



**FOUNDATION SEEPAGE INVESTIGATION REPORT
HIGHWAY 404, FROM 300 M TO 800 M NORTH OF HOLBORN ROAD
TOWN OF EAST GWILLIMBURY, ONTARIO
AGREEMENT NO. 2013-E-0039
TASK NO. 2013-E-0039-005, W.O. NO. 2014-11023**

PREPARED FOR MINISTRY OF TRANSPORTATION OF ONTARIO

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Foundation Seepage Investigation Report
Highway 404, From 300 m to 800 m North of Holborn Road
Town of East Gwillimbury, Ontario
Agreement No. 2013-E-0039
Task No. 2013-E-0039-005
W.O. No. 2014-11023

1. INTRODUCTION

Peto MacCallum Ltd. (PML) was retained by The Ministry of Transportation (MTO) to carry out an investigation of potential seepage to the west side of Highway 404 from neighbouring Chapman Farm (the Farm), north of Holborn Road in the Township of East Gwillimbury, Ontario, legally described as Concession 2, Lot 26, Ontario, hereinafter referred to as the Site (Figures 1 and 2).

The Site is located in the Right-of-Way (ROW) of Highway 404 between about 300 m and 800 m north of Holborn Road, about 1.2 km northeast of the Leslie Street and Holborn Road intersection and is about 30 m wide (from the edge of the southbound lane of Highway 404 to the Chapman Farms property boundary to the west).

The investigation consisted of two phases:

1. The initial field work and monitoring, which included installation of 8 monitoring wells and 8 vibrating wire piezometers, soil characterization, in-situ borehole permeability testing, water sampling, and other pertinent activities (see scope of work below), along with 3 months of monitoring and submission of a interim report.
2. Three Contingency Tasks which were approved in three stages by the MTO, consisting of 3-month monitoring periods to extend the initial preapproved 3-month monitoring noted above, to one 12-month hydrologic cycle. The above-noted monitoring data of the previously approved 3-months was reported in the original Appendix E (Technical Memorandum # 1) and the next two extended periods of monitoring were reported in Technical Memoranda # 2 and # 3, respectively. For ease of review, the data from the entire monitoring period, including the final 3-month period, has been consolidated and is included in Appendix E of this report.



This report presents finalization of the interim report dated April 16, 2015, after completion of the monitoring stages; and all technical memoranda noted above are now consolidated along with the initial and final 3-month periods, in the new Appendix E.

In this report all elevations are expressed in metres unless otherwise noted.

1.1 Purpose and Scope of Work

The purpose of this work was to determine the subsurface conditions within the assumed seepage zone, confirm negative impacts from the seepage into the highway ROW by the water pumped to an infiltration facility on the Farm, if any, and provide recommendations on possible remedial measures, if applicable.

Based on the project hydrogeological requirements, and the standard practice guidelines, the investigation involved the following tasks:

- Task 1: Carry out a detailed site background review including review of topographic maps, Ontario Base Maps (OBMs), site hydrogeological setting, surface drainage, surficial soil type, infiltration capacities and anticipated ground water flow direction. Review the available soil/hydrogeological data, wastewater management system report (prepared by AMEC) of the Farm to identify the potential environmental concerns that may result due to flooding of any untreated effluent.
- Task 2: Conduct a site reconnaissance to verify the existing field conditions, current surface water drainage flow and carry out a Preliminary Site Screening (PSS) of the Farm (from outside the property boundaries) to identify potential environmental concerns, if any.
- Task 3: Retrieve a surface water sample (ponded water from the effluent area) during site reconnaissance and carry out chemical analyses based on the findings of Tasks 1 and 2.
- Task 4: Locate, clear, drill, log, and sample a total of eight (8) boreholes with monitoring wells (50 mm diameter, to depths ranging from 3 to 6 m). Four (4) monitoring wells to be drilled on the west side of the berm and four (4) on the east side of the berm.



- Task 5: Install 8 vibrating wire piezometers (VWPs) in the boreholes with hardware for web-based groundwater monitoring.
- Task 6: Carry out moisture content, grain size analyses and corrosivity test on selected soil samples to establish soil physical properties.
- Task 7: Carry out ground water level monitoring and slug test in each installed monitoring well to establish the hydraulic conductivity K values of the stratigraphy explored. During the field investigation, also carry out a program of ground water sampling of selected monitoring wells and conduct chemical analyses to verify the groundwater quality in relation to the parameters tested in Task 3.
- Task 8: Carry out a program of ground water monitoring (level and temperature) for a period of 3 months to determine the ground water flow pattern and determine the ground water seepage across the berm from the Farm into the highway ROW, if any.
- Task 9: Evaluate the site setting and background information, evaluate the review findings and data compiled, prepare an interim report including description of the site hydrogeological setting, factual data, interpretation of the site conditions, infiltration capacity, hydraulic conductivity, surface drainage conditions, quality of surface and ground water and potential impacts of the flood/ponded water on the berm and MTO structures, if any. The report also includes:
- a) Evidence/confirmation of negative impacts (seepage of pumped wash water from treatment lagoons to the infiltration bed on the Farm and into the highway ROW), if any, on highway operation and maintenance.
 - b) Discussion and recommendation of the conceptual remedial measures, if required.
- Task 10: Continue monitoring the ground water conditions for three periods each 3 months long. At the end of periods #2 and #3 a technical memorandum was produced detailing the ground water monitoring results and discussing the possible long term impacts of the ground water changes on the highway ROW. The findings from the final 3-month period were consolidated with the previous findings into Appendix E of the final report.
- Task 11: Upon completion of the monitoring periods, finalize the interim report.



1.2 Review of Previous Reports Findings

A review was made of the relevant sections of the selected reports prepared by others listed below:

1. Review of Wastewater Management Site Information for Chapman Farms provided by the MOECC to the MTO, prepared by AMEC, dated February 4, 2015.
2. Chapman Farms Groundwater Impact Study, Lot 26, Concession 2 and Lots 26 and 27, Concession 3, Town of East Gwillimbury, prepared by Genivar Inc., dated February 2013.
3. Chapman Farms Limited Highway 404 Extension Impact Assessment and Preliminary Design, prepared by AMEC, revised March 2011.
4. An Application for a Certificate of Approval (C of A) for Modifications to a Wastewater Management System at Chapman Farms, 21413 Leslie Street, East Gwillimbury, Ontario, prepared by Watters Environmental Group, Inc. (WEGI), dated January 2011.

Our review findings pertinent to the subject work are outlined as follows:

- a) According to AMEC's report (Report 1 listed above) on page 1, *"The documents provided do not contain any information that can be used to determine the actual wastewater volumes that Chapman Farms has directed to the infiltration bed."* and, on page 2, *"The annual report however provides a single average wastewater production rate and establishes, based on data presented in previous reports, that the land base is adequate for the average volume of wastewater (212 m³/day) generated."*, and on page 2, *"The reports tend to concentrate on spray irrigation and demonstrate theoretically that the land base is adequate for spray irrigation of wastewater generated by Chapman Farms."*
- b) However, according to AMEC's report (Report 1 listed above) on page 2, *"Based on observations by MTO staff at the Chapman site adjacent to Highway 404, ponding regularly occurs in the area of the existing infiltration bed....This can be because the soils are behaving differently than theoretically anticipated or the infiltration tiles are plugged and not carrying the water away."*
- c) It is noted in AMEC's report (Report 1 listed above) on page 2, *"Pictures and information provided verbally by MTO staff familiar with the infiltration bed area of concern and present at the MOECC/MTO meeting January 20, 2015, have indicated that the infiltration bed tiles were observed to be plugged when they were excavated for removal from service as part of the construction activities for the 404 Highway."*



- d) According to AMEC's report (Report 1 listed above) on page 7, *"It is recommended that the MTO request the MOE have the infiltration rate for the site verified by insitu testing using a permeameter", and, "It is recommended that MTO request a tile bed study be completed to verify that the tiles are not plugged and are removing water as they are intended to.", and, "MTO should request that the MOECC revise the Chapman Farms ECA to provide a loading limit for the infiltration bed, based on actual infiltration rates determined for the bed area".*
- e) AMEC's report (Report 3 listed above) indicates on page 8, *"Effluent not required for spray irrigation is disposed of through groundwater infiltration. This operation is performed on a 6 ha parcel of land which is underdrained with field tile. The tile is at a depth of 1.2 m with spacing between laterals of 14.0 m. The lateral spacing calculation is based on air photos which clearly show the lateral locations. The length of the header pipe and laterals is approximately 294 and 210 m respectively. The total length of tile is approximately 2500 m.", and, on page 10, "The ROW will encroach on the existing infiltration area and will reduce the area by approximately 3.3 ha leaving 2.7 ha of existing laterals and header pipe. The existing laterals will need to be cut and capped. Based on calculations by AMEC, the linear length of the existing laterals and the total length will be reduced to approximately 100 m and 2023 m respectively."*
- f) WEGI's report (Report 4 listed above) indicates on page 1, *"The long-planned northward extension of Highway 404 is imminent and has an alignment that encroaches significantly onto the Chapman Farms property. This encroachment significantly reduces the lands available for spray irrigation and soil attenuation treatment (infiltration). It is predominantly for this reason that modifications of the existing wastewater management system are required.", and on page 18, "The proposed Right-of-Way for Highway 404 straddles the property line separating the east and west halves of Lot 26 and Lot 27, Concession 3. This Right-of-Way encroaches approximately 100 m onto the eastern-most portion of the Chapman Farms property. In addition, the Ministry of Transportation of Ontario (MTO) requires a runoff containment berm between the soil attenuation treatment (infiltration) area and the proposed Right-of-Way. There is a requirement for the easterly toe-of-slope of the containment berm to be set back from the Right-of-Way by a further 15 metres. Together, the width of the runoff containment berm and the set-back represent a further encroachment of approximately 17 metres."*



2. SITE BACKGROUND REVIEW

2.1 Site Physiographic, Geologic and Hydrogeologic Settings

The Site is bounded by the Maskinonge (Jersey) River, about 400 m to the east, flowing north, and tributaries of the East Holland River, about 800 m to the west and southwest, flowing west, and a ground water divide exists between them, see Figure 1.

A review of York Region Interactive GIS Maps indicates that the existing geodetic ground surface at the Site is about elevation 250. The ground surface along the Site dips from a high in the south of about elevation 250.0 to a low of about elevation 247.0 and then rises again to about elevation 250 in the north. Surface elevations gradually slope down towards the Site from the Farm on the west past the Highway embankment; and after rising 2 to 3 m along the east side of the Highway, continues to slope down east of the highway, approaching the Maskinonge River (see Figure 2).

The Site is located within the Maskinonge River subwatershed of the Lake Simcoe watershed. No watercourses cross the Site alignment. Agricultural fields surround the Site, and a woodlot is located to the north. In the vicinity of the Site exists the Maskinonge River wetland complex, evaluated as Provincially Significant.

According to Chapman and Putnam (1984), the Site is physiographically located in the Lake Simcoe basin of the region known as the Simcoe Lowlands, the low-lying lands bordering Georgian Bay and Lake Simcoe. Since the basin was once the floor of Lake Algonquin, its surface beds consist of sand, silt and clayey deposits.

The Ontario Geological Survey (OGS) OGSEarth data indicates that the surficial materials on the north and south ends of the Site are expected to be stone-poor, sandy silt to silty sand-textured till and deposits of fine-textured glaciolacustrine silts and clays and minor sand and gravel are expected in the middle of the Site.



According to the Bedrock Geology of Ontario, southern sheet, Ministry of Northern Development and Mines, dated 1991, bedrock in the vicinity of the Site is from the Middle Ordovician epoch of the Paleozoic era, consisting of limestone, dolostone, shale, arkose and sandstone (the Simcoe Group). The Bedrock Topography map of the Greater Toronto and Oak Ridges Moraine Areas, Southern Ontario, Geological Survey of Canada, dated 1998, indicates that the bedrock surface level is in the range of elevation 160 to 180 m (about 70 to 90 m deep) in the vicinity of the Study Area, and thus does not influence the ground water movement of the Site.

The soil stratigraphy at the Site generally comprised topsoil, overlying fill overlying the native soils. The topsoil typically consisted of silty soil and the fill typically consisted of silt, with clay content varying from trace to clayey. The native soils comprised generally clayey silt, silty clay or clay. Sand deposits were encountered in the south half of the Site.

The hydrogeology of the Site vicinity is expected to be primarily controlled by topography and the Maskinonge River.

2.2 Runoff Containment Berm and Storm Water Ditch

As mentioned in Section 1.2, above, the MTO constructed a runoff containment berm (the “highway berm”) and stormwater ditch in 2012 in the ROW to prevent surface water flowing from the Farm to the highway. The berm is about 300 m long and about 1.5 m high at the highest point in the middle (compared to the largely ungraded west side), and gradually decreases in height to the north and south as the respective ground surface elevations increase. The east side of the berm has a stormwater ditch at its toe for most of the alignment at surface levels ranging from elevation 245.7 to 248.5. The ground surface of the toe of the west side of the berm and top of the berm range from elevation 248.0 to 249.2 and about 249.2 to 249.6, respectively.

2.3 MOE Water Well Records Review

A map of the water wells recorded by MOECC in the vicinity of the Site is shown on Figure 1 of Appendix A and selected wells have been labelled with their well identification number. The records of water wells within 1 km of the Site were also obtained from the MOECC website files and are



provided in Appendix A. This list includes all recorded wells regardless of their current status. Unfortunately, due to the lack of wells close to the Site and lack of reported information in the well records that are available, the well records do not provide significant information for this study.

2.4 Site Observations

Reconnaissance of the Site was conducted on August 6 and November 26, 2014 to identify the patterns of drainage, vegetation and existing land uses within the Study Area.

The major features within the Study Area included:

- a) Highway 404 which is aligned north-south, and concession roads: Holborn Road to the south, Boag Road to the north, Leslie Street to the west and Woodbine Avenue to the east.
- b) Agricultural fields surround the site, and a woodlot is located to the north.
- c) A pair of hydro lines with towers cross the Site and Highway 404, aligned southwest to northeast, and have gated access roads on the northbound and southbound lanes.
- d) A runoff containment berm about 300 m long, located between the Chapman Farm property and the Highway 404 shoulder with its south end at the hydro towers.
- e) Corn was growing on the majority of the Farm, except for a half-circle area (about 100 by 200 m) next to the berm where short grasses were growing.
- f) A storm water ditch is located along the highway shoulder and is sloped to flow northerly, and which was relatively dry at the time of our visits.

Findings of the reconnaissance were used to complete an MTO preliminary site screening (PSS) form to identify potential environmental concerns, are included in Appendix B. Some portions of the form could not be completed since this screening had to be conducted from outside the Farm property boundaries.



3. FIELD WORK AND LABORATORY ANALYSES

As part of the site investigation, 8 boreholes (4 pairs) were drilled and monitoring wells were installed, and each was twinned with a borehole with a vibrating wire piezometer (VWP) installed. The eight boreholes were drilled in pairs such that four are in line with the west side of the berm and four are in line with the east side of the berm. The pairs are approximately 16 to 22 m apart. The MW1/MW2 pair is located north of the north end of the berm and the MW7/MW8 pair is located south of the berm's south end. The boreholes were surveyed by J.D. Barnes Ltd. as approximately shown on Drawing 404-1.

The borehole drilling, monitoring well installation, soil sample collection, and VWP installation were carried out on August 20, 21, 22 and 25, 2014. The ground water level measurements, in-situ borehole permeability testing, ground water and surface water sampling for chemical analyses and quality assessment, installation of VWP dataloggers and telemetry hub, and initialization of the dataloggers and hub were carried out on November 26, 2014.

The above-noted field activities and laboratory analyses in a hydrogeological context are further described in the following sections.

3.1 Borehole Drilling and Monitoring Well Installation

Prior to commencing the field work, the Site was cleared for underground utilities by a specialist contractor at the locations and vicinity of the proposed boreholes.

The boreholes were advanced using a track-mounted CME-75 drill rig equipped with continuous flight hollow stem auger, both owned and operated by a specialist-drilling contractor. The field work for the subsurface investigation was carried out under the full-time supervision of our technical staff. The boreholes with monitoring well (MW) installed were designated MW1 through MW8. During the borehole drilling operation, soil samples were recovered by the Standard Penetration Test (SPT) method and the number of blows required to advance the soil sampler 300 mm was recorded as the N value. Samples obtained from boreholes were immediately placed in glass jars and plastic bags. Observations of visible foreign materials and odour were



recorded during sampling operations. The depth of the ground water level first encountered (ground water strike) in the boreholes during drilling or interpreted based on observation and moisture content was recorded and the open boreholes were inspected for free-standing water level upon completion of drilling and sampling.

A monitoring well was installed in the boreholes, which consisted of 50 mm diameter, flush threaded, Schedule 40 clean PVC pipe with a screen and coupled with a PVC riser pipe. The annular space of the borehole around the screen was backfilled with clean filter sand (up to 0.6 m above the top of the well screen). The monitoring wells were registered with the MOECC with the well identification number 7227551, well tag number A102052, audit number C24623, and Contractor number 6032.

Refer to the Record of Boreholes MW1 through MW8 and Table 1 in Appendix E for the monitoring well installation details, stratigraphy, standard penetration resistance N values and ground water level observation.

The soil samples collected during this investigation were brought to the PML laboratories for detailed visual examination before selecting for testing.

3.2 Vibrating Wire Preparation and Installation

Vibrating wire piezometers (VWPs) were installed to measure the ground water pressure and temperature at a single point in the soil strata, and allow frequent, programmable measurements over a period of time. They also allow for telemetry of the data for remote access, as described below.

The VWPs and associated equipment and software were manufactured by RST Instruments Inc, and provided by Hoskins Scientific. The equipment included VWPs of model number 2100-0.35 (pressure range to 0.35 MPa), cable, DT2011B single channel dataloggers with RStar (L900), DT2011-SE pedestal enclosures, and an ELGL1300 FlexDaq Datalogger which includes battery unit, 2 channel VWP interface, CR800 RStar datalogger, antenna , cellular modem, 40 watt solar panel, mount, and fibreglass enclosure. The installation procedure is detailed below.



Vibrating wire piezometers were pre-saturated by removing the filter cap, filling the end with water, slowly replacing the cap, and storing them in water until installation. A VWP readout machine was used to record a zero reading (used for calibration) before each VWP was installed, and the serial number was recorded.

The VWPs were installed in boreholes drilled about 1 to 2 m apart from each borehole installed with a monitoring well installed by the same specialist-drilling contractor. The VWPs were designated VWP1 through VWP8 to match the monitoring well numbers. Each VWP was hooked with a weight to keep it upright and lowered by its cable through the hollow auger to either 3 or 6 m depth, to match the corresponding monitoring well screen's bottom depth. The borehole was then backfilled with bentonite – cement grout as the auger was lifted out. The screen depth, VWP depth and screen length are summarized on Table A, below:

Table A
 MW SCREEN DEPTHS, VWP DEPTHS, AND MW SCREEN LENGTH

BH / MW / VWP No.	1	2	3	4	5	6	7	8
Depth of well screen bottom and VWP depth (m)	6	3	6	6	3	3	3	6
MW screen length (m)	3	1.5	3	3	1.5	1.5	1.5	3

Refer to Table 1 for a summary of the VWP elevations and depths.

Immediately after installation, a VWP readout machine was used to verify that the VWP was producing a signal, and the remaining cable was bagged and suspended from a stake to keep it clean and dry.

On November 26, 2014, each VWP except VWP5 was connected to a datalogger with radio broadcast capability. At the location of VWP5, a telemetry hub, consisting of the FlexDaq datalogger, enclosure, solar panel and radio antennae mounted on wooden posts, was installed to collect and store data sent by radio from each datalogger. The cable from VWP5 was connected directly to the hub. The hub is equipped with cellular technology allowing the data and program instructions to be sent and received by Loggernet software running on a remote personal computer at PML's office.



The VWP dataloggers were programmed to record pressure and temperature every 1 hour. The data is recorded in the hub and is broadcasted once a day to be collected at PML's office where it is made available to MTO staff by internet on PML's FTP site.

3.3 Borehole Permeability Testing

In order to estimate the hydraulic conductivity of the overburden deposits, borehole permeability testing was conducted in monitoring wells 1 through 8 on November 26, 2014.

The field permeability testing was conducted by using the rising head method, in which periodic water level measurements were recorded manually as the water level recovered inside the monitoring wells after rapid removal of a volume of water (slug).

After purging the monitoring well, the rising head data was recorded using a Solinst flat tape water level meter. Using Hvorslev's method (Section 4.3 below), the collected data was plotted on a semi-logarithmic scale to estimate the basic time lag T_0 , which, combined with the geometric configuration of the well screen, resulted to an estimation of hydraulic conductivity for the soil surrounding the well screen. The plots of normalized head versus elapsed time and the estimation of the basic time lag (T_0 values) are included in Appendix C.

3.4 Water Sampling

On November 26, 2014, ground water samples were obtained from MW1 and MW5 and a surface water sample was obtained from the shallow ponded water in the stormwater ditch at the east toe of the berm for chemical analyses and assessment of the water quality as described in the following section. The ground water sample was taken after well development, which consisted of removing an equivalent of about 3 times the well volume.



3.5 Laboratory Analyses

3.5.1 Ground Water and Surface Water Sample Chemical Analyses

To address the baseline ground water quality, the ground water and surface water samples collected were delivered to AGAT Laboratories (AGAT) for chemical analyses. AGAT Laboratories is accredited by The Standards Council of Canada (SCC) and The Canadian Association for Laboratory Accreditation (CALA).

The water samples were analyzed for selected metals, organochlorine (OC) pesticides and biological oxygen demand (BOD) for comparison to O. Reg. 153/04 Table 1 site condition standards. O. Reg. 153 regulates the assessment and remediation of contaminated land or ground water, and Table 1 standards are the most stringent criteria for water quality assessment. BOD measures the amount of dissolved oxygen consumed by microorganisms in decomposing organic matter in a water sample, and is thus an indicator of organic quality of the water.

The Chain-of-Custody Record and the laboratory certificates of analyses are included in Appendix D.

3.5.2 Soil Particle Size Distribution Analyses

Eight representative soil samples obtained from MW1 and MW3 through MW7 were submitted to the PML laboratories in Toronto for particle size distribution analyses. The particle size distribution curves of these soil samples are shown on Figures GB-GS-1 through 5.

3.5.3 Soil Corrosivity Analyses

To determine the degree of corrosivity to cast iron pipe and sulphate attack on buried concrete in native soils, eight representative soil samples were selected and submitted to AGAT Laboratories.

The Chain-of-Custody Record and the laboratory certificate of analysis are included in Appendix D.



4. SUMMARIZED SUBSURFACE CONDITIONS

Reference is made to the appended Record of Borehole sheets, tables, figures, drawings and Appendices A through E for the field work details and laboratory data compiled. Our findings and interpretation of the Site subsurface conditions are presented below.

4.1 Soil Stratigraphy

Reference is made to the appended Record of Borehole sheets for monitoring wells (MWs) 1 through 8 and Section 3, above, for details of the field work and monitoring well installation including soil classification, inferred stratigraphy, standard penetration resistance N values, and ground water observation.

The soil stratigraphy at the Site generally comprised topsoil, overlying fill overlying the native soils. The topsoil typically consisted of silty soil and the fill typically consisted of silt, with clay varying from trace to clayey. The native soils generally comprised clayey silt, silty clay, or clay. Sand deposits were encountered in MW5, MW6, MW7 and MW8.

4.1.1 Topsoil

The topsoil was encountered at all monitoring wells except MW4 and MW6 and was typically moist silty soil ranging from 0.2 to 0.6 m thick.

4.1.2 Fill

Fill was encountered underlying the topsoil at MW3, MW5, MW7 and MW8, and at the surface at MW4 and MW6, elevations 247.6 to 249.6, extended to elevations 246.3 to 249.2, and comprised typically moist brown silt, trace clay to clayey, and trace sand, and ranging in thickness from 0.4 to 1.2 m.



4.1.3 Silty Sand, Sandy Silt

Very loose to loose brown or grey silty sand and sandy silt with trace gravel and trace clay were encountered beneath the topsoil in MW1, clayey silt in MW3 and fill in MW8, at elevations 246.0 to 249.1 and extended to elevations of 245.2 to 248.8. The deposit was about 0.3 to 0.8 m thick, moist, N values ranged from 3 to 9 and moisture contents were about 10 to 20 %.

4.1.4 Sand

Brown to grey sand, trace to with silt, and trace to some clay, was contacted in MW5 and MW7 underlying the silt and in MW6 underlying the silty clay at elevations 245.5 to 249.2 and extending to elevations 244.5 to 247.4. The sand was loose to compact, moist to wet, had N values ranging from 3 to 19, moisture contents about 17 to 19% and was 1.1 m and 1.8 m thick at MW6 and MW7, respectively, and was contacted to the borehole termination in MW5 (1.0 m thick).

4.1.5 Silty Clay Till

A silty clay till deposit was encountered underlying the silty sand in MW1 at elevation 248.8 and extended to elevation 247.6. The stiff to very stiff mottled grey/brown till comprised silty clay with trace sand, and trace gravel. The soil was moist, 1.2 m thick, the N values were 12 and 23, and the moisture contents were 9% and 11%.

4.1.6 Sandy Silt Till and Silt Till

A sandy silt till deposit was encountered underlying the silty clay till in MW1 at elevation 247.6, extending to elevation 246.4 and a deposit of silt till overlying sandy silt till was encountered underlying the silty clay in MW8 at elevation 247.6, extending to elevation 243.2 (borehole termination). The compact to very dense brown till comprised silt with trace to some sand and trace gravel, or sandy silt with trace gravel, trace clay and cobbles. The till was moist, the N values ranged from 43 to refusal and the moisture content varied from about 5 to 18%. The sandy silt till in MW1 was 1.2 m thick and in MW8 the silt till was 0.5 m thick and sandy silt till was encountered to borehole termination (a thickness of 3.9 m).



4.1.7 Clayey Silt, Silty Clay, Clay

Deposits of clayey silt, silty clay or clay were encountered underlying the sandy silt in MW1, the topsoil in MW2, the clayey silt fill and sandy silt in MW3, the silty clay fill in MW4, the clayey silt fill in MW5, the silty clay fill and sand deposits in MW6, the sand in MW7, and the silty sand in MW8. The deposits were encountered at elevations ranging from 245.2 to 248.7 and extended to elevations ranging from 240.2 to 245.5. The deposits comprised clayey silt with trace sand and occasional silt or sand partings, silty clay with trace sand, silt partings and seams, or clay with some silt and trace sand and were stiff to hard with N values ranging from 8 to 49 and moisture contents from about 18 to 25 % at MW1, MW2, MW7 and MW8, and were very soft to firm, with N values ranging from weight of hammer to 7 and moisture contents from about 18 to 52 % at the centrally located monitoring wells MW3 through MW6. The deposits were encountered as shallow, relatively thin (0.6 to 1.1 m) layers in MW3, MW6 and MW8, a 2.1 m thick layer in MW5, and were encountered to borehole termination, a minimum 0.7 to 6.1 m thickness, in MW1 through MW4, MW6 and MW7, indicating that the site is potentially underlain by a relatively thick, continuous deposit of these clayey soils. Deposits with N values corresponding to soft or very soft consistency were found in MW3 through MW6, the middle of the site alignment.

4.2 Ground Water Conditions

The depth to the ground water first encountered (ground water strike) in the boreholes, recorded during drilling or interpreted from moisture content or description, varied from 1.8 to 2.7 m below ground surface (bgs) (elevations 244.3 to 246.0). The ground water strike was not encountered in MW1, MW2, MW7 or MW8.

Hydrostatic ground water levels were measured manually in the monitoring wells on eight occasions beginning November 26, 2014 and ending December 4, 2015. The ground water level is subject to seasonal fluctuations and variations in precipitation.

Appendix E includes the ground water strike and manually measured hydrostatic ground water level readings from November 2014 to December 2015 listed on Table 1 and the charts of the ground



water level data. The highest ground water elevations were typically measured on the site visits in November and December 2014, and April 2015 and the lowest in October and December, 2015.

For further hydrogeological assessment, please refer to Sections 4.4 and 6 and Appendix E.

4.3 Estimated Hydraulic Conductivity and Infiltration Rate

4.3.1 Hydraulic Conductivity

The hydraulic conductivity of the soils encountered surrounding the monitoring well screens and the near-surface soils was estimated using in-situ permeability test data and grain size distribution test results as described below.

The hydraulic conductivity (K-value), K (cm/s), was estimated by performing a slug test and applying the following expression by Hvorslev (1951):

$$K = \frac{r^2}{2LT_0} \ln\left(\frac{L}{R}\right)$$

where K = hydraulic conductivity (cm/s)
 L = the length of the screen (150 or 300 cm)
 R = the radius of the borehole (7.62 cm)
 r = the radius of the well casing (2.54 cm)
 T₀ = the basic time lag in seconds (time at 37% recovery, see Appendix C).

In addition, the hydraulic conductivity of non-clayey soil samples taken in the vicinity of the monitoring well screens was estimated using particle size distribution test results and the Hazen (1911) equation:

$$K = C(D_{10}^2) \text{ in cm/s}$$

where D₁₀ = effective grain size in cm (Figures GB-GS-1 through 5)
 C = 100 (a parameter related to grain-size distribution uniformity)



The K-values of the soil samples containing clayey soils and soils with low D_{10} values were estimated using the following expression (Puckett et. al. 1985) in which the percentage of clay was taken from the particle size distribution charts (Figures GB-GS-1 through 5):

$$K = 4.36 \times 10^{-3} \times e^{(-0.1975 \times \% \text{ clay})}$$

where K = hydraulic conductivity (cm/s)

$\% \text{clay}$ = percentage of the total soil sample finer than 0.002 mm by weight
(Figures GB-GS-1 through 5)

The results of field permeability tests as well as the estimated K-values from particle size distribution test results are listed on Table 2.

4.3.2 Infiltration Rates

Due to wetting and drying cycles of soils, water flow occurs in two zones: the aeration (capillary fringe) zone, and below it, the saturated zone, where the demarcation between the two zones is usually referred to as the phreatic surface or water table. The movement of water in the aeration zone is infiltration and is governed by negative capillary suction (less than atmospheric pressure) whereas the water flow in the saturated zone is percolation and is controlled by positive hydrostatic pressure (or head). There is a time lag until the wetting front moves to complete saturation and changes completely the infiltration to percolation (namely the infiltration capacity).

Infiltration into soils is governed by the forces of gravity and in opposite direction of capillary suction. The infiltration rate is a measure of the rate at which soil is able to absorb precipitation or irrigation; and the maximum rate that water can enter into soils in a given condition is the infiltration capacity. If the arrival of the water at the soil surface is less than the infiltration capacity, all of the water will infiltrate, whereas if the water arrival rate exceeds the infiltration capacity, ponding begins which will be followed by overland flow. In addition to the soil hydraulic conductivity, the infiltration rate depends also on the intensity and duration of rainfall, prior weather condition (frozen ground for example), slope and vegetation cover.

The infiltration rate at the Site was estimated for each near-surface soil (<3.0 m depth) for which a K-value was estimated based on grain size distribution and/or borehole permeability test. The



infiltration rate was estimated based on the approximate relationship between infiltration rate and hydraulic conductivity described by the Ontario Ministry of Municipal Affairs and Housing (OMMAH)'s Supplementary Guidelines to the Ontario Building Code, 1997, SG-6 Percolation Time and Soil Descriptions. The results are given on Table 2.

It can be seen from the analysis above that the screened soils at MW5, MW6 and MW7, at the southern end of the site, encountered sand deposits and have infiltration rates of 40 mm/hr or greater, while the near-surface soils at MW2 and MW3 (the north end of the Site) have infiltration rates of 24 mm/hr or less, which is less desirable for infiltration.

Note that infiltration systems generally are not recommended where the infiltration rates are less than 12 to 15 mm/hr (Manual of Policy, Procedures and Guidelines for Private Sewage Disposal Systems, MOE, 1982; and Stormwater Management and Planning Design Manual, MOE, dated 2003).

4.4 Hydrogeological Conceptual Site Model

A simplified hydrogeological conceptual site model (HCSM) of the Site was developed based on the field and laboratory data compiled to date.

The generalized profile of the soils encountered in the field investigation indicates that the surface soils are primarily silty topsoil, and clayey silts and silty clays dominate the remainder of the profile, with some sandy deposits occurring in the southern half of the site. Loose, wet sand was encountered at about 2.7 and 1.8 m depths at MW5 and MW6, respectively (about elevation 245.6), indicating the presence of an aquifer at this location. Limited data indicates that this aquifer is about 1.0 m thick and is underlain by clayey soils. Since a sand layer was not encountered at this elevation at the other MW locations, it may be assumed to be narrow in the north-south direction, but of undefined length in the east-west direction.

Soil sampling and monitoring well permeability test results indicate that the near-surface soils (<3.0 m depth) in the south end of the Site are more conducive to infiltration than those of the north end of the Site.



Measured water levels were relatively stable between November 26, 2014 and January 19, 2015 for all monitoring wells except MW1. The water level rose at this well by 1.2 m over this period, while the water levels dropped at the other wells by an average of 0.3 m.

The observation of ground water strike at MW3 to MW6 indicates that water is found at about 1.8 to 2.7 m depth, elevation 244.3 to 246.0 at the monitoring wells, and the highest measured water levels at MW3 to MW6 were considerably higher, with pressure heads of 1.4, 0.4, 2.4 and 2.0 m, respectively, above the ground water strike. This suggests the sand aquifer at MW5 and MW6 is pressurized. The pressures are not expected to produce uplift, however, as the resisting soils are relatively thick (about 2.3 m on average) and the estimated average Factor of Safety is 2.4.

Based on the preliminary data averaged over the 3 water level readings, lateral, east to west hydraulic gradients of 0.11 to 0.13 were measured between MW1 and MW2 and between MW3 and MW4 (the north wells), respectively. A negligible lateral head difference was measured between the wells in the south part of the site. The longitudinal (north-south) gradients were typically smaller (about 0.005) and to the north, with the exception of between MW2 and MW4, which indicated a small southerly gradient, and between MW4 and MW6, which indicated a northerly gradient of 0.031.

Additional discussion utilizing the entire 12-month monitoring period is presented in Appendix E.

4.5 Ground and Surface Water Sample Chemical Test Results

The laboratory certificate of chemical analyses carried out by AGAT Laboratories on ground water samples from MW1 and MW5 and a surface water sample in accordance with the chain-of-custody records and the protocols described above (Section 3.4 and 3.5.1) are included in Appendix D.

The concentration of BOD was less than 5 mg/L, indicating a low level of organic content. The concentrations of OC pesticides and selected metals complied with O. Reg. 153(511) Table 1 site condition standards (the most stringent standard) with the exceptions listed on Table B below:



Table B
 ELEVATED LEVELS IN GROUND WATER SAMPLE ANALYZED¹

PARAMETER	GROUND WATER SAMPLE CONCENTRATION AT MW1 (µg/L)	GROUND WATER SAMPLE CONCENTRATION AT MW5 (µg/L)	SURFACE WATER SAMPLE CONCENTRATION (µg/L)	CONCENTRATION LIMIT FOR TABLE 1 STANDARD (µg/L)
Copper	2.2	1.7	13.7	5
Vanadium	4.3	<0.4	10.1	3.9
Uranium	4.4	13.1	1.8	8.9

Notes: 1. concentrations in bold exceed the O. Reg. 153(511) Table 1 Standard.

4.6 Soil Corrosivity Results

Eight representative soil samples were selected and submitted to AGAT Laboratories to determine the degree of corrosivity to cast iron pipe and sulphate attack on buried concrete in native soils. The test results are in Appendix D and summarized in the following tables:

Table C
 SOIL CORROSIVITY CHEMICAL TEST RESULTS

BOREHOLE/ SAMPLE No.	DEPTH (m)	RESISTIVITY (Ohm-cm)	pH	REDOX POTENTIAL (mV)	SULFIDES (%)
MW1 / SS 6	4.6 – 5.2	4390	8.21	214	0.05
MW3 / SS 6	4.6 – 5.2	4220	8.17	223	0.02
MW4 / SS 5	3.0 – 3.7	4720	8.20	204	0.02
MW5 / SS 5	3.0 – 3.7	6620	8.52	189	<0.01
MW6 / SS 3	1.5 – 2.1	5030	8.29	218	< 0.01
MW7 / SS 5	3.0 – 3.7	5560	8.24	223	0.01

Based on the above chemical analyses results and the criteria set in ANSI/AWWA C105/A21.5-99, the soil is considered to be not corrosive to grey or ductile cast-iron pipe.



Table D
SOIL SULPHATE CONTENT TEST RESULTS

BOREHOLE/ SAMPLE	DEPTH (m)	SOIL DESCRIPTION	WATER SOLUBLE SULPHATE (SO ₄) IN SOIL SAMPLE	
			ug/g	(%)
MW 1 / SS 6	4.6 – 5.2	Clayey Silt	106	0.0106
MW 3 / SS 6	4.6 – 5.2	Clayey Silt	127	0.0127
MW 4 / SS 5	3.0 – 3.7	Silty Clay	98	0.0098
MW 5 / SS 5	3.0 – 3.7	Sand	61	0.0061
MW 6 / SS 3	1.5 – 2.1	Sand	87	0.0087
MW 7 / SS 5	3.0 – 3.7	Silty Clay	59	0.0059

Based on the water soluble sulphate (SO₄) content in the soil samples analyzed, a negligible degree of sulphate attack is anticipated on concrete buried in native soils.

5. GROUND WATER LEVEL MONITORING

Ground water level was measured in both monitoring wells and vibrating wire piezometers from November 27, 2014 to December 14, 2015. The results of this monitoring, along with hydrogeological assessment and site visit observations, are summarized in Appendix E which also includes the Hourly VWP data in a more detailed monthly format and the trends observed.

6. ASSESSMENT OF GROUND AND SURFACE WATER IMPACT DURING THE MONITORING PERIOD

6.1 Surface Water, Ponding and Seepage

Eight site visits were conducted between November 27, 2014 and December 14, 2015. On each site visit, signs of ponding, seepage through the berm, and erosion of the berm side slopes were examined. The water level was recorded manually from each monitoring wells on each visit.



Water ponding was observed on the Farm on April 10, 2015. Additionally, a small amount of ponding was observed on the next site visit, on June 5, 2015. The ponding was not observed on subsequent site visits.

However, on these site visits the ponded water was not observed close to overtopping the highway berm or circumventing it to the north or south. On April 10, the maximum depth of water ponded was about 0.3 m, while the top of the berm would require at least another 1 m of water to overtop it. The ponding in June was considerably shallower.

It is likely that this ponding was the result of the snow melting and rainfall on the Farm, as indicated in the weather data of March (Figure 6 in Appendix E). In March and April the ground freezing would have likely impeded infiltration.

There were no signs of seepage on the east side of the berm, and no evidence of erosion of the berm side slopes, although the slopes became heavily vegetated which could have been hiding signs of seepage from our view.

Water in the stormwater ditch between the highway and the berm was minimal and showed no evidence of originating from the Farm.

The total precipitation recorded at the Baldwin weather station during the monitoring period was significantly lower than the 'climate normals' for 1981 to 2010 (see Appendix E for details) for the vicinity. Thus, the risk of impacts to the highway berm due to precipitation combined with water discharged by the Farm in future years may be greater if precipitation amounts return to or above normal.

6.2 Sudden Ground Water Surcharge

If the Farm's infiltration system were used over an extended period of time or if a considerable volume of water was discharged by the Farm, it would be expected that the surcharge to the ground water would be exhibited by an increase in HGWL in multiple VWP's and be unrelated to rainfall or snow melt events. No such event was observed during the twelve month monitoring



period. As detailed through examples in Appendix E, sudden increases in HGWL only followed rainfall or snow melt events.

6.3 Highway Berm Stability

Slope stability analysis of the highway berm was not within the scope of this work, however, it is noted that the ground water data collected to-date could be used for such an assessment, if required, with high, low and average pore water pressures for a twelve-month hydrologic cycle.

7. CONCLUDING REMARKS

Based on our findings of the Site settings, subsurface conditions revealed from field work and laboratory analyses, our concluding remarks are outlined in the following paragraphs:

- a) The soil stratigraphy at the Site generally comprised silty topsoil overlying native soils predominantly clayey silt, silty clay or clay. Sand deposits were encountered in the southern half of the Site. The encountered sand layer is at depths of 1.8 and 2.7 m and pressurized about 2.0 m of head above the ground water strike.
- b) The infiltration rates, estimated from the hydraulic conductivity K values compiled ranged from 10 to 24 mm/hr in the north to 40 to 50 mm/hr in the south. Infiltration systems generally are not recommended where the infiltration rates are less than 12 to 15 mm/hr according to the Manual of Policy, Procedures and Guidelines for Private Sewage Disposal Systems, MOE, 1982 and Stormwater Management and Planning Design Manual, MOE, dated 2003.
- c) The water quality of the ground water and surface water samples taken in November, 2014 did not necessarily indicate environmental impacts that can be related to activity or discharge from the Farm.
- d) The soil samples analyzed were found not to be corrosive to grey or ductile cast-iron pipes and had a negligible degree of sulphate attack on buried concrete.



- e) It appears from the 12-month monitoring program that ground water flows northerly along the Site and generally easterly with a steeper gradient in the north half of the Site.
- f) During this monitoring period, no spikes were observed in the water levels recorded by the vibrating wire piezometers that would indicate a sudden surge of water from the Farm. This may indicate that the Farm did not discharge water to the infiltration area during this monitoring period.
- g) During the site visits, ponding on the Farm property was observed twice, in April and June 2015. It is expected that the source of the ponded water was melted snow and rainfall, aided by frozen ground, and not the infiltration system. The ponding did not come close to overtopping or circumventing the highway berm.
- h) There were no signs of seepage on the east side of the berm and no evidence of erosion of the berm side slopes at any site visit, although the slopes became heavily vegetated and these features could have been hidden from view.
- i) No negative impacts on highway operations and maintenance were confirmed to be caused by activities on the Chapman Farm during the twelve-month monitoring period.
- j) The total precipitation during the monitoring period appears to have been lower than normals recorded between 1981 and 2010. For this reason, there may be an increased risk of impact due to precipitation (possibly combined with water disposed by the Farm) in future years.

8. CLOSURE

Messrs. F. Portela, and J. O carried out the field investigation for this study under the supervision of Mr. A. J. Cooke, PhD, P.Eng, Project Engineer. The equipment was supplied by Atcost Drilling Inc. and RST Instruments Ltd. The laboratory testing of selected soil samples was carried out at the PML laboratory in Toronto. Additional water level readings were conducted by D. Berwick, MTO Foundations Group Materials Engineering Research Office.



This report was prepared by Mr. A. J. Cooke, PhD, P.Eng, Project Engineer and reviewed by Mr. M. H. Mortazavi, MEng, P.Eng, P. Geo., Senior Consultant, and Mr. C.M.P. Nascimento, P.Eng., Project Manager and MTO Designated Principal Contact conducted an independent review of the report.

Yours very truly,

Peto MacCallum Ltd.



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AC/MHM/CN:ac-mm



TABLE 1
 VIBRATING WIRE PIEZOMETER (VWP) ELEVATIONS AND DEPTHS

VIBRATING WIRE PIEZOMETER (VWP) No. ⁽¹⁾	GROUND SURFACE ELEVATION ⁽²⁾	VWP ELEVATION (DEPTH, m)	OBSERVED OR INTERPRETED GROUND WATER STRIKE ELEVATION ⁽³⁾ (DEPTH, m)
VWP1	249.4	243.4 (6.0)	Not Apparent
VWP2	245.8	242.8 (3.0)	Not Apparent
VWP3	248.1	242.1 (6.0)	246.0 (2.1)
VWP4	246.9	240.9 (6.0)	244.3 (2.6)
VWP5	248.2	245.2 (3.0)	245.5 (2.7)
VWP6	247.6	244.6 (3.0)	245.8 (1.8)
VWP7	249.8	246.8 (3.0)	Not Apparent
VWP8	249.8	243.8 (6.0)	Not Apparent

Notes:

- (1) See Drawing 404-1 for approximate locations.
- (2) Ground surface elevations at the vibrating wire piezometer locations were surveyed by J.D. Barnes Ltd.
- (3) Ground water level first time encountered in the boreholes during drilling.

TABLE 2
 ESTIMATED INFILTRATION RATES AND HYDRAULIC CONDUCTIVITY (K) VALUES FROM
 SOIL SAMPLE GRAIN SIZE DISTRIBUTION AND BOREHOLE PERMEABILITY TEST RESULTS

MONITORING WELL (MW) NO.	MONITORING WELL (MW) MID-SCREEN ELEVATION (DEPTH, m)	SOIL TYPE (SAMPLE NO.) (DEPTH, m) (1)	D ₁₀ (mm) OR % CLAY (See Figures GB-GS-1 to GB-GS-5) (2)	ESTIMATED K-VALUES FROM GRAIN SIZE DISTRIBUTION TEST RESULTS (cm/sec) (3)	ESTIMATED K-VALUES FROM BOREHOLE PERMEABILITY TESTING (See Appendix D) (cm/sec) (4)	NEAR-SURFACE SOIL (<3.0m) INFILTRATION RATE (mm/hr) (5)
MW1	244.8 (4.6)	Clayey silt (SS 5) (3.0)	43%	9.0×10^{-7}	2.0×10^{-7}	Deep
MW2	243.6 (2.3)	Silty clay	-	-	3.0×10^{-7}	10
MW3	-	Clayey silt fill (SS 2) (0.5)	32%	8.0×10^{-6}	-	24
	-	Clayey silt (SS 3) (1.4)	34%	5.0×10^{-6}	-	20
	243.5 (4.6)	Clayey silt (SS 5) (3.0)	40%	2.0×10^{-6}	1.0×10^{-6}	Deep
MW4	242.3 (4.6)	Silty clay	-	-	7.0×10^{-8}	Deep
		Clay (SS 6) (4.5)	81%	5.0×10^{-10}		

Notes:

- (1) See Record of Borehole sheets for soil sample description.
- (2) % Clay is percentage of the total soil sample finer than 0.002 mm by weight.
- (3) K-Value estimated using Hazen Equation or Puckett's Equation; see Section 4.3 of the report text.
- (4) K-Value estimated using Hvorslev's Method; see Section 4.3 of the report text.
- (5) Infiltration rate estimated from K value based on relationship in Ontario Ministry of Municipal Affairs and Housing (OMMAH) Supplemental Guidelines to the Ontario Building Code, 1997. K value from grain size distribution test results are used where K value from borehole permeability testing is unavailable.
- Indicates no grain size distribution analysis or borehole permeability test.

TABLE 2
 ESTIMATED INFILTRATION RATES AND HYDRAULIC CONDUCTIVITY (K) VALUES FROM
 SOIL SAMPLE GRAIN SIZE DISTRIBUTION AND BOREHOLE PERMEABILITY TEST RESULTS

MONITORING WELL (MW) NO.	MONITORING WELL (MW) MID-SCREEN ELEVATION (DEPTH, m)	SOIL TYPE (SAMPLE NO.) (DEPTH, m) (1)	D ₁₀ (mm) OR % CLAY (See Figures GB-GS-1 to GB-GS-5) (2)	ESTIMATED K-VALUES FROM GRAIN SIZE DISTRIBUTION TEST RESULTS (cm/sec) (3)	ESTIMATED K-VALUES FROM BOREHOLE PERMEABILITY TESTING (See Appendix D) (cm/sec) (4)	NEAR-SURFACE SOIL (<3.0m) INFILTRATION RATE (mm/hr) (5)
MW5	245.9 (2.3)	Clayey silt (SS 2) (0.6)	19%	1.0×10^{-4}	6.0×10^{-5}	40
		Sand	-	-		
MW6	245.3 (2.3)	Silty clay	-	-	6.0×10^{-4}	>50
		Sand (SS 4) (3.0)	0.01	1.0×10^{-4}		
MW7	247.6 (2.3)	Sand (SS 3) (1.5)	11%	5.0×10^{-4}	4.0×10^{-4}	>50
		Silty clay	-	-		
MW8	245.3 (4.5)	Sandy silt till	-	-	1.0×10^{-5}	Deep

Notes:

- (1) See Record of Borehole sheets for soil sample description.
- (2) % Clay is percentage of the total soil sample finer than 0.002 mm by weight.
- (3) K-Value estimated using Hazen Equation or Puckett's Equation; see Section 4.3 of the report text.
- (4) K-Value estimated using Hvorslev's Method; see Section 4.3 of the report text.
- (5) Infiltration rate estimated from K value based on relationship in Ontario Ministry of Municipal Affairs and Housing (OMMAH) Supplemental Guidelines to the Ontario Building Code, 1997. K value from grain size distribution test results are used where K value from borehole permeability testing is unavailable.
- Indicates no grain size distribution analysis or borehole permeability test.



Plate 1: A view of the Site looking north from the Highway 404 southbound hydro tower access road (approximate location of MW7 and MW8). The Farm is left of the snow fence. The outline where corn was not growing on the Farm can be seen (August 6, 2014).



Plate 2: A view of the Site looking south from the north end of the Site. There is a steep side slope here down to the storm water ditch next to the highway (August 6, 2014).



Plate 3: A view, looking north, of the half-circle area where corn was not growing on the Farm property (centre) (August 6, 2014).



Plate 4: A view looking north along Highway 404 showing both sides of the highway in the vicinity of the Site (August 6, 2014).



Plate 5: Monitoring well 3 (left) and the pedestal for the vibrating wire piezometer (VWP) 3 datalogger (right) on the west side of the berm (November 26, 2014).



Plate 6: The mounted radio transmission receiver, Flexdaq datalogger, and cellular broadcasting hub at the location of MW5 and VWP5, west of the berm, looking north (November 26, 2014).



REFERENCE: THIS FIGURE WAS REPRODUCED FROM MAPDATA @2015 GOOGLE BY GOOGLE.

MINISTRY OF TRANSPORTATION, ONTARIO

FOUNDATION SEEPAGE INVESTIGATION FOR
HIGHWAY 404

300 TO 800m NORTH OF HOLBORN ROAD
TOWN OF EAST GWILLIMBURY, ONTARIO

KEY MAP



Peto MacCallum Ltd.
CONSULTING ENGINEERS

DRAWN: N.A.	DATE	SCALE	JOB NO.	FIGURE NO.
CHECKED: A.C.	JULY 2016	1 : 12,500	14TF023	1
APPROVED: C.N.				



REFERENCE: THIS FIGURE WAS REPRODUCED FROM YORK REGION INTERACTIVE MAPS.

