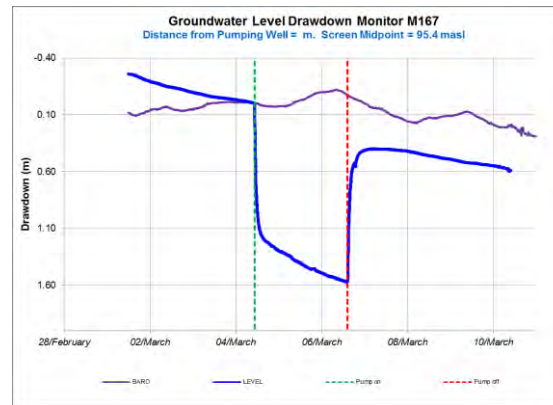
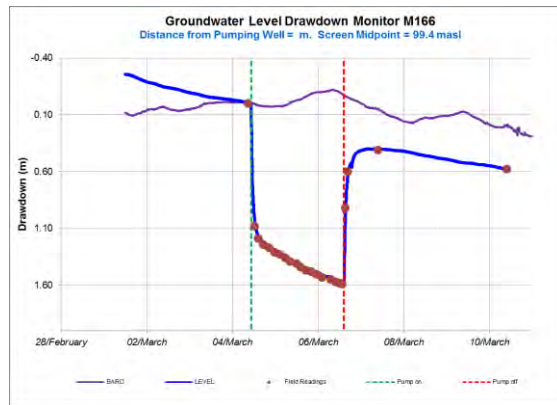
Not responsive to pumping



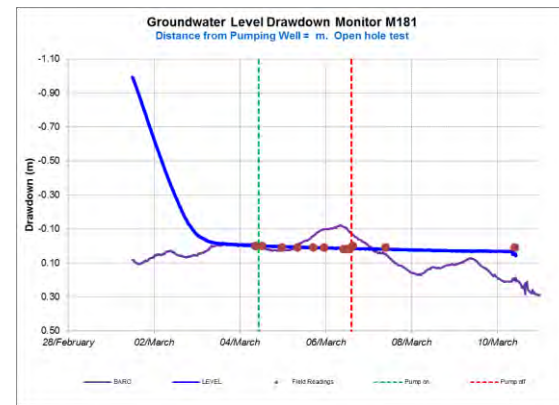
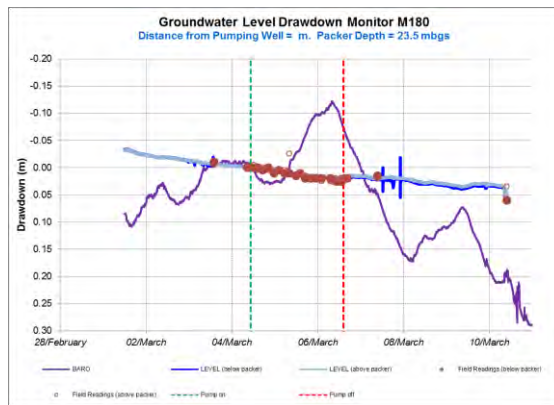
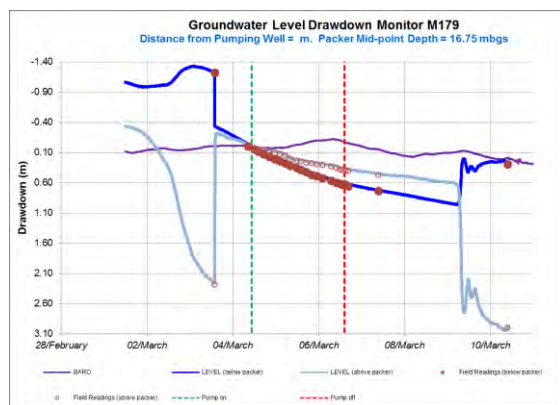
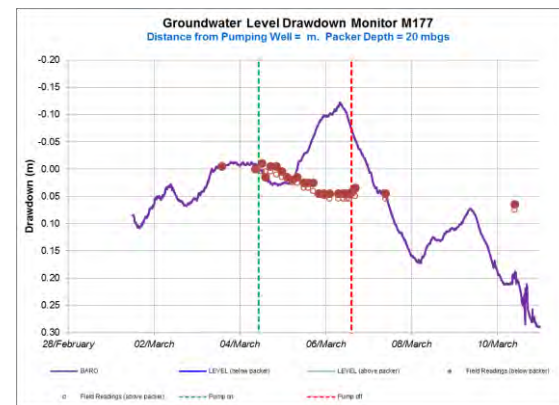
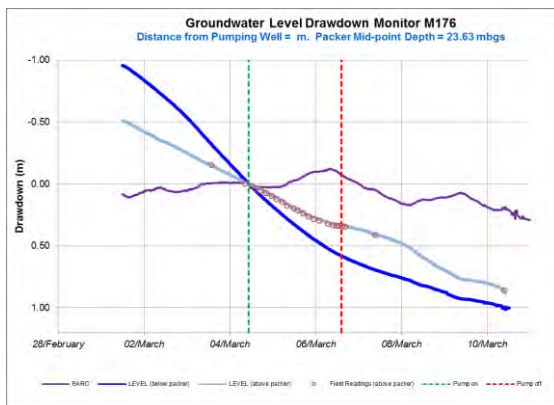
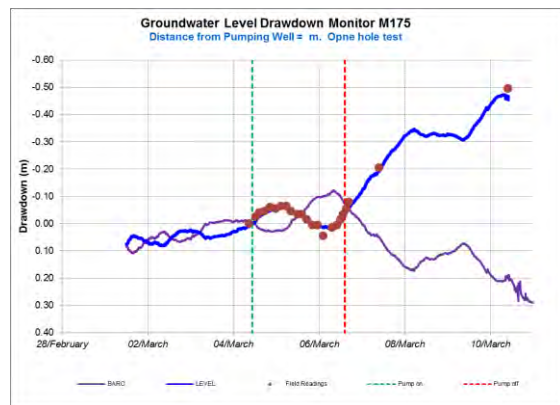
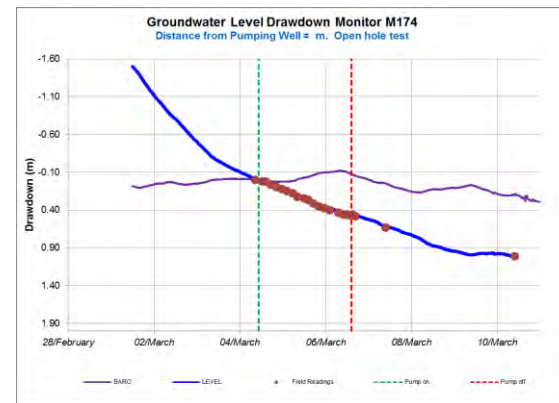
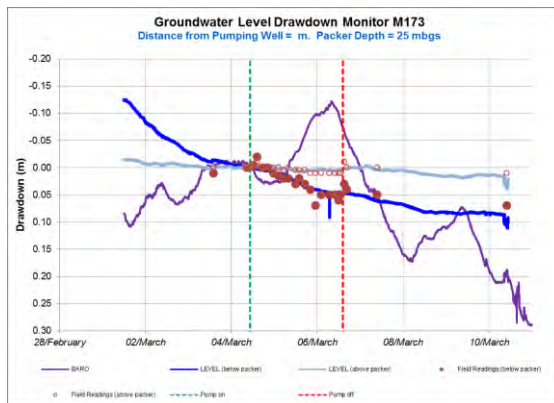
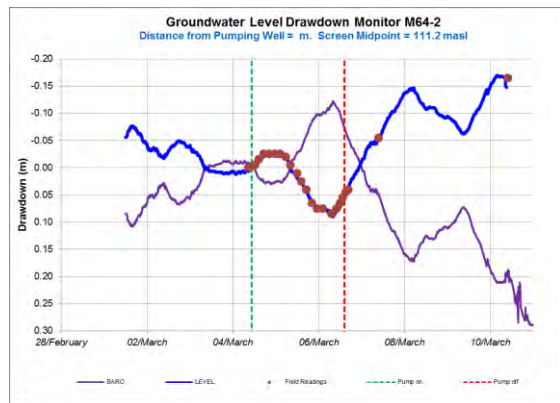
Responsive to pumping



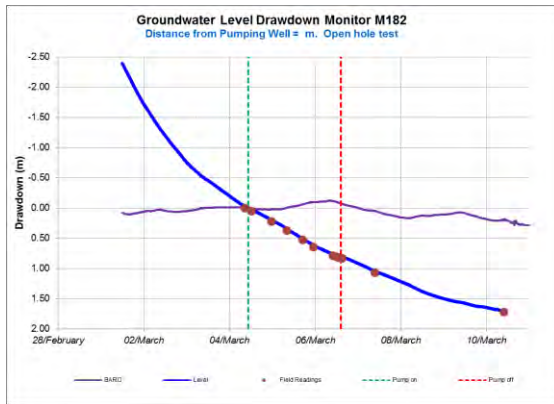
Responsive to pumping con't



No response to pumping

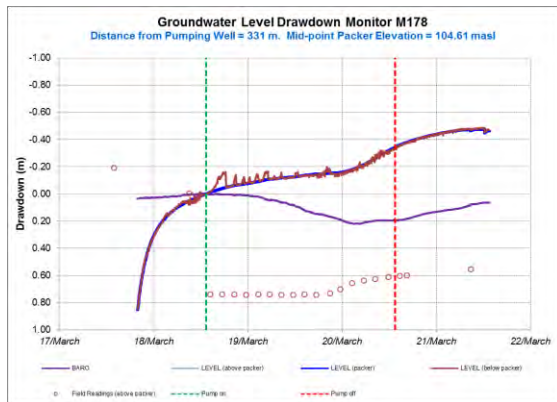
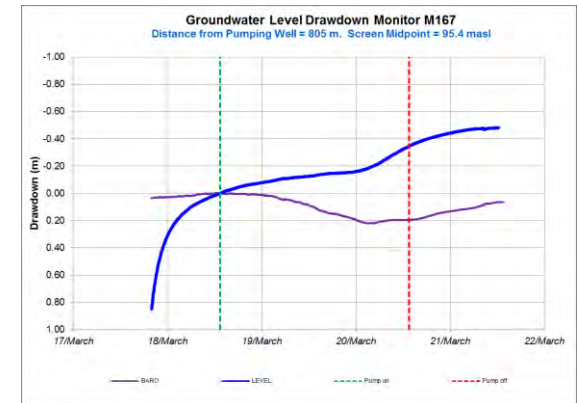
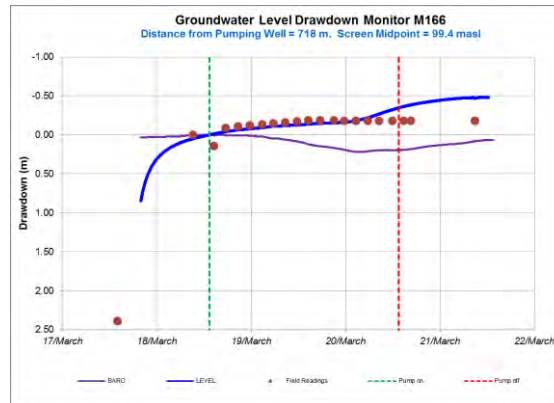
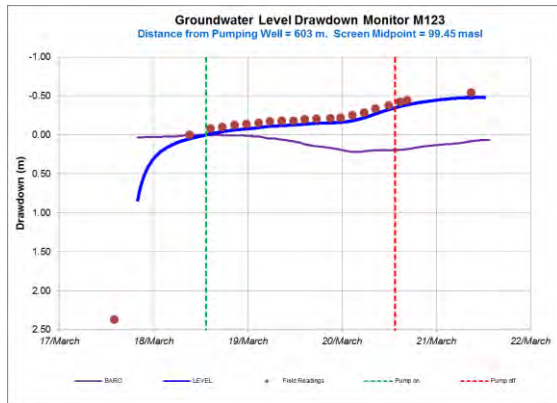
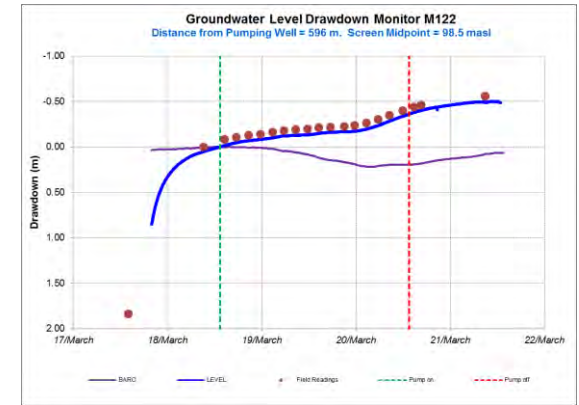
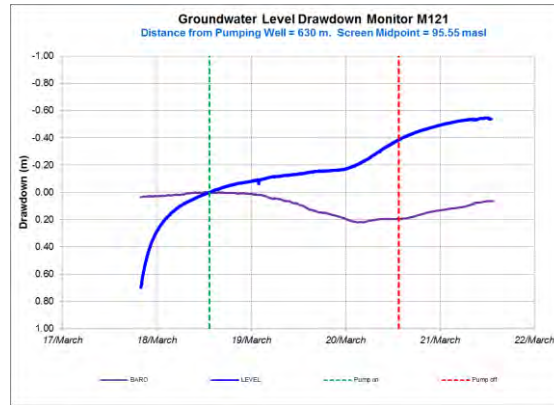
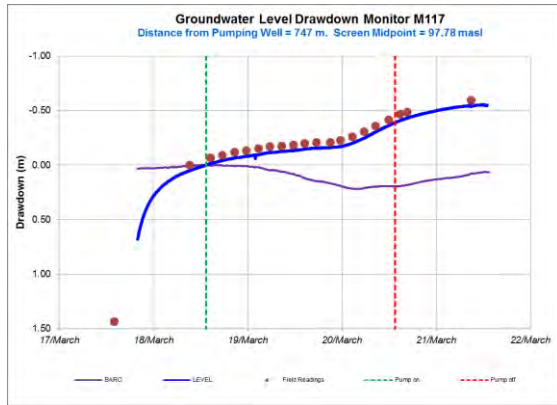


No response to pumping con't



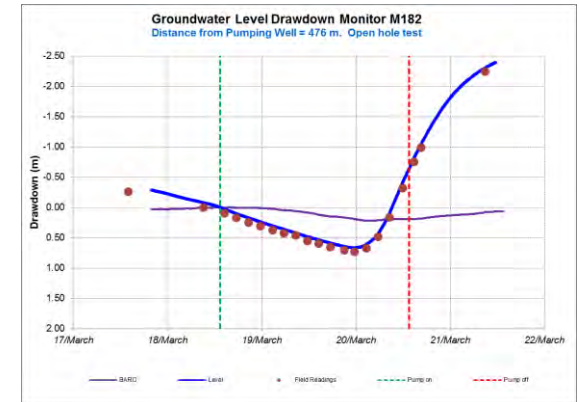
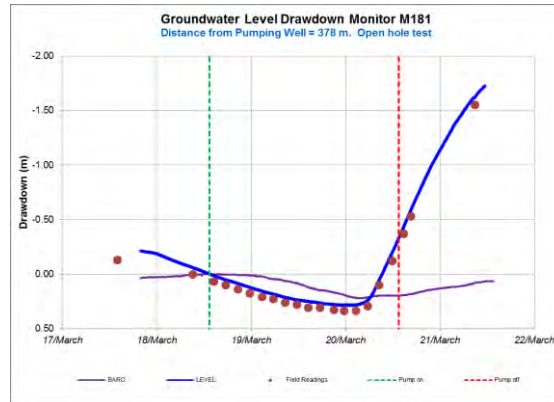
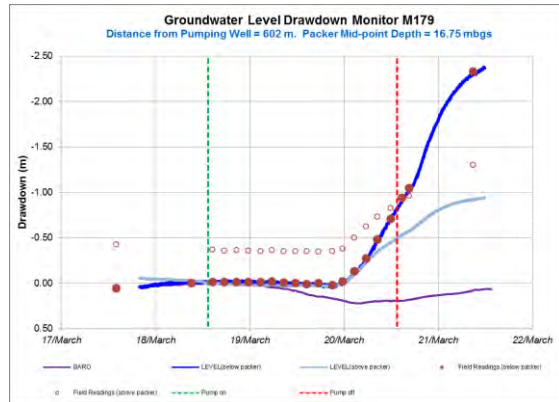
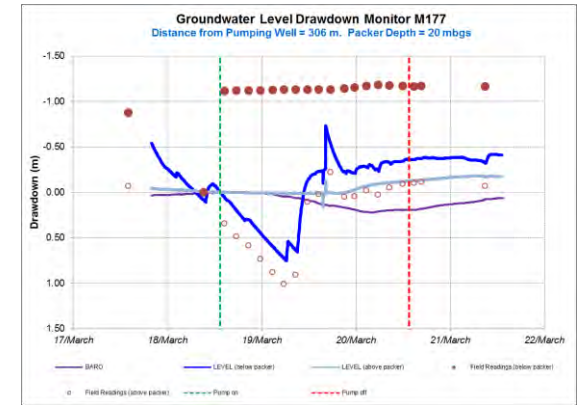
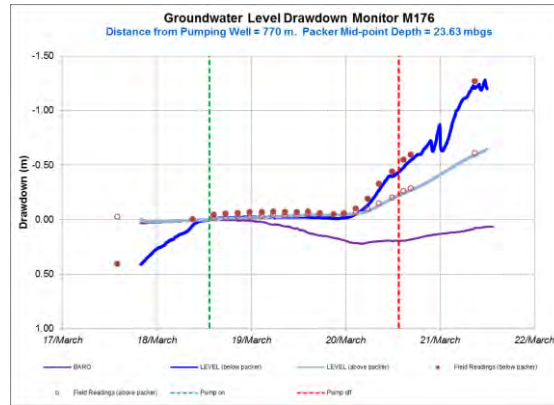
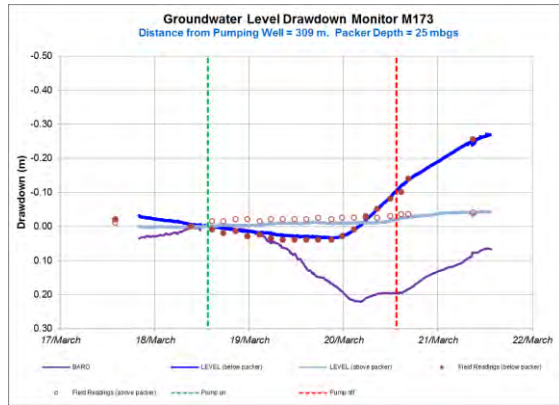
Group – 1

