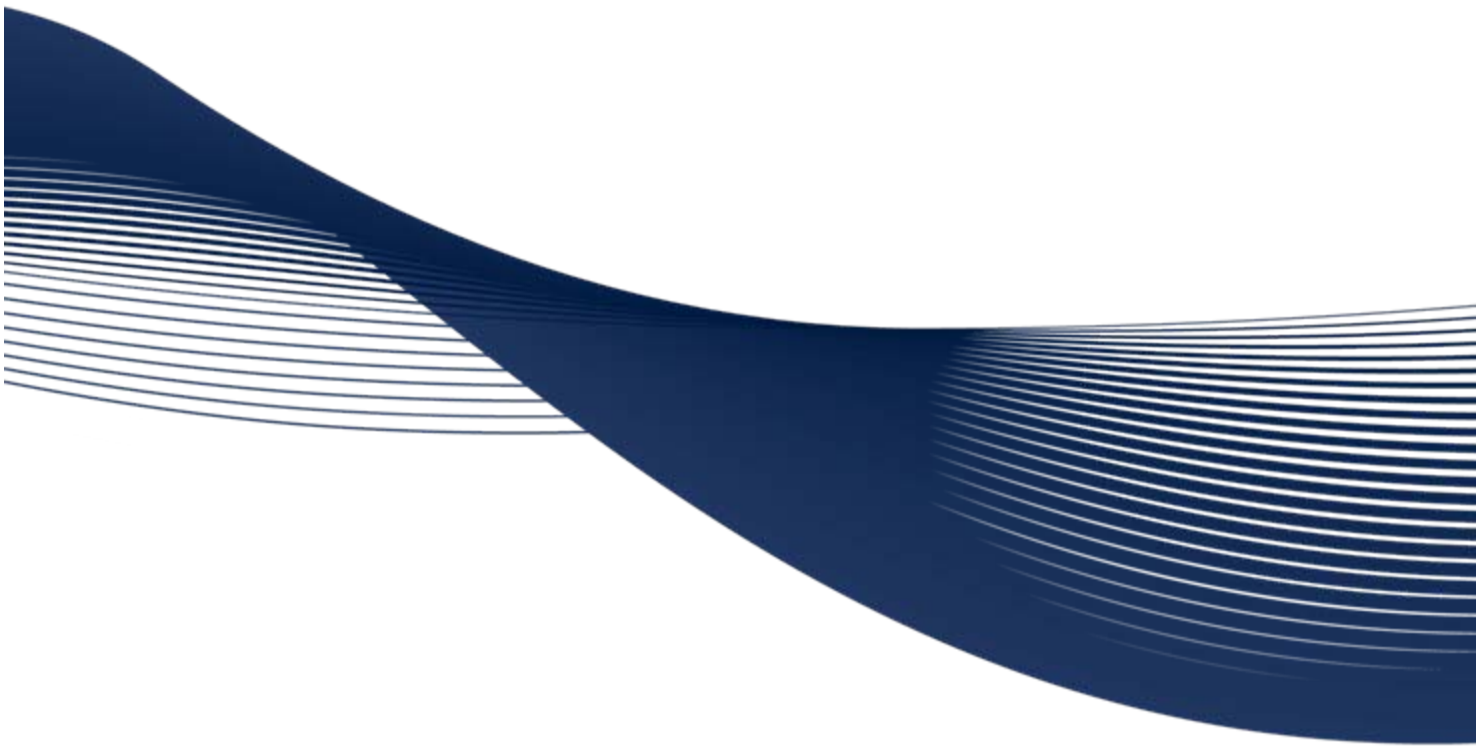
MARIANNEVILLE DEVELOPMENTS LTD.

HYDROGEOLOGICAL INVESTIGATION

Estates of Glenway, Town of Newmarket

Project No.: L09-301



NOVEMBER 2013

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November 20, 2013
Our Ref: L09-301

Marianneville Developments Limited
(c/o: The Kerbel Group Inc.)
Ms. Joanne Barnett
26 Lesmill Road, Unit 3
Toronto, ON
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Dear Ms. Barnett:

Re: Hydrogeological Investigation
Estates of Glenway
Town of Newmarket, Ontario

Cole Engineering Group Ltd. is pleased to submit the enclosed hydrogeological report for 470 Crossland Gate, Estates of Glenway, Marianneville Development Limited, Town of Newmarket, Ontario. The investigation includes a review of existing hydrogeological information for the study area, characterization of the geological and hydrogeological setting, and an assessment of potential impacts due to development and potential mitigation measures.

Should you have any questions or comments, please do not hesitate to contact the undersigned.

Yours truly,

COLE ENGINEERING GROUP LTD.

Tabitha Lee, M.A.Sc., P.Eng.
Senior Hydrogeologist

/ac

Statement of Conditions

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Executive Summary

Cole Engineering Group Ltd (CEG) was retained by Marianneville Development Limited (c/o The Kerbel Group) (the "Client") to prepare a Hydrogeological Investigation for a proposed mixed use development. The site is an irregularly shaped lot, comprising of approximately 36 hectares, located at the southwest quadrant of Davis Drive and Eagle Street, Town of Newmarket. It was previously used as a golf course. Surrounding properties mainly consist of residential land use, with the remainder of the golf course to the west, a GO Bus terminal to the east, and commercial property to the northeast. A hydro corridor runs through the middle of the site in a northwest-southeast direction.

A conceptual understanding of the geological and hydrogeological system was developed through the review of existing reports and available geological information. The site is located within the Simcoe Lowlands physiographic region, characterized by sand, silt and clay.

A total of 36 boreholes were drilled to depths ranging from 6.0 m to 11.1 m; 18 boreholes were instrumented with monitoring wells screened at varying depths. The shallow overburden materials on the site generally consist of glaciolacustrine silty clay materials, underlain by silty clay to sandy silt till. Discontinuous layers of fine to medium sand were encountered during drilling.

The site topography slopes to low points in the central north and southeast of the site, where man-made stormwater management (SWM) ponds are located. Water level trends observed on the site are a subdued reflection of the local topography and as such, water levels were generally higher in monitoring wells located at the northeast area of the site (maximum of 283.2 masl at MW-12S) and lower in monitoring wells in the southeast area of the site (minimum of 263.9 masl at MW-3S). The observed water levels ranged from 0 mbgs (in January 2012 MW-4D in the southeastern corner of the site) to 5.90 mbgs (in July 2012 in MW-11S in the central north area of the site). The water levels indicate a decreasing trend during the summer months. On a regional scale, groundwater flows northerly toward Lake Simcoe.

Potential long-term impacts to the groundwater system, local natural features, and groundwater users due to the proposed development may include:

- Decrease of infiltration contributing to groundwater system and increase in runoff as a result of the proposed development;
- Degradation of groundwater quality due to urbanization; and
- Alteration of groundwater movement through the introduction of preferential pathways.

Application of Best Management Practices and SWM ponds can reduce the effects of the impacts. Due to the shallow water table and upward hydraulic gradients, perimeter subdrains and dampproofing of foundation walls should be considered for basement construction of the proposed development.

Short-term impacts are typically associated with dewatering activities, which include reduction of groundwater input into nearby natural ecosystem features and reduction of available groundwater supply to nearby groundwater users. A review of final design grades will be conducted to confirm the potential need for dewatering in areas where high water levels were observed. If the expected dewatering rate exceeds 50,000 L/day, a Permit to Take Water (PTTW) will be required during installation of site services. The PTTW application package should include detailed study of the required dewatering rate, estimated zone of influence and mitigation measures required to minimize the dewatering impact.

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1.0 Introduction

Cole Engineering Group Ltd (CEG) was retained by Marianneville Development Limited (c/o The Kerbel Group) (the "Client") to prepare a Hydrogeological Investigation for a proposed mixed use development (site) located at the southwest quadrant of Davis Drive and Eagle Street, Town of Newmarket. The location of the site is shown in Figure 1.

1.1 Site Description

The site represents an irregularly shaped lot, comprising of approximately 36 hectares, located at the southwest quadrant of Davis Drive and Eagle Street, Town of Newmarket. The legal address of the site is as follows: Block 89, Plan 65M2263, PIN 03581-0027(LT); Block 144, Plan 65M2261, PIN 03581-0179(LT); Part Block 92, Plan 65M2212 Pts 1, 4-7 65R7939, PIN 03581-0209(LT); Block 155, Plan 65M2205, PIN 03580-0293(LT), and Block 73, Plan 65M2284, PIN 03584-0003(LT).

For the purposes of this report, the "Property" is defined as the area bounded to the north by Davis Drive; to the west by Bathurst Street, Sykes Road, Alex Doner Drive and property boundaries for 470 Crossland Gate; and to the east, south, and central boundaries by the property boundaries for 470 Crossland Gate. The "site" includes all portions of the Property to the east of the hydro corridor, the lands east of Kirby Crescent, and the north portion of the site bordering Alex Doner Drive on the west side of the hydro corridor between the existing residential properties (Figure 1).

1.2 Proposed Development

The proposed development involves converting existing golf course land into single detached units, condo units, townhouses, an apartment building, a commercial block, and stormwater management (SWM) facilities. The Draft Plan of Subdivision prepared by Zelinka Priamo Ltd. is included in Appendix A. A proposed grading plan is shown in Appendix A.

1.3 Objectives of the Hydrogeological Investigation

This Hydrogeological Investigation was conducted in order to:

- Characterize the existing geological and hydrogeological settings;
- Identify groundwater dependent natural ecosystem features;
- Identify water well owners within the vicinity of the proposed development;
- Assess potential impacts to the natural environment and other water well users as a result of the proposed development; and
- Provide recommendations on management measures to mitigate potential impacts.

1.3.1 Characterization of the Existing Geological and Hydrogeological Setting

A conceptual understanding of the geological and hydrogeological system was developed through the review of existing reports and available geological information, including:

- East Holland River Subwatershed Plan;
- Town of Newmarket Official Plan;
- York Region Official Plan;
- Updated Draft Assessment Report: Lake Simcoe and Couchiching-Black River Source Protection Area, June 2011 by the Lake Simcoe Region Conservation Authority (LSRCA), Nottawasaga Valley Conservation Authority (NVCA) and Severn Sound Environmental Association (SSEA);

- Draft Borehole Logs, January 2012 by Soil Engineers Ltd.;
- Geological and Hydrogeological Information from Ontario Geological Survey; and
- Geological and Hydrogeological Information from Ontario Ministry of Natural Resources.

Additional field investigations were carried out. A total of thirty-six (36) boreholes were drilled to depths ranging from 6.0 metres below ground surface (mbgs) to 11.1 mbgs. Twelve (12) shallow (screened at 3.0 – 6.0 mbgs) and six (6) deep (screened at 9.1 – 10.6 mbgs) monitoring wells were installed as part of the drilling program. Nested monitoring wells were installed to assess the vertical hydraulic gradients, and their influence on the local and regional groundwater systems. Data obtained in the field were used to comment on the flow patterns of the local groundwater system.

1.3.2 Identification of Groundwater-Dependent Natural Ecosystem Features

A desktop review was conducted to identify groundwater contributions to the natural ecosystem features in or near the proposed development. Information relating to these features was obtained from the following sources:

- East Holland River Subwatershed Plan;
- Town of Newmarket Official Plan;
- York Region Official Plan; and
- Natural Heritage Information Centre database.

1.3.3 Identification of Private Wells Around the Site

An understanding of typical groundwater usage in the area was obtained by:

- Querying MOE water well records within 1 km radius of the site;
- Identifying permitted water takers within 1 km radius of the site; and
- Conducting a door-to-door water well survey within 500 m radius of the site.

As part of the door-to-door survey, CEG staff noted the current water well usage, and collected information on the well. Information collected included the name and address of the owner, the well construction details and if easily accessible, measurement of a 'static' water level at the time of the survey. Where possible, a sample was taken and tested for microbial and nutrient parameters (coliform/E. coli, fecal coliform, heterotrophic plate count, orthophosphate, nitrate and nitrite), from untreated groundwater at the homeowners' property.

1.3.4 Assessment of Potential Impacts of the Proposed Development

Potential long-term and short-term impacts on the groundwater system due to the proposed development were identified. An integrated assessment of the water balance was conducted.

The key aspects considered as part of this phase of the hydrogeological investigation included an evaluation of the potential implications to the hydrologic form and function of the groundwater dependent features, ecosystem features, and the potential need for dewatering activities during the installation of services, and the potential impacts of the dewatering.

1.3.5 Recommended Mitigative Measures

The risks associated with the potential impacts of the proposed development were evaluated. Management plans were recommended to manage and mitigate potential short-term and long-term impacts associated with the development.

2.0 Existing Site Conditions

2.1 Topography and Drainage

The site is located to the south of Holland's Landing, just northeast of the Oak Ridges Moraine, and falls within the jurisdiction of Lake Simcoe Region Conservation Authority's (LSRCA). The development is located within the Lake Simcoe Watershed, predominantly in the East Holland River Subwatershed, with the western portion of the site in the West Holland River Subwatershed. There are no natural watercourses traversing the site. The regional topography undulates gently and slopes northerly toward Holland Marsh, which eventually empties into Lake Simcoe. A regional topographic map showing the boundaries of the subwatershed is presented in Figure 2.

The site has a landscaped rolling topography, with elevations ranging from approximately 265 metres above sea level (masl) near the pond in the southeast portion of the site, to a local high point of approximately 286 masl near the northeast corner of the site. A detailed topographic survey for the site was obtained from J.D. Barnes and is presented in Figure 3.

2.2 Physiography

The site is located within the Simcoe Lowlands physiographic region. The Simcoe Lowlands physiographic region is characterized by lower elevations and flat-floored valley features that generally correspond to current river systems (Sharpe et al., 1999). The floor materials in the lowlands consist of sand, silt and clay, as a result of flooding from glacial Lake Algonquin (Chapman and Putnam, 1984). The valley of Holland Marsh is covered by organic deposits, and has been one of the most intensively cultivated areas of the Province since the early 1900s.

To the east of the Simcoe Lowlands Physiographic Region is the Schomberg Clay Plains Physiographic Region, and to the west is the north slope of the Oak Ridges Moraine Physiographic Region. Figure 4 shows the general physiography.

2.3 Regional Geology and Hydrogeology

The current understanding of the geologic and hydrogeologic environment was based on scientific work conducted by the Geological Survey of Canada (GSC), Conservation Authorities Moraine Coalition (CAMC) and Lake Simcoe Region Conservation Authority (LSRCA). The regional geology and hydrogeology discussed in this report builds on information obtained from the above noted studies.

The regional geology in this area consists of Paleozoic sedimentary bedrock overlain by Pleistocene unconsolidated sedimentary materials that have been deposited and modified by glacial, fluvial and lacustrine processes over the last 135,000 years (Kassenaar & Wexler, 2006). Figure 5 shows the regional cross section obtained from the Approved Assessment Report: Lake Simcoe and Couchiching-Black River Source Protection Area (LSRCA, NVCA & SSEA, 2011). Figure 6 shows quaternary geology mapping for the region.

The depth of the bedrock in this area is expected to be at 130 masl. The different stratigraphic units that overlie the bedrock from the top include:

A. Recent Deposits;
B. Halton Till / Kettleby Till;
C. Oak Ridges Moraine;
D. Newmarket Till;

E. Channel Sediments;
F. Thorncliffe Formation;
G. Sunnybrook Drift;
H. Scarborough Formation; and
I. Bedrock.

Recent Deposits – The Recent Deposits are sediments deposited since the final retreat of the Pleistocene Glaciers. These are mostly glaciolacustrine silts and clays.

Halton Till/Kettleby Till – The Halton Till was deposited approximately 13,000 years before present (B.P.), due to the last glacial advance in the area. The thickness of Halton Till is typically 3 m to 6 m; however, it can locally exceed 15 m in thickness. The Halton Till consists of silt to silty clay with occasional gravel. This till acts as an aquitard of regional extent.

Oak Ridges Moraine – The Oak Ridges Moraine (ORM) is an extensive stratified sediment complex, 160 km long and 5 km to 20 km wide, located to the south of the site. The deposits consist mainly of sand and gravel. The ORM Complex is a major groundwater recharge area. The sediments in this area are around 100 m thick beneath the crest of the moraine but thins out rapidly towards its margins. The unit is water bearing and occurs at elevations between 230 masl and 260 masl.

The ORM is a regionally significant recharge area. It is known to be unconfined near the crest of the moraine, while it is confined by the till units both to the north and south of the highland. This unit serves as the main source of water for creeks as nearly 90% of the recharge via the ORM sediments discharges to the stream networks flowing north and south from the regional topographic divide. The ORM complex forms a regional aquifer and is commonly used for water supply.

Newmarket Till – The Newmarket Till is regionally extensive and is typically a massive, frequently over-consolidated, stony and dense silty sand diamicton deposited approximately 18,000 to 20,000 years B.P., when the Laurentide ice sheet was at its maximum extent. It acts as a regional aquitard separating the ORM Aquifer from the underlying Thorncliffe Aquifer. The thickness of Newmarket till typically varies between 20 m to 30 m but locally can exceed 60 m in thickness.

Channel Sediments – Sections of Newmarket Till were subject to erosional processes by glacial meltwater which occurred beneath glacial ice. The eroded channels were infilled with higher hydraulic conductivity material including sand and silt. This phenomenon created the potential for hydraulic connections between the shallow Oak Ridges Moraine Aquifer and deeper Thorncliffe Aquifer. Mapping from Earthfx Inc. (2006) show that the site does not directly overlie the eroded channel. The location of eroded channel is presented in Figure 6.

Thorncliffe Formation – The Thorncliffe Formation was deposited approximately 45,000 years B.P. and is made up of glaciofluvial and lacustrine deposits containing sand, silt, and clay. The Thorncliffe Formation shows a considerable variation in grain size and thickness regionally, and locally can vary between 10 m to 30 m in thickness. It acts as an aquifer of regional extent.

Sunnybrook Drift – The Sunnybrook Drift is a clast-poor silt to silty clay unit and is a regionally extensive aquitard. The thickness of the Sunnybrook Drift is generally less than 10 m to 20 m, although locally it can reach a thickness of 30 m. It was deposited in close proximity to an ice sheet as it finally reached the West Holland River Subwatershed approximately 45,000 B.P. (Earthfx & Gerber, 2008).

Scarborough Formation – The Scarborough Formation marks the beginning of the Wisconsin glaciation, approximately 100,000 years B.P. It is composed of graduated materials that vary from fine silts and clays to sand in a deltaic sequence. However, within the East and West Holland Subwatersheds, the Scarborough Formation is mainly comprised of sand. This unit is mostly found within bedrock valleys and thins laterally away from the valleys (Earthfx & Gerber, 2008). It acts as an aquifer of regional extent.

Bedrock – Underlying the unconsolidated sedimentary material at depths of over 150 m are regional scale, limestone and shale bedrock. These bedrock units were deposited on the Canadian Shield over a period of 200 million years, beginning approximately 550 million years B.P. (Kassenaar & Wexler, 2006). The bedrock underlying the majority of the site is known as the Georgian Bay Formation and Blue Mountain Formation, although the Simcoe Group underlies the north portion of the site (Earthfx, 2009). The Georgian Bay and Blue Mountain Formations were formed in the Upper Ordovician age approximately 455 to 460 million years B.P., and the Simcoe Group and was formed during the Middle Ordovician age, approximately 450 million years B.P. Figure 7 illustrates the bedrock geology underlying the site.

2.4 Monitoring Network

2.4.1 Borehole Investigation and Monitoring Well Installation

From December 12 to December 19, 2011, a total of 36 boreholes were drilled to depths ranging from 6.0 m to 11.1 m. Eighteen (18) boreholes were instrumented with monitoring wells screened at varying depths. Monitoring wells on-site are categorized by screening depth as follows:

- Twelve (12) shallow monitoring wells: screened with a 3.0 m screen between depths of 3.0 m to 6.0 m; and
- Six (6) deep monitoring wells: screened with a 1.5 m screen between depths of 9.1 m to 10.6 m.

Monitoring well and borehole locations are shown in Figure 8. The details of the monitoring wells are shown in Table 1. Each monitoring well was constructed with 5 cm (2 inch) diameter PVC casing. All boreholes and monitoring wells were drilled and installed by DBW Drilling Ltd. under supervision of Soil Engineers Ltd. The associated borehole logs are presented in Soil Engineers Ltd. Geotechnical Report, dated March 2012 (Appendix B).

2.5 Local Geology and Hydrogeology

The geotechnical borehole logs were reviewed and used to construct geological cross-sections across the site (Figures 9A-F, locations of the cross-sections are shown in Figure 8). The fill at the site is predominantly composed of silty clay with some sandy silt and gravel. It was observed in boreholes drilled in the vicinity of roads and ponds. Glacial lake deposits of silty clay compose the uppermost overburden unit on the site. It ranges in thickness from approximately 8.5 m in the central northern area of the site, and becomes locally thin to approximately 0.5 m near the central eastern portion of the site. The glacial lake deposits are underlain silty clay till or sandy silt till. Due to the nature of the till, it is expected that sand pockets will be occasionally found throughout it.

Discontinuous layers of fine to medium sand were encountered during the drilling of boreholes, which were believed to be sand pockets present in the till layers. The Oak Ridges Aquifer Complex was not encountered in the boreholes and thus may be locally discontinuous. The underlying regional aquifer unit is therefore the Thorncliffe Aquifer. Based on the borehole logs and expected depth of the Thorncliffe Aquifer, it is unlikely that it was encountered in any of the boreholes.

2.5.1 Groundwater Levels

Groundwater levels from all on-site monitoring wells were monitored on a bimonthly basis. Eight water level monitoring events took place, and water levels were also measured prior well development and conducting rising head tests. The monitoring results are summarized in Table 2 and hydrographs are shown in Appendix C. In addition to the regular monitoring events, data loggers were installed in monitoring wells MW-7S and MW-7D (February 3, 2012), and MW-10S (January 26, 2012) to collect continuous water level data.

The site topography slopes downward toward each of the stormwater ponds on the site. Based on the pond discharge points further discussed in Section 3.1.1, the overall site topography slopes toward the north or northwest for all areas that feed into the pond in the north central area of the site, and toward the southeast for all areas that feed into the ponds in the southern area of the site. There is an apparent groundwater divide running from the northeast to the central west portion of the site and mimics the site topography. Similarly, water level trends observed on the site are a subdued reflection of the local topography and as such, water levels were generally higher in monitoring wells located along the ridge and lower in monitoring wells in the south and north central portions of the site where the ponds are located.

The maximum water level observed was 283.3 masl (1.17 mbgs) in MW-12S in the northeast corner of the site on January 5, 2012. The minimum water level observed was 263.9 masl (3.39 mbgs) in MW-3S in the central south area of the site on July 10, 2012. This is fairly reflective of site topography which is highest in the northeast corner of the site and lowest in the southern area of the site.

Water levels ranged from 0 mbgs (268.4 masl) in MW-4D in the southeastern corner of the site on January 9, 2012, to 5.90 mbgs (271.4 masl) in MW-11S in the central north area of the site on July 10, 2012. Higher groundwater levels were observed during the winter and spring months (December to May), and lower levels were observed during the summer and autumn months (July to November). The range in seasonal fluctuation in each well was from 0.3 m (in MW-9S) to 4.4 m (in MW-11S) over the course of the monitoring period. Rises in groundwater levels due to infiltration were observed throughout the monitoring period. Both shallow and deep monitoring wells showed similar fluctuation.

2.5.2 Groundwater Flow

2.5.2.1 Horizontal Groundwater Flow

At a regional scale, groundwater flows generally northerly towards Lake Simcoe. Interpreted groundwater flow pattern in the shallow zone is shown in Figure 10A for the spring (March 14, 2012) and summer (July 10, 2012) events, when water levels are typically highest and lowest, respectively, and in Figure 10B for the fall event (November 27, 2012). In general, there is a divide across the middle of the site, from which groundwater flows northwesterly and southeasterly. No significant seasonal variation was observed in the flow pattern throughout the monitoring events.

2.5.2.2 Vertical Groundwater Flow

Hydraulic gradients were calculated from the nested monitoring wells for each of the monitoring events (Table 3). The hydraulic gradient across the site is generally neutral to downward across the majority of the site, with the exception at MW-8 and MW-4 in the central east and southeast areas of the site, which exhibit upward gradients. MW-7 in the centre of the site showed a change from downward gradient in the winter/spring to upward gradient in the summer. This indicates that the centre to east areas of the site may be seasonal groundwater discharge areas. This may be attributed to low lying topography, shallow water table, and upward hydraulic gradients. The rest of the site shows small

downward gradients and has the potential to provide some level of recharge. There are no natural surface water features in the vicinity of these locations.

2.5.3 Hydraulic Conductivity

Single-well rising head tests were conducted by CEG on January 26 and 31, 2012, and February 3, 2012, on all twelve shallow monitoring wells and deep wells MW-10D and MW-12D. These tests were done to measure the in-situ hydraulic conductivity (K) of the screened overburden materials. The Hazen (1951) method was used to calculate hydraulic conductivity values for wells where grain-size analysis data were available. The estimated hydraulic conductivities and the associated geological materials are presented in Table 4. The values presented in this table are the geometric average of the early and late calculated hydraulic conductivity values. Early and late time estimate responses were due to changes in the rate of water level response, which may be due to well geometry or stratigraphy.

During each rising head test, a known volume of water was removed from the well using a manual inertial pump. The water level recovery was measured using a combination of manual readings and a calibrated datalogger, until a minimum of 80% recovery had been achieved. The K values were calculated using the Hvorslev (1951) method, and the analyses are in Appendix D. These in-situ K values were supplemented by K values estimated from grain-size analysis of selected soil samples collected during drilling. Grain-size analyses were conducted and are presented in Appendix B.

The in-situ K values range from 2.8×10^{-6} m/s to 7.6×10^{-9} m/s, and the Hazen K values range from 1.4×10^{-7} m/s to 1.0×10^{-8} m/s. These values are within the expected range for silty till material observed.

2.5.4 Groundwater Quality

A total of four groundwater samples (including a field duplicate) were collected on January 26, 2012 from two shallow wells (MW-1S and MW-11S) and one deep well (MW-1D) using a manual inertial pump. Prior to collecting the groundwater samples, the monitoring wells were purged by pumping three well volumes from the well. The purging process removes stagnant water from the well, thereby ensuring the groundwater samples will be representative of the groundwater in the formation adjacent to the screen.

The collected water samples were sent to Maxxam Analytics Inc., Mississauga, for analysis of inorganic and metal parameters. Laboratory groundwater test results are summarized in Table 5, and the laboratory analytical results and the laboratory certificate of analysis are included in Appendix E. Test results were compared to the conservative *Soil and Groundwater Standards – Table 2 Potable Groundwater - as amended April 15, 2011* for All Types of Property Use for Coarse-grained materials.. The groundwater samples showed no exceedances.

3.0 Identification of Potential Receptors

As part of this study, potential groundwater receptors including natural ecosystem features and domestic or permitted water supply were identified. The following sections summarize findings related to groundwater-dependent natural ecosystem features and groundwater users.

3.1 Environmental Features

The development is located within the jurisdiction of the LSRCA. The western portion of the site is located within the West Holland River Subwatershed and the eastern portion of the site is located within the East Holland River Subwatershed. The local natural ecosystem features are illustrated in Figure 11.

Significant information on the surface water features were obtained from the East Holland River Subwatershed Plan and the West Holland River Subwatershed Plan, prepared by LSRCA in 2010. Key points from the reports are summarized in the following sections.

3.1.1 Surface Water Features

There are no natural surface water features traversing the site. A series of four (4) man-made stormwater management ponds are built on the site, which are connected to four (4) other ponds on the Property. The ponds are connected with a pump and piping system which transfers water from pond-to-pond in conjunction with the gravity-fed storm sewer system. The stormwater management pond system eventually discharges into both Ansnorveldt Creek of the West Holland River Subwatershed, and into Western Creek of the East Holland River Subwatershed. Water discharges from the northernmost pond into a culvert at Davis Drive east of the residential subdivision bordering Ford Wilson Boulevard, which conveys the water into Ansnorveldt Creek. The ponds in the southeastern quadrant of the site drain via underground piping into Western Creek.

Ansnorveldt Creek is located approximately 50 m north of the site. Western Creek is located approximately 120 m southeast of the site. Both creeks are classified as warm water watercourses, and thus are unlikely groundwater-dependent.

3.1.2 Natural Ecosystem Features

The site surroundings consist predominantly of residential properties, with some rural residential, commercial, and institutional properties. Land use to the west of the site consists of the remainder of the Glenway Golf Course and residential and rural residential properties. To the north is a residential subdivision, rural residential property, and the Upper Canada Mall. Immediately east of the site is a GO Bus terminal and residential subdivisions. South of the site are residential properties followed by the Ray Twinney Recreation Complex. The site is not located within the Oak Ridges Moraine, which is located approximately 150 m to the southwest.

A search on the Ministry of Natural Resources Natural Heritage Information Centre revealed no “Natural Areas” or “Plant Communities” of concern within a minimum 1 km radius of the site. However, the Greenbelt Protected Country Side is located just to the west of the site, as is the Oak Ridges Moraine Conservation Plan Area (ORMCP Area). The site is predominantly zoned as Parks and Open Space and as Stable Residential land use in Schedule A of the Town of Newmarket Official Plan. Schedule A also designates a natural heritage system approximately 100 m northwest of the proposed development, and one associated with Ansnorveldt Creek within 50 m north of the site. There are floodplains bounding Ansnorveldt Creek and Western Creek, within approximately 50 m and 85 m of the site, respectively.

A search on the Ministry of Natural Resources Natural Heritage Information Centre was conducted to identify groundwater dependent species. Five (5) species element occurrences were found within an approximate 1 km radius of the site. As the surrounding water features are classified as warm water, none of the species identified in the search were deemed as groundwater dependent species.

3.2 Surrounding Groundwater Users

A search of the MOE well records database was conducted within a 1 km radius around the site. The included 63 records and results are shown in Tables 7 and 8.

Groundwater in the area surrounding the development is primarily used for domestic supply (21%), followed by municipal supply (8%). Figure 13 shows the location of MOE Water Well Records and other local water users. A summary of the water well records search is included in Appendix F.

3.2.1 Municipal Groundwater Use

The Town of Newmarket currently operates six (6) municipal wells in the area to service the residential water supply needs:

- Well 1;
- Well 2;
- Well 13;
- Well 14;
- Well 15; and
- Well 16.

Based on the information available in the *Lake Simcoe and Couchiching Black River Source Protection Area Assessment Report* (South Georgian Bay-Lake Simcoe Source Protection Committee, 2011), three (3) municipal water wells were identified within a 1 km radius from the site: Well 1, Well 2, and Well 15.

The Newmarket municipal wells are grouped together with the Aurora, Holland Landing, Queensville and Yonge Street Area wells, which are part of a larger regional flow system that is locally influenced by a topographic basin, tunnel channel, and bedrock valley. Most of the Newmarket wells are located near the margins of the north-south tunnel channel that connects aquifer zones vertically and horizontally between the ORM and Scarborough Formation (LSRCA, NVCA & SSEA, 2011).

Table 8 summarizes details on all municipal groundwater wells in the area.

York Region Official Plan mapping indicates that the site is located in the 5, 10, and 25-year wellhead protection area (WHPA). It has an intrinsic vulnerability ranging from 2 to 8 (10 is high), shown in Figure 12. The York Region Official Plan policies limit or restrict certain land uses within WHPAs that may potentially impact groundwater quality and drinking water quality. A Source Water Impact Assessment and Mitigation Plan (Appendix I) is required by York Region as prescribed by the Clean Water Act, 2006, prior to the establishment of new land uses that involve the storage, manufacture, or use of the following materials:

- Petroleum-based fuels and/or solvents;
- Pesticides, herbicides, fungicides, or fertilizers;
- Construction equipment;
- Inorganic chemicals;
- Road salt and contaminants as identified by the Province;
- The generation and storage of hazardous waste or liquid industrial waste, and waste disposal sites and facilities;
- Organic soil conditioning sites and the storage and application of agricultural and non-agricultural source organic materials; and,
- Snow storage and disposal facilities.

3.2.2 Permitted Water Users

A search of permitted water takers within 3 km of the site was conducted. The MOE Permit To Take Water (PTTW) database identified eleven (11) permits for surface water and/or groundwater takings. The takings are primarily for municipal purposes (6 permits). The other water-taking purposes include construction (2 permits), and golf course irrigation (3 permits, including 2 permitted surface water takings on the site for Ponds 4a and Pond 6). Table 9 summarizes the nearby permitted water takers.

Other than the 2 permitted takings on the site, two (2) other permitted water takers were identified within 500 m of the site, which were Newmarket Wells 1 and 2. All six (6) municipal well takings are for groundwater, and the other five (5) takings are surface water takings.

3.2.3 Private (Domestic) Water Well Users

A water well survey was conducted to gain a better understanding of the usage of the local aquifer system and to establish baseline conditions for nearby wells. A search of the available MOE water well records was conducted for a radius of 1 km around the site. Search results are provided in Appendix F. The results indicate that approximately 63 wells have been drilled or dug in the area. Well usage based on the MOE water well record search is summarized in Table 7.

3.2.4 Private Water Well Survey

Private Water Well Survey (Methodology)

A door-to-door water well survey was conducted for properties located within a 500 m radius of the site. This survey was conducted on February 3, 2012 to confirm water well record search results and to obtain additional information on the water wells. A notice was provided on January 26, 2012 to inform the property owners of the water well survey. Participation was requested from the residents on a voluntary basis. A questionnaire about the well system and water usage was provided to the residences, a sample questionnaire is attached in Appendix G. Where accessible, groundwater levels were taken and groundwater samples were collected. In the event that no personal contact was made with the resident, a copy of the survey and a self addressed stamped envelope was provided so that residents could still complete the questionnaire and participate in the baseline survey.

According to the Town of Newmarket, only three (3) properties on well water are located within the 500 m radius around the site. All other properties are supplied with municipal water supply. As such, only the properties identified by the Town of Newmarket as being on well water were included in the door-to-door water well survey. Only one (1) property owner/tenant participated in the survey. A groundwater sample from the domestic well was collected from the one (1) property and submitted to Maxxam Analytics Inc. for microbial and general inorganic parameters, including nitrates, nitrites and orthophosphate analysis. Prior to collecting the water sample, all fixtures on the tap were removed, and the tap was dipped in a 6% sodium hypochlorite solution for a minimum of two (2) minutes for the purposes of disinfection. In addition, the tap was left running for a minimum of five (5) minutes to flush out stagnant water inside the system and to ensure the water sample collected was representative of the groundwater from the well.

Private Water Well Survey (Survey Results)

A telephone conversation took place with one resident on Davis Drive on February 1 and 2, 2012 providing consent to have her well examined and water sampled. A telephone conversation on February 2, 2012 with the former resident of two other properties on Davis Drive indicated that the properties

had been sold to a developer and had no one living in them for the past year or longer. Documents relating to these wells could not be found.

Based on the door-to-door water well survey, it was found that the property on Davis Drive had an individual drilled water well, at a depth of approximately 35.5 mbgs. The associated well survey details are presented in Appendix G.

Private Water Well Survey (Sample Results)

During the door-to-door water well survey, one (1) groundwater sample was collected from one (1) property. Groundwater analytical results were compared to the Ontario Drinking Water Standard (ODWS) criteria. The sample was collected on February 3, 2012 from a basement sink tap as there was no available garden tap. An exceedence of the ODWS criteria for total coliforms was detected. The resident was called and notified of the results. A summary of the laboratory sample results are presented in Table 10. The associated laboratory certificate of analysis and chain of custody form are presented in Appendix G.

4.0 Water Balance

The LSRCA Watershed Development Policies states that every feasible effort to maintain the pre-development infiltration and evapotranspiration rates must be maintained. A water balance was calculated using the drainage area plan developed by CEG in the Functional Servicing report (2012). The methodology used was the Thornthwaite and Mather (1957) water balance method, outlined in Chapter 3 of the MOE's Stormwater Management Planning and Design Manual (2003). Precipitation data was obtained from King Smoke Tree Station (Climate ID 6154142). The water balance calculations are shown in Appendix H.

In the post-development scenario, the area changes due to changes in drainage area catchments. The impervious area increases from approximately 42% to 58%. Assuming that all dwellings have disconnected roof leaders (including existing dwellings as well as those to be constructed), this results in a decrease in infiltration by approximately 5,763 m^3/year, and an increase in runoff by approximately 95,406 m^3/year. The loss in infiltration and increase in runoff will require mitigation/management measures as discussed in the following section.

5.0 Potential Impact and Proposed Mitigation

The key receptors identified in the previous section include:

- Natural Features (off-site streams); and
- Groundwater Users (municipal water supply).

Potential impacts associated with the proposed development can manifest in the short term as a result of construction related activities, or in the long term, if changes that occur during the site development alter the natural form or function of the hydrologic system.

5.1 Identification and Mitigation of Long-Term Impacts

5.1.1 Potential Long-Term Impacts to the Groundwater System

The proposed development will increase the amount of non-permeable surfaces and as a result, reduce the amount of infiltration to the underlying aquifer units, and increase the surface water run-off. Long-

term impacts to the regional groundwater system may result from the reduced amount of groundwater infiltration to the aquifers. This impact is anticipated to be negligible since the site is underlain by low permeability sediments and occupies less than 1% of the West Holland River Subwatershed and East Holland River Subwatershed.

The lands to the west and south of the site in the ORM are identified as significant groundwater recharge areas. These areas are important to the recharge of the regional groundwater system. The site is not located within the Oak Ridges Moraine Conservation Plan Area, and is instead identified as a possible groundwater discharge zone (LSRCA, 2010a). The low-permeability till that covers most of the site limits the amount of infiltration this site can contribute.

The introduction of overburden material with different hydraulic properties or alterations to the local topography can affect the existing groundwater system. Installation of site services could potentially introduce preferential pathways for contaminants to the groundwater and alter the natural groundwater levels.

Local residents have identified the existing shallow water table to be an issue resulting in basement flooding. Observed shallow water table across the site and strong upward hydraulic gradients at MW-8S/D and MW-4S/D on the central east and southeast areas of the site, coupled with the removal of surficial soils during site grading may result in issues such as groundwater seepage into the basements in the proposed development.

Local groundwater quality may be affected by the application of road salt along the public roadways. The underlying overburden materials are generally fine grained and the input to the regional aquifer may be retarded to some degree.