MINISTRY OF TRANSPORTATION, ONTARIO

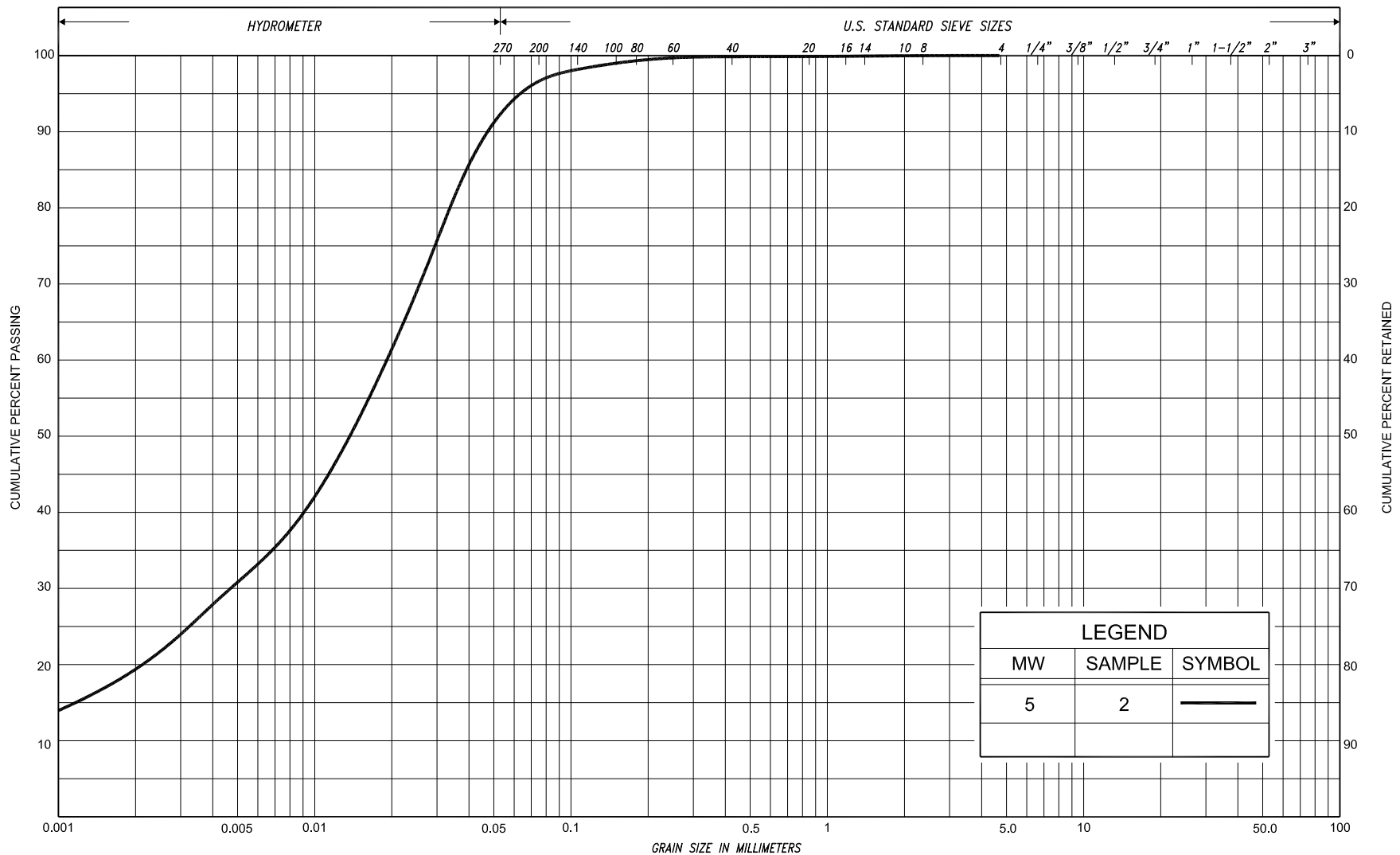
**FOUNDATION SEEPAGE INVESTIGATION FOR
HIGHWAY 404
300 TO 800m NORTH OF HOLBORN ROAD
TOWN OF EAST GWILLIMBURY, ONTARIO**

2015 AERIAL PHOTOGRAPH AND TOPOGRAPHY



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CONSULTING ENGINEERS

DRAWN: N.A.	DATE	SCALE	JOB NO.	FIGURE NO.
CHECKED: A.C.	JULY 2016	1 : 8,000	14TF023	2
APPROVED: C.N.				



SILT & CLAY				FINE		MEDIUM		COARSE	GRAVEL			COBBLES	UNIFIED	
				SAND										
CLAY	FINE	MEDIUM	COARSE	FINE	MEDIUM		COARSE		GRAVEL			COBBLES		
	SILT													
CLAY		SILT		V. FINE	FINE	MED.	COARSE	GRAVEL						U.S. BUREAU
SAND														

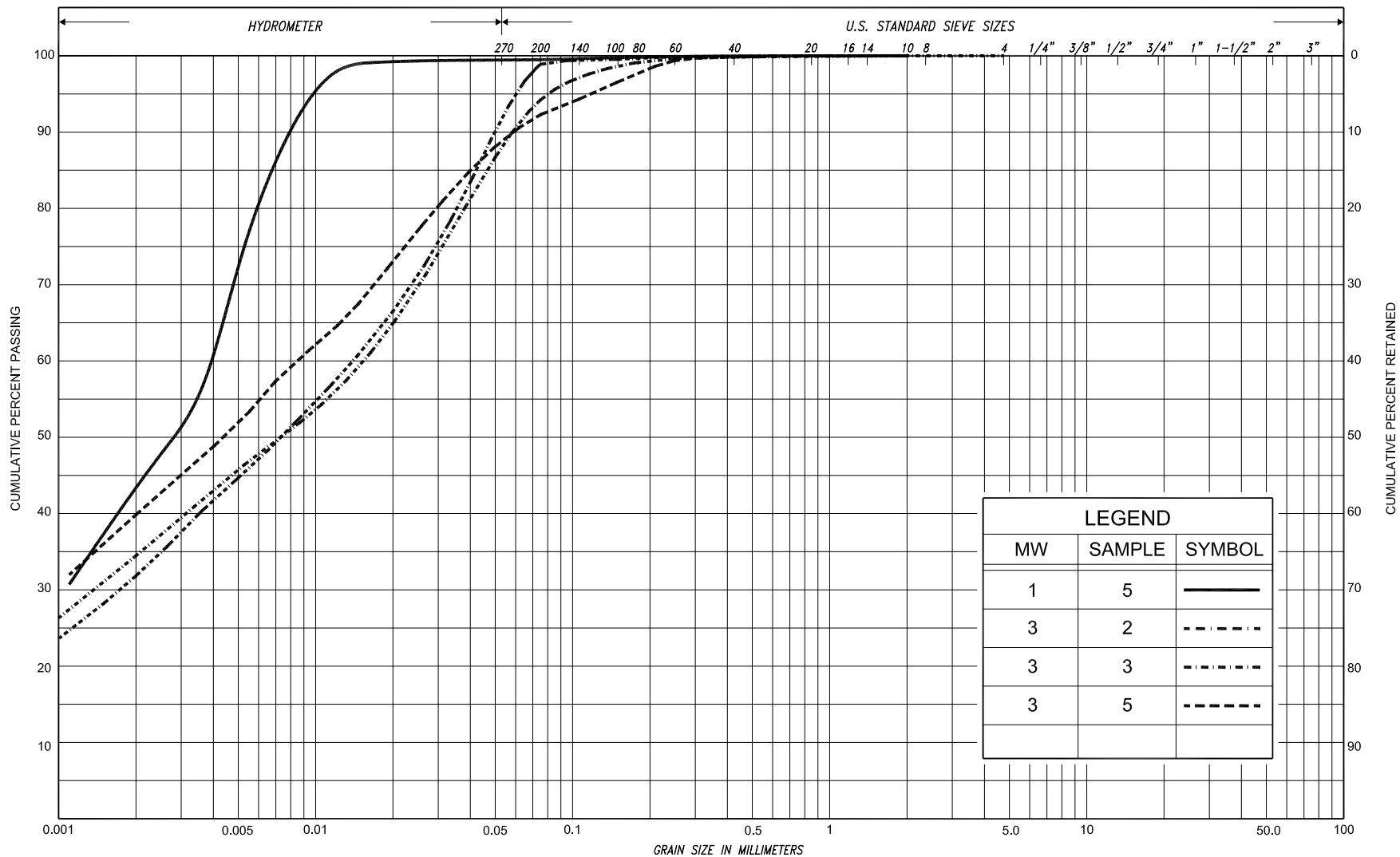


GRAIN SIZE DISTRIBUTION CLAYEY SILT, trace sand (CL) (FILL)

FIG No. GB-GS-1

HWY: 404

G.W.P. No.



SILT & CLAY					FINE		MEDIUM		COARSE	GRAVEL			COB BLES	UNIFIED	
					SAND										
CLAY	FINE		MEDIUM	COARSE	FINE		MEDIUM		COARSE		GRAVEL			COBBLES	M.I.T.
	SILT														
CLAY		SILT			V. FINE	FINE	MED.	COARSE		GRAVEL					U.S. BUREAU
					SAND										

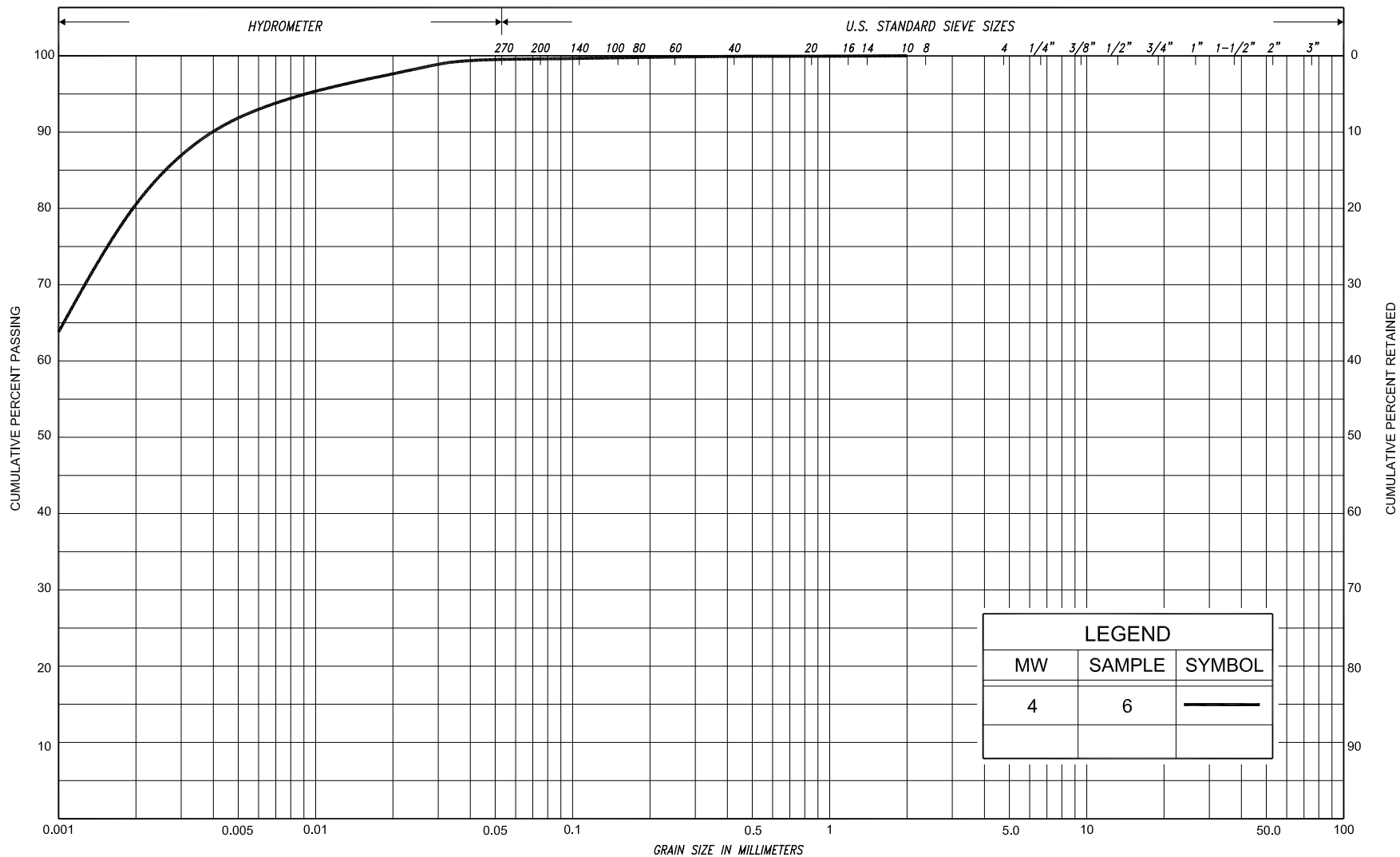


GRAIN SIZE DISTRIBUTION CLAYEY SILT, trace sand (CL)

FIG No. GB-GS-2

HWY: 404

G.W.P. No.



SILT & CLAY					FINE		MEDIUM		COARSE	GRAVEL			COB BLES	UNIFIED			
					SAND												
CLAY	FINE		MEDIUM		COARSE		FINE		MEDIUM		COARSE		GRAVEL			COBBLES	M.I.T.
	SILT																
CLAY		SILT			V. FINE	FINE	MED.	COARSE		GRAVEL							U.S. BUREAU
					SAND												



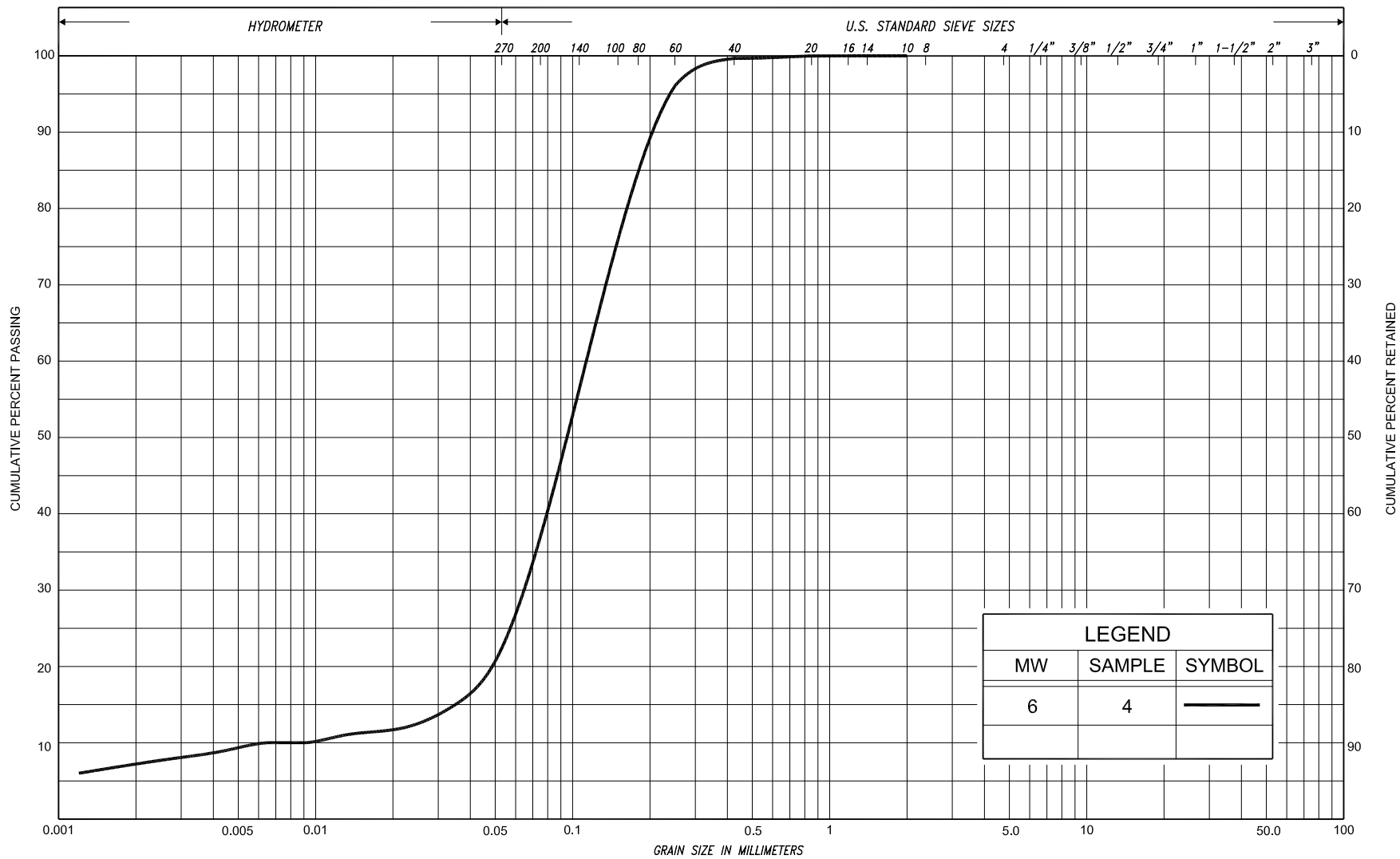
GRAIN SIZE DISTRIBUTION

CLAY, some silt, trace sand (CH)

FIG No. GB-GS-3

HWY: 404

G.W.P. No.



LEGEND		
MW	SAMPLE	SYMBOL
6	4	—



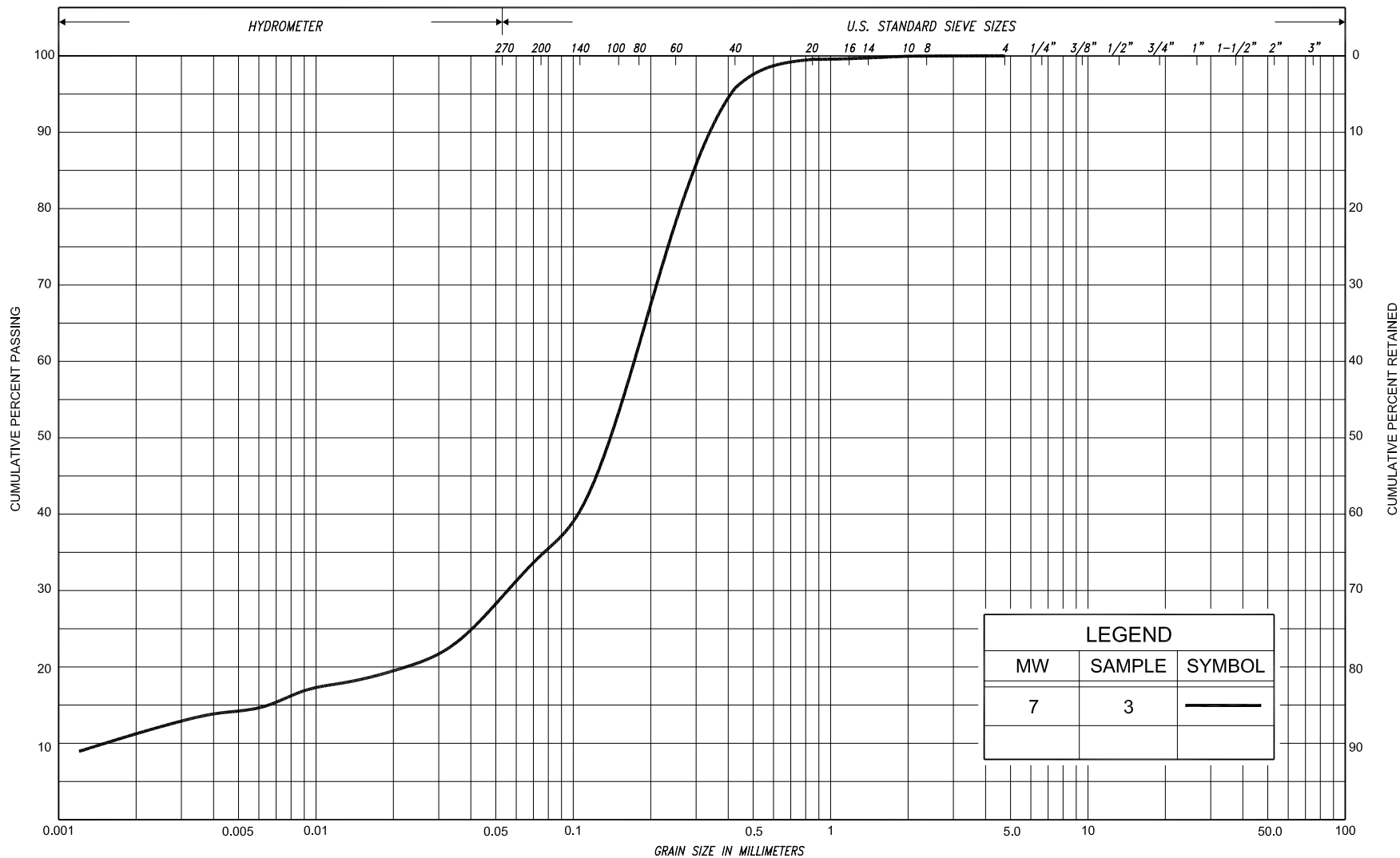
GRAIN SIZE DISTRIBUTION

SILTY SAND, trace clay

FIG No. GB-GS-4

HWY: 404

G.W.P. No.



SILT & CLAY					FINE		MEDIUM		COARSE	GRAVEL			COBBLES	UNIFIED	
					SAND										
CLAY	FINE		MEDIUM	COARSE	FINE		MEDIUM		COARSE		GRAVEL			COBBLES	M.I.T.
	SILT														
CLAY		SILT			V. FINE	FINE	MED.	COARSE	GRAVEL						U.S. BUREAU
					SAND										



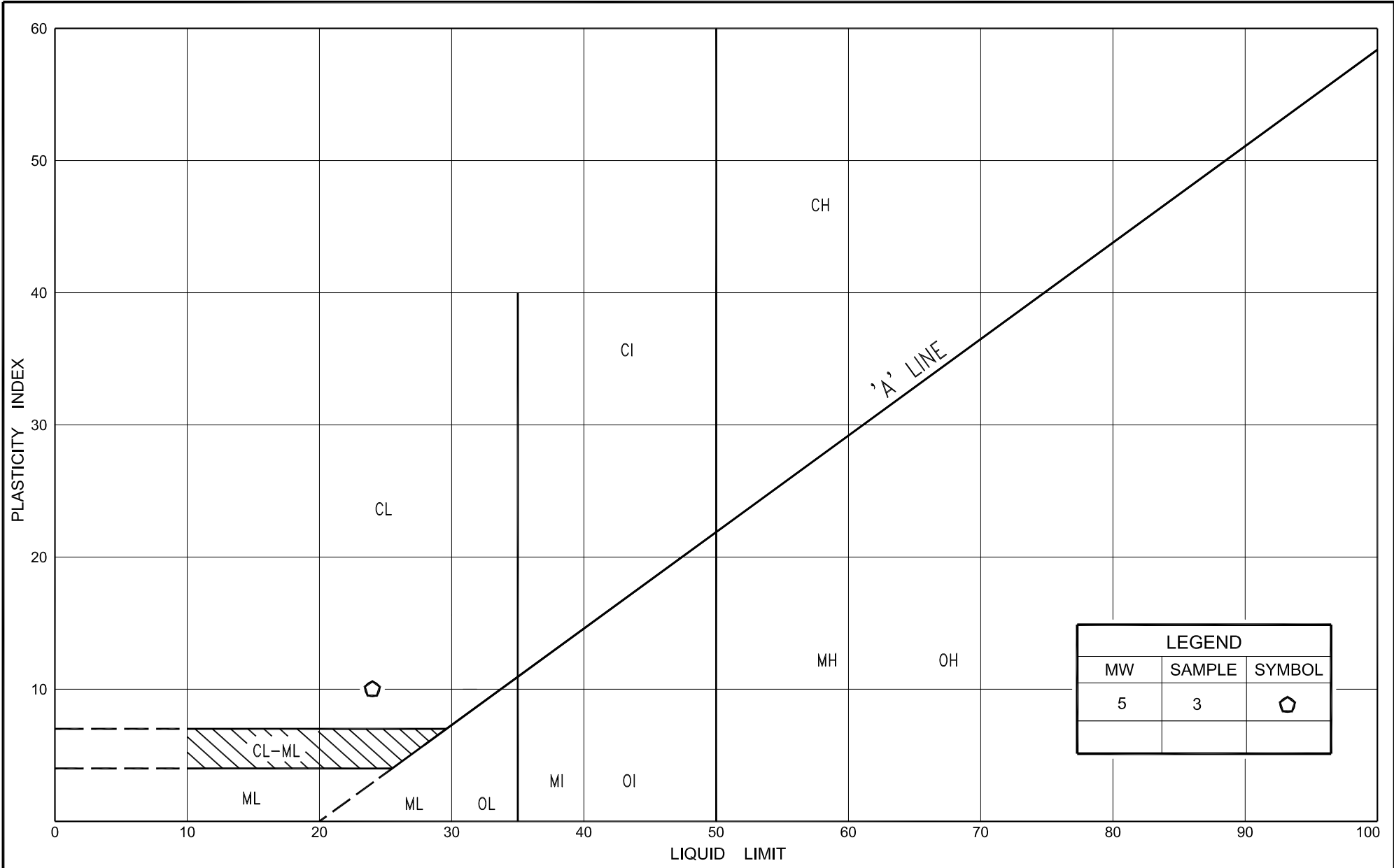
GRAIN SIZE DISTRIBUTION

SAND, with silt, some clay

FIG No. GB-GS-5

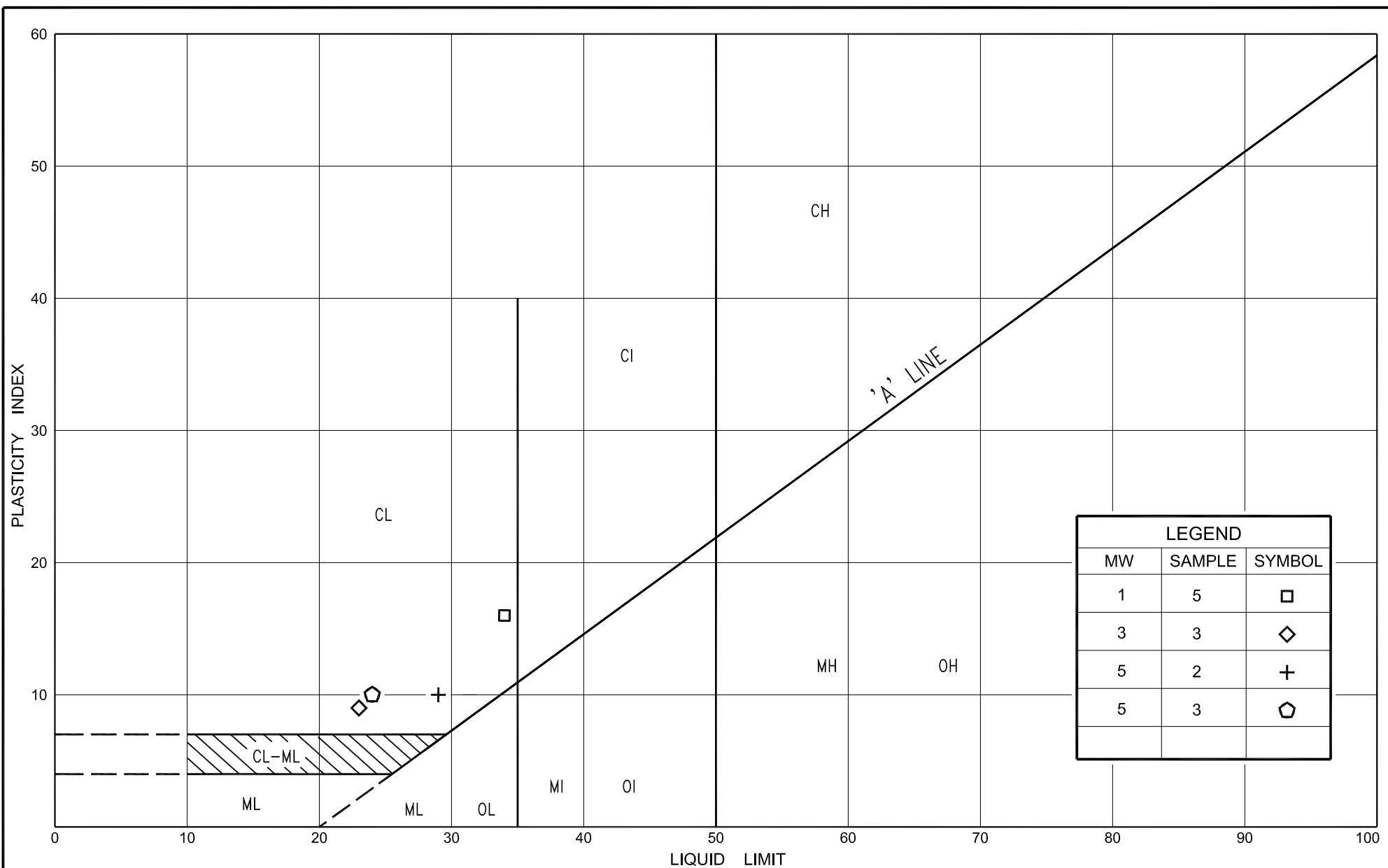
HWY: 404

G.W.P. No.



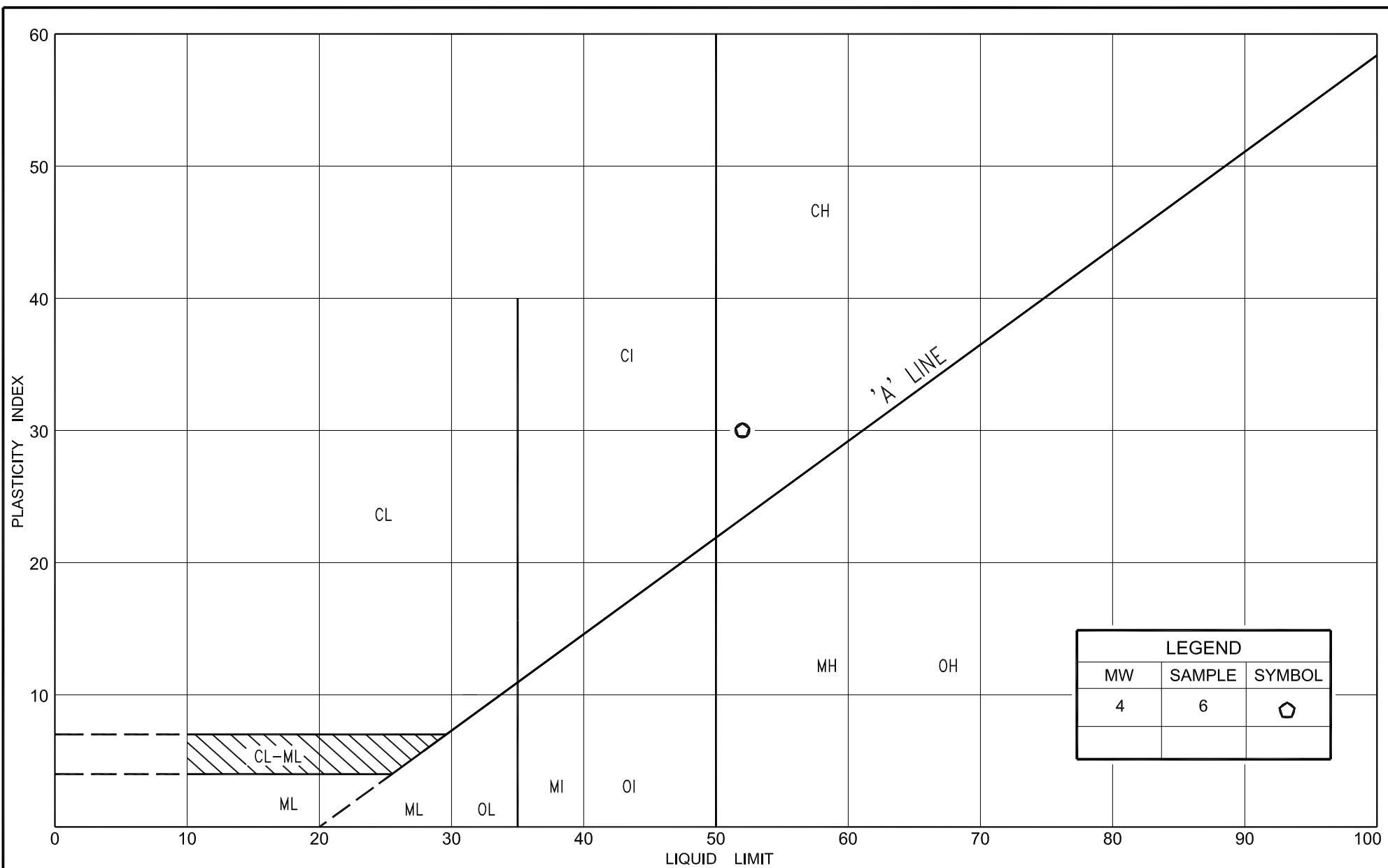
PLASTICITY CHART
CLAYEY SILT, trace sand (CL)
(FILL)

FIG No.	GB-PC-1
HWY:	404
G.W.P. No.	



PLASTICITY CHART CLAYEY SILT, trace sand (CL)

FIG No.	GB-PC-2
HWY:	404
G.W.P. No.	



PLASTICITY CHART
CLAY, some silt, trace sand (CH)

FIG No.	GB-PC-3
HWY:	404
G.W.P. No.	

CONT No 2013-E-0039
TASK No 2013-E-0039-005
WO No 2014-11023

FOUNDATION SEEPAGE INVESTIGATION
HIGHWAY 404
BOREHOLE LOCATIONS AND SOIL STRATA



SHEET

PML Peto MacCallum Ltd.
CONSULTING ENGINEERS



SCALE: 1:10,000 APPROX.

LEGEND

- Borehole
- Borehole and Cone
- Auger Probe
- N Blows/0.3m (Std. Pen Test, 475 J/blow)
- CONE Blows/0.3m (60 Cone, 475 J/blow)
- WL at time of investigation Aug. 2014
- 01/19/2015
- Water level in Monitoring Well and date
- WH Penetration due to weight of rods and hammer
- Head
- ARTESIAN WATER
- Encountered
- Monitoring Well

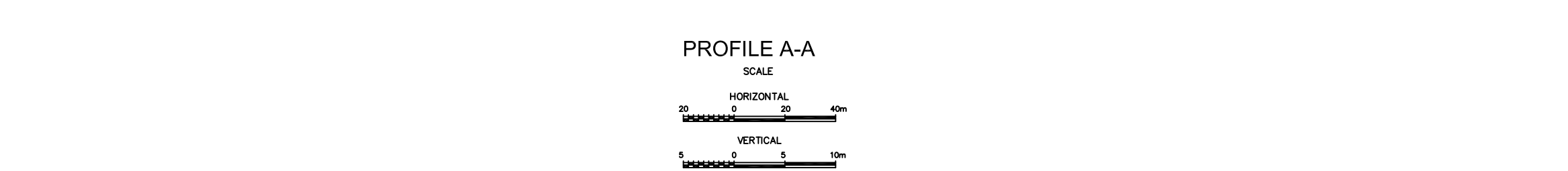
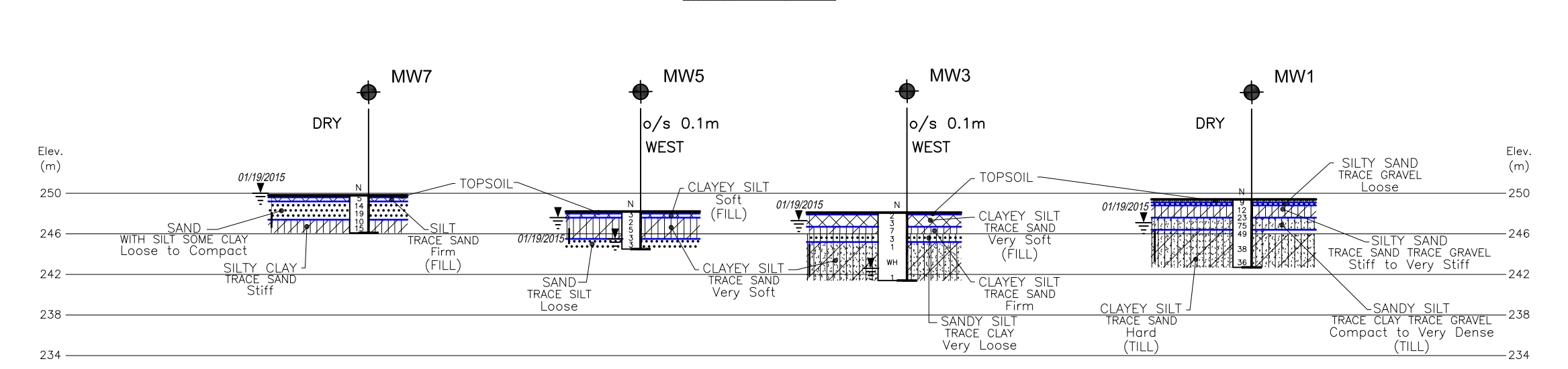
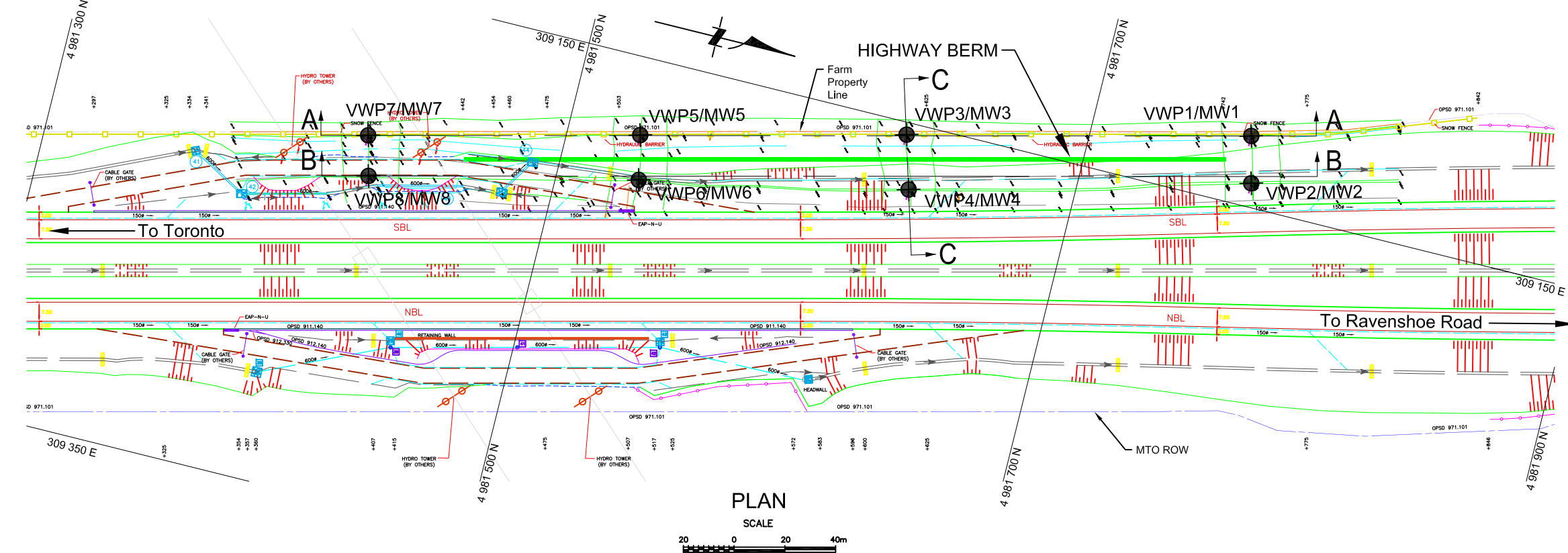
BH No	ELEVATION	NORTHINGS	EASTINGS
MW1	249.4	4 891 762.0	309 122.5
MW2	245.8	4 891 766.5	309 140.6
MW3	248.1	4 891 630.1	309 154.8
MW4	246.9	4 891 636.1	309 175.6
MW5	248.2	4 891 528.3	309 180.3
MW6	247.6	4 891 532.0	309 197.6
MW7	249.8	4 891 424.3	309 206.3
MW8	249.8	4 891 428.3	309 221.8

NOTE
The boundaries between soil strata have been established only at Borehole locations. Between Boreholes the boundaries are assumed from geological evidence.

REVISIONS	DATE	BY	DESCRIPTION

Geocres No. 31D-608			
HWY No 404	CHECKED AC	DATE JULY 2016	DIST Central
SUBM'D NA	CHECKED MHM	APPROVED CN	SITE
DRAWN NL	CHECKED MHM	APPROVED CN	DWG 404-1

REF Drawings: 2538-199-00_CT-XDesign.dwg dated January 3, 2011



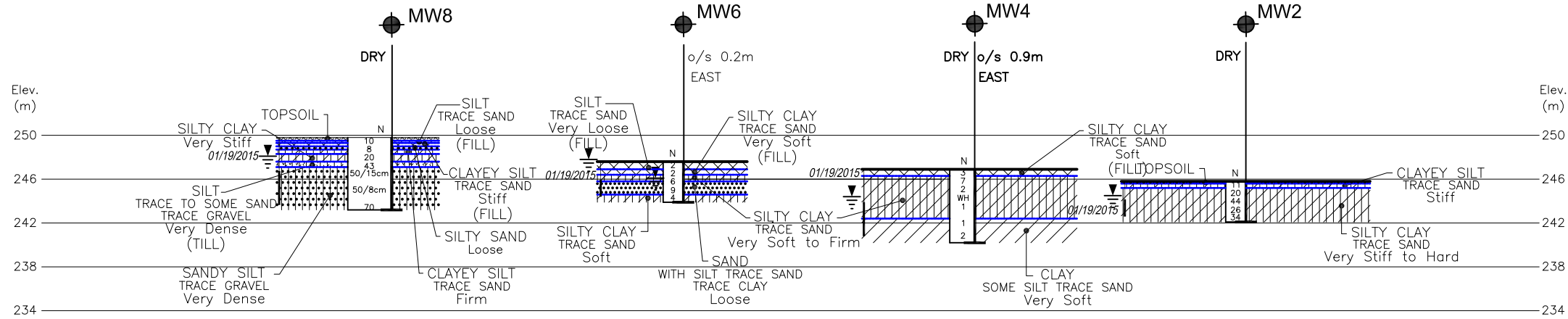
- NOTES:
- THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH THE TEXT OF REPORT AND RECORD OF BOREHOLE LOGS.
 - THIS DRAWING IS FOR SUBSURFACE INFORMATION ONLY. SURFACE DETAILS AND FEATURES ARE FOR CONCEPTUAL ILLUSTRATION.
 - REFER TO DRAWING 404-2 FOR PROFILE B-B AND SECTION C-C
 - DIMENSIONS ARE IN METRES AND/OR MILLIMETRES UNLESS OTHERWISE SHOWN. STATIONS ARE IN KILOMETRES AND METRES.

CONT No 2013-E-0039
TASK No 2013-E-0039-005
WO No 2014-11023

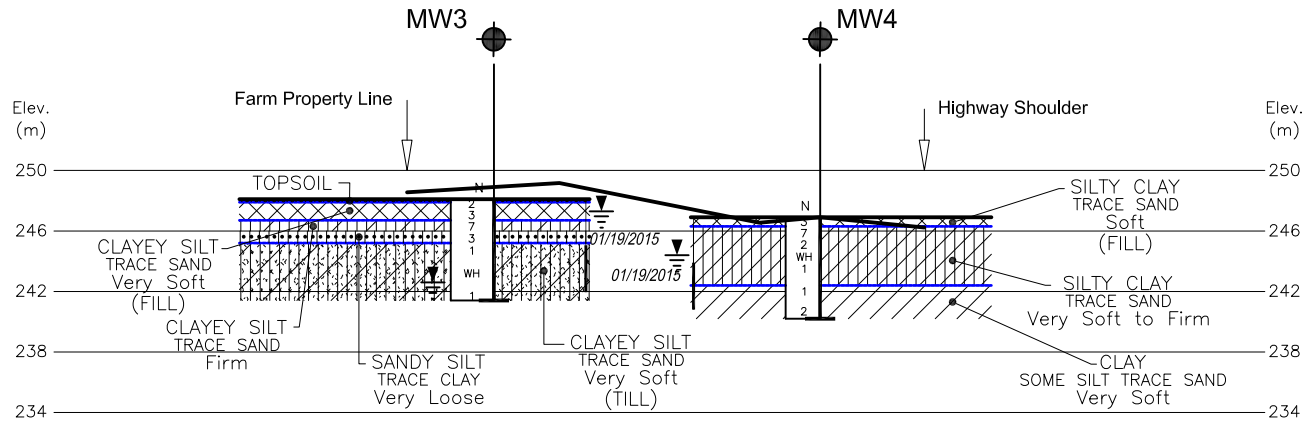
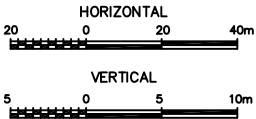
FOUNDATION SEEPAGE INVESTIGATION
HIGHWAY 404
SOIL STRATA

SHEET

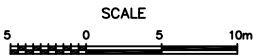
PML **Peto MacCallum Ltd.**
CONSULTING ENGINEERS



PROFILE B-B



SECTION C-C



NOTES:

1. THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH THE TEXT OF REPORT AND RECORD OF BOREHOLE LOGS.
2. THIS DRAWING IS FOR SUBSURFACE INFORMATION ONLY. SURFACE DETAILS AND FEATURES ARE FOR CONCEPTUAL ILLUSTRATION.
3. REFER TO DRAWING 404-1 FOR BORHOLE LOCATION PLAN AND PROFILE A-A
4. DIMENSIONS ARE IN METRES AND/OR MILLIMETRES UNLESS OTHERWISE SHOWN. STATIONS ARE IN KILOMETRES AND METRES.

LEGEND

- Borehole
- Borehole and Cone
- Auger Probe
- N Blows/0.3m (Std. Pen Test, 475 J/blow)
- CONE Blows/0.3m (60 Cone, 475 J/blow)
- WL at time of investigation Aug. 2014
- * Water level not established
- WH Penetration due to weight of rods and hammer
- Head
- ARTESIAN WATER
- Encountered
- PIEZOMETER

BH No	ELEVATION	NORTHINGS	EASTINGS
FOR DETAILS, REFER TO DRAWING 404-1			

NOTE

The boundaries between soil strata have been established only at Borehole locations. Between Boreholes the boundaries are assumed from geological evidence.

REVISIONS	DATE	BY	DESCRIPTION

Geocres No. 31D-608

HWY No 404	CHECKED AC	DATE JULY 2016	DIST Central
SUBM'D NA	CHECKED MHM	APPROVED CN	SITE
DRAWN NL	CHECKED MHM	APPROVED CN	DWG 404-2

REF Drawings: 2538-199-00_CT-XDesign.dwg dated January 3, 2011

EXPLANATION OF TERMS USED IN REPORT

N VALUE: THE STANDARD PENETRATION TEST (SPT) N VALUE IS THE NUMBER OF BLOWS REQUIRED TO CAUSE A STANDARD 51mm O.D. SPLIT BARREL SAMPLER TO PENETRATE 0.3m INTO UNDISTURBED GROUND IN A BOREHOLE WHEN DRIVEN BY A HAMMER WITH A MASS OF 63.5kg, FALLING FREELY A DISTANCE OF 0.76m. FOR PENETRATIONS OF LESS THAN 0.3m N VALUES ARE INDICATED AS THE NUMBER OF BLOWS FOR THE PENETRATION ACHIEVED. AVERAGE N VALUE IS DENOTED THUS \bar{N} .

DYNAMIC CONE PENETRATION TEST: CONTINUOUS PENETRATION OF A CONICAL STEEL POINT (51mm O.D. 60° CONE ANGLE) DRIVEN BY 475 J IMPACT ENERGY ON 'A' SIZE DRILL RODS. THE RESISTANCE TO CONE PENETRATION IS MEASURED AS THE NUMBER OF BLOWS FOR EACH 0.3m ADVANCE OF THE CONICAL POINT INTO THE UNDISTURBED GROUND.

SOILS ARE DESCRIBED BY THEIR COMPOSITION AND CONSISTENCY OR DENSENESS.

COMPOSITION: SECONDARY SOIL COMPONENTS ARE DESCRIBED ON THE BASIS OF PERCENTAGE BY MASS OF THE WHOLE SAMPLE AS FOLLOWS:

PERCENT BY MASS	0 - 10	10 - 20	20 - 30	30 - 40	> 40
	TRACE	SOME	WITH	ADJECTIVE (SILTY)	AND (AND SILT)

CONSISTENCY: COHESIVE SOILS ARE DESCRIBED ON THE BASIS OF THEIR UNDRAINED SHEAR STRENGTH (c_u) AS FOLLOWS:

c_u (kPa)	0 - 12	12 - 25	25 - 50	50 - 100	100 - 200	> 200
	VERY SOFT	SOFT	FIRM	STIFF	VERY STIFF	HARD

DENSENESS: COHESIONLESS SOILS ARE DESCRIBED ON THE BASIS OF DENSENESS AS INDICATED BY SPT N VALUES AS FOLLOWS:

N (BLOWS/0.3m)	0 - 5	5 - 10	10 - 30	30 - 50	> 50
	VERY LOOSE	LOOSE	COMPACT	DENSE	VERY DENSE

ROCKS ARE DESCRIBED BY THEIR COMPOSITION AND STRUCTURAL FEATURES AND / OR STRENGTH.

RECOVERY: SUM OF ALL RECOVERED ROCK CORE PIECES FROM A CORING RUN EXPRESSED AS A PERCENT OF THE TOTAL LENGTH OF THE CORING RUN.