M174 Pumping Test
March 17, 2014



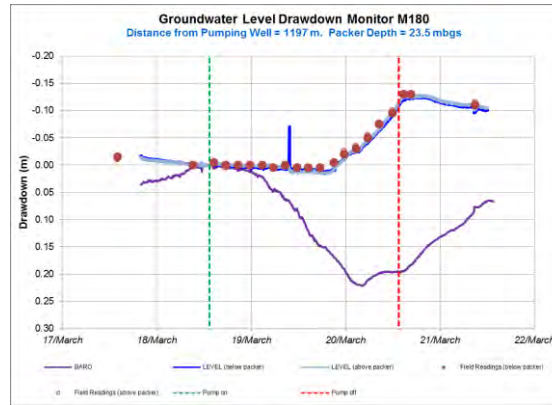
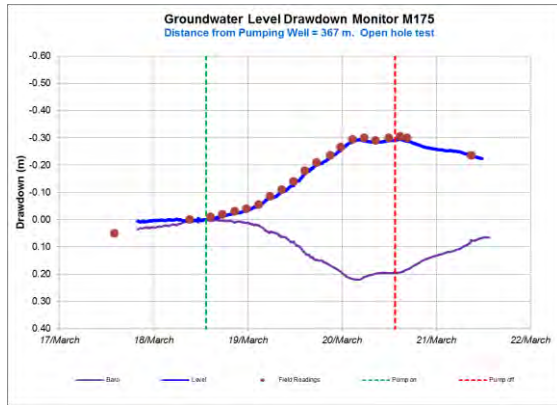
Group – 2

M174 Pumping Test
March 17, 2014



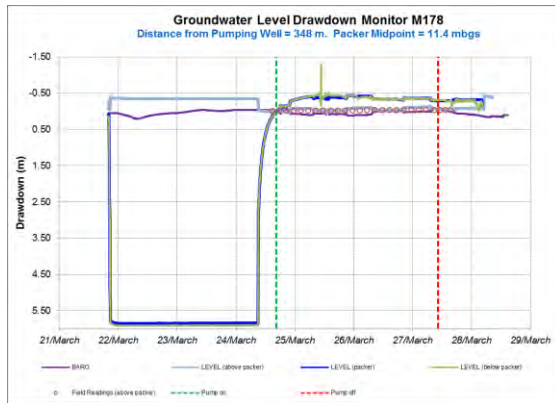
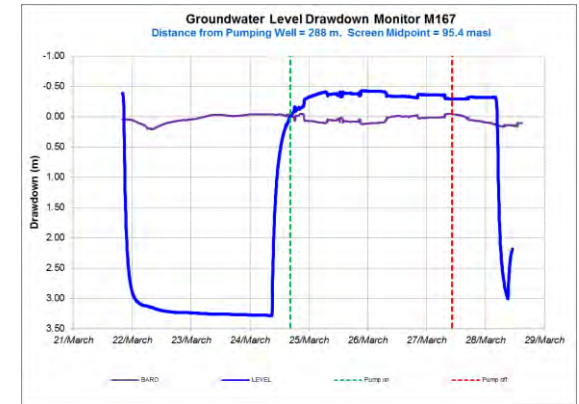
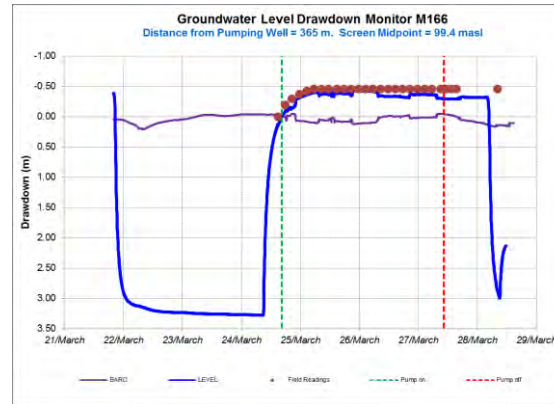
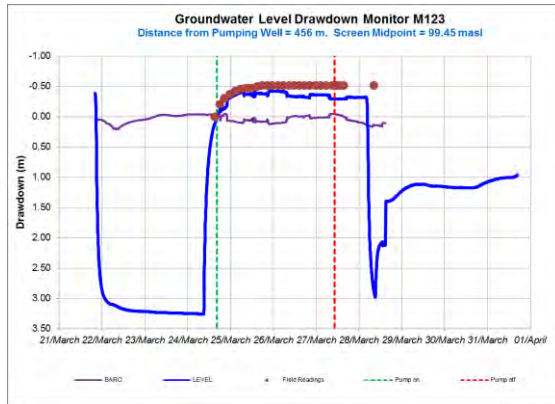
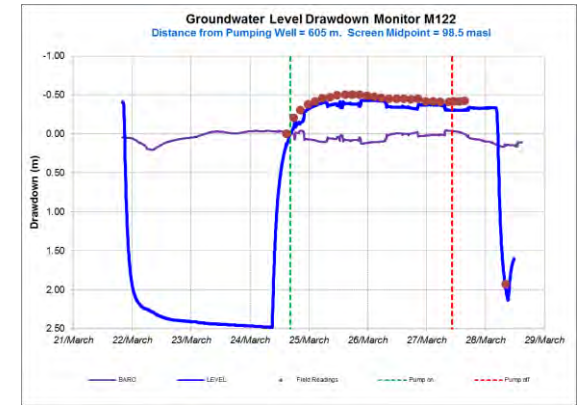
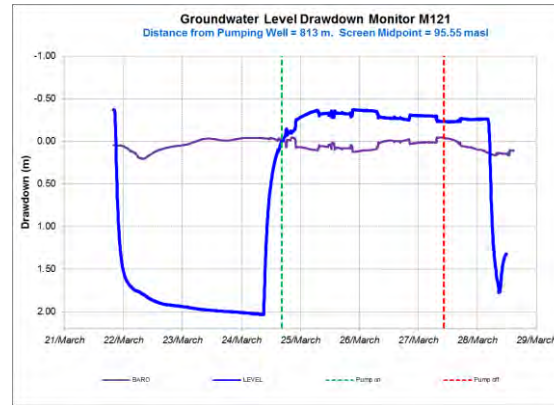
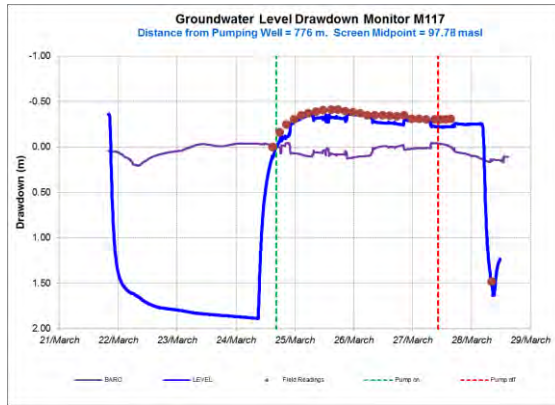
Group – 3

M174 Pumping Test
March 17, 2014



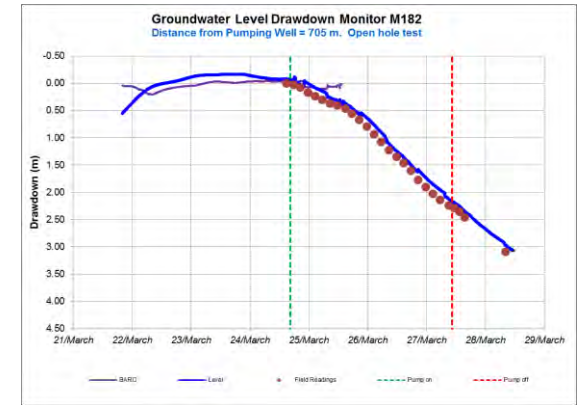
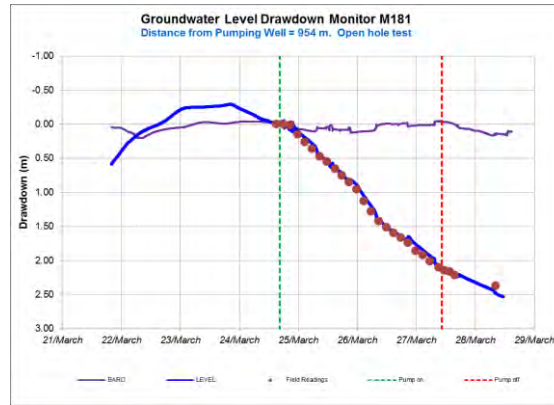
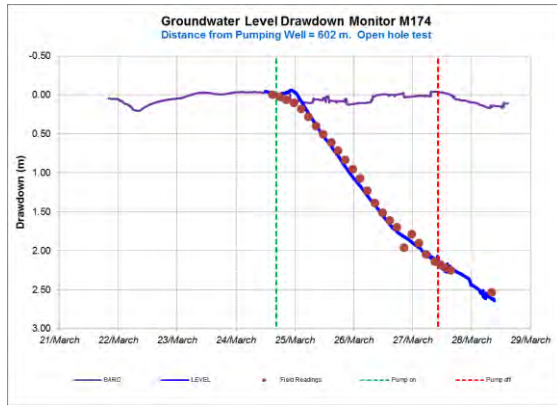
Group – 1

M179 Pumping Test
March 24, 2014



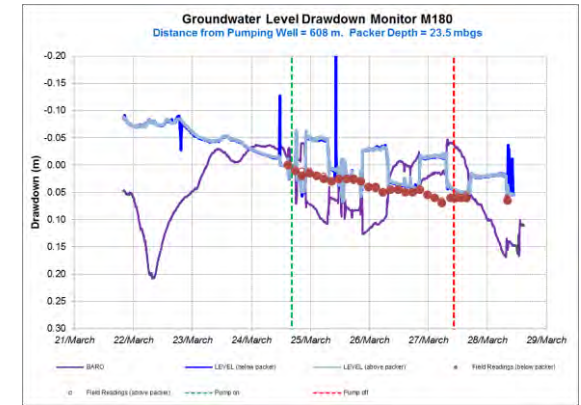
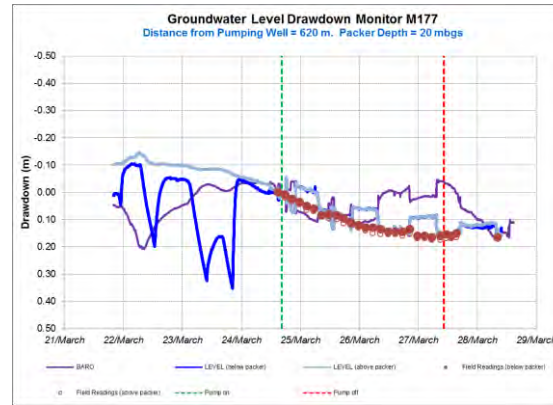
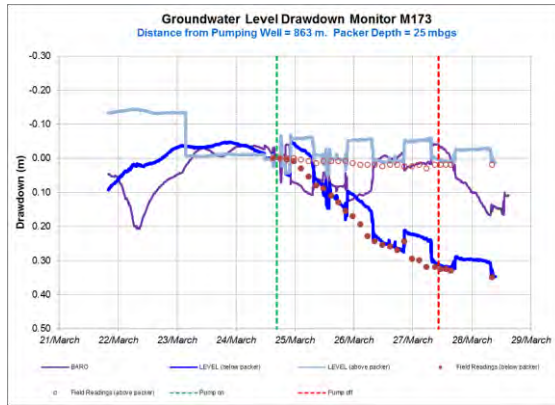
Group – 2

M179 Pumping Test
March 24, 2014



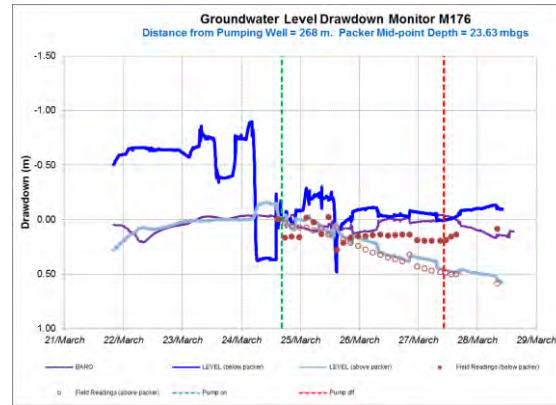
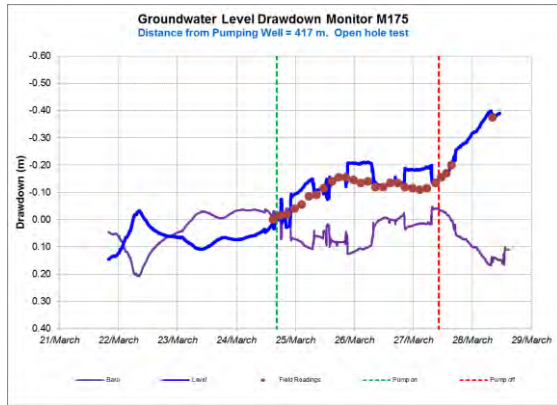
Group – 2b