5.1.2 Potential Long-Term Impacts to the Natural Features

There are no natural surface water features, wetlands, or forest features on the site. There are forest features identified by the MNR within 500 m of the site to the northwest and southeast. In general, forests are not groundwater-dependent and therefore changes to the groundwater system will not likely affect forests. No wetlands were identified within 1 km of the site. Ansnorveldt Creek is located approximately 50 m north of the site and Western Creek is located approximately 120 m southeast of the site. Both creeks are classified as warm water watercourses, and thus are unlikely groundwater-dependent.

The potential of reduced on-site infiltration is unlikely to have an impact on the hydrological and ecologic function of the natural features since they are not likely groundwater dependent.

It is expected that the proposed retrofitted stormwater management facilities would provide water quantity and quality control prior to releasing the water to the storm system and into the receiving surface water bodies. The downstream water quantity and quality of these surface water features are expected to be minimally impacted by the proposed development and urbanization.

5.1.3 Potential Long-Term Impacts to Groundwater Users

The water well survey only identified one (1) resident that used groundwater for domestic drinking water purposes. The well was approximately 35 mbgs. It is likely screened in the ORM aquifer unit. At the time the water level in the well was measured, it read 13.947 mbg, although water had been used in the house recently. Three municipal wells (Newmarket Well Nos. 1, 2, and 15) are located within 1 km of the site. Newmarket Well Nos. 1 and 2 are screened in the Thorncliffe aquifer unit, and Newmarket Well

No. 15 is screened in the deeper Scarborough aquifer unit. Interpreted tunnel channel sediments lie east of the site, and may provide hydraulic connectivity between the ORM and Thorncliffe aquifer units.

Alteration of site grading and the introduction of preferential pathways through site servicing could potentially alter the shallow groundwater flow system and reduce the quantity of groundwater available to nearby shallow groundwater users. The impacts from the development are expected to be small as the site is already used as a golf course with underground piping systems. No stress is expected in the deeper aquifer due to the thickness of the Newmarket Till formation.

There is potential for the degradation of groundwater quality as a result of urbanization.

5.1.4 Mitigation of Long-Term Impacts

On a regional scale, most aquifer recharge occurs in the ORM, or in areas where coarse-grained units are found at shallow depth. The site is not located within the Oak Ridges Moraine Conservation Plan Area, and is instead identified as a possible groundwater discharge zone (LSRCA, 2010a). It is therefore not expected to contribute a significant amount of infiltration on a watershed scale due to the generally low permeability of the overburden.

Various Best Management Practices (BMPs) could be incorporated into the proposed development that would promote infiltration and decrease runoff in order to help preserve the existing groundwater flow regime. Due to the shallow water table, soil amendments may be required to promote infiltration. The on-site SWM ponds will capture the storm runoff and provide water quality treatment, including temperature and flow moderation prior to discharge to the creek. Combined with various best management practices, the SWM ponds will help mitigate the impact to nearby watercourses. Use of collars or other methods to restrict the preferential movement of groundwater along the subsurface infrastructure corridors can be considered. Due to the shallow water table, perimeter subdrains and dampproofing of foundation walls should also be considered during basement construction.

5.2 Identification and Mitigation of Short-Term Impacts

On-site grading activities would affect the site topography and site drainage. Due to the relatively shallow water table observed across the site, dewatering activities maybe required to control water levels for the nominal depth sanitary services in the shallow overburden.

According to Section 34 of the Ontario Water Resources Act (OWRA), any groundwater taking greater than 50,000 L/day will require a Permit to Take Water (PTTW) from the MOE. The rate of dewatering for this site may exceed this threshold and therefore a PTTW may be required during the construction of on-site servicing. During the detailed design stage, it will be necessary to refine the hydrogeological analysis in locations along the proposed service alignments.

5.2.1 Potential Short-Term Impacts to the Groundwater System

Dewatering may result in a lowering of the groundwater levels in the aquifer, thereby reducing the available groundwater for nearby groundwater takers. However, such impacts would be short-term and localized, and recovery of the groundwater system would occur following completion of the dewatering activities. An Environmental Management Plan (EMP) will need to be developed to identify and reduce possible short-term impacts during construction.

5.2.2 Potential Short-Term Impacts to the Natural Features

The lowering of the water levels in the shallow perched systems or in underlying confined aquifer units could potentially reduce the groundwater input into nearby natural ecosystem features; however, no groundwater-dependent features were identified within 1 km of the site.

Dewatering discharge that may be directed to nearby watercourses could potentially alter the physical, chemical, and thermal regime of the receiving watercourses. Erosion control and water retention measures such as rock check dams, discharge via ponds, and silt controls should be considered in designing discharge plans to minimize the impacts.

5.2.3 Potential Short-Term Impacts to the Other Groundwater Users

Dewatering may result in a reduction of available groundwater supply in the private well and municipal Well Nos. 1 and 2. An Environmental Management Plan (EMP) needs to be developed to respond to potential well interference complaints and to provide mitigation during dewatering operations.

5.2.4 Mitigation of Short-Term Impacts

The zone of influence due to dewatering is expected to be localized and limited to the shallow depth due to the low hydraulic conductivity of the shallow till, and the shallow depth of the servicing. However, the dewatering volume and zone of influence could increase significantly if the deeper servicing connections intercept the ORM Aquifer. A review of final design grades will be conducted to confirm the potential need for dewatering in areas where high water levels were observed. If dewatering is required during installation of site servicing, a PTTW will be required. The PTTW application package should include detailed study of the required dewatering rate, estimated zone of influence and mitigation measures required to minimize the dewatering impact.

The nearby surface water features are unlikely groundwater-dependent. Therefore, no impact is anticipated at these reaches of the tributaries due to lowering of groundwater table from dewatering. They can still be impacted by dewatering discharge quality. To minimize potential impacts to these creeks due to dewatering discharge, if possible, dewatering should be conducted during the warm water timing window for construction (July 1st to March 31st), Prior to construction, it will be necessary to prepare a dewatering discharge plan that assesses the quantity and quality of dewatering discharge, as well as the assimilative capacity of the receiving water bodies depending on the discharge route.

Detailed assessment of the potential drawdown and zone of influence as a result of the dewatering will need to be conducted during the preparation of the PTTW application. Additionally, an EMP consisting of a monitoring and mitigation plan will have to be developed as a supporting document for the PTTW application.

6.0 Summary

Based on the above the analysis, we present the following summary of the hydrogeological conditions on the site:

1. The site is located within the East Holland River Subwatershed and the West Holland River Subwatershed, and falls under the jurisdiction of the LSRCA.

2. The site is within the Simcoe Lowlands physiographic region. The South Slope region is characterized by lower elevations and flat-floored valley features consisting of sand, silt, and clay deposits.

3. The bedrock in the regional area is interpreted to be at approximately 130 masl and is overlain by alternating aquifers and aquitards. The shallowest regional aquifer is the Thorncliffe Aquifer.

4. From December 12 to 19, 2011, a total of 36 geotechnical boreholes were drilled to depths ranging from 6.0 m to 11.1 m. 18 of the geotechnical boreholes were instrumented with monitoring wells at screened depths ranging from 3.0 m to 10.6 m.

5. Fill, composed mainly of silty clay, was also encountered in several boreholes during the subsurface investigation to a maximum depth of 3.0 m. The overburden material was identified to be predominately glaciolacustrine silty clay.

6. The ORM was not encountered in any of the boreholes drilled on-site and thus it is expected to be locally discontinuous. The Thorncliffe Aquifer is therefore expected to be the main aquifer underlying the site. It was not encountered in the boreholes and is thus deeper than 10 m below the site. Regional mapping indicates that the Thorncliffe Aquifer is locally deeper than 30 mbgs.

7. Groundwater levels generally mirror the site topography and are at a higher elevation along a central topographic high running from the northeast to the central west portion of the site. Groundwater tends to flow to the northwest north of the topographic high, and to the southeast south of the topographic high.

8. The hydraulic gradient across the site is generally neutral to slightly downward across the majority of the site, with the exception at MW-8 and MW-4 in the central east and southeast areas of the site, which exhibit upward gradients.

9. MOE water well search results indicate 63 records within 1 km of the site. Groundwater in the area surrounding the development is primarily used for domestic supply (21%), followed by municipal supply (8%). Eleven (11) PTTW holders were identified within 3 km of the site. The takings are primarily for municipal purposes (6 permits). The other water-taking purposes include construction (2 permits), and golf course irrigation (3 permits, including the 2 permitted surface water takings on the site).

10. The site is located within the 5, 10, and 25-year wellhead protection area (WHPA). It has an intrinsic vulnerability rating of 2 (low), 4, 6, and the southeast edge of the site has a rating of 8.

11. Potential long-term impacts to the groundwater system associated with the development include: reduction in infiltration, introduction of preferential pathways for contaminants such as road salt, and reduction of quantity of groundwater available to nearby shallow well systems. Existing shallow water table, upward hydraulic gradients, and proposed site grading could also influence groundwater seepage into the basements in the proposed development.

12. The following mitigation measures are recommended to mitigate the long-term impacts to the groundwater system: implementation of BMPs to promote infiltration and decrease runoff, use of SWM ponds to capture the storm runoff and provide water quality treatment, possible use of collars or other methods to restrict the preferential movement of groundwater in bedding, and perimeter subdrains and dampproofing of foundation walls for basement construction to prevent groundwater seepage into basements of the proposed development.

13. Potential short-term impacts are mostly associated with the construction dewatering. These impacts are expected to be localized and the groundwater system is expected to recover after the completion of the dewatering activities. A PTTW will be required during construction dewatering and the PTTW application package will include detailed study of the required dewatering rate,

estimated zone of influence and mitigation measures (Environmental Management Plan) required minimizing the dewatering impact.

7.0 Recommendations

1. During the detailed design stage, it will be necessary to refine the analysis of the hydrogeological conditions along the servicing alignments to estimate dewatering rates. The anticipated zone of influence and dewatering rates as a result of construction-related dewatering will be estimated. These findings will be used to prepare a PTTW application for construction dewatering.
2. Long-term impacts will need to be addressed through the implementation of best management practices to help increase the amount of infiltration to the aquifer system, and minimize the environmental impacts of the development.

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TABLES

Table 1 Monitoring Well Details

ID	Date Installed	Zone (Shallow/ Intermediate/Deep)	Depth to bottom (mbgs)	Stickup (m)	Ground Elevation (masl)	Screen Length (m)	Screened Unit
MW1S	12-Dec- 2011	Shallow	6.01	1.04	276.6	3.00	Silty Clay Till to Silty Sand and Sandy Silt Till
MW1D	12-Dec- 2011	Deep	10.77	1.06	276.5	1.50	Silty Sand and Sandy Silt Till
MW2S	13-Dec- 2011	Shallow	5.93	1.05	276.6	3.00	Silty Clay to Silty Clay Till
MW3S	14-Dec- 2011	Shallow	5.88	1.26	267.2	3.00	Silty Clay Till to Silty Sand and Sandy Silt Till
MW4S	19-Dec- 2011	Shallow	5.94	1.02	268.4	3.00	Silty Clay Till
MW4D	19-Dec- 2011	Deep	10.57	1.17	268.4	1.50	Silty Clay Till
MW5S	19-Dec- 2011	Shallow	5.96	1.12	272.8	3.00	Silty Clay Till to Silty Sand and Sandy Silt Till
MW6S	12-Dec- 2011	Shallow	5.93	1.18	282.1	3.00	Silty Sand and Sandy Silt Till
MW7S	15-Dec- 2011	Shallow	6.045	1.02	275.4	3.00	Silty Clay to Silty Clay Till
MW7D	15-Dec- 2011	Deep	10.185	1.19	275.4	1.50	Silty Sand and Sandy Silt Till
MW8S	17-Dec- 2011	Shallow	5.875	1.06	273.0	3.00	Silty Sand and Sandy Silt Till
MW8D	17-Dec- 2011	Deep	9.05	1.10	273.0	1.50	Silty Sand and Sandy Silt Till
MW9S	17-Dec- 2011	Shallow	5.635	1.04	273.9	3.00	Silty Clay Till
MW10S	16-Dec- 2011	Shallow	5.945	1.02	271.6	3.00	Silty Clay Till
MW10D	16-Dec- 2011	Deep	10.745	1.08	271.5	1.50	Silty Sand and Sandy Silt Till
MW11S	15-Dec- 2011	Shallow	5.97	1.08	277.3	3.00	Silty Clay Till to Silty Sand and Sandy Silt Till
MW12S	18-Dec- 2011	Shallow	6.15	1.03	284.5	3.00	Silty Clay to Silty Sand and Sandy Silt Till
MW12D	18-Dec- 2011	Deep	10.655	1.00	284.4	1.50	Silty Clay Till

Table 2 Monitoring Well Groundwater Levels

ID	Depth to bottom (mbgs)	Top of riser above grade (m)	Ground Elevation (masl)	January 5/9, 2012 (Well Development)		1/20/2012		1/26/2012 (Rising head test 1)		1/31/2012 (Rising head test2)		2/3/2012 (Rising head test3)		3/14/2012		5/18/2012		7/10/2012	
				(mbgs)	(masl)	(mbgs)	(masl)	(mbgs)	(masl)	(mbgs)	(masl)	(mbgs)	(masl)	(mbgs)	(masl)	(mbgs)	(masl)	(mbgs)	(masl)
MW1S	6.0	277.63	276.6	1.40	275.2	1.76	274.8	1.72	274.9					1.38	275.2	2.57	274.0	3.56	273.0
MW1D	10.8	277.55	276.5	1.68	274.8	2.01	274.5	2.03	274.5					1.69	274.8	2.83	273.7	3.79	272.7
MW2S	5.9	277.67	276.6	1.93	274.7	2.17	274.5					2.08	274.5	1.99	274.6	2.56	274.1	2.55	274.1
MW3S	5.9	268.5	267.2	0.30	266.9	0.46	266.8			0.46	266.8	0.52	266.7	0.38	266.9	0.67	266.6	3.39	263.9
MW4S	5.9	269.46	268.4	2.47	266.0	2.63	265.8			2.66	265.8			2.31	266.1	2.83	265.6	4.33	264.1
MW4D	10.6	269.56	268.4	0.00	268.4	0.18	268.2			0.24	268.2			0.05	268.3	0.79	267.6	1.81	266.6
MW5S	6.0	273.91	272.8	1.82	271.0	2.16	270.6			2.24	270.6			1.91	270.9	3.03	269.8	3.94	268.8
MW6S	5.9	283.32	282.1	0.39	281.7	0.71	281.4					0.73	281.4	0.48	281.7	1.47	280.7	2.63	279.5
MW7S	6.0	276.43	275.4	0.54	274.9	1.02	274.4			1.24	274.2	1.23	274.2	1.02	274.4	2.33	273.1	4.31	271.1
MW7D	10.2	276.6	275.4	1.11	274.3	1.49	273.9			1.62	273.8	1.57	273.8	1.51	273.9	2.65	272.8	3.61	271.8
MW8S	5.9	274.03	273.0	1.15	271.8	1.26	271.7			1.26	271.7	1.15	271.8	1.17	271.8	1.47	271.5	1.56	271.4
MW8D	9.1	274.14	273.0	0.56	272.5	0.63	272.4			0.63	272.4			0.40	272.6	0.84	272.2	1.20	271.8
MW9S	5.6	274.95	273.9	1.97	271.9	2.01	271.9	2.00	271.9					1.92	272.0	2.06	271.9	2.21	271.7
MW10S	5.9	272.65	271.6	1.47	270.2	1.67	270.0	1.64	270.0	1.60	270.0			1.46	270.2	1.88	269.7	2.40	269.2
MW10D	10.7	272.58	271.5	1.28	270.2	1.50	270.0	1.51	270.0	1.51	270.0			1.33	270.2	1.96	269.5	2.94	268.6
MW11S	6.0	278.41	277.3	1.56	275.8	2.07	275.3	2.31	275.0					2.73	274.6	4.32	273.0	5.90	271.4
MW12S	6.1	285.48	284.5	1.17	283.3	1.40	283.1	1.39	283.1			1.38	283.1	1.29	283.2	2.44	282.0	4.13	280.3
MW12D	10.7	285.42	284.4	1.35	283.1	1.56	282.9	1.55	282.9			1.54	282.9	1.42	283.0	2.54	281.9	4.17	280.3

Table 2 Monitoring Well Groundwater Levels

ID	9/21/2012		11/27/2012		3/1/2013	
	(mbgs)	(masl)	(mbgs)	(masl)	(mbgs)	(masl)
MW1S	2.67	273.9	1.82	274.8	2.70	273.9
MW1D	2.88	273.6	2.10	274.4	2.87	273.6
MW2S	2.91	273.7	2.12	274.5	2.27	274.4
MW3S	0.44	266.8	0.61	266.6	0.80	266.4
MW4S	3.04	265.4	2.69	265.7	2.88	265.6
MW4D	1.14	267.3	0.34	268.0	Frozen at *0.980 mbtoc*	
MW5S	3.27	269.5	2.45	270.3	2.95	269.8
MW6S	1.11	281.0	0.44	281.7	0.71	281.4
MW7S	2.95	272.5	1.12	274.3	1.64	273.8
MW7D	3.07	272.3	1.65	273.8	2.18	273.2
MW8S	1.06	271.9	1.16	271.8	2.49	270.5
MW8D	0.66	272.4	0.65	272.4	0.88	272.2
MW9S	2.04	271.9	2.08	271.8	2.16	271.8
MW10S	1.69	269.9	1.78	269.8	1.71	269.9
MW10D	2.04	269.5	1.74	269.8	1.80	269.7
MW11S	5.94	271.4	3.15	274.2	3.70	273.6
MW12S	3.32	281.1	1.56	282.9	1.81	282.6
MW12D	3.31	281.1	1.70	282.7	1.92	282.5

Notes:

mbtoc = metres below top of casing

Table 3 Hydraulic Gradient Calculations

ID	Elevation of Bottom (masl)	January 5/9, 2012		1/20/2012		3/14/2012		5/18/2012		7/10/2012		9/21/2012		11/27/2012		3/1/2013	
		Water Level (masl)	Hydraulic Gradient (m/m)	Water Level (masl)	Hydraulic Gradient (m/m)	Water Level (masl)	Hydraulic Gradient (m/m)	Water Level (masl)	Hydraulic Gradient (m/m)	Water Level (masl)	Hydraulic Gradient (m/m)	Water Level (masl)	Hydraulic Gradient (m/m)	Water Level (masl)	Hydraulic Gradient (m/m)	Water Level (masl)	Hydraulic Gradient (m/m)
MW1S	270.6	275.2	+0.07	274.8	+0.06	275.2	+0.07	274.0	+0.06	273.0	+0.06	273.9	+0.06	274.8	+0.07	273.9	+0.05
MW1D	265.7	274.8		274.5		274.8		273.7		272.7		273.6		274.4		273.6	
MW4S	262.5	266.0	-0.45	265.8	-0.44	266.1	-0.41	265.6	-0.37	264.1	-0.46	265.4	-0.34	265.7	-0.42	265.6	NA
MW4D	257.8	268.4		268.2		268.3		267.6		266.6		267.3		268.0		frozen	
MW7S	269.4	274.9	+0.12	274.4	+0.10	274.4	+0.10	273.1	+0.07	271.1	-0.14	272.5	+0.03	274.3	+0.11	273.8	+0.11
MW7D	265.2	274.3		273.9		273.9		272.8		271.8		272.3		273.8		273.2	
MW8S	267.1	271.8	-0.17	271.7	-0.18	271.8	-0.22	271.5	-0.18	271.4	-0.11	271.9	-0.12	271.8	-0.15	270.5	-0.44
MW8D	264.0	272.5		272.4		272.6		272.2		271.8		272.4		272.4		272.2	
MW10S	265.7	270.2	-0.01	270.0	-0.01	270.2	0.00	269.7	+0.04	269.2	+0.12	269.9	+0.09	269.8	+0.01	269.9	+0.04
MW10D	260.8	270.2		270.0		270.2		269.5		268.6		269.5		269.8		269.7	
MW12S	278.3	283.3	+0.04	283.1	+0.04	283.2	+0.03	282.0	+0.02	280.3	+0.01	281.1	0.00	282.9	+0.03	282.6	+0.03
MW12D	273.8	283.1		282.9		283.0		281.9		280.3		281.1		282.7		282.5	

Notes:

Yellow highlights indicate upward vertical hydraulic gradient

Green highlights indicate downward vertical hydraulic gradient

No highlights indicate neutral or near-neutral (-0.05 to +0.05 m/m) hydraulic gradient

NA Not applicable

Table 4 Estimated Hydraulic Conductivities

ID	Depth to bottom (mbgs)	Screened Unit	K (m/s) Hvorslev Method	K (m/s) Hazen Method
MW1S	6.01	Silty Clay Till to Silty Sand and Sandy Silt Till	2.8E-06	
MW1D	10.77	Silty Sand and Sandy Silt Till		6.3E-08
MW2S	5.93	Silty Clay to Silty Clay Till	4.4E-07	
MW3S	5.88	Silty Clay Till to Silty Sand and Sandy Silt Till	7.6E-09	
MW4S	5.94	Silty Clay Till	2.3E-06	
MW4D	10.57	Silty Clay Till		1.0E-08
MW5S	5.96	Silty Clay Till to Silty Sand and Sandy Silt Till	7.8E-07	
MW6S	5.93	Silty Sand and Sandy Silt Till	1.5E-06	
MW7S	6.045	Silty Clay to Silty Clay Till	1.3E-07	
MW7D	10.185	Silty Sand and Sandy Silt Till		1.2E-07
MW8S	5.875	Silty Sand and Sandy Silt Till	3.2E-07	
MW8D	9.05	Silty Sand and Sandy Silt Till		1.4E-07
MW9S	5.635	Silty Clay Till	2.0E-06	
MW10S	5.945	Silty Clay Till	1.8E-07	
MW10D	10.745	Silty Sand and Sandy Silt Till	1.9E-06	
MW11S	5.97	Silty Clay Till to Silty Sand and Sandy Silt Till	1.9E-07	
MW12S	6.15	Silty Clay to Silty Sand and Sandy Silt Till	2.2E-07	
MW12D	10.655	Silty Clay Till	6.2E-08	

Table 5 Groundwater Quality Summary

Parameter	Units	Table 1	Table 2	RDL	1/26/2012 MW-11S	1/26/2012 MW-1S	1/26/2012 MW1D	1/26/2012 DUPE (MW-1D)
Anion Sum	me/L	-	-	N/A	13.8	11.7	8.14	8.14
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	-	-	1	354	511	323	322
Calculated TDS	mg/L	-	-	1	808	620	432	433
Carb. Alkalinity (calc. as CaCO3)	mg/L	-	-	1	1.4	2.4	3.2	3.2
Cation Sum	me/L	-	-	N/A	15.7	12.1	8.46	8.45
Hardness (CaCO3)	mg/L	-	-	1	620	560	390	390
Ion Balance (% Difference)	%	-	-	N/A	6.63	1.95	1.91	1.89
Langelier Index (@ 20C)	N/A	-	-		0.966	1.1	0.950	0.960
Langelier Index (@ 4C)	N/A	-	-		0.719	0.889	0.702	0.711
Saturation pH (@ 20C)	N/A	-	-		6.66	6.56	7.07	7.07
Saturation pH (@ 4C)	N/A	-	-		6.91	6.81	7.32	7.32
Total Ammonia-N	mg/L	-		0.05	0.06	0.38	0.16	0.15
Conductivity	umho/cm	-		1	1400	1040	749	748
Dissolved Organic Carbon	mg/L	-		0.2	1.8	3.9	1.0	1.1
Orthophosphate (P)	mg/L	-		0.01	ND	ND	ND	0.04
pH	pH	-			7.62	7.69	8.02	8.03
Dissolved Sulphate (SO4)	mg/L	-		1	110	38	49	50
Alkalinity (Total as CaCO3)	mg/L	-		1	355	514	326	325
Dissolved Chloride (Cl)	mg/L	790	790	1-2	150	21	21	21
Nitrite (N)	mg/L	-		0.01	ND	ND	ND	ND
Nitrate (N)	mg/L	-		0.1	2.4	0.3	ND	ND
Nitrate + Nitrite	mg/L	-		0.1	2.4	0.3	ND	ND
Dissolved Aluminum (Al)	ug/L	-	-	5	ND	ND	ND	ND
Dissolved Antimony (Sb)	ug/L	1.5	6	0.5	ND	ND	ND	ND

Table 5 Groundwater Quality Summary

Parameter	Units	Table 1	Table 2	RDL	1/26/2012	1/26/2012	1/26/2012	1/26/2012
					MW-11S	MW-1S	MW1D	DUPE (MW-1D)
Dissolved Arsenic (As)	ug/L	13	25	1	ND	1.9	1.1	1.1
Dissolved Barium (Ba)	ug/L	610	1000	2.0	100	81	300	300
Dissolved Beryllium (Be)	ug/L	0.5	4	0.50	ND	ND	ND	ND
Dissolved Boron (B)	ug/L	1700	5000	10	47	28	23	23
Dissolved Cadmium (Cd)	ug/L	0.5	2.7	0.10	ND	ND	ND	ND
Dissolved Calcium (Ca)	ug/L	-		200	210000	170000	75000	75000
Dissolved Chromium (Cr)	ug/L	11	50	5.0	ND	ND	ND	ND
Dissolved Cobalt (Co)	ug/L	3.8	3.8	0.50	ND	2.5	ND	ND
Dissolved Copper (Cu)	ug/L	5	87	1.0	ND	ND	ND	ND
Dissolved Iron (Fe)	ug/L	-		100	ND	1100	390	340
Dissolved Lead (Pb)	ug/L	1.9	10	0.50	ND	ND	ND	ND
Dissolved Magnesium (Mg)	ug/L	-		50	26000	35000	49000	48000
Dissolved Manganese (Mn)	ug/L	-		2.0	26	6500	28	28
Dissolved Molybdenum (Mo)	ug/L	23	70	0.50	0.92	0.60	2.2	2.3
Dissolved Nickel (Ni)	ug/L	14	100	1.0	2.5	ND	ND	ND
Dissolved Phosphorus (P)	ug/L	-		100	ND	ND	ND	ND
Dissolved Potassium (K)	ug/L	-		200	1800	1300	3000	3000
Dissolved Selenium (Se)	ug/L	5	10	2.0	ND	ND	ND	ND
Dissolved Silicon (Si)	ug/L	-		50	8400	9500	12000	12000
Dissolved Silver (Ag)	ug/L	0.3	1.5	0.10	0.11	ND	ND	ND
Dissolved Sodium (Na)	ug/L	490000	490000	100	74000	19000	15000	14000
Dissolved Strontium (Sr)	ug/L	-		1.0	430	420	670	680
Dissolved Thallium (Tl)	ug/L	0.5	2	0.050	0.050	ND	ND	ND
Dissolved Titanium (Ti)	ug/L	-		5.0	ND	ND	ND	ND

Table 5 Groundwater Quality Summary

Parameter	Units	Table 1	Table 2	RDL	1/26/2012 MW-11S	1/26/2012 MW-1S	1/26/2012 MW1D	1/26/2012 DUPE (MW-1D)
Dissolved Uranium (U)	ug/L	-	20	0.10	1.1	0.95	ND	ND
Dissolved Vanadium (V)	ug/L	3.9	6.2	0.50	0.68	0.71	0.52	ND
Dissolved Zinc (Zn)	ug/L	160	1100	5	ND	ND	ND	ND

Notes:

ND = Not detected

RDL = Reportable Detection Limit

Table 1 = O.Reg. 153/04 Table 1 Criteria (All type of property use, All type soil texture)

Table 2 = O.Reg. 153/04 Table 2 Criteria (All type of property use, Coarse grained soil texture)

Highlighted values indicate an exceedance of Table 2 Criteria

Table 6 MOE Well Record Search Results

Name	Number of Wells within 1 km Radius of Site	Percentage of Total Well	Number of Wells on Site (Participating Properties)
Municipal/Public	5	7.9%	0
Domestic	13	20.6%	0
Commercial	2	3.2%	0
Livestock/Irrigation	1	1.6%	0
Abandoned/Not Used	5	7.9%	0
Observation/Monitoring/Test Hole	32	50.8%	0
Unknown	5	7.9%	0

Table 7 MOE Well Record Details

Well ID	Easting	Northing	Final Well Status	Primary Well Use	Secondary Well Use	Well Depth (m)	Static Level (m)	Recommended Rate (GPM)
6900679	621954	4879337	Water Supply	Domestic		33.5	9.1	2
6900686	621849	4879307	Water Supply	Domestic		74.4	6.7	
6900688	622028	4879293	Water Supply	Municipal		75.6	10.7	
6900689	621996	4879215	Water Supply	Commercial		59.4	9.1	
6900691	621774	4879228	Water Supply	Commercial		79.6	11.9	
6900693	621881	4879244	Water Supply	Municipal		117.3	21.3	
6900761	621464	4879649	Water Supply	Domestic		141.7	36.6	3
6900762	621559	4879735	Water Supply	Domestic		16.2	6.7	1
6901597	620344	4877581	Water Supply	Domestic		96.6	39.6	7
6904189	621925	4878516	Test Hole	Municipal		138.4	13.7	
6904190	621926	4878613	Test Hole	Municipal		137.2	13.7	
6904195	622008	4878028	Test Hole	Not Used		132.9		
6904203	621967	4878427	Test Hole	Not Used		102.1		
6904204	621946	4878526	Water Supply	Municipal		96.3	24.4	700
6907460	622484	4878365	Water Supply	Domestic		40.8	4.6	4
6908598	622245	4878823	Water Supply	Domestic		108.8	7.6	5
6908916	621865	4879073	Water Supply	Domestic		10.7	3.7	2
6909827	619665	4878173	Water Supply	Domestic		18.9	15.2	2
6910539	619375	4878173	Water Supply	Livestock	Domestic	16.5	2.4	8
6910910	619445	4878623	Water Supply	Domestic		32.3	20.4	12
6913276	621434	4878064	Abandoned-Supply			99.1		
6914093	621815	4879473	Test Hole	Not Used	Domestic	120.4		
6915134	621765	4879523	Water Supply	Municipal		99.7	30.5	
6915175	621015	4879023	Water Supply	Domestic		41.8	13.7	10
6917319	619415	4878523	Water Supply	Domestic		82.0	9.8	7
6919042	619635	4879059	Water Supply	Public		143.3	52.4	
6925045	621349	4879790	Abandoned-Other	Not Used		27.4		
6925386	621375	4879620				9.4		
6926463	620885	4877717	Abandoned-Other	Not Used				
6926464	620885	4877717	Abandoned-Other	Not Used				
6927802	621797	4879348	Observation Wells			3.6		
6928240	621249	4879575	Abandoned-Other			8.8	3.7	
6929453	621670	4879647	Observation Wells				55.7	10
6930191	621951	4879129	Observation Wells			5.2		
6930543	619275	4878719	Water Supply	Domestic		77.0		
7042864	621905	4878053	Observation Wells	Not Used		5.1		
7047550	621802	4877666	Observation Wells			4.5		
7048432	621806	4877691	Observation Wells			3.0		
7050022	620325	4877120	Test Hole	Not Used		4.9		
7112690	621857	4878612		Test Hole		6.1		
7116740	621840	4878610	Test Hole	Test Hole		6.1		
7129493	621895	4878506	Observation Wells	Monitoring		6.1		
7132692	622026	4878145	Test Hole	Test Hole	Monitoring	6.1		
7132693	622211	4878217	Test Hole	Test Hole	Monitoring	6.1		
7133950	622122	4879237	Test Hole	Test Hole	Monitoring	6.7		
7133950	622160	4879244	Test Hole	Test Hole	Monitoring	6.7		
7133950	622117	4879251	Test Hole	Test Hole	Monitoring	6.7		
7133950	622160	4879262	Test Hole	Test Hole	Monitoring	6.7		
7133950	622106	4879264	Test Hole	Test Hole	Monitoring	6.7		
7136658	620303	4877019	Test Hole	Test Hole	Monitoring	9.6		
7136658	620310	4877026	Test Hole	Test Hole	Monitoring	9.6		
7136868	621865	4879147	Test Hole	Test Hole		6.1		

Table 7 MOE Well Record Details

Well ID	Easting	Northing	Final Well Status	Primary Well Use	Secondary Well Use	Well Depth (m)	Static Level (m)	Recommended Rate (GPM)
7136874	621931	4879180	Test Hole	Test Hole		4.6		
7141728	622034	4879212	Test Hole	Test Hole		4.9		
7144313	622374	4878374	Test Hole	Test Hole	Monitoring	4.6		
7144313	622379	4878379	Test Hole	Test Hole	Monitoring	4.6		
7144313	622383	4878387	Test Hole	Test Hole	Monitoring	4.6		
7150386	621882	4878615	Test Hole	Test Hole	Monitoring	2.4		
7150387	621868	4878610	Test Hole	Test Hole	Monitoring	5.5		
7153331	621170	4879324	Test Hole	Test Hole		7.8		
7163453	621702	4879474						
7163458	622156	4878214						
7167636	622148	4879062						

Table 8 Municipal Groundwater Well Details

Name	Screened Depth (mbgs)	Permitted Capacity (m^3/day)	Aquifer Formation	Distance from Site
Well 1	84.3 – 91.9	2,290	Thorncliffe Formation	~ 420 m E
Well 2	86.2 – 94.2	4,580	Thorncliffe Formation	~ 410 m E
Well 13	100.4 – 108.2	5,890	Scarborough Formation	~ 1.9 km SE
Well 14	40.84 – 48.86	2,290	Oak Ridges Moraine	~ 4.6 km ENE
Well 15	84.12 – 85.65	3,270	Scarborough Formation	~ 860 km NE
Well 16	98.76 – 106.68	5,630	Scarborough Formation	~ 1.9 km SE

(LSRCA, NVCA, SSEA, 2011)

Table 9 Permitted Water Takers

Permit Number	Permit Owner	Purpose	Issue Date	Expiry Date	Maximum Permitted Rate (L/day)	Permitted Number of Days (days/year)	Water Source
1314-8ACS4J	Peter Kiewit Infrastructure Co.	Construction	21/10/2010	21/12/2016	110,000	365	Surface Water
96-P-3016	Glenway Country Club	Golf Course Irrigation	2/7/1996	1/1/5000	1,089,600	140	Surface Water
96-P-3016	Glenway Country Club	Golf Course Irrigation	2/7/1996	1/1/5000	378,000	50	Surface Water
6623-68QQ6L	The Regional Municipality of York	Municipal	31/3/2005	31/3/2015	5,891,760	365	Ground Water
6623-68QQ6L	The Regional Municipality of York	Municipal	31/3/2005	31/3/2015	2,291,184	365	Ground Water
6623-68QQ6L	The Regional Municipality of York	Municipal	31/3/2005	31/3/2015	4,582,512	365	Ground Water
6623-68QQ6L	The Regional Municipality of York	Municipal	31/3/2005	31/3/2015	5,891,760	365	Ground Water
6623-68QQ6L	The Regional Municipality of York	Municipal	31/3/2005	31/3/2015	3,273,120	365	Ground Water
6623-68QQ6L	The Regional Municipality of York	Municipal	31/3/2005	31/3/2015	5,629,824	365	Ground Water

Table 10 Water Well Survey Laboratory Sample Results

	Units	MAC	Sample 1	RDL
Inorganics				
Orthophosphate (P)	mg/L	-	ND	0.01
Nitrite (N)	mg/L	-	ND	0.01
Nitrate (N)	mg/L	1	ND	0.01
Nitrate + Nitrite	mg/L	10	1.8	0.1
Microbiological				
Heterotrophic plate count	CFU/mL	-	26	-
Background	CFU/100mL	-	56	-
Total Coliforms	CFU/100mL	0	6	-
Escherichia coli	CFU/100mL	0	0	-

Notes:

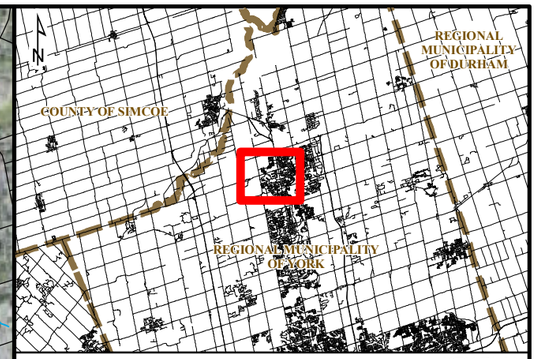
ND = Not detected

RDL = Reportable Detection Limit

MAC: Ontario Drinking Water Standards - Maximum Acceptable Concentration

Highlighted values indicate an exceedance of MAC Criteria

FIGURES



KEY PLAN

Legend

- Site
- Railway
- Road
- Waterbody
- Watercourse

Source: Google Earth, 2010

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MARIANNEVILLE DEVELOPMENTS
Estates of Glenway
Hydrogeological Investigation