MODIFIED RECOVERY: SUM OF THOSE INTACT CORE PIECES, 100mm+ IN LENGTH EXPRESSED AS A PERCENT OF THE LENGTH OF THE CORING RUN. THE ROCK QUALITY DESIGNATION (R Q D), FOR MODIFIED RECOVERY, IS:

R Q D (%)	0 - 25	25 - 50	50 - 75	75 - 90	90 - 100
	VERY POOR	POOR	FAIR	GOOD	EXCELLENT

JOINTING AND BEDDING:

SPACING	50mm	50 - 300mm	0.3m - 1m	1m - 3m	> 3m
JOINTING	VERY CLOSE	CLOSE	MOD. CLOSE	WIDE	VERY WIDE
BEDDING	VERY THIN	THIN	MEDIUM	THICK	VERY THICK

ABBREVIATIONS AND SYMBOLS

FIELD SAMPLING

S S SPLIT SPOON	T P THINWALL PISTON
W S WASH SAMPLE	O S OSTERBERG SAMPLE
S T SLOTTED TUBE SAMPLE	R C ROCK CORE
B S BLOCK SAMPLE	P H T W ADVANCED HYDRAULICALLY
C S CHUNK SAMPLE	P M T W ADVANCED MANUALLY
T W THINWALL OPEN	F S FOIL SAMPLE
F V FIELD VANE	

STRESS AND STRAIN

u_w	kPa	PORE WATER PRESSURE
u	1	PORE PRESSURE RATIO
σ	kPa	TOTAL NORMAL STRESS
σ'	kPa	EFFECTIVE NORMAL STRESS
τ	kPa	SHEAR STRESS
$\sigma_1, \sigma_2, \sigma_3$	kPa	PRINCIPAL STRESSES
ϵ	%	LINEAR STRAIN
$\epsilon_1, \epsilon_2, \epsilon_3$	%	PRINCIPAL STRAINS
E	kPa	MODULUS OF LINEAR DEFORMATION
G	kPa	MODULUS OF SHEAR DEFORMATION
μ	1	COEFFICIENT OF FRICTION

MECHANICAL PROPERTIES OF SOIL

m_v	kPa ⁻¹	COEFFICIENT OF VOLUME CHANGE
C_c	1	COMPRESSION INDEX
C_s	1	SWELLING INDEX
C_α	1	RATE OF SECONDARY CONSOLIDATION
c_v	m ² /s	COEFFICIENT OF CONSOLIDATION
H	m	DRAINAGE PATH
T_v	1	TIME FACTOR
U	%	DEGREE OF CONSOLIDATION
σ'_{vo}	kPa	EFFECTIVE OVERBURDEN PRESSURE
σ'_p	kPa	PRECONSOLIDATION PRESSURE
τ_f	kPa	SHEAR STRENGTH
c'	kPa	EFFECTIVE COHESION INTERCEPT
ϕ'	-°	EFFECTIVE ANGLE OF INTERNAL FRICTION
c_u	kPa	APPARENT COHESION INTERCEPT
ϕ_u	-°	APPARENT ANGLE OF INTERNAL FRICTION
τ_R	kPa	RESIDUAL SHEAR STRENGTH
τ_r	kPa	REMOULDED SHEAR STRENGTH
S_i	1	SENSITIVITY = $\frac{c_u}{\tau_r}$

PHYSICAL PROPERTIES OF SOIL

ρ_s	kg/m ³	DENSITY OF SOLID PARTICLES	n	1, %	POROSITY	e_{max}	1, %	VOID RATIO IN LOOSEST STATE
γ_s	kN/m ³	UNIT WEIGHT OF SOLID PARTICLES	w	1, %	WATER CONTENT	e_{min}	1, %	VOID RATIO IN DENSEST STATE
ρ_w	kg/m ³	DENSITY OF WATER	S_r	%	DEGREE OF SATURATION	I_D	1	DENSITY INDEX = $\frac{e_{max} - e}{e_{max} - e_{min}}$
γ_w	kN/m ³	UNIT WEIGHT OF WATER	w_L	%	LIQUID LIMIT	D	mm	GRAIN DIAMETER
ρ	kg/m ³	DENSITY OF SOIL	w_p	%	PLASTIC LIMIT	D_n	mm	n PERCENT - DIAMETER
γ	kN/m ³	UNIT WEIGHT OF SOIL	w_s	%	SHRINKAGE LIMIT	C_u	1	UNIFORMITY COEFFICIENT
ρ_d	kg/m ³	DENSITY OF DRY SOIL	I_p	%	PLASTICITY INDEX = $w_L - w_p$	h	m	HYDRAULIC HEAD OR POTENTIAL
γ_d	kN/m ³	UNIT WEIGHT OF DRY SOIL	I_L	1	LIQUIDITY INDEX = $\frac{w - w_p}{I_p}$	q	m ³ /s	RATE OF DISCHARGE
ρ_{sat}	kg/m ³	DENSITY OF SATURATED SOIL	I_C	1	CONSISTENCY INDEX = $\frac{w_L - w}{I_p}$	v	m/s	DISCHARGE VELOCITY
γ_{sat}	kN/m ³	UNIT WEIGHT OF SATURATED SOIL	DTPL		DRIER THAN PLASTIC LIMIT	i	1	HYDRAULIC GRADIENT
ρ'	kg/m ³	DENSITY OF SUBMERGED SOIL	APL		ABOUT PLASTIC LIMIT	k	m/s	HYDRAULIC CONDUCTIVITY
γ'	kN/m ³	UNIT WEIGHT OF SUBMERGED SOIL	WTP		WETTER THAN PLASTIC LIMIT	j	kN/m ³	SEEPAGE FORCE
e	1, %	VOID RATIO						

RECORD OF BOREHOLE No MW1

1 of 1

METRIC

W.O. No. <u>2014-11023</u>	LOCATION	<u>Coords: 4 891 762.0 N; 309 122.5 E</u>	ORIGINATED BY <u>F.P.</u>
DIST <u>Central</u> HWY <u>404</u>	BOREHOLE TYPE	<u>Continuous Flight Hollow Stem Augers</u>	COMPILED BY <u>A.C.</u>
DATUM <u>Geodetic</u>	DATE	<u>August 21, 2014</u>	CHECKED BY <u>M.H.M.</u>




[illegible]

RECORD OF BOREHOLE No MW2

1 of 1

METRIC

W.O. No. 2014-11023 LOCATION Coords: 4 891 766.5 N; 309 140.6 E ORIGINATED BY F.P.
DIST Central HWY 404 BOREHOLE TYPE Continuous Flight Hollow Stem Augers COMPILED BY A.C.
DATUM Geodetic DATE August 25, 2014 CHECKED BY M.H.M.

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa										WATER CONTENT (%)		
								○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE												
245.8						*	20	40	60	80	100	20	40	60						
245.6	Topsoil		1	SS	11							○								
0.2	Clayey silt, trace sand																			
245.2	Stiff Grey Moist																			
0.6	Silty clay, trace sand silt partings and silt seams		2	SS	20							○								
	Very stiff Grey Moist to hard		3	SS	44							○								
			4	SS	26							○								
			5	SS	34							○								
242.1	End of borehole																			
3.7																				
	* Borehole dry																			
	Monitoring Well Readings:																			
	Date Depth Elev.																			
	11/26/2014 1.0 244.8																			
	12/19/2014 0.9 244.9																			
	01/19/2015 1.3 244.5																			
	Monitoring Well Legend:																			
	 Bentonite																			
	 Filter sand																			
	 Screen																			

RECORD OF BOREHOLE No MW3

1 of 1

METRIC

W.O. No. 2014-11023 LOCATION Coords: 4 891 630.1 N; 309 154.8 E ORIGINATED BY F.P.
DIST Central HWY 404 BOREHOLE TYPE Continuous Flight Hollow Stem Augers COMPILED BY A.C.
DATUM Geodetic DATE August 21, 2014 CHECKED BY M.H.M.

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT				PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)												
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa																				
								○ UNCONFINED + FIELD VANE																				
								● QUICK TRIAXIAL × LAB VANE																				
				WATER CONTENT (%)																								
248.1							20	40	60	80	100	20	40	60														
247.9	Topsoil																											
0.2	Clayey silt, trace sand		1	SS	2																							
	Very soft Brown Moist to soft (FILL)																											
246.7			2	SS	3											0 2 66 32												
1.4	Clayey silt, trace sand silt seams																											
246.0	Firm Brown Moist		3	SS	7											0 6 60 34												
2.1	Sandy silt, trace clay																											
245.2	Very loose Grey Moist		4	SS	3																							
2.9	Clayey silt, trace sand silt partings to 4.3m																											
	Very soft Grey Moist		5	SS	1											0 8 52 40												
			6	SS	WH**																							
241.4			7	SS	1																							
6.7	End of borehole																											
<div>* 2014 08 21</div> <div>▽ Water level observed during drilling</div> <div>▼ Water level measured after drilling</div> <div>WH** denotes penetration due to weight of rods and hammer</div> <div>Monitoring Well Readings:</div> <table><thead><tr><th>Date</th><th>Depth (m)</th><th>Elev.</th></tr></thead><tbody><tr><td>11/26/2014</td><td>0.8</td><td>247.3</td></tr><tr><td>12/19/2014</td><td>0.7</td><td>247.4</td></tr><tr><td>01/19/2015</td><td>0.8</td><td>247.3</td></tr></tbody></table> <div>Monitoring Well Legend:</div> <div><div>Bentonite</div><div>Filter sand</div><div>Screen</div></div>																	Date	Depth (m)	Elev.	11/26/2014	0.8	247.3	12/19/2014	0.7	247.4	01/19/2015	0.8	247.3
Date	Depth (m)	Elev.																										
11/26/2014	0.8	247.3																										
12/19/2014	0.7	247.4																										
01/19/2015	0.8	247.3																										

RECORD OF BOREHOLE No MW4

1 of 1

METRIC

W.O. No. 2014-11023 LOCATION Coords: 4 891 636.1 N; 309 175.6 E ORIGINATED BY F.P.
DIST Central HWY 404 BOREHOLE TYPE Continuous Flight Hollow Stem Augers COMPILED BY A.C.
DATUM Geodetic DATE August 25, 2014 CHECKED BY M.H.M.

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES		SHEAR STRENGTH kPa										WATER CONTENT (%)		
							20 40 60 80 100										20 40 60		
246.9						*													
0.0	Silty clay, trace sand organic inclusions		1	SS	3														
246.3	Soft Brown Moist (FILL)																		
0.6	Silty clay, trace sand		2	SS	7														
	Very soft Grey Moist to firm to wet																		
			3	SS	2														
			4	SS	WH**														
			5	SS	1														
242.4																			
4.5	Clay, some silt, trace sand		6	SS	1														
	Very soft Grey Wet																		
			7	SS	2														
240.2																			
6.7	End of borehole																		

RECORD OF BOREHOLE No MW5

1 of 1

METRIC

W.O. No. 2014-11023 LOCATION Coords: 4 891 528.3 N; 309 180.3 E ORIGINATED BY F.P.
DIST Central HWY 404 BOREHOLE TYPE Continuous Flight Hollow Stem Augers COMPILED BY A.C.
DATUM Geodetic DATE August 22, 2014 CHECKED BY M.H.M.




























SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL											
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa																				
								○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE																				
248.2							20	40	60	80	100																	
248.0	Topsoil		1	SS	3		248																					
0.2	Clayey silt organic inclusions																											
247.6	Soft Dark Moist brown (FILL)		2	SS	2		247									0 3 78 19												
0.6	Clayey silt, trace sand																											
	Very soft Brown Moist to grey to wet		3	SS	5		246																					
	sand partings																											
245.5	Sand, trace silt		4	SS	3		245																					
2.7	Loose Grey Wet																											
244.5			5	SS	3																							
3.7	End of borehole																											
<div>* 2014 08 22</div> <div> Water level observed during drilling</div> <div> Water level measured after drilling</div> <div>Monitoring Well Readings:</div> <table><thead><tr><th>Date</th><th>Depth (m)</th><th>Elev.</th></tr></thead><tbody><tr><td>11/26/2014</td><td>0.3</td><td>247.9</td></tr><tr><td>12/19/2014</td><td>0.6</td><td>247.6</td></tr><tr><td>01/19/2015</td><td>0.6</td><td>247.6</td></tr></tbody></table> <div>Monitoring Well Legend:</div> <div> Bentonite</div> <div> Filter sand</div> <div> Screen</div>																	Date	Depth (m)	Elev.	11/26/2014	0.3	247.9	12/19/2014	0.6	247.6	01/19/2015	0.6	247.6
Date	Depth (m)	Elev.																										
11/26/2014	0.3	247.9																										
12/19/2014	0.6	247.6																										
01/19/2015	0.6	247.6																										

RECORD OF BOREHOLE No MW6

1 of 1

METRIC

W.O. No. 2014-11023 LOCATION Coords: 4 891 532.0 N; 309 197.6 E ORIGINATED BY F.P.
 DIST Central HWY 404 BOREHOLE TYPE Continuous Flight Hollow Stem Augers COMPILED BY A.C.
 DATUM Geodetic DATE August 22, 2014 CHECKED BY M.H.M.

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL											
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa																				
								○ UNCONFINED + FIELD VANE																				
								● QUICK TRIAXIAL × LAB VANE																				
					WATER CONTENT (%)																							
247.6						20	40	60	80	100	20	40	60															
0.0	Silt, trace sand trace clay, organics		1	SS	2																							
	Very loose Brown Moist																											
	Silty clay, organics																											
246.4	Very soft Brown Moist (FILL)		2	SS	2																							
1.2	Silty clay, trace sand																											
245.8	Very soft Grey Moist to firm		3	SS	6																							
1.8	Sand with silt to silty trace clay																											
	Loose Grey Wet																											
244.6																												
3.0	Silty clay, trace sand silt lenses																											
243.9	Soft Grey Moist		5	SS	4																							
3.7	End of borehole																											
<div>* 2014 08 22</div> <div> Water level observed during drilling</div> <div> Water level measured after drilling</div> <div>Monitoring Well Readings:</div> <table><thead><tr><th>Date</th><th>Depth (m)</th><th>Elev.</th></tr></thead><tbody><tr><td>11/26/2014</td><td>-0.2</td><td>247.8</td></tr><tr><td>12/19/2014</td><td>Frozen</td><td></td></tr><tr><td>01/19/2015</td><td>-0.2</td><td>247.8</td></tr></tbody></table> <div>Monitoring Well Legend:</div> <div> Bentonite</div> <div> Filter sand</div> <div> Screen</div>																	Date	Depth (m)	Elev.	11/26/2014	-0.2	247.8	12/19/2014	Frozen		01/19/2015	-0.2	247.8
Date	Depth (m)	Elev.																										
11/26/2014	-0.2	247.8																										
12/19/2014	Frozen																											
01/19/2015	-0.2	247.8																										

RECORD OF BOREHOLE No MW7

1 of 1

METRIC

W.O. No. 2014-11023 LOCATION Coords: 4 891 424.3 N; 309 206.3 E ORIGINATED BY F.P.
DIST Central HWY 404 BOREHOLE TYPE Continuous Flight Hollow Stem Augers COMPILED BY A.C.
DATUM Geodetic DATE August 20, 2014 CHECKED BY M.H.M.

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa										WATER CONTENT (%)		
								○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE												
249.8						*		20	40	60	80	100					GR SA SI CL			
249.6	Topsoil		1	SS	5		249													
0.2	Silt, trace sand																			
249.2	Firm Brown Moist																			
0.6	(FILL)		2	SS	14															
	Sand with silt, some clay																			
	Loose to Brown Moist compact		3	SS	19		248										0 66 23 17			
247.4	Silty clay, trace sand																			
2.4	Stiff Brown Moist to grey		4	SS	10		247													
246.1			5	SS	15															
3.7	End of borehole																			

RECORD OF BOREHOLE No MW8

1 of 1

METRIC

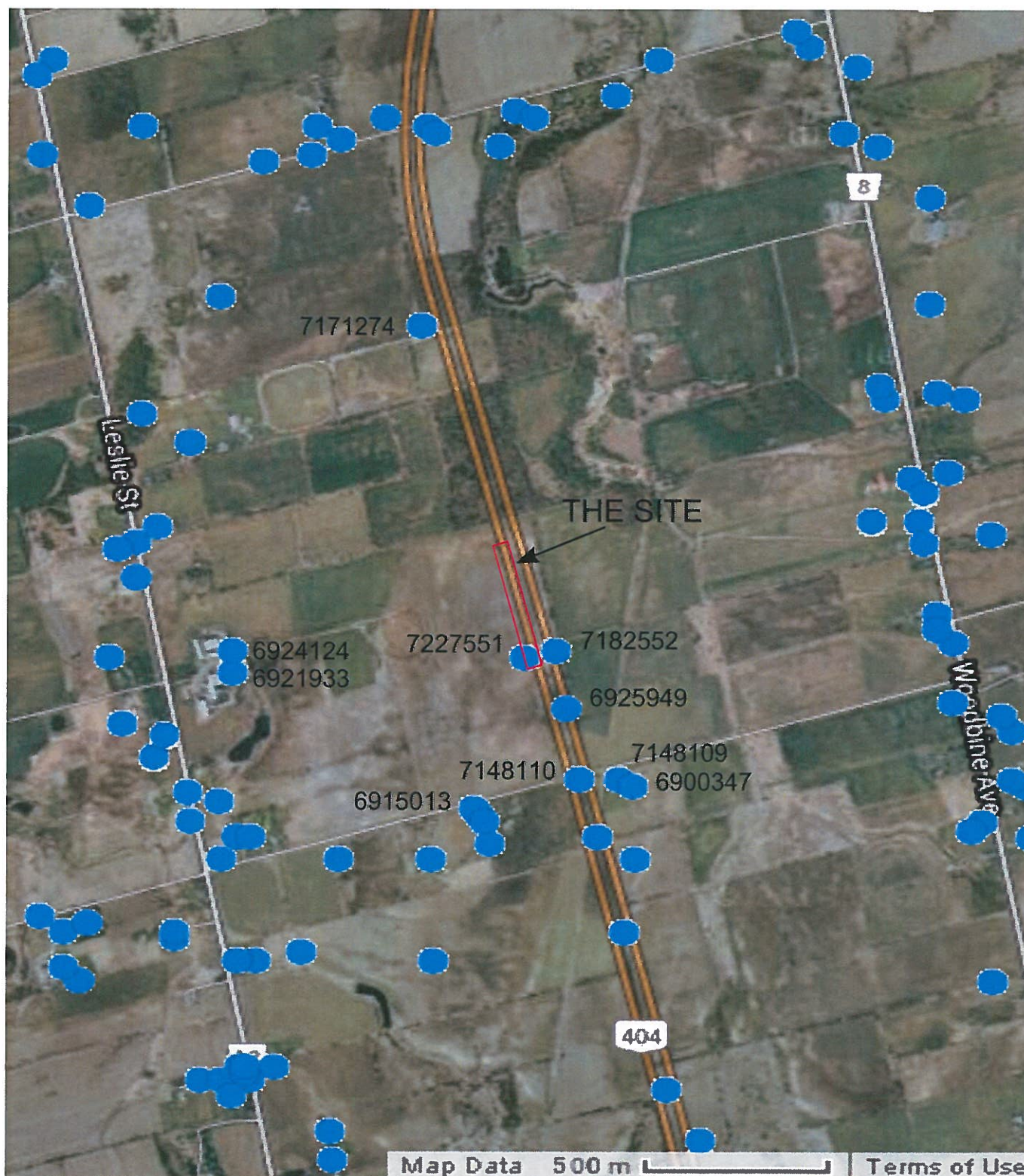
W.O. No. <u>2014-11023</u>	LOCATION	<u>Coords: 4 891 428.3 N; 309 221.8 E</u>	ORIGINATED BY <u>F.P.</u>
DIST <u>Central</u> HWY <u>404</u>	BOREHOLE TYPE	<u>Continuous Flight Hollow Stem Augers</u>	COMPILED BY <u>A.C.</u>
DATUM <u>Geodetic</u>	DATE	<u>August 20, 2014</u>	CHECKED BY <u>M.H.M.</u>

SOIL PROFILE				SAMPLES			DYNAMIC CONE PENETRATION RESISTANCE PLOT										PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT	REMARKS & GRAIN SIZE DISTRIBUTION (%)		
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	SHEAR STRENGTH kPa					WATER CONTENT (%)					γ kN/m ³	GR SA SI CL				
							20 40 60 80 100					20 40 60											
								○ UNCONFINED + FIELD VANE															
								● QUICK TRIAXIAL × LAB VANE															
249.8						*																	
0.0 249.5	Topsoil		1	SS	10																		
0.3	Silt, trace sand																						
	Loose Grey																						
249.0	Clayey silt, trace sand																						
0.8	organic inclusions		2	SS	8		249																
248.7																							
1.1	Stiff Grey (FILL)																						
248.3																							
1.5	Silty sand		3	SS	20		248																
	Loose Brown																						
247.6	Clayey silt, trace sand																						
2.2																							
	Firm Brown		4	SS	43		247																
247.1	Silty clay																						
2.7																							
	Very stiff Brown																						
	Silt trace to some sand trace gravel		5	SS	50/15cm		246																
	Very dense Brown (TILL)																						
	Sandy silt, trace gravel cobbles																						
	Very dense Brown to grey		6	SS	50/8cm		245																



APPENDIX A

MOECC Water Well Records



THIS FIGURE WAS REPRODUCED FROM THE
MOECC WATER WELL MAPPING WEBSITE

MINISTRY OF TRANSPORTATION

FOUNDATION SEEPAGE INVESTIGATION
HIGHWAY 404, NORTH OF HOLBORN ROAD
EAST GWILLIMBURY, ONTARIO

MOECC RECORDED WATER WELL LOCATION MAP



DRAWN: A.C.	DATE	SCALE	JOB NO.	FIGURE NO.
CHECKED: A.C.	MAR. 2015	AS SHOWN	14TF023	1
APPROVED: M.H.M.				

Well Computer Print Out Data as of April 9 2015

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TOWNSHIP CONCESSION (LOT)	UTM ¹	DATE ² CNTR ³	CASING DIA ⁴	WATER ^{5,6} DETAIL	STAT LVL/PUMP LVL ⁷ RATE ⁸ /TIME HR:MIN	WATER USE ⁹	SCREEN INFO ¹⁰	WELL # (AUDIT#) WELL TAG # STATE ¹² DEPTHS TO WHICH FORMATIONS EXTEND ^{5,11}
VESPRE TOWNSHIP ()	17 624624 4890304 W	2006/09 6607	02	FR 0035			30 10	7035810 (254918) A046480 BRWN SAND CGVL 0005 BRWN SAND 0020 GREY FSND 0040
EAST GWILLIMBURY TOW CON 02(027)	17 623477 4890697 W	1987/04 5459	06	FR 0243	025 / 200 005 / 2:45	DO	242 3	6919145 () BLCK LOAM 0002 BRWN CLAY 0008 BRWN CLAY STNS 0016 BLUE CLAY SOFT 0141 GREN CLAY SOFT 0147 GREY CLAY STNS HARD 0180 GREY CLAY SOFT 0205 GREY CLAY FSND 0209 GREY CLAY SOFT 0243 GREY MSND 0245
EAST GWILLIMBURY TOW CON 03(025)	17 624643 4890528 W	1967/09 4102	30	FR 0018	010 / 004 / :0	DO		6900348 () BRWN CLAY GRVL 0018 BRWN CLAY MSND 0020 BLUE CLAY 0035
EAST GWILLIMBURY TOW CON 03(025)	17 625450 4891017 W	1975/11 2310	05	FR 0160	031 / 040 010 / 1:0	DO	157 3	6912996 () PRDR 0133 BLUE CLAY SAND 0160 CSND 0164
EAST GWILLIMBURY TOW CON 03(025)	17 623787 4890215 W	1958/12 4102	34	FR 0018	010 / 004 / :0	ST		6900346 () BLUE CLAY 0018 MSND 0022
EAST GWILLIMBURY TOW CON 03(025)	17 624637 4890749 W	1960/05 4102	30	FR 0035	010 / 002 / :0	DO		6900347 () BLUE CLAY 0035
EAST GWILLIMBURY TOW CON 03(025)	17 624588 4890769 W	2010/05 1663	06		071 / / :0	NU		7148109 (Z110304) A GREY 0153
EAST GWILLIMBURY TOW CON 03(025)	17 624543 4890584 L	2003/06 4102				NU		6927136 (245424) A
EAST GWILLIMBURY TOW CON 03(025)	17 623617 4890190 W	1991/10 2801	02		006 / / :0	NU	19.7 10.2	6925785 (231581) LOAM SNDY 0002 BRWN SILT CLAY GRVL 0013 GREY SILT FSND GRVL 0017 GREY SILT FGVL 0025 FSND SILT GRVL 0035
EAST GWILLIMBURY TOW CON 03(025)	17 623667 4890196 W	1998/10 1413	06 06	FR 0253	061 / 195 050 / 2:0	DO		6924647 (188882) BRWN LOAM SOFT 0001 BRWN CLAY SOFT 0012 GREY CLAY FGVL STNS 0047 GREY CLAY HARD 0074 GREY CLAY SAND LYRD 0138 GREY CLAY VERY DNSE 0153 GREY CLAY HARD 0183 GREY CLAY HARD 0244 GREY LMSN CLAY FCRD 0251 GREY LMSN HARD 0253 GREY LMSN FCRD 0262

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TOWNSHIP CONCESSION (LOT)	UTM ¹	DATE ² CNTR ³	CASING DIA ⁴	WATER ^{5,6} DETAIL	STAT LVL/PUMP LVL ⁷ RATE ⁸ /TIME HR:MIN	WATER USE ⁹	SCREEN INFO ¹⁰	WELL # (AUDIT#) WELL TAG # STATE ¹² DEPTHS TO WHICH FORMATIONS EXTEND ^{5,11}
EAST GWILLIMBURY TOW CON 03(025)	17 624246 4890627 W	1996/09 1413	06	FR 0136	025 / 130 040 / 1:0	DO	133 3	6923707 (166622) BRWN CLAY STNS HARD 0025 BRWN CLAY SILT SOFT 0117 BRWN SAND GRVL CGVL 0136
EAST GWILLIMBURY TOW CON 03(025)	17 624265 4890553 W	1968/09 1555	30	FR 0025	020 / 039 / 1:0	DO		6909019 () LOAM 0001 BRWN CLAY 0011 STNS MSND 0022 CLAY STNS 0031 MSND STNS 0040
EAST GWILLIMBURY TOW CON 03(025)	17 624115 4890523 W	1978/05 1711	05	FR 0128	020 / 025 012 / 1:0	DO	127 4	6914630 () GREY CLAY STNS 0034 GREY CLAY STNS SAND 0107 BLUE CLAY 0128 CSND 0134
EAST GWILLIMBURY TOW CON 03(025)	17 624215 4890673 W	1979/02 1711	04	FR 0116	035 / 055 010 / 1:0	DO	117 4	6915013 () PRDG 0033 GREY CLAY STNS 0095 BLUE CLAY STNS 0116 CSND 0123
EAST GWILLIMBURY TOW CON 03(025)	17 624498 4890752 W	2010/05 1663	06			NU		7148110 (Z110305) A GREY 0256
EAST GWILLIMBURY TOW CON 03(026)	17 623614 4890573 W	1978/06 3109	30	FR 0028	010 / / 12:0	DO		6914737 () LOAM 0002 BRWN CLAY SLTY 0012 BLUE CLAY STNY 0028 FSND 0030
EAST GWILLIMBURY TOW CON 03(026)	17 623614 4890573 W	1977/06 3109	30	FR 0028	001 / / :0	DO		6914136 () LOAM 0002 BRWN CLAY 0018 BLUE CLAY SLTY 0027 SAND SLTY 0029
EAST GWILLIMBURY TOW CON 03(026)	17 625453 4891212 W	1965/05 1413	05	FR 0080	040 / 060 008 / 1:30	DO		6900351 () BLUE CLAY STNS 0018 BLUE CLAY 0052 CLAY SILT 0076 GRVL 0080
EAST GWILLIMBURY TOW CON 03(026)	17 623556 4890671 W	1964/06 2310	04	FR 0176	020 / 160 008 / 2:0	ST DO	176 4	6900350 () GREY CLAY STNS 0033 BLUE CLAY 0140 FSND 0176 CSND 0180
EAST GWILLIMBURY TOW CON 03(026)	17 625412 4891237 W	1957/05 2310	02	FR 0086	030 / 042 003 / 2:0	ST DO		6900349 () PRDG 0042 BLUE CLAY 0084 STNS 0088
EAST GWILLIMBURY TOW CON 03(026)	17 624425 4891167 W	2012/04 3108						7182552 (Z139974) A
EAST GWILLIMBURY TOW CON 03(026)	17 624460 4890989 L	2001/08 6300				NU		6925950 (230622) A

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TOWNSHIP CONCESSION (LOT)	UTM ¹	DATE ² CNTR ³	CASING DIA ⁴	WATER ^{5,6} DETAIL	STAT LVL/PUMP LVL ⁷ RATE ⁸ /TIME HR:MIN	WATER USE ⁹	SCREEN INFO ¹⁰	WELL # (AUDIT#) WELL TAG # STATE ¹² DEPTHS TO WHICH FORMATIONS EXTEND ^{5,11}
EAST GWILLIMBURY TOW CON 03(026)	17 624460 4890989 L	2001/07 6300	05 06	FR 0240	045 / 181 005 / 8:0	DO	240 3	6925949 (219348) BRWN CLAY 0016 BLUE CLAY HARD 0080 BLUE CLAY GRVL HARD 0112 BLUE CLAY 0229 BLUE SAND CLAY 0236 BLUE CLAY 0240 BLUE SAND CLN 0245 BLUE CLAY 0251
EAST GWILLIMBURY TOW CON 03(026)	17 623574 4890508 W	1992/08 6418	06	FR 0280	045 / 120 045 / 2:15	DO		6921998 (119556) BRWN CLAY PCKD 0012 GREY CLAY STNS PCKD 0038 GREY SAND STNS FSND 0041 GREY CLAY STNS PCKD 0107 BRWN GRVL SAND CSND 0121 GREY CLAY STNS PCKD 0150 GREY SAND GRVL CLAY 0155 GREY CLAY PCKD PCKD 0218 GREY GRVL SAND CSND 0227 GREY CLAY STNS PCKD 0238 GREY GRVL SAND CLN 0261 GREY LMSN FCRD HARD 0280
EAST GWILLIMBURY TOW CON 03(026)	17 623652 4890568 W	1992/08 6418	06	FR 0280	040 / 100 045 / 2:5	DO		6921997 (119558) BRWN CLAY STNS PCKD 0007 GREY CLAY STNS PCKD 0030 GREY GRVL CLAY SLTY 0037 GREY CLAY STNS PCKD 0050 GREY CLAY STNS DNSE 0100 GREY CLAY STNS PCKD 0216 BRWN GRVL SAND 0223 GREY CLAY STNS PCKD 0241 GREY CLAY HPAN GRVL 0259 GREY LMSN FCRD HARD 0280
EAST GWILLIMBURY TOW CON 03(026)	17 624234 4890638 W	1982/08 6418	06	FR 0262	055 / 140 020 / 2:10	DO	258 4	6921996 (119557) BRWN CLAY STNS PCKD 0017 GREY CLAY STNS PCKD 0043 GREY SAND GRVL LOOS 0045 GREY CLAY STNS PCKD 0062 GREY CLAY STNS SLTY 0135 BRWN GRVL CLAY 0186 GREY CLAY STNS SNDY 0197 GREY CLAY STNS PCKD 0233 BRWN SAND GRVL CLN 0262 GREY CLAY DNSE 0271 BRWN GRVL CLAY FSND 0278 GREY LMSN HARD 0278
EAST GWILLIMBURY TOW CON 03(027)	17 625234 4891582 W	1964/10 1413	05	FR 0160	040 / 050 010 / 3:0	ST DO		6900354 () PRDG 0060 CLAY MSND 0100 BLUE CLAY 0150 MSND GRVL 0160
EAST GWILLIMBURY TOW CON 03(027)	17 625374 4891654 W	1959/04 1413	05	FR 0085	035 / 062 006 / 1:0	DO		6900352 () PRDG 0037 CLAY MSND GRVL 0062 HPAN STNS 0075 CLAY SILT GRVL 0083 GRVL 0085

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TOWNSHIP CONCESSION (LOT)	UTM ¹	DATE ² CNTR ³	CASING DIA ⁴	WATER ^{5,6} DETAIL	STAT LVL/PUMP LVL ⁷ RATE ⁸ /TIME HR:MIN	WATER USE ⁹	SCREEN INFO ¹⁰	WELL # (AUDIT#) WELL TAG # STATE ¹² DEPTHS TO WHICH FORMATIONS EXTEND ^{5,11}
EAST GWILLIMBURY TOW CON 03(027)	17 623590 4891088 W	1992/06 1413	06	FR 0163	032 / 160 075 / 1:0	IN	166 10	6921933 (115378) BRWN CLAY SOFT 0008 GREY CLAY STNS HARD 0083 GREY SILT CLAY SOFT 0113 GREY CLAY SILT LYRD 0128 GREY CLAY DNSE 0163 BRWN CSND MSND 0176 GREY CLAY STNS HARD 0218 GREY CLAY DNSE 0230 GREY CLAY STNS HARD 0237 GREY LMSN CLAY HARD 0251
EAST GWILLIMBURY TOW CON 03(027)	17 623582 4891144 W	1997/10 1413	08	FR 0274	053 / 220 040 / 5:0	IN	264 10	6924124 (178127) BRWN CLAY HARD 0017 GREY CLAY SOFT 0170 BRWN SAND GRVL CGRD 0190 GREY CLAY STNS HARD 0255 BRWN SAND GRVL CGRD 0274
EAST GWILLIMBURY TOW CON 03(027)	17 625365 4891523 W	1969/10 1413	05	FR 0087	042 / 075 006 / 3:30	DO		6909550 () BRWN MSND CLAY 0009 BRWN CLAY 0026 BLUE CLAY 0080 BLUE SILT MSND 0083 BLCK MSND GRVL 0087
EAST GWILLIMBURY TOW CON 03(027)	17 625327 4891704 W	1999/05 1413	06	FR 0165	060 / 155 010 / 1:0	DO	162 3	6924869 (202719) BRWN LOAM SOFT 0001 BRWN SAND CLAY SOFT 0003 BRWN CLAY STNS HARD 0016 BRWN SAND GRVL CGVL 0021 BRWN CLAY DNSE 0031 GREY CLAY STNS DNSE 0084 GREY CLAY SILT LYRD 0141 GREY CLAY GRVL LYRD 0156 GREY GRVL SAND FSND 0167
EAST GWILLIMBURY TOW CON 03(027)	17 625360 4891583 W	1962/05 2310	02	FR 0090	040 / 007 / 2:0	DO	89 7	6900353 () BRWN CLAY 0002 GREY CLAY STNS 0036 GRVL 0040 GREY CLAY STNS 0080 CLAY MSND 0090 CSND 0096
EAST GWILLIMBURY TOW CON 03(027)	17 623490 4890604 W	2004/02 1413	06	FR 0157	049 / 157 125 / 2:0	IN	170 19	6927647 (Z06736) A003789 BRWN CLAY STNS HARD 0025 GREY CLAY STNS HARD 0065 GREY CLAY DNSE 0160 BRWN MSND CLN 0189
EAST GWILLIMBURY TOW CON 03(028)	17 625263 4891963 W	1990/12 1350	07	FR 0100	040 / 090 008 / :0	DO	97 5	6921358 (86454) BRWN CLAY GRVL SAND 0022 BRWN GRVL CLAY 0048 GREY CLAY GRVL 0080 BRWN SILT CLAY 0095 BRWN CLAY 0100 BRWN SAND FSND VERY 0105
EAST GWILLIMBURY TOW CON 03(029)	17 623463 4891781 W	1965/12 2310	04	FR 0192	070 / 140 006 / 3:0	ST DO	189 7	6900356 () LOAM 0001 CLAY GRVL 0032 FSND 0068 BLUE CLAY 0192 MSND 0196

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TOWNSHIP CONCESSION (LOT)	UTM ¹	DATE ² CNTR ³	CASING DIA ⁴	WATER ^{5,6} DETAIL	STAT LVL/PUMP LVL ⁷ RATE ⁸ /TIME HR:MIN	WATER USE ⁹	SCREEN INFO ¹⁰	WELL # (AUDIT#) WELL TAG # STATE ¹² DEPTHS TO WHICH FORMATIONS EXTEND ^{5,11}
EAST GWILLIMBURY TOW CON 03(029)	17 623468 4891781 W	1962/07 2310	04 04	FR 0228	080 / 190 003 / :0	ST DO		6900355 () PRDG 0056 GREY CLAY MSND 0064 BLUE CLAY 0195 MSND 0200 BLUE CLAY STNS 0228 HPAN 0262
EAST GWILLIMBURY TOW CON 04(027)	17 625397 4891971 W	1965/11 1413	05	FR 0104	040 / 100 002 / 1:0	DO	100 4	6900439 () HPAN 0070 CLAY SILT 0098 MSND SILT 0104
EAST GWILLIMBURY TOW ()	17 624134 4890186 W	2006/04 6607	02	FR 0025			20 10	6930273 (Z46631) A040995 BRWN SAND GRVL 0005 BRWN CLAY SLTY 0020 GREY CLAY 0030
EAST GWILLIMBURY TOW 03(025)	17 623871 4890508 W	2007/06 5459	06	FR 0170	031 / 034 010 / 1:0		160 10	7046038 (Z56489) A051013 BRWN LOAM PCKD 0006 GREY CLAY SILT STNS 0055 BRWN SILT STNS FSND 0085 BRWN SAND GRVL SILT 0130 GREY CLAY SILT STNS 0143 BRWN SAND GRVL LOOS 0170 GREY CLAY SILT STNS 0247 GREY LMSN HARD
EAST GWILLIMBURY TOW 03(026)	17 625417 4891296 W	1987/06 1413	07 05	FR 0145	033 / 045 015 / 2:30	ST	142 3	6918775 (13608) BRWN SAND LOAM PCKD 0003 BRWN CLAY DNSE 0018 BLUE CLAY SOFT 0080 GREY SILT SAND CMTD 0085 GREY CLAY DNSE 0100 BRWN SAND SILT LYRD 0112 GREY CLAY HARD 0133 GREY SAND STNS LOOS 0145
EAST GWILLIMBURY TOW 03(027)	17 625427 4891736 W	1984/03 1350	06	FR 0180	057 / 120 008 / 24:0	DO		6917641 () YLLW CLAY GRVL STNS 0028 GREY CLAY 0095 GREY GRVL SILT 0104 GREY CLAY 0180 GREY GRVL 0182
EAST GWILLIMBURY TOW ()	17 624346 4891128 W	2014/08 6032						7227551 (C24623) A102052 P

Notes:

1. UTM in Zone, Easting, Northing and Datum is NAD83; L: UTM estimated from Centroid of Lot; W: UTM not from Lot Centroid
2. Date Work Completed
3. Well Contractor Licence Number
4. Casing diameter in inches
5. Unit of Depth in Feet
6. See Table 4 for Meaning of Code

7. STAT LVL: Static Water Level in Feet ; PUMP LVL: Water Level After Pumping in Feet
8. Pump Test Rate in GPM, Pump Test Duration in Hour : Minutes
9. See Table 3 for Meaning of Code
10. Screen Depth and Length in feet
11. See Table 1 and 2 for Meaning of Code
12. A: Abandonment; P: Partial Data Entry Only

1. Core Material and Descriptive terms										
Code	Description	...	Code	Description	...	Code	Description	...	Code	Description
BLDR	BOULDERS		FCRD	FRACTURED		IRFM	IRON FORMATION		PORS	POROUS
BSLT	BASALT		FGRD	FINE-GRAINED		LIMY	LIMY		PRDG	PREVIOUSLY DUG
CGRD	COARSE-GRAINED		FGVL	FINE GRAVEL		LMSN	LIMESTONE		PRDR	PREV. DRILLED
CGVL	COARSE GRAVEL		FILL	FILL		LOAM	TOPSOIL		QRTZ	QUARTZITE
CHRT	CHERT		FLDS	FELDSPAR		LOOS	LOOSE		QSND	QUICKSAND
CLAY	CLAY		FLNT	FLINT		LTCL	LIGHT-COLOURED		QTZ	QUARTZ
CLN	CLEAN		FOSS	FOSILIFEROUS		LYRD	LAYERED		ROCK	ROCK
CLYY	CLAYEY		FSND	FINE SAND		MARL	MARL		SAND	SAND
CMTD	CEMENTED		GNIS	GNEISS		MGRD	MEDIUM-GRAINED		SHLE	SHALE
CONG	CONGLOMERATE		GRNT	GRANITE		MGVL	MEDIUM GRAVEL		SHLY	SHALY
CRYS	CRYSTALLINE		GRSN	GREENSTONE		MRBL	MARBLE		SHRP	SHARP
CSND	COARSE SAND		GRVL	GRAVEL		MSND	MEDIUM SAND		SHST	SCHIST
DKCL	DARK-COLOURED		GRWK	GREYWACKE		MUCK	MUCK		SILT	SILT
DLMT	DOLOMITE		GVLY	GRAVELLY		OBDN	OVERBURDEN		SLTE	SLATE
DNSE	DENSE		GYPS	GYPSUM		PCKD	PACKED		SLTY	SILTY
DRTY	DIRTY		HARD	HARD		PEAT	PEAT		SNDS	SANDSTONE
DRY	DRY		HPAN	HARDPAN		PGVL	PEA GRAVEL		SNDY	SANDY

2. Core Color	
Code	Description
WHIT	WHITE
GREY	GREY
BLUE	BLUE
GRN	GREEN
YLLW	YELLOW
BRWN	BROWN
RED	RED
BLCK	BLACK
BLGY	BLUE-GREY

3. Water Use			
Code	Description	Code	Description
DO	Domestic	OT	Other
ST	Livestock	TH	Test Hole
IR	Irrigation	DE	Dewatering
IN	Industrial	MO	Monitoring
CO	Commercial	MT	Monitoring & Test Hole
MN	Municipal		
PS	Public		
AC	Cooling And A/C		
NU	Not Used		

4. Water Detail			
Code	Description	Code	Description
FR	Fresh	GS	Gas
SA	Salty	IR	Iron
SU	Sulphur		
MN	Mineral		
UK	Unknown		



APPENDIX B

Preliminary Site Screening (PSS) Form



MINISTRY OF TRANSPORTATION

**APPENDIX B:
THE PRELIMINARY SITE SCREENING
(PSS) FORM**

**Environmental Guide for Contaminated
Property Identification and Management**

Version: October 2006

VERSION HISTORY

VERSION #	DATE	DESCRIPTION OF MAJOR CHANGE

The following is a copy of the Preliminary Site Screening (PSS) form. Following the PSS form is a table with the sources of the information needed to complete the various sections of the PSS Form.

PRELIMINARY SITE SCREENING FORM

1.0 GENERAL INFORMATION

Inspection Date: _____

Note: The inspector should use all resources available including acquisition files and property management files in order to complete this section as accurately as possible.

- 1.1 Property Address: 21413 Leslie Street
 Town/Township/City: East Gwillimbury
 Municipality: York
 Legal Description: Concession 3 (East Half), Lot 26 and Concession 3 (East Half), Lot 27
- 1.2 Highway: 404 MTO Project Title/WP No.: 2013-E-0039-005 Land Mgmt File No.: _____

Type of Transaction:

- | | | | |
|-------------------------|----------------|------------------------|----------------------------------|
| 1) Acquisition: | Purchase _____ | Advance Purchase _____ | Temporary Limited Interest _____ |
| 2) Disposition: | Sale _____ | Transfer to ORC _____ | |
| 3) Property Management: | Lease _____ | Demolition _____ | |

Approximate Transaction Timeframe: _____

- 1.3 Provide a brief description of current land use and site activities: Growth of crops, processing (washing, cutting, packaging, and freezing) vegetables.

- 1.4 Zoning (Present): Residential _____ Commercial/Industrial _____ Agricultural/Parkland X
 Is there evidence that a future change in zoning is possible: Yes _____ No X
 If yes, indicate possible future zoning: Residential _____ Commercial/Industrial _____ Agricultural/Parkland _____
 Has a Title Search been done on the property: Yes _____ No X
 If yes, please describe any owners/tenants identified on the Title Search that may have been associated with environmentally sensitive activities: _____

- 1.5 Property Size 700,000 m² Property Size (Required): 700,000 m²

- 1.6 Property Owner: _____ Phone Number: _____

Is the Property Owner aware of any previous land uses or activities that may have resulted in property contamination?
 Yes _____ No _____ Details: _____

Is the Property Owner able to provide any Environmental Reports? Yes _____ No _____

- 1.7 Occupant (if different than owner): _____ Phone Number: _____

Is the Occupant aware of any previous land uses or activities that may have resulted in property contamination?
 Yes _____ No _____ Details: _____

- 1.8 ATTACHMENTS: Map _____ Title Search _____ Site Sketch _____ (please complete Section 3.0)
 Survey _____ Photos _____ Other _____

PRELIMINARY SITE SCREENING FORM

2.0 SITE CHARACTERISTICS AND ACTIVITIES OF POTENTIAL ENVIRONMENTAL CONCERN

RESIDENTIAL, COMMERCIAL/INDUSTRIAL, AGRICULTURAL/PARKLAND

The inspector should incorporate any information obtained from owners/occupants, to complete this section.

NOTE: Please put an X in either the yes or no circle next to all of the following questions. Include relevant details to support each answer if possible/available, in the space provided. Also, indicate on the site survey or sketch (Section 3.0), the location of all site characteristics and activities identified below.

		YES	NO
2.1	STRUCTURES		
2.1.1	Are there buildings on the property? Please describe the buildings, their age and their uses. (Note: Older buildings may contain hazardous building materials, such as asbestos, lead paint and PCBs)	<input checked="" type="radio"/>	<input type="radio"/>
2.1.2	Is there evidence of mould, water damage, or a musty smell?	<input type="radio"/>	<input type="radio"/>
2.1.3	Are there equipment or vehicle repair/maintenance garages/sheds on the property (e.g. auto or farm equipment)?	<input checked="" type="radio"/>	<input type="radio"/>
2.1.4	Is there evidence of remnants of former buildings (e.g. foundation walls) or roads/driveways/parking lots on the property?	<input type="radio"/>	<input checked="" type="radio"/>
2.2	SERVICES		
2.2.1	Are the buildings serviced by municipal water? <div style="margin-left: 20px;"> - Supply for all uses including production plant - Three (3) drilled wells - PTTW 2582-7 FUKBW </div>	<input type="radio"/>	<input checked="" type="radio"/>
2.2.2	Is there evidence of wells on the property? Please describe location, casing material and diameter, depth if possible, and the building it services. If available, please provide date of most recent water analysis and attach results.	<input checked="" type="radio"/>	<input type="radio"/>
2.2.3	Is there evidence of cisterns on the property? Please describe location and capacity/size if possible.	<input type="radio"/>	<input type="radio"/>

PRELIMINARY SITE SCREENING FORM

		YES	NO
2.2.4	Is there evidence of a septic system on the property? Please describe location. - House/Business /septic - Production plant wastewater - tile bed at East end of property	<input checked="" type="radio"/>	<input type="radio"/>
2.2.5	Is there evidence that the buildings are heated, or were previously heated, with oil or coal (e.g. oil tank inside)?	<input type="radio"/>	<input checked="" type="radio"/>
2.2.6	Is there evidence of above or below ground fuel storage tanks on the property (e.g. piping for heating oil tanks, diesel or gasoline pumps)?	<input type="radio"/>	<input type="radio"/>
2.2.7	Is there electrical equipment on the property that contains, or may contain, PCBs (e.g. fluorescent lights, transformers, capacitors)?	<input type="radio"/>	<input type="radio"/>
2.2.8	Are there ventilation pipes to the natural environment coming from the buildings or the ground on the property (e.g. vents, chimneys, air emission stacks)?	<input type="radio"/>	<input type="radio"/>
2.3	PROPERTY		
2.3.1	Is there any evidence of vehicle repair or maintenance (e.g. oily stains on ground surface)?	<input type="radio"/>	<input type="radio"/>
2.3.2	Is there evidence of spills on the property (e.g. stained ground surface, damaged vegetation, water sheens)?	<input type="radio"/>	<input type="radio"/>
2.3.3	Is there evidence of chemical, hazardous material or waste storage or storage areas on the property (e.g. drums, or containers with chemical products, hazardous materials or wastes such as waste oil, paint, or pesticides?) (Check for attached labels).	<input type="radio"/>	<input type="radio"/>
2.3.4	Is there evidence of debris or garbage having been dumped or buried on the property (e.g. tires, empty drums)?	<input type="radio"/>	<input type="radio"/>

PRELIMINARY SITE SCREENING FORM

YES NO

2.3.5 Is there evidence of garbage having been burned on the property (e.g. scorched surfaces, drums, ashes)? ☐ ☐

2.3.6 Is there evidence of fill material deposited on the property, or material stockpiling (e.g. graded topography, mounds of earth, or piles of gravel, asphalt, concrete, etc.)? ☐ ☐

2.3.7 Are bulk materials stockpiled on the property (e.g. salt, recovered asphalt)? ☐ ☐

2.3.8 Is there evidence of oil having been sprayed on driveways, or parking areas, to control dust? ☐ ☐

2.3.9 Are there unusual odours on the property (e.g. gasoline, diesel, or solvents)? ☐ ☒

2.3.10 Is there evidence of any surface water body on the subject property (e.g. creek, pond, river, lake)? ☒ ☐
 Water treatment pond southeast of main buildings
 - anaerobic and aerobic/aerated ponds
 + Wetland in south west corner of property

2.3.11 Is there any visual evidence of contamination to any surface water bodies (e.g. oily sheen, dead fish, foreign materials)? ☐ ☐

2.3.12 Is there evidence of a cemetery or human burial on the property? ☐ ☐

PRELIMINARY SITE SCREENING FORM

		YES	NO
2.4	AGRICULTURAL ONLY		
2.4.1	Is there, or is there evidence of, livestock being kept on the property?	<input type="radio"/>	<input checked="" type="radio"/>
2.4.2	Is there, or is there evidence of, sewage biosolids application on the property?	<input checked="" type="radio"/>	<input type="radio"/>
2.4.3	Is the property being used for intensive cultivation (e.g. crops, vineyards, orchards, tree nursery)?	<input checked="" type="radio"/>	<input type="radio"/>
2.5	COMMERCIAL/INDUSTRIAL ONLY		
2.5.1	Are there commercial (e.g. gas station or vehicle repair) industrial (e.g. manufacturing plant), or resource based activities (e.g. quarries, mines) on the property?	<input type="radio"/>	<input type="radio"/>
2.5.2	Is there evidence that industrial waste materials are treated or processed on the property?	<input type="radio"/>	<input type="radio"/>
2.5.3	Is there evidence that industrial wastewater is treated or processed on the property (e.g. lagoons or settling ponds)?	<input type="radio"/>	<input type="radio"/>
2.5.4	Is there evidence of effluent outfalls, or pipes discharging into surface waters, or drainage ditches?	<input type="radio"/>	<input type="radio"/>
2.5.5	Is there evidence of a licensed PCB Waste Storage or Disposal Site on the property (check for signs on storage sites)?	<input type="radio"/>	<input type="radio"/>

PRELIMINARY SITE SCREENING FORM

		YES	NO
2.6	ADJACENT PROPERTIES		
2.6.1	Are there commercial activities adjacent to the property (e.g. gas station or vehicle repair)?	<input type="radio"/>	<input checked="" type="radio"/>
2.6.2	Are there industrial activities adjacent to the property (e.g. manufacturing or processing plants)?	<input type="radio"/>	<input checked="" type="radio"/>
2.6.3	Are there resource-based activities adjacent to the property (e.g. quarries, mines)?	<input type="radio"/>	<input checked="" type="radio"/>
2.6.4	Do any of the adjacent properties appear to have contaminated, or have the potential to contaminate, the subject property from an environmental perspective?	<input type="radio"/>	<input checked="" type="radio"/>
2.6.5	Is there evidence of any surface water body adjacent to the property (e.g. creek, pond, river, lake)?	<input type="radio"/>	<input type="radio"/>
2.6.6	Is there any visual evidence of contamination to any surface water bodies (e.g. oily sheen, dead fish, foreign materials)?	<input type="radio"/>	<input type="radio"/>
2.6.7	Are there any other features about the surrounding area that may be of environmental interest?	<input type="radio"/>	<input type="radio"/>

PRELIMINARY SITE SCREENING FORM

3.0 SITE SKETCH

Use the space provided to draw a sketch of the subject property and surrounding area showing; property boundaries including the property being transacted within the total property area, roads and driveways, structures, all environmental features identified and discussed in this form and addresses of adjacent properties and their land use. Also, show the location and direction of all photos attached to this form.

Note: You MUST provide a north arrow.

PRELIMINARY SITE SCREENING FORM

4.0 FUTURE ACTION

- 4.1 Describe any conditions/limitations that may have hindered the inspector's ability to complete the Preliminary Site Screening.

- 4.2 Action Taken:

If the answer to any of the questions in Section 2.0 is "YES" and the inspector is unsure whether it presents an environmental concern, this form may be forwarded to the Regional Environmental Office/Section/Unit for consideration and recommendation. If Phase I ESA work is required, it may be focused to specifically address the "YES" items only, as determined by the Regional Environmental Office/Section/Unit.

Note: Prior to sending completed form to the Regional Environmental Office/Section/Unit, please ensure that all supporting documents indicated in Section 1.8 have been attached.