M179 Pumping Test
March 24, 2014

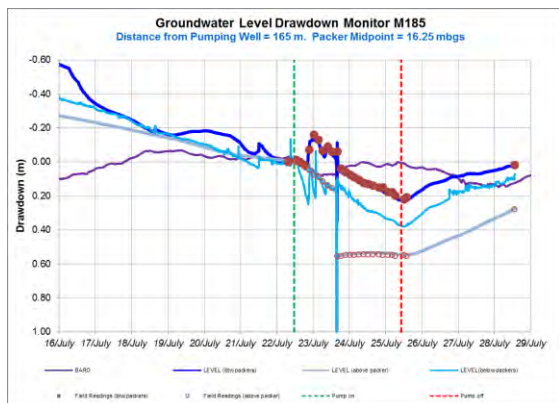
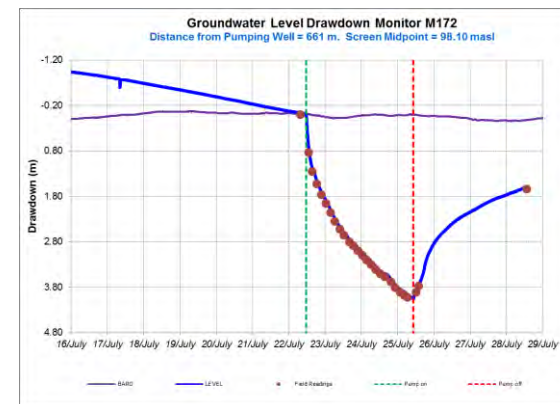
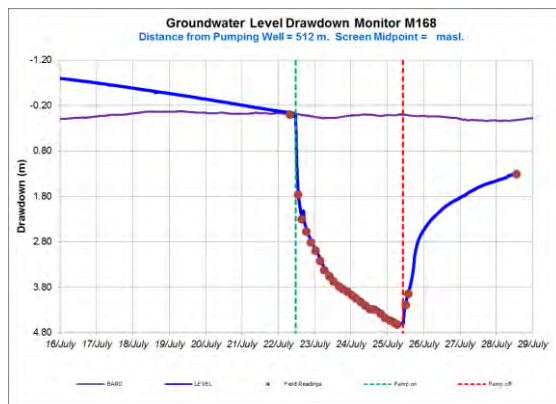
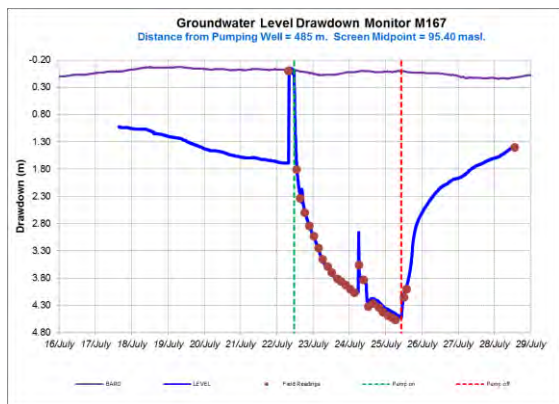
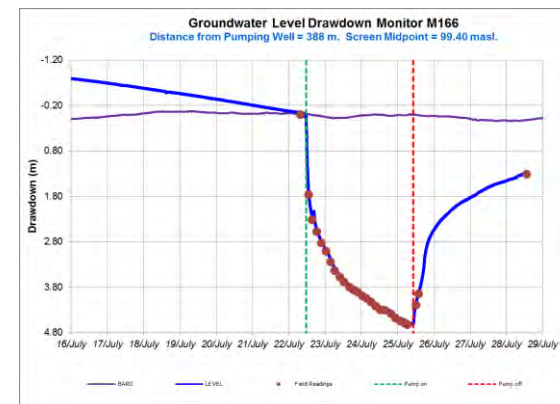
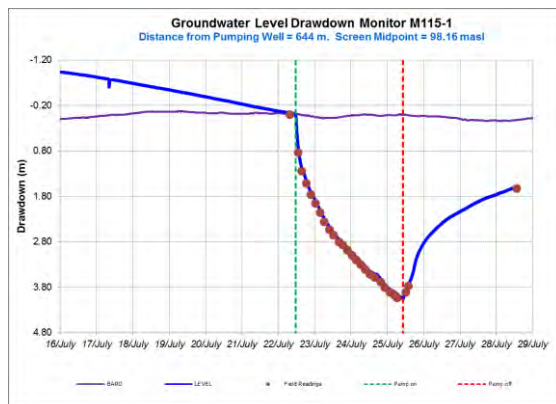
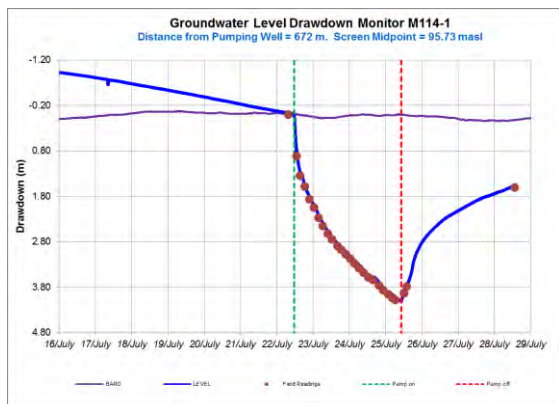


Group – 3

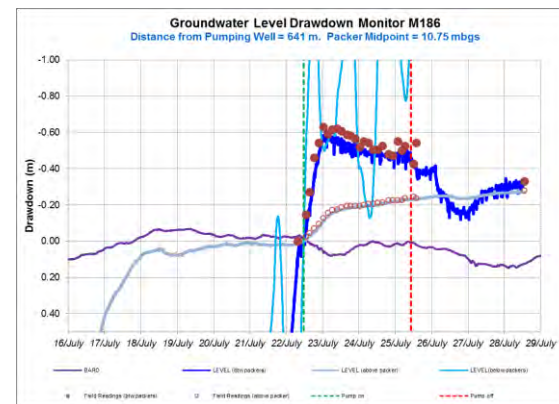
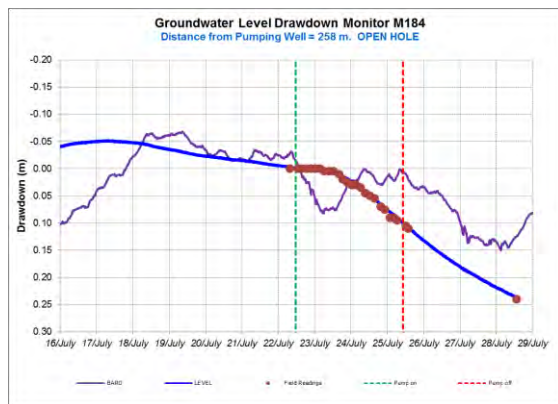
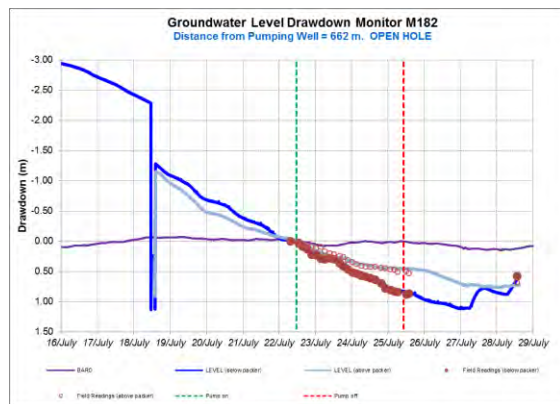
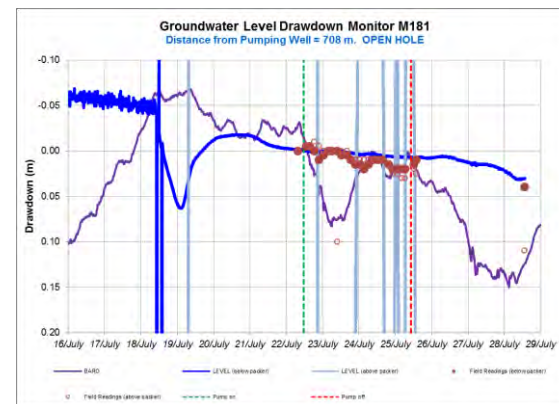
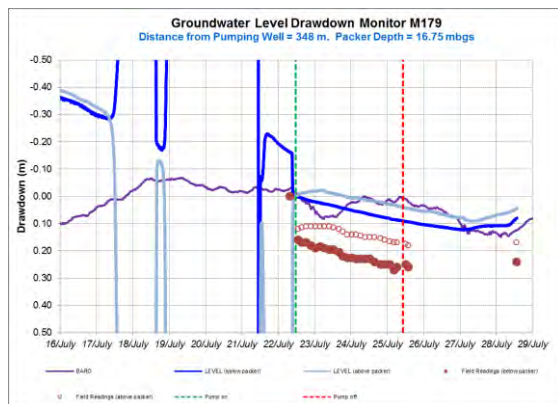
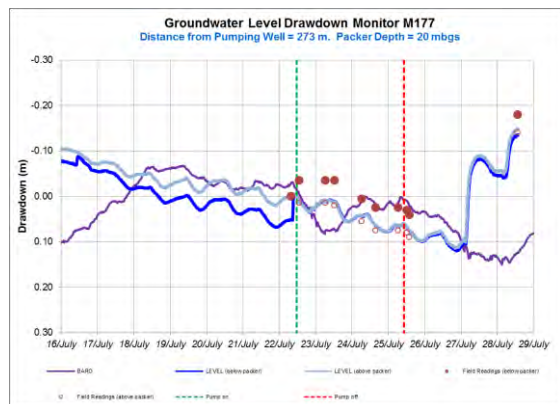
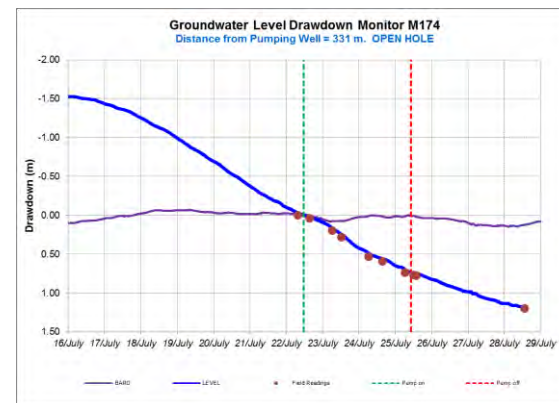
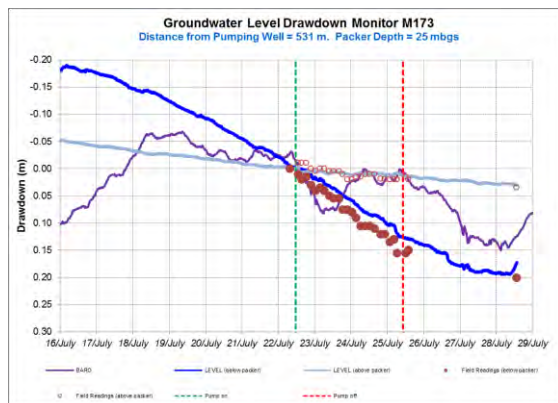
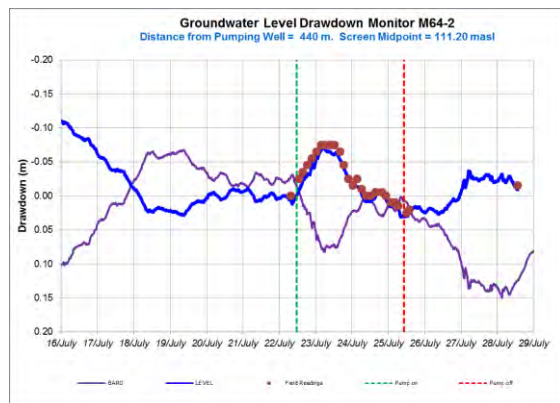
M179 Pumping Test
March 24, 2014



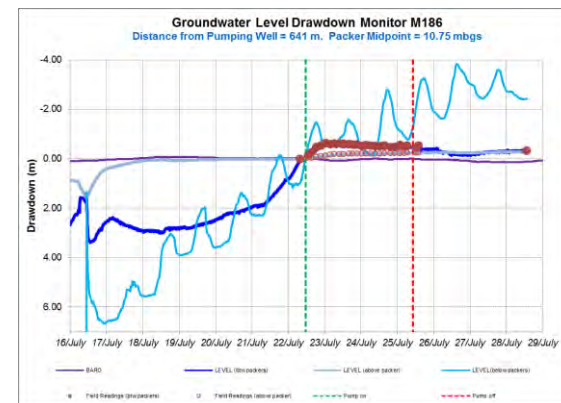
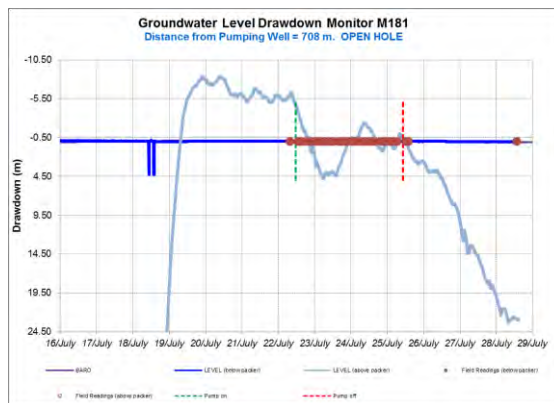
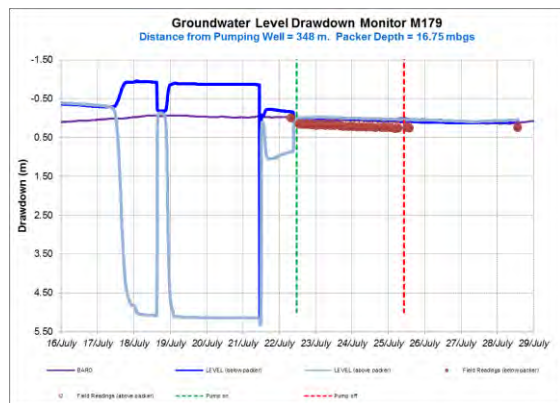
Responsive to pumping

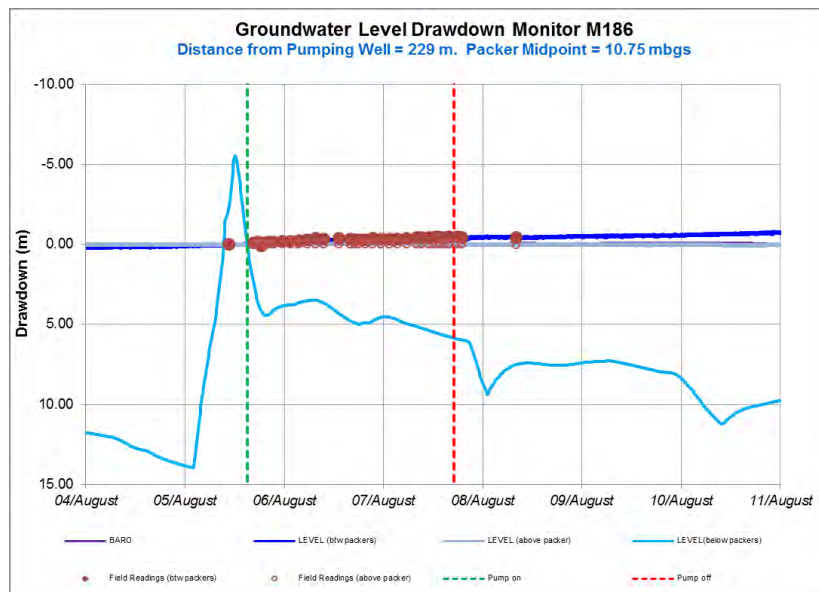
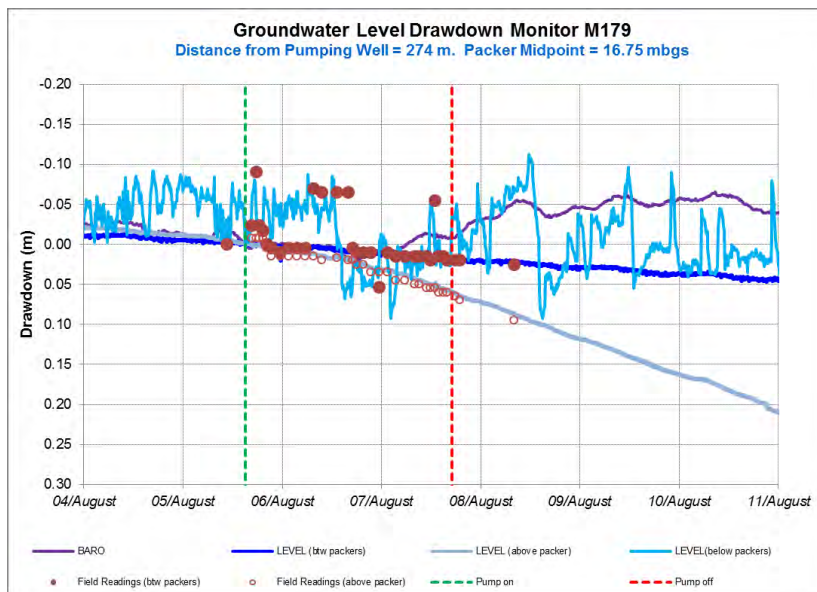
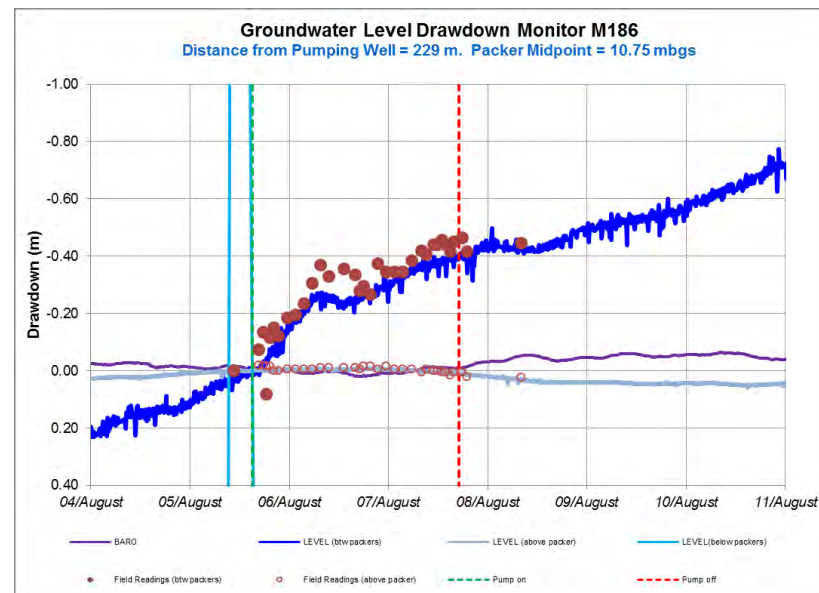
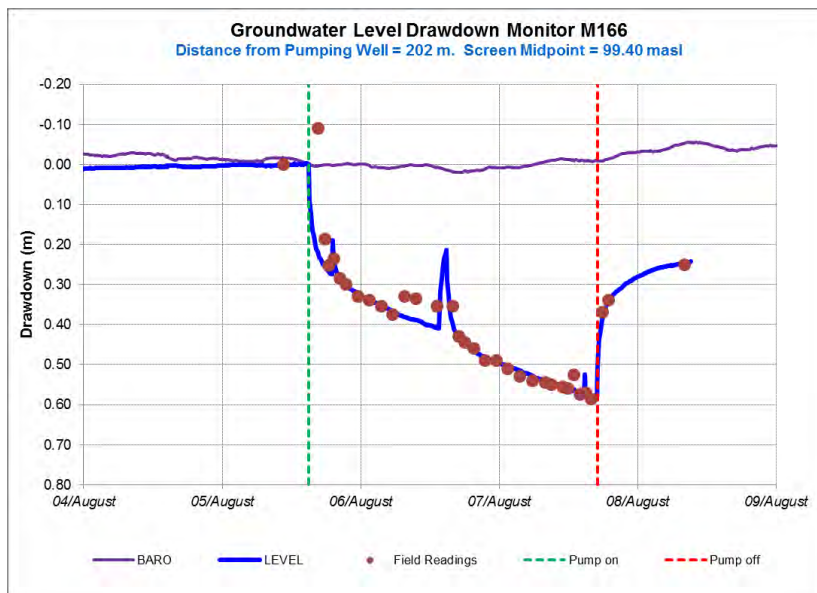