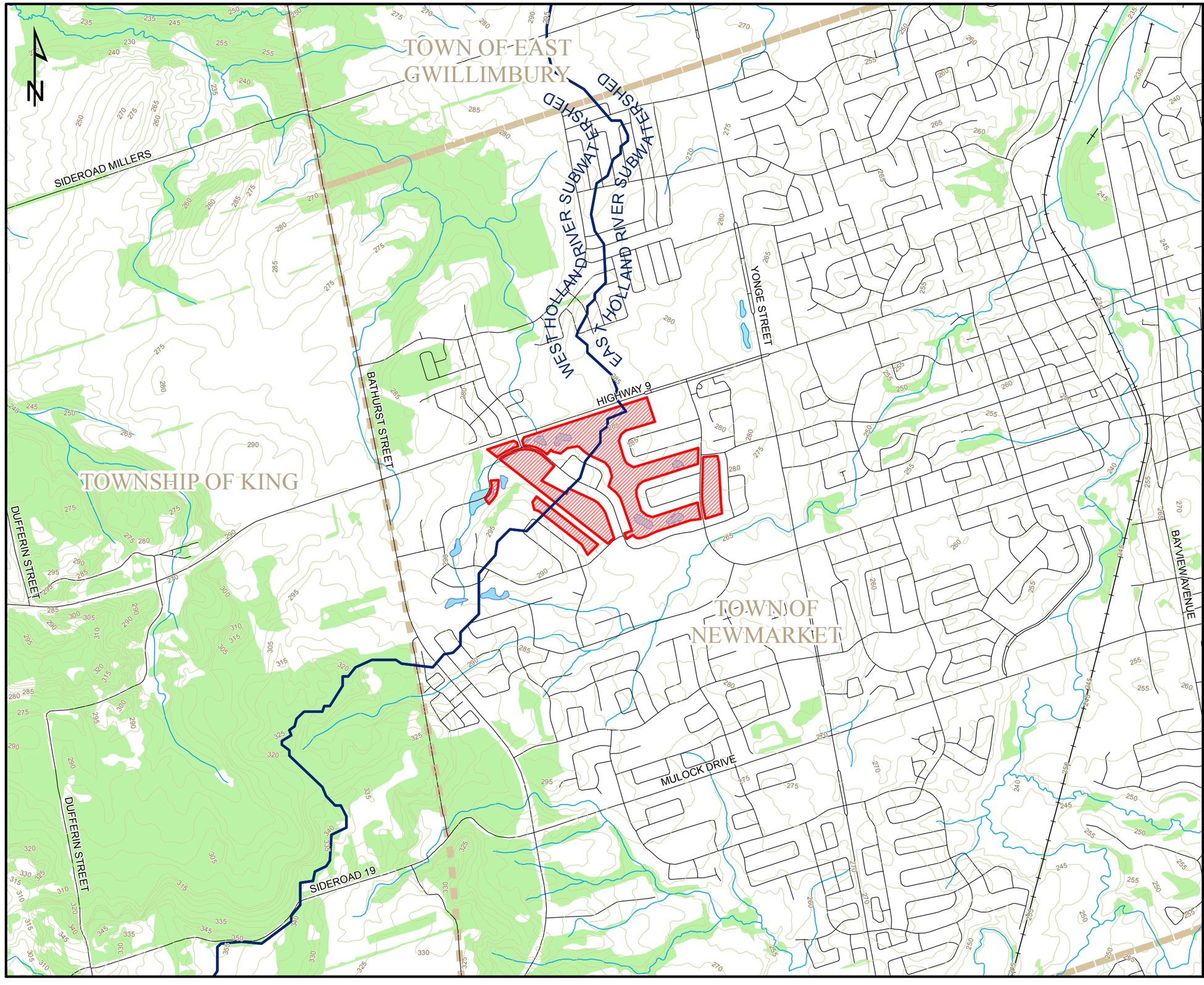
Scale:

0 125 250 500 750 1,000 Meters

Title:

Location Map

Project No.:	Date:
L09-301	NOVEMBER 2013
Drawn By:	Figure No.:
AC	1



Legend

- Site
- Railway
- Road
- Waterbody
- Watercourse
- Contour (5m Interval)
- Lower Tier Municipality
- Wooded Area
- Watershed Boundary

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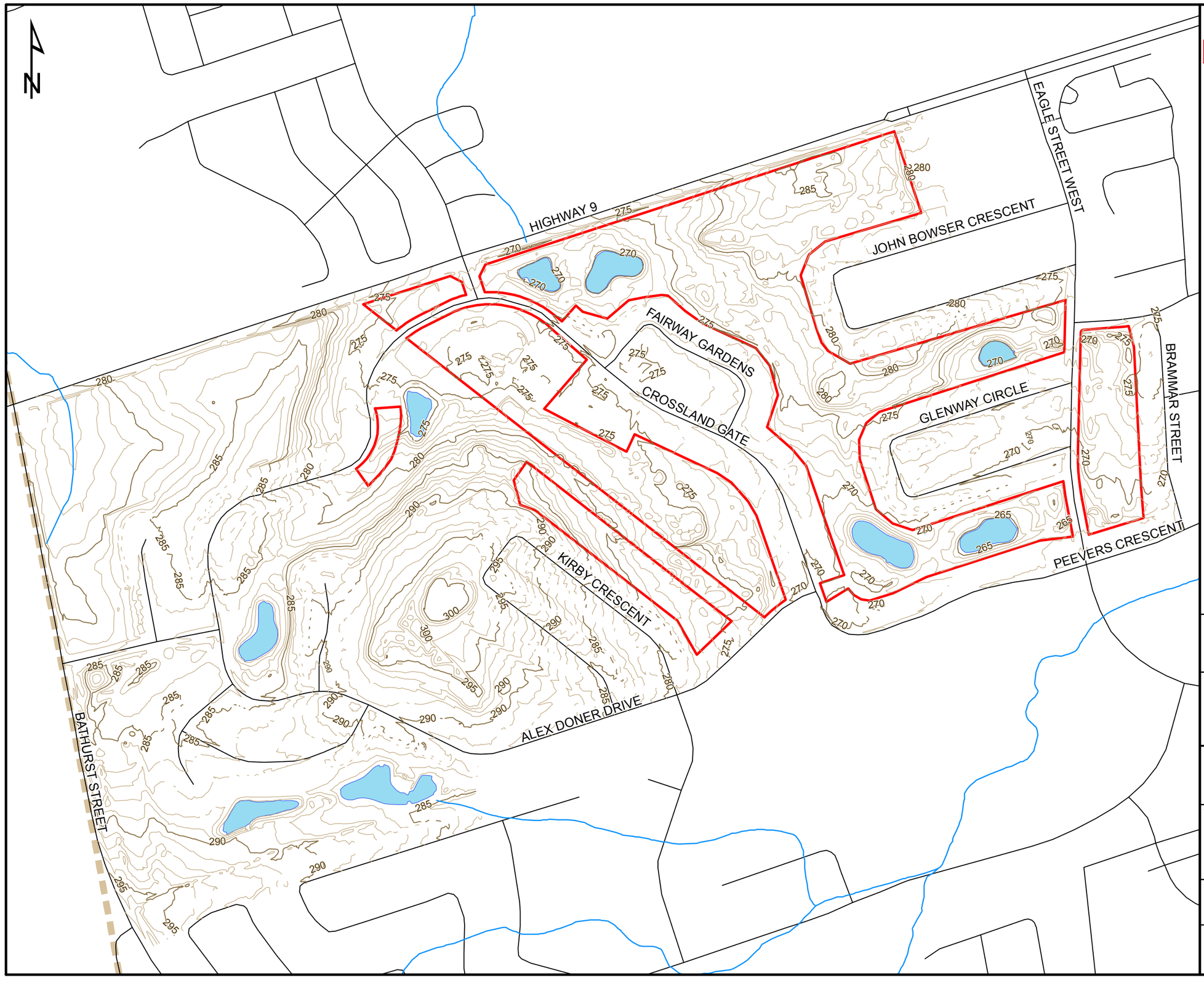
Scale: 0 125 250 500 750 1,000 Meters

Title: Regional Topography

Project No.:	Date:
L09-301	NOVEMBER 2013
Drawn By: CCK	Figure No.: 2



Legend

- Site
- Road
- Railway
- Watercourse

Contours

- Major Topographic Contour Interval
- Minor Topographic Contour Interval
- Waterbody

Source: JD Barnes Topographic Survey, 2013

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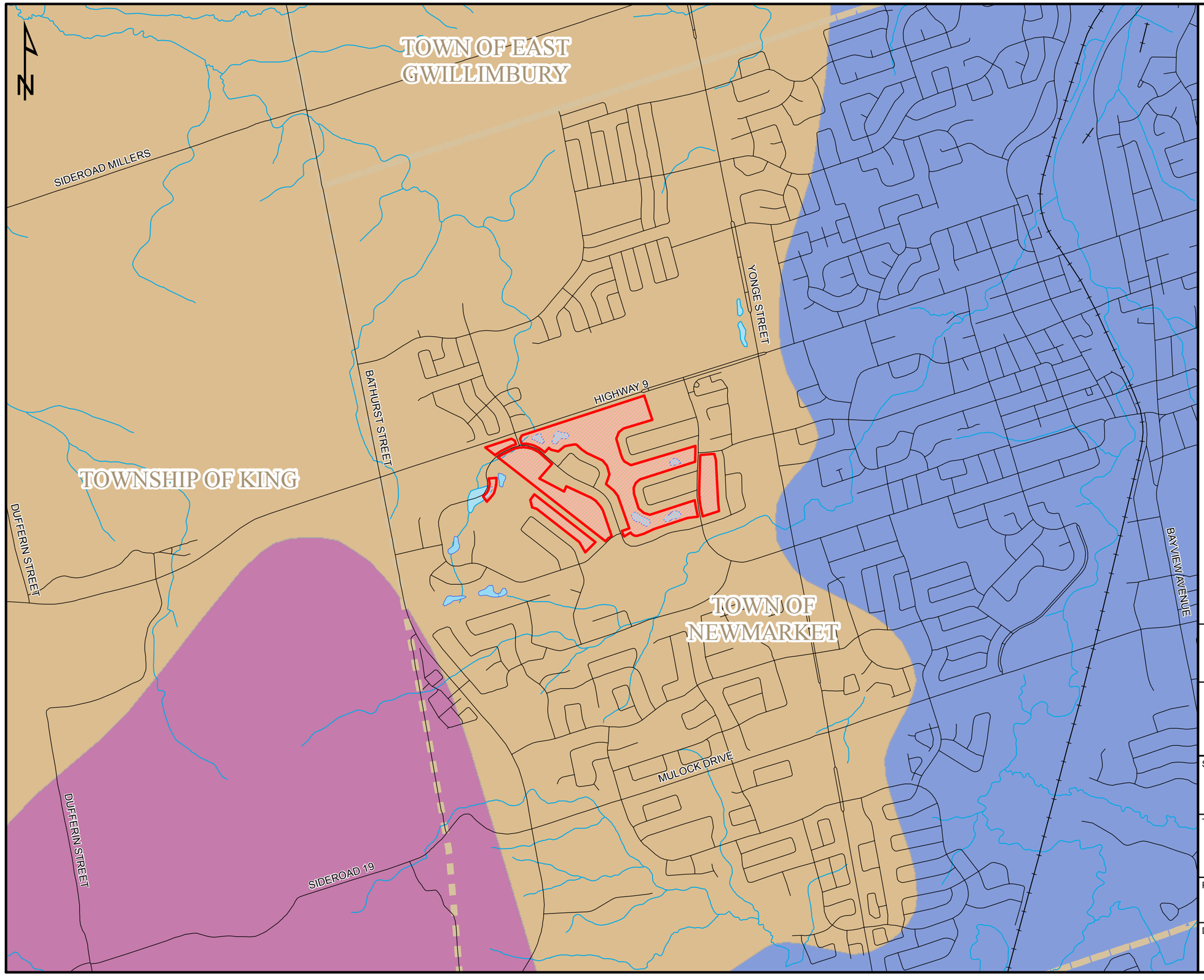
Scale: 0 50 100 200 300 400 m

Title: Site Topography

Project No.:	Date:
L09-301	NOVEMBER 2013
Drawn By: CCK	Figure No.: 3



Legend

- Site
- Railway
- Road
- Watercourse
- Waterbody
- Lower Tier Municipality

Physiography

- Oak Ridges Moraine
- Schomberg Clay Plains
- Simcoe Lowlands

Source: Ontario Geological Survey, Physiography of Southern Ontario, MRD 228.

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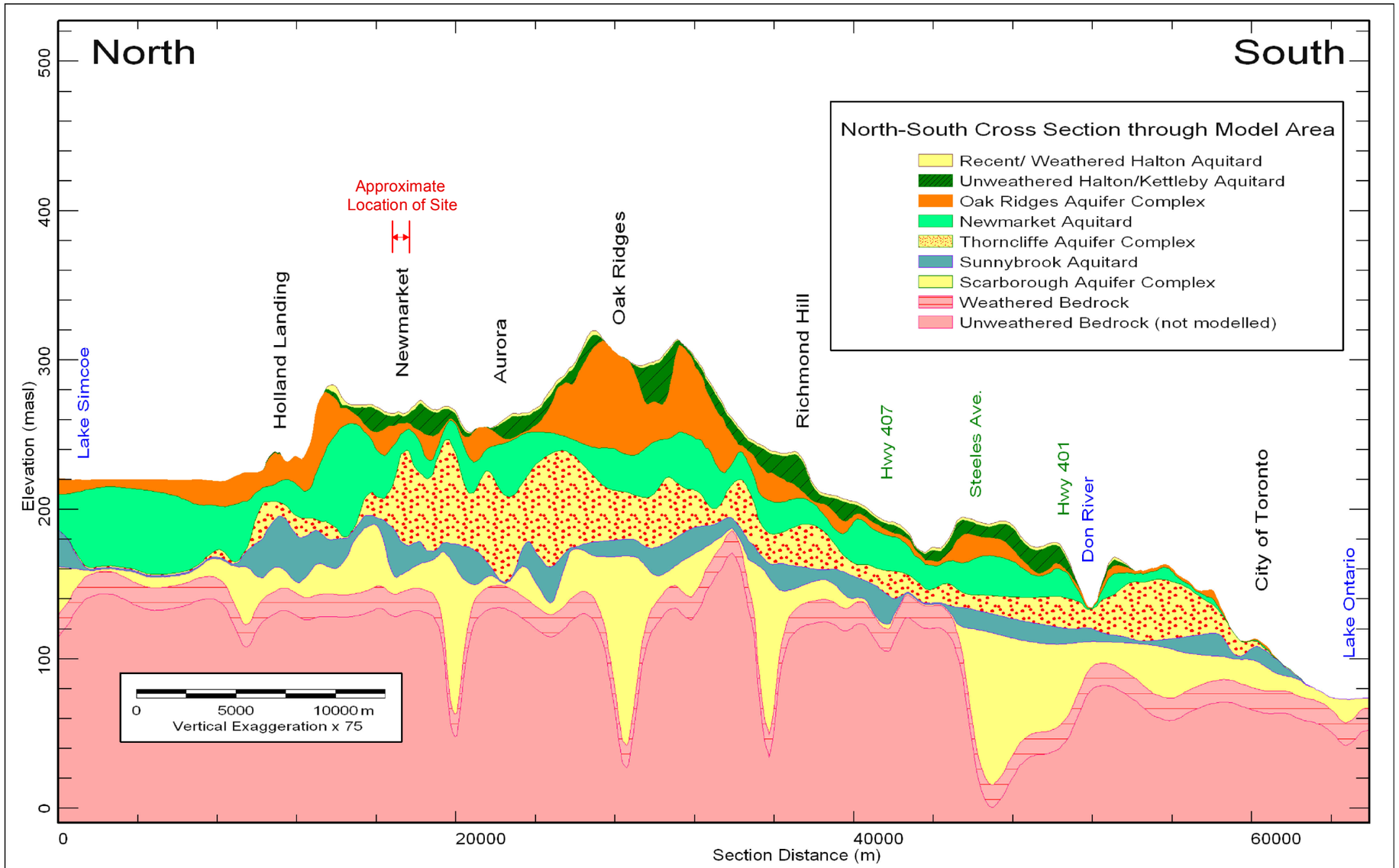
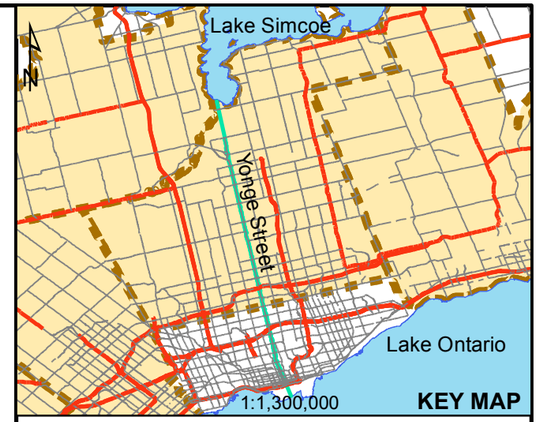
Scale: 0 125 250 500 750 1,000 Meters

Title: Regional Physiography

Project No.:	Date:
L09-301	NOVEMBER 2013
Drawn By: CCK	Figure No.: 4





Legend

Roads

- Arterial
- Highway
- Yonge St Section Line
- Water Body
- Upper Tier Municipality

Note: Site is located between 300 m and 1650 m west of Yonge Street. Local geology underlying the site may differ from that of the regional cross-section.

Source: LSRCA, NVCA & SSEA, 2011

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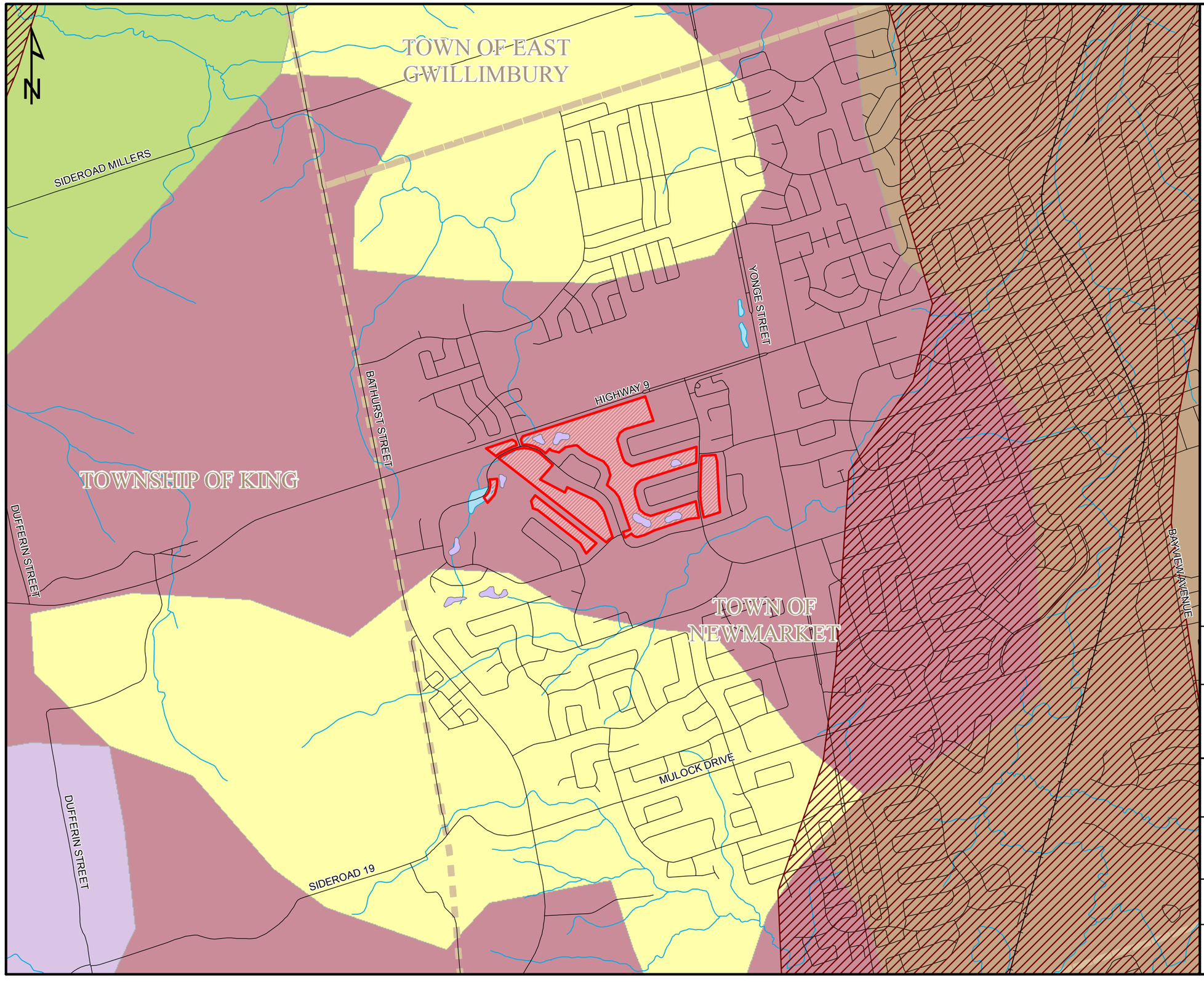
Hydrogeological Investigation

SCALE AS SHOWN

Title:
Regional Cross Section
Along Yonge Street

Project No.:	Date:
L09-301	NOVEMBER 2013
Drawn By:	Figure No.:
CCK	5



Legend

- Site
- Road
- Railway
- Watercourse
- Waterbody
- Lower Tier Municipality
- Interpreted Tunnel Channel

Quaternary Geology

- Newmarket Till (sandy silt to silt matrix)
- Kettleby Till (silt to silty clay matrix)
- Glaciofluvial ice-contact deposits (gravel and sand, minor till)
- Glaciolacustrine deposits (silt and clay, minor sand)
- Glaciolacustrine deposits (sand and gravel)

Source: Earthfx and Azimuth, 2009

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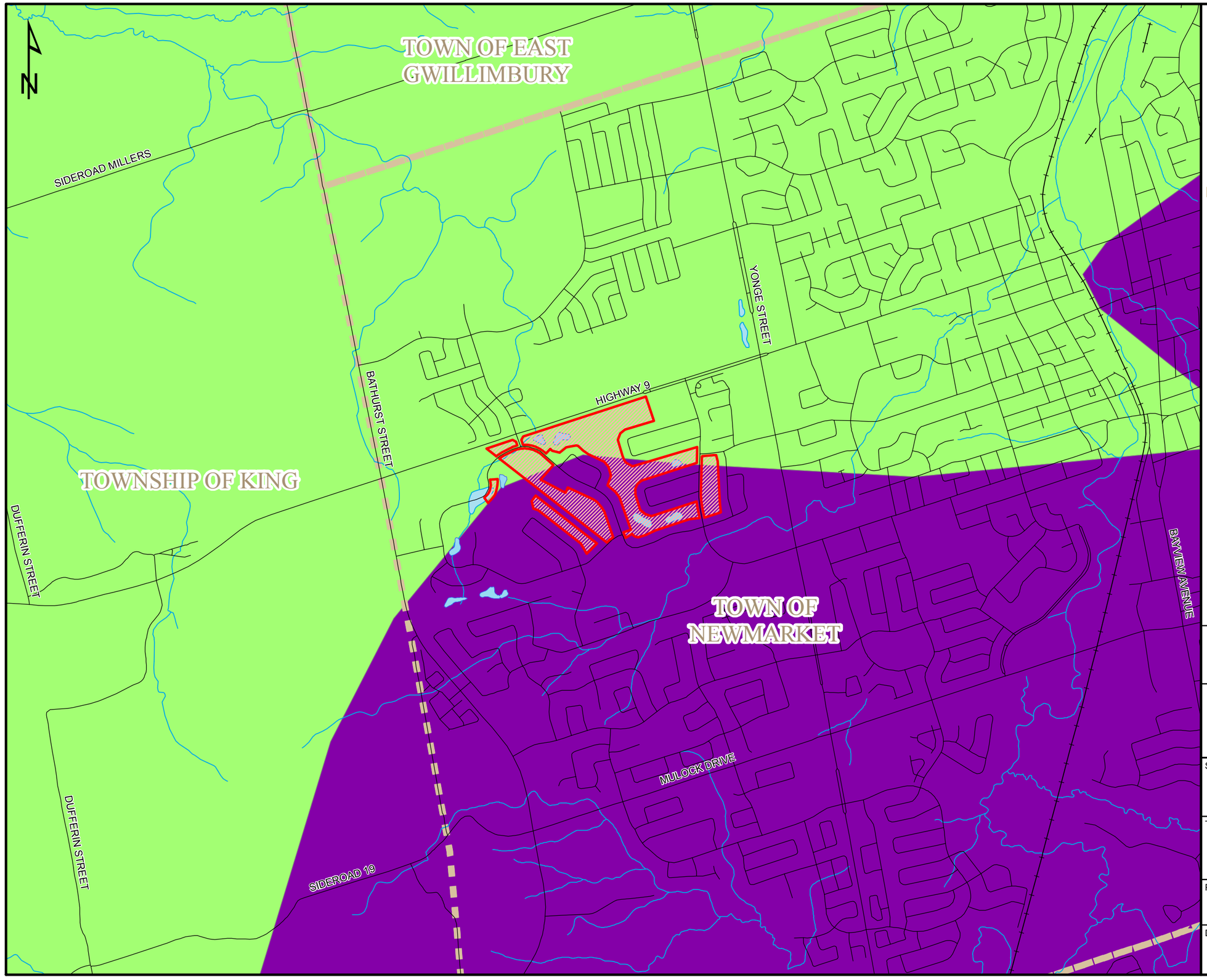
Estates of Glenway
Hydrogeological Investigation

Scale: 0 125 250 500 750 1,000 Meters

Title: Quaternary Geology

Project No.:	Date:
L09-301	NOVEMBER 2013
Drawn By: AC	Figure No.: 6



Legend

- Site
- Railway
- Road
- Watercourse
- Waterbody
- Lower Tier Municipality

Bedrock Geology

- Georgian bay Fm.; Blue Mountain Fm.; Billings Fm.; Collingwood Mb.; Eastview Mb.
- Ottawa Gp.; Simcoe Gp.; Shadow Lake Fm

Source: Ontario Geological Survey, 2005. Bedrock Geology of Ontario Seamless Coverage Data Set 6.

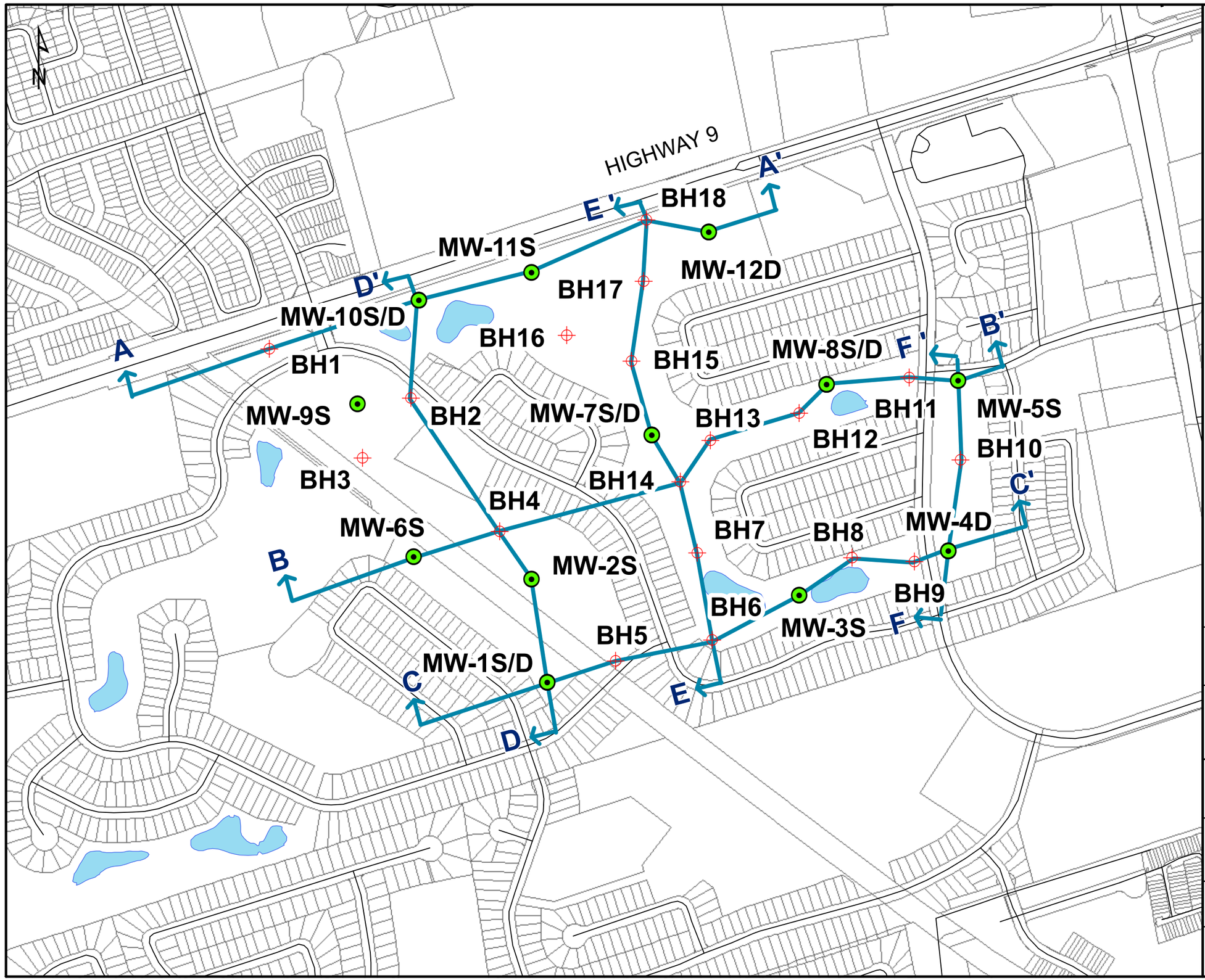
COLE ENGINEERING

MARIANNEVILLE DEVELOPMENTS
Estates of Glenway
Hydrogeological Investigation

Scale: 0 125 250 500 750 1,000 Meters

Title: Bedrock Geology

Project No.:	Date:
L09-301	NOVEMBER 2013
Drawn By:	Figure No.:
CCK	7



Legend

- Borehole Location
- Monitoring Well Location
- Cross Sections Locations
- Stormwater Management Ponds
- Road
- Parcel Fabric

Source: Teranet Inc., 2012

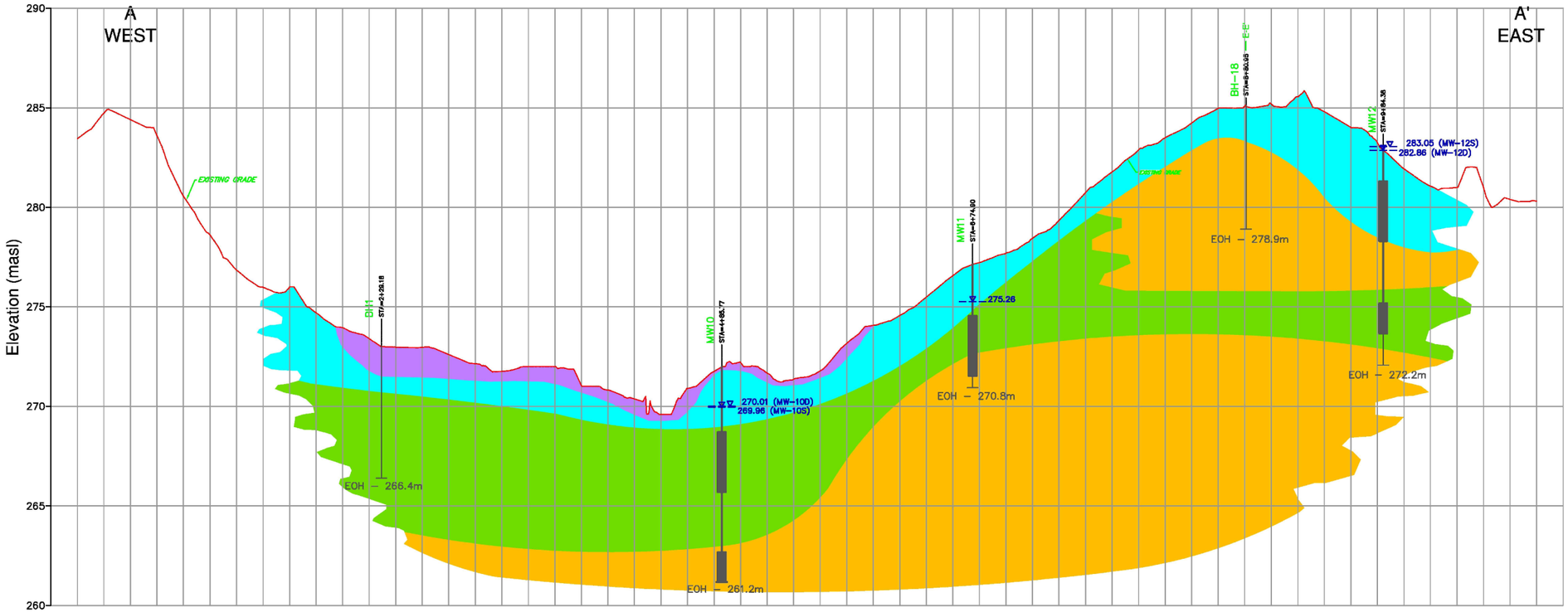
COLE ENGINEERING

MARIANNEVILLE DEVELOPMENTS
Estates of Glenway
Hydrogeological Investigation

Scale: 0 50 100 200 300 400 Meters

Title: Borehole and Monitoring Well Locations

Project No.:	Date:
L09-301	NOVEMBER 2013
Drawn By:	Figure No.:
RW	8



Legend

- Fill (mainly silty clay)
- Silty Clay
- Silty Clay Till
- Silty Sand/Sandy Silt Till
- Geotechnical borehole, unscreened
- Monitoring Well
- Groundwater level (January 20, 2012)

Source: Soil Engineers Limited, 2012

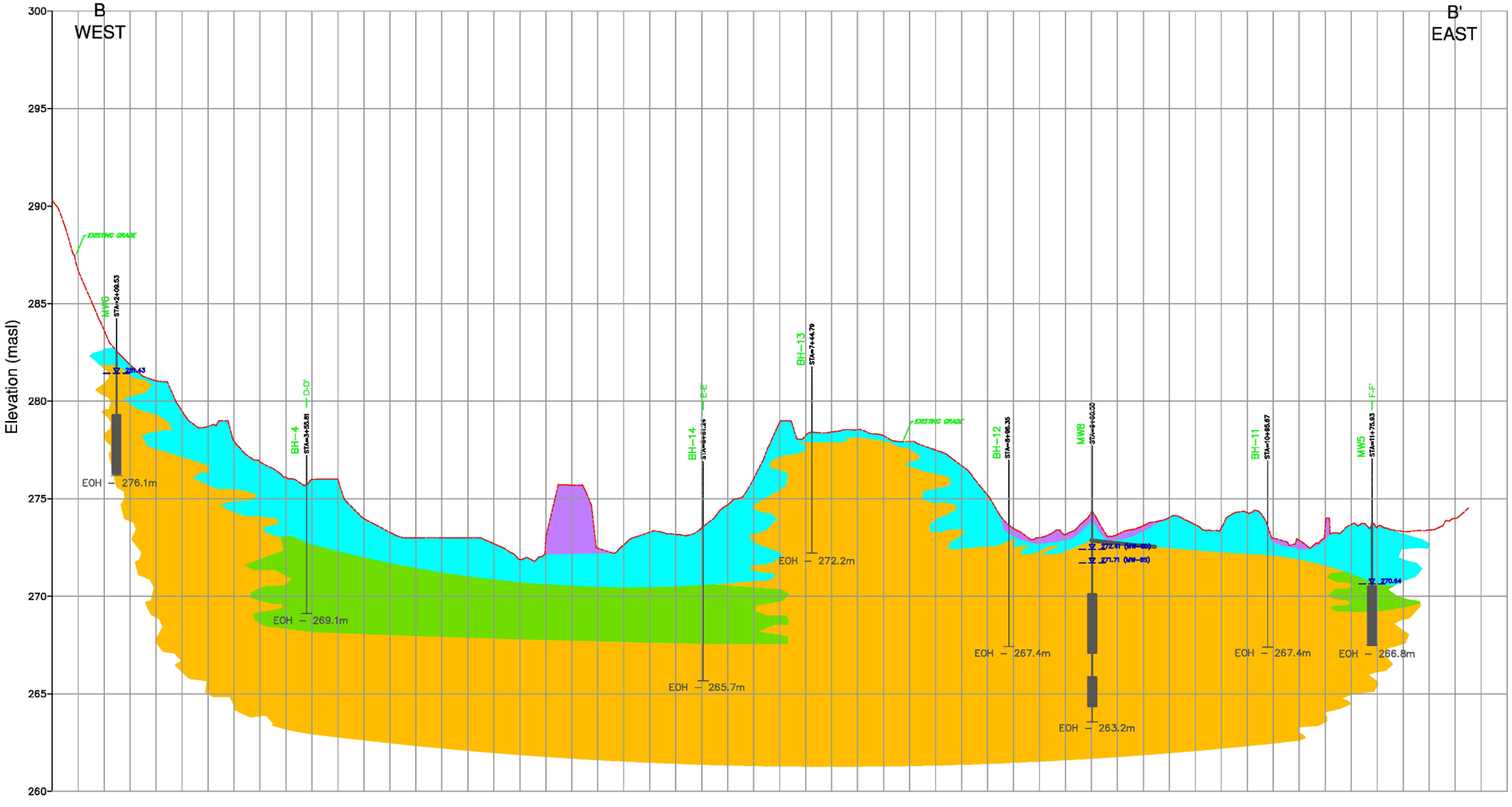
COLE ENGINEERING

MARIANNEVILLE DEVELOPMENTS
Estates of Glenway
Hydrogeological Investigation

Scale:
Horizontal Scale: 1:4000
Vertical Scale: 1:250
Vertical Exaggeration: 16x

Title:
Cross Section A-A'

Project No.:	Date:
L09-301	NOVEMBER 2013
Drawn By:	Figure No.:
RW	9A



Legend

- Fill (mainly silty clay)
- Silty Clay
- Silty Clay Till
- Silty Sand/Sandy Silt Till
- Geotechnical borehole, unscreened
- Monitoring Well
- Groundwater level (January 20, 2012)