Sent to File: _____ Sent to Regional Environmental Office/Section/Unit for Review: _____

- 4.3 Comments:

Property Inspected By: _____

Print Name

Telephone Number

Signature

Date

5.0 ENVIRONMENTAL REVIEW

5.1 Is an Environmental Site Assessment recommended?: Yes _____ No _____

5.2 Comments:

This image shows a blank sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

Reviewed By:

Print Name

Telephone Number

Telephone Number

Signature _____

Date _____

Date _____

Summary Table of Significant Information for Completing the Preliminary Site Screening (PSS) Form

Section from the PSS Form	Summary of Information
SECTION 1.0 - GENERAL INFORMATION	
This part of the form requests general information about the property. This information is necessary for record keeping purposes, to establish a general understanding of the property for further planning and investigation purposes, and to coordinate site visits.	
1.1 Property Address and Legal Description	This information identifies the property and is a useful reference when researching property information in government records/archives.
1.2 Project File Numbers and Type of Property Transaction	This information includes the reference project and file numbers. It also includes the type of property transaction, i.e., acquisition, disposition or property management.
1.3 Current Land-use and Site Activities	This information helps to establish a general understanding of the type of environmental liabilities that may exist on a property, and can be used to direct future inspections and investigations.
1.4 Zoning and Title Search	<p>This section provides information on the nature of land-use on the property (e.g., residential, commercial, industrial, etc.) based on current zoning by-laws. It also provides information on any possible re-zoning initiatives that could invoke the necessity to complete, as a minimum, a Phase I ESA on the property. An example of this would be a change in land-use from industrial to residential.</p> <p>It should be understood that this section of the PSS Form is not intended to imply that a Title Search is to be undertaken as part of the PSS step. Rather, it acknowledges that existing Title Search documents that may be included in the property files are useful sources of information during completion of the PSS Form, as they can provide information (based on property owner name only) on the current and historical nature of land-use on the property that could be associated with potential site contamination.</p>
1.5 Property Size	The size of the property is important because larger sites will require greater investigation and sampling effort to determine the extent and type of contamination present. This is particularly true for industrial property. Furthermore, only a small portion of the overall property may be required for a transportation project. For the purposes of the PSS Form, the "property size (required)" is the portion within the total "property size (actual)" in which t MTO is interested.
1.6/1.7 Property Owner/Occupant	Permission to enter the property must be obtained from the current property owners and/or occupants in order to enter the property, coordinate site visits, and establish contacts for site interviews. Knowledge of the current owner and/or occupant may also provide insight into former and current property uses/activities.
1.8 Attachments & Photos	Site Sketch - A site sketch and any other supporting documentation is necessary to record the location of features and structures of environmental significance. The site sketch must be included in Section 3.0 of the PSS Form.

Section from the PSS Form	Summary of Information
SECTION 2.0 - SITE CHARACTERISTICS AND ACTIVITIES OF POTENTIAL ENVIRONMENTAL CONCERN	
This part of the form requests more specific information to help develop an understanding of the type and location of potential environmental liabilities associated with the property (i.e., gasoline contamination could have occurred if underground storage tanks are or were present) and potential receptors (e.g., groundwater wells, surface water).	
2.1 Structures	
2.1.1 Buildings	<p>Buildings represent areas of past and present site activity. The types of activities associated with buildings can help to determine the type of contaminants that may be present on the site. For example, farms and parks often have buildings for equipment maintenance/repair and pesticide/fertilizer storage. Vehicle and equipment storage/maintenance shops can lead to soil and groundwater contamination from the changing of oil and other lubricants, (e.g., for farm machinery, spillage from the on-site use of parts cleaners or solvents, metals such as lead from batteries) and other pollutants, if products and wastes have not been properly stored or disposed of. This could also be a concern at MTO patrol yards and former district yards where vehicle maintenance activities have taken place.</p> <p>Building Age - a building's age can be used to establish the likelihood of hazardous substances in the building's construction materials. Buildings constructed prior to 1980 have a higher potential of containing environmentally hazardous substances such as asbestos-containing materials (e.g., ceiling tiles), urea formaldehyde foam insulation, electrical equipment containing polychlorinated biphenyls (e.g., capacitors) and lead (e.g., paint and protective coatings).</p>
2.1.2 Mould, Water Damage, or Musty Smell	Buildings containing mould, signs of water damage or exhibiting a musty smell represent a potential health hazard.
2.1.3 Vehicle Repair / Maintenance Garages / Sheds	Vehicle storage and maintenance shops may also be of concern at residential properties, particularly in rural areas where on-site car repair and maintenance activities tend to be more prevalent compared to urban residential properties.
2.1.4 Building Remnants	<p>Old foundations, walls and platforms, storage vessels and protruding pipes, etc., represent areas of past activity/operations which may have led to soil, groundwater and surface water contamination.</p> <p>For example, from the mid 1800s to the 1950s, manufactured gas plants were widely used to produce lighting and heating from coal, or oil. Prior to World War II, there were hundreds of these plants throughout North America and sensitivity to environmental protection was not as great when gas plants were operating as it is today. In many instances, wastes and by-products (e.g., tars) were disposed of on-site, and facilities were never properly decommissioned. Waste from these plants has also been found deposited on other types of property including parks and residential lands.</p>

Section from the PSS Form	Summary of Information
2.2 Services	
2.2.1 Wells and Cisterns	Wells and cisterns are potential receptors of contamination. If present, they may act as conduits for contaminant migration, causing groundwater contamination problems.
2.2.2 Septic Systems	On-site septic systems may be a source of contamination in that contaminants, such as metals, may have discharged to and leached into surrounding soils from a sewage tile bed.
2.2.3 Method of Heating	Leaks and spills from fuel-oil heating systems (e.g., tanks and piping), represent significant environmental liability. Where a facility has been converted from fuel-oil to an alternate type of heating, equipment and/or contamination may remain. Fuel oil heating is often associated with rural properties or older buildings where alternate heating sources, such as natural gas, were not available at the time of initial development.
2.2.4 Aboveground and Underground Storage Tanks	Abandoned or operating storage tanks represent significant environmental liabilities if materials have been handled improperly, or the systems improperly maintained. Gasoline and fuel-oil storage tanks may be associated with most property types, including parks, farming operations and rural properties where home businesses are operated. Other uses for underground storage tanks include product and waste storage (e.g., solvents, oil). Evidence of existing or former underground storage tanks includes soil depressions, pipe vents, fill lines, and pump islands.
2.2.5 Electrical Equipment	Electrical equipment may contain PCBs. PCB equipment and wastes have special and expensive management requirements. Also, the presence of such equipment may increase the potential of PCB contamination elsewhere on the property (e.g., spills may have contaminated building materials and soils, or PCB oils may have been disposed of on the property).
2.2.6 Ventilation Pipes	Air emissions may be tested at points of discharge (e.g., stack emissions) to identify contaminants that are associated with the facility. Contaminants that are identified at points of discharge may also be present elsewhere on the property.
2.3 Property	
2.3.1 Visible Soil/Water Contamination	<p>Barring intrusive investigation, the best site-specific information on the possible extent of contamination is a careful visual inspection of the ground surface (e.g., stains), surface water (e.g., oily sheens), and any waste materials and containers.</p> <p>Soil stains near product/waste storage and processing areas may be indicative of poor materials and waste management practices and more serious contamination problems, such as groundwater and/or surface water contamination.</p> <p>Oily sheens or other discoloration of surface water may be the result of contaminated surface run-off, sub-surface contaminant migration, or direct discharges.</p>
2.3.2 Chemicals, Hazardous Materials and Waste Storage Areas	Improper waste handling and storage may have resulted in emissions to soil, groundwater and/or surface water. Abandoned chemicals, hazardous materials and wastes will require testing and disposal.

Section from the PSS Form	Summary of Information
2.3.3 Signs of Dumping	<p>Soil stains, odours, garbage, drums, containers and other debris may be indicative of poor waste management practices and more extensive contamination. Care should be taken to investigate remote areas of the property for dumping, including wells, surface water, wooded lots, fill areas and embankments.</p> <p>Abandoned equipment (e.g., vehicles, machinery, trailers) and residual wastes associated with equipment may require decommissioning and/or disposal. Also, property contamination may have occurred as a result of emissions/escapes from the equipment.</p>
2.3.4 Fill Material	<p>The potential exists for contaminants to be present on a property if contaminated fill material has been introduced from an off-site location. Also, contaminants may be spread to other parts of the property if fill material has been taken from a part of the property that is contaminated and moved to other areas.</p>
2.3.5 Bulk Materials Storage/Stockpiles	<p>Bulk storage areas (e.g., salt) may lead to on and off-site contamination problems caused by surface run-off after periods of precipitation.</p>
2.3.6 Parking Areas and Driveways	<p>Historically, it was common practice to spray used oil on driveways and parking areas to control dust. Repeated applications may have caused contamination from hydrocarbons and/or other substances present in the oil when it was applied (e.g., PCBs and metals). Surface soil is the most often contaminated receptor from oil spraying activities. However, sub-surface soil, groundwater, or surface water may also be affected, depending on the extent to which oil spraying was practiced, and the proximity of receptors to affected areas. The size of the area that may be affected is important, as the larger the area, the greater the potential environmental liability.</p>
2.3.7 Odour Problems	<p>Odours may be noticeable from surface water, surface soil, abandoned wells and areas of waste disposal, as well as conduits (e.g., storm sewers/utility lines) where contamination has migrated.</p>
2.3.8 Surface Water	<p>Streams, creeks, lakes and other surface water bodies are potential receptors of contamination. Visual signs of surface water contamination may be indicative of more serious contamination problems that are otherwise not readily observable. Surface water may also raise the public profile of the site in the event that contamination is present.</p>
2.4 Agricultural Only	
2.4.1 Intensive Cultivation	<p>Intensive cultivation for crops, vinelands, orchards and tree nurseries generally require the widespread use of fertilizers and pesticides. Historically, pesticides that were used were not environmentally friendly and were/are persistent (i.e., the compounds are resistant to chemical and biological breakdown and therefore persist in the environment for years or decades), which may have resulted in residual soil and groundwater impacts.</p>

Section from the PSS Form	Summary of Information
2.5 Commercial / Industrial Only	
2.5.1 Waste Processing and Wastewater Treatment	Processing and treatment facilities (e.g., oil/water separators) may have contamination problems associated with them (e.g., at point of discharge) and the treatment equipment itself may require special decommissioning procedures, if contaminated or have conditions attached as outlined in a Certificate of Approval. The type or purpose of the treatment process can help to identify contaminants for testing.
2.5.2 Lagoons /Settling Ponds	Lagoons and settling ponds may contain waste discharge and will require decommissioning. Contaminants may also have escaped to surrounding soils, groundwater and surface water.
2.5.3 Effluent Discharges	Effluent samples may be collected at points of discharge (e.g., catch basins) and analyzed to identify contaminants associated with the facility. Contaminants that are identified at points of discharge may also be present elsewhere on the property.
2.5.4 PCB Waste Disposal Sites	Certified PCB waste storage sites have special on-going monitoring and reporting requirements and are costly to decommission. PCB soil and groundwater contamination may also be associated with these sites.
2.6 Adjacent Properties	<p>Contaminants from adjacent properties have the potential to migrate to neighbouring properties. The type of contaminant and extent of off-site migration will vary with land-use. For example, the existence of an adjacent mining operation or heavy industry (e.g., steel mill) is of obvious concern. Leaking underground storage tanks at gas stations also have the potential to cause extensive soil and groundwater contamination.</p> <p>Adjacent retail, commercial or residential properties are of less concern. However, examples of activities on these properties that may cause contamination include dry cleaning, sand blasting, vehicle maintenance, and scrap metal and parts storage.</p>

Section from the PSS Form	Summary of Information
SECTION 3.0 - SITE SKETCH AND SITE PHOTOGRAPHS	
	<p>Space is provided for the inspector to draw a site sketch of the property and surrounding area, showing property boundaries, roads and driveways, structures and all environmental features discussed in the form. Addresses of adjacent properties and their land-uses can also be recorded.</p> <p>Site photographs should be taken to supplement the answers to the questions in Section 2.0 of the form, to assist the inspector in evaluating the information gathered, to determine the need for Phase I ESA work.</p>
SECTION 4.0 - FUTURE ACTION	
	<p>Section 4.0 of the form has been provided to note conditions that may have limited the inspector's ability to accurately or fully answer the questions in Section 2.0. For example, snow cover may prevent the inspector from observing soil stains, fill material and debris. It is therefore recommended that the site visit be undertaken during favourable weather conditions to maximize the amount and accuracy of the information that can be recorded. Other conditions/limitations to the inspector may include property owners limiting access to the property, or parts thereof, or to site buildings or adjacent properties.</p> <p>It is recognized that by only pre-screening properties, there is a risk that extensive environmental liabilities will go undetected. However, given the numerous properties managed by MTO, the PSS Step is needed to avoid unnecessary, additional ESA work on properties that have a low likelihood of environmental contamination. It is anticipated that subsequent ESA work can be avoided for most residential, agricultural or parkland properties. However, very few, if any, former or existing commercial or industrial properties will likely be found to represent a low potential for contamination and, as such, will require subsequent ESA work (i.e., Phase I ESA).</p> <p>If the answer to any of the questions in Section 2.0 is "YES" and the inspector is unsure whether it presents an environmental concern, the form may be forwarded to the Regional Environmental Office/Section/Unit for consideration and recommendation.</p>
SECTION 5.0 - ENVIRONMENTAL REVIEW	
	<p>This section may be completed at the discretion of the MTO Regional Environmental Office/Section/Unit to provide comments on the PSS, and any recommendations for follow-up environmental site assessment work, i.e., Phase I ESA.</p>



APPENDIX C

Borehole Permeability Testing Plots

Date: 26-Nov-14
 Conducted by: JIN

Well Number: MW1
 Well Screen Bottom: 6.00 mbgs
 Top of Pipe: mags
 Well Casing Diameter:
 Well Elevation: masl
 Static Water Level: 3.51 mbgs
 Ground Elevation: 249.4

WATER LEVEL BEFORE TEST 3.48

H = Static Water Level mbgs
 Ho = Head at time = 0 mbgs
 h = Water Level at time t mbgs
 To = 200000 sec

L = 250 cm
 2R = 15.24 cm
 2r = 5.08 cm

2.3E-07 cm/s

Time t (sec)	Water Level (mbgs)	Water Level Elevation (masl)
0	3.82	245.58
2	3.8198	245.58
4	3.8193	245.58
6	3.8193	245.58
8	3.819	245.58
10	3.8186	245.58
12	3.8092	245.59
14	3.8152	245.58
16	3.8173	245.58
18	3.8188	245.58
20	3.8177	245.58
22	3.8174	245.58
24	3.817	245.58
26	3.8167	245.58
28	3.8165	245.58
30	3.8163	245.58
32	3.816	245.58
34	3.8161	245.58
36	3.8155	245.58
38	3.8153	245.58
40	3.8151	245.58
42	3.815	245.59
44	3.8147	245.59
46	3.8151	245.58
48	3.8146	245.59
50	3.8145	245.59
52	3.8143	245.59
54	3.8144	245.59

Time t (sec)	H-h	H-Ho	(H-h)/(H-Ho)
0	0.340	0.340	1.000
2	0.340	0.340	0.999
4	0.339	0.340	0.998
6	0.339	0.340	0.998
8	0.339	0.340	0.997
10	0.339	0.340	0.996
12	0.329	0.340	0.968
14	0.335	0.340	0.986
16	0.337	0.340	0.992
18	0.339	0.340	0.996
20	0.338	0.340	0.993
22	0.337	0.340	0.992
24	0.337	0.340	0.991
26	0.337	0.340	0.990
28	0.337	0.340	0.990
30	0.336	0.340	0.989
32	0.336	0.340	0.988
34	0.336	0.340	0.989
36	0.336	0.340	0.987
38	0.335	0.340	0.986
40	0.335	0.340	0.986
42	0.335	0.340	0.985
44	0.335	0.340	0.984
46	0.335	0.340	0.986
48	0.335	0.340	0.984
50	0.335	0.340	0.984
52	0.334	0.340	0.983
54	0.334	0.340	0.984

56	3.814	245.59
58	3.814	245.59
60	3.8143	245.59
62	3.8148	245.59
64	3.8141	245.59
66	3.8128	245.59
68	3.8137	245.59
70	3.8142	245.59
72	3.8137	245.59
74	3.8137	245.59
76	3.8133	245.59
78	3.8132	245.59
80	3.8128	245.59
82	3.8127	245.59
84	3.8129	245.59
86	3.8122	245.59
88	3.8125	245.59
90	3.8121	245.59
92	3.8119	245.59
94	3.8119	245.59
96	3.8117	245.59
98	3.8117	245.59
100	3.8113	245.59
102	3.8115	245.59
104	3.8115	245.59
106	3.8018	245.60
108	3.8112	245.59
110	3.8122	245.59
112	3.8124	245.59
114	3.8124	245.59
116	3.812	245.59
118	3.8118	245.59
120	3.8116	245.59
122	3.8117	245.59
124	3.8114	245.59
126	3.8112	245.59
128	3.8109	245.59
130	3.8109	245.59
132	3.8108	245.59
134	3.8108	245.59
136	3.8108	245.59
138	3.8102	245.59
140	3.8104	245.59
142	3.8103	245.59
144	3.8101	245.59
146	3.8101	245.59
148	3.8099	245.59
150	3.8092	245.59
152	3.8098	245.59

56	0.334	0.340	0.982
58	0.334	0.340	0.982
60	0.334	0.340	0.983
62	0.335	0.340	0.985
64	0.334	0.340	0.983
66	0.333	0.340	0.979
68	0.334	0.340	0.981
70	0.334	0.340	0.983
72	0.334	0.340	0.981
74	0.334	0.340	0.981
76	0.333	0.340	0.980
78	0.333	0.340	0.980
80	0.333	0.340	0.979
82	0.333	0.340	0.979
84	0.333	0.340	0.979
86	0.332	0.340	0.977
88	0.333	0.340	0.978
90	0.332	0.340	0.977
92	0.332	0.340	0.976
94	0.332	0.340	0.976
96	0.332	0.340	0.976
98	0.332	0.340	0.976
100	0.331	0.340	0.974
102	0.332	0.340	0.975
104	0.332	0.340	0.975
106	0.322	0.340	0.946
108	0.331	0.340	0.974
110	0.332	0.340	0.977
112	0.332	0.340	0.978
114	0.332	0.340	0.978
116	0.332	0.340	0.976
118	0.332	0.340	0.976
120	0.332	0.340	0.975
122	0.332	0.340	0.976
124	0.331	0.340	0.975
126	0.331	0.340	0.974
128	0.331	0.340	0.973
130	0.331	0.340	0.973
132	0.331	0.340	0.973
134	0.331	0.340	0.973
136	0.331	0.340	0.973
138	0.330	0.340	0.971
140	0.330	0.340	0.972
142	0.330	0.340	0.971
144	0.330	0.340	0.971
146	0.330	0.340	0.971
148	0.330	0.340	0.970
150	0.329	0.340	0.968
152	0.330	0.340	0.970

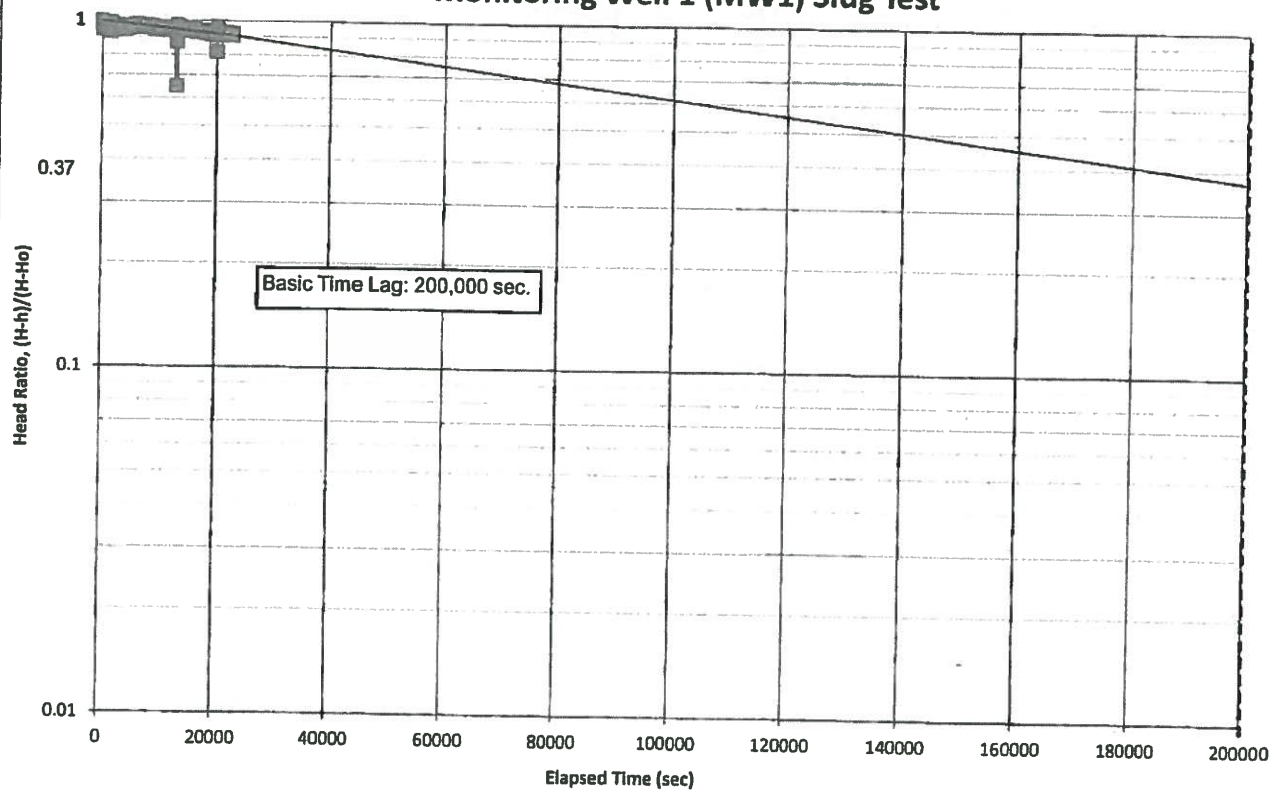
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156	3.8086	245.59
158	3.8107	245.59
160	3.8114	245.59
162	3.8104	245.59
164	3.8104	245.59
166	3.8109	245.59
168	3.8105	245.59
170	3.8105	245.59
172	3.8107	245.59
174	3.8103	245.59
176	3.8101	245.59
178	3.8102	245.59
180	3.81	245.59
182	3.8098	245.59
184	3.81	245.59
186	3.8097	245.59
188	3.8099	245.59
190	3.8098	245.59
192	3.8098	245.59
194	3.8097	245.59
196	3.8095	245.59
198	3.8124	245.59
200	3.8102	245.59
202	3.8102	245.59
204	3.8101	245.59
206	3.8098	245.59
208	3.8099	245.59
210	3.8097	245.59
212	3.8099	245.59
214	3.8097	245.59
216	3.8097	245.59
218	3.8098	245.59
220	3.8096	245.59
222	3.8094	245.59
224	3.8063	245.59
226	3.8109	245.59
228	3.8085	245.59
230	3.8075	245.59
232	3.8111	245.59
234	3.8105	245.59
236	3.8103	245.59
238	3.8101	245.59
240	3.8101	245.59
242	3.81	245.59
244	3.8102	245.59
246	3.8098	245.59
248	3.8099	245.59
250	3.8099	245.59
252	3.8095	245.59
254	3.8098	245.59
256	3.8097	245.59

154	0.333	0.340	0.979
156	0.329	0.340	0.966
158	0.331	0.340	0.973
160	0.331	0.340	0.975
162	0.330	0.340	0.972
164	0.330	0.340	0.972
166	0.331	0.340	0.973
168	0.331	0.340	0.972
170	0.331	0.340	0.972
172	0.331	0.340	0.973
174	0.330	0.340	0.971
176	0.330	0.340	0.971
178	0.330	0.340	0.971
180	0.330	0.340	0.971
182	0.330	0.340	0.970
184	0.330	0.340	0.971
186	0.330	0.340	0.970
188	0.330	0.340	0.970
190	0.330	0.340	0.970
192	0.330	0.340	0.970
194	0.330	0.340	0.970
196	0.330	0.340	0.969
198	0.332	0.340	0.978
200	0.330	0.340	0.971
202	0.330	0.340	0.971
204	0.330	0.340	0.971
206	0.330	0.340	0.970
208	0.330	0.340	0.970
210	0.330	0.340	0.970
212	0.330	0.340	0.970
214	0.330	0.340	0.970
216	0.330	0.340	0.970
218	0.330	0.340	0.970
220	0.330	0.340	0.969
222	0.329	0.340	0.969
224	0.326	0.340	0.960
226	0.331	0.340	0.973
228	0.329	0.340	0.966
230	0.328	0.340	0.963
232	0.331	0.340	0.974
234	0.331	0.340	0.972
236	0.330	0.340	0.971
238	0.330	0.340	0.971
240	0.330	0.340	0.971
242	0.330	0.340	0.971
244	0.330	0.340	0.971
246	0.330	0.340	0.970
248	0.330	0.340	0.970
250	0.330	0.340	0.970
252	0.330	0.340	0.969
254	0.330	0.340	0.970
256	0.330	0.340	0.970

258	3.8099	245.59
260	3.81	245.59
262	3.8098	245.59
264	3.8097	245.59
266	3.8097	245.59
268	3.8096	245.59
270	3.8094	245.59
272	3.8095	245.59
274	3.8089	245.59
276	3.8092	245.59
278	3.8094	245.59
280	3.8091	245.59
282	3.8092	245.59
284	3.8092	245.59
286	3.8089	245.59
288	3.809	245.59
290	3.809	245.59
292	3.8089	245.59
294	3.8088	245.59
296	3.8088	245.59
298	3.8088	245.59
300	3.8088	245.59
302	3.8089	245.59
304	3.8088	245.59
306	3.8084	245.59
308	3.8086	245.59
310	3.8085	245.59
312	3.8084	245.59
314	3.8084	245.59
316	3.8082	245.59
318	3.8081	245.59
320	3.808	245.59
322	3.8081	245.59
324	3.8083	245.59
326	3.8078	245.59
328	3.8078	245.59
330	3.8077	245.59
332	3.8076	245.59
334	3.8075	245.59
336	3.8072	245.59
338	3.8074	245.59
340	3.807	245.59
342	3.8073	245.59
344	3.8071	245.59
346	3.807	245.59
348	3.8069	245.59
350	3.8068	245.59
352	3.8068	245.59
354	3.8065	245.59
356	3.8065	245.59
358	3.8066	245.59
360	3.8065	245.59

258	0.330	0.340	0.970
260	0.330	0.340	0.971
262	0.330	0.340	0.970
264	0.330	0.340	0.970
266	0.330	0.340	0.970
268	0.330	0.340	0.969
270	0.329	0.340	0.969
272	0.330	0.340	0.969
274	0.329	0.340	0.967
276	0.329	0.340	0.968
278	0.329	0.340	0.969
280	0.329	0.340	0.968
282	0.329	0.340	0.968
284	0.329	0.340	0.968
286	0.329	0.340	0.967
288	0.329	0.340	0.968
290	0.329	0.340	0.968
292	0.329	0.340	0.967
294	0.329	0.340	0.967
296	0.329	0.340	0.967
298	0.329	0.340	0.967
300	0.329	0.340	0.967
302	0.329	0.340	0.967
304	0.329	0.340	0.967
306	0.328	0.340	0.966
308	0.329	0.340	0.966
310	0.329	0.340	0.966
312	0.328	0.340	0.966
314	0.328	0.340	0.966
316	0.328	0.340	0.965
318	0.328	0.340	0.965
320	0.328	0.340	0.965
322	0.328	0.340	0.965
324	0.328	0.340	0.966
326	0.328	0.340	0.964
328	0.328	0.340	0.964
330	0.328	0.340	0.964
332	0.328	0.340	0.964
334	0.328	0.340	0.963
336	0.327	0.340	0.962
338	0.327	0.340	0.963
340	0.327	0.340	0.962
342	0.327	0.340	0.963
344	0.327	0.340	0.962
346	0.327	0.340	0.962
348	0.327	0.340	0.961
350	0.327	0.340	0.961
352	0.327	0.340	0.961
354	0.327	0.340	0.960
356	0.327	0.340	0.960
358	0.327	0.340	0.961
360	0.327	0.340	0.960

Plot of Normalized Head Versus Elapsed Time
Monitoring Well 1 (MW1) Slug Test



Date: 26-Nov-14
 Conducted by: JIN

Well Number: MW2
 Well Screen Bottom: 3.00 mbgs
 Top of Pipe: mags
 Well Casing Diameter:
 Well Elevation: masl
 Static Water Level: 1.00 mbgs
 Ground Elevation: 245.8

H = Static Water Level mbgs
 Ho = Head at time = 0 mbgs
 h = Water Level at time t mbgs
 To = 197000 sec
 L = 150 cm
 2R = 15.24 cm
 2r = 5.08 cm

3.3E-07 cm/s

WATER LEVEL BEFORE TEST 0.95

Time t (sec)	Water Level (mbgs)	Water Level Elevation (masl)
0	1.72	244.08
2	1.7193	244.08
4	1.72	244.08
6	1.7199	244.08
8	1.7188	244.08
10	1.7194	244.08
12	1.7196	244.08
14	1.7185	244.08
16	1.719	244.08
18	1.7187	244.08
20	1.7183	244.08
22	1.7198	244.08
24	1.7188	244.08
26	1.7184	244.08
28	1.7191	244.08
30	1.7176	244.08
32	1.7179	244.08
34	1.7189	244.08
36	1.7192	244.08
38	1.7194	244.08
40	1.7189	244.08
42	1.7187	244.08
44	1.7191	244.08
46	1.7181	244.08
48	1.7178	244.08
50	1.7173	244.08
52	1.7185	244.08
54	1.7177	244.08

Time t (sec)	H-h	H-Ho	(H-h)/(H-Ho)
0	0.770	0.770	1.000
2	0.769	0.770	0.999
4	0.770	0.770	1.000
6	0.770	0.770	1.000
8	0.769	0.770	0.998
10	0.769	0.770	0.999
12	0.770	0.770	0.999
14	0.769	0.770	0.998
16	0.769	0.770	0.999
18	0.769	0.770	0.998
20	0.768	0.770	0.998
22	0.770	0.770	1.000
24	0.769	0.770	0.998
26	0.768	0.770	0.998
28	0.769	0.770	0.999
30	0.768	0.770	0.997
32	0.768	0.770	0.997
34	0.769	0.770	0.999
36	0.769	0.770	0.999
38	0.769	0.770	0.999
40	0.769	0.770	0.999
42	0.769	0.770	0.998
44	0.769	0.770	0.999
46	0.768	0.770	0.998
48	0.768	0.770	0.997
50	0.767	0.770	0.996
52	0.769	0.770	0.998
54	0.768	0.770	0.997

56	1.7183	244.08
58	1.7178	244.08
60	1.7178	244.08
62	1.7181	244.08
64	1.7176	244.08
66	1.718	244.08
68	1.7173	244.08
70	1.7165	244.08
72	1.718	244.08
74	1.7175	244.08
76	1.7175	244.08
78	1.7177	244.08
80	1.7175	244.08
82	1.7171	244.08
84	1.7183	244.08
86	1.7182	244.08
88	1.7177	244.08
90	1.7179	244.08
92	1.7185	244.08
94	1.7177	244.08
96	1.7182	244.08
98	1.7185	244.08
100	1.7174	244.08
102	1.7172	244.08
104	1.7175	244.08
106	1.719	244.08
108	1.7182	244.08
110	1.7186	244.08
112	1.7182	244.08
114	1.7175	244.08
116	1.7168	244.08
118	1.718	244.08
120	1.7173	244.08
122	1.7177	244.08
124	1.7175	244.08
126	1.7181	244.08
128	1.7171	244.08
130	1.7179	244.08
132	1.7171	244.08
134	1.7179	244.08
136	1.7174	244.08
138	1.717	244.08
140	1.7173	244.08
142	1.7177	244.08
144	1.7178	244.08
146	1.7167	244.08
148	1.7175	244.08
150	1.7179	244.08
152	1.7175	244.08

56	0.768	0.770	0.998
58	0.768	0.770	0.997
60	0.768	0.770	0.997
62	0.768	0.770	0.998
64	0.768	0.770	0.997
66	0.768	0.770	0.997
68	0.767	0.770	0.996
70	0.767	0.770	0.995
72	0.768	0.770	0.997
74	0.768	0.770	0.997
76	0.768	0.770	0.997
78	0.768	0.770	0.997
80	0.768	0.770	0.997
82	0.767	0.770	0.996
84	0.768	0.770	0.998
86	0.768	0.770	0.998
88	0.768	0.770	0.997
90	0.768	0.770	0.997
92	0.769	0.770	0.998
94	0.768	0.770	0.997
96	0.768	0.770	0.998
98	0.769	0.770	0.998
100	0.767	0.770	0.997
102	0.767	0.770	0.996
104	0.768	0.770	0.997
106	0.769	0.770	0.999
108	0.768	0.770	0.998
110	0.769	0.770	0.998
112	0.768	0.770	0.998
114	0.768	0.770	0.997
116	0.767	0.770	0.996
118	0.768	0.770	0.997
120	0.767	0.770	0.996
122	0.768	0.770	0.997
124	0.768	0.770	0.997
126	0.768	0.770	0.998
128	0.767	0.770	0.996
130	0.768	0.770	0.997
132	0.767	0.770	0.996
134	0.768	0.770	0.997
136	0.767	0.770	0.997
138	0.767	0.770	0.996
140	0.767	0.770	0.996
142	0.768	0.770	0.997
144	0.768	0.770	0.997
146	0.767	0.770	0.996
148	0.768	0.770	0.997
150	0.768	0.770	0.997
152	0.768	0.770	0.997

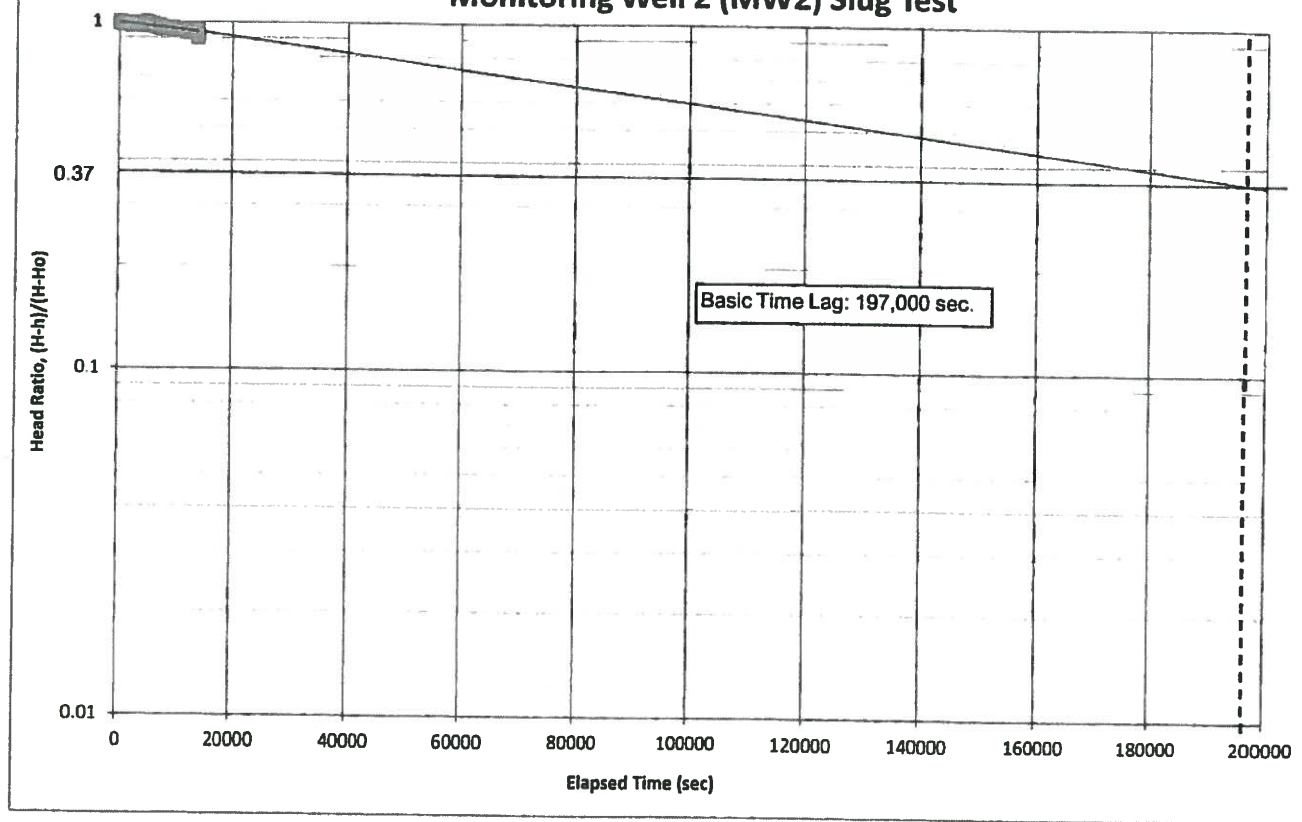
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156	1.7173	244.08
158	1.7165	244.08
160	1.718	244.08
162	1.7175	244.08
164	1.7165	244.08
166	1.7168	244.08
168	1.7172	244.08
170	1.7173	244.08
172	1.7175	244.08
174	1.7165	244.08
176	1.7174	244.08
178	1.7168	244.08
180	1.7182	244.08
182	1.7174	244.08
184	1.7171	244.08
186	1.7172	244.08
188	1.7171	244.08
190	1.7167	244.08
192	1.7173	244.08
194	1.7178	244.08
196	1.7171	244.08
198	1.7173	244.08
200	1.7182	244.08
202	1.7178	244.08
204	1.7177	244.08
206	1.7183	244.08
208	1.7167	244.08
210	1.7165	244.08
212	1.7173	244.08
214	1.7163	244.08
216	1.7171	244.08
218	1.7169	244.08
220	1.7175	244.08
222	1.7178	244.08
224	1.7177	244.08
226	1.7169	244.08
228	1.7176	244.08
230	1.717	244.08
232	1.7168	244.08
234	1.7163	244.08
236	1.7175	244.08
238	1.7178	244.08
240	1.7173	244.08
242	1.7171	244.08
244	1.7167	244.08
246	1.7176	244.08
248	1.7167	244.08
250	1.7176	244.08
252	1.7184	244.08
254	1.7175	244.08
256	1.7174	244.08

154	0.768	0.770	0.997
156	0.767	0.770	0.996
158	0.767	0.770	0.995
160	0.768	0.770	0.997
162	0.768	0.770	0.997
164	0.767	0.770	0.995
166	0.767	0.770	0.996
168	0.767	0.770	0.996
170	0.767	0.770	0.996
172	0.768	0.770	0.997
174	0.767	0.770	0.995
176	0.767	0.770	0.997
178	0.767	0.770	0.996
180	0.768	0.770	0.998
182	0.767	0.770	0.997
184	0.767	0.770	0.996
186	0.767	0.770	0.996
188	0.767	0.770	0.996
190	0.767	0.770	0.996
192	0.767	0.770	0.996
194	0.768	0.770	0.997
196	0.767	0.770	0.996
198	0.767	0.770	0.996
200	0.768	0.770	0.998
202	0.768	0.770	0.997
204	0.768	0.770	0.997
206	0.768	0.770	0.998
208	0.767	0.770	0.996
210	0.767	0.770	0.995
212	0.767	0.770	0.996
214	0.766	0.770	0.995
216	0.767	0.770	0.996
218	0.767	0.770	0.996
220	0.768	0.770	0.997
222	0.768	0.770	0.997
224	0.768	0.770	0.997
226	0.767	0.770	0.996
228	0.768	0.770	0.997
230	0.767	0.770	0.996
232	0.767	0.770	0.996
234	0.766	0.770	0.995
236	0.768	0.770	0.997
238	0.768	0.770	0.997
240	0.767	0.770	0.996
242	0.767	0.770	0.996
244	0.767	0.770	0.996
246	0.768	0.770	0.997
248	0.767	0.770	0.996
250	0.768	0.770	0.997
252	0.768	0.770	0.998
254	0.768	0.770	0.997
256	0.767	0.770	0.997

258	1.7168	244.08
260	1.7182	244.08
262	1.7176	244.08
264	1.717	244.08
266	1.7181	244.08
268	1.7174	244.08
270	1.7176	244.08
272	1.7173	244.08
274	1.7171	244.08
276	1.7184	244.08
278	1.7177	244.08
280	1.7167	244.08
282	1.7173	244.08
284	1.7175	244.08
286	1.717	244.08
288	1.7171	244.08
290	1.7177	244.08
292	1.7176	244.08
294	1.717	244.08
296	1.7175	244.08
298	1.7168	244.08
300	1.7174	244.08
302	1.7173	244.08
304	1.7178	244.08
306	1.7171	244.08
308	1.7175	244.08
310	1.7168	244.08
312	1.7167	244.08
314	1.7181	244.08
316	1.7175	244.08
318	1.7183	244.08
320	1.7166	244.08
322	1.7171	244.08
324	1.7171	244.08
326	1.7181	244.08
328	1.7178	244.08
330	1.7175	244.08
332	1.7181	244.08
334	1.7173	244.08
336	1.7169	244.08
338	1.7186	244.08
340	1.7171	244.08
342	1.7179	244.08
344	1.7181	244.08
346	1.7181	244.08
348	1.7177	244.08
350	1.7183	244.08
352	1.7172	244.08
354	1.718	244.08
356	1.717	244.08
358	1.7174	244.08
360	1.7182	244.08

258	0.767	0.770	0.996
260	0.768	0.770	0.998
262	0.768	0.770	0.997
264	0.767	0.770	0.996
266	0.768	0.770	0.998
268	0.767	0.770	0.997
270	0.768	0.770	0.997
272	0.767	0.770	0.996
274	0.767	0.770	0.996
276	0.768	0.770	0.998
278	0.768	0.770	0.997
280	0.767	0.770	0.996
282	0.767	0.770	0.996
284	0.768	0.770	0.997
286	0.767	0.770	0.996
288	0.767	0.770	0.996
290	0.768	0.770	0.997
292	0.768	0.770	0.997
294	0.767	0.770	0.996
296	0.768	0.770	0.997
298	0.767	0.770	0.996
300	0.767	0.770	0.997
302	0.767	0.770	0.996
304	0.768	0.770	0.997
306	0.767	0.770	0.996
308	0.768	0.770	0.997
310	0.767	0.770	0.996
312	0.767	0.770	0.996
314	0.768	0.770	0.998
316	0.768	0.770	0.997
318	0.768	0.770	0.998
320	0.767	0.770	0.996
322	0.767	0.770	0.996
324	0.767	0.770	0.996
326	0.768	0.770	0.998
328	0.768	0.770	0.997
330	0.768	0.770	0.997
332	0.768	0.770	0.998
334	0.767	0.770	0.996
336	0.767	0.770	0.996
338	0.769	0.770	0.998
340	0.767	0.770	0.996
342	0.768	0.770	0.997
344	0.768	0.770	0.998
346	0.768	0.770	0.998
348	0.768	0.770	0.997
350	0.768	0.770	0.998
352	0.767	0.770	0.996
354	0.768	0.770	0.997
356	0.767	0.770	0.996
358	0.767	0.770	0.997
360	0.768	0.770	0.998

Plot of Normalized Head Versus Elapsed Time
Monitoring Well 2 (MW2) Slug Test



Date: 26-Nov-14

Conducted by: JIN

Well Number: MW3

Well Screen Bottom: 6.00 mbgs

Top of Pipe: mags

Well Casing Diameter:

Well Elevation: masl

Static Water Level: 0.76 mbgs

Ground Elevation: 248.1

WATER LEVEL BEFORE TEST 0.74

H = Static Water Level mbgs

Ho = Head at time = 0 mbgs

h = Water Level at time t mbgs

To = 29000 sec

L = 300 cm

2R = 15.24 cm

2r = 5.08 cm

1.4E-06 cm/s

Time t (sec)	Water Level (mbgs)	Water Level Elevation (masl)
0	3.195	244.91
3	3.1916	244.91
6	3.1896	244.91
9	3.1877	244.91
12	3.1867	244.91
15	3.1856	244.91
18	3.1769	244.92
21	3.1802	244.92
24	3.1838	244.92
27	3.1832	244.92
30	3.1826	244.92
33	3.182	244.92
36	3.1812	244.92
39	3.1766	244.92
42	3.1816	244.92
45	3.1798	244.92
48	3.1798	244.92
51	3.1792	244.92
54	3.1788	244.92
57	3.1782	244.92
60	3.1778	244.92
63	3.1774	244.92
66	3.177	244.92
69	3.1765	244.92
72	3.1762	244.92
75	3.1758	244.92
78	3.1753	244.92
81	3.1744	244.93

Time t (sec)	H-h	H-Ho	(H-h)/(H-Ho)
0	2.455	2.455	1.000
3	2.452	2.455	0.999
6	2.450	2.455	0.998
9	2.448	2.455	0.997
12	2.447	2.455	0.997
15	2.446	2.455	0.996
18	2.437	2.455	0.993
21	2.440	2.455	0.994
24	2.444	2.455	0.995
27	2.443	2.455	0.995
30	2.443	2.455	0.995
33	2.442	2.455	0.995
36	2.441	2.455	0.994
39	2.437	2.455	0.993
42	2.442	2.455	0.995
45	2.440	2.455	0.994
48	2.440	2.455	0.994
51	2.439	2.455	0.994
54	2.439	2.455	0.993
57	2.438	2.455	0.993
60	2.438	2.455	0.993
63	2.437	2.455	0.993
66	2.437	2.455	0.993
69	2.437	2.455	0.992
72	2.436	2.455	0.992
75	2.436	2.455	0.992
78	2.435	2.455	0.992
81	2.434	2.455	0.992

84	3.1706	244.93
87	3.1748	244.93
90	3.1741	244.93
93	3.1737	244.93
96	3.1732	244.93
99	3.1729	244.93
102	3.1724	244.93
105	3.172	244.93
108	3.1719	244.93
111	3.1718	244.93
114	3.1712	244.93
117	3.1707	244.93
120	3.1704	244.93
123	3.1702	244.93
126	3.1674	244.93
129	3.1657	244.93
132	3.1688	244.93
135	3.1688	244.93
138	3.1685	244.93
141	3.1683	244.93
144	3.1678	244.93
147	3.1676	244.93
150	3.1673	244.93
153	3.1671	244.93
156	3.1665	244.93
159	3.1664	244.93
162	3.1661	244.93
165	3.1659	244.93
168	3.1657	244.93
171	3.1652	244.93
174	3.1649	244.94
177	3.1646	244.94
180	3.1645	244.94
183	3.1612	244.94
186	3.1665	244.93
189	3.164	244.94
192	3.1637	244.94
195	3.1635	244.94
198	3.1634	244.94
201	3.163	244.94
204	3.1625	244.94
207	3.1628	244.94
210	3.1625	244.94
213	3.1622	244.94
216	3.1621	244.94
219	3.1617	244.94
222	3.1616	244.94
225	3.1615	244.94
228	3.1568	244.94

84	2.431	2.455	0.990
87	2.435	2.455	0.992
90	2.434	2.455	0.991
93	2.434	2.455	0.991
96	2.433	2.455	0.991
99	2.433	2.455	0.991
102	2.432	2.455	0.991
105	2.432	2.455	0.991
108	2.432	2.455	0.991
111	2.432	2.455	0.991
114	2.431	2.455	0.990
117	2.431	2.455	0.990
120	2.430	2.455	0.990
123	2.430	2.455	0.990
126	2.427	2.455	0.989
129	2.426	2.455	0.988
132	2.429	2.455	0.989
135	2.429	2.455	0.989
138	2.429	2.455	0.989
141	2.428	2.455	0.989
144	2.428	2.455	0.989
147	2.428	2.455	0.989
150	2.427	2.455	0.989
153	2.427	2.455	0.989
156	2.427	2.455	0.988
159	2.426	2.455	0.988
162	2.426	2.455	0.988
165	2.426	2.455	0.988
168	2.426	2.455	0.988
171	2.425	2.455	0.988
174	2.425	2.455	0.988
177	2.425	2.455	0.988
180	2.425	2.455	0.988
183	2.421	2.455	0.986
186	2.427	2.455	0.988
189	2.424	2.455	0.987
192	2.424	2.455	0.987
195	2.424	2.455	0.987
198	2.423	2.455	0.987
201	2.423	2.455	0.987
204	2.423	2.455	0.987
207	2.423	2.455	0.987
210	2.423	2.455	0.987
213	2.422	2.455	0.987
216	2.422	2.455	0.987
219	2.422	2.455	0.986
222	2.422	2.455	0.986
225	2.422	2.455	0.986
228	2.417	2.455	0.984

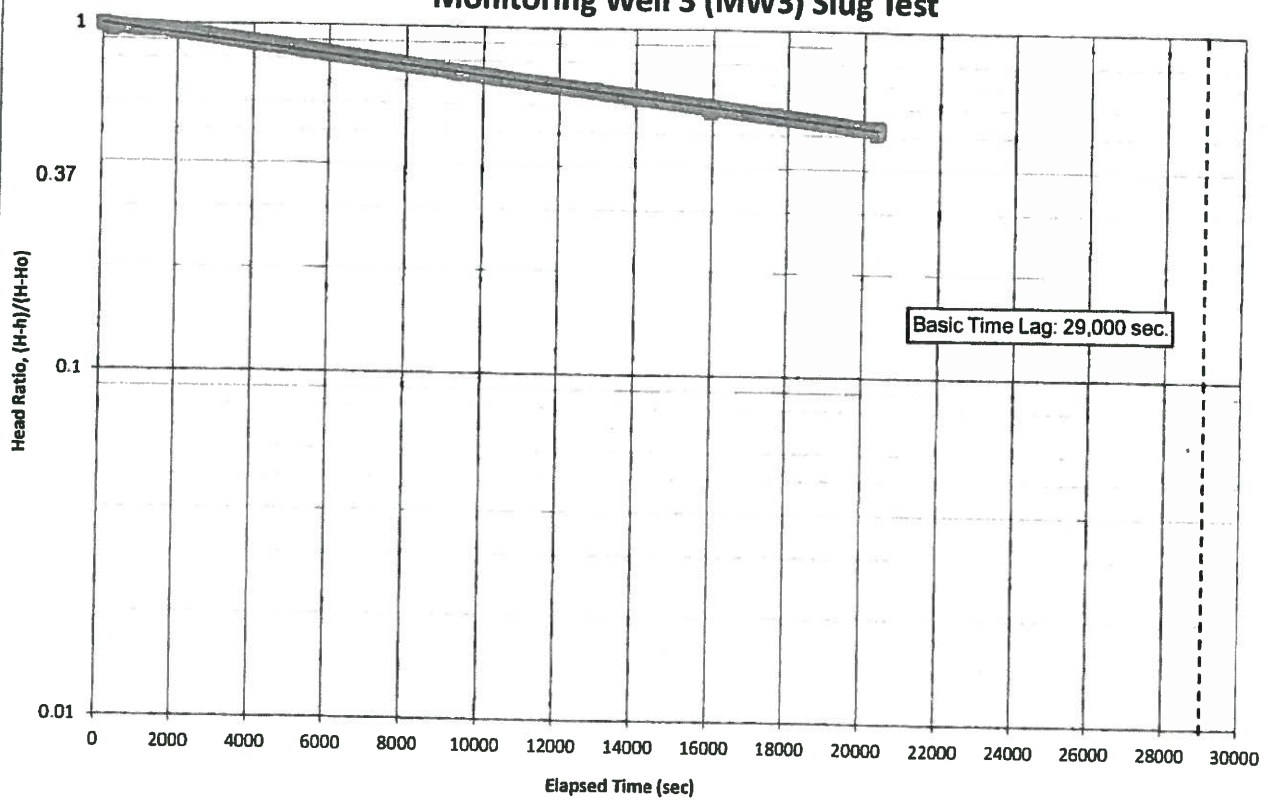
231	3.1571	244.94
234	3.161	244.94
237	3.161	244.94
240	3.1633	244.94
243	3.1087	244.99
246	3.1491	244.95
249	3.1621	244.94
252	3.1618	244.94
255	3.1618	244.94
258	3.1614	244.94
261	3.1613	244.94
264	3.1611	244.94
267	3.1611	244.94
270	3.1609	244.94
273	3.1609	244.94
276	3.1605	244.94
279	3.1604	244.94
282	3.1603	244.94
285	3.1601	244.94
288	3.16	244.94
291	3.1596	244.94
294	3.1595	244.94
297	3.1592	244.94
300	3.1594	244.94
303	3.159	244.94
306	3.1592	244.94
309	3.1589	244.94
312	3.159	244.94
315	3.1587	244.94
318	3.1588	244.94
321	3.1584	244.94
324	3.1582	244.94
327	3.1579	244.94
330	3.158	244.94
333	3.1578	244.94
336	3.1576	244.94
339	3.1574	244.94
342	3.1573	244.94
345	3.157	244.94
348	3.1571	244.94
351	3.1569	244.94
354	3.1566	244.94
357	3.1565	244.94
360	3.1563	244.94
363	3.156	244.94
366	3.1562	244.94
369	3.1559	244.94
372	3.1557	244.94
375	3.1556	244.94
378	3.1552	244.94
381	3.1551	244.94
384	3.1547	244.95