No response to pumping



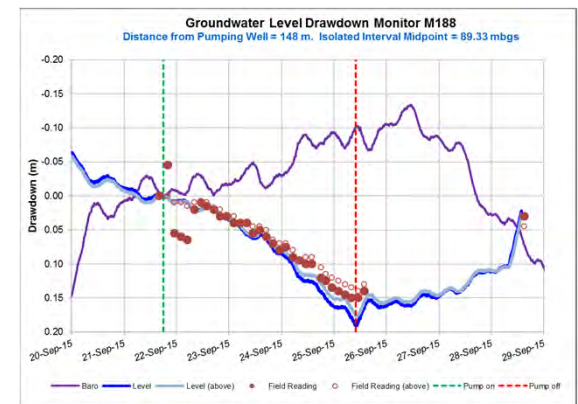
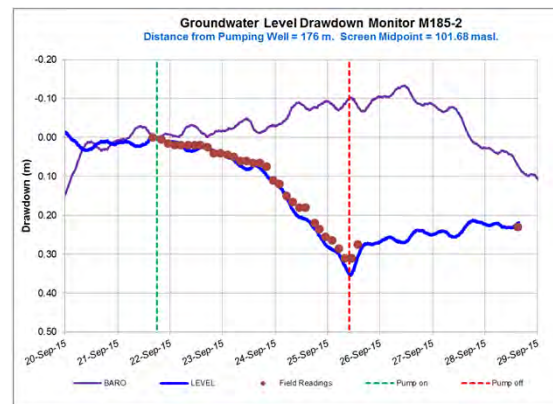
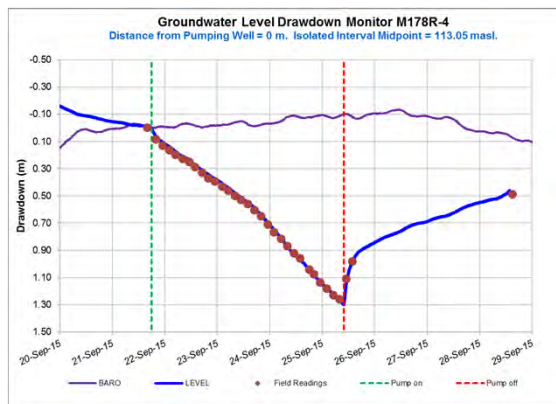
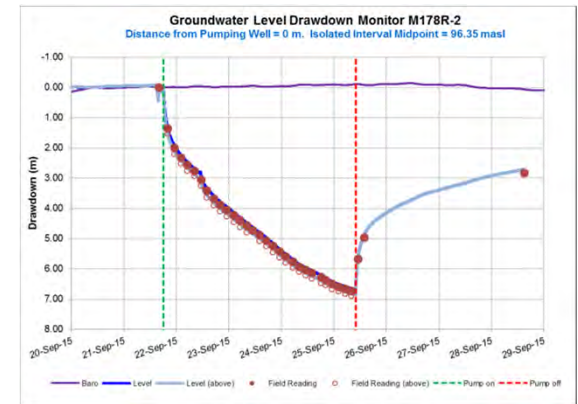
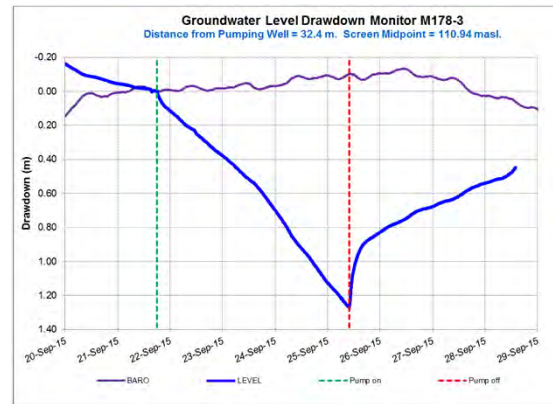
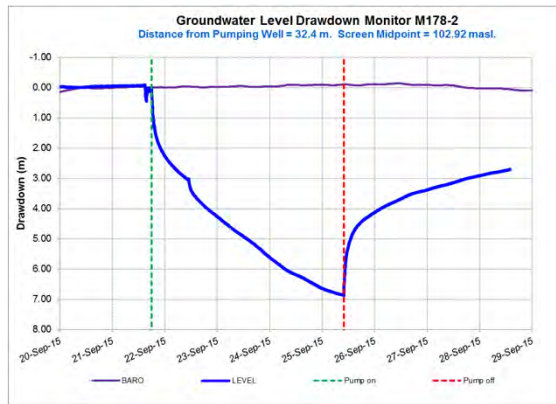
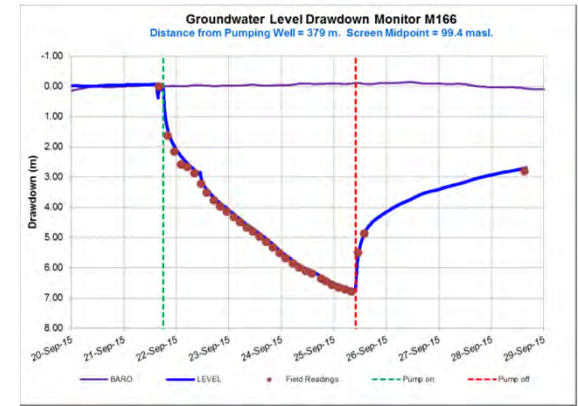
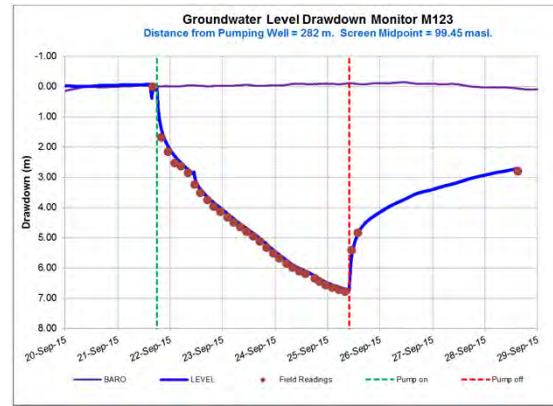
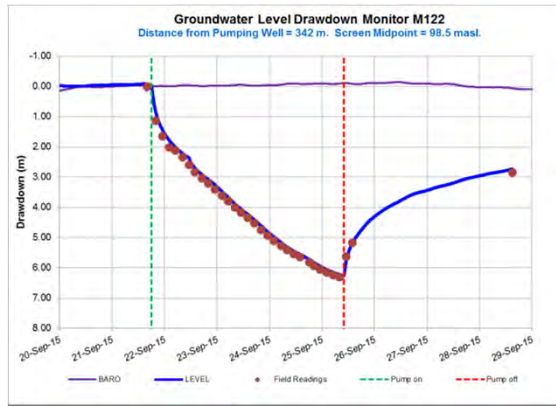
No response to pumping





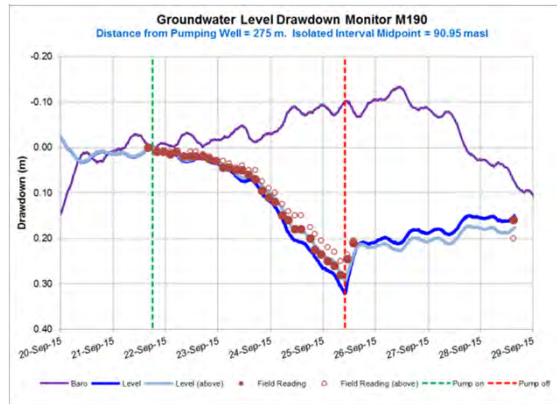
Responsive to pumping

M178R-3 Pumping Test
September 21, 2015



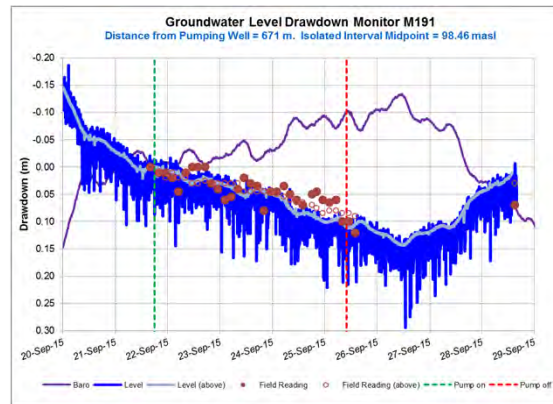
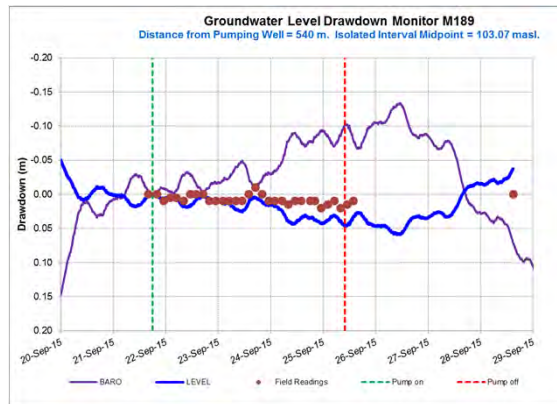
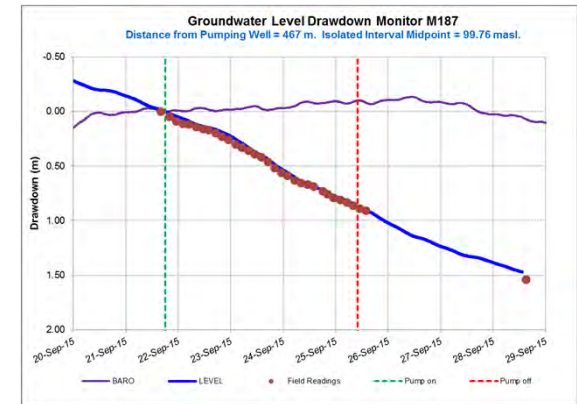
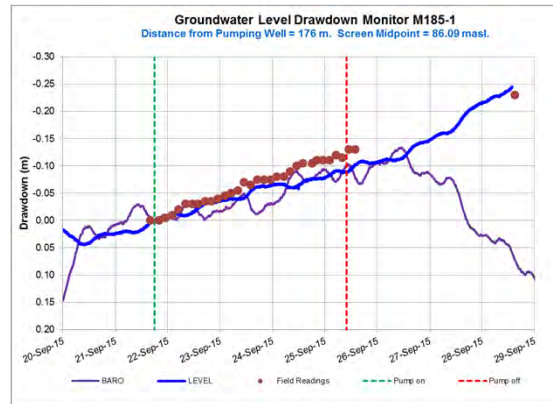
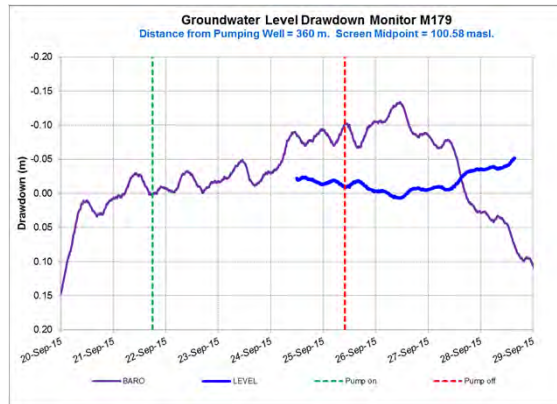
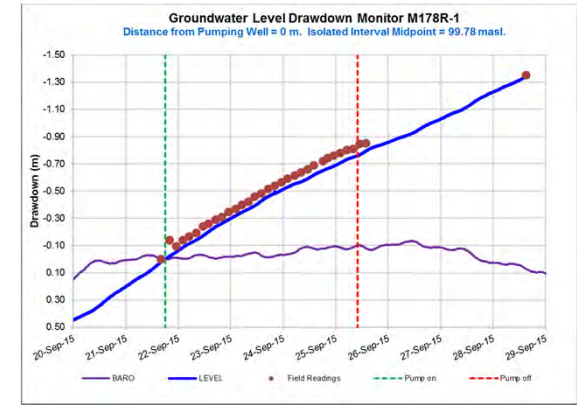
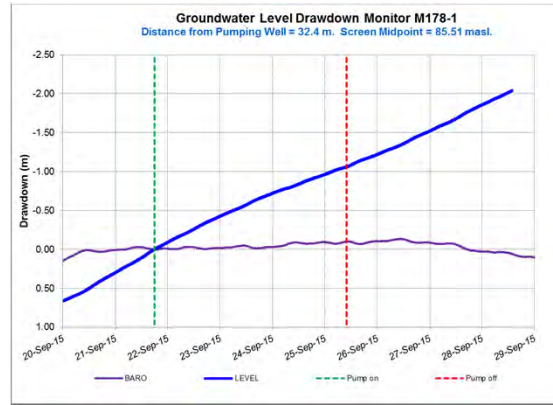
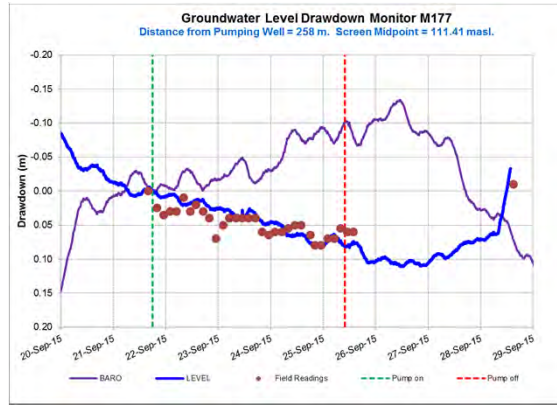
Responsive to pumping (continued)