Source: Soil Engineers Limited, 2012

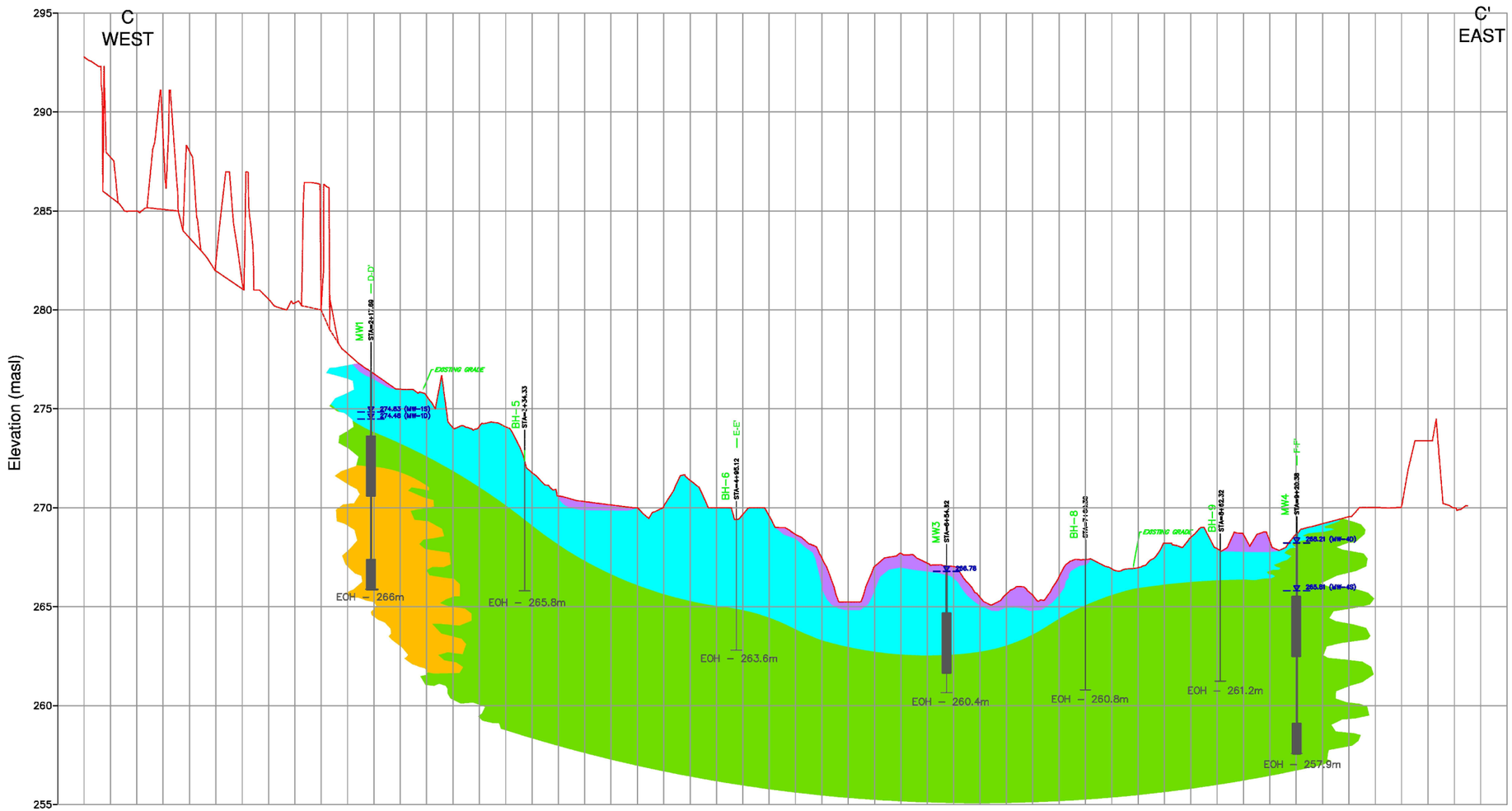
COLE ENGINEERING

MARIANNEVILLE DEVELOPMENTS
Estates of Glenway
Hydrogeological Investigation

Scale:
Horizontal Scale: 1:4000
Vertical Scale: 1:250
Vertical Exaggeration: 16x

Title:
Cross Section B-B'

Project No.:	Date:
L09-301	NOVEMBER 2013
Drawn By:	Figure No.:
RW	9B



Legend

- Fill (mainly silty clay)
- Silty Clay
- Silty Clay Till
- Silty Sand/Sandy Silt Till
- Geotechnical borehole, unscreened
- Monitoring Well
- Groundwater level (January 20, 2012)

Source: Soil Engineers Limited, 2012

COLE ENGINEERING

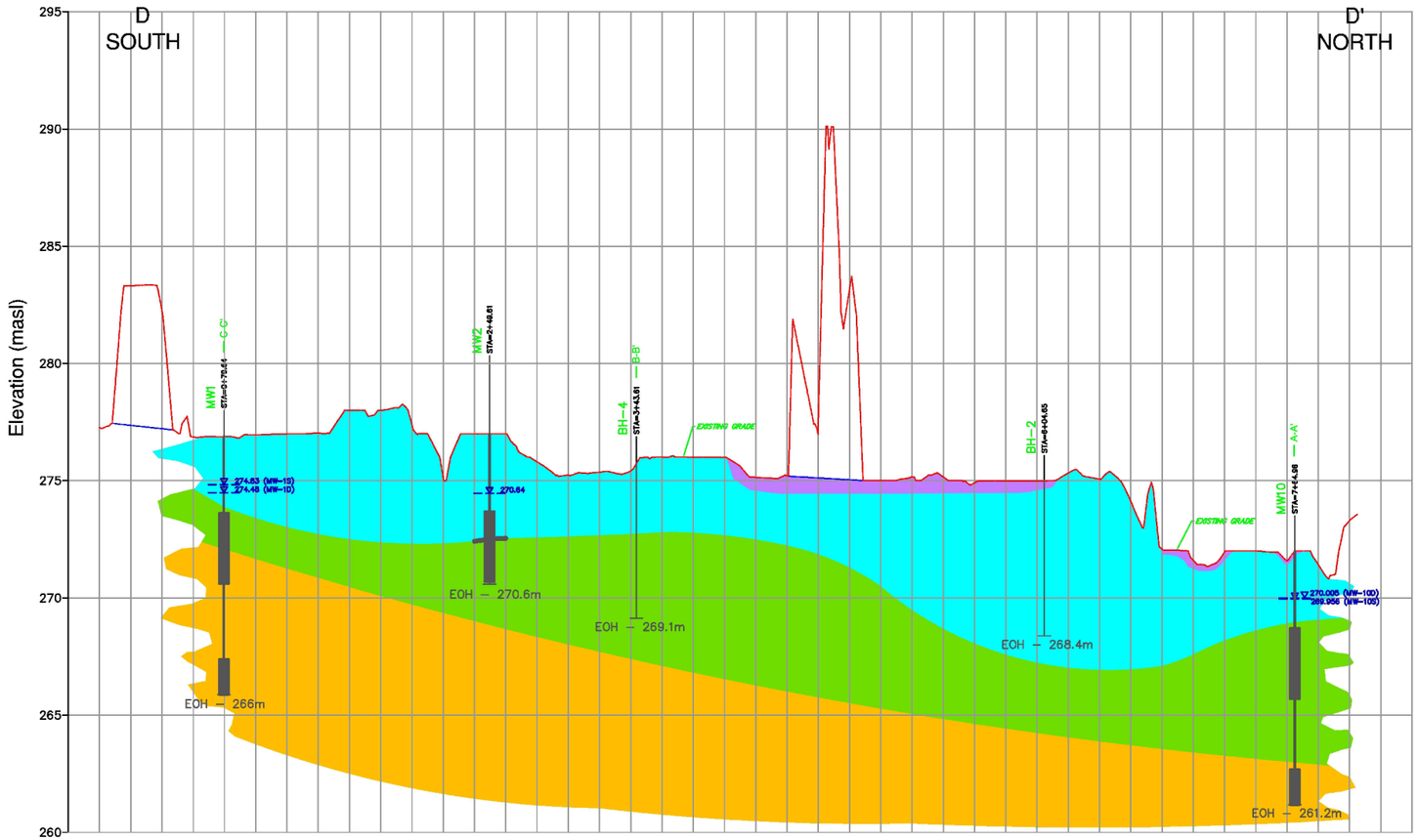
MARIANNEVILLE DEVELOPMENTS
Estates of Glenway
Hydrogeological Investigation

Scale:
Horizontal Scale: 1:4000
Vertical Scale: 1:250
Vertical Exaggeration: 16x

Title:

Cross Section C-C'

Project No.:	Date:
L09-301	NOVEMBER 2013
Drawn By:	Figure No.:
RW	9C



Legend

- Fill (mainly silty clay)
- Silty Clay
- Silty Clay Till
- Silty Sand/Sandy Silt Till
- Geotechnical borehole, unscreened
- Monitoring Well
- Groundwater level (January 20, 2012)

Source: Soil Engineers Limited, 2012

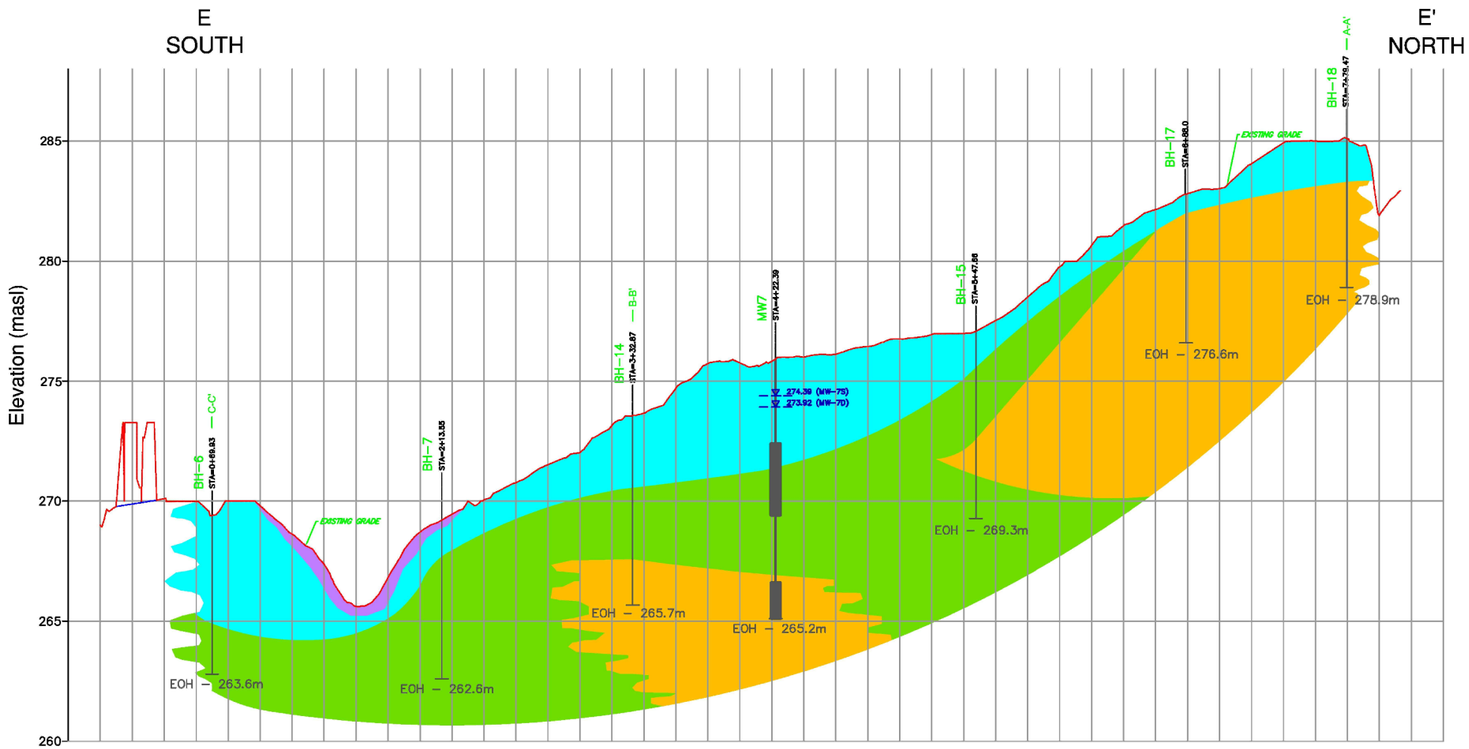
COLE ENGINEERING

MARIANNEVILLE DEVELOPMENTS
Estates of Glenway
Hydrogeological Investigation

Scale:
Horizontal Scale: 1:4000
Vertical Scale: 1:250
Vertical Exaggeration: 16x

Title:
Cross Section D-D'

Project No.:	Date:
L09-301	NOVEMBER 2013
Drawn By:	Figure No.:
RW	9D



Legend

- Fill (mainly silty clay)
- Silty Clay
- Silty Clay Till
- Silty Sand/Sandy Silt Till
- Geotechnical borehole, unscreened
- Monitoring Well
- Groundwater level (January 20, 2012)

Source: Soil Engineers Limited, 2012

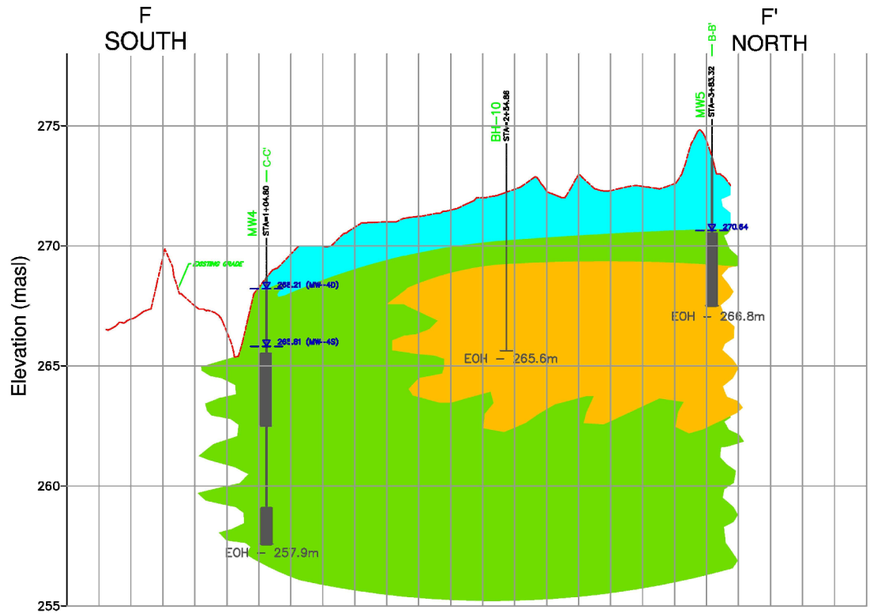
COLE ENGINEERING

MARIANNEVILLE DEVELOPMENTS
Estates of Glenway
Hydrogeological Investigation

Scale:
Horizontal Scale: 1:4000
Vertical Scale: 1:250
Vertical Exaggeration: 16x

Title:
Cross Section E-E'

Project No.:	Date:
L09-301	NOVEMBER 2013
Drawn By:	Figure No.:
RW	9E



Legend

- Fill (mainly silty clay)
- Silty Clay
- Silty Clay Till
- Silty Sand/Sandy Silt Till
- Geotechnical borehole, unscreened
- Monitoring Well
- Groundwater level (January 20, 2012)

Source: Soil Engineers Limited, 2012

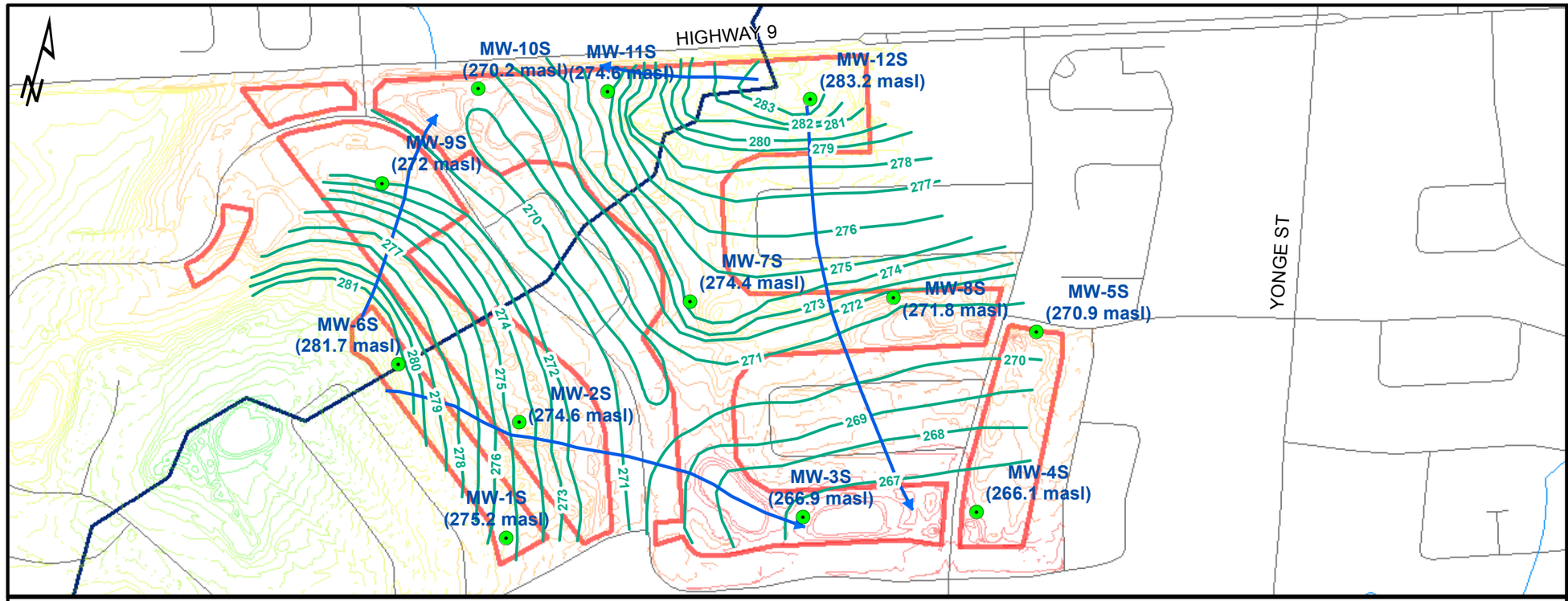
COLE ENGINEERING

MARIANNEVILLE DEVELOPMENTS
Estates of Glenway
Hydrogeological Investigation

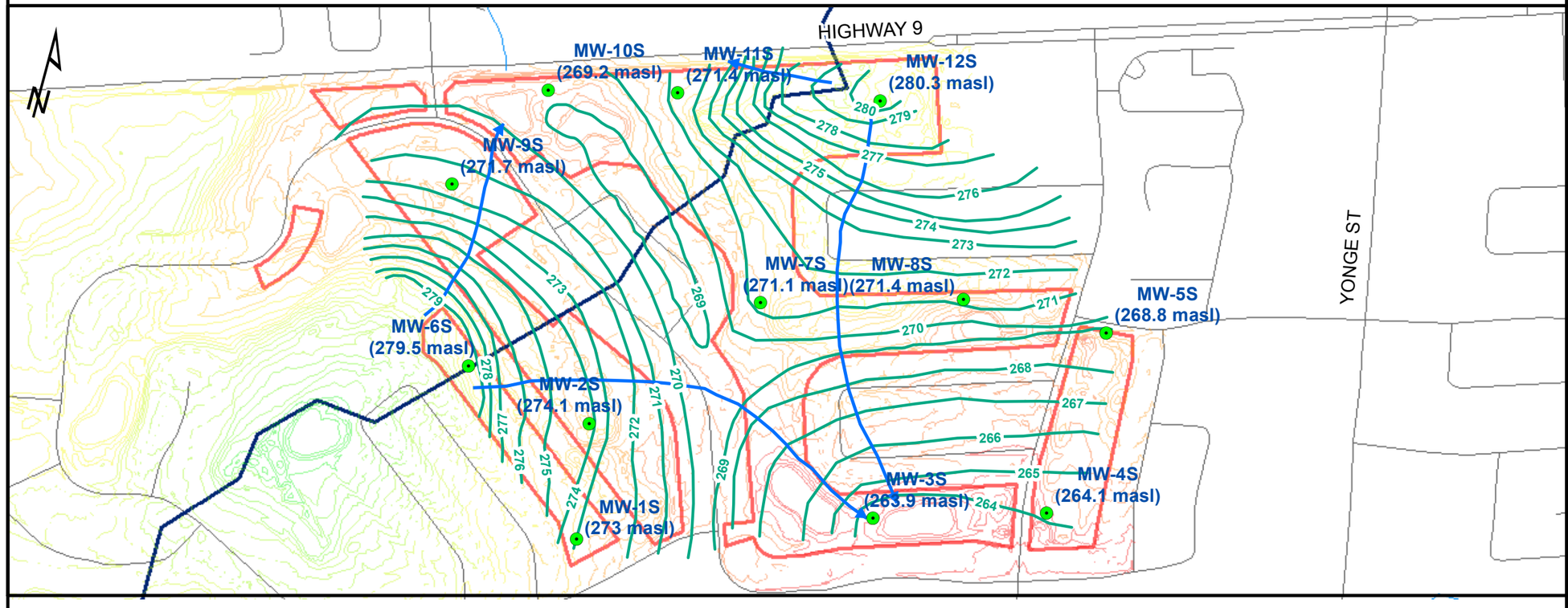
Scale:
Horizontal Scale: 1:4000
Vertical Scale: 1:250
Vertical Exaggeration: 16x

Title:
Cross Section F-F'

Project No.:	Date:
L09-301	NOVEMBER 2013
Drawn By:	Figure No.:
RW	9F



SPRING SHALLOW GROUNDWATER CONTOURS (MARCH 14, 2012)



SUMMER SHALLOW GROUNDWATER CONTOURS (JULY 10, 2012)

Legend

- Site
- Road
- Watercourse
- Shallow Monitoring Well
- Groundwater Contour
- Interpreted Groundwater Flow Direction
- Watershed Boundary

Topographic Contours

- 265 - 269
- >269 - 272
- >272 - 276
- >276 - 280
- >280 - 284
- >284 - 288
- >288 - 292
- >292 - 296
- >296 - 304

Source: JD Barnes Topographic Survey, 2012.

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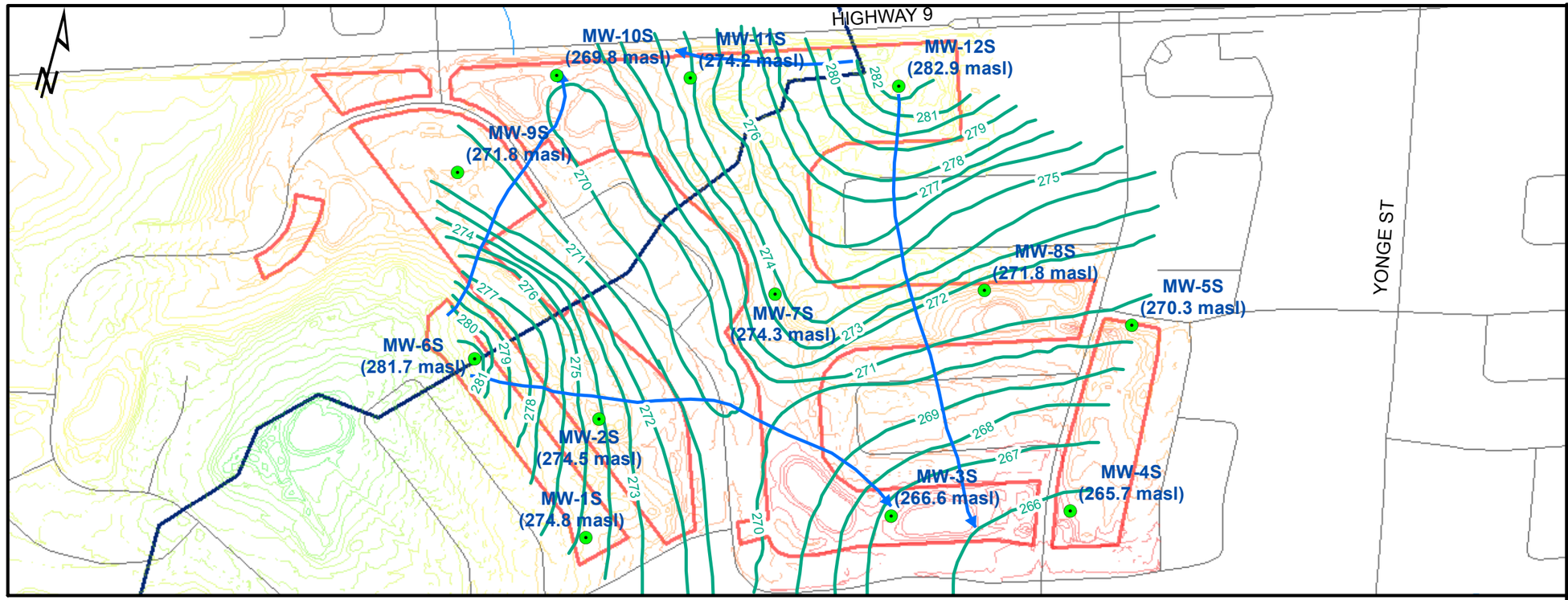
COLE ENGINEERING

MARIANNEVILLE DEVELOPMENTS
Estates of Glenway
Hydrogeological Investigation

Scale: 0 50 100 200 300 400 Meters

Title: Shallow Groundwater Flow Patterns (Spring/Summer)

Project No.:	Date:
L09-301	NOVEMBER 2013
Drawn By: AC	Figure No.: 10A



FALL SHALLOW GROUNDWATER CONTOURS (NOVEMBER 27, 2012)

Legend

- Site
- Road
- Watercourse
- Shallow Monitoring Well
- Groundwater Contour
- Interpreted Groundwater Flow Direction
- Watershed Boundary

Topographic Contours

- 265 - 269
- >269 - 272
- >272 - 276
- >276 - 280
- >280 - 284
- >284 - 288
- >288 - 292
- >292 - 296
- >296 - 304

Source: JD Barnes Topographic Survey, 2012.

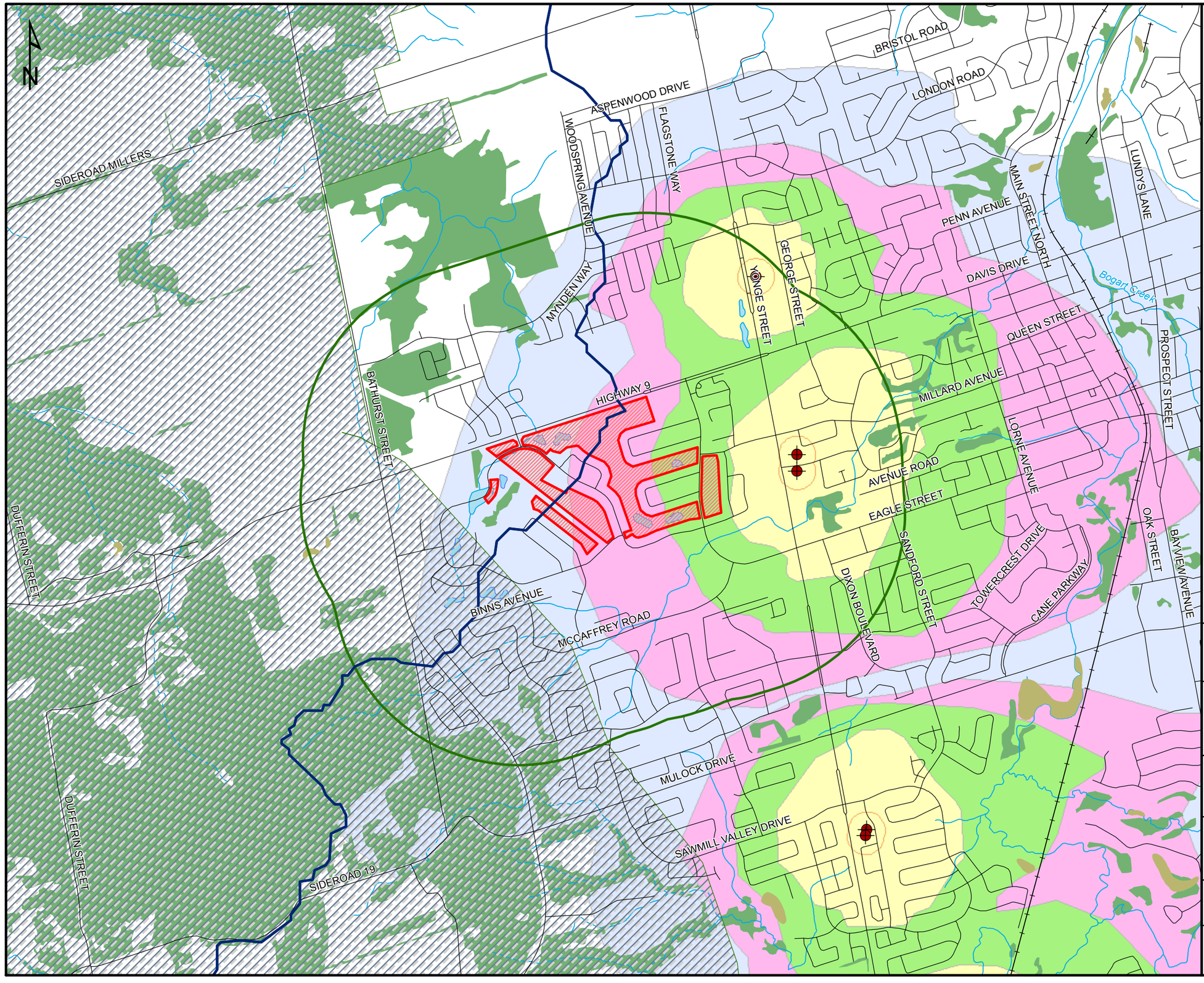
COLE ENGINEERING

MARIANNEVILLE DEVELOPMENTS
Estates of Glenway
Hydrogeological Investigation

Scale: 0 50 100 200 300 400 Meters

Title: Shallow Groundwater Flow Patterns (Fall)

Project No.:	Date:
L09-301	NOVEMBER 2013
Drawn By: AC	Figure No.: 10B



Legend

- Site
- Road
- Railway
- Watercourse
- Waterbody
- Watershed Boundary
- Wetland
- Wooded Area
- Greenbelt Boundary
- 1 km Buffer Around Site
- Municipal Wells

Well Head Protection Areas

- 100 m
- 2 Year
- 5 Year
- 10 Year
- 25 Year

Source: The Regional Municipality of York, 2011.

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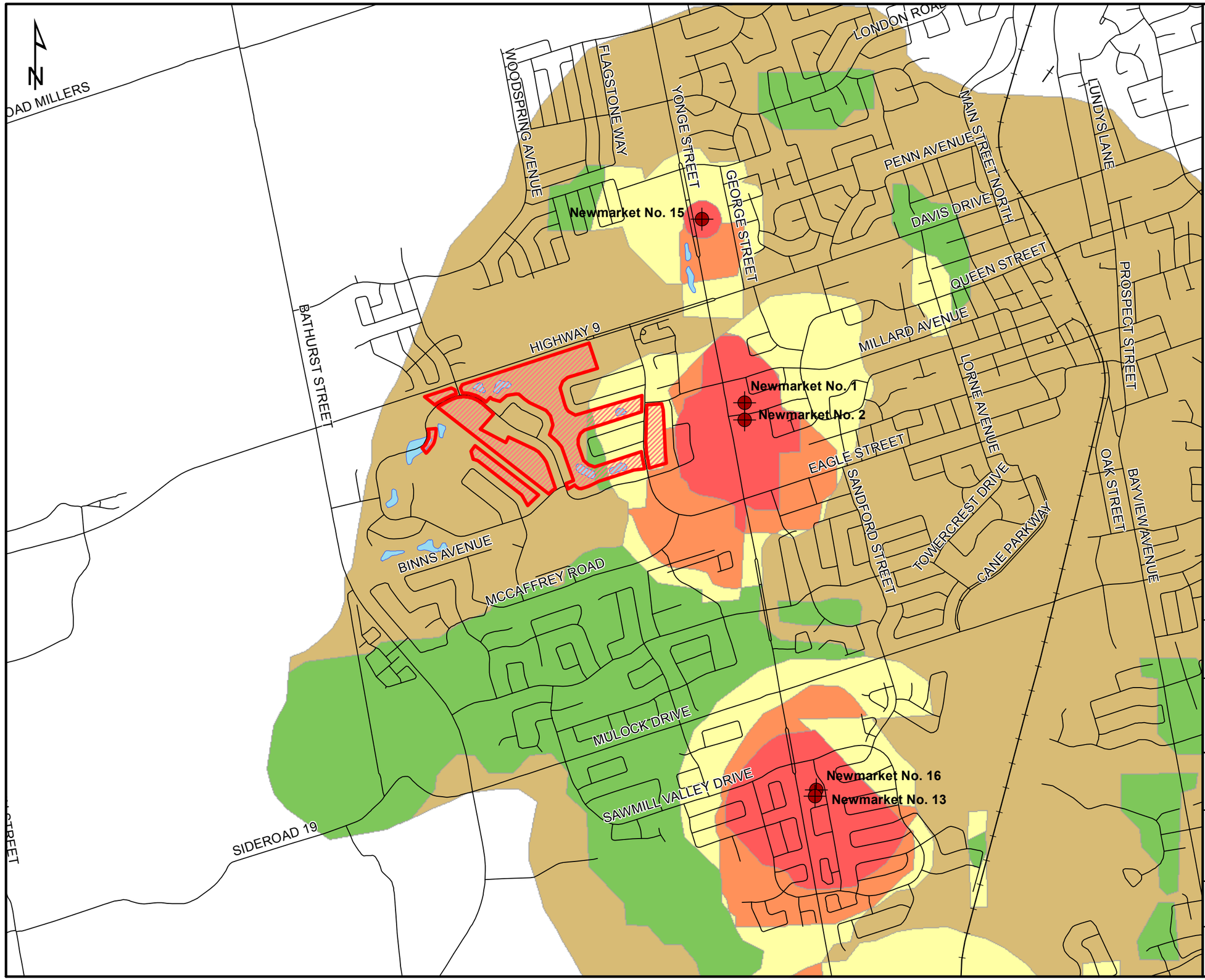
MARIANNEVILLE DEVELOPMENTS
Estates of Glenway
Hydrogeological Investigation

Scale: 0 125 250 500 750 1,000 Meters

Title: Environmental Features

Project No.:	Date:
L09-301	NOVEMBER 2013
Drawn By: CCK	Figure No.: 11



Legend

- Site
- Railway
- Road
- Watercourse
- Waterbody
- Municipal Well

Intrinsic Vulnerability Score

- 2 (Low)
- 4
- 6
- 8
- 10 (High)

Note: Aquifer vulnerability is defined in Source Water Protection as "a numerical indicator of an aquifer's intrinsic or inherent vulnerability susceptibility, to contamination expressed as a function of the thickness and permeability of overlying layers" (South Georgian Bay - Lake Simcoe Source Protection Region, 2012).

Source: The Regional Municipality of York, 2011.

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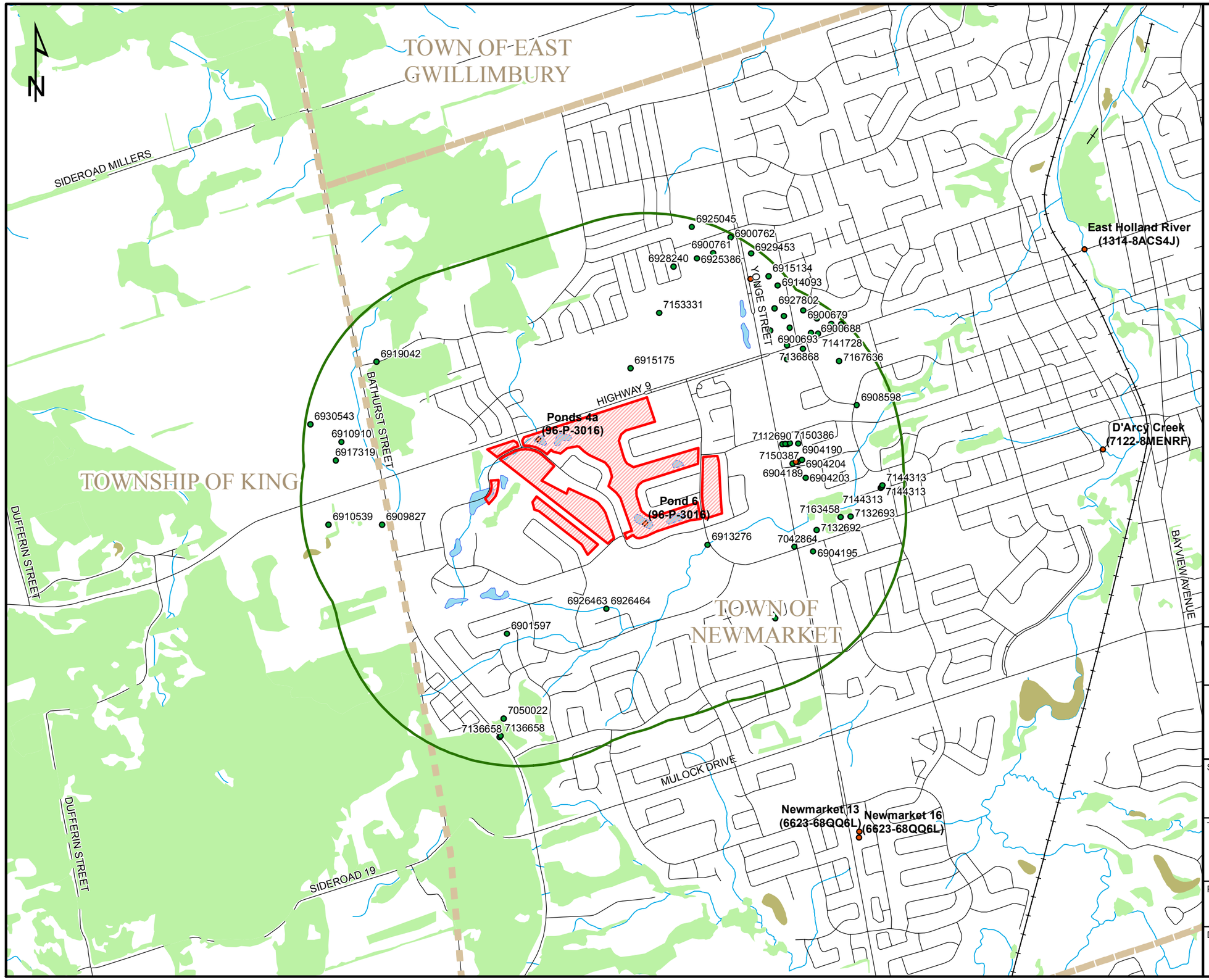
MARIANNEVILLE DEVELOPMENTS
Estates of Glenway
Hydrogeological Investigation

Scale: 0 125 250 500 750 1,000 Meters

Title: Aquifer Vulnerability

Project No.:	Date:
L09-301	NOVEMBER 2013
Drawn By: CCK	Figure No.: 12



Legend

- Site
- PTTW Sources
- MOE Wells
- Railway
- 1 km Buffer Around Site
- Lower Tier Municipality
- Wetland
- Wooded Area
- Road
- Waterbody
- Watercourse

Source: Ontario Ministry of the Environment. 2010. Well Record Data Release Version 2.03. Queen's Printer for Ontario.