231	2.417	2.455	0.985
234	2.421	2.455	0.986
237	2.421	2.455	0.986
240	2.423	2.455	0.987
243	2.369	2.455	0.965
246	2.409	2.455	0.981
249	2.422	2.455	0.987
252	2.422	2.455	0.986
255	2.422	2.455	0.986
258	2.421	2.455	0.986
261	2.421	2.455	0.986
264	2.421	2.455	0.986
267	2.421	2.455	0.986
270	2.421	2.455	0.986
273	2.421	2.455	0.986
276	2.421	2.455	0.986
279	2.420	2.455	0.986
282	2.420	2.455	0.986
285	2.420	2.455	0.986
288	2.420	2.455	0.986
291	2.420	2.455	0.986
294	2.420	2.455	0.986
297	2.419	2.455	0.985
300	2.419	2.455	0.985
303	2.419	2.455	0.985
306	2.419	2.455	0.985
309	2.419	2.455	0.985
312	2.419	2.455	0.985
315	2.419	2.455	0.985
318	2.419	2.455	0.985
321	2.418	2.455	0.985
324	2.418	2.455	0.985
327	2.418	2.455	0.985
330	2.418	2.455	0.985
333	2.418	2.455	0.985
336	2.418	2.455	0.985
339	2.417	2.455	0.985
342	2.417	2.455	0.985
345	2.417	2.455	0.985
348	2.417	2.455	0.985
351	2.417	2.455	0.984
354	2.417	2.455	0.984
357	2.417	2.455	0.984
360	2.416	2.455	0.984
363	2.416	2.455	0.984
366	2.416	2.455	0.984
369	2.416	2.455	0.984
372	2.416	2.455	0.984
375	2.416	2.455	0.984
378	2.415	2.455	0.984
381	2.415	2.455	0.984
384	2.415	2.455	0.984

387	3.155	244.95
390	3.1544	244.95
393	3.1545	244.95
396	3.1543	244.95
399	3.1542	244.95
402	3.1538	244.95
405	3.1536	244.95
408	3.1535	244.95
411	3.1533	244.95
414	3.1531	244.95
417	3.1528	244.95
420	3.1527	244.95
423	3.1526	244.95
426	3.1523	244.95
429	3.1522	244.95
432	3.1519	244.95
435	3.1517	244.95
438	3.1518	244.95
441	3.1512	244.95
444	3.1512	244.95
447	3.1509	244.95
450	3.1508	244.95
453	3.1505	244.95
456	3.1505	244.95
459	3.1503	244.95
462	3.15	244.95
465	3.1499	244.95
468	3.1497	244.95
471	3.1495	244.95
474	3.1496	244.95
477	3.1491	244.95
480	3.149	244.95
483	3.1488	244.95
486	3.1487	244.95
489	3.1484	244.95
492	3.1483	244.95
495	3.1482	244.95
498	3.148	244.95
501	3.1481	244.95
504	3.1479	244.95
507	3.1472	244.95
510	3.1471	244.95
513	3.1468	244.95
516	3.1469	244.95
519	3.1468	244.95
522	3.1468	244.95
525	3.1464	244.95
528	3.1465	244.95
531	3.146	244.95
534	3.1458	244.95
537	3.1457	244.95
540	3.1456	244.95

387	2.415	2.455	0.984
390	2.414	2.455	0.983
393	2.415	2.455	0.984
396	2.414	2.455	0.983
399	2.414	2.455	0.983
402	2.414	2.455	0.983
405	2.414	2.455	0.983
408	2.414	2.455	0.983
411	2.413	2.455	0.983
414	2.413	2.455	0.983
417	2.413	2.455	0.983
420	2.413	2.455	0.983
423	2.413	2.455	0.983
426	2.412	2.455	0.983
429	2.412	2.455	0.983
432	2.412	2.455	0.982
435	2.412	2.455	0.982
438	2.412	2.455	0.982
441	2.411	2.455	0.982
444	2.411	2.455	0.982
447	2.411	2.455	0.982
450	2.411	2.455	0.982
453	2.411	2.455	0.982
456	2.411	2.455	0.982
459	2.410	2.455	0.982
462	2.410	2.455	0.982
465	2.410	2.455	0.982
468	2.410	2.455	0.982
471	2.410	2.455	0.981
474	2.410	2.455	0.982
477	2.409	2.455	0.981
480	2.409	2.455	0.981
483	2.409	2.455	0.981
486	2.409	2.455	0.981
489	2.408	2.455	0.981
492	2.408	2.455	0.981
495	2.408	2.455	0.981
498	2.408	2.455	0.981
501	2.408	2.455	0.981
504	2.408	2.455	0.981
507	2.407	2.455	0.981
510	2.407	2.455	0.980
513	2.407	2.455	0.980
516	2.407	2.455	0.980
519	2.407	2.455	0.980
522	2.407	2.455	0.980
525	2.406	2.455	0.980
528	2.407	2.455	0.980
531	2.406	2.455	0.980
534	2.406	2.455	0.980
537	2.406	2.455	0.980
540	2.406	2.455	0.980

Plot of Normalized Head Versus Elapsed Time
Monitoring Well 3 (MW3) Slug Test



Date: 26-Nov-14
 Conducted by: JIN

Well Number: MW4
 Well Screen Bottom: 6.00 mbgs
 Top of Pipe: mags
 Well Casing Diameter:
 Well Elevation: masl
 Static Water Level: 2.18 mbgs
 Ground Elevation: 246.9

WATER LEVEL BEFORE TEST 2.145

H = Static Water Level mbgs
 Ho = Head at time = 0 mbgs
 h = Water Level at time t mbgs
 To = 600000 sec
 L = 300 cm
 2R = 15.24 cm
 2r = 5.08 cm

6.6E-08 cm/s

Time t (sec)	Water Level (mbgs)	Water Level Elevation (masl)
0	3.27	243.63
3	3.2694	243.63
6	3.2688	243.63
9	3.2688	243.63
12	3.2686	243.63
15	3.2685	243.63
18	3.2678	243.63
21	3.2683	243.63
24	3.2683	243.63
27	3.2675	243.63
30	3.2674	243.63
33	3.268	243.63
36	3.2674	243.63
39	3.2672	243.63
42	3.2669	243.63
45	3.2669	243.63
48	3.2668	243.63
51	3.267	243.63
54	3.2669	243.63
57	3.2665	243.63
60	3.2663	243.63
63	3.2664	243.63
66	3.2669	243.63
69	3.2663	243.63
72	3.2657	243.63
75	3.2664	243.63
78	3.267	243.63
81	3.2664	243.63

Time t (sec)	H-h	H-Ho	(H-h)/(H-Ho)
0	1.125	1.125	1.000
3	1.124	1.125	0.999
6	1.124	1.125	0.999
9	1.124	1.125	0.999
12	1.124	1.125	0.999
15	1.124	1.125	0.999
18	1.123	1.125	0.998
21	1.123	1.125	0.998
24	1.123	1.125	0.998
27	1.123	1.125	0.998
30	1.122	1.125	0.998
33	1.123	1.125	0.998
36	1.122	1.125	0.998
39	1.122	1.125	0.998
42	1.122	1.125	0.997
45	1.122	1.125	0.997
48	1.122	1.125	0.997
51	1.122	1.125	0.997
54	1.122	1.125	0.997
57	1.122	1.125	0.997
60	1.121	1.125	0.997
63	1.121	1.125	0.997
66	1.122	1.125	0.997
69	1.121	1.125	0.997
72	1.121	1.125	0.996
75	1.121	1.125	0.997
78	1.122	1.125	0.997
81	1.121	1.125	0.997

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93	3.2653	243.63
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111	3.2654	243.63
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96	1.120	1.125	0.995
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105	1.121	1.125	0.996
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135	1.120	1.125	0.995
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147	1.119	1.125	0.995
150	1.120	1.125	0.995
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159	1.119	1.125	0.994
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171	1.118	1.125	0.994
174	1.118	1.125	0.994
177	1.118	1.125	0.994
180	1.120	1.125	0.995
183	1.118	1.125	0.994
186	1.119	1.125	0.994
189	1.119	1.125	0.995
192	1.118	1.125	0.993
195	1.119	1.125	0.995
198	1.119	1.125	0.995
201	1.119	1.125	0.995
204	1.119	1.125	0.994
207	1.118	1.125	0.993
210	1.118	1.125	0.994
213	1.120	1.125	0.995
216	1.118	1.125	0.994
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225	1.118	1.125	0.994
228	1.118	1.125	0.994

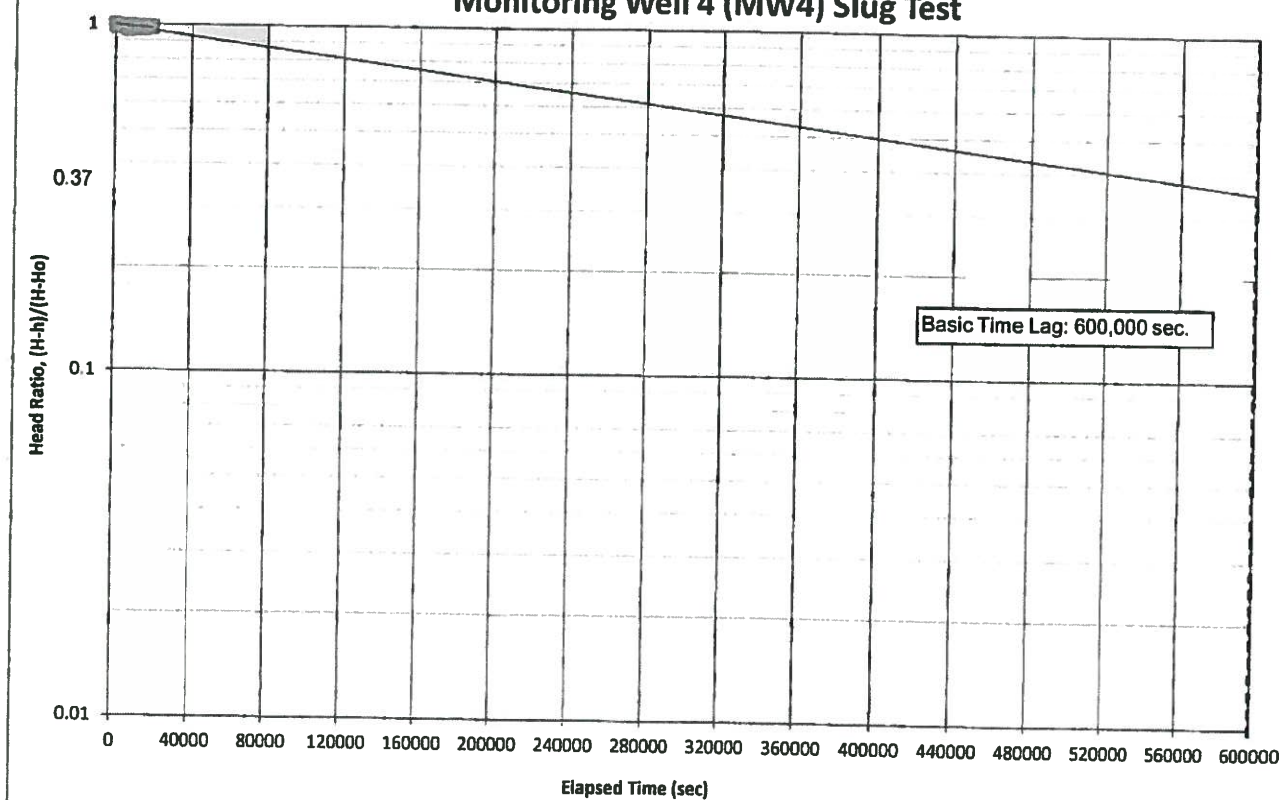
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255	3.2641	243.64
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270	3.2637	243.64
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282	3.2619	243.64
285	3.2627	243.64
288	3.2629	243.64
291	3.2629	243.64
294	3.2623	243.64
297	3.2629	243.64
300	3.2623	243.64
303	3.2634	243.64
306	3.263	243.64
309	3.2625	243.64
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327	3.262	243.64
330	3.263	243.64
333	3.2627	243.64
336	3.2618	243.64
339	3.2622	243.64
342	3.2621	243.64
345	3.2619	243.64
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351	3.2629	243.64
354	3.2622	243.64
357	3.2622	243.64
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363	3.2625	243.64
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369	3.2619	243.64
372	3.2621	243.64
375	3.2617	243.64
378	3.262	243.64
381	3.2611	243.64
384	3.2612	243.64

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234	1.119	1.125	0.995
237	1.119	1.125	0.995
240	1.118	1.125	0.994
243	1.117	1.125	0.993
246	1.118	1.125	0.993
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252	1.119	1.125	0.994
255	1.119	1.125	0.995
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276	1.118	1.125	0.994
279	1.118	1.125	0.994
282	1.117	1.125	0.993
285	1.118	1.125	0.994
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369	1.117	1.125	0.993
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375	1.117	1.125	0.993
378	1.117	1.125	0.993
381	1.116	1.125	0.992
384	1.116	1.125	0.992

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393	3.2617	243.64
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411	3.2612	243.64
414	3.2621	243.64
417	3.2611	243.64
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423	3.2613	243.64
426	3.2612	243.64
429	3.2617	243.64
432	3.2617	243.64
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438	3.2622	243.64
441	3.2626	243.64
444	3.2616	243.64
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456	3.2619	243.64
459	3.2622	243.64
462	3.2612	243.64
465	3.262	243.64
468	3.2613	243.64
471	3.2614	243.64
474	3.2623	243.64
477	3.2618	243.64
480	3.2616	243.64
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489	3.262	243.64
492	3.2616	243.64
495	3.2622	243.64
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501	3.2618	243.64
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507	3.2612	243.64
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519	3.2609	243.64
522	3.2607	243.64
525	3.262	243.64
528	3.2613	243.64
531	3.261	243.64
534	3.2604	243.64
537	3.2624	243.64
540	3.2607	243.64

387	1.117	1.125	0.993
390	1.117	1.125	0.993
393	1.117	1.125	0.993
396	1.116	1.125	0.992
399	1.116	1.125	0.992
402	1.116	1.125	0.992
405	1.116	1.125	0.992
408	1.117	1.125	0.993
411	1.116	1.125	0.992
414	1.117	1.125	0.993
417	1.116	1.125	0.992
420	1.116	1.125	0.992
423	1.116	1.125	0.992
426	1.116	1.125	0.992
429	1.117	1.125	0.993
432	1.117	1.125	0.993
435	1.116	1.125	0.992
438	1.117	1.125	0.993
441	1.118	1.125	0.993
444	1.117	1.125	0.993
447	1.116	1.125	0.992
450	1.117	1.125	0.993
453	1.117	1.125	0.993
456	1.117	1.125	0.993
459	1.117	1.125	0.993
462	1.116	1.125	0.992
465	1.117	1.125	0.993
468	1.116	1.125	0.992
471	1.116	1.125	0.992
474	1.117	1.125	0.993
477	1.117	1.125	0.993
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501	1.117	1.125	0.993
504	1.116	1.125	0.992
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513	1.116	1.125	0.992
516	1.117	1.125	0.993
519	1.116	1.125	0.992
522	1.116	1.125	0.992
525	1.117	1.125	0.993
528	1.116	1.125	0.992
531	1.116	1.125	0.992
534	1.115	1.125	0.991
537	1.117	1.125	0.993
540	1.116	1.125	0.992

Plot of Normalized Head Versus Elapsed Time
Monitoring Well 4 (MW4) Slug Test



Date: 26-Nov-14
Conducted by: JIN

Well Number: MW5
Well Screen Bottom: 3.00 mbgs
Top of Pipe: 0.78 mags
Well Casing Diameter:
Well Elevation: masl
Static Water Level: 0.33 mbgs
Ground Elevation: 248.2

H = Static Water Level mbgs
Ho = Head at time = 0 mbgs
h = Water Level at time t mbgs
To = 1100 sec

L = 150 cm
2R = 15.24 cm
2r = 5.08 cm

5.8E-05 cm/s

WATER LEVEL BEFORE TEST 0.33

Time t (sec)	Water Level (mbgs)	Water Level Elevation (masl)
0	1.84	246.36
2	1.8339	246.37
4	1.8271	246.37
6	1.82	246.38
8	1.816	246.38
10	1.8101	246.39
12	1.805	246.40
14	1.8001	246.40
16	1.7954	246.40
18	1.7917	246.41
20	1.7861	246.41
22	1.783	246.42
24	1.7825	246.42
26	1.7694	246.43
28	1.7652	246.43
30	1.762	246.44
32	1.7579	246.44
34	1.7537	246.45
36	1.7332	246.47
38	1.733	246.47
40	1.7469	246.45
42	1.7302	246.47
44	1.7263	246.47
46	1.7238	246.48
48	1.7195	246.48
50	1.7164	246.48
52	1.7121	246.49
54	1.7085	246.49

Time t (sec)	H-h	H-Ho	(H-h)/(H-Ho)
0	1.510	1.510	1.000
2	1.504	1.510	0.996
4	1.497	1.510	0.991
6	1.490	1.510	0.987
8	1.486	1.510	0.984
10	1.480	1.510	0.980
12	1.475	1.510	0.977
14	1.470	1.510	0.974
16	1.465	1.510	0.970
18	1.462	1.510	0.968
20	1.456	1.510	0.964
22	1.453	1.510	0.962
24	1.453	1.510	0.962
26	1.439	1.510	0.953
28	1.435	1.510	0.950
30	1.432	1.510	0.948
32	1.428	1.510	0.946
34	1.424	1.510	0.943
36	1.403	1.510	0.929
38	1.403	1.510	0.929
40	1.417	1.510	0.938
42	1.400	1.510	0.927
44	1.396	1.510	0.925
46	1.394	1.510	0.923
48	1.390	1.510	0.920
50	1.386	1.510	0.918
52	1.382	1.510	0.915
54	1.379	1.510	0.913

56	1.7057	246.49
58	1.7016	246.50
60	1.6981	246.50
62	1.6948	246.51
64	1.6922	246.51
66	1.6891	246.51
68	1.6842	246.52
70	1.6807	246.52
72	1.6776	246.52
74	1.6747	246.53
76	1.6708	246.53
78	1.668	246.53
80	1.6642	246.54
82	1.6616	246.54
84	1.6578	246.54
86	1.6549	246.55
88	1.6511	246.55
90	1.6485	246.55
92	1.6464	246.55
94	1.6313	246.57
96	1.6284	246.57
98	1.6185	246.58
100	1.6084	246.59
102	1.6263	246.57
104	1.6337	246.57
106	1.6079	246.59
108	1.6272	246.57
110	1.6245	246.58
112	1.6089	246.59
114	1.602	246.60
116	1.6011	246.60
118	1.5985	246.60
120	1.5853	246.61
122	1.5893	246.61
124	1.6028	246.60
126	1.5991	246.60
128	1.5975	246.60
130	1.595	246.61
132	1.5906	246.61
134	1.5831	246.62
136	1.5803	246.62
138	1.5822	246.62
140	1.579	246.62
142	1.5781	246.62
144	1.5739	246.63
146	1.5725	246.63
148	1.5685	246.63
150	1.5655	246.63
152	1.5623	246.64

56	1.376	1.510	0.911
58	1.372	1.510	0.908
60	1.368	1.510	0.906
62	1.365	1.510	0.904
64	1.362	1.510	0.902
66	1.359	1.510	0.900
68	1.354	1.510	0.897
70	1.351	1.510	0.895
72	1.348	1.510	0.892
74	1.345	1.510	0.891
76	1.341	1.510	0.888
78	1.338	1.510	0.886
80	1.334	1.510	0.884
82	1.332	1.510	0.882
84	1.328	1.510	0.879
86	1.325	1.510	0.877
88	1.321	1.510	0.875
90	1.319	1.510	0.873
92	1.316	1.510	0.872
94	1.301	1.510	0.862
96	1.298	1.510	0.860
98	1.289	1.510	0.853
100	1.278	1.510	0.847
102	1.296	1.510	0.858
104	1.304	1.510	0.863
106	1.278	1.510	0.846
108	1.297	1.510	0.859
110	1.295	1.510	0.857
112	1.279	1.510	0.847
114	1.272	1.510	0.842
116	1.271	1.510	0.842
118	1.269	1.510	0.840
120	1.255	1.510	0.831
122	1.259	1.510	0.834
124	1.273	1.510	0.843
126	1.269	1.510	0.840
128	1.268	1.510	0.839
130	1.265	1.510	0.838
132	1.261	1.510	0.835
134	1.253	1.510	0.830
136	1.250	1.510	0.828
138	1.252	1.510	0.829
140	1.249	1.510	0.827
142	1.248	1.510	0.827
144	1.244	1.510	0.824
146	1.243	1.510	0.823
148	1.239	1.510	0.820
150	1.236	1.510	0.818
152	1.232	1.510	0.816

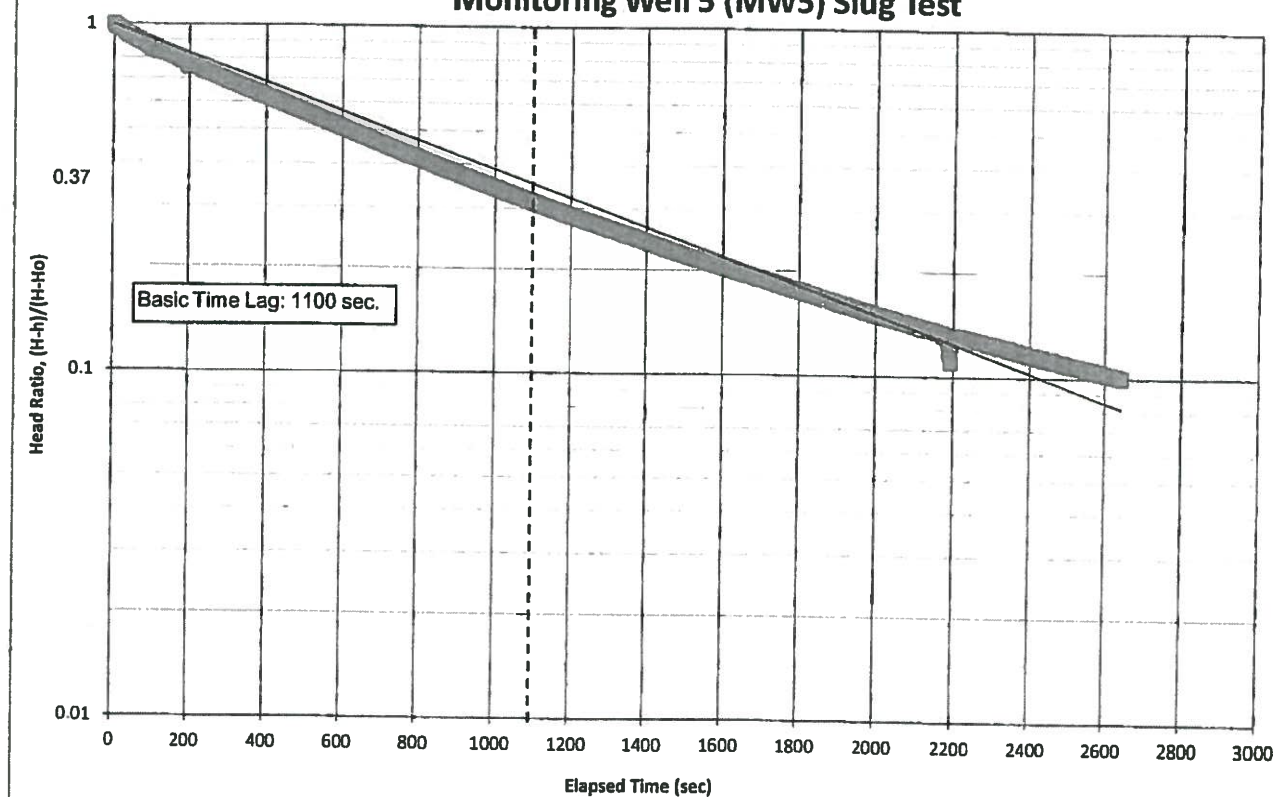
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160	1.5517	246.65
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164	1.545	246.66
166	1.5414	246.66
168	1.5399	246.66
170	1.5332	246.67
172	1.5297	246.67
174	1.5308	246.67
176	1.5281	246.67
178	1.5258	246.67
180	1.523	246.68
182	1.5197	246.68
184	1.5174	246.68
186	1.5156	246.68
188	1.5124	246.69
190	1.5097	246.69
192	1.5085	246.69
194	1.4835	246.72
196	1.4743	246.73
198	1.4673	246.73
200	1.4806	246.72
202	1.4838	246.72
204	1.4869	246.71
206	1.485	246.72
208	1.4828	246.72
210	1.4796	246.72
212	1.4767	246.72
214	1.4754	246.72
216	1.4722	246.73
218	1.4704	246.73
220	1.4675	246.73
222	1.4654	246.73
224	1.4632	246.74
226	1.4603	246.74
228	1.4575	246.74
230	1.4555	246.74
232	1.4537	246.75
234	1.451	246.75
236	1.4483	246.75
238	1.4457	246.75
240	1.4421	246.76
242	1.44	246.76
244	1.4373	246.76
246	1.4356	246.76
248	1.4329	246.77
250	1.4303	246.77
252	1.4278	246.77
254	1.4258	246.77
256	1.4237	246.78

154	1.229	1.510	0.814
156	1.227	1.510	0.813
158	1.224	1.510	0.810
160	1.222	1.510	0.809
162	1.218	1.510	0.806
164	1.215	1.510	0.805
166	1.211	1.510	0.802
168	1.210	1.510	0.801
170	1.203	1.510	0.797
172	1.200	1.510	0.795
174	1.201	1.510	0.795
176	1.198	1.510	0.793
178	1.196	1.510	0.792
180	1.193	1.510	0.790
182	1.190	1.510	0.788
184	1.187	1.510	0.786
186	1.186	1.510	0.785
188	1.182	1.510	0.783
190	1.180	1.510	0.781
192	1.179	1.510	0.780
194	1.154	1.510	0.764
196	1.144	1.510	0.758
198	1.137	1.510	0.753
200	1.151	1.510	0.762
202	1.154	1.510	0.764
204	1.157	1.510	0.766
206	1.155	1.510	0.765
208	1.153	1.510	0.763
210	1.150	1.510	0.761
212	1.147	1.510	0.759
214	1.145	1.510	0.759
216	1.142	1.510	0.756
218	1.140	1.510	0.755
220	1.138	1.510	0.753
222	1.135	1.510	0.752
224	1.133	1.510	0.750
226	1.130	1.510	0.749
228	1.128	1.510	0.747
230	1.126	1.510	0.745
232	1.124	1.510	0.744
234	1.121	1.510	0.742
236	1.118	1.510	0.741
238	1.116	1.510	0.739
240	1.112	1.510	0.736
242	1.110	1.510	0.735
244	1.107	1.510	0.733
246	1.106	1.510	0.732
248	1.103	1.510	0.730
250	1.100	1.510	0.729
252	1.098	1.510	0.727
254	1.096	1.510	0.726
256	1.094	1.510	0.724

258	1.4207	246.78
260	1.4197	246.78
262	1.4159	246.78
264	1.4144	246.79
266	1.4126	246.79
268	1.4097	246.79
270	1.4075	246.79
272	1.4057	246.79
274	1.4022	246.80
276	1.3994	246.80
278	1.397	246.80
280	1.3952	246.80
282	1.3921	246.81
284	1.3907	246.81
286	1.3883	246.81
288	1.3855	246.81
290	1.3837	246.82
292	1.3815	246.82
294	1.3791	246.82
296	1.377	246.82
298	1.3749	246.83
300	1.3724	246.83
302	1.3697	246.83
304	1.3678	246.83
306	1.3651	246.83
308	1.3629	246.84
310	1.3621	246.84
312	1.3587	246.84
314	1.3565	246.84
316	1.3544	246.85
318	1.3522	246.85
320	1.3494	246.85
322	1.3482	246.85
324	1.3457	246.85
326	1.3437	246.86
328	1.3418	246.86
330	1.3396	246.86
332	1.337	246.86
334	1.3355	246.86
336	1.3336	246.87
338	1.3314	246.87
340	1.3297	246.87
342	1.3276	246.87
344	1.3248	246.88
346	1.3226	246.88
348	1.3209	246.88
350	1.3191	246.88
352	1.3165	246.88
354	1.3146	246.89
356	1.3129	246.89
358	1.3106	246.89
360	1.3087	246.89

258	1.091	1.510	0.722
260	1.090	1.510	0.722
262	1.086	1.510	0.719
264	1.084	1.510	0.718
266	1.083	1.510	0.717
268	1.080	1.510	0.715
270	1.078	1.510	0.714
272	1.076	1.510	0.712
274	1.072	1.510	0.710
276	1.069	1.510	0.708
278	1.067	1.510	0.707
280	1.065	1.510	0.705
282	1.062	1.510	0.703
284	1.061	1.510	0.702
286	1.058	1.510	0.701
288	1.056	1.510	0.699
290	1.054	1.510	0.698
292	1.052	1.510	0.696
294	1.049	1.510	0.695
296	1.047	1.510	0.693
298	1.045	1.510	0.692
300	1.042	1.510	0.690
302	1.040	1.510	0.689
304	1.038	1.510	0.687
306	1.035	1.510	0.685
308	1.033	1.510	0.684
310	1.032	1.510	0.684
312	1.029	1.510	0.681
314	1.027	1.510	0.680
316	1.024	1.510	0.678
318	1.022	1.510	0.677
320	1.019	1.510	0.675
322	1.018	1.510	0.674
324	1.016	1.510	0.673
326	1.014	1.510	0.671
328	1.012	1.510	0.670
330	1.010	1.510	0.669
332	1.007	1.510	0.667
334	1.006	1.510	0.666
336	1.004	1.510	0.665
338	1.001	1.510	0.663
340	1.000	1.510	0.662
342	0.998	1.510	0.661
344	0.995	1.510	0.659
346	0.993	1.510	0.657
348	0.991	1.510	0.656
350	0.989	1.510	0.655
352	0.987	1.510	0.653
354	0.985	1.510	0.652
356	0.983	1.510	0.651
358	0.981	1.510	0.649
360	0.979	1.510	0.648

Plot of Normalized Head Versus Elapsed Time
Monitoring Well 5 (MW5) Slug Test



Date: 26-Nov-14

Conducted by: JIN

Well Number: MW6

Well Screen Bottom: 3.00 mbgs

Top of Pipe: mags

Well Casing Diameter:

Well Elevation: masl

Static Water Level: 0.57 mbgs

Ground Elevation: 247.6

WATER LEVEL BEFORE TEST 0.57

H = Static Water Level mbgs

Ho = Head at time = 0 mbgs

h = Water Level at time t mbgs

To = 105 sec

L = 150 cm

2R = 15.24 cm

2r = 5.08 cm

6.1E-04 cm/s

Time t (sec)	Water Level (mbgs)	Water Level Elevation (masl)
0	1.76	245.84
2	1.7389	245.86
4	1.7179	245.88
6	1.6969	245.90
8	1.677	245.92
10	1.6565	245.94
12	1.6404	245.96
14	1.6219	245.98
16	1.5936	246.01
18	1.5792	246.02
20	1.5641	246.04
22	1.547	246.05
24	1.5336	246.07
26	1.5146	246.09
28	1.4965	246.10
30	1.4835	246.12
32	1.4664	246.13
34	1.4487	246.15
36	1.4327	246.17
38	1.3918	246.21
40	1.3917	246.21
42	1.3793	246.22
44	1.3661	246.23
46	1.3523	246.25
48	1.3387	246.26
50	1.3253	246.27
52	1.3115	246.29
54	1.3017	246.30

Time t (sec)	H-h	H-Ho	(H-h)/(H-Ho)
0	1.190	1.190	1.000
2	1.169	1.190	0.982
4	1.148	1.190	0.965
6	1.127	1.190	0.947
8	1.107	1.190	0.930
10	1.087	1.190	0.913
12	1.070	1.190	0.899
14	1.052	1.190	0.884
16	1.024	1.190	0.860
18	1.009	1.190	0.848
20	0.994	1.190	0.835
22	0.977	1.190	0.821
24	0.964	1.190	0.810
26	0.945	1.190	0.794
28	0.927	1.190	0.779
30	0.914	1.190	0.768
32	0.896	1.190	0.753
34	0.879	1.190	0.738
36	0.863	1.190	0.725
38	0.822	1.190	0.691
40	0.822	1.190	0.691
42	0.809	1.190	0.680
44	0.796	1.190	0.669
46	0.782	1.190	0.657
48	0.769	1.190	0.646
50	0.755	1.190	0.635
52	0.742	1.190	0.623
54	0.732	1.190	0.615

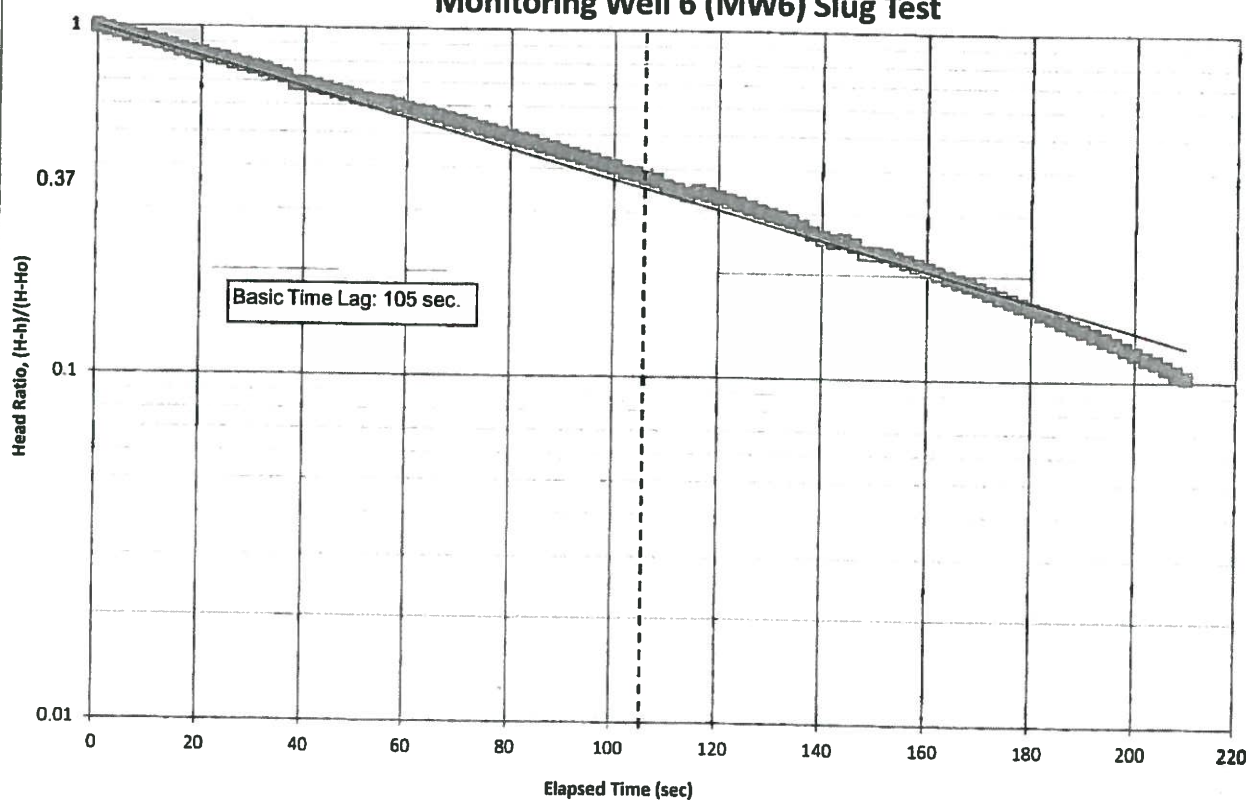
56	1.2993	246.30
58	1.2868	246.31
60	1.2698	246.33
62	1.2574	246.34
64	1.2489	246.35
66	1.2382	246.36
68	1.2248	246.38
70	1.2133	246.39
72	1.2023	246.40
74	1.1888	246.41
76	1.1773	246.42
78	1.1669	246.43
80	1.1554	246.44
82	1.1444	246.46
84	1.1335	246.47
86	1.1236	246.48
88	1.1134	246.49
90	1.1019	246.50
92	1.0926	246.51
94	1.082	246.52
96	1.0718	246.53
98	1.061	246.54
100	1.0521	246.55
102	1.0349	246.57
104	1.031	246.57
106	1.0189	246.58
108	1.0107	246.59
110	0.9924	246.61
112	0.9836	246.62
114	0.9727	246.63
116	0.9805	246.62
118	0.9721	246.63
120	0.9643	246.64
122	0.9557	246.64
124	0.9485	246.65
126	0.9403	246.66
128	0.9314	246.67
130	0.9237	246.68
132	0.9171	246.68
134	0.9101	246.69
136	0.8979	246.70
138	0.8845	246.72
140	0.8748	246.73
142	0.8682	246.73
144	0.8703	246.73
146	0.8618	246.74
148	0.8468	246.75
150	0.8459	246.75
152	0.8434	246.76

56	0.729	1.190	0.613
58	0.717	1.190	0.602
60	0.700	1.190	0.588
62	0.687	1.190	0.578
64	0.679	1.190	0.571
66	0.668	1.190	0.562
68	0.655	1.190	0.550
70	0.643	1.190	0.541
72	0.632	1.190	0.531
74	0.619	1.190	0.520
76	0.607	1.190	0.510
78	0.597	1.190	0.502
80	0.585	1.190	0.492
82	0.574	1.190	0.483
84	0.564	1.190	0.474
86	0.554	1.190	0.465
88	0.543	1.190	0.457
90	0.532	1.190	0.447
92	0.523	1.190	0.439
94	0.512	1.190	0.430
96	0.502	1.190	0.422
98	0.491	1.190	0.413
100	0.482	1.190	0.405
102	0.465	1.190	0.391
104	0.461	1.190	0.387
106	0.449	1.190	0.377
108	0.441	1.190	0.370
110	0.422	1.190	0.355
112	0.414	1.190	0.348
114	0.403	1.190	0.338
116	0.411	1.190	0.345
118	0.402	1.190	0.338
120	0.394	1.190	0.331
122	0.386	1.190	0.324
124	0.379	1.190	0.318
126	0.370	1.190	0.311
128	0.361	1.190	0.304
130	0.354	1.190	0.297
132	0.347	1.190	0.292
134	0.340	1.190	0.286
136	0.328	1.190	0.276
138	0.315	1.190	0.264
140	0.305	1.190	0.256
142	0.298	1.190	0.251
144	0.300	1.190	0.252
146	0.292	1.190	0.245
148	0.277	1.190	0.233
150	0.276	1.190	0.232
152	0.273	1.190	0.230

154	0.8371	246.76
156	0.8313	246.77
158	0.8252	246.77
160	0.8187	246.78
162	0.8126	246.79
164	0.8063	246.79
166	0.8004	246.80
168	0.7957	246.80
170	0.7896	246.81
172	0.7838	246.82
174	0.7778	246.82
176	0.7725	246.83
178	0.7672	246.83
180	0.7622	246.84
182	0.7571	246.84
184	0.7524	246.85
186	0.7468	246.85
188	0.7417	246.86
190	0.7372	246.86
192	0.7324	246.87
194	0.7279	246.87
196	0.7236	246.88
198	0.7183	246.88
200	0.7137	246.89
202	0.7091	246.89
204	0.706	246.89
206	0.7012	246.90
208	0.6968	246.90
210	0.6929	246.91

154	0.267	1.190	0.224
156	0.261	1.190	0.220
158	0.255	1.190	0.214
160	0.249	1.190	0.209
162	0.243	1.190	0.204
164	0.236	1.190	0.199
166	0.230	1.190	0.194
168	0.226	1.190	0.190
170	0.220	1.190	0.185
172	0.214	1.190	0.180
174	0.208	1.190	0.175
176	0.203	1.190	0.170
178	0.197	1.190	0.166
180	0.192	1.190	0.162
182	0.187	1.190	0.157
184	0.182	1.190	0.153
186	0.177	1.190	0.149
188	0.172	1.190	0.144
190	0.167	1.190	0.141
192	0.162	1.190	0.136
194	0.158	1.190	0.133
196	0.154	1.190	0.129
198	0.148	1.190	0.125
200	0.144	1.190	0.121
202	0.139	1.190	0.117
204	0.136	1.190	0.114
206	0.131	1.190	0.110
208	0.127	1.190	0.107
210	0.123	1.190	0.103

Plot of Normalized Head Versus Elapsed Time
Monitoring Well 6 (MW6) Slug Test



Date: 26-Nov-14
 Conducted by: JIN

Well Number: MW7
 Well Screen Bottom: 3.00 mbgs
 Top of Pipe: mags
 Well Casing Diameter:
 Well Elevation: masl
 Static Water Level: 1.43 mbgs
 Ground Elevation: 249.8

H = Static Water Level mbgs
 Ho = Head at time = 0 mbgs
 h = Water Level at time t mbgs
 To = 180 sec
 L = 150 cm
 2R = 15.24 cm
 2r = 5.08 cm

3.6E-04 cm/s

WATER LEVEL BEFORE TEST 1.39

Time t (sec)	Water Level (mbgs)	Water Level Elevation (masl)
0	1.825	247.98
2	1.8167	247.98
4	1.813	247.99
6	1.8115	247.99
8	1.8088	247.99
10	1.8073	247.99
12	1.8039	248.00
14	1.8023	248.00
16	1.8003	248.00
18	1.7942	248.01
20	1.7927	248.01
22	1.7918	248.01
24	1.7906	248.01
26	1.7878	248.01
28	1.7863	248.01
30	1.7839	248.02
32	1.779	248.02
34	1.7771	248.02
36	1.7757	248.02
38	1.7745	248.03
40	1.7708	248.03
42	1.767	248.03
44	1.7624	248.04
46	1.7589	248.04
48	1.7574	248.04
50	1.7557	248.04
52	1.7525	248.05
54	1.7502	248.05

Time t (sec)	H-h	H-Ho	(H-h)/(H-Ho)
0	0.435	0.435	1.000
2	0.427	0.435	0.981
4	0.423	0.435	0.972
6	0.422	0.435	0.969
8	0.419	0.435	0.963
10	0.417	0.435	0.959
12	0.414	0.435	0.951
14	0.412	0.435	0.948
16	0.410	0.435	0.943
18	0.404	0.435	0.929
20	0.403	0.435	0.926
22	0.402	0.435	0.924
24	0.401	0.435	0.921
26	0.398	0.435	0.914
28	0.396	0.435	0.911
30	0.394	0.435	0.906
32	0.389	0.435	0.894
34	0.387	0.435	0.890
36	0.386	0.435	0.887
38	0.385	0.435	0.884
40	0.381	0.435	0.875
42	0.377	0.435	0.867
44	0.372	0.435	0.856
46	0.369	0.435	0.848
48	0.367	0.435	0.845
50	0.366	0.435	0.841
52	0.363	0.435	0.833
54	0.360	0.435	0.828

56	1.7486	248.05
58	1.7467	248.05
60	1.7446	248.06
62	1.7431	248.06
64	1.7403	248.06
66	1.7386	248.06
68	1.7365	248.06
70	1.7342	248.07
72	1.7334	248.07
74	1.7303	248.07
76	1.7299	248.07
78	1.727	248.07
80	1.7252	248.07
82	1.7227	248.08
84	1.7211	248.08
86	1.7178	248.08
88	1.7158	248.08
90	1.7142	248.09
92	1.7138	248.09
94	1.712	248.09
96	1.7249	248.08
98	1.6985	248.10
100	1.6969	248.10
102	1.696	248.10
104	1.6948	248.11
106	1.693	248.11
108	1.6918	248.11
110	1.6898	248.11
112	1.6883	248.11
114	1.6861	248.11
116	1.686	248.11
118	1.6841	248.12
120	1.6837	248.12
122	1.6808	248.12
124	1.6807	248.12
126	1.6776	248.12
128	1.677	248.12
130	1.6758	248.12
132	1.6748	248.13
134	1.6723	248.13
136	1.6721	248.13
138	1.6716	248.13
140	1.6671	248.13
142	1.6637	248.14
144	1.6517	248.15
146	1.6457	248.15
148	1.6405	248.16
150	1.6353	248.16
152	1.6284	248.17

56	0.359	0.435	0.824
58	0.357	0.435	0.820
60	0.355	0.435	0.815
62	0.353	0.435	0.812
64	0.350	0.435	0.805
66	0.349	0.435	0.801
68	0.347	0.435	0.797
70	0.344	0.435	0.791
72	0.343	0.435	0.789
74	0.340	0.435	0.782
76	0.340	0.435	0.781
78	0.337	0.435	0.775
80	0.335	0.435	0.771
82	0.333	0.435	0.765
84	0.331	0.435	0.761
86	0.328	0.435	0.754
88	0.326	0.435	0.749
90	0.324	0.435	0.745
92	0.324	0.435	0.744
94	0.322	0.435	0.740
96	0.335	0.435	0.770
98	0.309	0.435	0.709
100	0.307	0.435	0.706
102	0.306	0.435	0.703
104	0.305	0.435	0.701
106	0.303	0.435	0.697
108	0.302	0.435	0.694
110	0.300	0.435	0.689
112	0.298	0.435	0.686
114	0.296	0.435	0.681
116	0.296	0.435	0.680
118	0.294	0.435	0.676
120	0.294	0.435	0.675
122	0.291	0.435	0.669
124	0.291	0.435	0.668
126	0.288	0.435	0.661
128	0.287	0.435	0.660
130	0.286	0.435	0.657
132	0.285	0.435	0.655
134	0.282	0.435	0.649
136	0.282	0.435	0.649
138	0.282	0.435	0.647
140	0.277	0.435	0.637
142	0.274	0.435	0.629
144	0.262	0.435	0.602
146	0.256	0.435	0.588
148	0.251	0.435	0.576
150	0.245	0.435	0.564
152	0.238	0.435	0.548

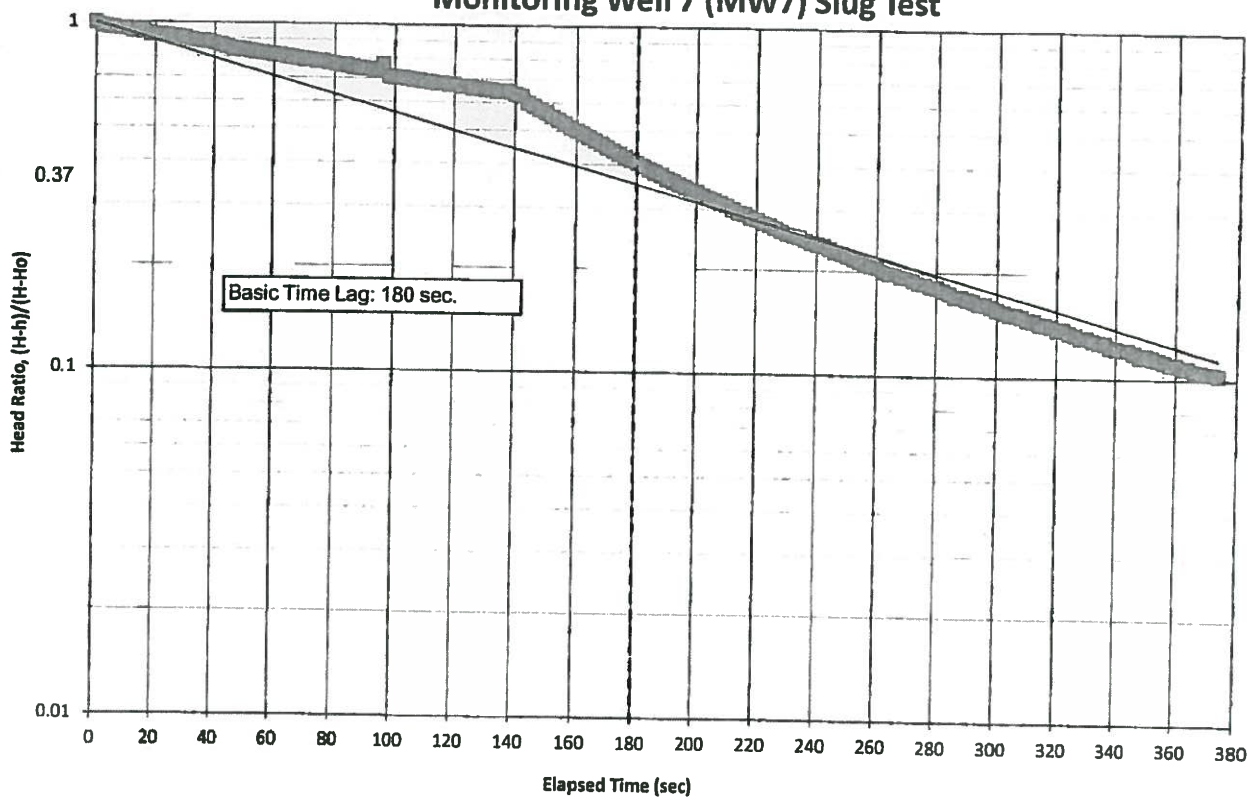
154	1.6233	248.18
156	1.6183	248.18
158	1.6121	248.19
160	1.6073	248.19
162	1.603	248.20
164	1.5987	248.20
166	1.5939	248.21
168	1.5898	248.21
170	1.5852	248.21
172	1.5809	248.22
174	1.5771	248.22
176	1.5731	248.23
178	1.5696	248.23
180	1.5662	248.23
182	1.5626	248.24
184	1.5591	248.24
186	1.5557	248.24
188	1.553	248.25
190	1.5491	248.25
192	1.5467	248.25
194	1.5434	248.26
196	1.5407	248.26
198	1.5383	248.26
200	1.5362	248.26
202	1.5328	248.27
204	1.5301	248.27
206	1.5282	248.27
208	1.5258	248.27
210	1.5241	248.28
212	1.5205	248.28
214	1.5178	248.28
216	1.5166	248.28
218	1.5135	248.29
220	1.5122	248.29
222	1.5095	248.29
224	1.5083	248.29
226	1.5057	248.29
228	1.5032	248.30
230	1.5013	248.30
232	1.5005	248.30
234	1.4993	248.30
236	1.4971	248.30
238	1.4954	248.30
240	1.4941	248.31
242	1.4932	248.31
244	1.4911	248.31
246	1.4889	248.31
248	1.4879	248.31
250	1.4865	248.31
252	1.485	248.32
254	1.4832	248.32
256	1.4819	248.32