M178R-3 Pumping Test
September 21, 2015



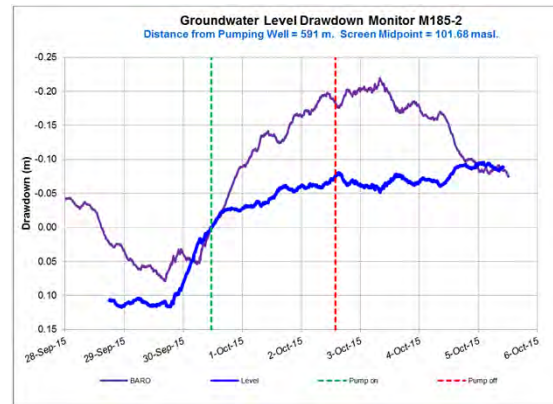
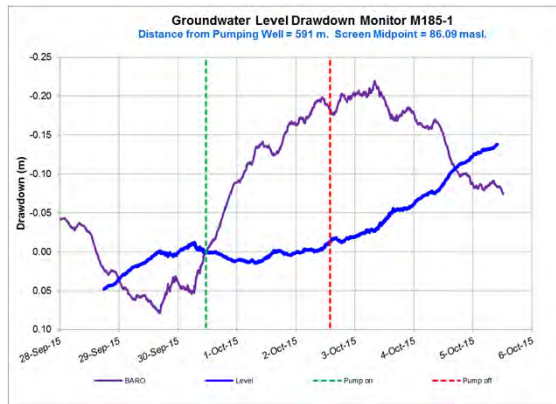
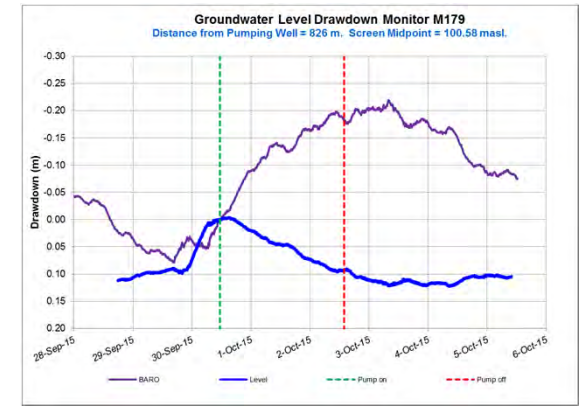
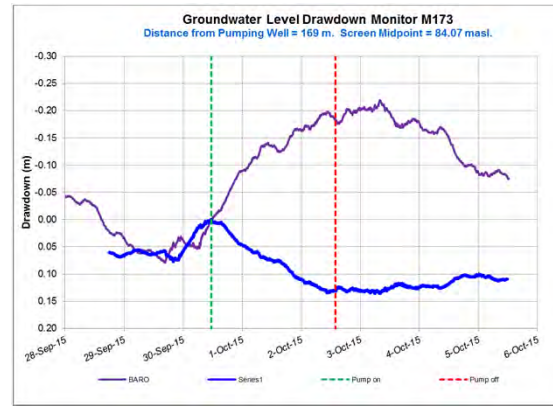
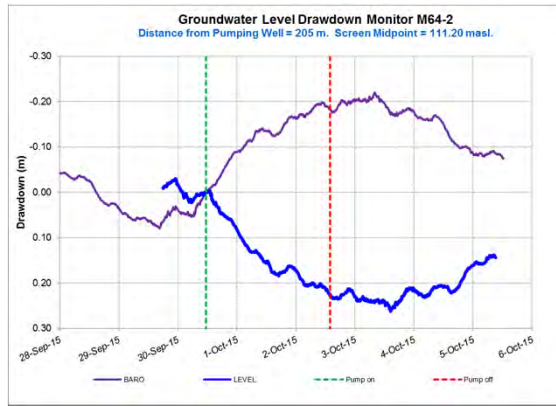
No response to pumping

M178R-3 Pumping Test
September 21, 2015



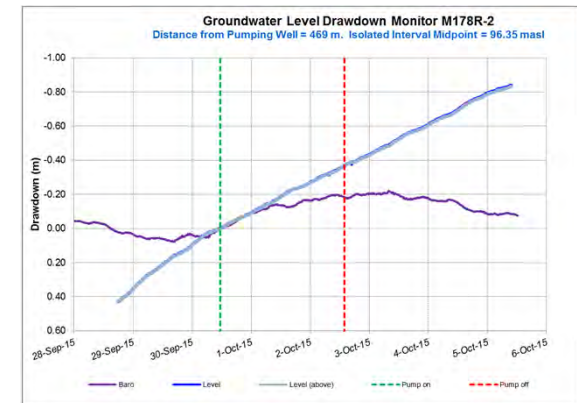
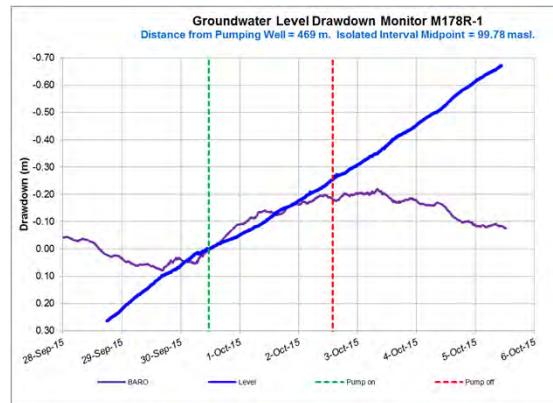
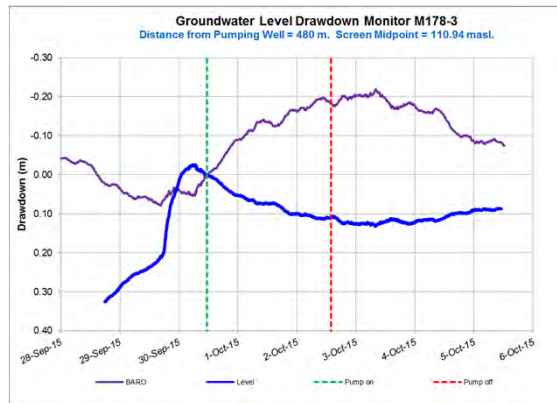
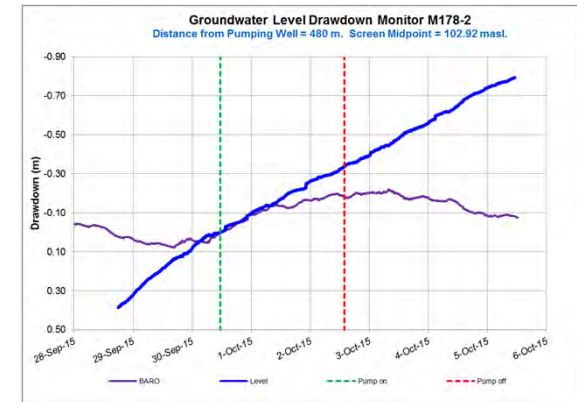
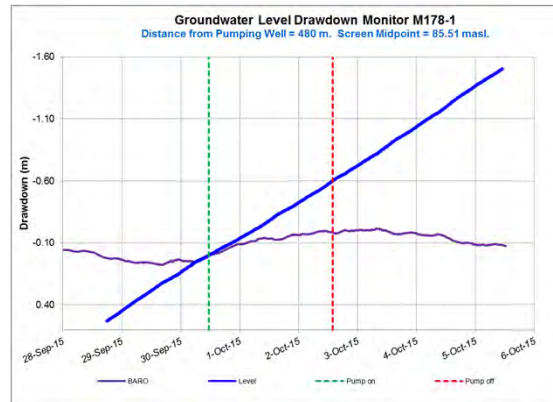
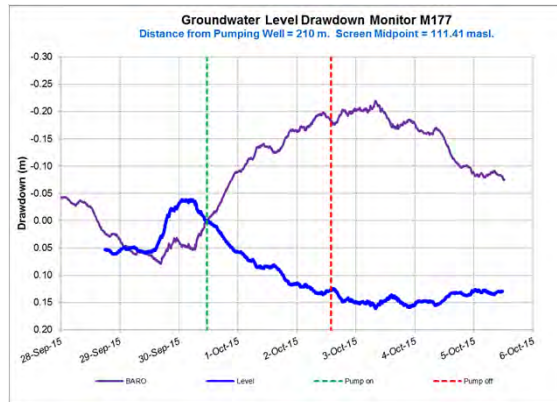
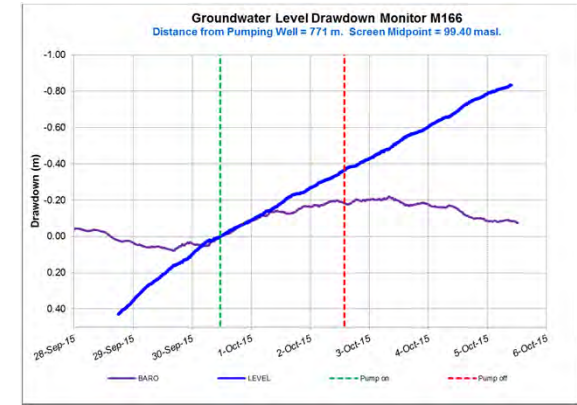
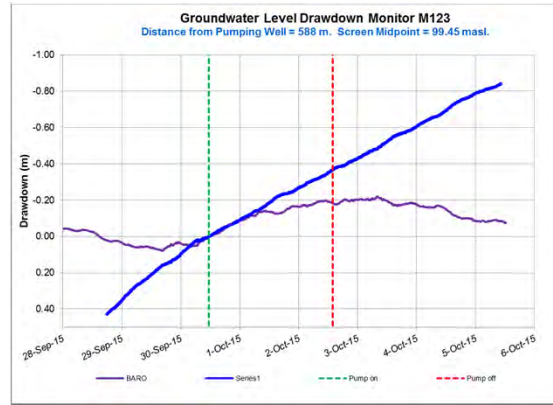
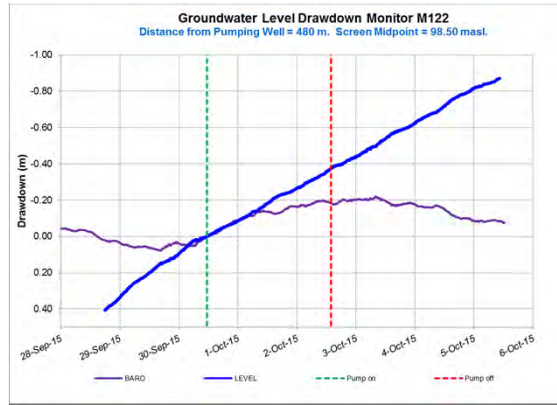
Responsive to pumping

M187 Pumping Test
September 30, 2015



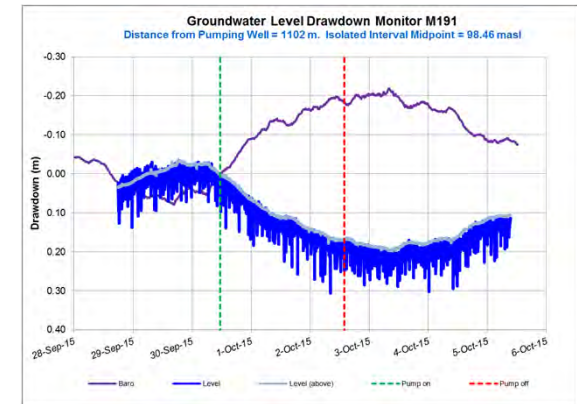
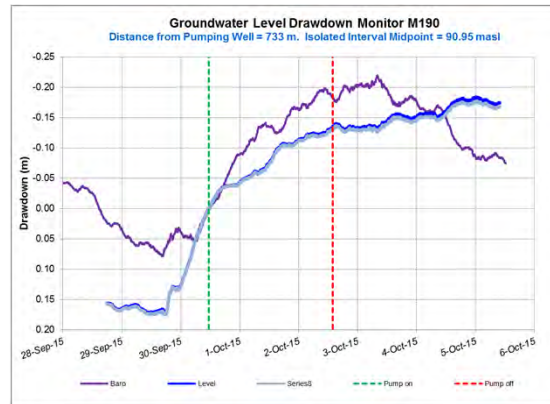
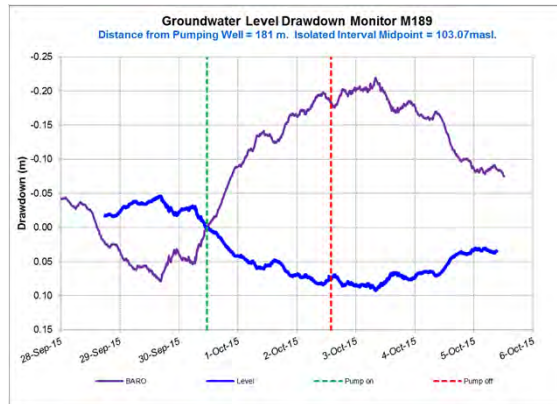
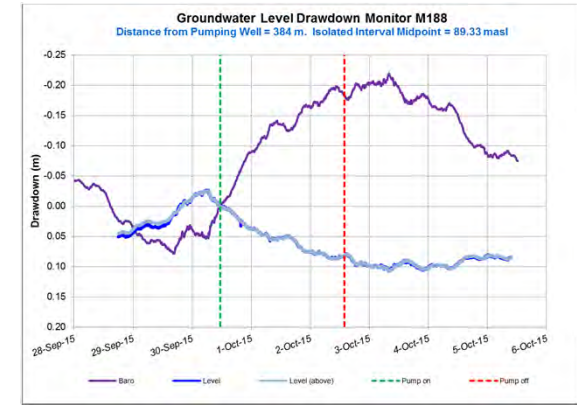
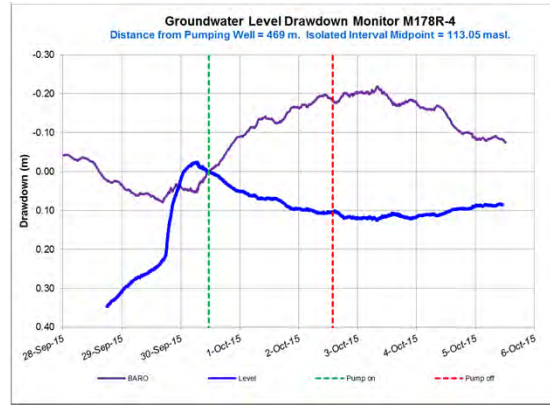
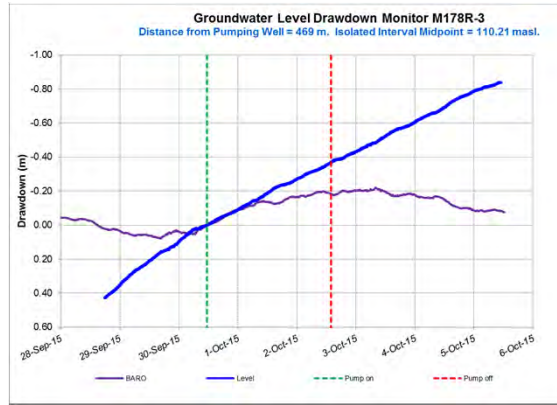
No response to pumping