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MARIANNEVILLE DEVELOPMENTS
Estates of Glenway
Hydrogeological Investigation

Scale: 0 125 250 500 750 1,000 Meters

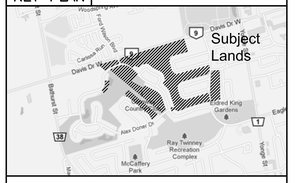
Title: Local Well Users

Project No.:	Date:
L09-301	NOVEMBER 2013
Drawn By: CCK	Figure No.: 13

APPENDIX A

Draft Plan of Subdivision and Grading Plan

KEY PLAN



DRAFT PLAN OF SUBDIVISION

OF PART OF
LOTS 60, 61, 64, 65, 66, 67
BLOCK 92, RP 65M-2212
AND ALL OF
BLOCK 91, RP 65M-2212
BLOCK 155, RP 65M-2205
BLOCKS 144 RP 65M-2261
BLOCK 89, RP 65M-2263
BLOCK 73, RP 65M-2284
TOWN OF NEWMARKET
REGIONAL MUNICIPALITY OF YORK

INFORMATION REQUIRED UNDER SECTION 51 (17) OF THE PLANNING ACT

A) As shown	G) As shown
B) As shown	H) Municipal water supply available
C) As shown	I) Mix of Silty Sand & Silty Clay
D) As listed above	J) As shown
E) As shown	K) All municipal services to be available
F) As shown	L) As shown

PROPOSED LAND USES AND AREAS

RESIDENTIAL (LOTS 1-111, 115-154)	151 units	11.138 ha
INSTITUTIONAL/RESIDENTIAL (LOTS 112-115)	3 units	0.220 ha
RESIDENTIAL, MEDIUM DENSITY (BLOCKS 155-156)	217 units	5.532 ha
RESIDENTIAL, CONDOS (BLOCKS 157-159)	55 units	4.535 ha
INSTITUTIONAL/RESIDENTIAL, HIGH DENSITY (BLOCK 160)	292 units	2.337 ha
INSTITUTIONAL/MIXED USE (BLOCK 161)	12 units	0.373 ha
COMMERCIAL (BLOCK 162)		0.648 ha
PARKLAND (BLOCKS 163)		1.838 ha
STORMWATER MANAGMENT & OPEN SPACE (BLOCKS 164-167)		6.469 ha
RESIDENTIAL, EXISTING (BLOCK 168)		0.030 ha
PROPOSED ROADS		3.178 ha
TOTAL	730 units	36.298 ha

OWNER'S CERTIFICATE

MARIANNEVILLE DEVELOPMENTS LIMITED
HEREBY CONSENTS TO THE FILING OF THIS PLAN IN DRAFT FORM

MARIANNEVILLE DEVELOPMENTS LTD., OWNER — DATED

SURVEYOR'S CERTIFICATE

I HEREBY CERTIFY THAT THE BOUNDARIES OF THE LAND TO BE SUBDIVIDED AND THEIR RELATIONSHIP TO THE ADJACENT LANDS ARE ACCURATELY SHOWN ON THIS PLAN.

Greg G. Robinson, ONTARIO LAND SURVEYOR
for J.D. BARNES LTD. — DATED

NO.	REVISION	DATE	INITIAL
3	Revised for submission to Town	Nov 15	CK
2	Parkland Dedication Revisions	Nov 7	CK
1	Revised for OMB Prehearing	Aug 6	CK

ZELINKA PRIAMO LTD
A Professional Planning Practice
318 Wellington Road, London, Ontario N6C 4P4
Tel: (519) 474-7137 Fax: (519) 474-2284 e-mail: zp@zpplan.com

DRAWN BY	PROJECT NO.
CK	MVL/NMK/10-01
DATE	SCALE
MARCH 2012	1:2,000

GRADING PLAN

MARIANNEVILLE DEVELOPMENT LTD.
ESTATES OF GLENWAY NEWMARKET
TOWN OF NEWMARKET

DATE:	NOV. 18, 2013	PROJECT No.:	L09-301
SCALE:	1:1500	FIGURE No.:	GR-1

COLE ENGINEERING
70 VALLEYWOOD DR., MARKHAM, ON L3R 4T5
T:416.987.6161 / 905.940.6161 F:905.940.2064

LEGEND

×271.56	EX. GRADE
×272.00	PROPOSED GRADE
2.0%	PROPOSED SLOPE
F	FRONT DRAINAGE TYPE LOT
S	SPLIT DRAINAGE TYPE LOT
D	DECL/BACKSPLIT TYPE LOT
W/O	WALKOUT TYPE LOT

EX. DIRECTION OF MAJOR DRAINAGE FLOWS

POST DEV. DIRECTION OF MAJOR DRAINAGE FLOWS

DAVIS DRIVE (OLD KING'S HIGHWAY No. 9)

BLOCK 172 COMMERCIAL

BLOCK 166 MEDIUM DENSITY RESIDENTIAL

BLOCK 167 MEDIUM DENSITY RESIDENTIAL

BLOCK 168 MEDIUM DENSITY RESIDENTIAL

BLOCK 171 HIGH DENSITY RESIDENTIAL

BLOCK 150 CONDO RESIDENTIAL

CONDO BLOCK 156

CONDO BLOCK 157

ALEX DONER DRIVE

CROSSLAND GATE

FAIRWAY GARDEN

STREET A

STREET B

STREET C

STREET D

LANE 2

LANE 3

BOWSER CRESCENT

GLENWAY CIRCLE

KIRBY CRESCENT

MARSDEN COURT

EAGLE STREET

MILLARD AVENUE WEST

BRAMMAR STRAY

PEEVERS CRESCENT

BRIMSON DR.

EX. 0.4kV HYDRO CORRIDOR

EX. GO TRANSIT BUS TERMINAL

EX. PARKING AREA

EX. PARKLAND

ADDITIONAL LANDS OWNED BY APPLICANT

SWMP #5

SWMP #6

SWMP #9

FFE = 283.50 (PRELIMINARY)

NOTE:
RETAING WALL SHOULD NOT BE LOCATED ON TOP OF 300mm W/M
a) CREATE BLOCK WITH 2 RET. WALLS
b) M
M7-3.1 SLOPE ONLY – PROBLEM

PROPOSE CREATION OF SEPARATE BLOCK ALONG W/M AND ADJUST LOT LINES – IT IS A MUST

SWM #9 EMERGENCY OVERLOW TO BE DIRECTED VIA SURFACE SWALE TOWARDS EAGLE STREET

TO WESTERN CREEK

APPENDIX B

Borehole Logs and Geological Material Grain Size Analyses

Soil Engineers Ltd.

A Soil Investigation for Proposed Residential Subdivision

Estates of Glenway Newmarket

March 2012

Boreholes Logs and Grain-Size Analyses

JOB NO: 1111-S053

LOG OF BOREHOLE NO: MW-1D

FIGURE NO: 19A

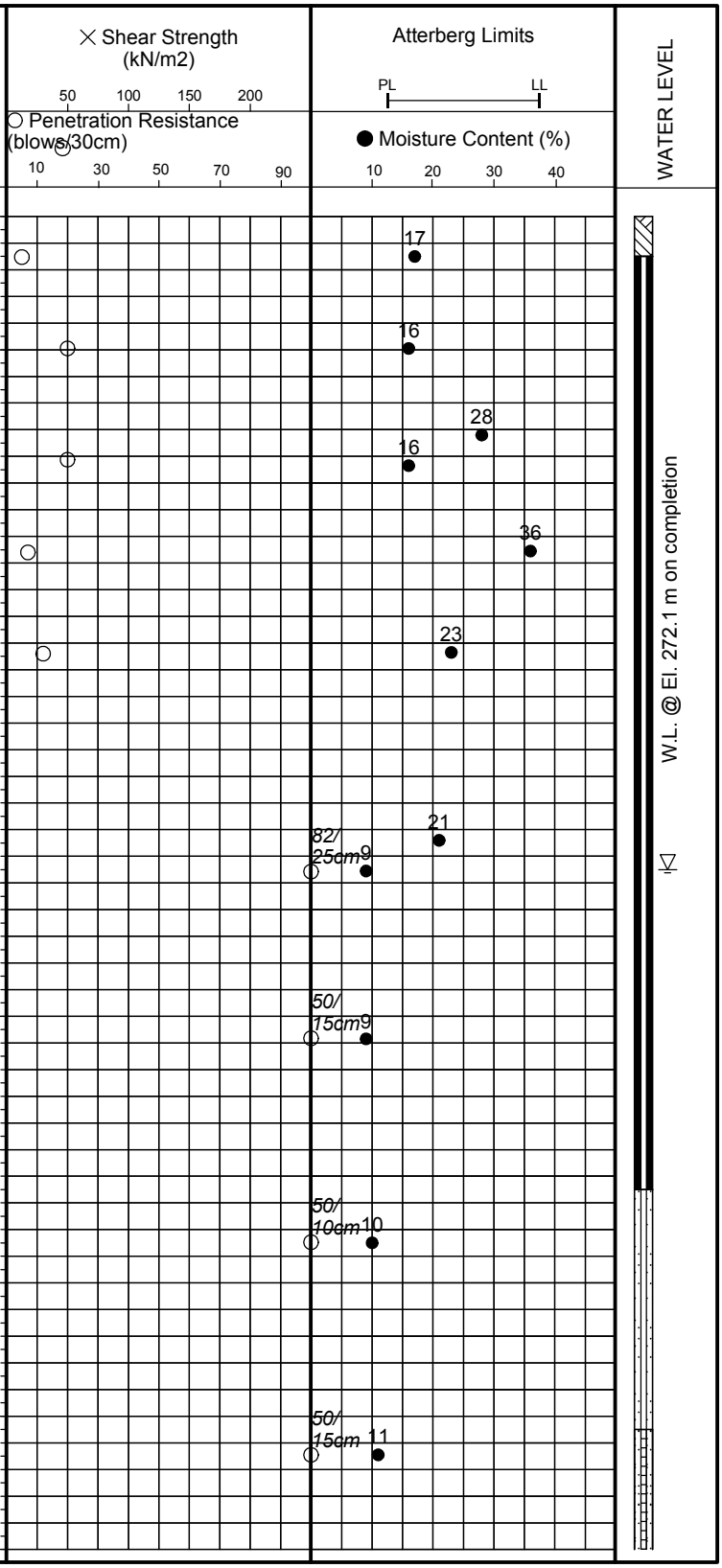
JOB DESCRIPTION: Proposed Residential Subdivision (Estates of Glenway Newmarket)

JOB LOCATION: Davis Drive West and Bathurst Street, Town of Newmarket

METHOD OF BORING: Flight-Auger

DATE: December 12, 2011

Depth / Elev. (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
0.0	Ground Surface			
277.0	**30 cm TOPSOIL, Fill**	1	DO	5
	Grey **SILTY CLAY, Fill** some sand and occ. topsoil incl.	2	DO	20
	topsoil layer	3A	DO	-
1.8		3B	DO	20
275.2	Greyish-brown, firm to very stiff, weathered **SILTY CLAY** a tr. to some sand occ. sand and silt seams and layers	4	DO	7
3.0				
274.0	Brown, stiff **SILTY CLAY, Till** some sand to sandy, a tr. of gravel occ. sand and silt seams and layers, cobbles and boulders	5	DO	12
4.8		6A	DO	-
272.2	Very dense	6B	DO	82/ 25
	SILTY SAND, Till and SANDY SILT, Till some clay, a tr. of gravel occ. sand and silt seams and layers cobbles and boulders	7	DO	50/ 15
	brown grey	8	DO	50/ 10
		9	DO	50/ 15



Soil Engineers Ltd.

JOB NO: 1111-S053

LOG OF BOREHOLE NO: MW-1D

FIGURE NO: 19B

JOB DESCRIPTION: Proposed Residential Subdivision (Estates of Glenway Newmarket)

JOB LOCATION: Davis Drive West and Bathurst Street, Town of Newmarket

METHOD OF BORING: Flight-Auger

DATE: December 12, 2011

Depth Elev. (m)	SOIL DESCRIPTION	SAMPLES Number	SAMPLES Type	SAMPLES N-Value
10.0				
267.0	Grey, very dense **SILTY SAND, Till and SANDY SILT, Till** some clay, a tr. of gravel	10	DO	50/ 15
266.0	**END OF BOREHOLE**			

Installed 50 mm standpipe to 10.6 m with 1.5 m screen. Sand backfill from 7.3 to 10.6 m. Bentonite seal from 0.3 to 7.3 m. Concrete from 0.0 to 0.3 m. Provided with steel casing and lock.

Depth Scale (m): 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20

× Shear Strength (kN/m2): 50, 100, 150, 200

○ Penetration Resistance (blows/30cm): 10, 30, 50, 70, 90

Atterberg Limits: PL — LL

● Moisture Content (%): 10, 20, 30, 40

50/ 15cm

11

WATER LEVEL

W.L. @ El. 272.1 m on completion

Soil Engineers Ltd.

JOB NO: 1111-S053

LOG OF BOREHOLE NO: MW-1S

FIGURE NO: 20

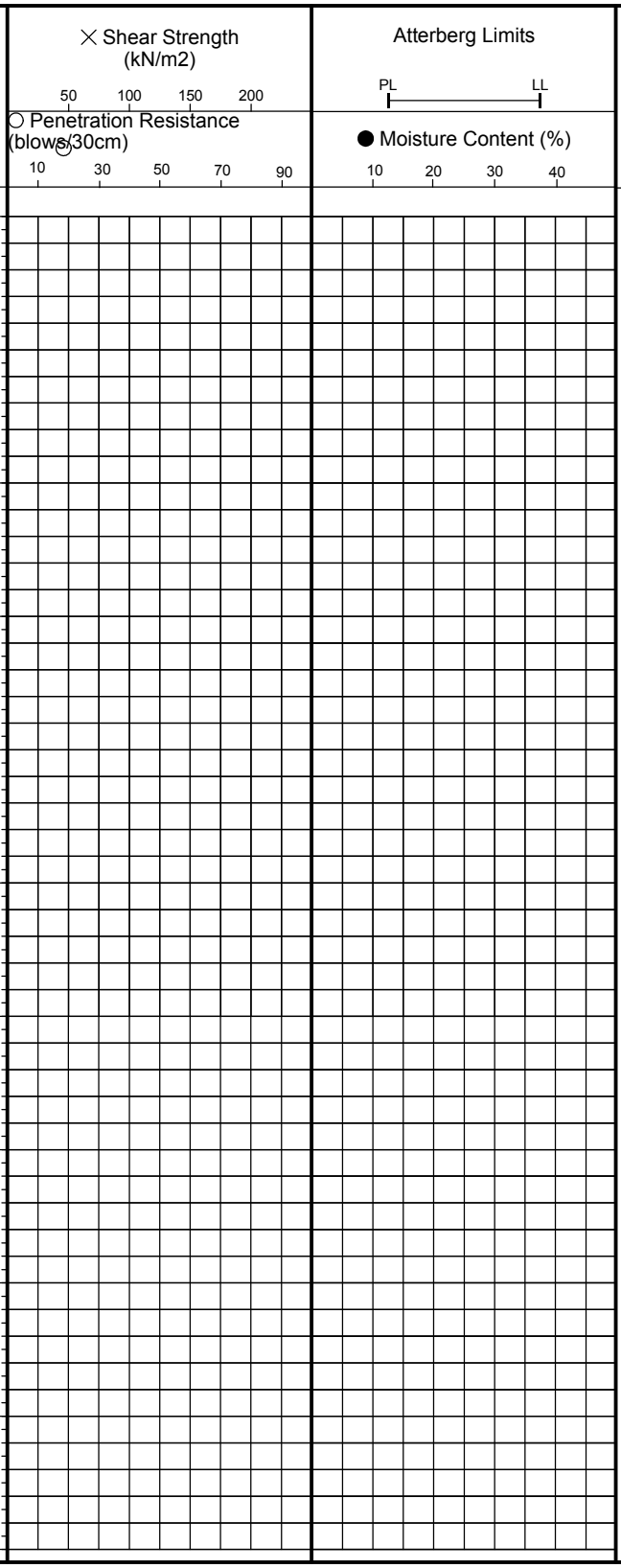
JOB DESCRIPTION: Proposed Residential Subdivision (Estates of Glenway Newmarket)

JOB LOCATION: Davis Drive West and Bathurst Street, Town of Newmarket

METHOD OF BORING: Flight-Auger

DATE: December 12, 2011

Depth Elev. (m)	SOIL DESCRIPTION	SAMPLES Number	SAMPLES Type	SAMPLES N-Value	Depth Scale (m)
0.0	Ground Surface				0
277.0	**30 cm TOPSOIL, Fill**				
	Grey **SILTY CLAY, Fill** some sand and occ. topsoil incl. topsoil layer				1
1.8					
275.2	Greyish-brown, firm to very stiff, weathered **SILTY CLAY** tr. to some sand occ. sand and silt seams and layers				2
3.0					3
274.0	Brown, stiff **SILTY CLAY, Till** some sand to sandy, a tr. of gravel occ. sand and silt seams and layers, cobbles and boulders				4
4.8					5
272.2	Brown, very dense **SILTY SAND, Till and SANDY SILT, Till** some clay, a tr. of gravel occ. sand and silt seams and layers cobbles and boulders				6
6.0					
271.0	**END OF BOREHOLE** Installed 50 mm standpipe to 6.0 m with 3.0 m screen. Sand backfill from 1.8 to 6.0 m. Bentonite seal from 0.3 to 1.8 m. Concrete from 0.0 to 0.3 m. Provided with steel casing and lock.				7
					8
					9
					10



Soil Engineers Ltd.

JOB NO: 1111-S053

LOG OF BOREHOLE NO: MW-2S

FIGURE NO: 21

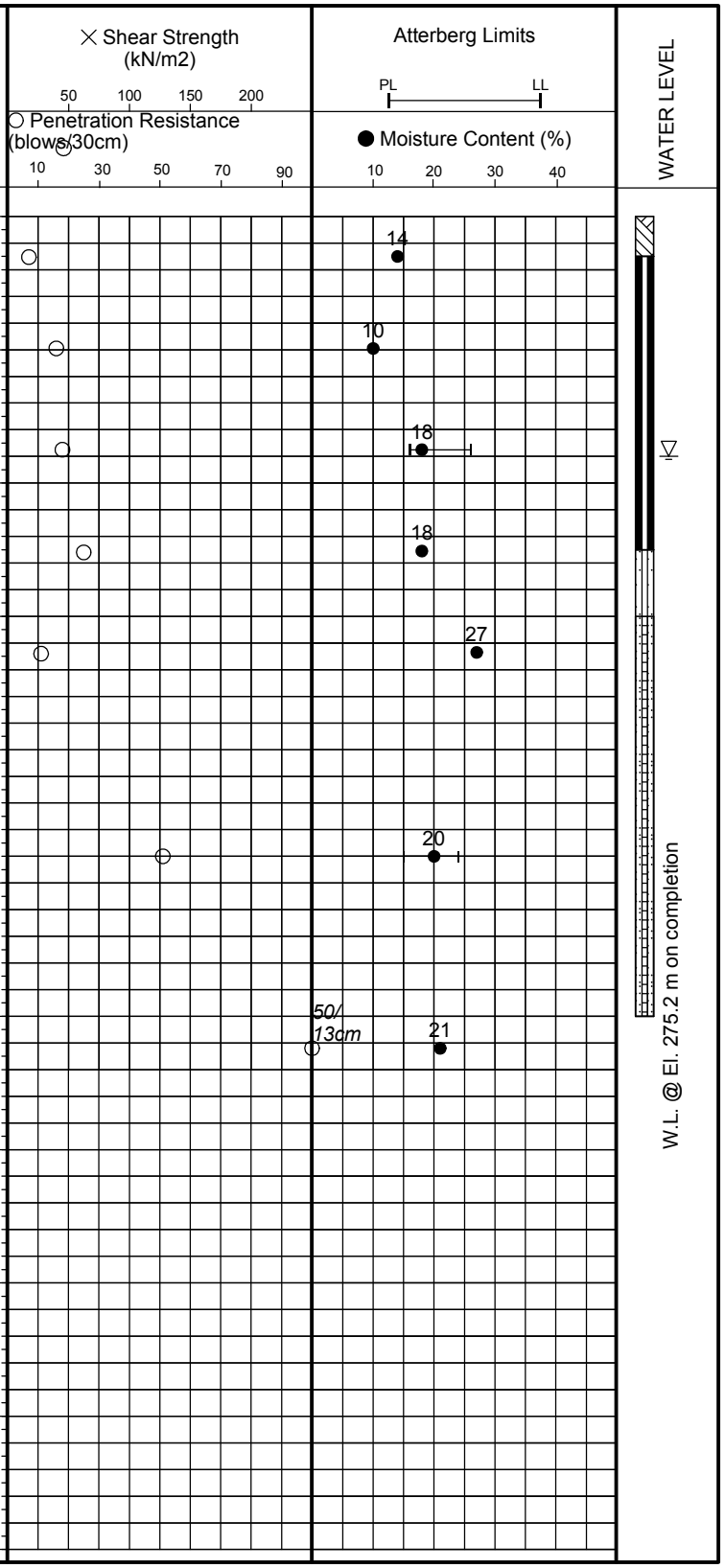
JOB DESCRIPTION: Proposed Residential Subdivision (Estates of Glenway Newmarket)

JOB LOCATION: Davis Drive West and Bathurst Street, Town of Newmarket

METHOD OF BORING: Flight-Auger

DATE: December 13, 2011

Depth Elev. (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
0.0	Ground Surface			
277.0	**45 cm TOPSOIL, Fill**	1	DO	7
	Brown **SILTY CLAY, Fill** some sand and occ. topsoil incl.	2	DO	16
1.5				
275.5	Brown, stiff to very stiff **SILTY CLAY** a tr. to some sand occ. sand and silt seams and layers	3	DO	18
		4	DO	25
		5	DO	11
4.5				
272.5	Brown, hard **SILTY CLAY, Till** some sand to sandy, a tr. of gravel occ. sand and silt seams and layers, cobbles and boulders	6	DO	51
		7	DO	50/ 13
6.4				
270.6	**END OF BOREHOLE** Installed 50 mm standpipe to 6.0 m with 3.0 m screen. Sand backfill from 2.5 to 6.0 m. Bentonite seal from 0.3 to 2.5 m. Concrete from 0.0 to 0.3 m. Provided with steel casing and lock.			



Soil Engineers Ltd.

JOB NO: 1111-S053

LOG OF BOREHOLE NO: MW-3S

FIGURE NO: 22

JOB DESCRIPTION: Proposed Residential Subdivision (Estates of Glenway Newmarket)

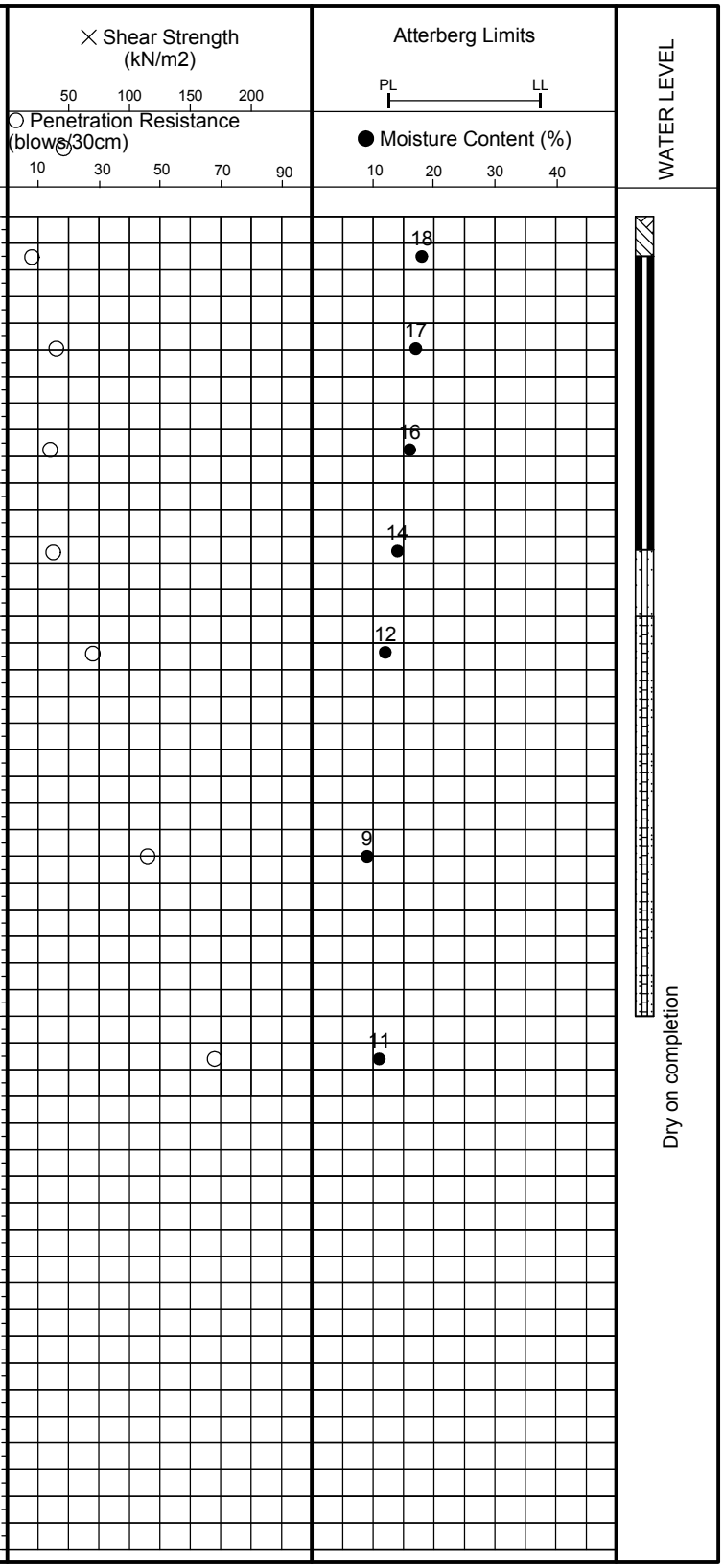
JOB LOCATION: Davis Drive West and Bathurst Street, Town of Newmarket

METHOD OF BORING: Flight-Auger

DATE: December 14, 2011

Depth Elev. (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
0.0	Ground Surface			
267.0	**45 cm TOPSOIL**	1	DO	8
	Stiff to very stiff weathered			
		2	DO	16
	SILTY CLAY, Till			
		3	DO	14
	some sand to sandy, a tr. of gravel occ. sand and silt seams and layers, brown cobbles and boulders			
	grey	4	DO	15
		5	DO	28
4.5				
262.5	Grey, dense to very dense	6	DO	46
	SILTY SAND, Till and SANDY SILT, Till some clay, a tr. of gravel occ. sand and silt seams and layers cobbles and boulders			
		7	DO	68
6.6				
260.4	**END OF BOREHOLE**			

Installed 50 mm standpipe to 6.0 m with 3.0 m screen. Sand backfill from 2.5 to 6.0 m. Bentonite seal from 0.3 to 2.5 m. Concrete from 0.0 to 0.3 m. Provided with steel casing and lock.



Soil Engineers Ltd.

JOB NO: 1111-S053

LOG OF BOREHOLE NO: MW-4D

FIGURE NO: 23A

JOB DESCRIPTION: Proposed Residential Subdivision (Estates of Glenway Newmarket)

JOB LOCATION: Davis Drive West and Bathurst Street, Town of Newmarket

METHOD OF BORING: Flight-Auger

DATE: December 19, 2011

Depth Elev. (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)	× Shear Strength (kN/m2) 50 100 150 200 ○ Penetration Resistance (blows/30cm) 10 30 50 70 90	Atterberg Limits PL LL ● Moisture Content (%) 10 20 30 40	WATER LEVEL
0.0	Ground Surface				0			
269.0	**45 cm TOPSOIL**	1	DO	15			14	
	Stiff to hard							
		2	DO	10	1		12	
	weathered							
	SILTY CLAY, Till	3	DO	18			16	
					2			
		4	DO	16			15	
	some sand to sandy, a tr. of gravel occ. sand and silt seams and layers, cobbles and boulders				3			
		5	DO	20			15	
					4			
		6	DO	25			13	
					5			
	brown grey				6			
		7	DO	36			10	
					7			
		8	DO	42			11	
					8			
		9	DO	18			11	
					9			
					10			

Well flushed-out; no measurement

Soil Engineers Ltd.

JOB NO: 1111-S053

LOG OF BOREHOLE NO: MW-4D

FIGURE NO: 23B

JOB DESCRIPTION: Proposed Residential Subdivision (Estates of Glenway Newmarket)

JOB LOCATION: Davis Drive West and Bathurst Street, Town of Newmarket

METHOD OF BORING: Flight-Auger

DATE: December 19, 2011

Depth Elev. (m)	SOIL DESCRIPTION	SAMPLES Number	SAMPLES Type	SAMPLES N-Value
10.0				
259.0	Grey, hard **SILTY CLAY, Till** some sand to sandy, a tr. of gravel occ. sand and silt seams and layers, cobbles and boulders	10	DO	37
257.9	**END OF BOREHOLE** Installed 50 mm standpipe to 10.6 m with 1.5 m screen. Sand backfill from 8.8 to 10.6 m. Bentonite seal from 0.3 to 8.8 m. Concrete from 0.0 to 0.3. Provided with steel casing and lock.			

Depth Scale (m): 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20

× Shear Strength (kN/m2): 50, 100, 150, 200

○ Penetration Resistance (blows/30cm): 10, 30, 50, 70, 90

Atterberg Limits: PL, LL

● Moisture Content (%): 10, 20, 30, 40

WATER LEVEL

Well flushed-out; no measurement

Soil Engineers Ltd.

JOB NO: 1111-S053

LOG OF BOREHOLE NO: MW-4S

FIGURE NO: 24

JOB DESCRIPTION: Proposed Residential Subdivision (Estates of Glenway Newmarket)

JOB LOCATION: Davis Drive West and Bathurst Street, Town of Newmarket

METHOD OF BORING: Flight-Auger

DATE: December 19, 2011

Depth Elev. (m)	SOIL DESCRIPTION	SAMPLES Number	SAMPLES Type	SAMPLES N-Value	Depth Scale (m)	× Shear Strength (kN/m2) 50 100 150 200 ○ Penetration Resistance (blows/30cm) 10 30 50 70 90	Atterberg Limits PL LL ● Moisture Content (%) 10 20 30 40	WATER LEVEL
0.0	Ground Surface				0			
269.0	**45 cm TOPSOIL**							
	Brown, stiff to very stiff							
	weathered				1			
	SILTY CLAY, Till							
	some sand to sandy, a tr. of gravel occ. sand and silt seams and layers, cobbles and boulders				2			
					3			
					4			
					5			
6.0								
263.0	**END OF BOREHOLE**				6			
	Installed 50 mm standpipe to 6.0 m with 3.0 m screen. Sand backfill from 2.5 to 6.0 m. Bentonite seal from 0.3 to 2.5 m. Concrete from 0.0 to 0.3 m. Provided with steel casing and lock.				7			
					8			
					9			
					10			

Soil Engineers Ltd.

JOB NO: 1111-S053

LOG OF BOREHOLE NO: MW-5S

FIGURE NO: 25

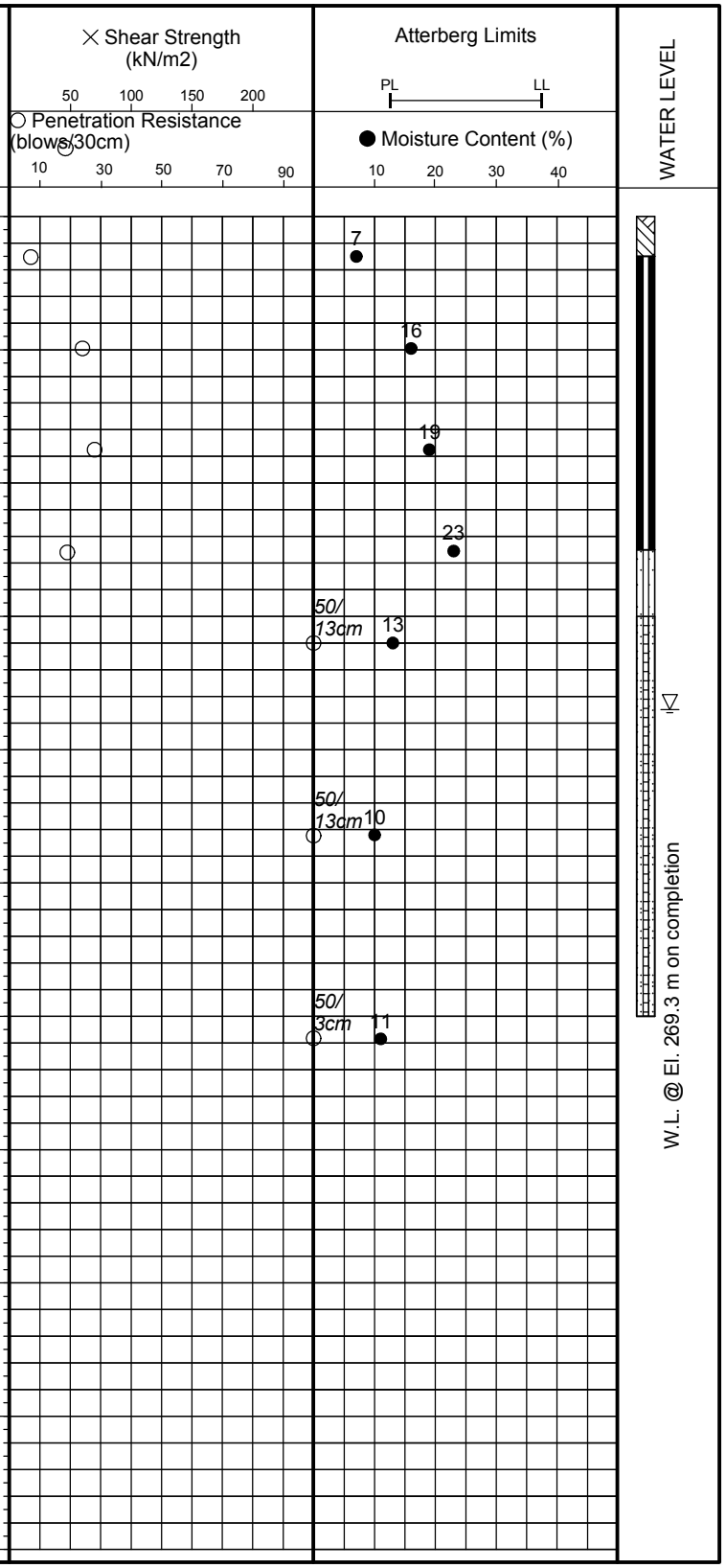
JOB DESCRIPTION: Proposed Residential Subdivision (Estates of Glenway Newmarket)

JOB LOCATION: Davis Drive West and Bathurst Street, Town of Newmarket

METHOD OF BORING: Flight-Auger

DATE: December 19, 2011

Depth / Elev. (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
0.0	Ground Surface			
273.0	**60 cm TOPSOIL, Fill**	1	DO	7
0.8	Brown			
272.2	**SILTY CLAY, Fill** some sand and occ. topsoil incl.	2	DO	24
	Brown, very stiff			
	SILTY CLAY a tr. to some sand occ. sand and silt seams and layers	3	DO	28
		4	DO	19
3.0				
270.0	Brown, hard **SILTY CLAY, Till** some sand to sandy, a tr. of gravel occ. sand and silt seams and layers, cobbles and boulders	5	DO	50/ 13
4.5				
268.5	Very dense **SILTY SAND, Till and SANDY SILT, Till** some clay, a tr. of gravel occ. sand and silt seams and layers cobbles and boulders — brown / grey	6	DO	50/ 13
6.2		7	DO	50/ 3
266.8	**END OF BOREHOLE** Installed 50 mm standpipe to 6.0 m with 3.0 m screen. Sand backfill from 2.5 to 6.0 m. Bentonite seal from 0.3 to 2.5 m. Concrete from 0.0 to 0.3 m. Provided with steel casing and lock.			



Soil Engineers Ltd.

JOB NO: 1111-S053

LOG OF BOREHOLE NO: MW-6S

FIGURE NO: 26

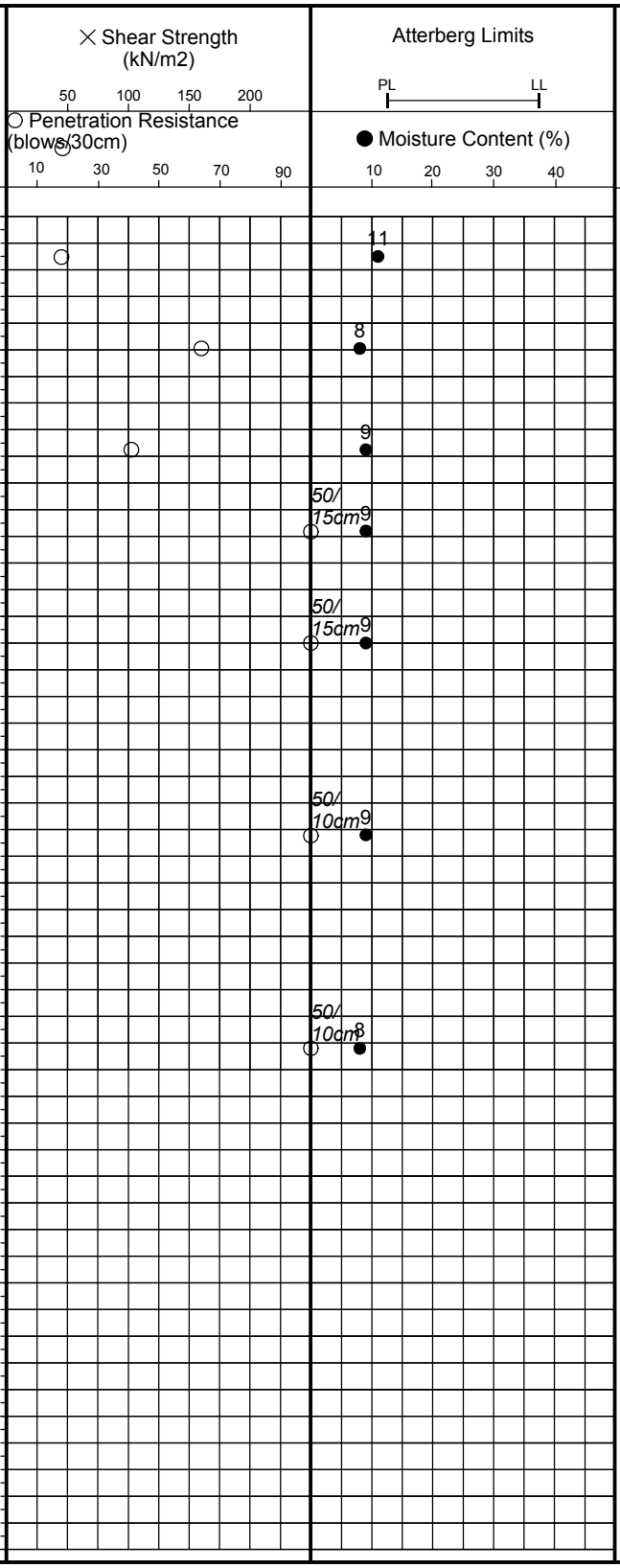
JOB DESCRIPTION: Proposed Residential Subdivision (Estates of Glenway Newmarket)

JOB LOCATION: Davis Drive West and Bathurst Street, Town of Newmarket

METHOD OF BORING: Flight-Auger

DATE: December 12, 2011

Depth Elev. (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)
0.0	Ground Surface				0
282.5	**30 cm TOPSOIL, Fill**	1	DO	18	
	Brown				
0.8	**SILTY CLAY, Fill**				
281.7	some sand and occ. topsoil incl.	2	DO	64	1
	Dense to very dense				
	SILTY SAND, Till and SANDY SILT, Till	3	DO	41	
	some clay, a tr. of gravel occ. sand and silt seams and layers cobbles and boulders	4	DO	50/ 15	2
		5	DO	50/ 15	3
					4
		6	DO	50/ 10	
	brown grey				5
		7	DO	50/ 10	6
6.4					
276.1	**END OF BOREHOLE**				7
	Installed 50 mm standpipe to 6.0 m with 3.0 m screen. Sand backfill from 2.5 to 6.0 m. Bentonite seal from 0.3 to 2.5 m. Concrete from 0.0 to 0.3 m. Provided with steel casing and lock.				8
					9
					10



WATER LEVEL

Well flushed-out; no measurement

Soil Engineers Ltd.