154	0.233	0.435	0.536
156	0.228	0.435	0.525
158	0.222	0.435	0.511
160	0.217	0.435	0.500
162	0.213	0.435	0.490
164	0.209	0.435	0.480
166	0.204	0.435	0.469
168	0.200	0.435	0.459
170	0.195	0.435	0.449
172	0.191	0.435	0.439
174	0.187	0.435	0.430
176	0.183	0.435	0.421
178	0.180	0.435	0.413
180	0.176	0.435	0.405
182	0.173	0.435	0.397
184	0.169	0.435	0.389
186	0.166	0.435	0.381
188	0.163	0.435	0.375
190	0.159	0.435	0.366
192	0.157	0.435	0.360
194	0.153	0.435	0.353
196	0.151	0.435	0.346
198	0.148	0.435	0.341
200	0.146	0.435	0.336
202	0.143	0.435	0.328
204	0.140	0.435	0.322
206	0.138	0.435	0.318
208	0.136	0.435	0.312
210	0.134	0.435	0.308
212	0.131	0.435	0.300
214	0.128	0.435	0.294
216	0.127	0.435	0.291
218	0.124	0.435	0.284
220	0.122	0.435	0.281
222	0.120	0.435	0.275
224	0.118	0.435	0.272
226	0.116	0.435	0.266
228	0.113	0.435	0.260
230	0.111	0.435	0.256
232	0.111	0.435	0.254
234	0.109	0.435	0.251
236	0.107	0.435	0.246
238	0.105	0.435	0.242
240	0.104	0.435	0.239
242	0.103	0.435	0.237
244	0.101	0.435	0.232
246	0.099	0.435	0.227
248	0.098	0.435	0.225
250	0.097	0.435	0.222
252	0.095	0.435	0.218
254	0.093	0.435	0.214
256	0.092	0.435	0.211

258	1.4806	248.32
260	1.4799	248.32
262	1.4774	248.32
264	1.4763	248.32
266	1.4763	248.32
268	1.4746	248.33
270	1.4744	248.33
272	1.4727	248.33
274	1.4711	248.33
276	1.4709	248.33
278	1.4694	248.33
280	1.4688	248.33
282	1.4674	248.33
284	1.4661	248.33
286	1.464	248.34
288	1.4642	248.34
290	1.463	248.34
292	1.4623	248.34
294	1.4609	248.34
296	1.4608	248.34
298	1.4596	248.34
300	1.4582	248.34
302	1.4572	248.34
304	1.4564	248.34
306	1.4561	248.34
308	1.4553	248.34
310	1.454	248.35
312	1.4535	248.35
314	1.4522	248.35
316	1.4519	248.35
318	1.4514	248.35
320	1.4498	248.35
322	1.4502	248.35
324	1.4488	248.35
326	1.4482	248.35
328	1.4469	248.35
330	1.4469	248.35
332	1.446	248.35
334	1.4454	248.35
336	1.4451	248.35
338	1.4436	248.36
340	1.4432	248.36
342	1.4428	248.36
344	1.4428	248.36
346	1.4418	248.36
348	1.4405	248.36
350	1.4409	248.36
352	1.4402	248.36
354	1.4395	248.36
356	1.4389	248.36
358	1.4381	248.36
360	1.438	248.36

258	0.091	0.435	0.208
260	0.090	0.435	0.207
262	0.087	0.435	0.201
264	0.086	0.435	0.198
266	0.086	0.435	0.198
268	0.085	0.435	0.194
270	0.084	0.435	0.194
272	0.083	0.435	0.190
274	0.081	0.435	0.186
276	0.081	0.435	0.186
278	0.079	0.435	0.183
280	0.079	0.435	0.181
282	0.077	0.435	0.178
284	0.076	0.435	0.175
286	0.074	0.435	0.170
288	0.074	0.435	0.171
290	0.073	0.435	0.168
292	0.072	0.435	0.166
294	0.071	0.435	0.163
296	0.071	0.435	0.163
298	0.070	0.435	0.160
300	0.068	0.435	0.157
302	0.067	0.435	0.154
304	0.066	0.435	0.153
306	0.066	0.435	0.152
308	0.065	0.435	0.150
310	0.064	0.435	0.147
312	0.064	0.435	0.146
314	0.062	0.435	0.143
316	0.062	0.435	0.142
318	0.061	0.435	0.141
320	0.060	0.435	0.137
322	0.060	0.435	0.138
324	0.059	0.435	0.135
326	0.058	0.435	0.134
328	0.057	0.435	0.131
330	0.057	0.435	0.131
332	0.056	0.435	0.129
334	0.055	0.435	0.127
336	0.055	0.435	0.127
338	0.054	0.435	0.123
340	0.053	0.435	0.122
342	0.053	0.435	0.121
344	0.053	0.435	0.121
346	0.052	0.435	0.119
348	0.051	0.435	0.116
350	0.051	0.435	0.117
352	0.050	0.435	0.115
354	0.049	0.435	0.114
356	0.049	0.435	0.112
358	0.048	0.435	0.111
360	0.048	0.435	0.110

Plot of Normalized Head Versus Elapsed Time
Monitoring Well 7 (MW7) Slug Test



Date: 26-Nov-14

Conducted by: JIN

Well Number: MW8

Well Screen Bottom: 6.00 mbgs

Top of Pipe: mags

Well Casing Diameter:

Well Elevation: masl

Static Water Level: 1.40 mbgs

Ground Elevation: 249.8

WATER LEVEL BEFORE TEST

1.29

H = Static Water Level mbgs

Ho = Head at time = 0 mbgs

h = Water Level at time t mbgs

To = 3700 sec

L = 300 cm

2R = 15.24 cm

2r = 5.08 cm

1.1E-05 cm/s

Time t (sec)	Water Level (mbgs)	Water Level Elevation (masl)
0	3.085	246.72
2	3.0787	246.72
4	3.0739	246.73
6	3.0702	246.73
8	3.0662	246.73
10	3.0624	246.74
12	3.0596	246.74
14	3.0551	246.74
16	3.0513	246.75
18	3.0492	246.75
20	3.0496	246.75
22	3.0494	246.75
24	3.0463	246.75
26	3.044	246.76
28	3.0144	246.79
30	3.0184	246.78
32	3.0317	246.77
34	3.0387	246.76
36	3.0263	246.77
38	3.0348	246.77
40	3.0265	246.77
42	3.029	246.77
44	3.0287	246.77
46	3.0265	246.77
48	3.0245	246.78
50	3.0194	246.78
52	2.9747	246.83
54	3.032	246.77

Time t (sec)	H-h	H-Ho	(H-h)/(H-Ho)
0	1.795	1.795	1.000
2	1.789	1.795	0.996
4	1.784	1.795	0.994
6	1.780	1.795	0.992
8	1.776	1.795	0.990
10	1.772	1.795	0.987
12	1.770	1.795	0.986
14	1.765	1.795	0.983
16	1.761	1.795	0.981
18	1.759	1.795	0.980
20	1.760	1.795	0.980
22	1.759	1.795	0.980
24	1.756	1.795	0.978
26	1.754	1.795	0.977
28	1.724	1.795	0.961
30	1.728	1.795	0.963
32	1.742	1.795	0.970
34	1.749	1.795	0.974
36	1.736	1.795	0.967
38	1.745	1.795	0.972
40	1.737	1.795	0.967
42	1.739	1.795	0.969
44	1.739	1.795	0.969
46	1.737	1.795	0.967
48	1.735	1.795	0.966
50	1.729	1.795	0.963
52	1.685	1.795	0.939
54	1.742	1.795	0.970

56	3.0183	246.78
58	3.0176	246.78
60	3.0153	246.78
62	3.0144	246.79
64	3.0124	246.79
66	3.0109	246.79
68	3.0086	246.79
70	3.0078	246.79
72	3.0067	246.79
74	3.0042	246.80
76	3.0024	246.80
78	3.0015	246.80
80	3.0008	246.80
82	2.9985	246.80
84	2.9963	246.80
86	2.9956	246.80
88	2.9941	246.81
90	2.9934	246.81
92	2.9918	246.81
94	2.9892	246.81
96	2.9888	246.81
98	2.9871	246.81
100	2.9861	246.81
102	2.9842	246.82
104	2.9826	246.82
106	2.9809	246.82
108	2.9811	246.82
110	2.9781	246.82
112	2.9772	246.82
114	2.9762	246.82
116	2.974	246.83
118	2.9733	246.83
120	2.9711	246.83
122	2.9706	246.83
124	2.9685	246.83
126	2.9622	246.84
128	2.9606	246.84
130	2.9579	246.84
132	2.9589	246.84
134	2.9615	246.84
136	2.9564	246.84
138	2.9583	246.84
140	2.9549	246.85
142	2.9577	246.84
144	2.9547	246.85
146	2.9538	246.85
148	2.9495	246.85
150	2.9268	246.87
152	2.9431	246.86

56	1.728	1.795	0.963
58	1.728	1.795	0.962
60	1.725	1.795	0.961
62	1.724	1.795	0.961
64	1.722	1.795	0.960
66	1.721	1.795	0.959
68	1.719	1.795	0.957
70	1.718	1.795	0.957
72	1.717	1.795	0.956
74	1.714	1.795	0.955
76	1.712	1.795	0.954
78	1.712	1.795	0.953
80	1.711	1.795	0.953
82	1.709	1.795	0.952
84	1.706	1.795	0.951
86	1.706	1.795	0.950
88	1.704	1.795	0.949
90	1.703	1.795	0.949
92	1.702	1.795	0.948
94	1.699	1.795	0.947
96	1.699	1.795	0.946
98	1.697	1.795	0.945
100	1.696	1.795	0.945
102	1.694	1.795	0.944
104	1.693	1.795	0.943
106	1.691	1.795	0.942
108	1.691	1.795	0.942
110	1.688	1.795	0.940
112	1.687	1.795	0.940
114	1.686	1.795	0.939
116	1.684	1.795	0.938
118	1.683	1.795	0.938
120	1.681	1.795	0.937
122	1.681	1.795	0.936
124	1.679	1.795	0.935
126	1.672	1.795	0.932
128	1.671	1.795	0.931
130	1.668	1.795	0.929
132	1.669	1.795	0.930
134	1.672	1.795	0.931
136	1.666	1.795	0.928
138	1.668	1.795	0.929
140	1.665	1.795	0.928
142	1.668	1.795	0.929
144	1.665	1.795	0.927
146	1.664	1.795	0.927
148	1.660	1.795	0.925
150	1.637	1.795	0.912
152	1.653	1.795	0.921

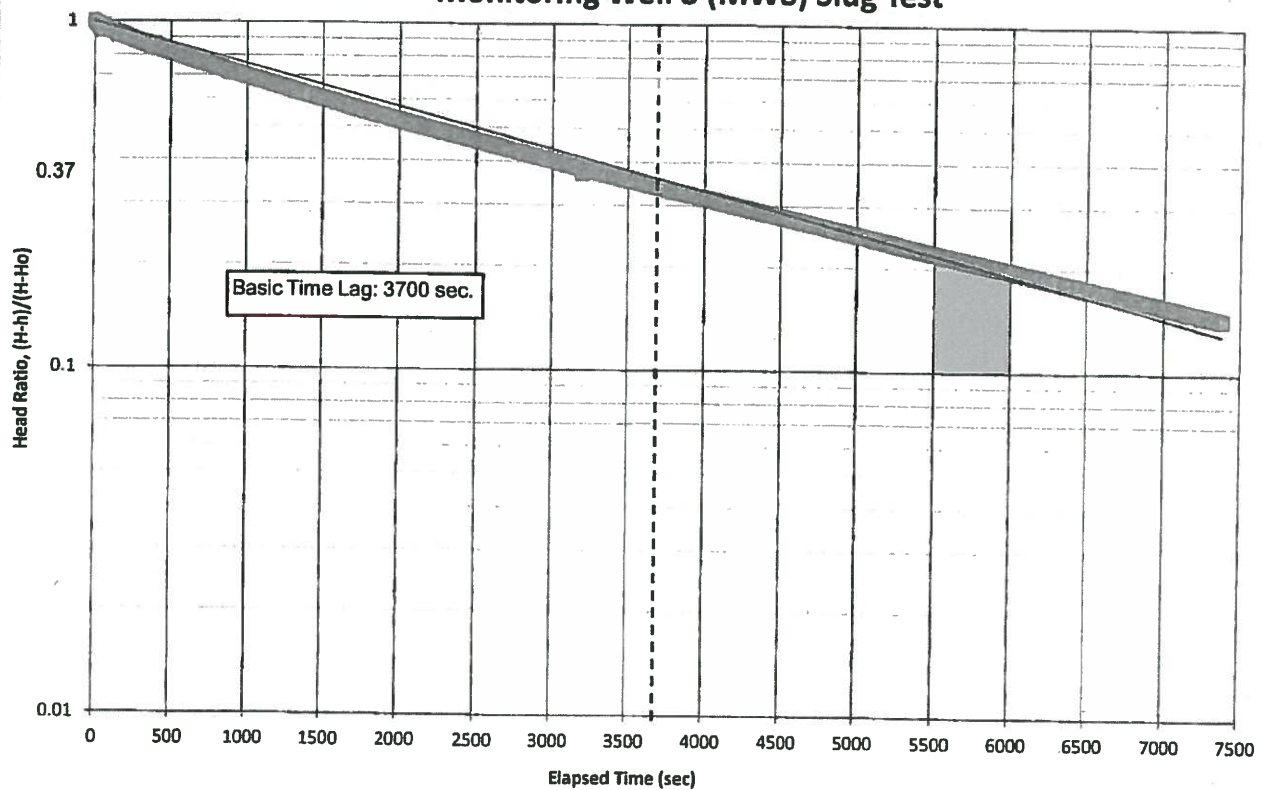
154	2.9479	246.85
156	2.9479	246.85
158	2.9467	246.85
160	2.9462	246.85
162	2.944	246.86
164	2.9423	246.86
166	2.9397	246.86
168	2.9386	246.86
170	2.9368	246.86
172	2.9357	246.86
174	2.9352	246.86
176	2.934	246.87
178	2.9321	246.87
180	2.9302	246.87
182	2.9302	246.87
184	2.9285	246.87
186	2.9266	246.87
188	2.9254	246.87
190	2.9241	246.88
192	2.9233	246.88
194	2.9211	246.88
196	2.921	246.88
198	2.9199	246.88
200	2.9172	246.88
202	2.9153	246.88
204	2.9154	246.88
206	2.9133	246.89
208	2.9121	246.89
210	2.911	246.89
212	2.9089	246.89
214	2.9084	246.89
216	2.9069	246.89
218	2.9057	246.89
220	2.9043	246.90
222	2.9033	246.90
224	2.9018	246.90
226	2.9003	246.90
228	2.9	246.90
230	2.898	246.90
232	2.8959	246.90
234	2.8955	246.90
236	2.8935	246.91
238	2.894	246.91
240	2.891	246.91
242	2.8898	246.91
244	2.8886	246.91
246	2.8889	246.91
248	2.8864	246.91
250	2.8849	246.92
252	2.8827	246.92
254	2.8829	246.92
256	2.8809	246.92

154	1.658	1.795	0.924
156	1.658	1.795	0.924
158	1.657	1.795	0.923
160	1.656	1.795	0.923
162	1.654	1.795	0.921
164	1.652	1.795	0.921
166	1.650	1.795	0.919
168	1.649	1.795	0.918
170	1.647	1.795	0.917
172	1.646	1.795	0.917
174	1.645	1.795	0.917
176	1.644	1.795	0.916
178	1.642	1.795	0.915
180	1.640	1.795	0.914
182	1.640	1.795	0.914
184	1.639	1.795	0.913
186	1.637	1.795	0.912
188	1.635	1.795	0.911
190	1.634	1.795	0.910
192	1.633	1.795	0.910
194	1.631	1.795	0.909
196	1.631	1.795	0.909
198	1.630	1.795	0.908
200	1.627	1.795	0.907
202	1.625	1.795	0.905
204	1.625	1.795	0.906
206	1.623	1.795	0.904
208	1.622	1.795	0.904
210	1.621	1.795	0.903
212	1.619	1.795	0.902
214	1.618	1.795	0.902
216	1.617	1.795	0.901
218	1.616	1.795	0.900
220	1.614	1.795	0.899
222	1.613	1.795	0.899
224	1.612	1.795	0.898
226	1.610	1.795	0.897
228	1.610	1.795	0.897
230	1.608	1.795	0.896
232	1.606	1.795	0.895
234	1.606	1.795	0.894
236	1.604	1.795	0.893
238	1.604	1.795	0.894
240	1.601	1.795	0.892
242	1.600	1.795	0.891
244	1.599	1.795	0.891
246	1.599	1.795	0.891
248	1.596	1.795	0.889
250	1.595	1.795	0.889
252	1.593	1.795	0.887
254	1.593	1.795	0.887
256	1.591	1.795	0.886

258	2.8806	246.92
260	2.8786	246.92
262	2.8772	246.92
264	2.8769	246.92
266	2.8747	246.93
268	2.8736	246.93
270	2.8725	246.93
272	2.8717	246.93
274	2.8698	246.93
276	2.8691	246.93
278	2.8685	246.93
280	2.8664	246.93
282	2.8657	246.93
284	2.8647	246.94
286	2.8636	246.94
288	2.8618	246.94
290	2.8607	246.94
292	2.8596	246.94
294	2.8584	246.94
296	2.8574	246.94
298	2.8572	246.94
300	2.856	246.94
302	2.8538	246.95
304	2.8523	246.95
306	2.852	246.95
308	2.8502	246.95
310	2.8486	246.95
312	2.8466	246.95
314	2.8464	246.95
316	2.8448	246.96
318	2.8443	246.96
320	2.8434	246.96
322	2.8422	246.96
324	2.8413	246.96
326	2.8396	246.96
328	2.8395	246.96
330	2.837	246.96
332	2.8368	246.96
334	2.8359	246.96
336	2.8343	246.97
338	2.8334	246.97
340	2.8321	246.97
342	2.8308	246.97
344	2.8302	246.97
346	2.8284	246.97
348	2.8277	246.97
350	2.8267	246.97
352	2.8265	246.97
354	2.8244	246.98
356	2.8237	246.98
358	2.8232	246.98
360	2.8218	246.98

258	1.591	1.795	0.886
260	1.589	1.795	0.885
262	1.587	1.795	0.884
264	1.587	1.795	0.884
266	1.585	1.795	0.883
268	1.584	1.795	0.882
270	1.583	1.795	0.882
272	1.582	1.795	0.881
274	1.580	1.795	0.880
276	1.579	1.795	0.880
278	1.579	1.795	0.879
280	1.576	1.795	0.878
282	1.576	1.795	0.878
284	1.575	1.795	0.877
286	1.574	1.795	0.877
288	1.572	1.795	0.876
290	1.571	1.795	0.875
292	1.570	1.795	0.874
294	1.568	1.795	0.874
296	1.567	1.795	0.873
298	1.567	1.795	0.873
300	1.566	1.795	0.872
302	1.564	1.795	0.871
304	1.562	1.795	0.870
306	1.562	1.795	0.870
308	1.560	1.795	0.869
310	1.559	1.795	0.868
312	1.557	1.795	0.867
314	1.556	1.795	0.867
316	1.555	1.795	0.866
318	1.554	1.795	0.866
320	1.553	1.795	0.865
322	1.552	1.795	0.865
324	1.551	1.795	0.864
326	1.550	1.795	0.863
328	1.550	1.795	0.863
330	1.547	1.795	0.862
332	1.547	1.795	0.862
334	1.546	1.795	0.861
336	1.544	1.795	0.860
338	1.543	1.795	0.860
340	1.542	1.795	0.859
342	1.541	1.795	0.858
344	1.540	1.795	0.858
346	1.538	1.795	0.857
348	1.538	1.795	0.857
350	1.537	1.795	0.856
352	1.537	1.795	0.856
354	1.534	1.795	0.855
356	1.534	1.795	0.854
358	1.533	1.795	0.854
360	1.532	1.795	0.853

Plot of Normalized Head Versus Elapsed Time
Monitoring Well 8 (MW8) Slug Test





APPENDIX D

Water and Soil Samples Laboratory Certificates of Analyses

CLIENT NAME: PETO MACCALLUM LIMITED
165 CARTWRIGHT AVENUE
TORONTO, ON M6A1V5
(416) 785-5110

ATTENTION TO: Andrew Cooke

PROJECT: 14TF023

AGAT WORK ORDER: 14T921310

TRACE ORGANICS REVIEWED BY: Neli Popnikolova, Senior Chemist

WATER ANALYSIS REVIEWED BY: Sofka Pehlyova, Senior Analyst

DATE REPORTED: Dec 05, 2014

PAGES (INCLUDING COVER): 8

VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (905) 712-5100

*NOTES

All samples will be disposed of within 30 days following analysis. Please contact the lab if you require additional sample storage time.

Certificate of Analysis

AGAT WORK ORDER: 14T921310

PROJECT: 14TF023

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
<http://www.agatlabs.com>

CLIENT NAME: PETO MACCALLUM LIMITED

ATTENTION TO: Andrew Cooke

SAMPLING SITE:

SAMPLED BY: Jinsuko

O. Reg. 153(511) - OC Pesticides (Water)

DATE RECEIVED: 2014-11-27

DATE REPORTED: 2014-12-05

Parameter	Unit	SAMPLE DESCRIPTION:		S	MW1	MW5
		SAMPLE TYPE:		Water	Water	Water
		DATE SAMPLED:		11/26/2014	11/26/2014	11/26/2014
		G / S	RDL	6126775	6126787	6126798
Gamma-Hexachlorocyclohexane	µg/L	0.01	0.01	<0.01	<0.01	<0.01
Heptachlor	µg/L	0.01	0.01	<0.01	<0.01	<0.01
Aldrin	µg/L	0.01	0.01	<0.01	<0.01	<0.01
Heptachlor Epoxide	µg/L	0.01	0.01	<0.01	<0.01	<0.01
Endosulfan	µg/L	0.05	0.05	<0.05	<0.05	<0.05
Chlordane	µg/L	0.06	0.04	<0.04	<0.04	<0.04
DDE	µg/L	10	0.01	<0.01	<0.01	<0.01
DDD	µg/L	1.8	0.05	<0.05	<0.05	<0.05
DDT	µg/L	0.05	0.04	<0.04	<0.04	<0.04
Dieldrin	µg/L	0.05	0.02	<0.02	<0.02	<0.02
Endrin	µg/L	0.05	0.05	<0.05	<0.05	<0.05
Methoxychlor	µg/L	0.05	0.04	<0.04	<0.04	<0.04
Hexachlorobenzene	ug/L	0.01	0.01	<0.01	<0.01	<0.01
Hexachlorobutadiene	ug/L	0.01	0.01	<0.01	<0.01	<0.01
Hexachloroethane	ug/L	0.01	0.01	<0.01	<0.01	<0.01
Surrogate	Unit	Acceptable Limits				
TCMX	%	50-140	121	113	117	
Decachlorobiphenyl	%	60-140	98	94	99	

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to T1(ALL GW) - Current

6126775-6126798 Note: DDT applies to the total of op'DDT and pp'DDT, DDD applies to the total of op'DDD and pp'DDD and DDE applies to the total of op'DDE and pp'DDE. Endosulfan applies to the total of Endosulfan I and Endosulfan II.

Chlordane applies to the total of Alpha-Chlordane and Gamma-Chlordane.

Certified By:





AGAT Laboratories

Certificate of Analysis

AGAT WORK ORDER: 14T921310

PROJECT: 14TF023

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
<http://www.agatlabs.com>

CLIENT NAME: PETO MACCALLUM LIMITED

SAMPLING SITE:

ATTENTION TO: Andrew Cooke

SAMPLED BY: Jinsuko

BOD (Water)						
DATE RECEIVED: 2014-11-27				DATE REPORTED: 2014-12-05		
		SAMPLE DESCRIPTION:		S	MW1	MW5
		SAMPLE TYPE:		Water	Water	Water
		DATE SAMPLED:		11/26/2014	11/26/2014	11/26/2014
Parameter	Unit	G / S	RDL	6126775	6126787	6126798
BOD (5)	mg/L	5	11	<5	<5	

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

Certified By:

Sofra Pehlyora



AGAT Laboratories

Certificate of Analysis

AGAT WORK ORDER: 14T921310

PROJECT: 14TF023

5835 COOPERS AVENUE
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<http://www.agatlabs.com>

CLIENT NAME: PETO MACCALLUM LIMITED

ATTENTION TO: Andrew Cooke

SAMPLING SITE:

SAMPLED BY: Jinsuko

O. Reg. 153(511) - Metals (Comprehensive) (Water)

DATE RECEIVED: 2014-11-27

DATE REPORTED: 2014-12-05

Parameter	Unit	SAMPLE DESCRIPTION:		S	MW1	MW5
		SAMPLE TYPE:		Water	Water	Water
		DATE SAMPLED:		11/26/2014	11/26/2014	11/26/2014
		G / S	RDL	6126775	6126787	6126798
Antimony	µg/L	1.5	0.5	<0.5	<0.5	<0.5
Arsenic	µg/L	13	1.0	1.4	2.0	1.2
Barium	µg/L	610	2.0	37.0	64.3	45.4
Beryllium	µg/L	0.5	0.5	<0.5	<0.5	<0.5
Boron	µg/L	1700	10.0	30.5	35.6	44.9
Cadmium	µg/L	0.5	0.2	<0.2	<0.2	<0.2
Chromium	µg/L	11	2.0	8.0	2.6	<2.0
Cobalt	µg/L	3.8	0.5	1.4	<0.5	2.1
Copper	µg/L	5	1.0	13.7	2.2	1.7
Lead	µg/L	1.9	0.5	0.6	<0.5	<0.5
Molybdenum	µg/L	23	0.5	8.8	18.5	1.8
Nickel	µg/L	14	1.0	7.4	<1.0	9.0
Selenium	µg/L	5	1.0	1.4	1.8	<1.0
Silver	µg/L	0.3	0.2	<0.2	<0.2	<0.2
Thallium	µg/L	0.5	0.3	<0.3	<0.3	<0.3
Uranium	µg/L	8.9	0.5	1.8	4.4	13.1
Vanadium	µg/L	3.9	0.4	10.1	4.3	<0.4
Zinc	µg/L	160	5.0	14.3	<5.0	7.4

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to T1(ALL GW) - Current

Certified By:

Sofia Pehlyova



AGAT Laboratories

Guideline Violation

AGAT WORK ORDER: 14T921310

PROJECT: 14TF023

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
<http://www.agatlabs.com>

CLIENT NAME: PETO MACCALLUM LIMITED

ATTENTION TO: Andrew Cooke

SAMPLEID	SAMPLE TITLE	GUIDELINE	ANALYSIS PACKAGE	PARAMETER	GUIDEVALUE	RESULT
6126775	S	T1(ALL GW) - Current	O. Reg. 153(511) - Metals (Comprehensive) (Water)	Copper	5	13.7
6126775	S	T1(ALL GW) - Current	O. Reg. 153(511) - Metals (Comprehensive) (Water)	Vanadium	3.9	10.1
6126787	MW1	T1(ALL GW) - Current	O. Reg. 153(511) - Metals (Comprehensive) (Water)	Vanadium	3.9	4.3
6126798	MW5	T1(ALL GW) - Current	O. Reg. 153(511) - Metals (Comprehensive) (Water)	Uranium	8.9	13.1



Quality Assurance

CLIENT NAME: PETO MACCALLUM LIMITED

PROJECT: 14TF023

SAMPLING SITE:

AGAT WORK ORDER: 14T921310

ATTENTION TO: Andrew Cooke

SAMPLED BY: Jinsuko

Trace Organics Analysis

RPT Date: Dec 05, 2014			DUPLICATE			Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD		Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
O. Reg. 153(511) - OC Pesticides (Water)															
Gamma-Hexachlorocyclohexane	6123474		< 0.01	< 0.01	0.0%	< 0.01	103%	50%	140%	77%	50%	140%	64%	50%	140%
Heptachlor	6123474		< 0.01	< 0.01	0.0%	< 0.01	54%	50%	140%	99%	50%	140%	98%	50%	140%
Aldrin	6123474		< 0.01	< 0.01	0.0%	< 0.01	94%	50%	140%	125%	50%	140%	101%	50%	140%
Heptachlor Epoxide	6123474		< 0.01	< 0.01	0.0%	< 0.01	92%	50%	140%	123%	50%	140%	100%	50%	140%
Endosulfan	6123474		< 0.05	< 0.05	0.0%	< 0.05	114%	50%	140%	119%	50%	140%	95%	50%	140%
Chlordane	6123474		< 0.04	< 0.04	0.0%	< 0.04	121%	50%	140%	117%	50%	140%	102%	50%	140%
DDE	6123474		< 0.01	< 0.01	0.0%	< 0.01	114%	50%	140%	121%	50%	140%	100%	50%	140%
DDD	6123474		< 0.05	< 0.05	0.0%	< 0.05	108%	50%	140%	128%	50%	140%	107%	50%	140%
DDT	6123474		< 0.04	< 0.04	0.0%	< 0.04	86%	50%	140%	70%	50%	140%	71%	50%	140%
Dieldrin	6123474		< 0.02	< 0.02	0.0%	< 0.02	92%	50%	140%	123%	50%	140%	99%	50%	140%
Endrin	6123474		< 0.05	< 0.05	0.0%	< 0.05	97%	50%	140%	132%	50%	140%	120%	50%	140%
Methoxychlor	6123474		< 0.04	< 0.04	0.0%	< 0.04	55%	50%	140%	87%	50%	140%	98%	50%	140%
Hexachlorobenzene	6123474		< 0.01	< 0.01	0.0%	< 0.01	88%	50%	140%	106%	50%	140%	89%	50%	140%
Hexachlorobutadiene	6123474		< 0.01	< 0.01	0.0%	< 0.01	132%	50%	140%	138%	50%	140%	117%	50%	140%
Hexachloroethane	6123474		< 0.01	< 0.01	0.0%	< 0.01	114%	50%	140%	131%	50%	140%	122%	50%	140%

Certified By:

Quality Assurance

CLIENT NAME: PETO MACCALLUM LIMITED

PROJECT: 14TF023

SAMPLING SITE:

AGAT WORK ORDER: 14T921310

ATTENTION TO: Andrew Cooke

SAMPLED BY: Jinsuko

Water Analysis															
RPT Date: Dec 05, 2014			DUPLICATE			Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD		Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper

O. Reg. 153(511) - Metals (Comprehensive) (Water)

Antimony	6126775	6126775	<0.5	<0.5	0.0%	< 0.5	101%	70%	130%	98%	80%	120%	103%	70%	130%
Arsenic	6126775	6126775	1.4	1.5	6.9%	< 1.0	100%	70%	130%	99%	80%	120%	115%	70%	130%
Barium	6126775	6126775	37.0	38.1	2.9%	< 2.0	100%	70%	130%	100%	80%	120%	99%	70%	130%
Beryllium	6126775	6126775	<0.5	<0.5	0.0%	< 0.5	97%	70%	130%	98%	80%	120%	107%	70%	130%
Boron	6126775	6126775	30.5	33.8	10.3%	< 10.0	100%	70%	130%	102%	80%	120%	104%	70%	130%
Cadmium	6126775	6126775	<0.2	<0.2	0.0%	< 0.2	98%	70%	130%	100%	80%	120%	107%	70%	130%
Chromium	6126775	6126775	8.0	8.2	2.5%	< 2.0	101%	70%	130%	100%	80%	120%	109%	70%	130%
Cobalt	6126775	6126775	1.4	1.5	6.9%	< 0.5	98%	70%	130%	98%	80%	120%	103%	70%	130%
Copper	6126775	6126775	13.7	13.7	0.0%	< 1.0	99%	70%	130%	100%	80%	120%	93%	70%	130%
Lead	6126775	6126775	0.6	0.6	0.0%	< 0.5	94%	70%	130%	97%	80%	120%	96%	70%	130%
Molybdenum	6126775	6126775	8.8	9.4	6.6%	< 0.5	96%	70%	130%	97%	80%	120%	105%	70%	130%
Nickel	6126775	6126775	7.4	7.2	2.7%	< 1.0	97%	70%	130%	98%	80%	120%	100%	70%	130%
Selenium	6126775	6126775	1.4	1.7	19.4%	< 1.0	102%	70%	130%	104%	80%	120%	123%	70%	130%
Silver	6126775	6126775	<0.2	<0.2	0.0%	< 0.2	94%	70%	130%	101%	80%	120%	71%	70%	130%
Thallium	6126775	6126775	<0.3	<0.3	0.0%	< 0.3	96%	70%	130%	97%	80%	120%	97%	70%	130%
Uranium	6126775	6126775	1.8	1.8	0.0%	< 0.5	95%	70%	130%	98%	80%	120%	100%	70%	130%
Vanadium	6126775	6126775	10.1	10.3	2.0%	< 0.4	107%	70%	130%	107%	80%	120%	118%	70%	130%
Zinc	6126775	6126775	14.3	15.0	4.8%	< 5.0	103%	70%	130%	103%	80%	120%	118%	70%	130%

BOD (Water)

BOD (5)	6127809	593	589	0.7%	< 5	101%	75%	125%	NA				NA		
---------	---------	-----	-----	------	-----	------	-----	------	----	--	--	--	----	--	--

Comments: NA signifies Not Applicable.

Certified By:



Method Summary

CLIENT NAME: PETO MACCALLUM LIMITED

AGAT WORK ORDER: 14T921310

PROJECT: 14TF023

ATTENTION TO: Andrew Cooke

SAMPLING SITE:

SAMPLED BY: Jinsuko

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Trace Organics Analysis			
Gamma-Hexachlorocyclohexane	ORG-91-5112	EPA SW-846 3510 & 8081	GC/ECD
Heptachlor	ORG-91-5112	EPA SW-846 3510 & 8081	GC/ECD
Aldrin	ORG-91-5112	EPA SW-846 3510 & 8081	GC/ECD
Heptachlor Epoxide	ORG-91-5112	EPA SW-846 3510 & 8081	GC/ECD
Endosulfan	ORG-91-5112	EPA SW-846 3510 & 8081	GC/ECD
Chlordane	ORG-91-5112	EPA SW-846 3510 & 8081	GC/ECD
DDE	ORG-91-5112	EPA SW-846 3510 & 8081	GC/ECD
DDD	ORG-91-5112	EPA SW-846 3510 & 8081	GC/ECD
DDT	ORG-91-5112	EPA SW-846 3510 & 8081	GC/ECD
Dieldrin	ORG-91-5112	EPA SW-846 3510 & 8081	GC/ECD
Endrin	ORG-91-5112	EPA SW-846 3510 & 8081	GC/ECD
Methoxychlor	ORG-91-5112	EPA SW-846 3510 & 8081	GC/ECD
Hexachlorobenzene	ORG-91-5112	EPA SW-846 3510 & 8081	GC/ECD
Hexachlorobutadiene	ORG-91-5112	EPA SW-846 3510 & 8081	GC/ECD
Hexachloroethane	ORG-91-5112	EPA SW-846 3510 & 8081	GC/ECD
TCMX	ORG-91-5112	EPA SW-846 3510 & 8081	GC/ECD
Decachlorobiphenyl	ORG-91-5112	EPA SW-846 3510 & 8081	GC/ECD
Water Analysis			
BOD (5)	INOR-93-6006	SM 5210 B	DO METER
Antimony	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Arsenic	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Barium	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Beryllium	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Boron	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Cadmium	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Chromium	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Cobalt	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Copper	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Lead	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Molybdenum	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Nickel	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Selenium	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Silver	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Thallium	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Uranium	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Vanadium	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Zinc	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS



Date Recd: Mar. 21, 2000

CLIENT NAME: PETO MACCALLUM LIMITED
165 CARTWRIGHT AVENUE
TORONTO, ON M6A1V5
(416) 785-5110

ATTENTION TO: Andrew Cooke

PROJECT: 14TF023

AGAT WORK ORDER: 14T881937

SOIL ANALYSIS REVIEWED BY: Anthony Dapaah, PhD (Chem), Inorganic Lab Manager

DATE REPORTED: Sep 11, 2014

PAGES (INCLUDING COVER): 4

VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (905) 712-5100

*NOTES

All samples will be disposed of within 30 days following analysis. Please contact the lab if you require additional sample storage time.



AGAT Laboratories

Certificate of Analysis

AGAT WORK ORDER: 14T881937

PROJECT: 14TF023

5835 COOPERS AVENUE
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CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
<http://www.agatllabs.com>

CLIENT NAME: PETO MACCALLUM LIMITED

SAMPLING SITE:

ATTENTION TO: Andrew Cooke

SAMPLED BY: Bujing Guan

Corrosivity Package

DATE RECEIVED: 2014-08-28

DATE REPORTED: 2014-09-11

		SAMPLE DESCRIPTION:		MW1 SS6	MW3 SS6	MW4 SS5	MW5 SS5	MW6 SS3	MW7 SS5
		SAMPLE TYPE:		Soil	Soil	Soil	Soil	Soil	Soil
		DATE SAMPLED:		8/21/2014	8/21/2014	8/25/2014	8/22/2014	8/22/2014	8/20/2014
Parameter	Unit	G / S	RDL	5749405	5749408	5749410	5749412	5749414	5749416
Sulfide	%	0.01	0.05	0.02	0.02	<0.01	<0.01	0.01	
Chloride (2:1)	µg/g	2	8	3	4	12	25	11	
Sulphate (2:1)	µg/g	2	106	127	98	61	87	59	
pH (2:1)	pH Units	NA	8.21	8.17	8.20	8.52	8.29	8.24	
Electrical Conductivity (2:1)	mS/cm	0.005	0.228	0.237	0.212	0.151	0.199	0.180	
Resistivity (2:1)	ohm.cm	1	4390	4220	4720	6620	5030	5560	
Redox Potential (2:1)	mV	5	214	223	204	189	218	223	

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard
5749405-5749416 * Analysis was performed at AGAT's Mining Division.

EC/Resistivity, pH, Chloride, Sulphate and Redox Potential were determined on the extract obtained from the 2:1 leaching procedure (2 parts DI water: 1 part soil).

Certified By:





Quality Assurance

CLIENT NAME: PETO MACCALLUM LIMITED

PROJECT: 14TF023

SAMPLING SITE:

AGAT WORK ORDER: 14T881937

ATTENTION TO: Andrew Cooke

SAMPLED BY: Bujing Guan

Soil Analysis

RPT Date: Sep 11, 2014			DUPLICATE			Method Blank	REFERENCE MATERIAL		METHOD BLANK SPIKE		MATRIX SPIKE	
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD		Measured Value	Acceptable Limits	Recovery	Acceptable Limits	Recovery	Acceptable Limits
								Lower		Upper		Lower

Corrosivity Package

Sulfide	5749405	5749405	0.02	0.02	0.0%	< 0.01	90%	80%	120%						
Chloride (2:1)	5749405	5749405	8	7	13.3%	< 2	100%	80%	120%	105%	80%	120%	102%	70%	130%
Sulphate (2:1)	5749405	5749405	106	98	7.8%	< 2	99%	80%	120%	102%	80%	120%	106%	70%	130%
pH (2:1)	5763979		8.39	8.44	0.6%	NA	100%	90%	110%	NA			NA		
Electrical Conductivity (2:1)	5749405	5749405	0.228	0.227	0.4%	< 0.005	105%	90%	110%	NA			NA		
Redox Potential (2:1)	5763979		205	198	3.4%	< 5	95%	70%	130%	NA			NA		

Comments: NA signifies Not Applicable.

Certified By: _____





Method Summary

CLIENT NAME: PETO MACCALLUM LIMITED

AGAT WORK ORDER: 14T881937

PROJECT: 14TF023

ATTENTION TO: Andrew Cooke

SAMPLING SITE:

SAMPLED BY: Bujing Guan

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Soil Analysis			
Sulfide			GRAVIMETRIC
Chloride (2:1)	INOR-93-6004	McKeague 4.12 & SM 4110 B	ION CHROMATOGRAPH
Sulphate (2:1)	INOR-93-6004	McKeague 4.12 & SM 4110 B	ION CHROMATOGRAPH
pH (2:1)	INOR 93-6031	MSA part 3 & SM 4500-H+ B	PH METER
Electrical Conductivity (2:1)	INOR-93-6036	McKeague 4.12, SM 2510 B	EC METER
Resistivity (2:1)	INOR-93-6036		CALCULATION
Redox Potential (2:1)		McKeague 4.12 & SM 2510 B	REDOX POTENTIAL ELECTRODE



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P: 905.712.5100 • F: 905.712.5122

Chain of Custody Record

Client Information

Company: Peto MacCallum
Contact: A. Cooke
Address: 165 Cartwright Ave

Phone: 416 785 5110 Fax: 416 785 5120
Project: K1F023 PO: _____
AGAT Quotation #: PMI Bates

**Please note, if quotation number is not provided,
client will be billed full price for analysis.**

Regulatory Requirements

☐ Regulation 153/04
(reg. 511 Amend.)

Table _____

Indicate one

☐ Ind/Com☐ Res/Park☐ Agriculture

Soil Texture (check one)

☐ Coarse ☐ Fine☐ Sewer Use

Region _____
Indicate one

☐ Sanitary

☐ Storm

Regulation 558

☐ CCME☐ Other (specify) _____

Prov. Water Quality Objectives (PWQO)

☒ None

Is this a drinking water sample?
(potable water intended for human consumption)
☐ Yes ☐ No

If "Yes", please use the
Drinking Water Chain of Custody Form

Is this submission for a **Record of Site Condition?**

☐ Yes ☐ No

Legend Matrix

GW Ground Water **O** Oil
SW Surface Water **P** Paint
SD Sediment **S** Soil

Report Information – reports to be sent to:

1. Name: Andrew Cooke
Email: acooke@petomacallum.com

2. Name: _____
Email: _____

[illegible]

Samples Relinquished By (Print Name and Sign):

Buyong Guan

Samples Relinquished by (Print Name and Sign):

Date/Time

Date/Time	
-----------	--

Samp as Received By (Print Name and Sign)

Samples Received By (Print Name and Sign)

Date/Time: _____

Date/Time

Pink Copy - Client

Yellow Copy - AGAT

White Copy- AGAT

Page 1 of 1

Nº: 44133



APPENDIX E

Ground Water Level Monitoring Data from November 27, 2014 to December 14, 2015



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5. CONCLUDING REMARKS	6

ATTACHMENTS:

Plates 1 to 18: Site Photographs

Table 1 – Ground Water Level Readings in Monitoring Wells

Figure 1 – Manually Measured Hydrostatic Ground Water Level Elevations in Monitoring Wells

Figure 2 – Hourly Hydrostatic Ground Water Level Elevations Recorded in Vibrating Wire Piezometers
and Daily Precipitation

Figure 3 – Hourly Hydrostatic Ground Water Level Elevations Recorded in Vibrating Wire Piezometers
and Daily Precipitation in December, 2014

Figure 4 – Hourly Hydrostatic Ground Water Level Elevations Recorded in Vibrating Wire Piezometers
and Daily Precipitation in January, 2015

Figure 5 – Hourly Hydrostatic Ground Water Level Elevations Recorded in Vibrating Wire Piezometers
and Daily Precipitation in February, 2015

Figure 6 – Hourly Hydrostatic Ground Water Level Elevations Recorded in Vibrating Wire Piezometers
and Daily Precipitation in March, 2015

Figure 7 – Hourly Hydrostatic Ground Water Level Elevations Recorded in Vibrating Wire Piezometers
and Daily Precipitation in April, 2015

Figure 8 – Hourly Hydrostatic Ground Water Level Elevations Recorded in Vibrating Wire Piezometers
and Daily Precipitation in May, 2015

Figure 9 – Hourly Hydrostatic Ground Water Level Elevations Recorded in Vibrating Wire Piezometers
and Daily Precipitation in June, 2015

Figure 10 – Hourly Hydrostatic Ground Water Level Elevations Recorded in Vibrating Wire Piezometers
and Daily Precipitation in July, 2015



Figure 11 – Hourly Hydrostatic Ground Water Level Elevations Recorded in Vibrating Wire Piezometers and Daily Precipitation in August, 2015

Figure 12 –Hourly Hydrostatic Ground Water Level Elevations Recorded in Vibrating Wire Piezometers and Daily Precipitation in September, 2015

Figure 13 –Hourly Hydrostatic Ground Water Level Elevations Recorded in Vibrating Wire Piezometers and Daily Precipitation in October, 2015

Figure 14 –Hourly Hydrostatic Ground Water Level Elevations Recorded in Vibrating Wire Piezometers and Daily Precipitation in November, 2015

Figure 15 – Average Monthly Hydrostatic Ground Water Level Elevations along West Side of the Berm

Figure 16 – Average Monthly Hydrostatic Ground Water Level Elevations along East Side of the Berm

Figure 17 –Average Monthly Hydrostatic Ground Water Level Elevations across the Berm

APPENDIX E

for

Ground Water Level Monitoring Data

From November 27, 2014 to December 14, 2016

Highway 404, from 300 m to 800 m North of Holborn Road

Town of East Gwillimbury, Ontario

Agreement No. 2013-E-0039

Task No. 2013-E-0039-005

W.O. No. 2014-11023

1. INTRODUCTION

Presented in this Appendix are the ground water level monitoring data compiled from the installed vibrating wire piezometers (VWPs) and manual readings in the monitoring wells (MWs) for a 12-month hydrologic cycle from November 27, 2014 to December 14, 2016.

2. OBSERVATIONS DURING MONITORING PERIOD

The Site was visited on eight occasions to take manual ground water level readings and make observations, outlined below:

- a) On the site visit on April 10, 2015, water was observed ponding on the Chapman Farm property (the Farm). The photographs taken that day are attached as Plates 1 to 6. The water ponded area was semi-circular and approximately located between VWP5/MW5 and VWP3/MW3, about 100 m long, in a north–south direction, and extended about 50 m west onto the Farm from the fenceline. The maximum depth of water was about 0.2 m. A small amount of water (perhaps up to 7 to 8 cm deep) was observed in the stormwater drainage ditch along the southbound lanes of Highway 404 (east of the berm).
- b) During the next site visit on June 5, 2015, ponded water was again observed on the Farm and along the fenceline, but it was considerably less than that observed on the April 10 site visit, see photographs on Plates 7 to 10. The stormwater ditch along the southbound lanes of Highway 404 (east of the berm) contained some water.
- c) During the subsequent site visit on August 24, 2015, no ponded water was observed on the Farm, see photographs on Plates 11 and 12. The former water ponded area was covered predominantly with weeds. Corn was grown outside this area on the Farm. The stormwater ditch contained no visible water, with the exception of the area around MW6. Bulrushes had grown along this ditch between MW 2 and MW4.



- d) The photographs taken during the site visit on October 23, Plates 13 to 18, are attached. No ponded water was observed at the Site. The ground was dry on the Farm. The stormwater ditch contained only a very small amount of visible water.

During site visits, no signs of seepages or erosion were observed on the side slopes of the highway berm; however, after spring, the slopes became heavily vegetated and these features could have been hidden from view. When the ponded water was observed, its height and extent were never close to overtopping the highway berm or circumventing it on the north or south.

3. MANUALLY MEASURED HYDROSTATIC GROUND WATER LEVEL (HGWL) IN MONITORING WELLS

The monitoring wells were used for water sampling, hydraulic conductivity testing and manual water level measurements over the length of the well screen, 1.5 or 3.0 m long.

The ground water strike and hydrostatic ground water level readings are listed on Table 1. A chart of the manually measured water levels from November 2014 to December 2015 is shown on Figure 1. During this period, the highest ground water elevations were typically measured in November and December 2014 and April 2015 and the lowest in October and December, 2015.

4. VIBRATING WIRE PIEZOMETER (VWP) DATA

The VWPs were used to measure the ground water pressure and temperature at a single point, and allow frequent, programmable measurements over a period of time. Since the readings from a monitoring well are representative of a well screen surrounding, which may contain varying soil stratigraphy and water pressures, the VWP readings are not expected to be exactly the same as the manually measured ground water level in the monitoring wells.

Data collection from the vibrating wire piezometers commenced on November 27, 2014. The data consists of pressure and temperature readings measured every hour. The pressure reading is converted to an equivalent pressure head and added to the elevation of the VWP to arrive at the elevation of the hydrostatic ground water level. Between January 26 and February 24, 2015, and from March 13 to the end of monitoring, the datalogger for VWP6 did not send useful data. The site inspections concluded that the problem was in either the cable or the piezometer below the ground surface.



In late September, data files sent from the Site began to include short periods of missing information for some VWP. The periods of missing information became larger over time. The manufacturer of the equipment suggested that the datalogger batteries were failing to consistently provide enough power for the transmission of data to the Flexdaq hub, and it was likely that the data was collected at each VWP without omissions. On a January 14, 2016 site visit the VWP datafiles were downloaded from each datalogger separately and were found to be relatively complete.

4.1 Hourly HGWL Readings and Daily Precipitation

Figure 2 shows the hourly HGWL readings for the period of November 27, 2014 to December 14, 2015 (a little more than twelve (12) months). The graph also shows the total daily precipitation, which is the sum of the rainfall and water equivalent to the total snowfall recorded at the Environment Canada's Baldwin weather station (about 15 km northeast of the Site), and the depth of the snow on the ground at the station. This data is being monitored so that the ground water introduced by the Farm and ground water introduced by precipitation or snow melt may be differentiated.

It should be noted that the pore pressures recorded at some VWPs were below zero for brief periods of time, which indicates that the water level in the vicinity of the VWP was temporarily below the probe (substantiated by manual readings). This occurred at VWP 2 between February 11 and April 3, 2015 and September 5 and October 25, 2015, and for very brief periods at VWPs 1 and 7 in late October and early November, 2015. The HGWLs recorded by these VWPs during the periods noted above may be erroneous.

Figures 3 through 14 show the same results monthly for December 2014 through November 2015, respectively, so that they can be seen in greater detail. The salient findings are discussed below.

Trends Observed:

Figure 2, which shows the entire 12-month monitoring period, indicates that HGWLs generally fell in January and February, rose in March, remained steady in April, fell in May, rose in June, and fell during July through September and rose slightly in October and November, all primarily due to the infiltration of snow melt and rainfall over the year in the vicinity.

Precipitation on December 10 and 11, 2015 (Figure 3) was followed by an increase in snow on the ground, which is seen decreasing (melting) over the following 13 days, and appears to correspond to increasing HGWLs at the VWPs, likely due to infiltration of the snow melt water. HGWLs generally decreased throughout January and February 2015 (Figures 4 and 5) while precipitation was held in



the accumulated snow. The snow melting in March (Figure 6), was followed by increases in HGWLs throughout March and the first half of April (Figure 7). Significant rain events such as the one on May 10 (Figure 8) were typically followed by increases in HGWL, with immediate increases in VWP 4 and 5. In June (Figure 9), immediate increases in HGWL after rains events were seen in VWPs 3, 5 and 7, all of which are on the east side of the highway berm. An unusual repeated pattern of daily rising and falling HGWL of about 0.15 m developed in VWP 4 and continued from July (Figure 10) to September (Figure 12). As a pattern, the HGWL is generally lowest at about 4 pm each day. Throughout the monitoring period, increases in HGWL continued to follow rain events, and no immediate increases in HGWL in multiple VWPs appeared to happen without a preceding rain event, indicating that it is unlikely that the Farm used an infiltration system to discharge a significant volume of waste water.