M187 Pumping Test
September 30, 2015



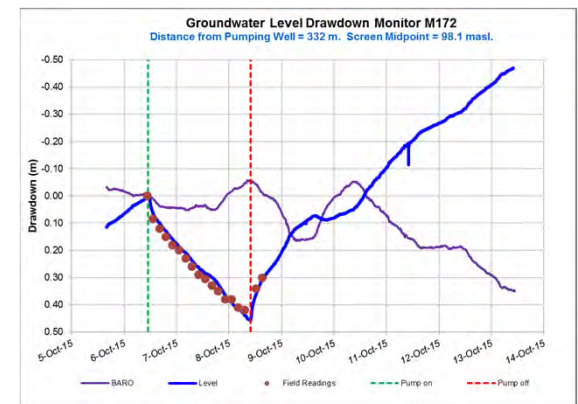
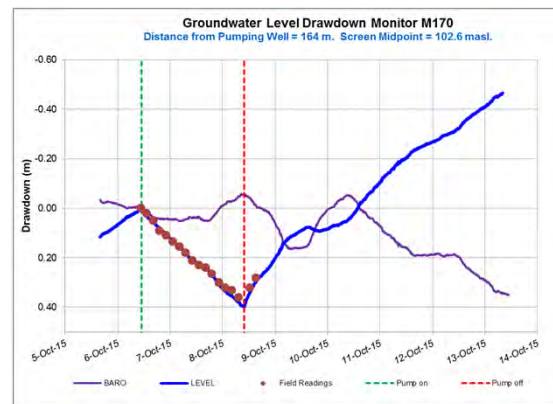
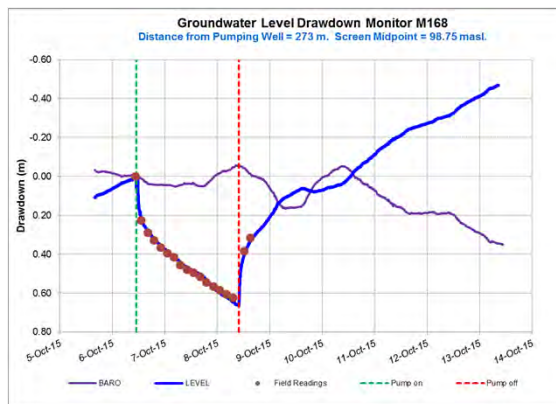
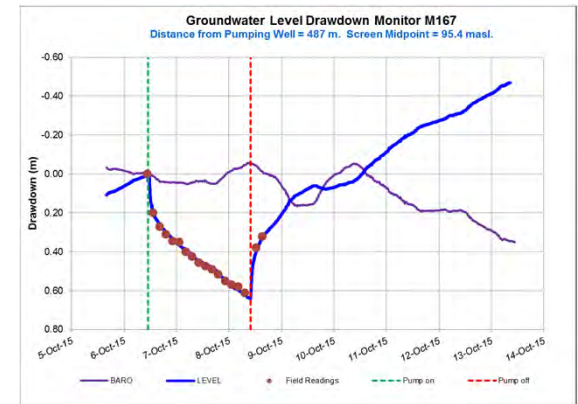
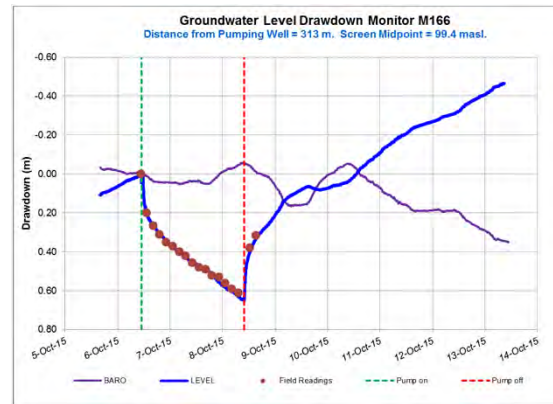
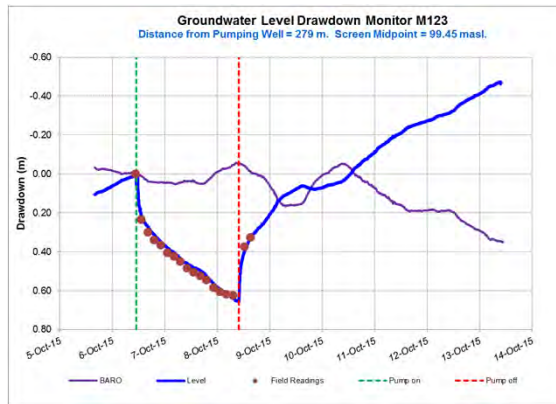
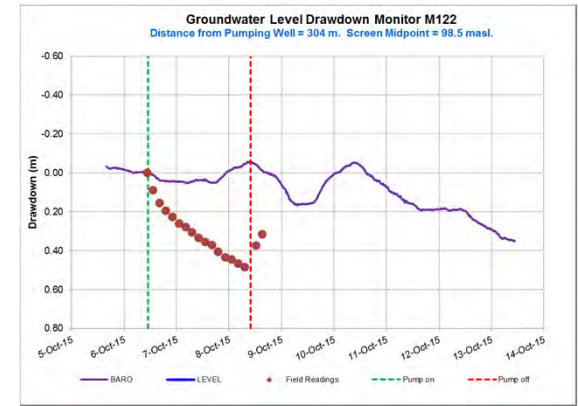
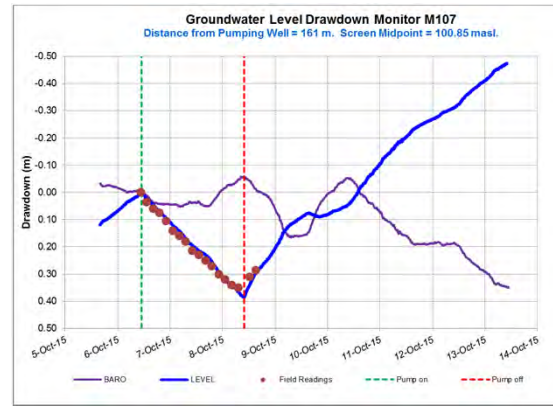
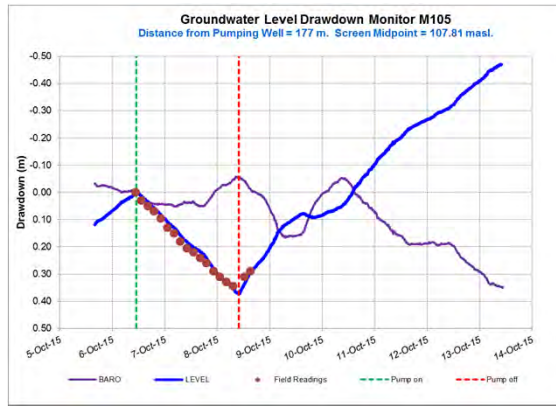
No response to pumping (continued)

M187 Pumping Test
September 30, 2015



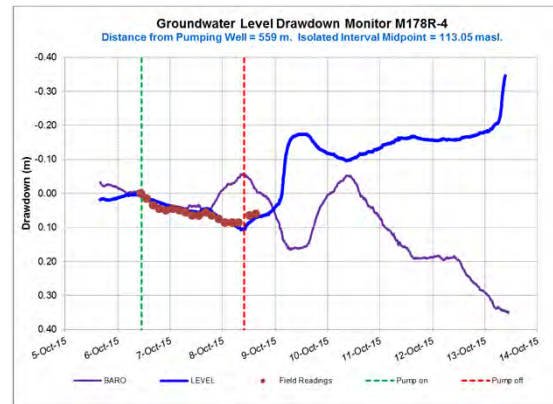
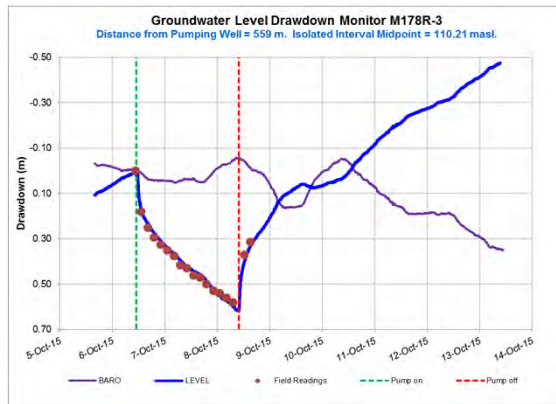
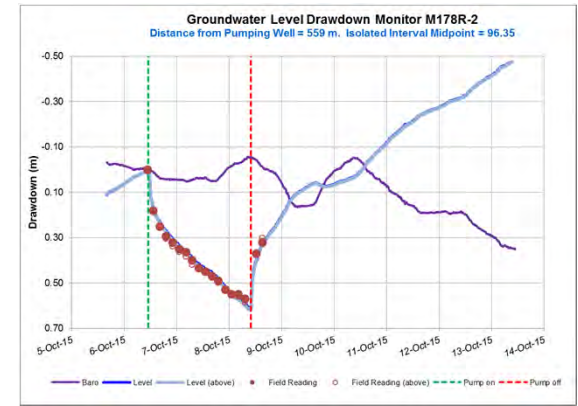
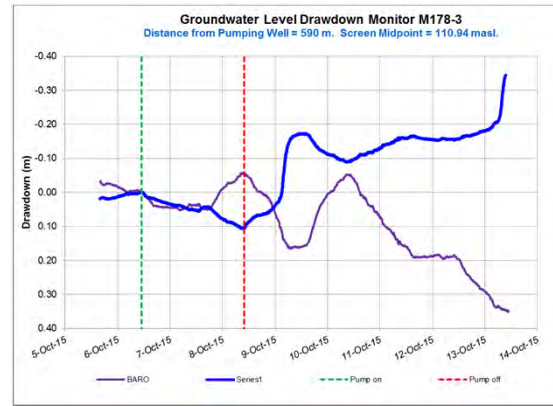
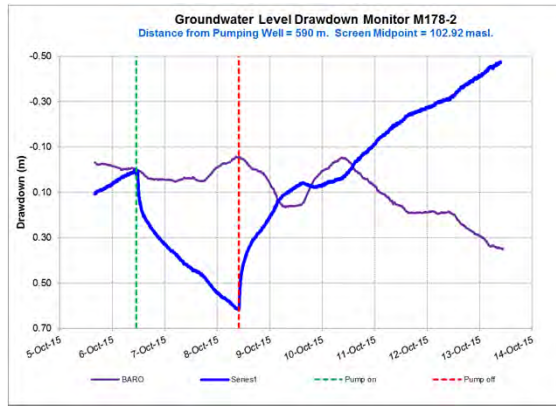
Responsive to pumping

M108 Pumping Test
October 6, 2015



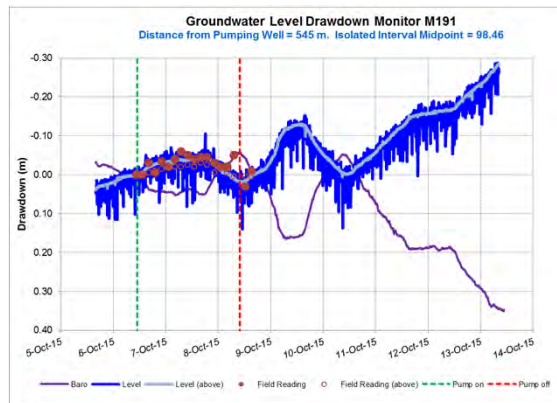
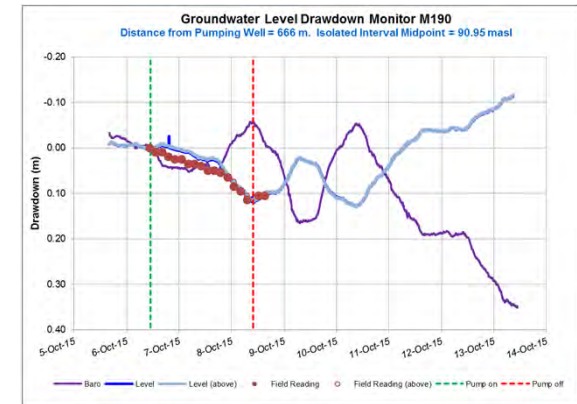
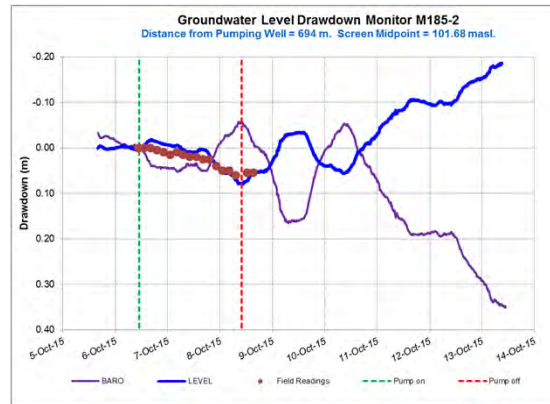
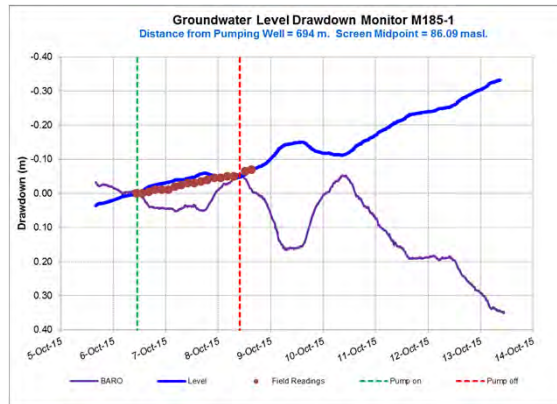
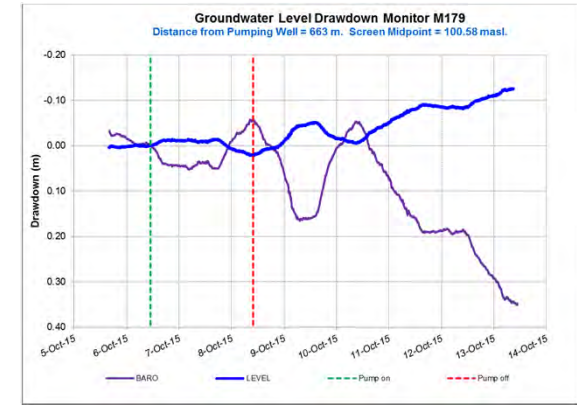
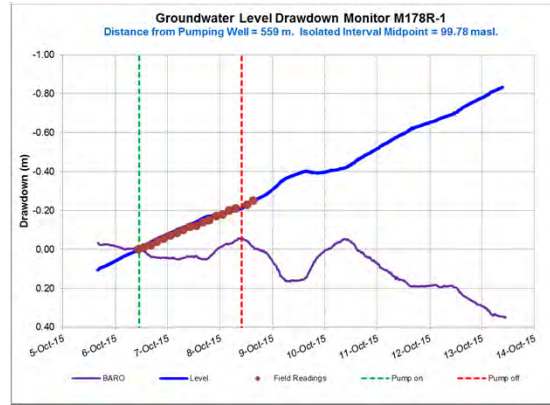
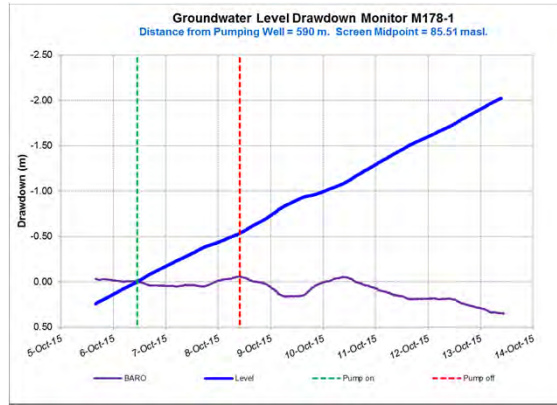
Responsive to pumping (continued)