JOB NO: 1111-S053

LOG OF BOREHOLE NO: MW-7D

FIGURE NO: 27A

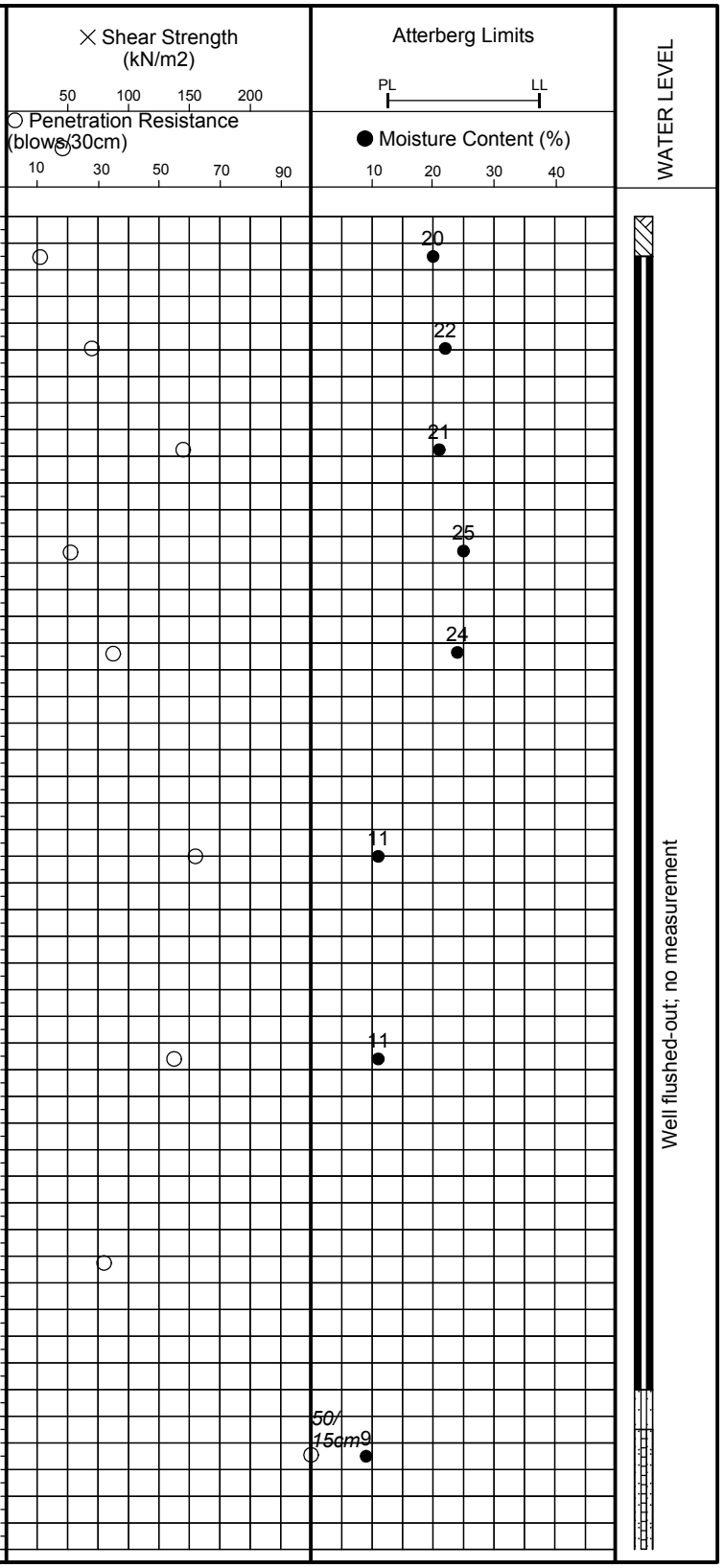
JOB DESCRIPTION: Proposed Residential Subdivision (Estates of Glenway Newmarket)

JOB LOCATION: Davis Drive West and Bathurst Street, Town of Newmarket

METHOD OF BORING: Flight-Auger

DATE: December 15, 2011

Depth Elev. (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
0.0	Ground Surface			
276.0	**30 cm TOPSOIL**			
	Brown, very stiff to hard	1	DO	11
	weathered			
	SILTY CLAY	2	DO	28
	tr. to some sand occ. sand and silt seams and layers	3	DO	58
		4	DO	21
		5	DO	35
4.5				
271.5	Hard	6	DO	62
	SILTY CLAY, Till			
	brown grey			
	some sand to sandy, a tr. of gravel occ. sand and silt seams and layers, cobbles and boulders	7	DO	55
		8	DO	32
9.0				
267.0	Grey, very dense **SILTY SAND, Till** **and SANDY SILT, Till** some clay, a tr. of gravel occ. sand and silt seams and layers cobbles and boulders	9	DO	50/ 15



Soil Engineers Ltd.

JOB NO: 1111-S053

LOG OF BOREHOLE NO: MW-7D

FIGURE NO: 27B

JOB DESCRIPTION: Proposed Residential Subdivision (Estates of Glenway Newmarket)

JOB LOCATION: Davis Drive West and Bathurst Street, Town of Newmarket

METHOD OF BORING: Flight-Auger

DATE: December 15, 2011

Depth Elev. (m)	SOIL DESCRIPTION	SAMPLES Number	SAMPLES Type	SAMPLES N-Value
10.0				
266.0	Grey, very dense **SILTY SAND, Till and SANDY SILT, Till** some clay, a tr. of gravel	10	DO	50/3
265.2	**END OF BOREHOLE**			

Installed 50 mm standpipe to 10.6 m with 1.5 m screen. Sand backfill from 8.8 to 10.6 m. Bentonite seal from 0.3 to 8.8 m. Concrete from 0.0 to 0.3 m. Provided with steel casing and lock.

Depth Scale (m): 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20

× Shear Strength (kN/m2): 50, 100, 150, 200

○ Penetration Resistance (blows/30cm): 10, 30, 50, 70, 90

50/3cm

Atterberg Limits: PL, LL

● Moisture Content (%): 10, 20, 30, 40

● 11

WATER LEVEL

Well flushed-out; no measurement

Soil Engineers Ltd.

JOB NO: 1111-S053

LOG OF BOREHOLE NO: MW-7S

FIGURE NO: 28

JOB DESCRIPTION: Proposed Residential Subdivision (Estates of Glenway Newmarket)

JOB LOCATION: Davis Drive West and Bathurst Street, Town of Newmarket

METHOD OF BORING: Flight-Auger

DATE: December 15, 2011

Depth Elev. (m)	SOIL DESCRIPTION	SAMPLES Number	SAMPLES Type	SAMPLES N-Value	Depth Scale (m)	× Shear Strength (kN/m2) 50 100 150 200 / ○ Penetration Resistance (blows/30cm) 10 30 50 70 90	Atterberg Limits PL LL / ● Moisture Content (%) 10 20 30 40	WATER LEVEL
0.0	Ground Surface				0			
276.0	**30 cm TOPSOIL, Fill**							
	Brown, very stiff to hard weathered **SILTY CLAY** a tr. to some sand occ. sand and silt seams and layers				1 2 3 4			
4.5								
271.5	Brown, hard **SILTY CLAY, Till** some sand to sandy, a tr. of gravel occ. sand and silt seams and layers, cobbles and boulders				5			
6.0					6			
270.0	**END OF BOREHOLE** Installed 50 mm standpipe to 6.0 m with 3.0 m screen. Sand backfill from 0.6 to 6.0 m. Bentonite seal from 0.3 to 0.6 m. Concrete from 0.0 to 0.3 m. Provided with steel casing and lock.				7 8 9 10			

Soil Engineers Ltd.

JOB NO: 1111-S053

LOG OF BOREHOLE NO: MW-8D

FIGURE NO: 29A

JOB DESCRIPTION: Proposed Residential Subdivision (Estates of Glenway Newmarket)

JOB LOCATION: Davis Drive West and Bathurst Street, Town of Newmarket

METHOD OF BORING: Flight-Auger

DATE: December 17, 2011

Depth Elev. (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
0.0	Ground Surface			
274.0	**50 cm TOPSOIL, Fill**	1	DO	10
	Brown			
	SILTY CLAY, Fill some sand and occ. topsoil incl.	2	DO	22
1.5				
272.5	Brown, very dense	3	DO	50/ 10
		4	DO	90/ 28
	SILTY SAND, Till and SANDY SILT, Till	5	DO	82/ 28
	some clay, a tr. of gravel occ. sand and silt seams and layers cobbles and boulders	6	DO	50/ 15
		7	DO	50/ 13
		8	DO	50/ 3
		9	DO	50/ 13

Depth Scale (m): 0 1 2 3 4 5 6 7 8 9 10

× Shear Strength (kN/m2): 50 100 150 200

○ Penetration Resistance (blows/30cm): 10 30 50 70 90

Atterberg Limits: PL — LL

● Moisture Content (%): 10 20 30 40

Moisture Content (%)	Penetration Resistance (blows/30cm)
22	
12	
16	50/ 10cm
10	90/ 28cm
7	82/ 28cm
12	50/ 15cm
11	50/ 13cm
9	50/ 3cm
	50/ 13cm

WATER LEVEL: W.L. @ El. 267.6 m on completion

Soil Engineers Ltd.

JOB NO: 1111-S053

LOG OF BOREHOLE NO: MW-8D

FIGURE NO: 29B

JOB DESCRIPTION: Proposed Residential Subdivision (Estates of Glenway Newmarket)

JOB LOCATION: Davis Drive West and Bathurst Street, Town of Newmarket

METHOD OF BORING: Flight-Auger

DATE: December 17, 2011

Depth Elev. (m)	SOIL DESCRIPTION	SAMPLES Number	SAMPLES Type	SAMPLES N-Value	Depth Scale (m)	× Shear Strength (kN/m2) 50 100 150 200 / ○ Penetration Resistance (blows/30cm) 10 30 50 70 90	Atterberg Limits PL LL / ● Moisture Content (%) 10 20 30 40	WATER LEVEL
10.0					10			
	Brown, very dense **SILTY SAND, Till and SANDY SILT, Till** some clay, a tr. of gravel	10	DO	50/5			50/5cm	
263.2	**END OF BOREHOLE**				11			
	Installed 50 mm standpipe to 10.6 m with 1.5 m screen. Sand backfill from 8.4 to 10.6 m. Bentonite seal from 0.3 to 8.4 m. Concrete from 0.0 to 0.3 m. Provided with steel casing and lock.				12			W.L. @ El. 267.6 m on completion
					13			
					14			
					15			
					16			
					17			
					18			
					19			
					20			

Soil Engineers Ltd.

JOB NO: 1111-S053

LOG OF BOREHOLE NO: MW-8S

FIGURE NO: 30

JOB DESCRIPTION: Proposed Residential Subdivision (Estates of Glenway Newmarket)

JOB LOCATION: Davis Drive West and Bathurst Street, Town of Newmarket

METHOD OF BORING: Flight-Auger

DATE: December 17, 2011

Depth Elev. (m)	SOIL DESCRIPTION	SAMPLES Number	SAMPLES Type	SAMPLES N-Value	Depth Scale (m)
0.0	Ground Surface				0
274.0	**50 cm TOPSOIL, Fill**				
	Brown **SILTY CLAY, Fill** some sand and occ. topsoil incl.				1
1.5 272.5	Brown, very dense **SILTY SAND, Till and SANDY SILT, Till** some clay, a tr. of gravel occ. sand and silt seams and layers cobbles and boulders				2 3 4 5
6.0 268.0	**END OF BOREHOLE** Installed 50 mm standpipe to 6.0 m with 3.0 m screen. Sand backfill from 2.5 to 6.0 m. Bentonite seal from 0.3 to 2.5 m. Concrete from 0.0 to 0.3 m. Provided with steel casing and lock.				6 7 8 9 10

× Shear Strength (kN/m2): 50 100 150 200

○ Penetration Resistance (blows/30cm): 10 30 50 70 90

Atterberg Limits: PL — LL

● Moisture Content (%): 10 20 30 40

WATER LEVEL

Soil Engineers Ltd.

JOB NO: 1111-S053

LOG OF BOREHOLE NO: MW-9S

FIGURE NO: 31

JOB DESCRIPTION: Proposed Residential Subdivision (Estates of Glenway Newmarket)

JOB LOCATION: Davis Drive West and Bathurst Street, Town of Newmarket

METHOD OF BORING: Flight-Auger

DATE: December 17, 2011

Depth Elev. (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
0.0	Ground Surface			
273.0	**25 cm TOPSOIL, Fill**			
	Brown **SILTY CLAY, Fill** some sand, traces of gravel and topsoil	1	DO	13
		2	DO	30
1.5				
271.5	Brown, stiff to hard **SILTY CLAY, Till**	3	DO	24
		4	DO	12
	some sand to sandy, a tr. of gravel occ. sand and silt seams and layers, cobbles and boulders	5	DO	25
		6	DO	21
		7	DO	39
6.6				
266.4	**END OF BOREHOLE** Installed 50 mm standpipe to 6.0 m with 3.0 m screen. Sand backfill from 2.5 to 6.0 m. Bentonite seal from 0.3 to 2.5 m. Concrete from 0.0 to 0.3 m. Provided with steel casing and lock.			

Depth Scale (m): 0 1 2 3 4 5 6 7 8 9 10

× Shear Strength (kN/m2): 50 100 150 200

○ Penetration Resistance (blows/30cm): 10 30 50 70 90

Atterberg Limits: PL — LL

● Moisture Content (%): 10 20 30 40

● 12 15 18 16 16 16

WATER LEVEL

W.L. @ El. 269.3 m on completion

Soil Engineers Ltd.

JOB NO: 1111-S053

LOG OF BOREHOLE NO: MW-10D

FIGURE NO: 32A

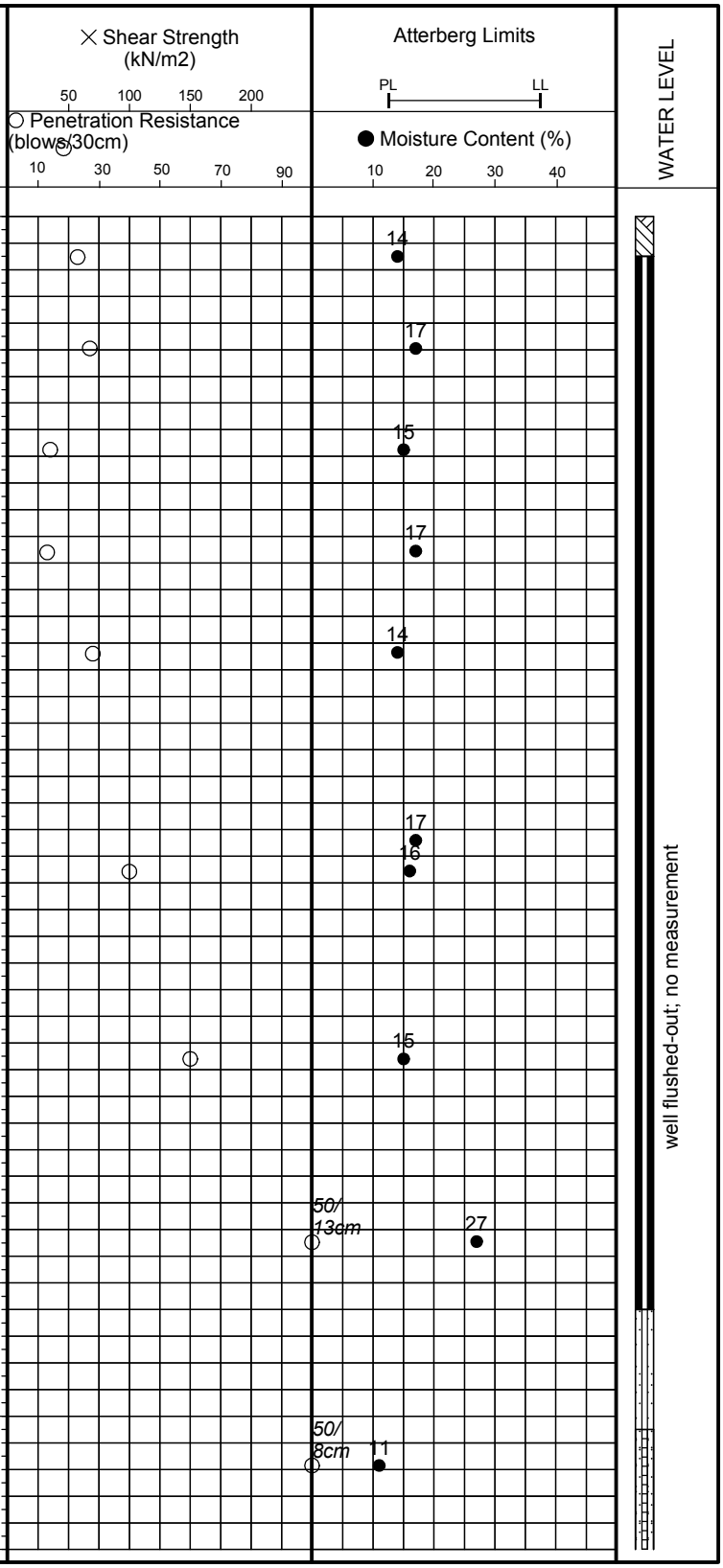
JOB DESCRIPTION: Proposed Residential Subdivision (Estates of Glenway Newmarket)

JOB LOCATION: Davis Drive West and Bathurst Street, Town of Newmarket

METHOD OF BORING: Flight-Auger

DATE: December 16, 2011

Depth / Elev. (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
0.0	Ground Surface			
272.0	**15 cm TOPSOIL, Fill**			
	Brown **SILTY CLAY, Fill** some sand and occ. topsoil incl.	1	DO	23
		2	DO	27
1.5				
270.5	Brown, stiff **SILTY CLAY** a tr. to some sand occ. sand and silt seams and layers	3	DO	14
		4	DO	13
3.0				
269.0	Very stiff to hard **SILTY CLAY, Till** some sand to sandy, a tr. of gravel occ. sand and silt seams and layers, sand layer cobbles and boulders	5	DO	28
		6A	DO	-
		6B	DO	40
	brown grey	7	DO	60
		8	DO	50/13
9.0				
263.0	Grey, very dense **SILTY SAND, Till and SANDY SILT, Till** some clay, a tr. of gravel occ. sand and silt seams and layers cobbles and boulders	9	DO	50/8



Soil Engineers Ltd.

JOB NO: 1111-S053

LOG OF BOREHOLE NO: MW-10D

FIGURE NO: 32B

JOB DESCRIPTION: Proposed Residential Subdivision (Estates of Glenway Newmarket)

JOB LOCATION: Davis Drive West and Bathurst Street, Town of Newmarket

METHOD OF BORING: Flight-Auger

DATE: December 16, 2011

Depth Elev. (m)	SOIL DESCRIPTION	SAMPLES Number	SAMPLES Type	SAMPLES N-Value
10.0				
262.0	Grey, very dense **SILTY SAND, Till and SANDY SILT, Till** some clay, a tr. of gravel	10	DO	50/ 10
261.2	**END OF BOREHOLE**			

Installed 50 mm standpipe to 10.6 m with 1.5 m screen. Sand backfill from 8.2 to 10.6 m. Bentonite seal from 0.3 to 8.2 m. Concrete from 0.0 to 0.3 m. Provided with steel casing and lock.

Depth Scale (m): 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20

× Shear Strength (kN/m2): 50, 100, 150, 200

○ Penetration Resistance (blows/30cm): 10, 30, 50, 70, 90

Atterberg Limits: PL — LL

● Moisture Content (%): 10, 20, 30, 40

50/ 10cm 11

WATER LEVEL

well flushed-out; no measurement

Soil Engineers Ltd.

JOB NO: 1111-S053

LOG OF BOREHOLE NO: MW-10S

FIGURE NO: 33

JOB DESCRIPTION: Proposed Residential Subdivision (Estates of Glenway Newmarket)

JOB LOCATION: Davis Drive West and Bathurst Street, Town of Newmarket

METHOD OF BORING: Flight-Auger

DATE: December 16, 2011

Depth Elev. (m)	SOIL DESCRIPTION	SAMPLES Number	SAMPLES Type	SAMPLES N-Value	Depth Scale (m)
0.0	Ground Surface				0
272.0	**15 cm TOPSOIL, Fill**				
	Brown				
	SILTY CLAY, Fill some sand and occ. topsoil incl.				1
1.5					
270.5	Brown, stiff				
	SILTY CLAY a tr. to some sand occ. sand and silt seams and layers				2
3.0					
269.0	Brown, very stiff to hard				3
	SILTY CLAY, Till some sand to sandy, a tr. of gravel occ. sand and silt seams and layers, cobbles and boulders				4
	sand layer				5
6.0					6
266.0	**END OF BOREHOLE**				7
	Installed 50 mm standpipe to 6.0 m with 3.0 m screen. Sand backfill from 2.4 to 6.0 m. Bentonite seal from 0.3 to 2.4 m. Concrete from 0.0 to 0.3 m. Provided with steel casing and lock.				8
					9
					10

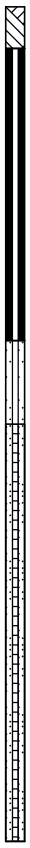
× Shear Strength (kN/m2): 50, 100, 150, 200

○ Penetration Resistance (blows/30cm): 10, 30, 50, 70, 90

Atterberg Limits: PL, LL

● Moisture Content (%): 10, 20, 30, 40

WATER LEVEL



Soil Engineers Ltd.

JOB NO: 1111-S053

LOG OF BOREHOLE NO: MW-11S

FIGURE NO: 34

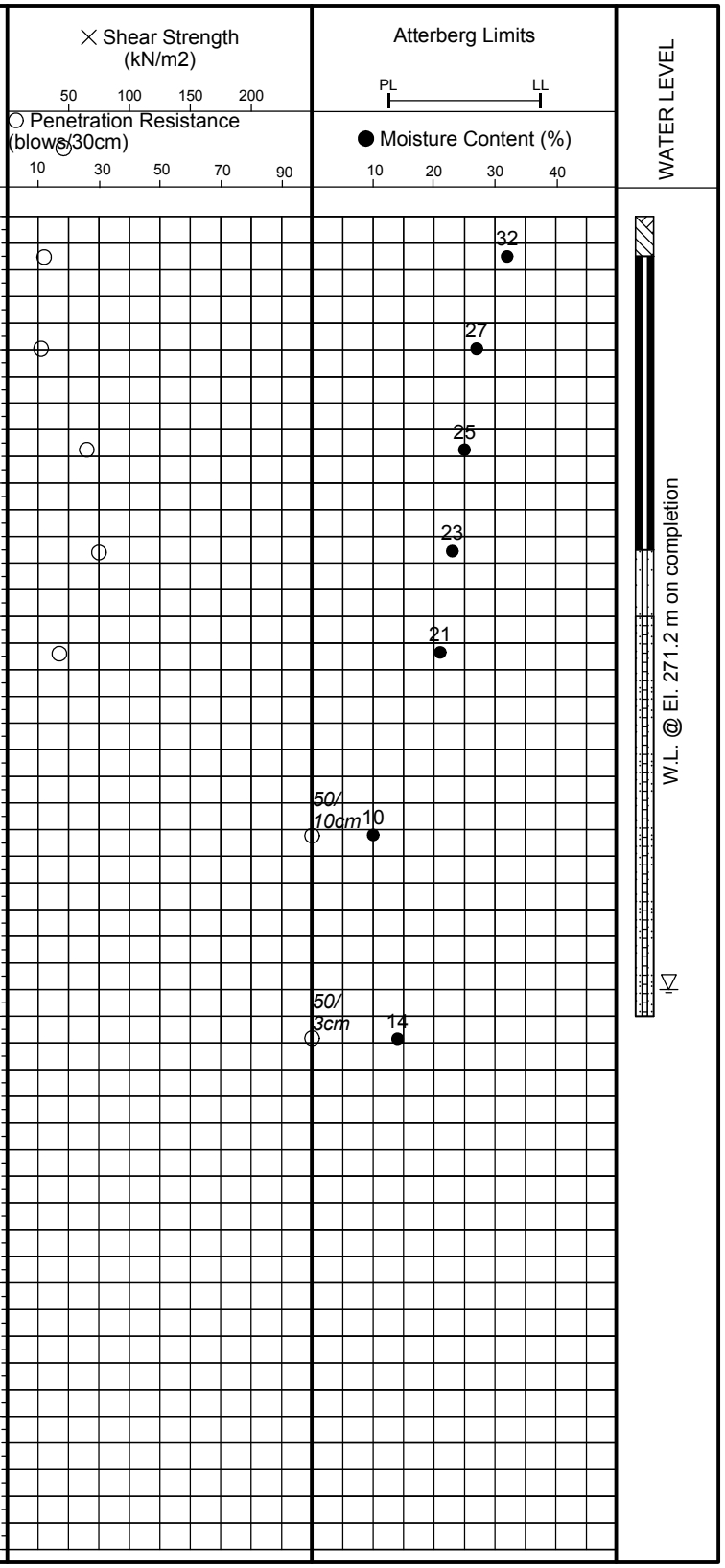
JOB DESCRIPTION: Proposed Residential Subdivision (Estates of Glenway Newmarket)

JOB LOCATION: Davis Drive West and Bathurst Street, Town of Newmarket

METHOD OF BORING: Flight-Auger

DATE: December 15, 2011

Depth Elev. (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
0.0	Ground Surface			
277.0	**51 cm TOPSOIL**	1	DO	12
	Brown, stiff to very stiff			
	SILTY CLAY weathered	2	DO	11
	tr. to some sand occ. sand and silt seams and layers	3	DO	26
2.3				
274.7	Brown, very stiff	4	DO	30
	SILTY CLAY, Till			
	some sand to sandy, a tr. of gravel occ. sand and silt seams and layers, cobbles and boulders	5	DO	17
4.5				
272.5	Brown, very dense	6	DO	50/10
	SILTY SAND, Till and SANDY SILT, Till some clay, a tr. of gravel occ. sand and silt seams and layers cobbles and boulders			
6.2		7	DO	50/3
270.8	**END OF BOREHOLE**			
	Installed 50 mm standpipe to 6.0 m with 3.0 m screen. Sand backfill from 2.5 to 6.0 m. Bentonite seal from 0.3 to 2.5 m. Concrete from 0.0 to 0.3 m. Provided with steel casing and lock.			



Soil Engineers Ltd.

JOB NO: 1111-S053

LOG OF BOREHOLE NO: MW-12D

FIGURE NO: 35A

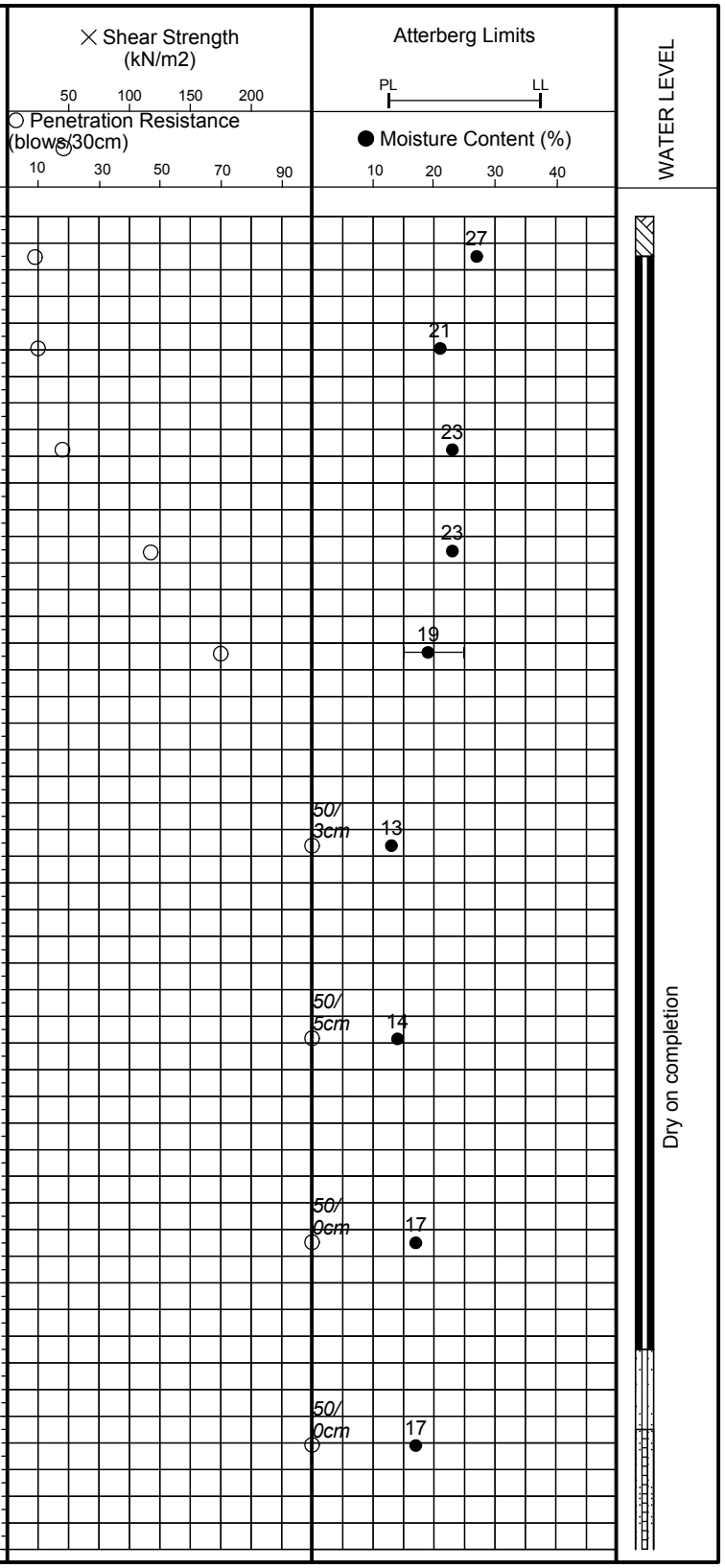
JOB DESCRIPTION: Proposed Residential Subdivision (Estates of Glenway Newmarket)

JOB LOCATION: Davis Drive West and Bathurst Street, Town of Newmarket

METHOD OF BORING: Flight-Auger

DATE: December 18, 2011

Depth Elev. (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
0.0	Ground Surface			
283.0	**60 cm TOPSOIL**	1	DO	9
	Brown, stiff to hard			
	weathered	2	DO	10
	SILTY CLAY			
	tr. to some sand occ. sand and silt seams and layers	3	DO	18
		4	DO	47
		5	DO	70
4.5				
278.5	Brown, very dense	6	DO	50/ 3
	SILTY SAND, Till and SANDY SILT, Till			
	some clay, a tr. of gravel occ. sand and silt seams and layers cobbles and boulders	7	AS	50/ 5
7.0				
276.0	Brown, hard			
	SILTY CLAY, Till	8	AS	50/ 0
	some sand to sandy, a tr. of gravel occ. sand and silt seams and layers, cobbles and boulders	9	AS	50/ 0



Soil Engineers Ltd.

JOB NO: 1111-S053

LOG OF BOREHOLE NO: MW-12D

FIGURE NO: 35B

JOB DESCRIPTION: Proposed Residential Subdivision (Estates of Glenway Newmarket)

JOB LOCATION: Davis Drive West and Bathurst Street, Town of Newmarket

METHOD OF BORING: Flight-Auger

DATE: December 18, 2011

Depth Elev. (m)	SOIL DESCRIPTION	SAMPLES Number	SAMPLES Type	SAMPLES N-Value
10.0				
273.0	Grey, very dense **SANDY SILT, Till** some clay, a tr. of gravel occ. sand and silt seams and layers cobbles and boulders	10	AS	50/ 3
272.2	**END OF BOREHOLE**			
	Installed 50 mm standpipe to 10.6 m with 1.5 m screen. Sand backfill from 8.5 to 10.6 m. Bentonite seal from 0.3 to 8.5 m. Concrete from 0.0 to 0.3 m. Provided with steel casing and lock.			

Depth Scale (m): 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20

× Shear Strength (kN/m2): 50, 100, 150, 200

○ Penetration Resistance (blows/30cm): 10, 30, 50, 70, 90

Atterberg Limits: PL — LL

● Moisture Content (%): 10, 20, 30, 40

50/ 3cm

11

WATER LEVEL

Dry on completion

Soil Engineers Ltd.

JOB NO: 1111-S053

LOG OF BOREHOLE NO: MW-12S

FIGURE NO: 36

JOB DESCRIPTION: Proposed Residential Subdivision (Estates of Glenway Newmarket)

JOB LOCATION: Davis Drive West and Bathurst Street, Town of Newmarket

METHOD OF BORING: Flight-Auger

DATE: December 18, 2011

Depth Elev. (m)	SOIL DESCRIPTION	SAMPLES Number	SAMPLES Type	SAMPLES N-Value	Depth Scale (m)	× Shear Strength (kN/m2) 50 100 150 200 / ○ Penetration Resistance (blows/30cm) 10 30 50 70 90	Atterberg Limits PL LL / ● Moisture Content (%) 10 20 30 40	WATER LEVEL
0.0	Ground Surface				0			
283.0	**60 cm TOPSOIL**							
	Brown, stiff to hard weathered **SILTY CLAY** a tr. to some sand occ. sand and silt seams and layers				1 2 3 4			
4.5 278.5	Brown, very dense **SILTY SAND, Till and SANDY SILT, Till** some clay, a tr. of gravel occ. sand and silt seams and layers cobbles and boulders				5			
6.0 277.0	**END OF BOREHOLE** Installed 50 mm standpipe to 6.0 m with 3.0 m screen. Sand backfill from 2.5 to 6.0 m. Bentonite seal from 0.3 to 2.5 m. Concrete from 0.0 to 0.3 m. Provided with steel casing and lock.				6 7 8 9 10			

Soil Engineers Ltd.

JOB NO: 1111-S053

LOG OF BOREHOLE NO: 1

FIGURE NO: 1

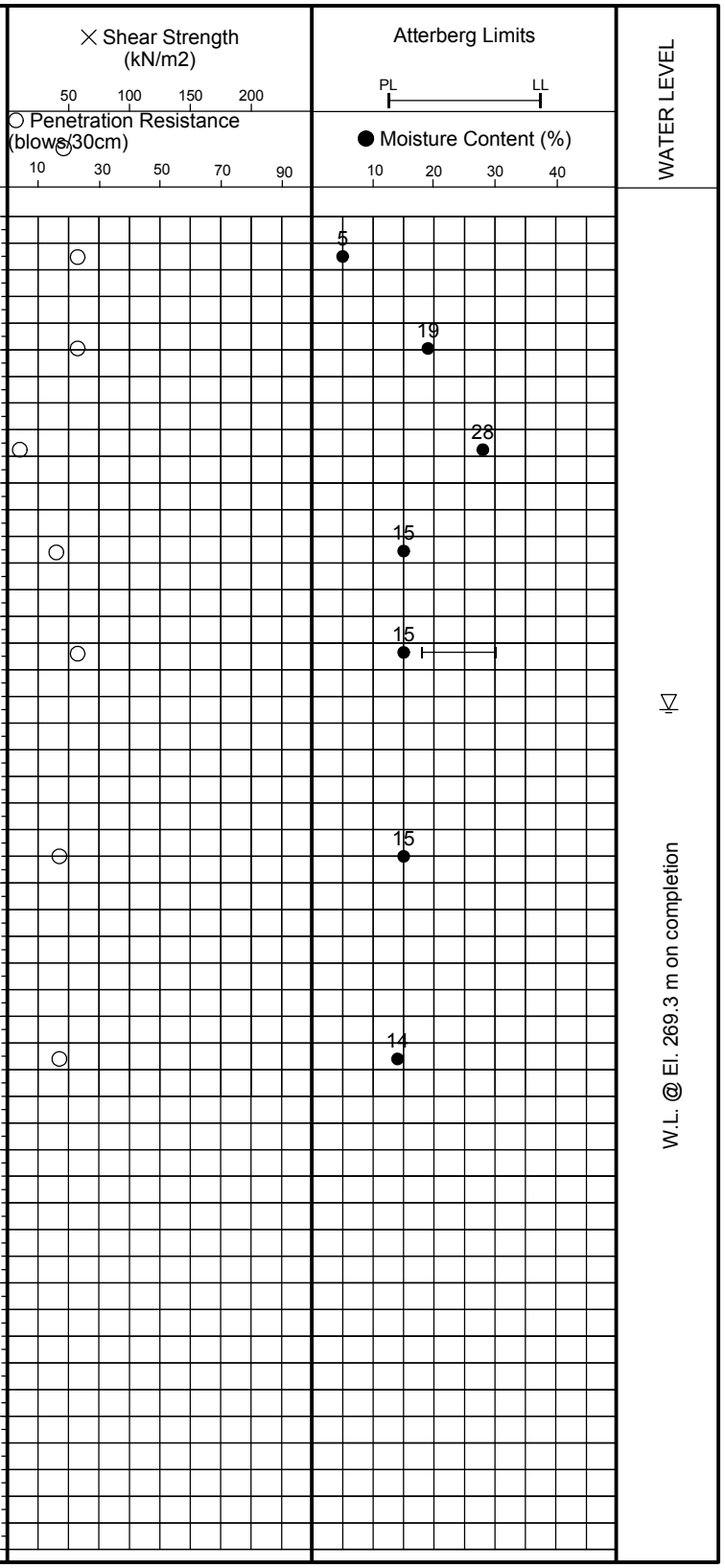
JOB DESCRIPTION: Proposed Residential Subdivision (Estates of Glenway Newmarket)

JOB LOCATION: Davis Drive West and Bathurst Street, Town of Newmarket

METHOD OF BORING: Flight-Auger

DATE: December 17, 2011

Depth Elev. (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
0.0	Ground Surface			
273.0	**75 mm ASPHALTIC CONCRETE** **250 mm GRANULAR, Fill** Grey/brown	1	DO	23
	EARTH, Fill sandy silt, some clay, a tr. of gravel	2	DO	23
1.5				
271.5	Greyish-brown, soft, weathered **SILTY CLAY** a tr. of sand occ. sand and silt seams and layers	3	DO	4
2.3				
270.7	Stiff to very stiff brown **SILTY CLAY, Till** grey	4	DO	16
		5	DO	23
	some sand to sandy, a tr. of gravel occ. sand and silt seams and layers, cobbles and boulders	6	DO	17
		7	DO	17
6.6				
266.4	**END OF BOREHOLE**			



Soil Engineers Ltd.