Storm Events

There were six days with a total precipitation greater than 20 mm: on May 10, June 10, 12, 22, 27 and July 7. The greatest was June 22 with 29.2 mm. It is noted that for the spring and summer months in this region, historic high daily rainfall events are typically greater than 50 mm.

Comparison of Precipitation Data during Monitoring Period to Selected Averages

The total precipitation at Baldwin weather station during the monitoring period December 2014 to November 2015 was more than 200 mm lower than the normal amounts (average of the available qualified data) recorded at two other Environment Canada weather stations in the vicinity of the Site between 1981 and 2010 (see Table A, below); note that the climate normals were not available for Baldwin station. During the monitoring period, the monthly total precipitation was typically below or close-to the normal total precipitation recorded at these other stations, with the exception of June, which was significantly above normal. Based on this data, assuming this was a period of lower-than-normal precipitation, the potential for increased impacts due to precipitation (i.e. ponding) may be greater in the future years than was observed during the monitoring period.



TABLE A
 MONTHLY TOTAL PRECIPITATION RECORDED AT
 ENVIRONMENT CANADA WEATHER STATIONS (mm)

Month	Baldwin Station (Dec. 2014 to Nov. 2015)	King Smoke Tree Station (1981-2010 Normals)	Udora Station (1981-2010 Normals)
Dec.	30.6	55.5	60.0
Jan.	22.0	51.7	64.9
Feb.	51.6	46.0	45.9
Mar.	4.8	51.2	53.1
Apr.	46.2	64.9	67.9
May	68.7	87.1	82.1
Jun.	179.6	84.8	106.6
Jul.	38.8	86.4	86.4
Aug.	57.2	88.4	73.9
Sep.	19.8	84.2	87.3
Oct.	70.2	72.9	74.9
Nov.	46.0	84.6	83.2
Total	635.5	857.6	886.3

4.2 Average Monthly HGWLs Along East and West Sides of Berm

Figures 15 and 16 show the averaged monthly HGWL between November 2014 and December 2015 for the VWP's on the west (VWP1, 3, 5 and 7) and east (VWP2, 4, 6 and 8) sides of the berm, respectively, together with ground surface elevations. It can be seen that the ground surface elevations are generally the same along the east and west sides of the berm in the south half of the Site, but in the north end (in the vicinity of VWP pairs 1 and 2), where the original ground surface was cut to allow for the highway Right-Of-Way (ROW), surface elevations are lower on the east side of the berm.

Over the twelve-month period, HGWLs along the west side of the berm were typically lowest at VWP's 1 and 3, and along the east side of the berm at VWP2, which are all in the north end of the Site, indicating ground water flow is generally from south to north. The lowest readings were at VWP2, indicating a relatively high northerly hydraulic gradient between VWP4 and VWP2. On the



west side of the berm, the highest average monthly readings were typically in April, 2015, and the lowest were typically in October, 2015, while on the east side of the berm the results are less consistent, and the highest average monthly readings were in December, 2014 and April 2015, and the lowest were in February and March, 2015.

4.3 Average Monthly HGWLs Across Berm

Figure 17 shows the average monthly HGWL readings between November 2014 and December 2015 for each of the four VWP pairs, together with the ground surface elevations. The outline of the berm can be seen more clearly in the surface elevation plots for VWPs 3 and 4 and VWPs 5 and 6 pairs. Due to the malfunction of VWP6, the manual readings from MW6 were used for April, June, August, October and December 2015.

Comparing the four VWP pair graphs, it can be seen that the HGWL typically drops from the west side to the east side of the berm (an easterly gradient), and the largest drop occurs between the VWP1 and 2 pair. The data indicates that over the twelve month period of monitoring, the greatest average hydraulic gradients towards the highway (easterly) occurred between VWP1 and VWP2 with a maximum of 0.22 in the month of April and an average gradient of about 0.13 for the entire period. The second greatest hydraulic gradients occurred between VWP3 and VWP4, with a maximum average monthly easterly gradient of 0.05 in April and an average gradient of 0.0 for the entire period. All of the VWP pairs indicated small westerly gradients for at least one month, typically in the later months of 2015, which were negligible relative to the easterly gradients at VWPs 1 and 2, but more significant in the southern half of the site. Notably, at VWPs 7 and 8, the average gradient for the twelve months is westerly at 0.01.

5. CONCLUDING REMARKS

Based on the ground water level monitoring data and site visit observations, our salient findings are outlined below:

- a) The ponded water was observed on the Farm during site visits on April 10 and June 5, 2015; however, the ponded water was never close to overtopping or circumventing the highway berm, no signs of seepages or erosion were observed on the side slopes of the highway berm, and little water was observed in the stormwater swale along the southbound lanes. No ponded water was observed on the subsequent visits.



- b) The source of the ponded water cannot be entirely verified; however, it is likely the result of snow melt and rainfall infiltration that is impeded when the ground is frozen.
- c) During the monitoring period, increases in HGWL appear to follow the infiltration of snow melt or rainfall events, and do not indicate spikes in ground water level caused by waste water discharge from the Farm.
- d) It appears from the data compiled to-date that ground water flows northerly along the Site and also easterly with a steeper gradient in the north half of the Site.



Plate 1: A view of the Site looking south from the berm built by MTO along the Highway 404 southbound Right-Of-Way. The Farm is to the right of the fence. Water ponding of the field and at the fenceline can be seen (April 10, 2015).



Plate 2: A view of the Site looking northwest from the berm. The water ponding in the field can be seen at the centre (April 10, 2015).



Plate 3: A view of the Site looking north from the berm. From left to right are the water ponded field, the berm on the Farm, the fenceline, and the berm in the highway Right-Of-Way (April 10, 2015).



Plate 4: A view of the water ponding along the fenceline at the VWP3 / MW3 pair. The ponding in this area was up to 0.20 m deep (April 10, 2015).



Plate 5: A view of the berm slope (bottom), stormwater drainage ditch (centre), MW/VWP 6 and the gate to the hydro access road and Highway 404 (top), looking southeast. A small amount of water can be seen in the ditch on this day (April 10, 2015).



Plate 6: A view of the berm slope (bottom), stormwater drainage swale (centre) and Highway 404 (top), looking northeasterly. A small amount of water can be seen in the ditch on this day (April 10, 2015).



Plate 7: A view of the Site looking south from the Highway 404 southbound Right-Of-Way and the berm. The Farm is to the right of the fence (June 5, 2015).



Plate 8: A view of the Site looking southwest from the berm. A small amount of water ponding in the field can be seen at centre (June 5, 2015).



Plate 9: A view of the Site looking northwest from the berm. From left to right are the farm field with ponded water, a berm on the Farm property, fenceline, and the berm along the highway Right-Of-Way (June 5, 2015).



Plate 10: A view of the surface water in the stormwater drainage swale at the VWP6 / MW6 pair (June 5, 2015).



Plate 11: A view of the site looking west from the highway berm. No ponding was observed (August 24, 2015).



Plate 12: A view of the Site looking northwest. No ponding was observed (August 24, 2015).



Plate 13: A view of the Site looking south from the highway berm along the Highway 404 southbound Right-Of-Way. The Farm is to the right of the fence. No ponding was observed (October 23, 2015).



Plate 14: A view of the Site looking west from the berm. (October 23, 2015).



Plate 15: A view of the Site looking north from the berm. From left to right are the Farm, a berm on the Farm, the fenceline, and the berm along the highway Right-Of-Way (October 23, 2015).



Plate 16: A view of the ground surface, fenceline and a berm on the Farm in the vicinity of MW5/VWP5 pair (October 23, 2015).



Plate 17: A view of the highway berm slope, looking north (October 23, 2015).



Plate 18: A view of the highway berm slope, looking northwest. No signs of seeps or erosion were evident on the berm (October 23, 2015).

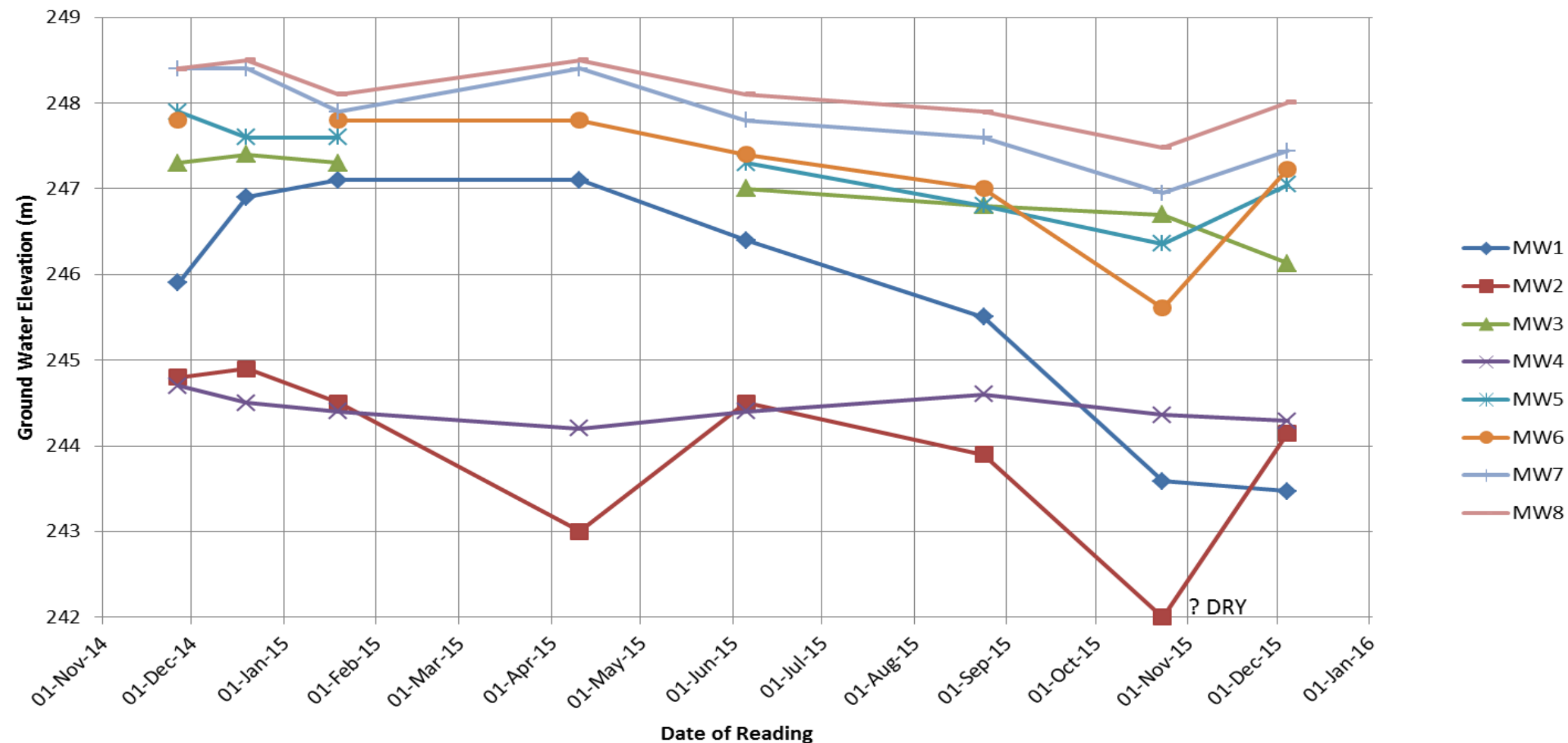
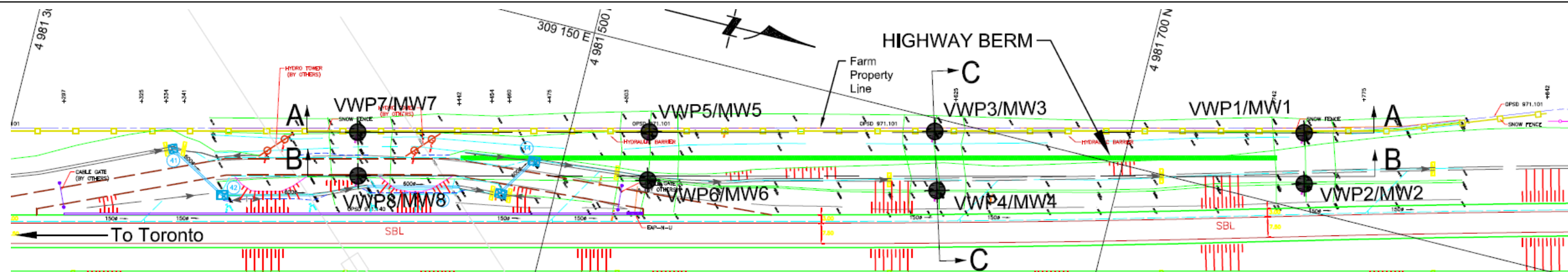



TABLE 1
 GROUND WATER LEVEL READINGS IN MONITORING WELLS ⁽¹⁾

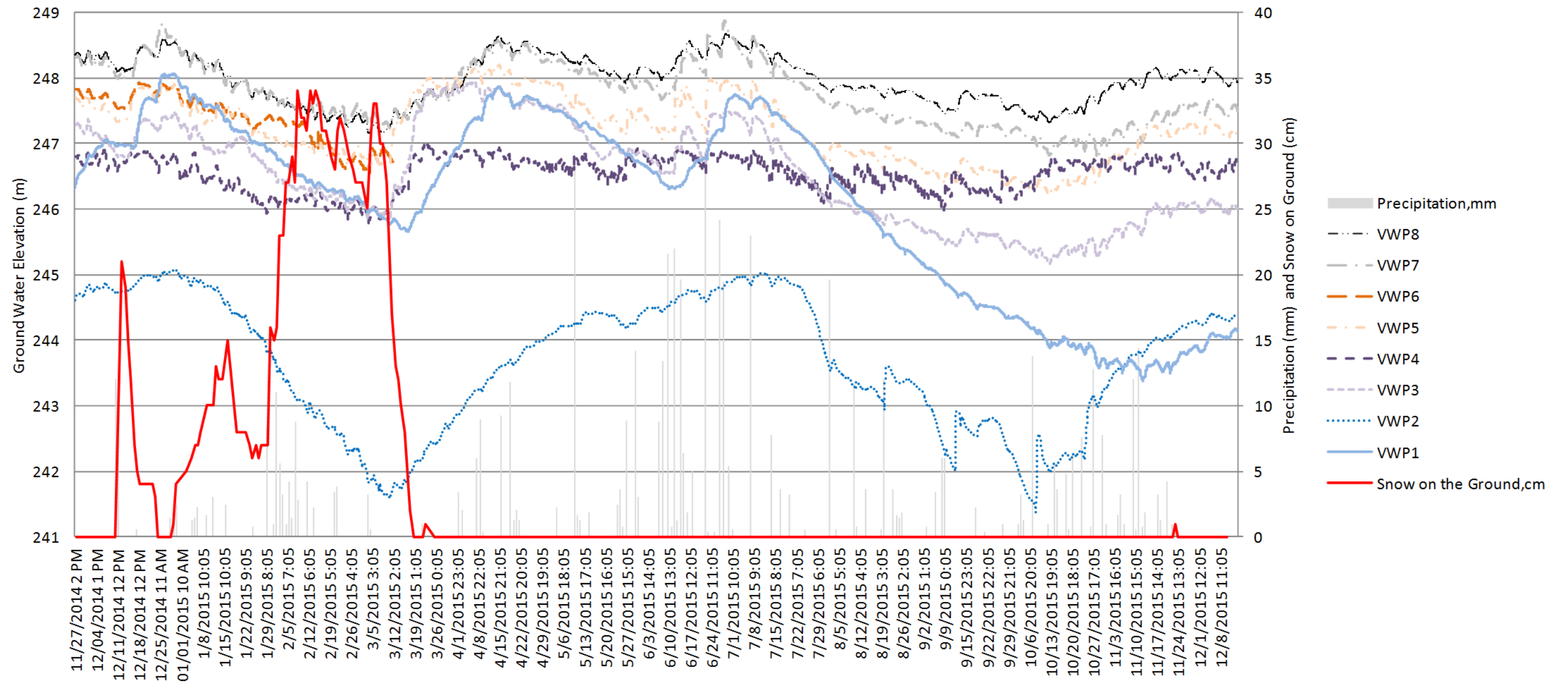
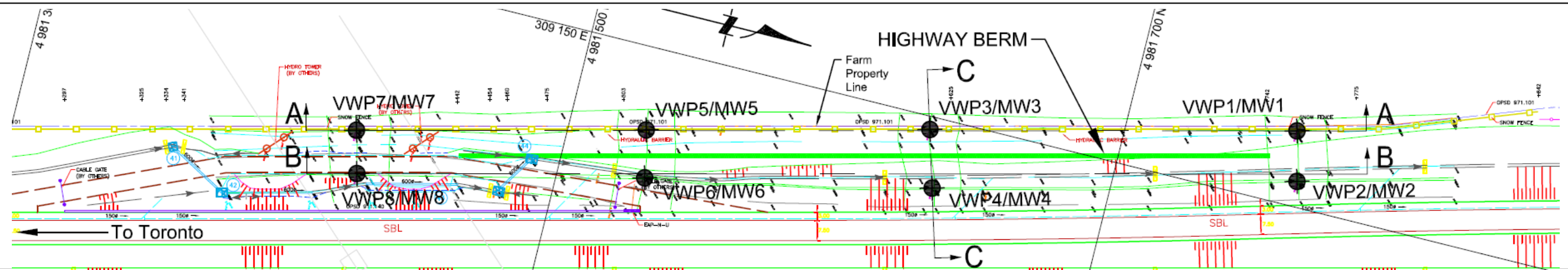
MONITORING WELL (MW) No. ⁽²⁾	GROUND SURFACE ELEVATION ⁽³⁾	MID-SCREEN ELEVATION ⁽²⁾ (DEPTH, m)	OBSERVED OR INTERPRETED GROUND WATER STRIKE ELEVATION ⁽⁴⁾ (DEPTH, m)	HYDROSTATIC GROUND WATER LEVEL ELEVATION (DEPTH, m)							
				8 READINGS IN 12-MONTH MONITORING PERIOD							
				DATE: 11/26/2014	DATE: 12/19/2014	DATE: 01/19/2015	DATE: 04/10/2015	DATE: 06/05/2015	DATE: 08/24/2015	DATE: 10/23/2015	DATE: 12/04/2015
MW1	249.4	244.8 (4.6)	Not Apparent	245.9 (3.5)	246.9 (2.5)	247.1 (2.3)	247.1 (2.3)	246.4 (3.0)	245.5 (3.9)	243.6 (5.8)	243.5 (5.9)
MW2	245.8	243.6 (2.3)	Not Apparent	244.8 (1.0)	244.9 (0.9)	244.5 (1.3)	243.0 (2.8)	244.5 (1.3)	243.9 (1.9)	Dry	244.2 (1.6)
MW3	248.1	243.5 (4.6)	246.0 (2.1)	247.3 (0.8)	247.4 (0.7)	247.3 (0.8)	Inaccessible	247.0 (1.1)	246.8 (1.3)	246.7 (1.4)	246.1 (2.0)
MW4	246.9	242.3 (4.6)	244.3 (2.6)	244.7 (2.2)	244.5 (2.4)	244.4 (2.5)	244.2 (2.7)	244.4 (2.5)	244.6 (2.3)	244.4 (2.5)	244.3 (2.6)
MW5	248.2	245.9 (2.3)	245.5 (2.7)	247.9 (0.3)	247.6 (0.6)	247.6 (0.6)	Inaccessible	247.3 (0.9)	246.8 (1.4)	246.4 (1.8)	247.1 (1.1)
MW6	247.6	245.3 (2.3)	245.8 (1.8)	247.8 (-0.2)	Frozen	247.8 (-0.2)	247.8 (-0.2)	247.4 (0.2)	247.0 (0.6)	245.6 (2.0)	247.2 (0.4)
MW7	249.8	247.6 (2.3)	Not Apparent	248.4 (1.4)	248.4 (1.4)	247.9 (1.9)	248.4 (1.4)	247.8 (2.0)	247.6 (2.2)	247.0 (2.8)	247.4 (2.4)
MW8	249.8	245.3 (4.5)	Not Apparent	248.4 (1.4)	248.5 (1.3)	248.1 (1.7)	248.5 (1.3)	248.1 (1.7)	247.9 (1.9)	247.5 (2.3)	248.0 (1.8)

Notes:

- (1) Water levels measured using a Solinst flat tape water level reader.
- (2) See Drawing 404-1 for approximate locations and record of borehole sheets for details of monitoring well installation.
- (3) Ground surface elevations at the monitoring well locations were surveyed by J.D. Barnes Ltd.
- (4) Ground water level first time encountered in the boreholes during drilling.

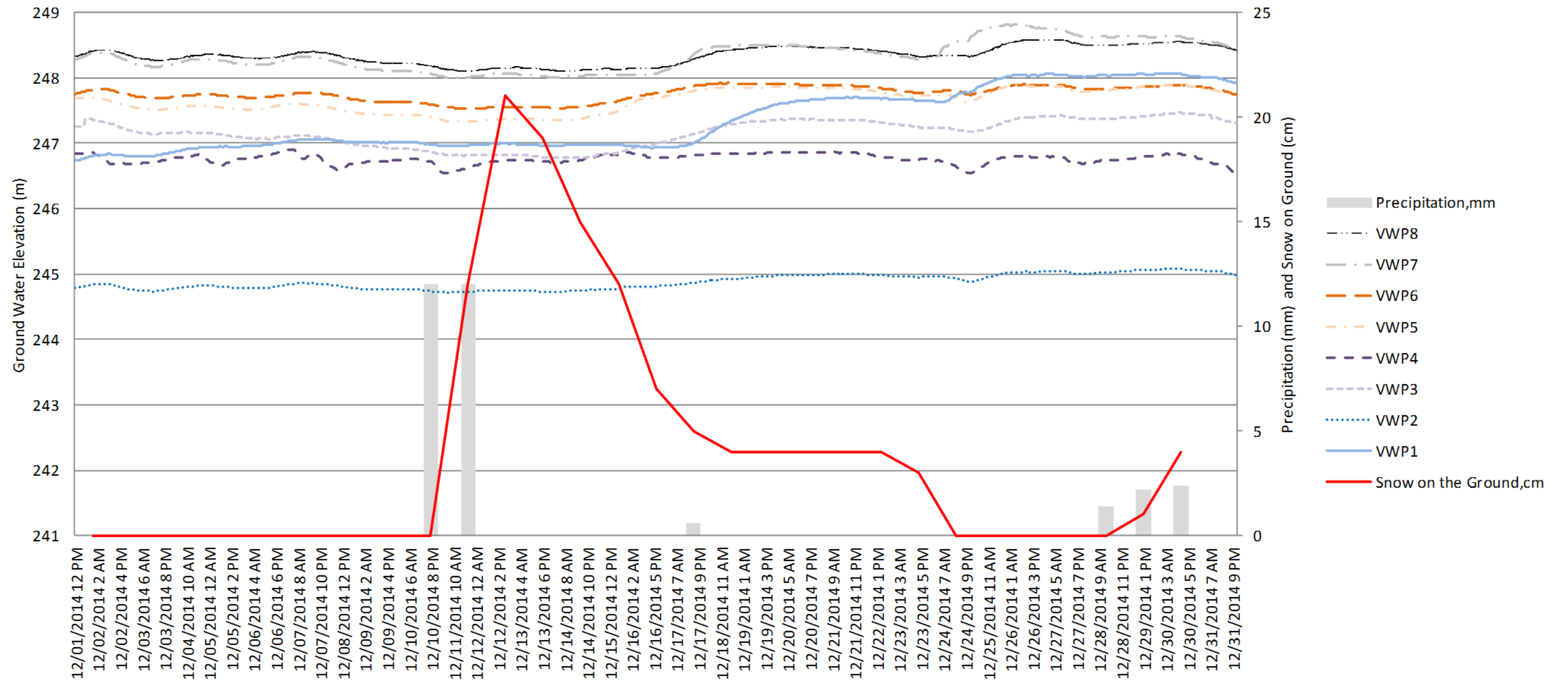
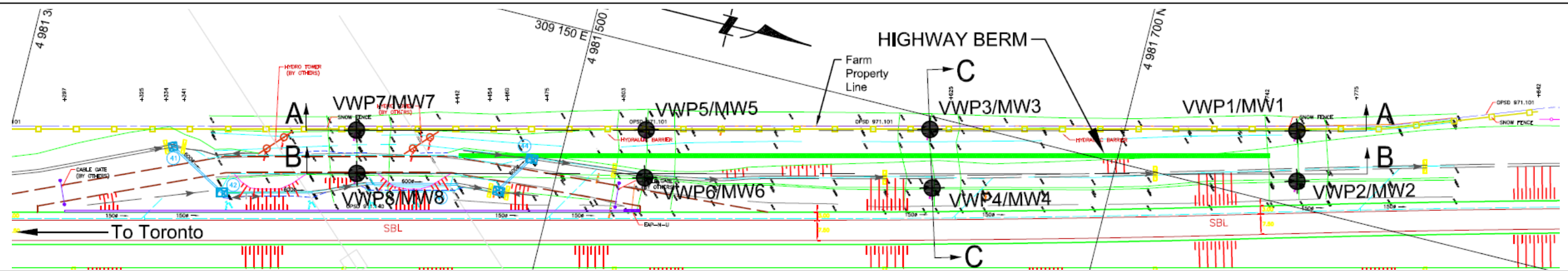



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		APPROVED: M.H.M.				

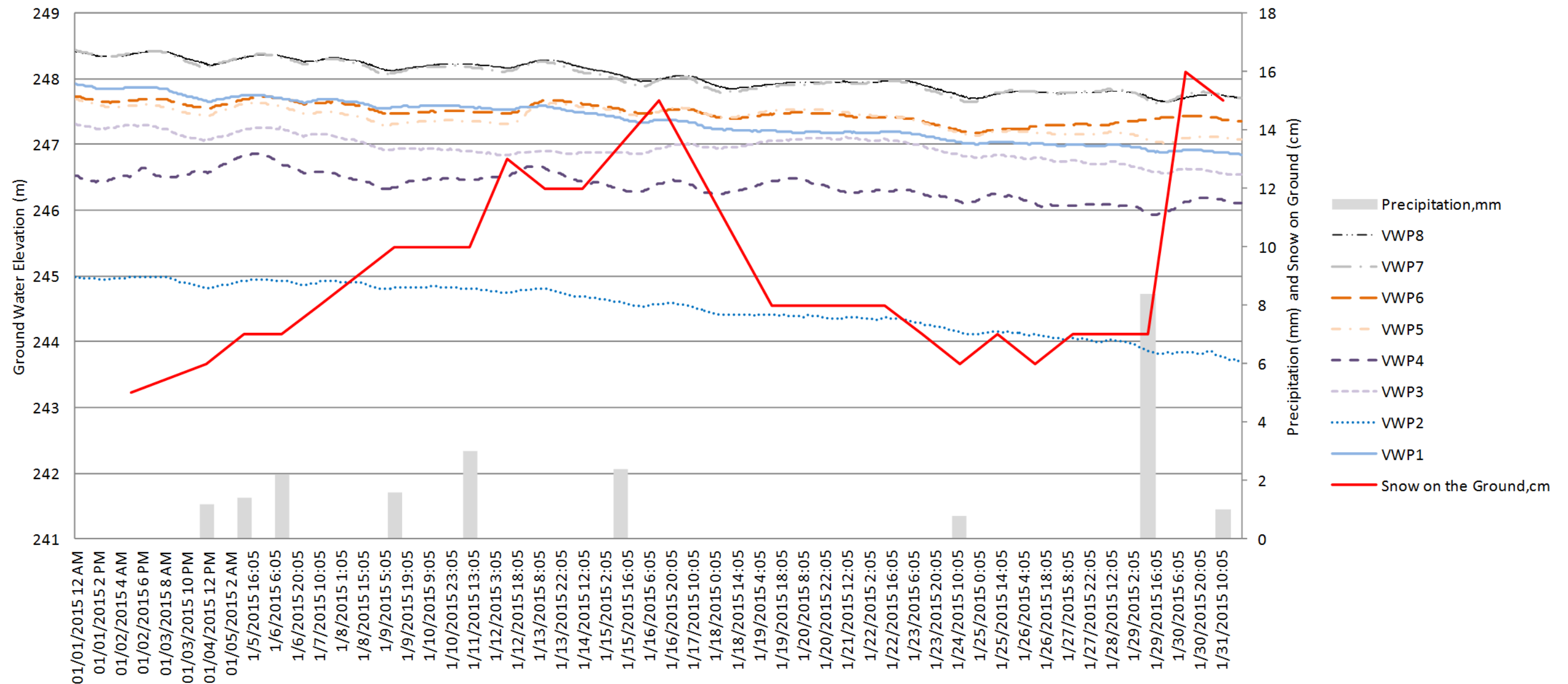
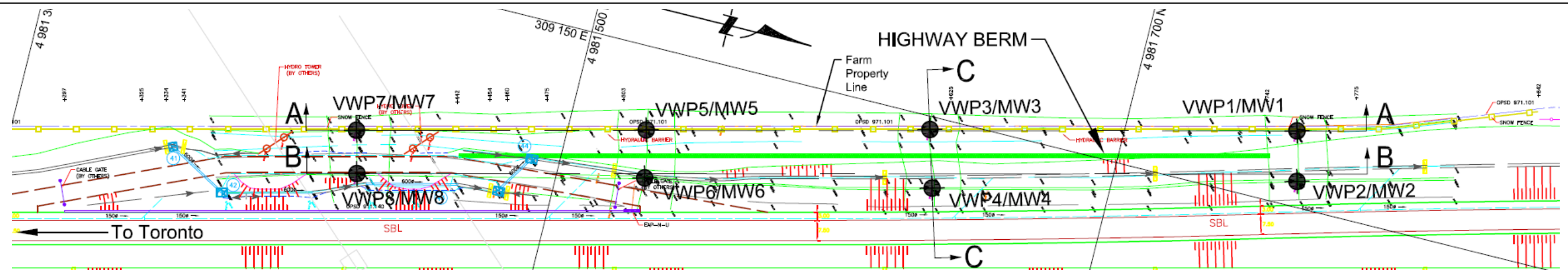



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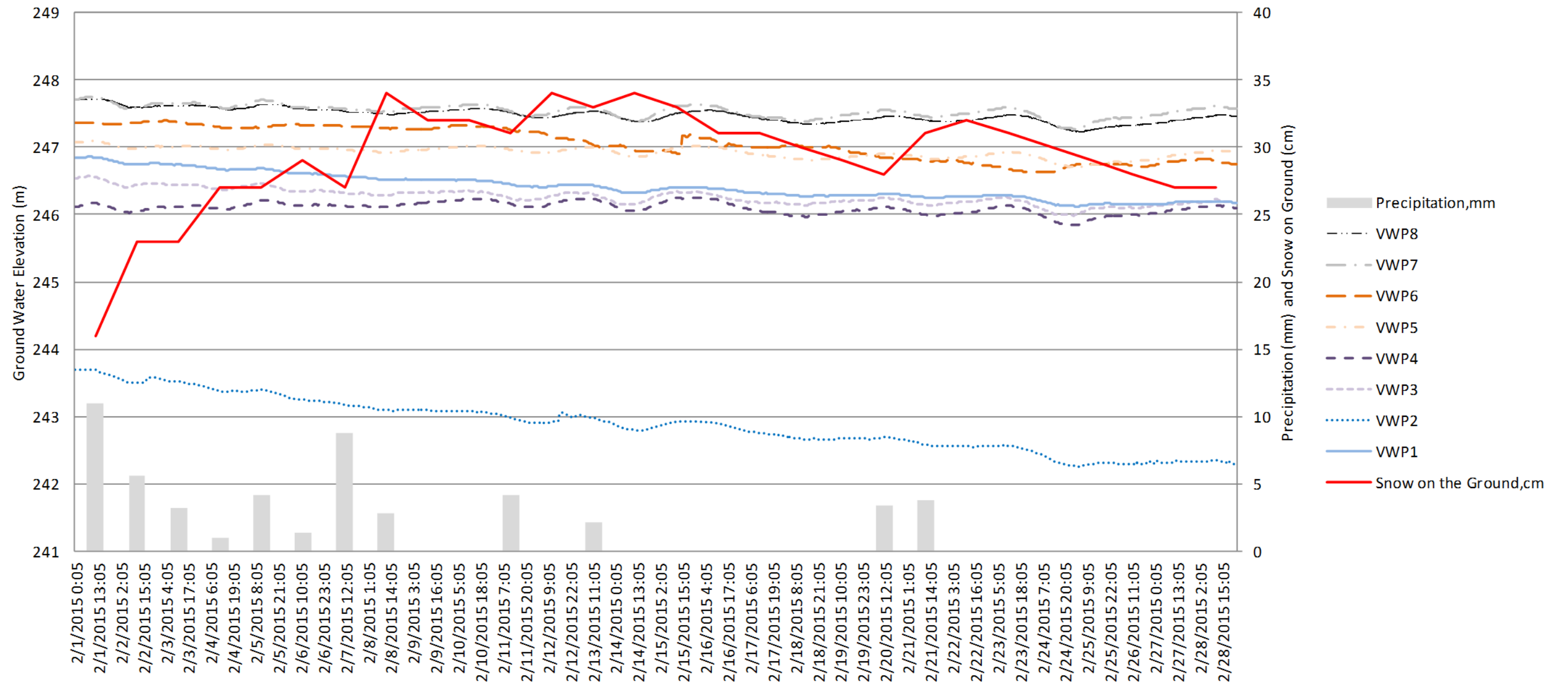
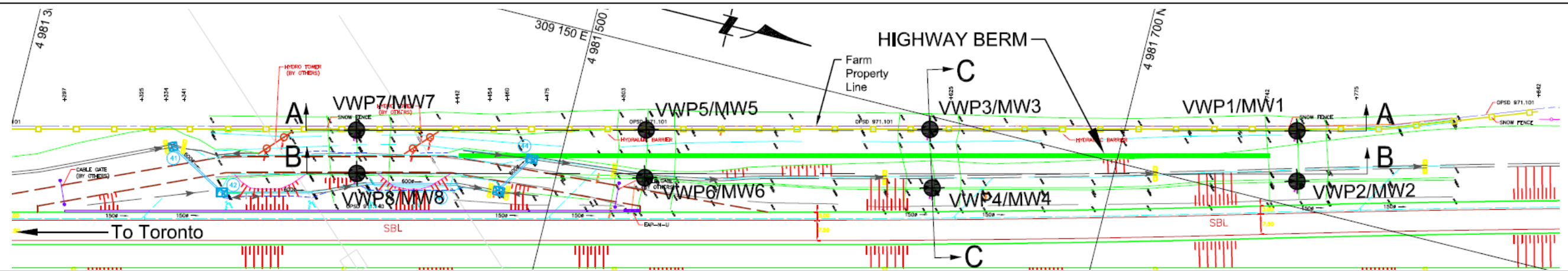
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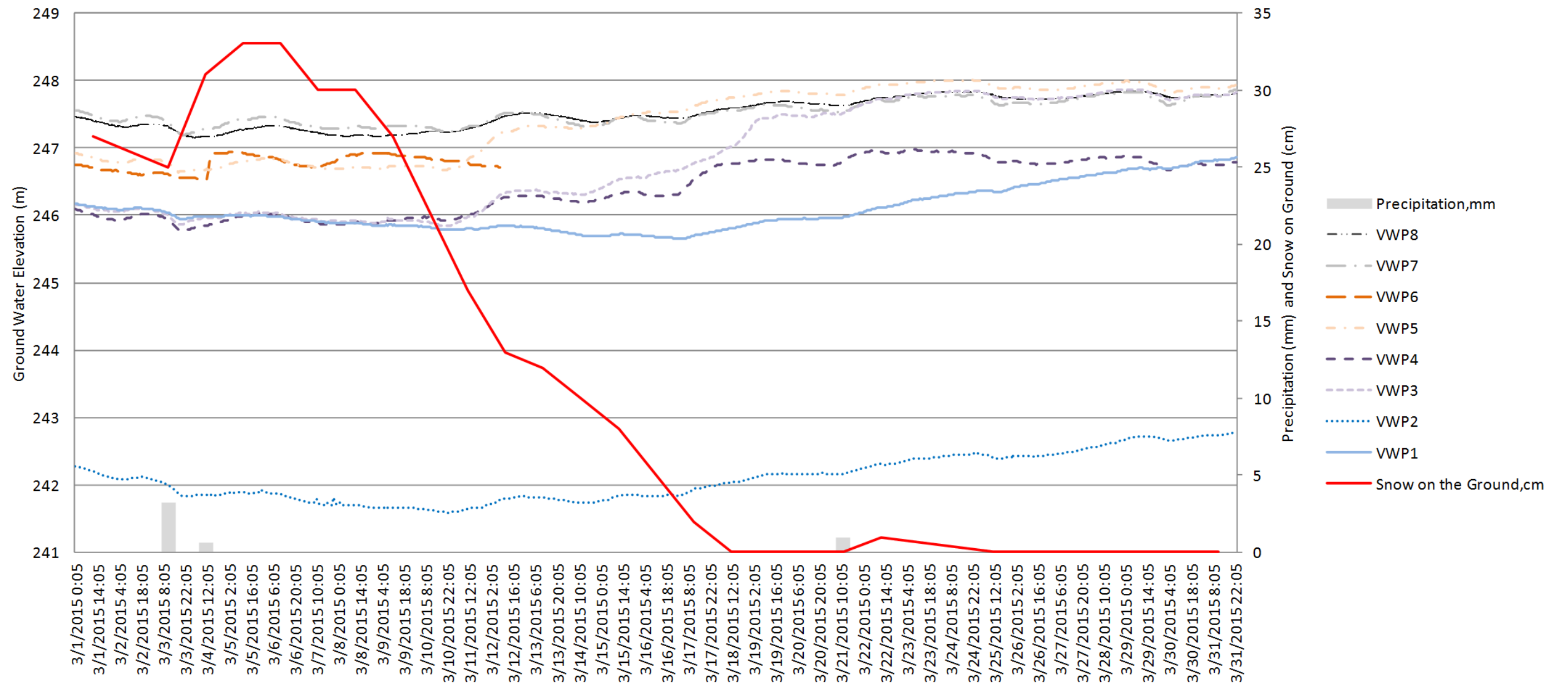
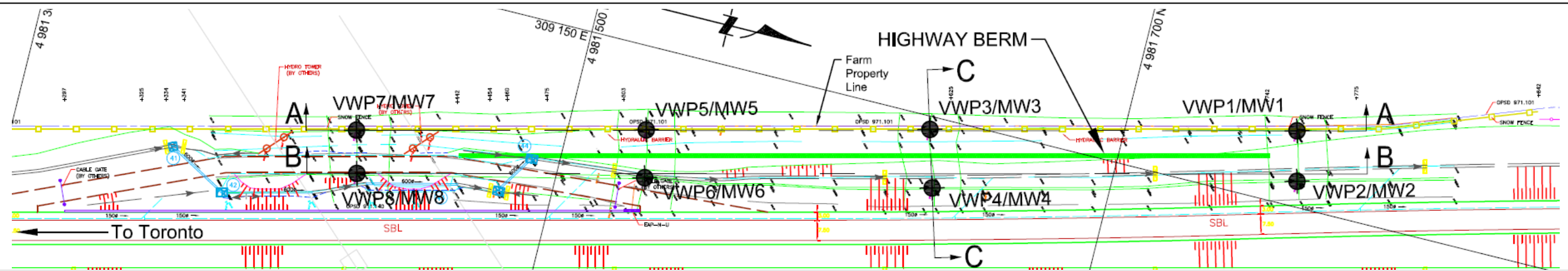
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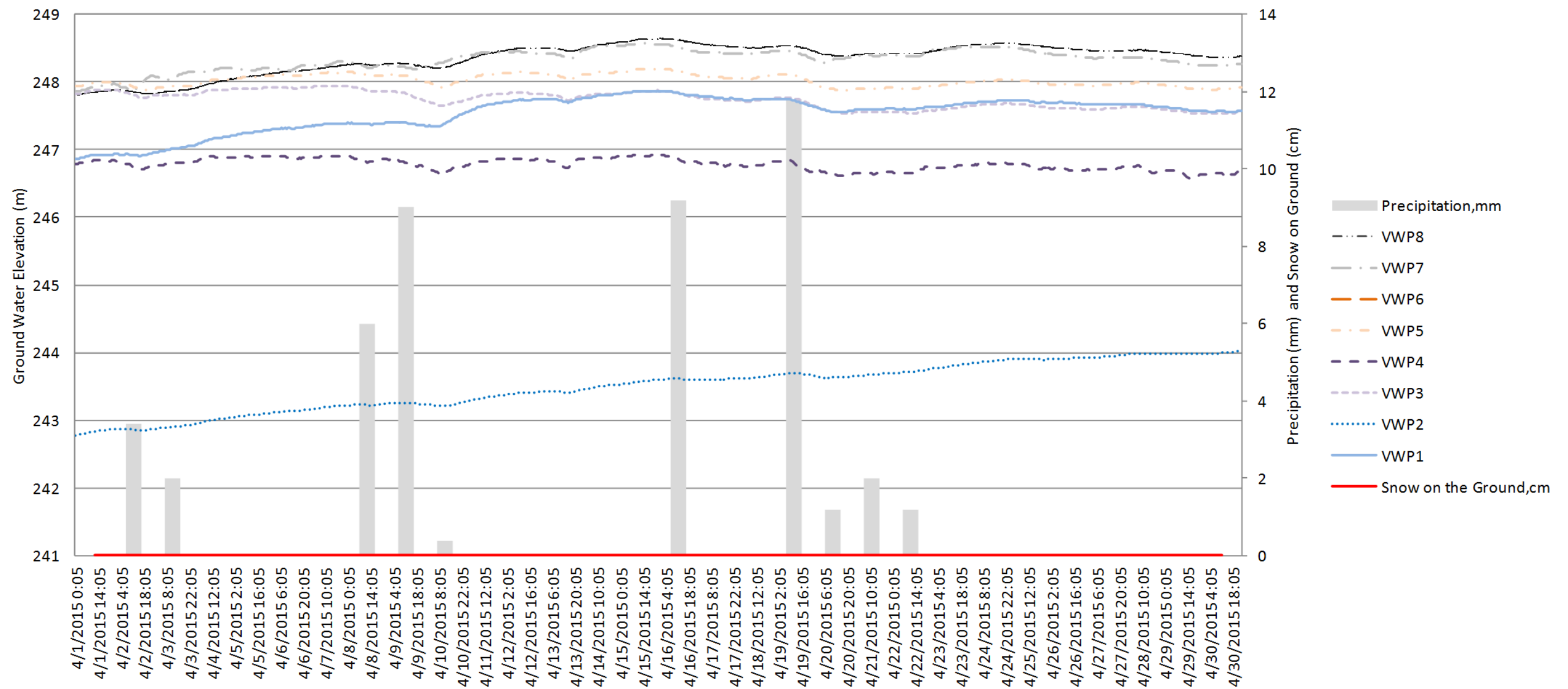
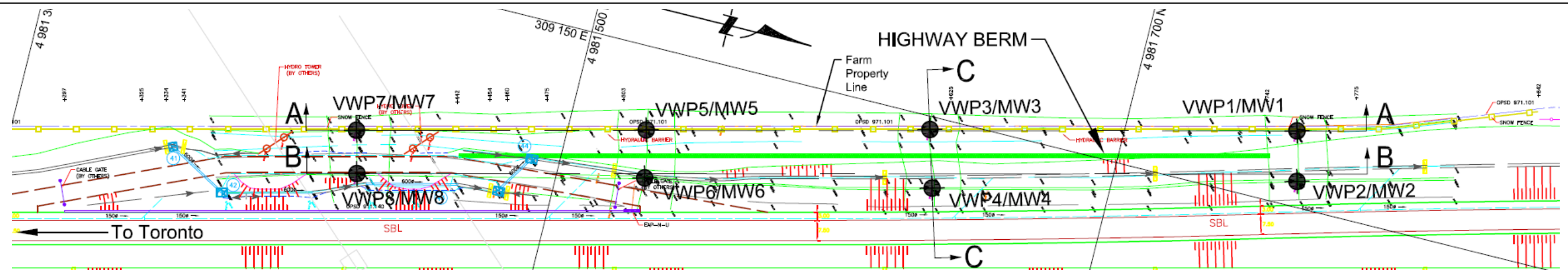



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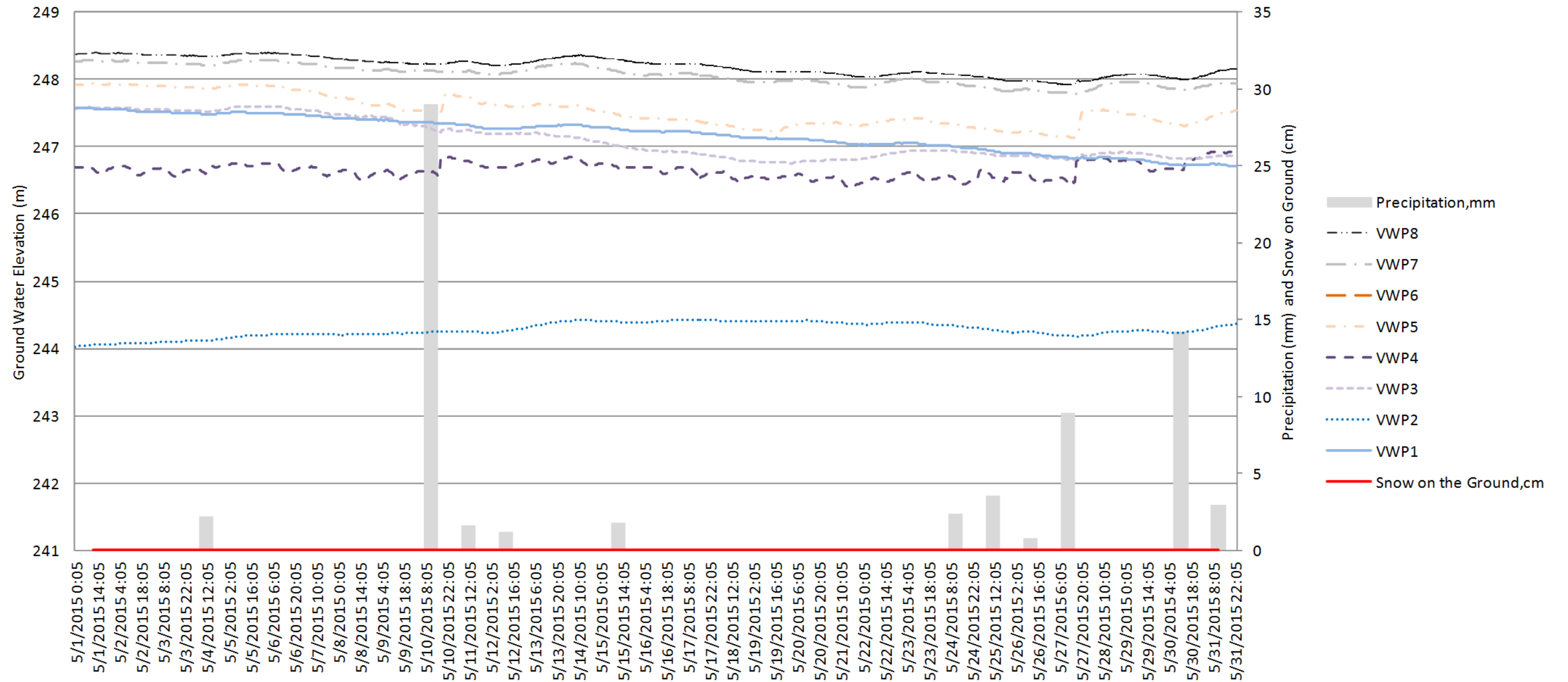
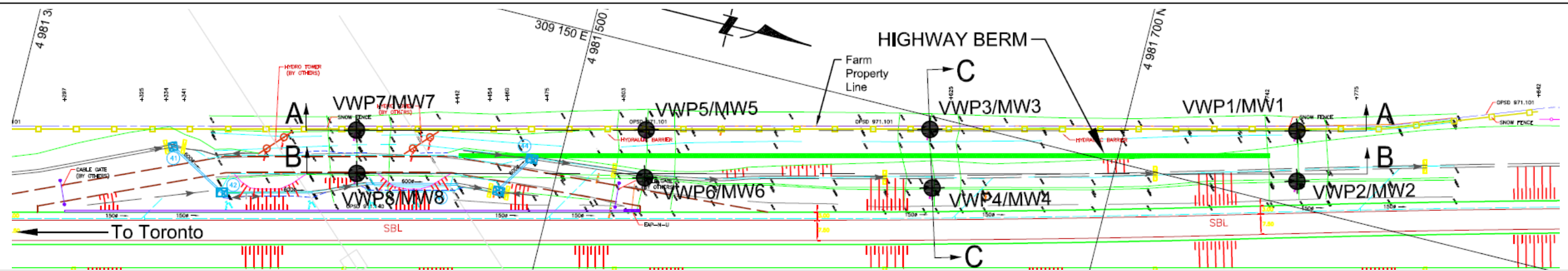