M108 Pumping Test
October 6, 2015



No response to pumping

M108 Pumping Test
October 6, 2015



APPENDIX A.6

Water Level Measurements and Groundwater Contours



APPENDIX A.6

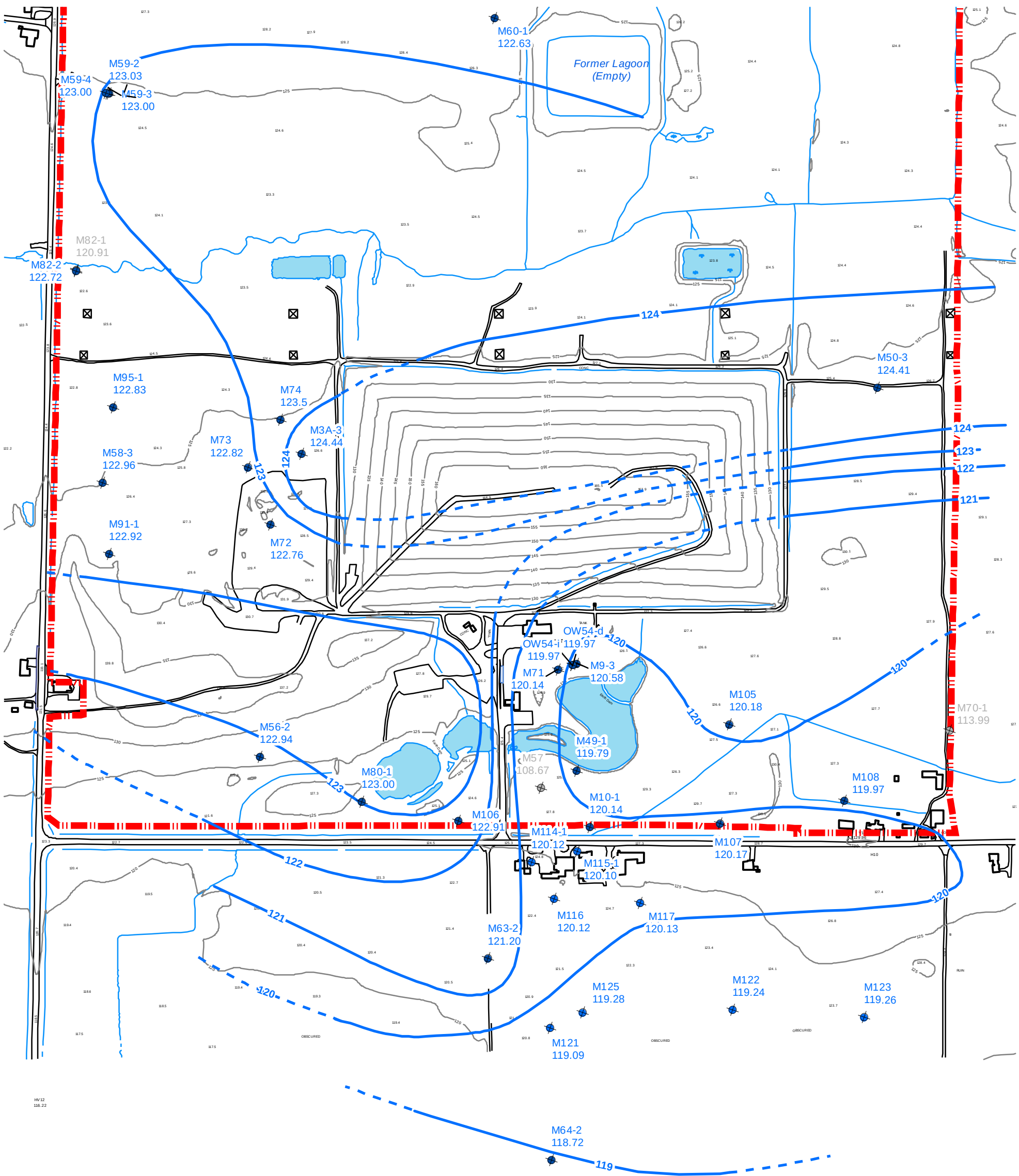
Water Level Measurements and Groundwater Contours

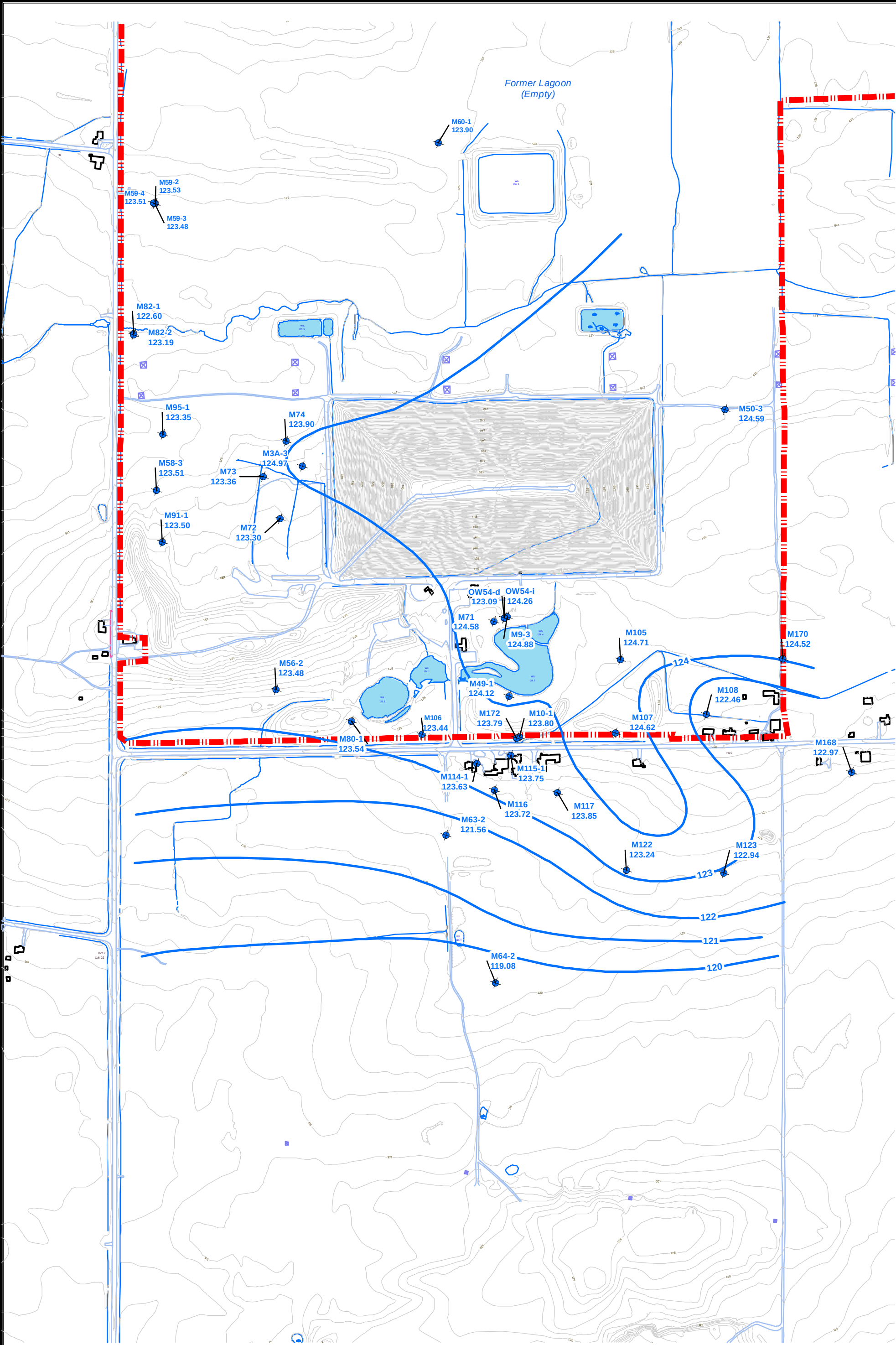


	Water Level (masl)						
Well	19/10/2012	19/04/2013	13/08/2013	16/10/2013	05/05/2014	10/09/2014	20/11/2015
M3A-3	124.44	124.97	124.62	124.64	124.93	124.66	124.93
M5-3							123.29
M6-3							123.44
M9-2							121.93
M9-3	120.58	124.88	120.86	120.47	124.65	118.49	122.12
M10-1	120.14	123.80	120.52	120.13	122.52	118.15	121.55
M46-2							123.24
M49-1	119.79	124.12	120.28	119.97	123.60	117.33	121.53
M49-2		122.70	118.95	119.84	120.79	117.67	
M50-3	124.41	124.59	124.43	124.44	124.43		124.31
M52-1		120.12	110.87	111.86	111.82		
M52-2							120.83
M53-2	120.01	123.65	120.32	119.96	122.45	117.99	121.33
M56-2	122.94	123.48	122.78	122.72	123.50	122.80	123.39
M58-3	122.96	123.51	122.80	122.74	123.53	122.82	123.41
M59-2	123.03	123.53	122.80	122.75	123.59		123.49
M59-3	123.00	123.48	122.77	122.72	123.55		123.45
M59-4	123.00	123.51	122.78	122.73	123.55		123.46
M60-1	122.63	123.90	122.65	122.59			122.20
M63-2	121.20	121.56	121.48	121.13	121.48	121.05	121.49
M64-2	118.73	119.08	118.85	118.56	119.01	118.65	118.81
M70-1	113.99	117.52	114.65	116.67	120.50	118.01	
M70-2							120.65
M71	120.14	124.58	120.58	120.16	124.17	123.61	124.08
M72	122.76	123.30	122.58	122.52	123.30	122.60	123.19
M73	122.82	123.36	122.65	122.59	123.36	122.67	123.26
M74	123.50	123.90	123.53	124.33	123.84	123.47	123.93
M75							123.30
M80-1	123.00	123.54	122.83	122.78	123.56	122.85	123.46
M82-1	120.91	122.60	121.64	122.20	122.86		122.85
M82-2	122.72	123.19	122.52	122.46	123.19		123.04
M91-1	122.92	123.50	126.20	122.75	123.45	122.80	123.36
M95-1	122.83	123.35	122.66	122.59	123.39	122.77	123.27
M105	120.18	124.71	120.62	120.19	124.36	118.19	121.94
M106	122.91	123.44	122.73	122.68	123.45	122.75	123.33
M107	120.17	124.62	120.60	120.17	124.20	118.18	121.88
M108	119.97	122.46	120.24	119.89	121.18	118.09	120.92
M109-1							121.92
M109-2							121.99
M110-1							121.94
M111-1							123.32
M112-1							123.36
M113-1							123.35
M114-1	120.12	123.63	120.48	120.09	122.44	118.16	121.45
M115-1	120.10	123.75	120.49	120.09	122.58	118.17	121.51

Well	Water Level (masl)						
	19/10/2012	19/04/2013	13/08/2013	16/10/2013	05/05/2014	10/09/2014	20/11/2015
M116	120.12	123.72	120.49	120.09	122.45	118.18	121.46
M117	120.13	123.85	120.51	120.10	122.56	118.18	121.51
M121	119.09		120.46	120.08		118.52	121.34
M122	119.24	123.24	120.38	120.01		118.11	121.10
M123	119.26	122.94	120.20	119.85		118.07	120.85
M125	119.28		120.51	120.11		118.18	121.47
M166			120.22	119.87		118.10	120.86
M167			120.24	119.87		118.10	>120.68*
M168		122.97	120.23	119.89		118.11	120.87
M170		124.52	120.58	120.15	124.15	118.16	121.82
M172		123.79	120.48	120.11	122.51	118.16	121.53
M173						100.18	100.81
M174						92.93	94.89
M176						108.80	109.64
M177						115.17	115.30
M178-1						91.45	
M178-2						118.15	
M178-3						115.88	
M178R-2							>117.24*
M178R-3							>117.14*
M178R-4							116.55
M179						108.90	110.06
M180						111.60	112.13
M181-1						96.03	96.04
M181-2						105.25	105.32
M182						91.19	96.76
M183						112.09	
M185-1						84.62	107.60
M185-2						115.03	116.14
M186						114.36	114.57
M187							96.17
M188							115.61
M189							104.78
M190							115.81
OW54-d	119.97	123.09	120.24	119.86	124.02	117.89	
OW54-i	119.97	124.27	120.25	119.86	124.05	117.88	

* Indicates flowing artesian conditions (top of casing elevation reported)





WASTE MANAGEMENT
RICHMOND LANDFILL

-  M58-3

Intermediate Groundwater Zone Elevation Monitor
- 

Topographic Contour Lines
- 

Potentiometric Surface (masl)
- 

Hydro Tower
- 

Surface Water
- 

Property Boundary

Project : K-B9506-00-16
Data Source: WM Canada, WESA,
HPA Ltd. Base Mapping 2009
Date: October 2014

Prepared by:
WESA Geomatics
Units:
UTM NAD 83 Zone 18
Scale: 1:6000

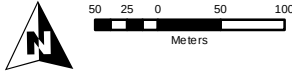
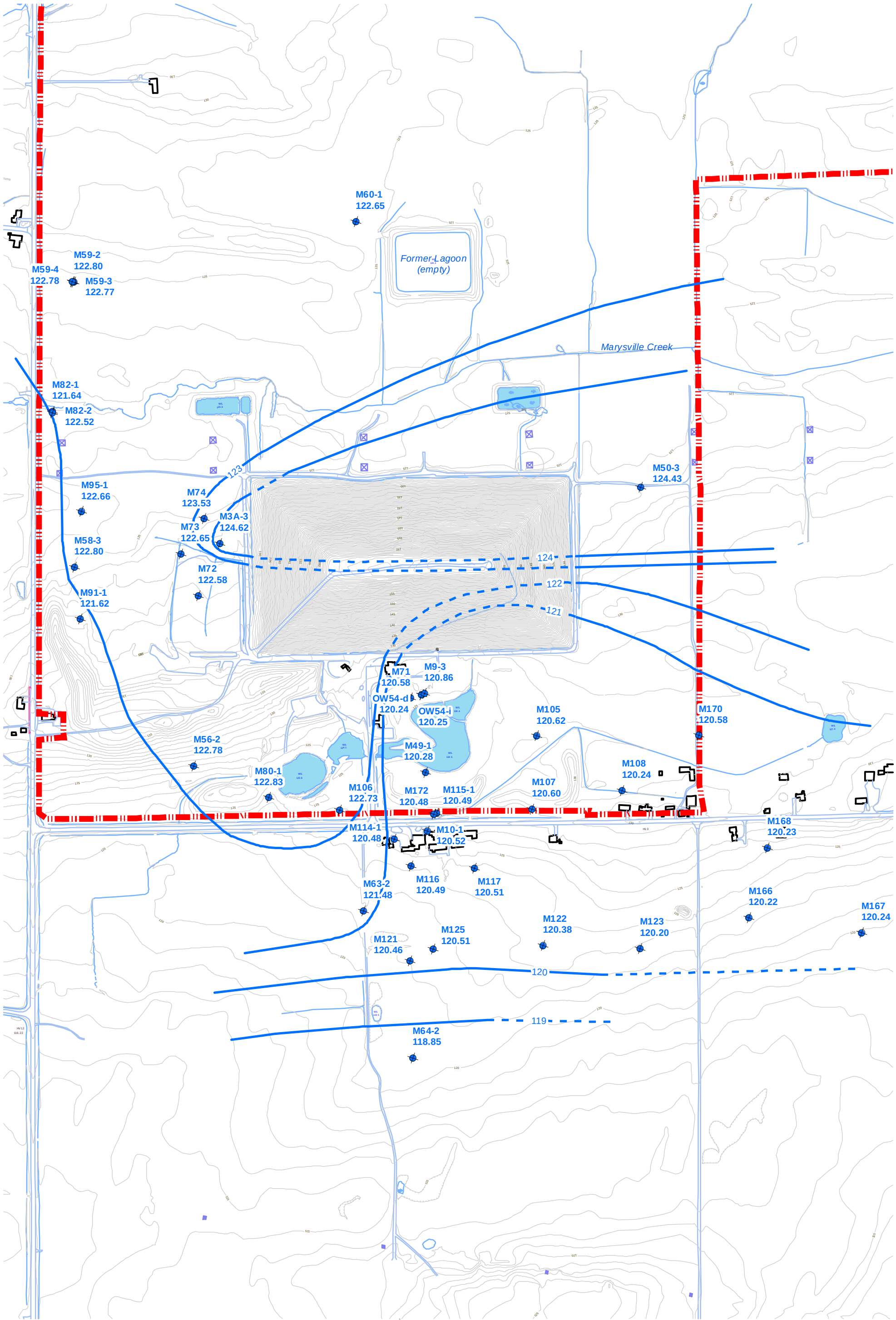


Figure A.6.2:
Intermediate Bedrock Groundwater Flow Zone Potentiometric Surface - April 19, 2013



WASTE MANAGEMENT
RICHMOND LANDFILL

- M58-3 Intermediate Groundwater Zone Elevation Monitor
- Topographic Contour Lines
- Potentiometric Surface (masl)