JOB NO: 1111-S053

LOG OF BOREHOLE NO: 2

FIGURE NO: 2

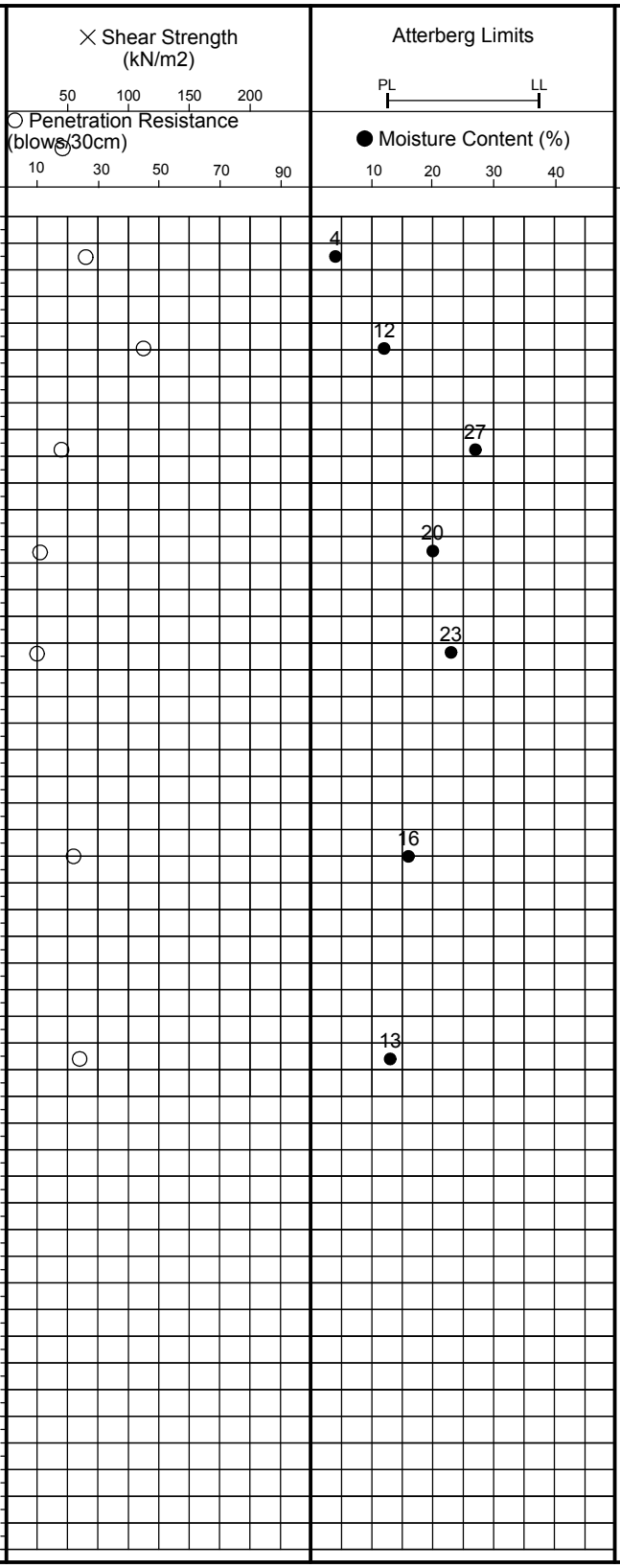
JOB DESCRIPTION: Proposed Residential Subdivision (Estates of Glenway Newmarket)

JOB LOCATION: Davis Drive West and Bathurst Street, Town of Newmarket

METHOD OF BORING: Flight-Auger

DATE: December 17, 2011

Depth Elev. (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
0.0	Ground Surface			
275.0	**75 mm ASPHALTIC CONCRETE** **250 mm GRANULAR, Fill** Brown/grey	1	DO	26
	SILTY CLAY, Fill some sand, a tr. of gravel occ. topsoil incl.	2	DO	45
	topsoil	3	DO	18
2.3	layer			
272.7	Stiff to very stiff **SILTY CLAY** a tr. of sand occ. sand and silt seams and layers	4	DO	11
	brown	5	DO	10
	grey	6	DO	22
		7	DO	24
6.6				
268.4	**END OF BOREHOLE**			



Soil Engineers Ltd.

JOB NO: 1111-S053

LOG OF BOREHOLE NO: 3

FIGURE NO: 3

JOB DESCRIPTION: Proposed Residential Subdivision (Estates of Glenway Newmarket)

JOB LOCATION: Davis Drive West and Bathurst Street, Town of Newmarket

METHOD OF BORING: Flight-Auger

DATE: December 12, 2011

Depth Elev. (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
0.0	Ground Surface			
278.0	**50 cm TOPSOIL, Fill**	1	DO	6
	Brown/grey			
	SILTY CLAY, Fill	2	DO	20
	some sand, a tr. of gravel occ. topsoil incl.	3	DO	17
	topsoil layer	4	DO	38
3.0				
275.0	Very stiff to hard	5	DO	19
	SILTY CLAY			
	a tr. of sand occ. sand and silt seams and layers			
	brown grey	6	DO	35
6.2		7	DO	50/8
271.8	**END OF BOREHOLE**			

Depth Scale (m): 0 1 2 3 4 5 6 7 8 9 10

× Shear Strength (kN/m2): 50 100 150 200

○ Penetration Resistance (blows/30cm): 10 30 50 70 90

Atterberg Limits: PL — LL

● Moisture Content (%): 10 20 30 40

22 17 16 23 21 16 50/8cm7

WATER LEVEL

W.L. @ El. 274.0 m on completion
Cave-in @ El. 272.2 m on completion

Soil Engineers Ltd.

JOB NO: 1111-S053

LOG OF BOREHOLE NO: 4

FIGURE NO: 4

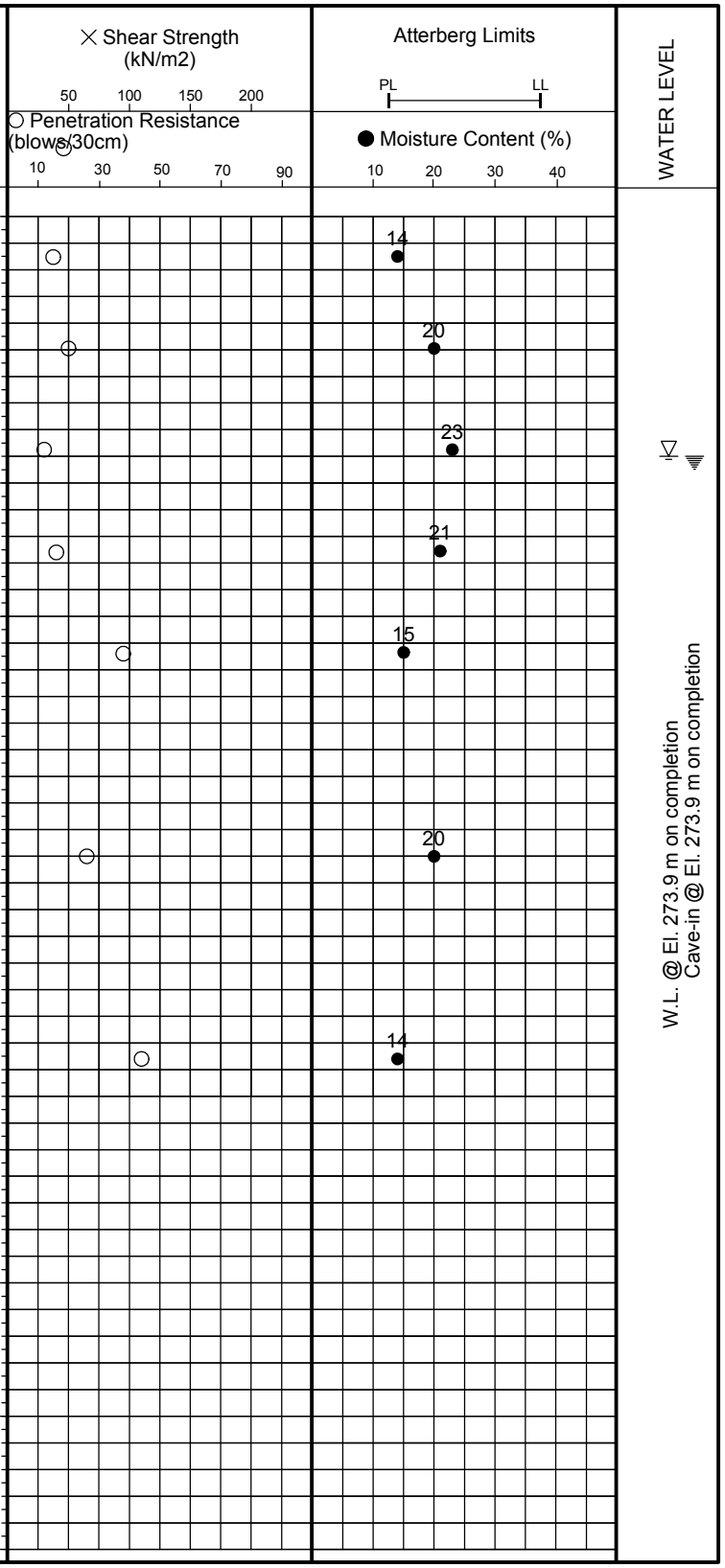
JOB DESCRIPTION: Proposed Residential Subdivision (Estates of Glenway Newmarket)

JOB LOCATION: Davis Drive West and Bathurst Street, Town of Newmarket

METHOD OF BORING: Flight-Auger

DATE: December 13, 2011

Depth Elev. (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
0.0	Ground Surface			
275.7	**60 cm TOPSOIL**	1	DO	15
	Brown, stiff to very stiff weathered			
	SILTY CLAY	2	DO	20
	a tr. to some sand occ. sand and silt seams and layers	3	DO	12
		4	DO	16
3.0				
272.7	Very stiff to hard	5	DO	38
	SILTY CLAY, Till			
	some sand to sandy, a tr. of gravel occ. sand and silt seams and layers, cobbles and boulders brown/grey	6	DO	26
		7	DO	44
6.6				
269.1	**END OF BOREHOLE**			



Soil Engineers Ltd.

JOB NO: 1111-S053

LOG OF BOREHOLE NO: 5

FIGURE NO: 5

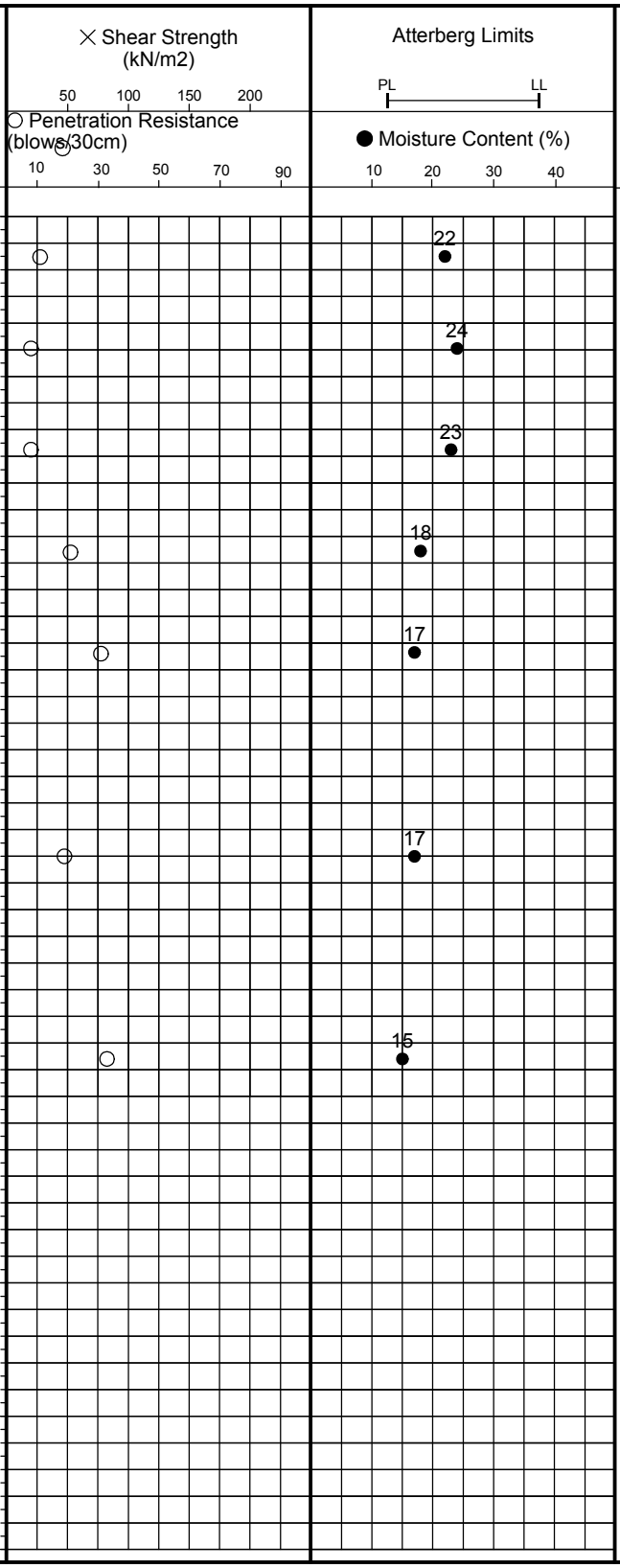
JOB DESCRIPTION: Proposed Residential Subdivision (Estates of Glenway Newmarket)

JOB LOCATION: Davis Drive West and Bathurst Street, Town of Newmarket

METHOD OF BORING: Flight-Auger

DATE: December 13, 2011

Depth Elev. (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
0.0	Ground Surface			
272.4	**30 cm TOPSOIL**	1	DO	11
	Brown, stiff to very stiff			
	SILTY CLAY			
	weathered	2	DO	8
	a tr. to some sand occ. sand and silt seams and layers			
		3	DO	8
		4	DO	21
3.0				
269.4	Grey, very stiff to hard	5	DO	31
	SILTY CLAY, Till			
	some sand to sandy, a tr. of gravel occ. sand and silt seams and layers, cobbles and boulders	6	DO	19
		7	DO	33
6.6				
265.8	**END OF BOREHOLE**			



Soil Engineers Ltd.

JOB NO: 1111-S053

LOG OF BOREHOLE NO: 6

FIGURE NO: 6

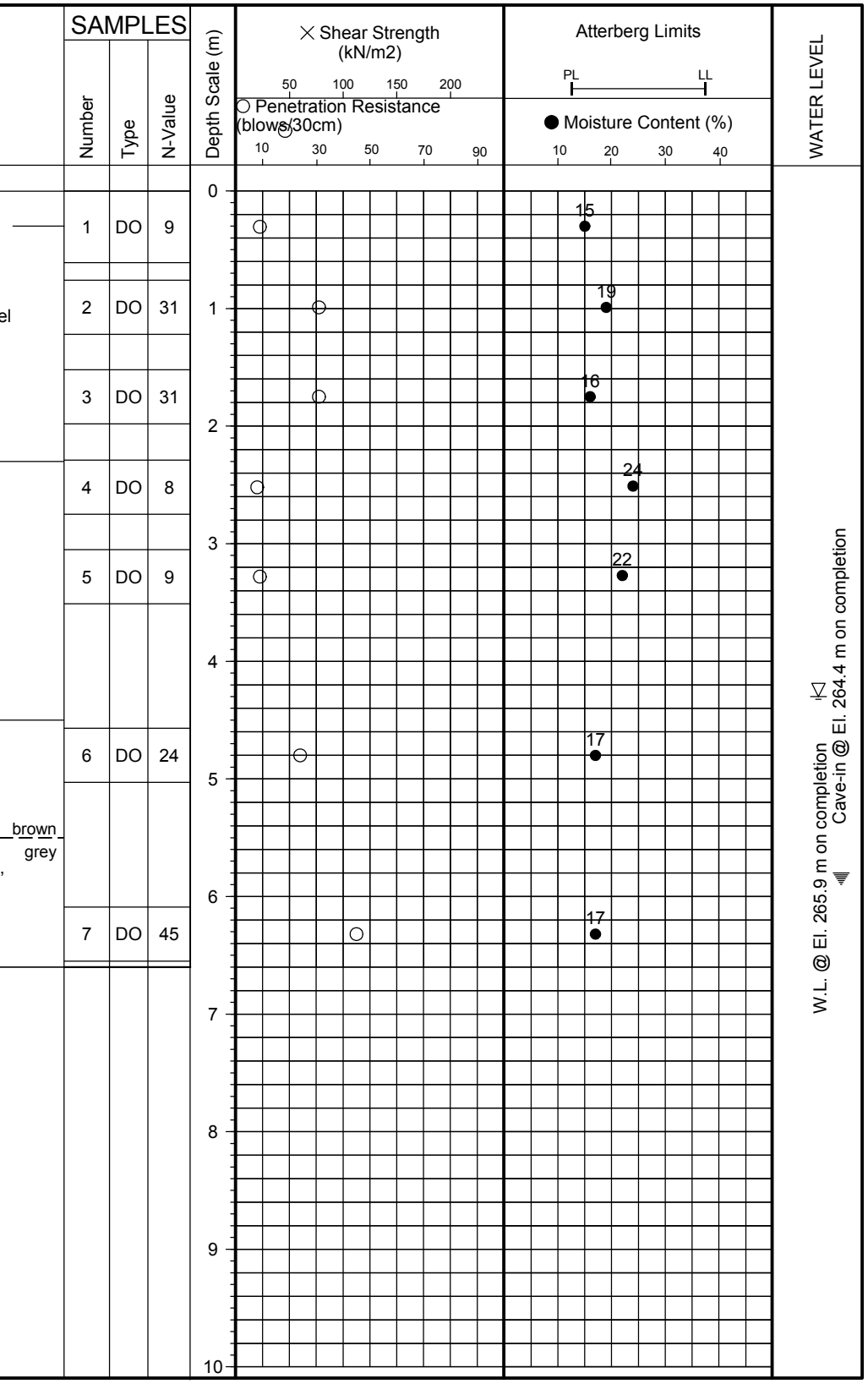
JOB DESCRIPTION: Proposed Residential Subdivision (Estates of Glenway Newmarket)

JOB LOCATION: Davis Drive West and Bathurst Street, Town of Newmarket

METHOD OF BORING: Flight-Auger

DATE: December 13, 2011

Depth / Elev. (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
0.0	Ground Surface			
270.2	**30 cm TOPSOIL, Fill**	1	DO	9
	Brown/grey **EARTH, Fill** silty clay and silty sand, a tr. of gravel occ. topsoil incl.	2	DO	31
		3	DO	31
2.3				
267.9	Brown, stiff **SILTY CLAY** a tr. to some sand occ. sand and silt seams and layers	4	DO	8
		5	DO	9
4.5				
265.7	Very stiff to hard **SILTY CLAY, Till** some sand to sandy, a tr. of gravel (brown / grey) occ. sand and silt seams and layers, cobbles and boulders	6	DO	24
		7	DO	45
6.6				
263.6	**END OF BOREHOLE**			



Soil Engineers Ltd.

JOB NO: 1111-S053

LOG OF BOREHOLE NO: 7

FIGURE NO: 7

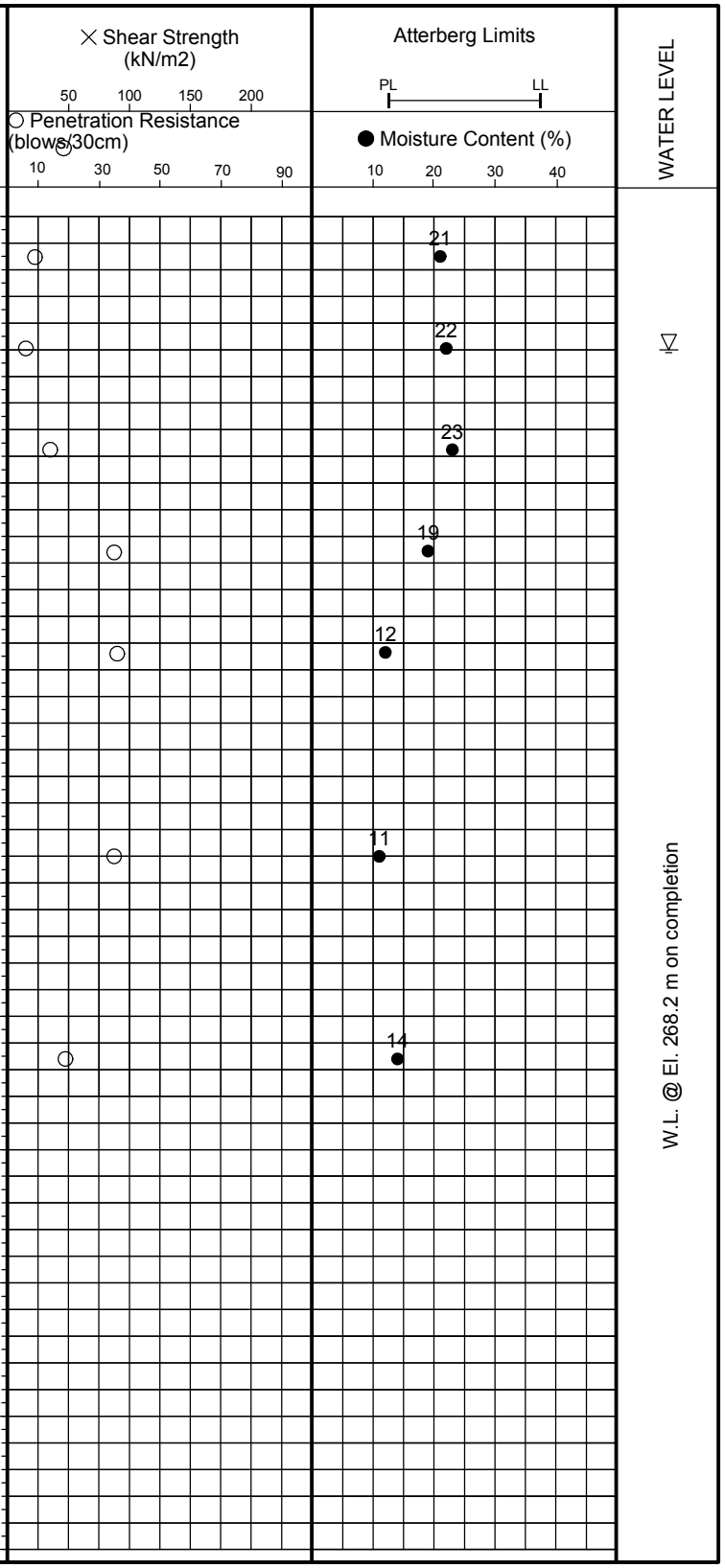
JOB DESCRIPTION: Proposed Residential Subdivision (Estates of Glenway Newmarket)

JOB LOCATION: Davis Drive West and Bathurst Street, Town of Newmarket

METHOD OF BORING: Flight-Auger

DATE: December 13, 2011

Depth Elev. (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
0.0	Ground Surface			
269.2	**36 cm TOPSOIL, Fill**	1	DO	9
	Brown/grey			
	SILTY CLAY, Fill some sand, a tr. of gravel occ. topsoil incl.	2	DO	6
1.5				
267.7	Stiff to hard	3	DO	14
	SILTY CLAY, Till	4	DO	35
	some sand to sandy, a tr. of gravel occ. sand and silt seams and layers, cobbles and boulders	5	DO	36
	brown / grey	6	DO	35
		7	DO	19
6.6				
262.6	**END OF BOREHOLE**			



Soil Engineers Ltd.

JOB NO: 1111-S053

LOG OF BOREHOLE NO: 8

FIGURE NO: 8

JOB DESCRIPTION: Proposed Residential Subdivision (Estates of Glenway Newmarket)

JOB LOCATION: Davis Drive West and Bathurst Street, Town of Newmarket

METHOD OF BORING: Flight-Auger

DATE: December 14, 2011

Depth Elev. (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
0.0	Ground Surface			
267.4	**28 cm TOPSOIL**	1	DO	8
	Brown/greyish-brown, firm to hard			
	SILTY CLAY weathered	2	DO	21
	a tr. to some sand occ. sand and silt seams and layers			
		3	DO	45
2.3				
265.1	Grey, very stiff to hard	4	DO	34
	SILTY CLAY, Till	5	DO	26
	some sand to sandy, a tr. of gravel occ. sand and silt seams and layers, cobbles and boulders			
		6	DO	29
		7	DO	38
6.6				
260.8	**END OF BOREHOLE**			

Depth Scale (m): 0 1 2 3 4 5 6 7 8 9 10

× Shear Strength (kN/m2): 50 100 150 200

○ Penetration Resistance (blows/30cm): 10 30 50 70 90

Atterberg Limits: PL — LL

● Moisture Content (%): 10 20 30 40

● 18 17 22 19 20 16 20

WATER LEVEL

W.L. @ El. 265.3 m on completion
Cave-in @ El. 261.6 m on completion

Soil Engineers Ltd.

JOB NO: 1111-S053

LOG OF BOREHOLE NO: 9

FIGURE NO: 9

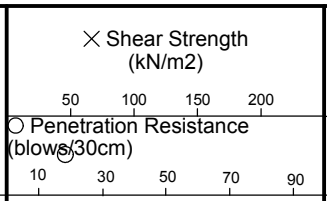
JOB DESCRIPTION: Proposed Residential Subdivision (Estates of Glenway Newmarket)

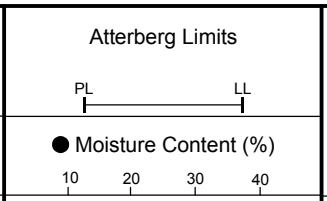
JOB LOCATION: Davis Drive West and Bathurst Street, Town of Newmarket

METHOD OF BORING: Flight-Auger

DATE: December 14, 2011

Depth Elev. (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)
0.0	Ground Surface				0
267.8	**30 cm TOPSOIL, Fill**	1	DO	14	
	Brown **SILTY CLAY, Fill** some sand, a tr. of gravel occ. topsoil incl.	2	DO	15	1
1.5	topsoil layer				
266.3	Very stiff to hard **SILTY CLAY, Till** some sand to sandy, a tr. of gravel occ. sand and silt seams and layers, cobbles and boulders	3	DO	27	2
		4	DO	29	
		5	DO	54	3
	brown grey	6	DO	53	4
		7	DO	30	5
6.6					6
261.2	**END OF BOREHOLE**				7
					8
					9
					10





WATER LEVEL

Dry on completion

Soil Engineers Ltd.

JOB NO: 1111-S053

LOG OF BOREHOLE NO: 10

FIGURE NO: 10

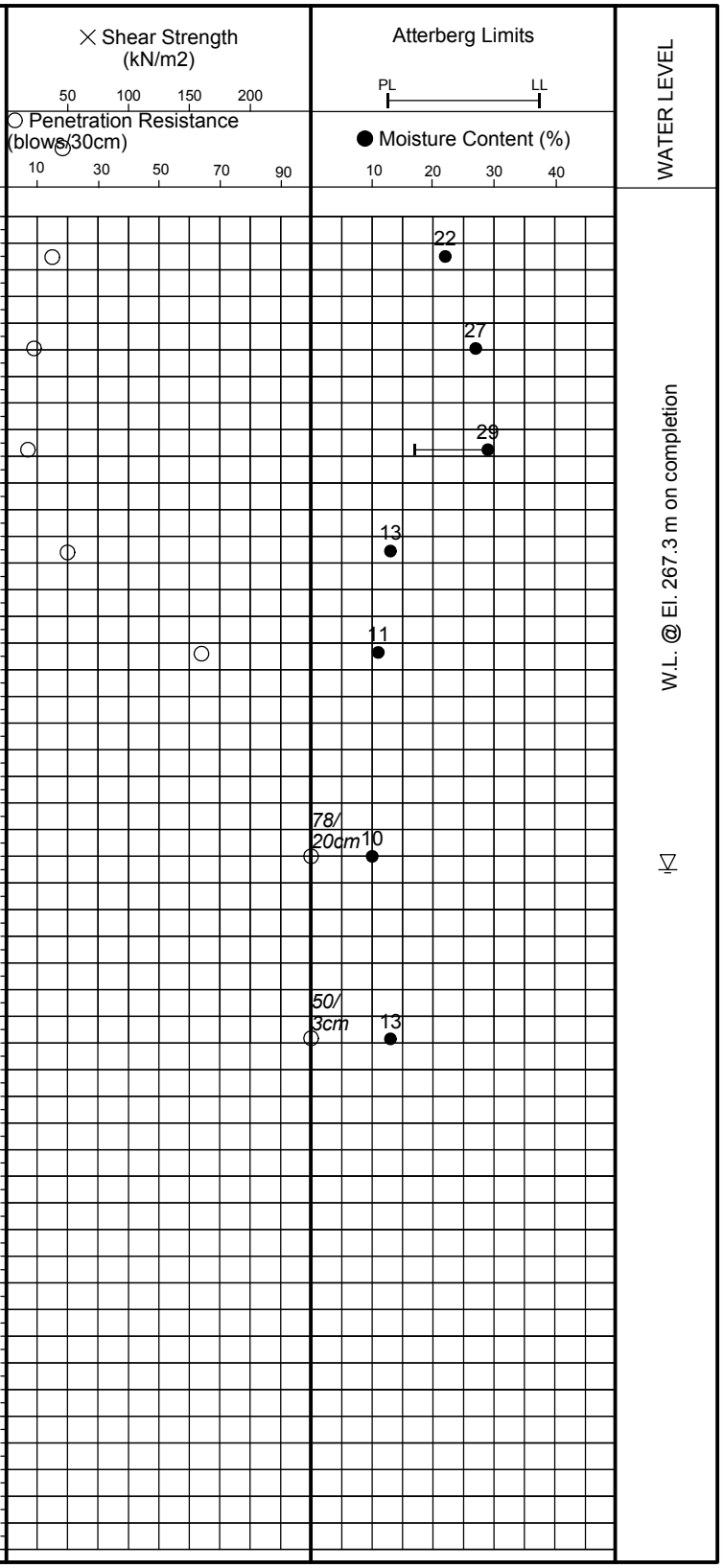
JOB DESCRIPTION: Proposed Residential Subdivision (Estates of Glenway Newmarket)

JOB LOCATION: Davis Drive West and Bathurst Street, Town of Newmarket

METHOD OF BORING: Flight-Auger

DATE: December 19, 2011

Depth Elev. (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
0.0	Ground Surface			
272.2	**51 cm TOPSOIL**	1	DO	15
	Brown, firm to stiff, weathered **SILTY CLAY** a tr. to some sand occ. sand and silt seams and layers	2	DO	9
		3	DO	7
2.0				
270.2	Brown, very stiff **SILTY CLAY, Till** some sand to sandy, a tr. of gravel occ. sand and silt seams and layers,	4	DO	20
3.0				
269.2	Very dense **SILTY SAND, Till and SANDY SILT, Till** some clay, a tr. of gravel occ. sand and silt seams and layers cobbles and boulders	5	DO	64
	brown / grey	6	DO	78/ 20
6.2		7	DO	50/ 3
266.0	**END OF BOREHOLE**			



Soil Engineers Ltd.

JOB NO: 1111-S053

LOG OF BOREHOLE NO: 11

FIGURE NO: 11

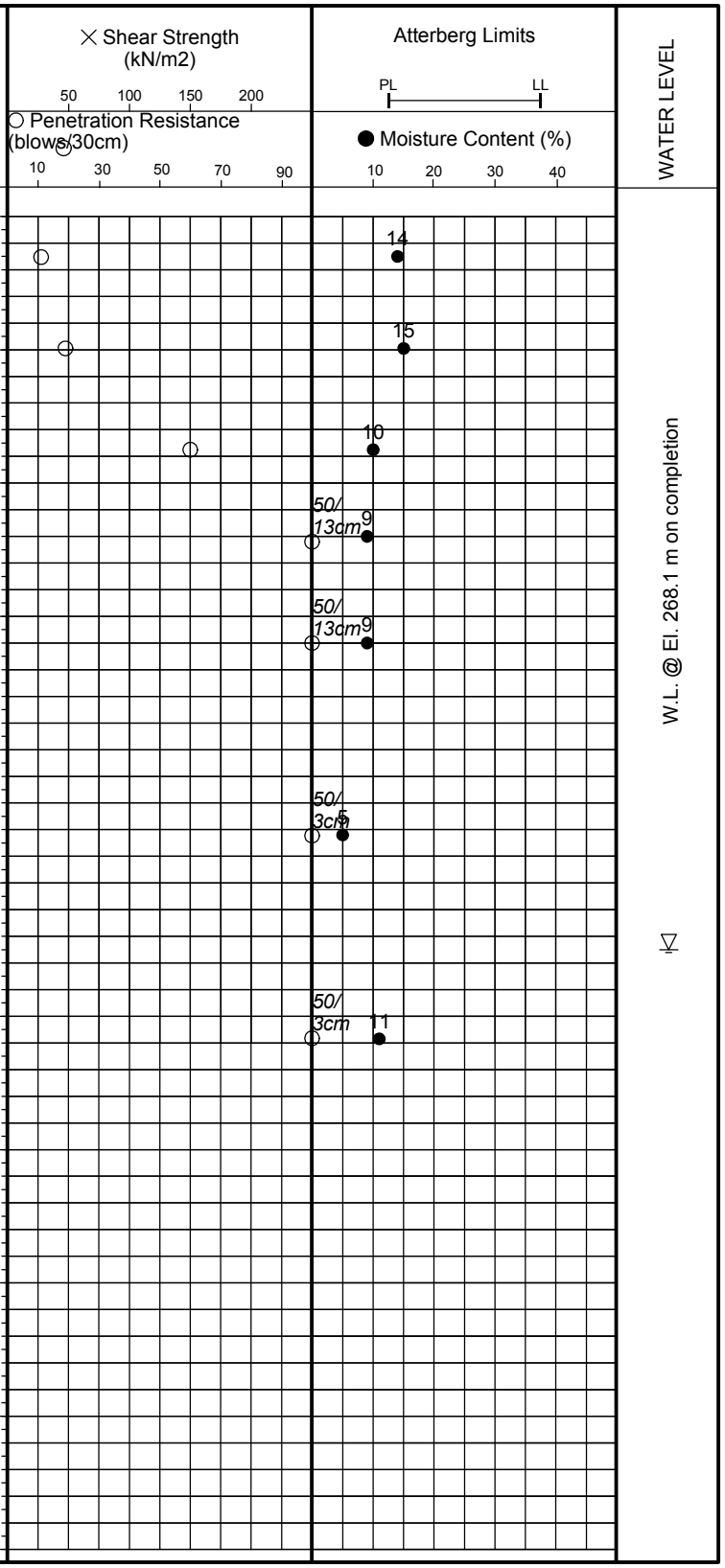
JOB DESCRIPTION: Proposed Residential Subdivision (Estates of Glenway Newmarket)

JOB LOCATION: Davis Drive West and Bathurst Street, Town of Newmarket

METHOD OF BORING: Flight-Auger

DATE: December 17, 2011

Depth / Elev. (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
0.0	Ground Surface			
273.6	**23 cm TOPSOIL, Fill**			
	Brown	1	DO	11
	SILTY CLAY, Fill some sand, a tr. of gravel occ. topsoil incl.	2	DO	19
1.5				
272.1	Brown, very dense	3	DO	60
	SILTY SAND, Till and SANDY SILT, Till some clay, a tr. of gravel occ. sand and silt seams and layers cobbles and boulders	4	DO	50/ 13
		5	DO	50/ 13
		6	DO	50/ 3
6.2		7	DO	50/ 3
267.4	**END OF BOREHOLE**			



Soil Engineers Ltd.