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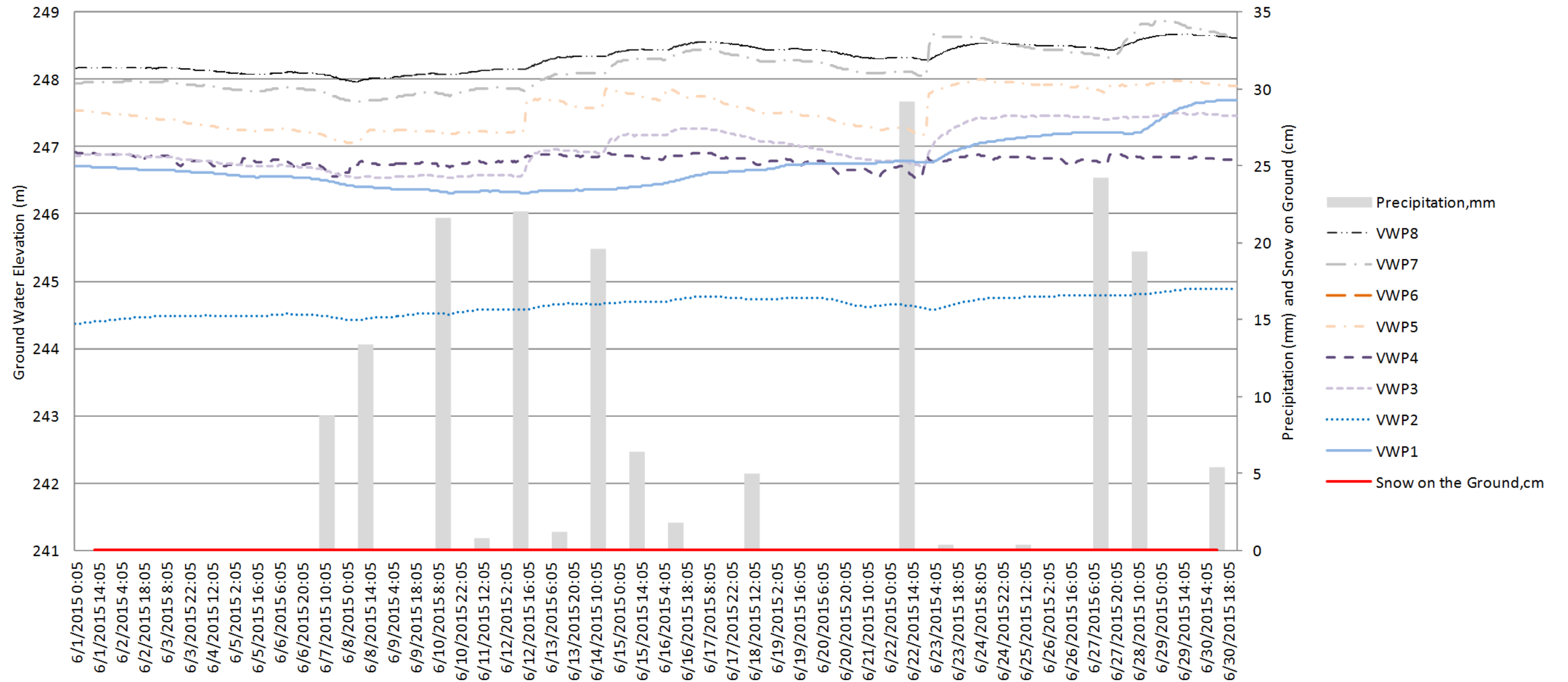
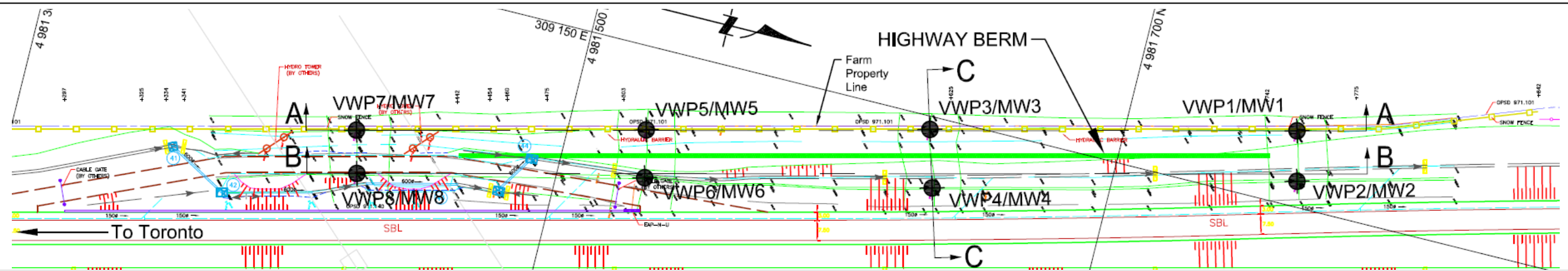
				
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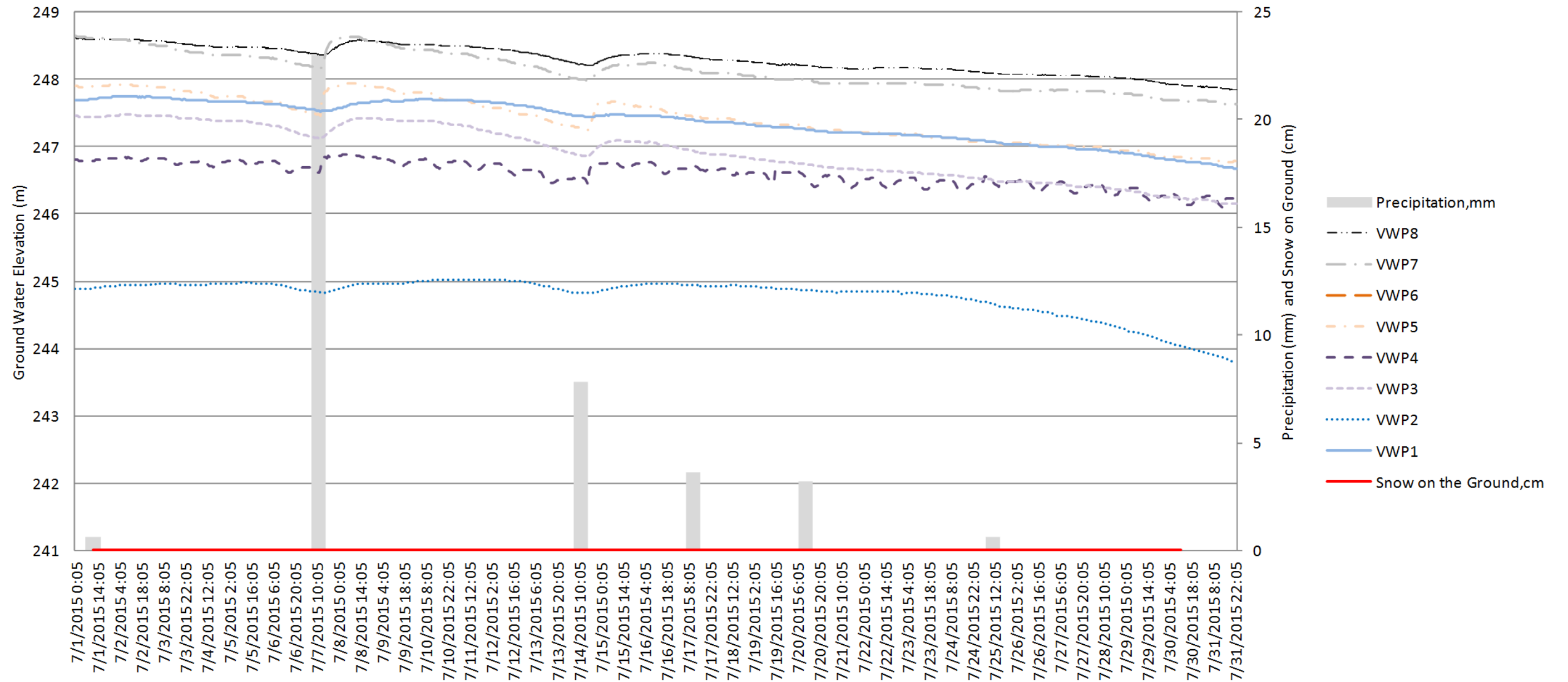
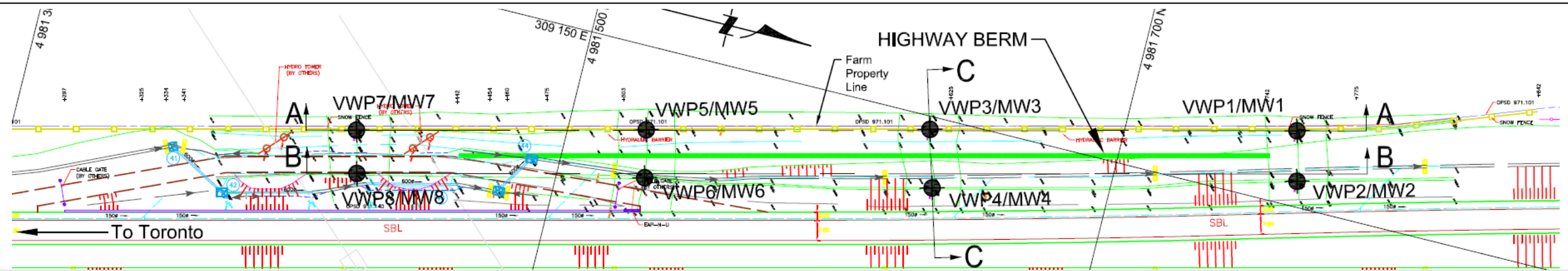
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FOUNDATION SEEPAGE INVESTIGATION FOR HIGHWAY 404 NORTH OF HOLBORN ROAD TOWNSHIP OF EAST Gwillimbury, Ontario				
HOURLY HYDROSTATIC GROUND WATER LEVEL ELEVATIONS RECORDED IN VIBRATING WIRE PIEZOMETERS AND DAILY PRECIPITATION IN MAY, 2015				
DRAWN: A.C.	DATE	SCALE	JOB NO.	FIGURE NO.
CHECKED: A.C.	FEB. 2016	N.T.S.	14TF023	8
APPROVED: M.H.M.				



MINISTRY OF TRANSPORTATION		<div> Peto MacCallum Ltd. CONSULTING ENGINEERS</div>				
FOUNDATION SEEPAGE INVESTIGATION FOR HIGHWAY 404 NORTH OF HOLBORN ROAD TOWNSHIP OF EAST GWILLIMBURY, ONTARIO		DRAWN: A.C.	DATE	SCALE	JOB NO.	FIGURE NO.
HOURLY HYDROSTATIC GROUND WATER LEVEL ELEVATIONS RECORDED IN VIBRATING WIRE PIEZOMETERS AND DAILY PRECIPITATION IN JUNE, 2015		CHECKED: A.C.	FEB. 2016	N.T.S.	14TF023	9
		APPROVED: M.H.M.				



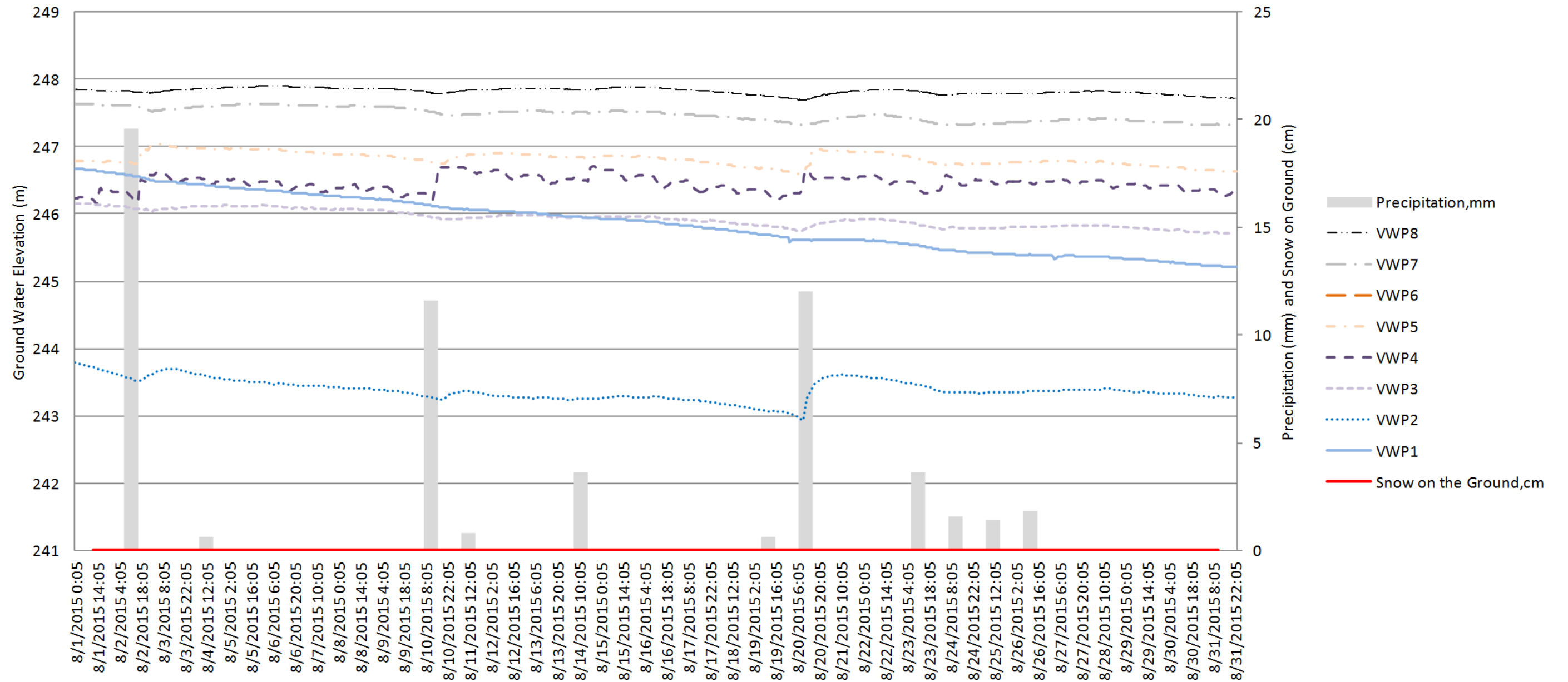
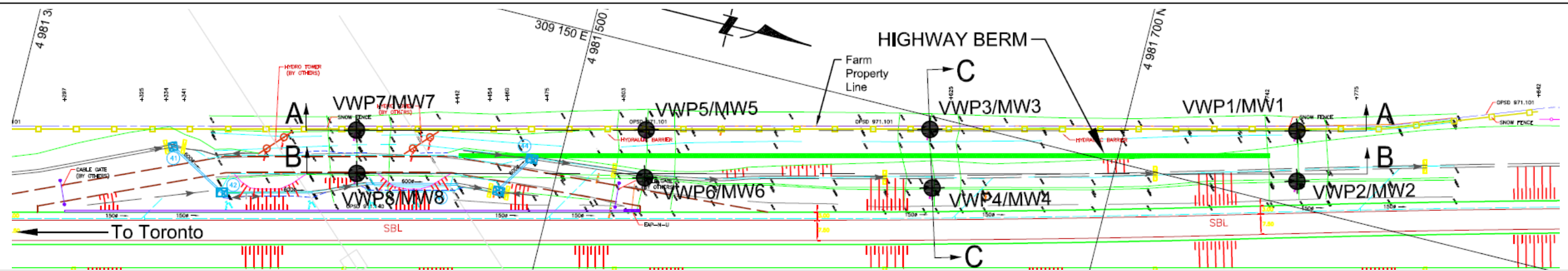
MINISTRY OF TRANSPORTATION

FOUNDATION SEEPAGE INVESTIGATION FOR
HIGHWAY 404 NORTH OF HOLBORN ROAD
TOWNSHIP OF EAST GWILLIMBURY, ONTARIO

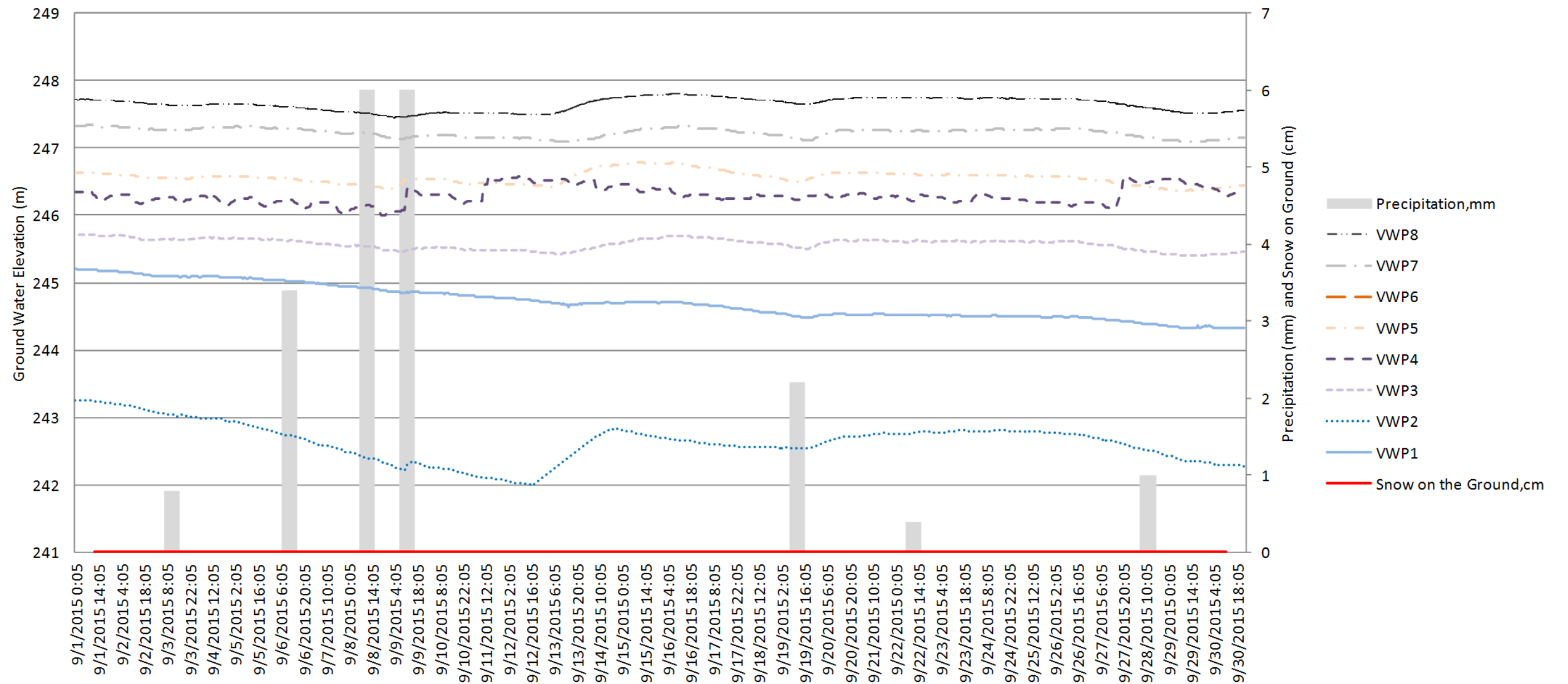
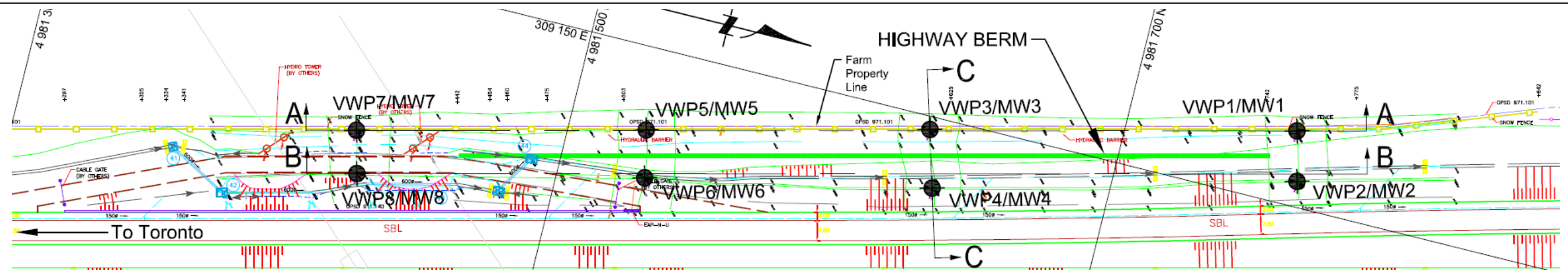
HOURLY HYDROSTATIC GROUND WATER LEVEL
ELEVATIONS RECORDED IN VIBRATING WIRE PIEZOMETERS
AND DAILY PRECIPITATION IN JULY, 2015



DRAWN: A.C.	DATE	SCALE	JOB NO.	FIGURE NO.
CHECKED: A.C.	FEB. 2016	N.T.S.	14TF023	10
APPROVED: M.H.M.				

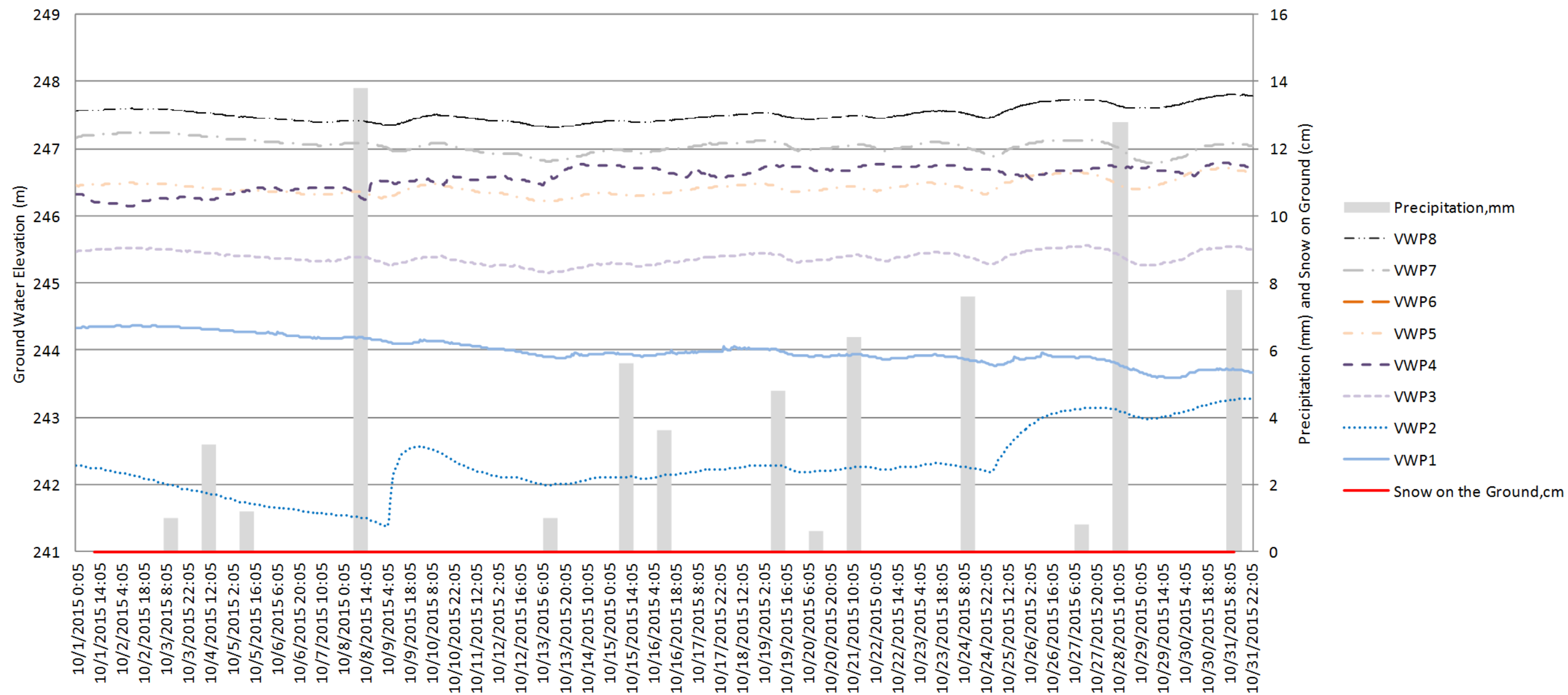
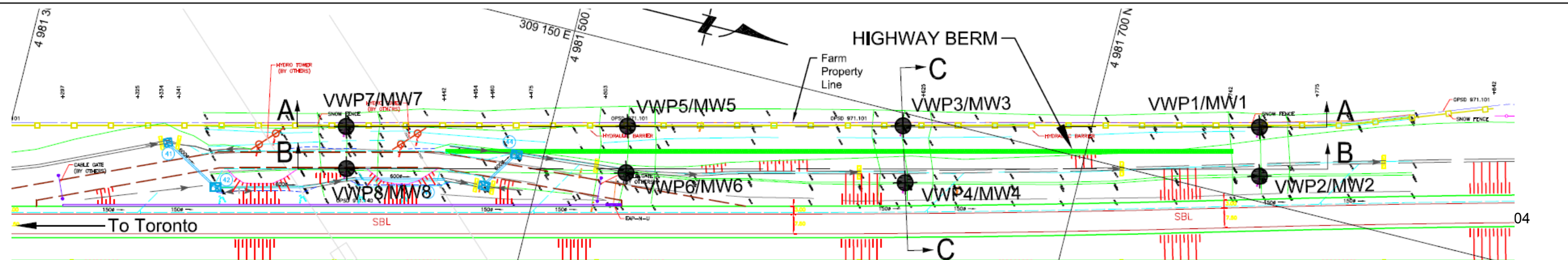



MINISTRY OF TRANSPORTATION				
FOUNDATION SEEPAGE INVESTIGATION FOR HIGHWAY 404 NORTH OF HOLBORN ROAD TOWNSHIP OF EAST Gwillimbury, Ontario				
HOURLY HYDROSTATIC GROUND WATER LEVEL ELEVATIONS RECORDED IN VIBRATING WIRE PIEZOMETERS AND DAILY PRECIPITATION IN AUGUST, 2015				
DRAWN: A.C.	DATE	SCALE	JOB NO.	FIGURE NO.
CHECKED: A.C.	FEB. 2016	N.T.S.	14TF023	11
APPROVED: M.H.M.				

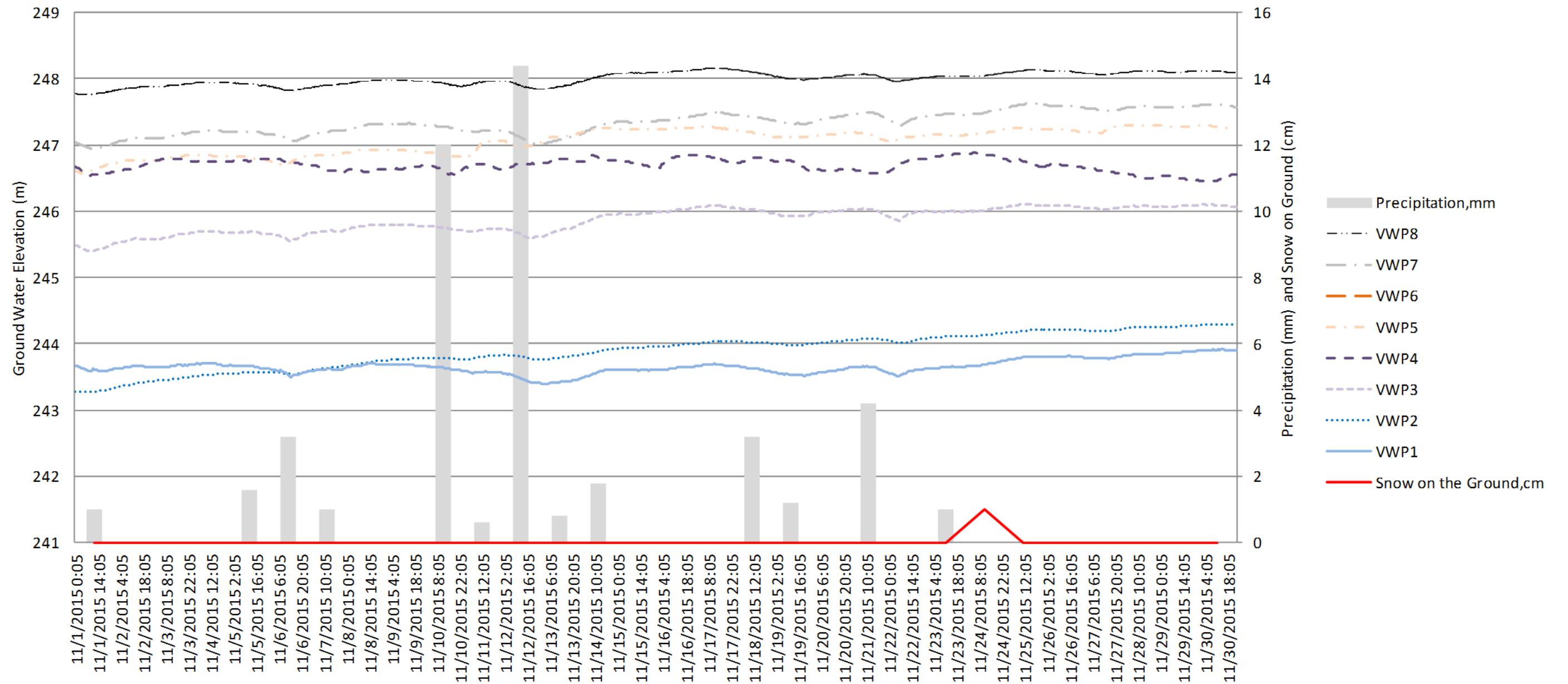
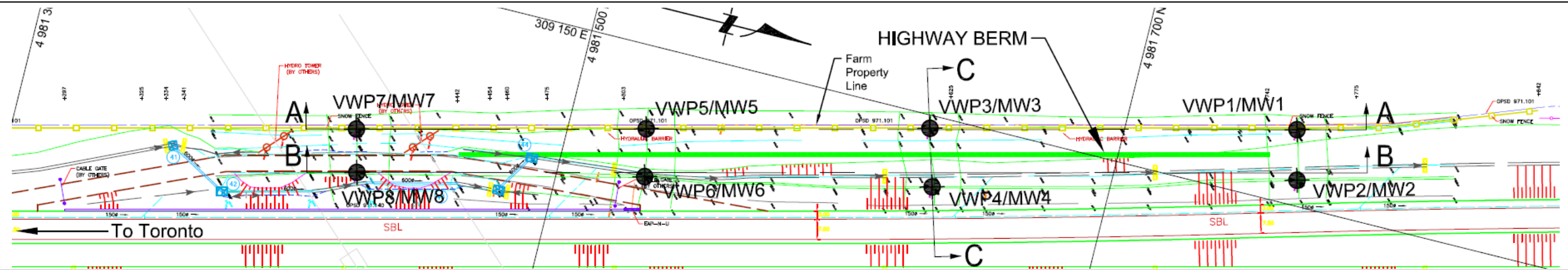



MINISTRY OF TRANSPORTATION				
FOUNDATION SEEPAGE INVESTIGATION FOR HIGHWAY 404 NORTH OF HOLBORN ROAD TOWNSHIP OF EAST Gwillimbury, Ontario				
HOURLY HYDROSTATIC GROUND WATER LEVEL ELEVATIONS RECORDED IN VIBRATING WIRE PIEZOMETERS AND DAILY PRECIPITATION IN SEPTEMBER, 2015				

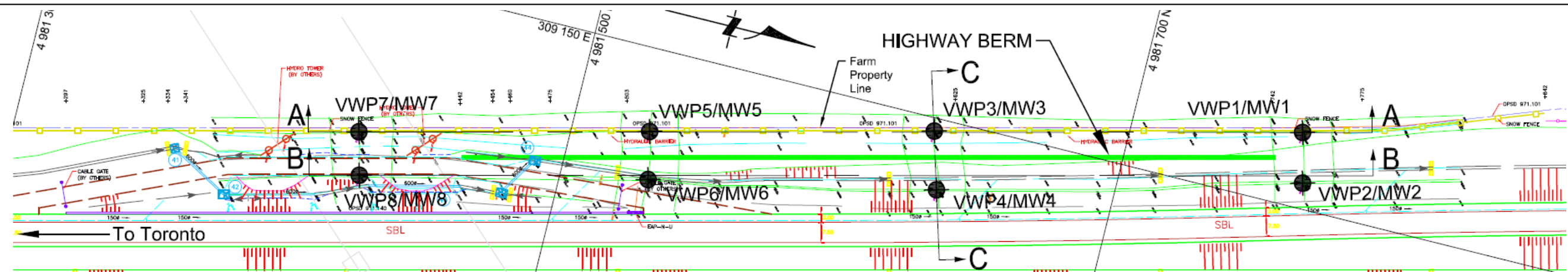
DRAWN: A.C.	DATE	SCALE	JOB NO.	FIGURE NO.
CHECKED: A.C.	FEB. 2016	N.T.S.	14TF023	12
APPROVED: M.H.M.				



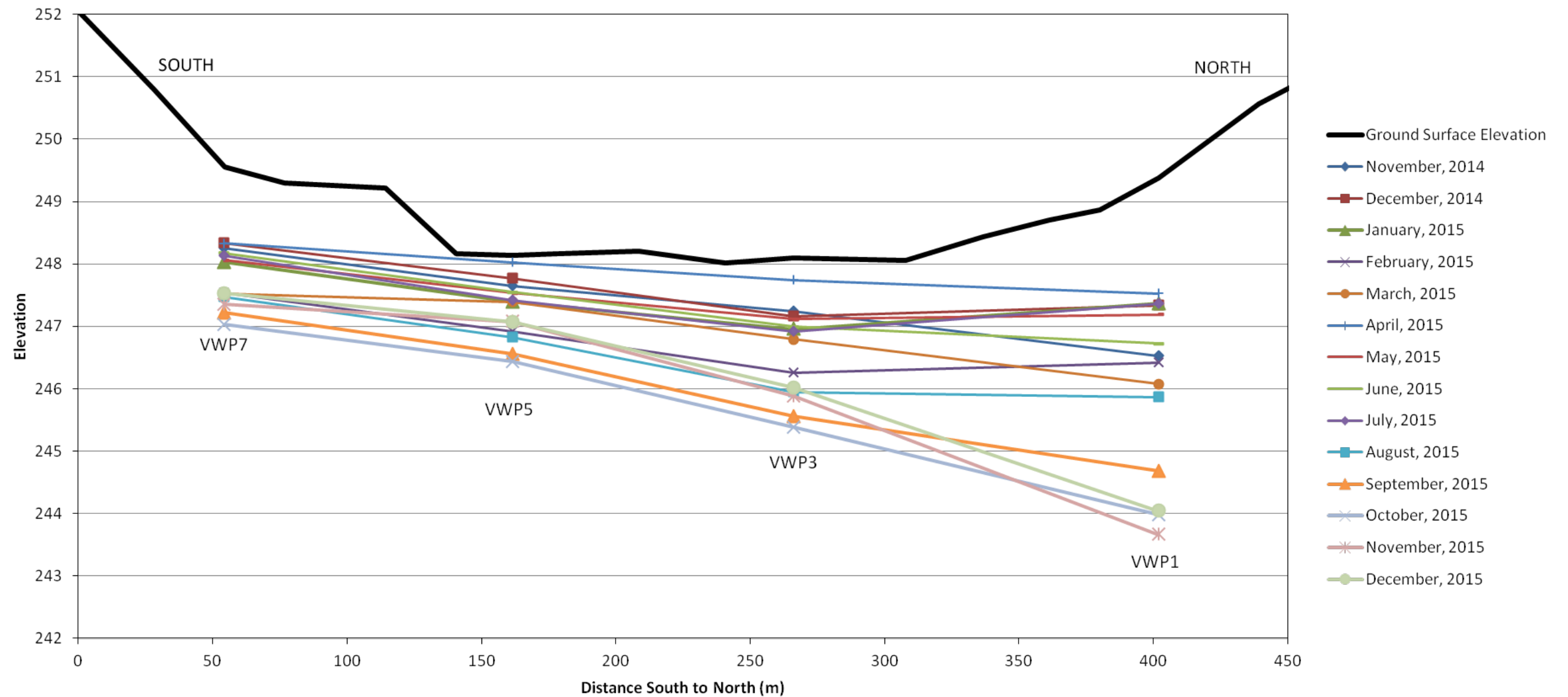
MINISTRY OF TRANSPORTATION		<div> Peto MacCallum Ltd. CONSULTING ENGINEERS</div>					
FOUNDATION SEEPAGE INVESTIGATION FOR HIGHWAY 404 NORTH OF HOLBORN ROAD TOWNSHIP OF EAST GWILLIMBURY, ONTARIO		DRAWN:	A.C.	DATE	SCALE	JOB NO.	FIGURE NO.
HOURLY HYDROSTATIC GROUND WATER LEVEL ELEVATIONS RECORDED IN VIBRATING WIRE PIEZOMETERS AND DAILY PRECIPITATION IN OCTOBER, 2015		CHECKED:	A.C.	FEB. 2016	N.T.S.	14TF023	13
		APPROVED:	M.H.M.				



MINISTRY OF TRANSPORTATION		<div> Peto MacCallum Ltd. CONSULTING ENGINEERS</div>				
FOUNDATION SEEPAGE INVESTIGATION FOR HIGHWAY 404 NORTH OF HOLBORN ROAD TOWNSHIP OF EAST GWILLIMBURY, ONTARIO		DRAWN: A.C.	DATE	SCALE	JOB NO.	FIGURE NO.
HOURLY HYDROSTATIC GROUND WATER LEVEL ELEVATIONS RECORDED IN VIBRATING WIRE PIEZOMETERS AND DAILY PRECIPITATION IN NOVEMBER, 2015		CHECKED: A.C.	FEB. 2016	N.T.S.	14TF023	14
		APPROVED: M.H.M.				



Average Monthly HGWL Elevations, West Side of Berm



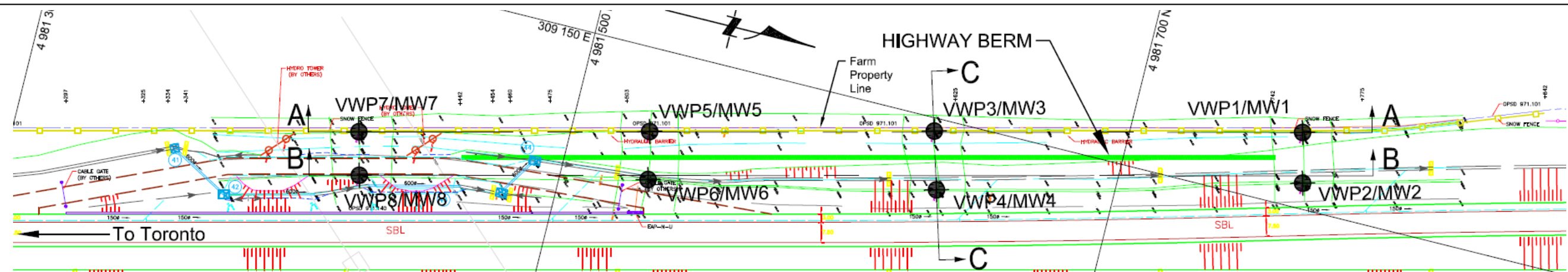
MINISTRY OF TRANSPORTATION

FOUNDATION SEEPAGE INVESTIGATION FOR
HIGHWAY 404 NORTH OF HOLBORN ROAD
TOWNSHIP OF EAST GWILLIMBURY, ONTARIO

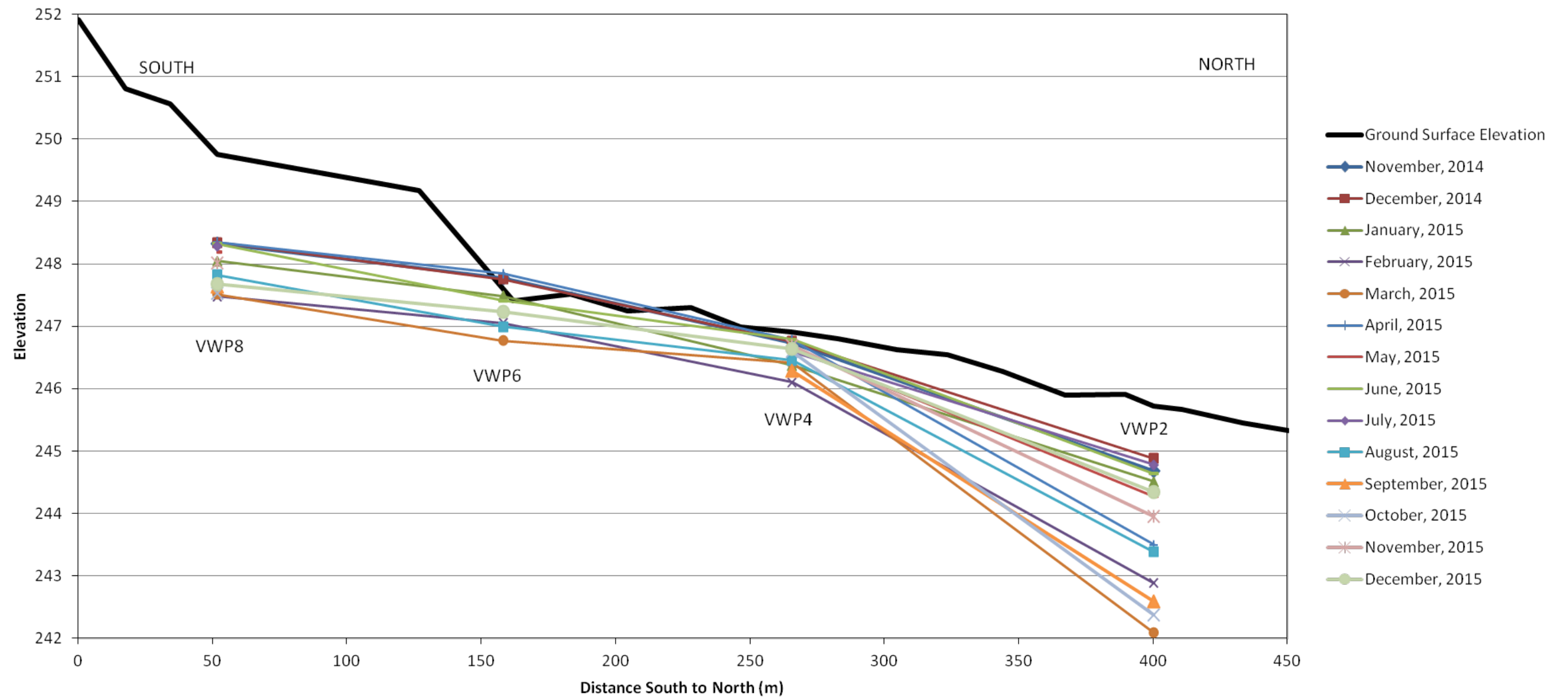
AVERAGE MONTHLY HYDROSTATIC GROUND WATER
LEVEL ELEVATIONS ALONG WEST SIDE OF THE BERM



DRAWN: A.C.	DATE	SCALE	JOB NO.	FIGURE NO.
CHECKED: A.C.	FEB. 2016	N.T.S.	14TF023	15
APPROVED: M.H.M.				



Average Monthly HGWL Elevations, East Side of Berm



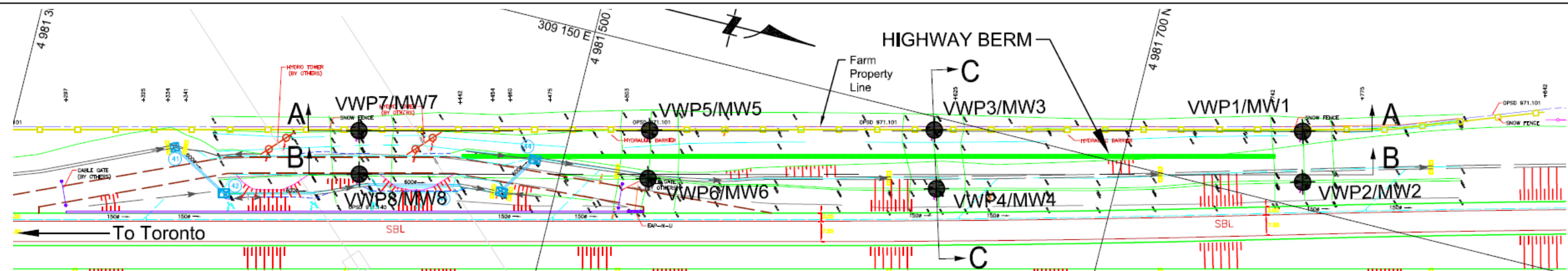
MINISTRY OF TRANSPORTATION

FOUNDATION SEEPAGE INVESTIGATION FOR
HIGHWAY 404 NORTH OF HOLBORN ROAD
TOWNSHIP OF EAST GWILLIMBURY, ONTARIO

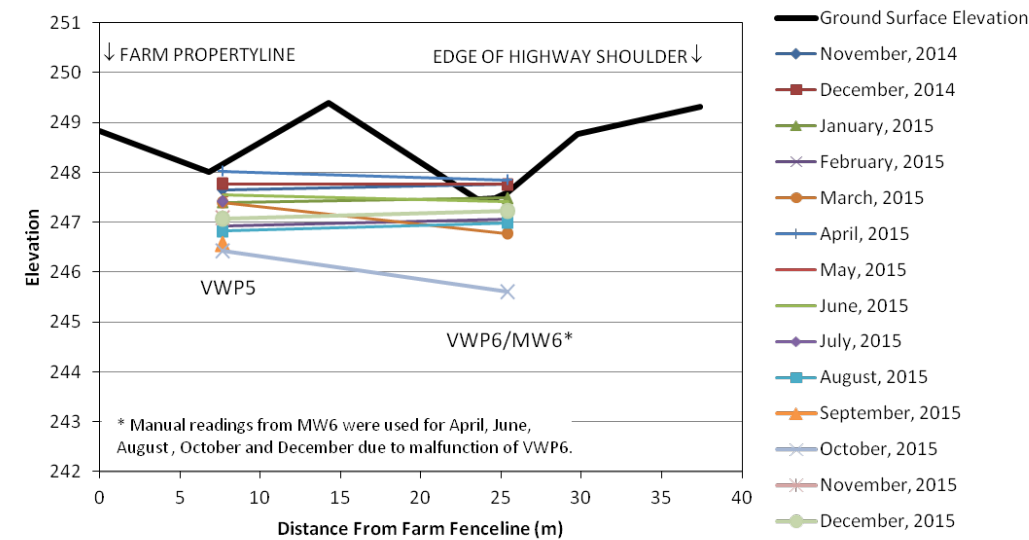
AVERAGE MONTHLY HYDROSTATIC GROUND WATER
LEVEL ELEVATIONS ALONG EAST SIDE OF THE BERM



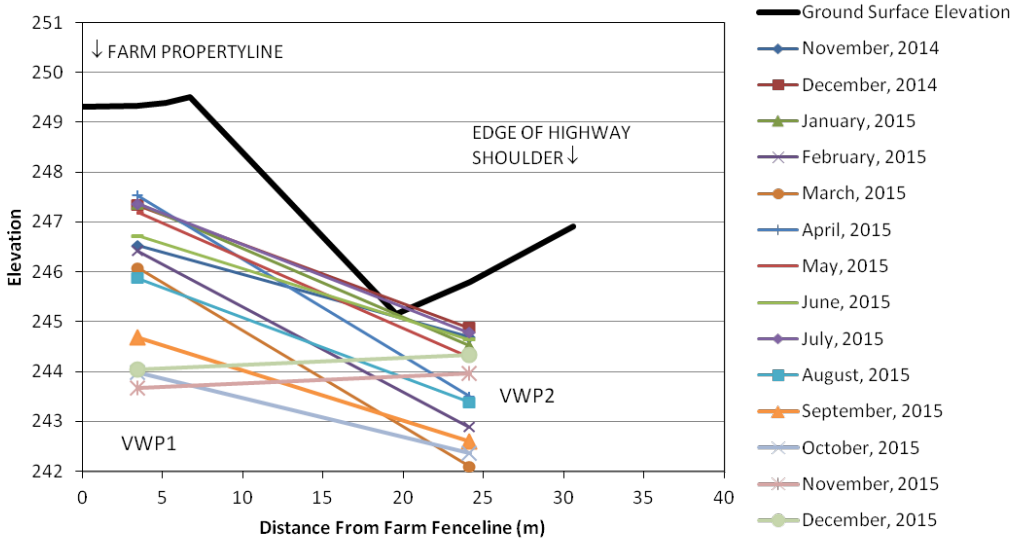
DRAWN: A.C.	DATE	SCALE	JOB NO.	FIGURE NO.
CHECKED: A.C.	FEB. 2016	N.T.S.	14TF023	16
APPROVED: M.H.M.				



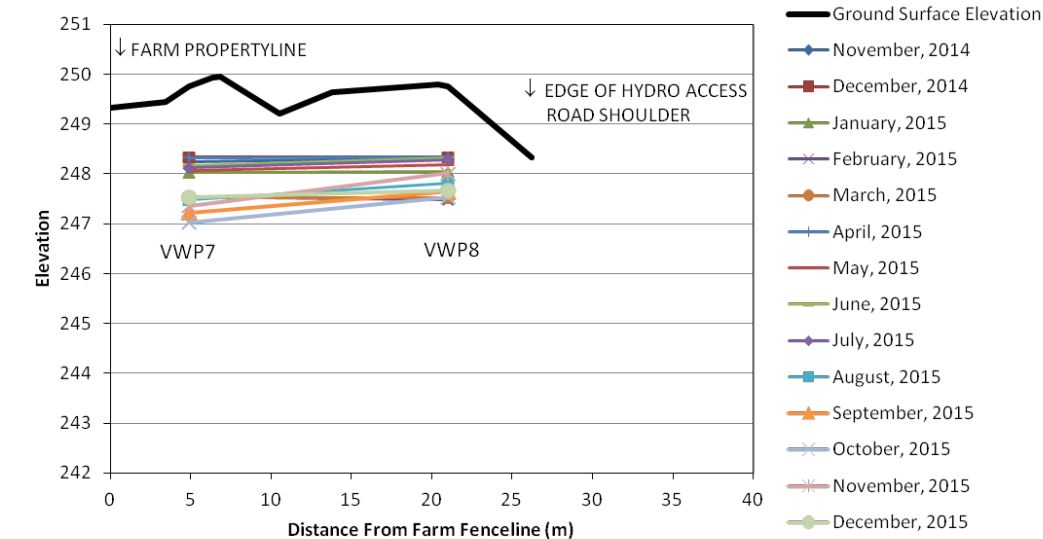
Average Monthly HGWL Elevations for VWP 5 and VWP 6



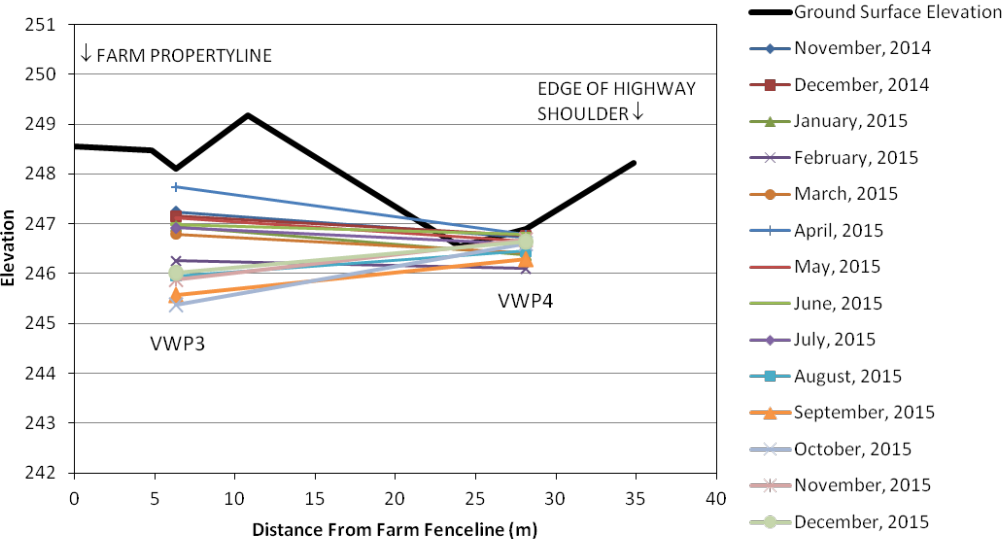
Average Monthly HGWL Elevations for VWP 1 and VWP 2



Average Monthly HGWL Elevations for VWP 7 and VWP 8



Average Monthly HGWL Elevations for VWP 3 and VWP 4



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FOUNDATION SEEPAGE INVESTIGATION FOR
HIGHWAY 404 NORTH OF HOLBORN ROAD
TOWNSHIP OF EAST GWILLIMBURY, ONTARIO

AVERAGE MONTHLY HYDROSTATIC GROUND WATER
LEVEL ELEVATIONS ACROSS THE BERM



DRAWN: A.C.	DATE	SCALE	JOB NO.	FIGURE NO.
CHECKED: A.C.	FEB. 2016	N.T.S.	14TF023	17
APPROVED: M.H.M.				