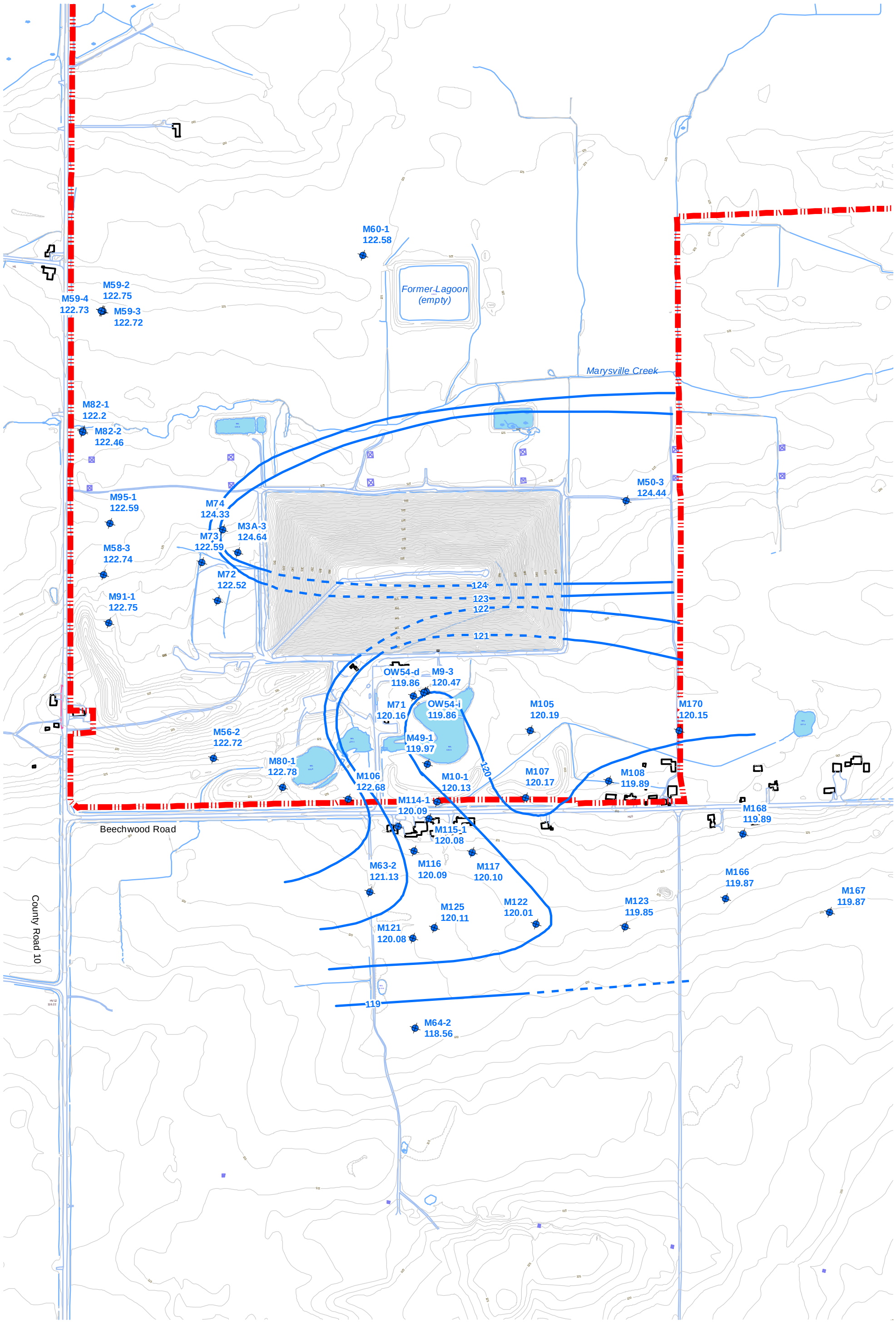
- Hydro Tower
- Surface Water
- Property Boundary

Project : K-B9504-00-16
Data Source: WM Canada, WESA,
HPA Ltd. Base Mapping 2009
Date: October 2014

Prepared by:
WESA Geomatics
Units:
UTM NAD 83 Zone 18
Scale: 1:6000



Figure A.6.3:
Intermediate Bedrock Groundwater Flow Zone Potentiometric Surface - August 13, 2013



WASTE MANAGEMENT
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- M58-3 Intermediate Groundwater Zone Elevation Monitor
- Topographic Contour Lines
- Potentiometric Surface (masl)

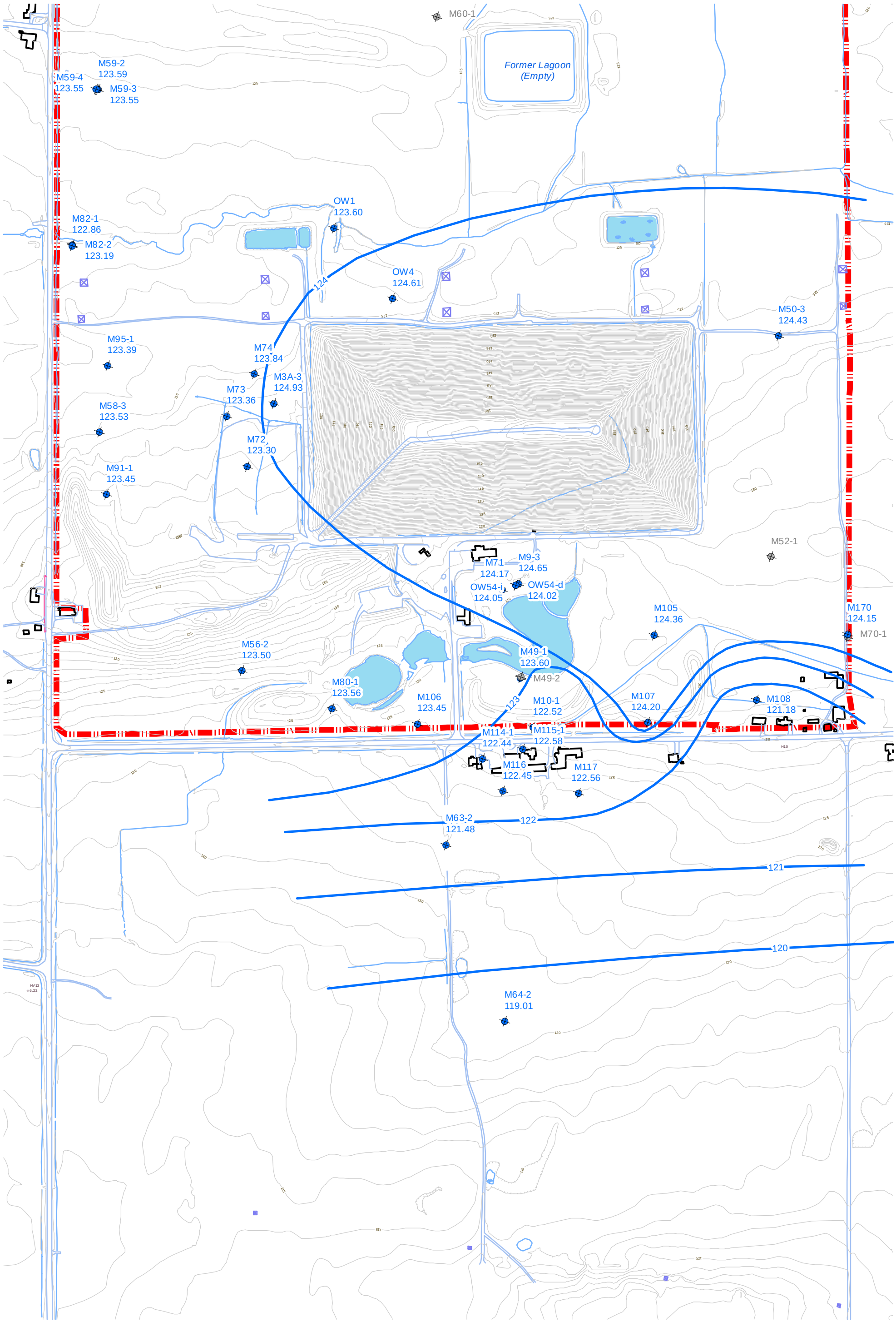
- Hydro Tower
- Surface Water
- Property Boundary

Project : K-B9504-00-16
Data Source: WM Canada, WESA,
HPA Ltd. Base Mapping 2009
Date: October 2014

Prepared by:
WESA Geomatics
Units:
UTM NAD 83 Zone 18
Scale: 1:6500



Figure A.6.4:
Intermediate Bedrock Groundwater Flow Zone Potentiometric Surface - October 16, 2013



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- M58-3 Intermediate Groundwater Zone Elevation Monitor
- Topographic Contour Lines
- Potentiometric Surface (masl)

- Hydro Tower
- Surface Water
- Property Boundary

Note:
M49-2, M52-1, M60-1, M70-1:
Not used in contouring

Project : K-B9504-00-16
Data Source : WM Canada, WESA,
HPA Ltd. Base Mapping 2009

Prepared by:
WESA Geomatics
Units:
UTM NAD 83 Zone 18
Scale: 1:5000

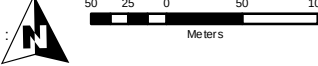
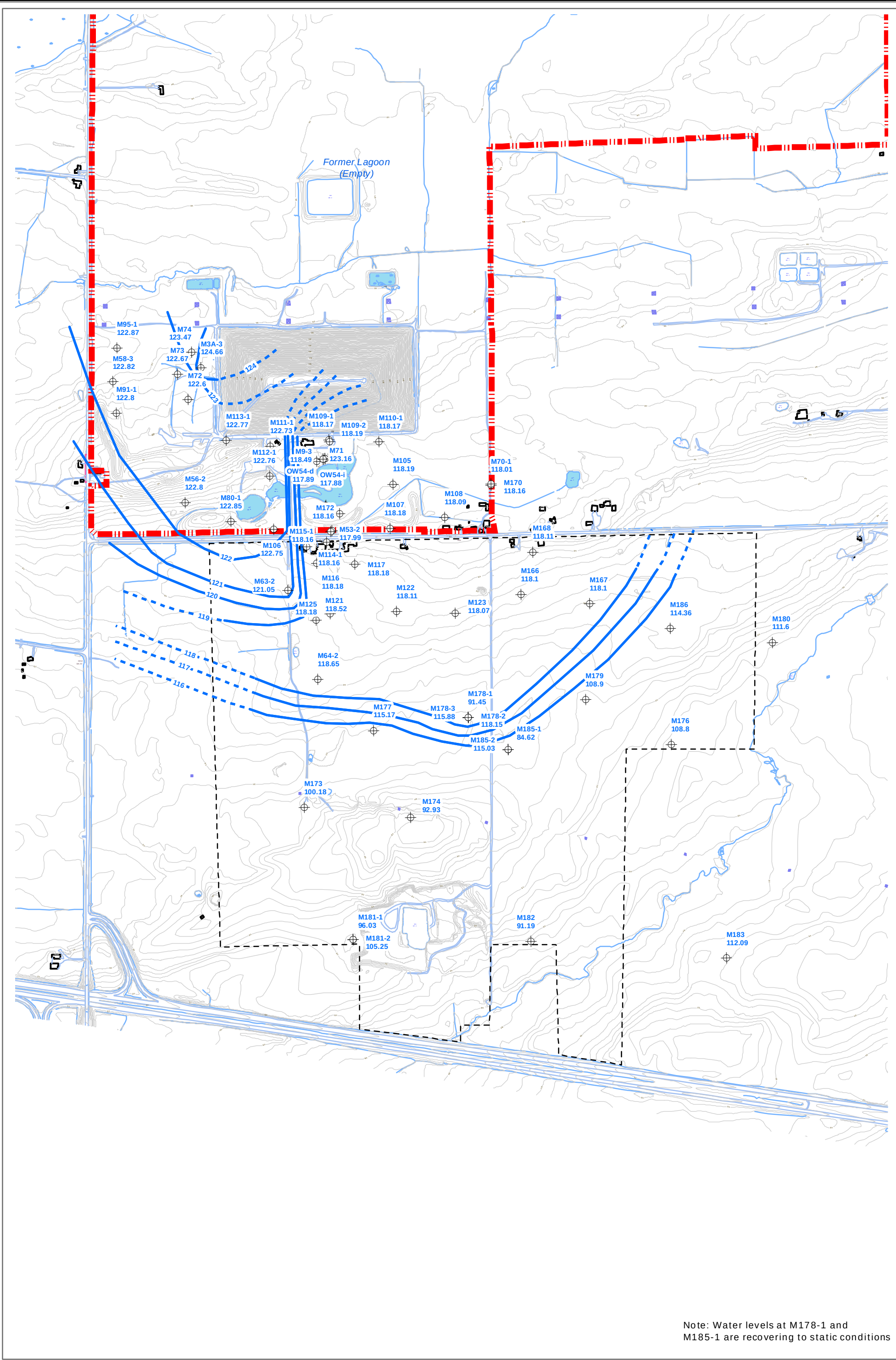


Figure A.6.5:
Intermediate Bedrock Groundwater Flow Zone Potentiometric Surface - May 5, 2014



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- M35 Monitoring Well Used to Measure Water Level
- Property Boundary
- Groundwater Elevation Contour (Intermediate Bedrock)
- Proposed CAZ Boundary

Figure A.6.6:
Intermediate Bedrock Groundwater Flow Zone Potentiometric Surface - Sept 10, 2014

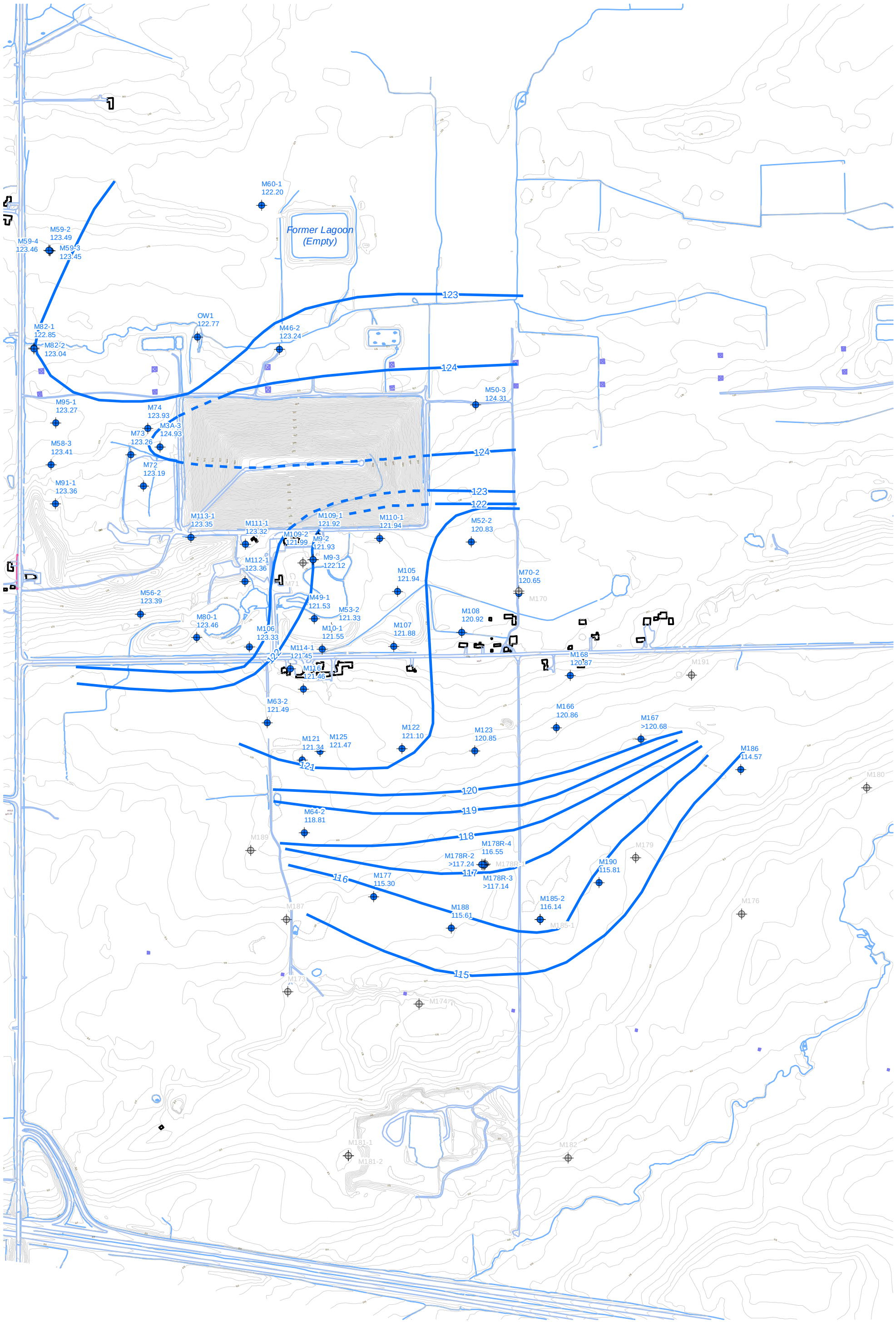
Project : K-B9504-00-16
Data Source: WM Canada, WESA,
HPA Ltd. Base Mapping 2009
Date: October 2014



0 25 50 75 100
Metres

Prepared by:
WESA Geomatics
Units:
UTM NAD 83 Zone 18
Scale: 1:10000



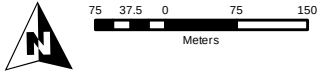


WASTE MANAGEMENT
RICHMOND LANDFILL
FALL 2015 SEMI-ANNUAL REPORT

Figure A.6.7:
Intermediate Bedrock Groundwater Flow Zone Potentiometric Surface - November 20, 2015

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

Project : K-B13060-00-16
Data Source : WM Canada, WESA,
HPA Ltd. Base Mapping 2009
Date: January 2016



Units:
UTM NAD 83 Zone 18
Scale: 1:8000