JOB NO: 1111-S053

LOG OF BOREHOLE NO: 12

FIGURE NO: 12

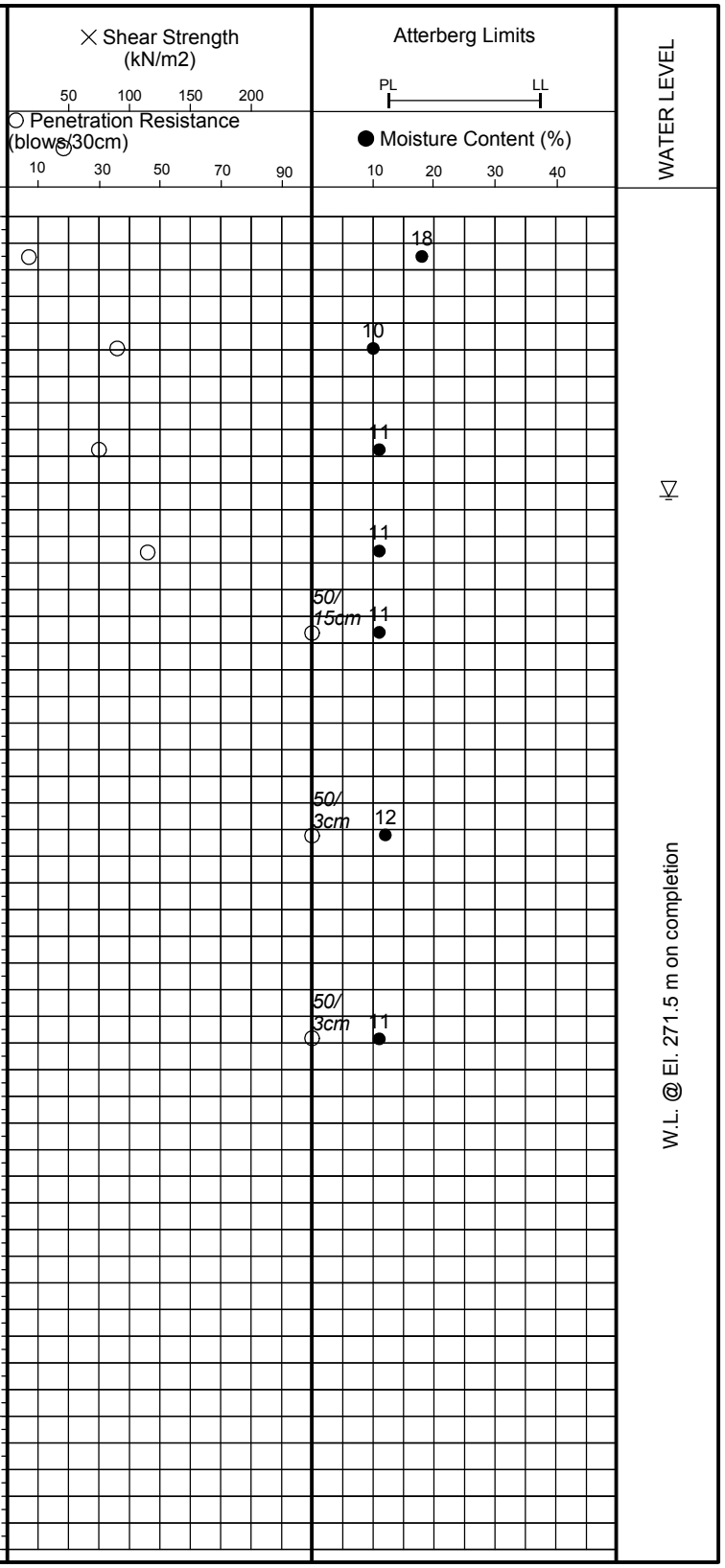
JOB DESCRIPTION: Proposed Residential Subdivision (Estates of Glenway Newmarket)

JOB LOCATION: Davis Drive West and Bathurst Street, Town of Newmarket

METHOD OF BORING: Flight-Auger

DATE: December 16, 2011

Depth Elev. (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
0.0	Ground Surface			
273.6	**40 cm TOPSOIL, Fill**	1	DO	7
	Brown **SILTY CLAY, Fill** some sand, a tr. of gravel occ. topsoil incl.			
0.8 / 272.8	Brown, dense to very dense	2	DO	36
	SILTY SAND, Till and SANDY SILT, Till some clay, a tr. of gravel occ. sand and silt seams and layers cobbles and boulders	3	DO	30
		4	DO	46
		5	DO	50/15
		6	DO	50/3
6.2 / 267.4	**END OF BOREHOLE**	7	DO	50/3



Soil Engineers Ltd.

JOB NO: 1111-S053

LOG OF BOREHOLE NO: 13

FIGURE NO: 13

JOB DESCRIPTION: Proposed Residential Subdivision (Estates of Glenway Newmarket)

JOB LOCATION: Davis Drive West and Bathurst Street, Town of Newmarket

METHOD OF BORING: Flight-Auger

DATE: December 14, 2011

Depth Elev. (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
0.0	Ground Surface			
278.4	**50 cm TOPSOIL**	1	DO	13
	Brown, compact to very dense weathered	2	DO	70
	SILTY SAND, Till and SANDY SILT, Till	3	DO	50/ 15
	some clay, a tr. of gravel occ. sand and silt seams and layers cobbles and boulders	4	DO	50/ 10
		5	DO	50/ 3
		6	DO	50/ 5
6.2		7	DO	50/ 5
272.2	**END OF BOREHOLE**			

Depth Scale (m): 0 1 2 3 4 5 6 7 8 9 10

× Shear Strength (kN/m2): 50 100 150 200

○ Penetration Resistance (blows/30cm): 10 30 50 70 90

Atterberg Limits: PL — LL

● Moisture Content (%): 10 20 30 40

14 9 50/ 15cm 7 50/ 10cm 7 50/ 3cm 8 50/ 5cm 10 50/ 5cm 8

WATER LEVEL: Dry on completion

Soil Engineers Ltd.

JOB NO: 1111-S053

LOG OF BOREHOLE NO: 14

FIGURE NO: 14

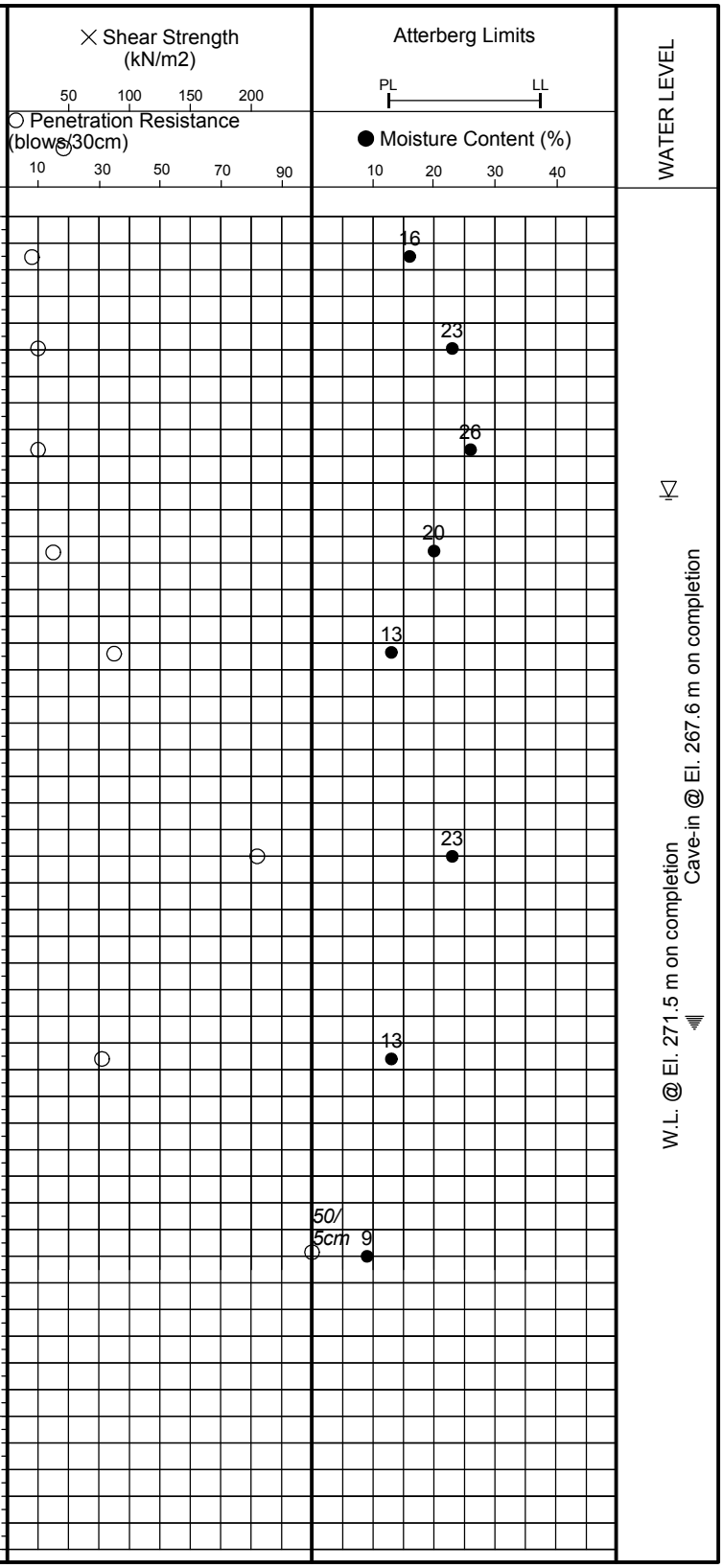
JOB DESCRIPTION: Proposed Residential Subdivision (Estates of Glenway Newmarket)

JOB LOCATION: Davis Drive West and Bathurst Street, Town of Newmarket

METHOD OF BORING: Flight-Auger

DATE: December 14, 2011

Depth / Elev. (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
0.0	Ground Surface			
273.6	**30 cm TOPSOIL, Fill**	1	DO	8
	Brown **SILTY CLAY, Fill** some sand occ. topsoil incl.	2	DO	10
1.5				
272.1	Brown, stiff **SILTY CLAY** a tr. to some sand occ. sand and silt seams and layers	3	DO	10
	weathered	4	DO	15
3.0				
270.6	Hard **SILTY CLAY, Till** some sand to sandy, a tr. of gravel occ. sand and silt seams and layers, cobbles and boulders	5	DO	35
	brown grey	6	DO	82
6.0				
267.6	Grey, dense to very dense **SILTY SAND, Till and SANDY SILT, Till** some clay, a tr. of gravel occ. sand and silt seams and layers cobbles and boulders	7	DO	31
7.9		8	DO	50/5
265.7	**END OF BOREHOLE**			



Soil Engineers Ltd.

JOB NO: 1111-S053

LOG OF BOREHOLE NO: 15

FIGURE NO: 15

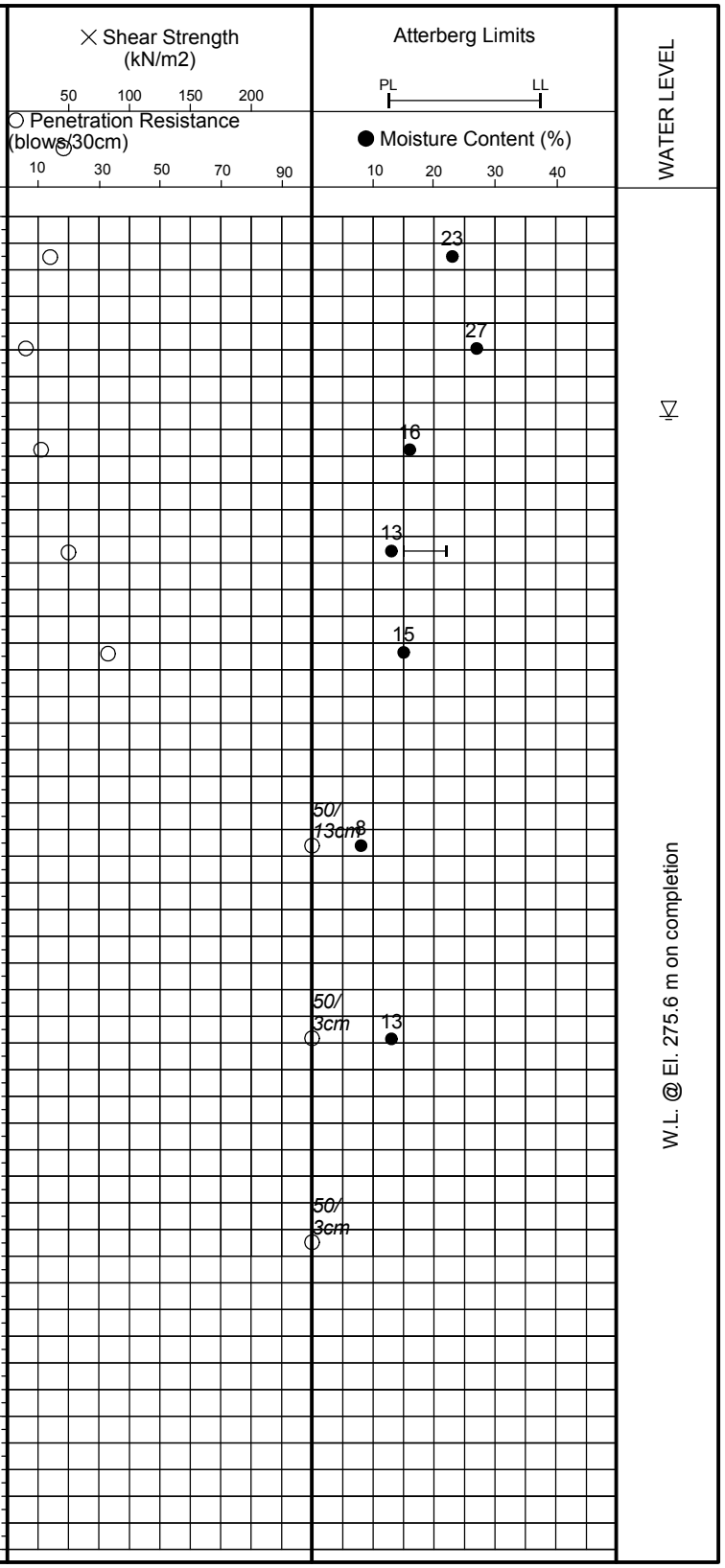
JOB DESCRIPTION: Proposed Residential Subdivision (Estates of Glenway Newmarket)

JOB LOCATION: Davis Drive West and Bathurst Street, Town of Newmarket

METHOD OF BORING: Flight-Auger

DATE: December 15, 2011

Depth Elev. (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
0.0	Ground Surface			
277.1	**70 cm TOPSOIL**	1	DO	14
	Brown, firm, weathered **SILTY CLAY** a tr. to some sand occ. sand and silt seams and layers	2	DO	6
1.5				
275.6	Brown, stiff to hard **SILTY CLAY, Till** some sand to sandy, a tr. of gravel occ. sand and silt seams and layers, cobbles and boulders	3	DO	11
		4	DO	20
		5	DO	33
4.5				
272.6	Brown, very dense **SILTY SAND, Till and SANDY SILT, Till** some clay, a tr. of gravel occ. sand and silt seams and layers cobbles and boulders	6	DO	50/ 13
6.0				
271.1	Brown, hard **SILTY CLAY, Till** some sand to sandy, a tr. of gravel occ. sand and silt seams and layers, cobbles and boulders	7	DO	50/ 3
7.8		8	DO	50/ 3
269.3	**END OF BOREHOLE**			



Soil Engineers Ltd.

JOB NO: 1111-S053

LOG OF BOREHOLE NO: 16

FIGURE NO: 16

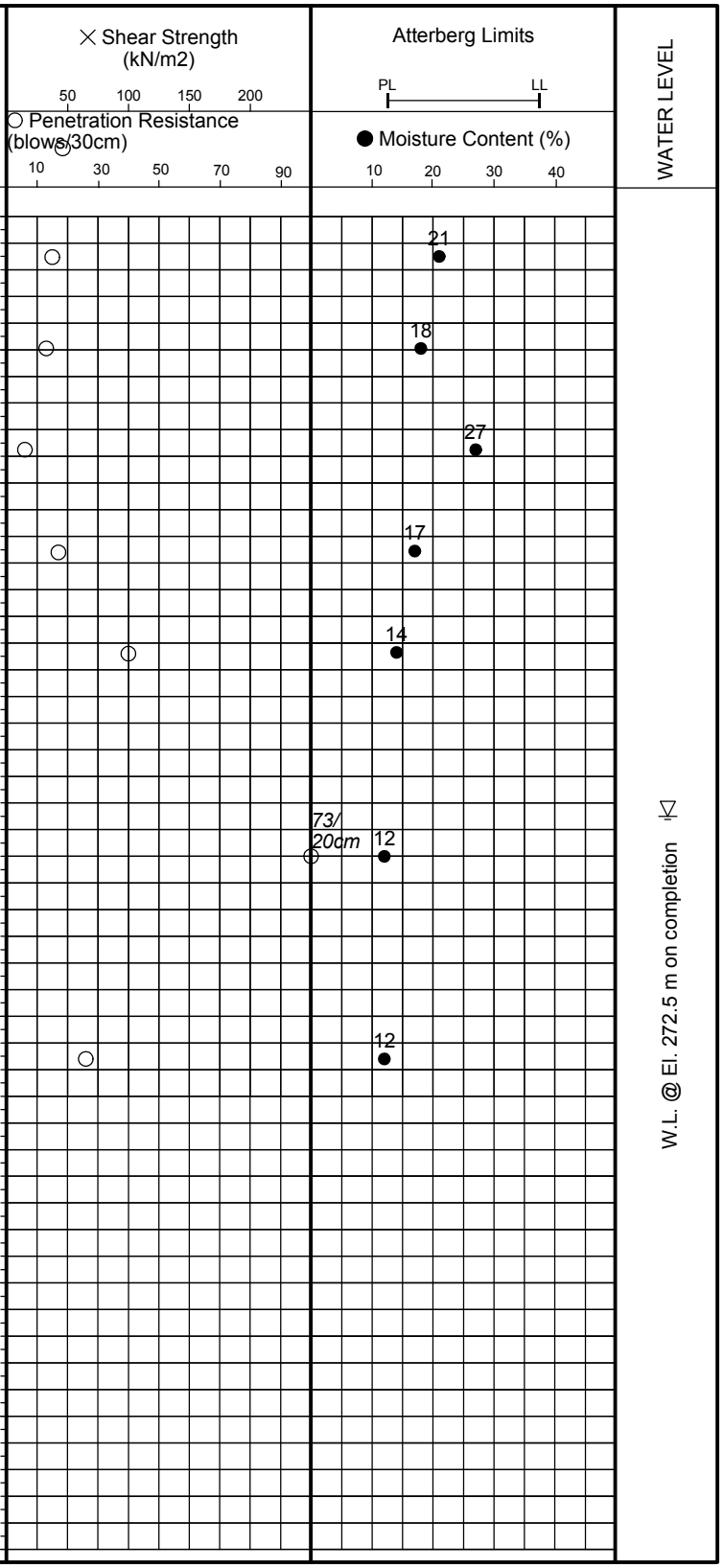
JOB DESCRIPTION: Proposed Residential Subdivision (Estates of Glenway Newmarket)

JOB LOCATION: Davis Drive West and Bathurst Street, Town of Newmarket

METHOD OF BORING: Flight-Auger

DATE: December 15, 2011

Depth / Elev. (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
0.0	Ground Surface			
277.0	**33 cm TOPSOIL**	1	DO	15
	Brown, firm to stiff, weathered **SILTY CLAY** a tr. to some sand occ. sand and silt seams and layers	2	DO	13
		3	DO	6
2.3				
274.7	Brown, very stiff to hard **SILTY CLAY, TiII** some sand to sandy, a tr. of gravel occ. sand and silt seams and layers, cobbles and boulders	4	DO	17
		5	DO	40
4.5				
272.5	Brown, compact to very dense **SILTY SAND, TiII and SANDY SILT, TiII** some clay, a tr. of gravel occ. sand and silt seams and layers cobbles and boulders	6	DO	73/20
		7	DO	26
6.6				
270.4	**END OF BOREHOLE**			



Soil Engineers Ltd.

JOB NO: 1111-S053

LOG OF BOREHOLE NO: 17

FIGURE NO: 17

JOB DESCRIPTION: Proposed Residential Subdivision (Estates of Glenway Newmarket)

JOB LOCATION: Davis Drive West and Bathurst Street, Town of Newmarket

METHOD OF BORING: Flight-Auger

DATE: December 15, 2011

Depth Elev. (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
0.0	Ground Surface			
282.8	**30 cm TOPSOIL**	1	DO	9
	Brown, stiff, weathered **SILTY CLAY, Till** some sand, a tr. of gravel occ. sand and silt seams and layers			
0.8				
282.0	Brown, very dense	2	DO	50/ 13
		3	DO	50/ 13
	SILTY SAND, Till and SANDY SILT, Till	4	DO	50/ 8
	some clay, a tr. of gravel occ. sand and silt seams and layers cobbles and boulders	5	DO	50/ 15
		6	DO	50/ 0
6.2		7	DO	50/ 3
276.6	**END OF BOREHOLE**			

Depth Scale (m): 0 1 2 3 4 5 6 7 8 9 10

× Shear Strength (kN/m2): 50 100 150 200

○ Penetration Resistance (blows/30cm): 10 30 50 70 90

Atterberg Limits: PL — LL

● Moisture Content (%): 10 20 30 40

Sample	Penetration Resistance	Moisture Content (%)
1		23
2	50/ 13cm	10
3	50/ 13cm	7
4	50/ 8cm	7
5	50/ 15cm	7
6	50/ 0cm	11
7	50/ 3cm	12

WATER LEVEL: Dry on completion

Soil Engineers Ltd.

JOB NO: 1111-S053

LOG OF BOREHOLE NO: 18

FIGURE NO: 18

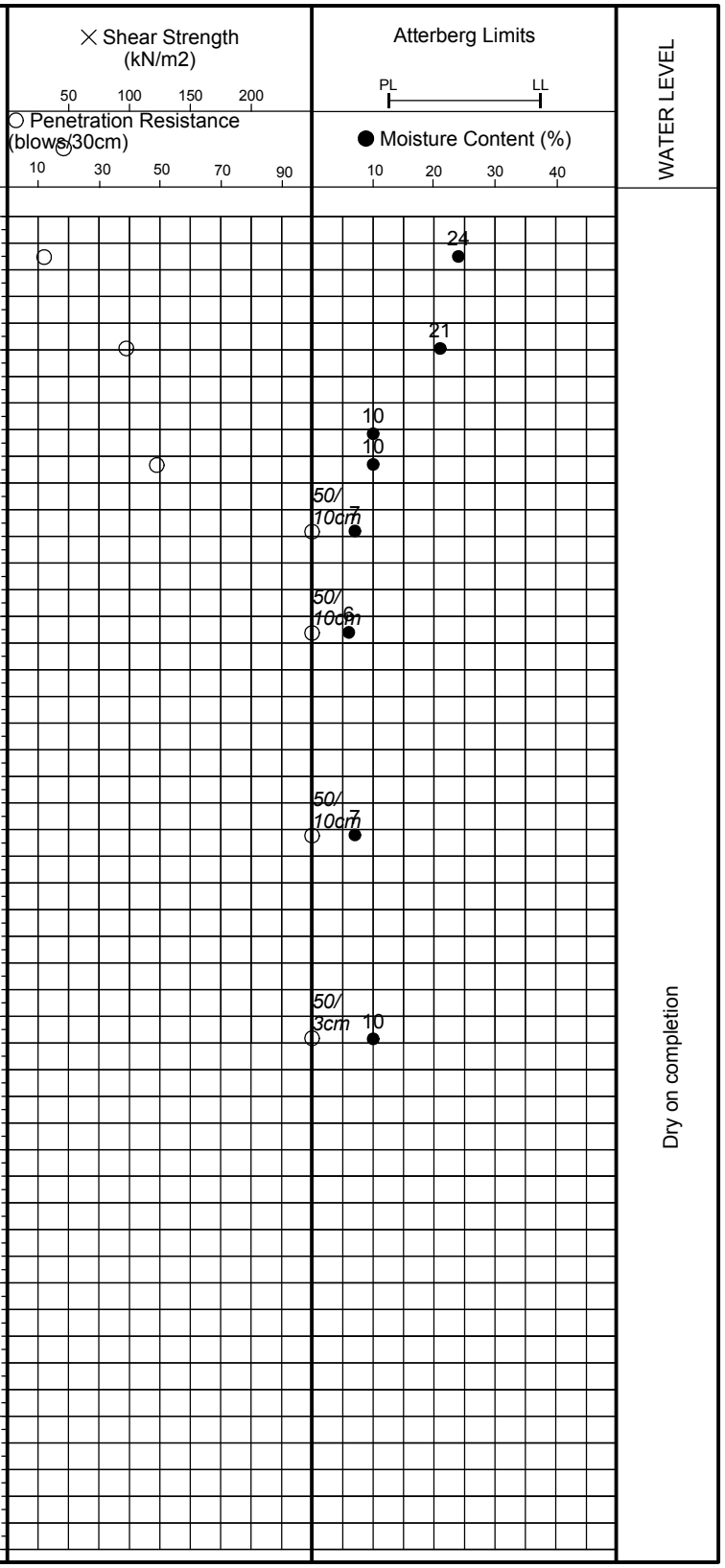
JOB DESCRIPTION: Proposed Residential Subdivision (Estates of Glenway Newmarket)

JOB LOCATION: Davis Drive West and Bathurst Street, Town of Newmarket

METHOD OF BORING: Flight-Auger

DATE: December 16, 2011

Depth / Elev. (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
0.0	Ground Surface			
285.1	**30 cm TOPSOIL**	1	DO	12
	Brown, stiff to hard			
	SILTY CLAY weathered			
	a tr. to some sand occ. sand and silt seams and layers	2	DO	39
1.8		3A	DO	-
283.3	Brown, dense to very dense	3B	DO	49
	SILTY SAND, Till and SANDY SILT, Till	4	DO	50/ 10
	some clay, a tr. of gravel occ. sand and silt seams and layers cobbles and boulders	5	DO	50/ 10
		6	DO	50/ 10
6.2		7	DO	50/ 3
278.9	**END OF BOREHOLE**			



Soil Engineers Ltd.

Soil Engineers Ltd.

GRAIN SIZE DISTRIBUTION

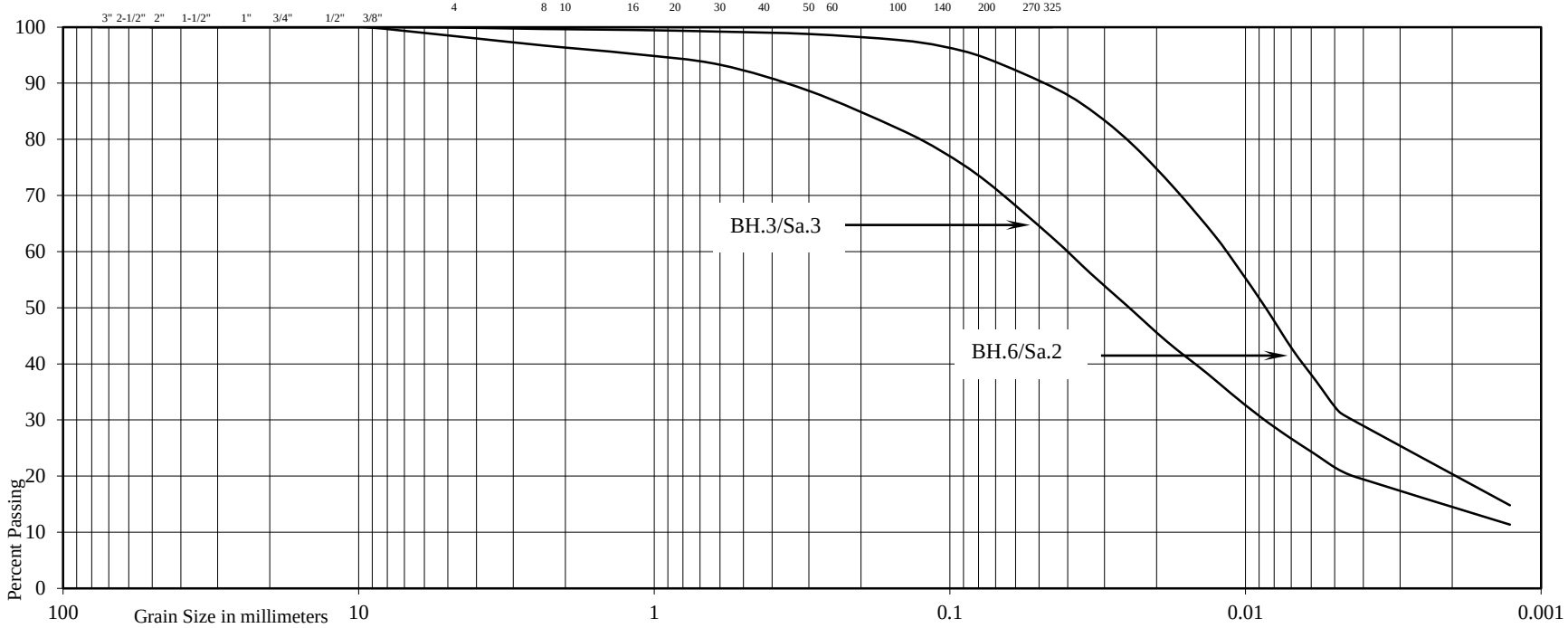
Reference No: 1111-S053

U.S. BUREAU OF SOILS CLASSIFICATION

GRAVEL		SAND				SILT	CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	V. FINE		

UNIFIED SOIL CLASSIFICATION

GRAVEL		SAND			SILT & CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	



Project: Proposed Residential Subdivision Estates of Glenway Newmarket

Location: Davis Drive West and Bathurst Street, Town of Newmarket

Borehole No:	3	6
Sample No:	3	2
Depth (m):	1.8	1.0
Elevation (m):	276.2	269.2

BH./Sa.	3/3	6/2
Liquid Limit (%) =	-	-
Plastic Limit (%) =	-	-
Plasticity Index (%) =	-	-
Moisture Content (%) =	16	19
Estimated Permeability (cm./sec.) =	10^{-7}	10^{-7}

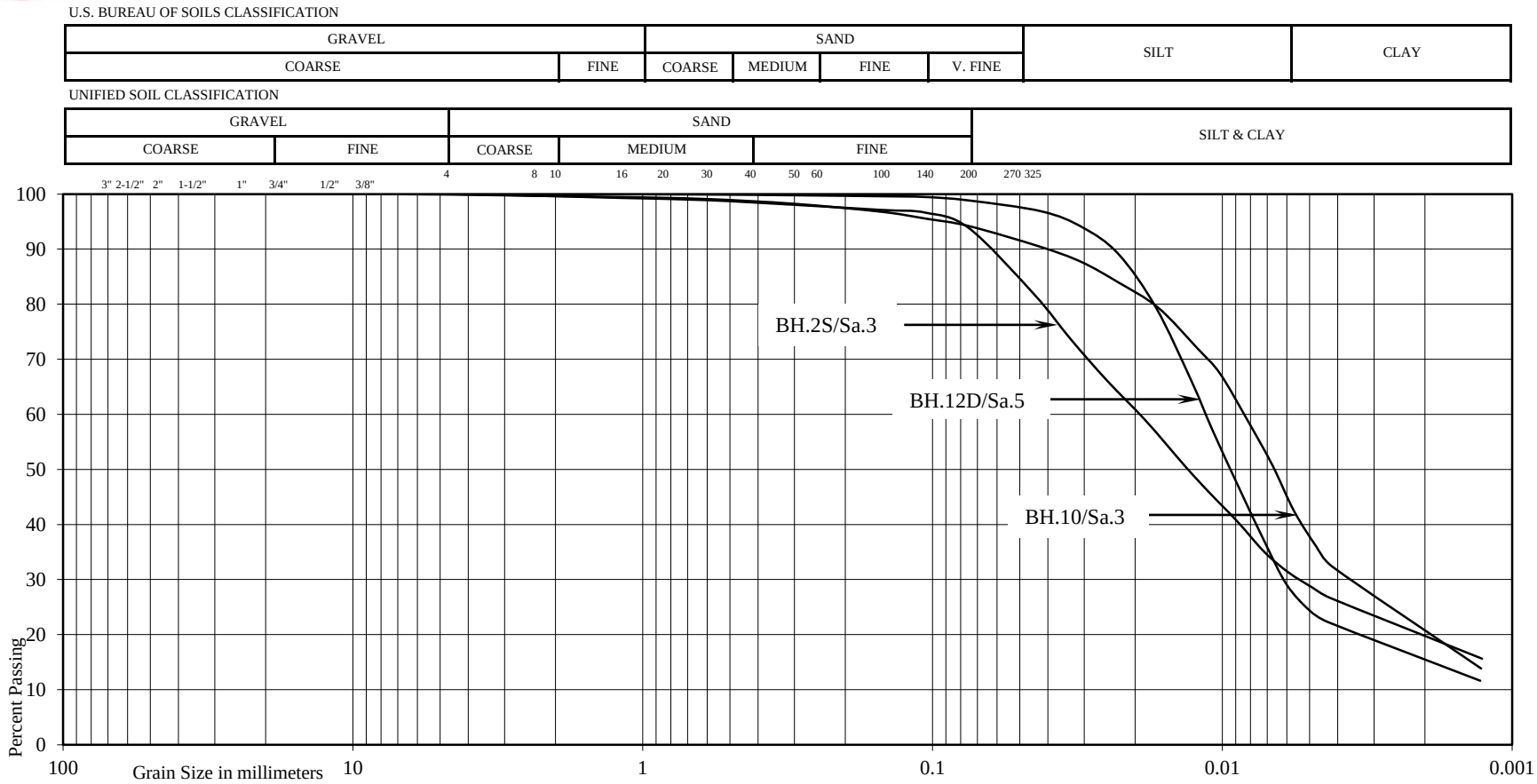
Classification of Sample [& Group Symbol]: SILTY CLAY, Fill
traces of gravel and sand

Figure: 37

Soil Engineers Ltd.

GRAIN SIZE DISTRIBUTION

Reference No: 1111-S053



Project:	Proposed Residential Subdivision Estates of Glenway Newmarket		
Location:	Davis Drive West and Bathurst Street, Town of Newmarket		
Borehole No:	2S	10	12D
Sample No:	3	3	5
Depth (m):	1.8	1.8	3.3
Elevation (m):	275.2	270.4	279.7

BH./Sa.	2S/3	10/3	12D/5
Liquid Limit (%) =	26	29	25
Plastic Limit (%) =	16	17	15
Plasticity Index (%) =	10	12	10
Moisture Content (%) =	18	29	19
Estimated Permeability (cm./sec.) =	10^{-7}	10^{-7}	10^{-7}

Classification of Sample [& Group Symbol]: SILTY CLAY
a trace of sand

Figure: 38

Soil Engineers Ltd.

GRAIN SIZE DISTRIBUTION

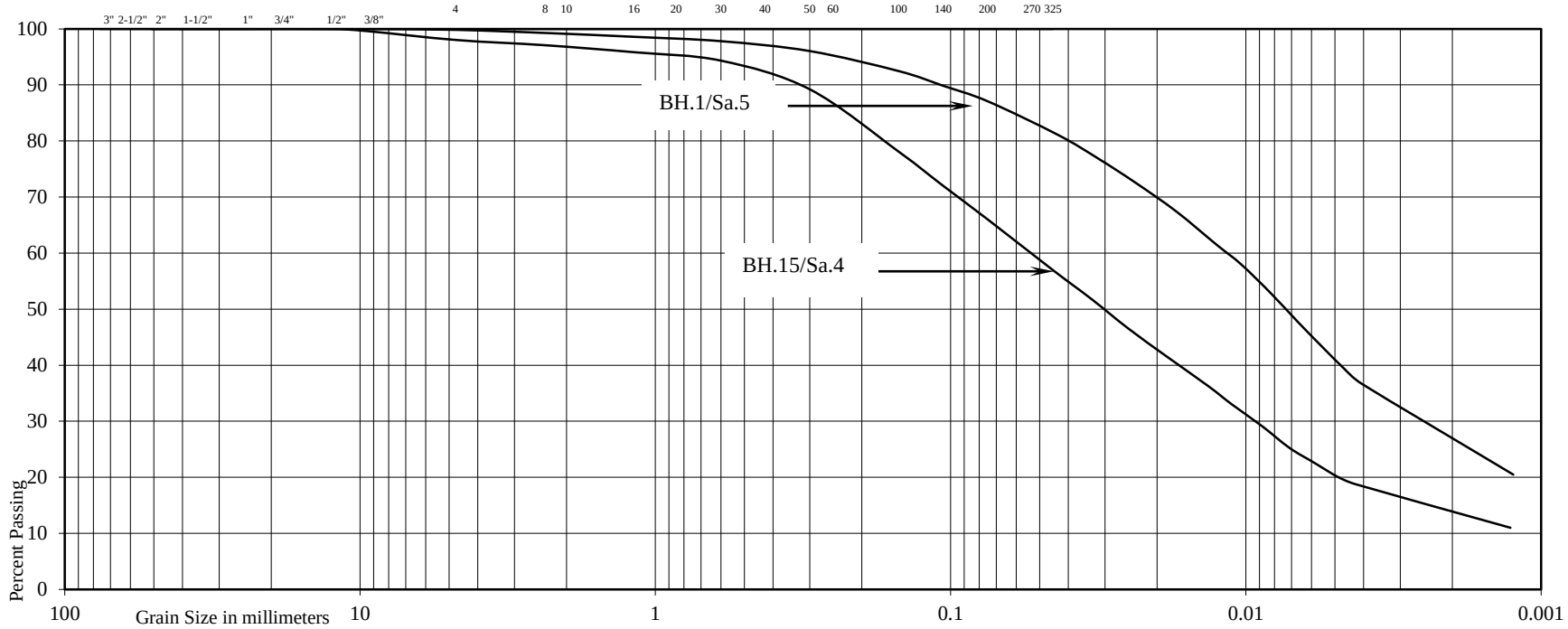
Reference No: 1111-S053

U.S. BUREAU OF SOILS CLASSIFICATION

GRAVEL		SAND				SILT	CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	V. FINE		

UNIFIED SOIL CLASSIFICATION

GRAVEL		SAND			SILT & CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	



Project:	Proposed Residential Subdivision Estates of Glenway Newmarket	
Location:	Davis Drive West and Bathurst Street, Town of Newmarket	
Borehole No:	1	15
Sample No:	5	4
Depth (m):	3.3	2.5
Elevation (m):	269.7	274.6

BH./Sa.	1/5	15/4
Liquid Limit (%) =	30	22
Plastic Limit (%) =	18	15
Plasticity Index (%) =	12	7
Moisture Content (%) =	15	13
Estimated Permeability (cm./sec.) =	10^{-7}	10^{-7}

Classification of Sample [& Group Symbol]: SILTY CLAY, Till
some sand to sandy, a trace of gravel

Figure: 39

Soil Engineers Ltd.

GRAIN SIZE DISTRIBUTION

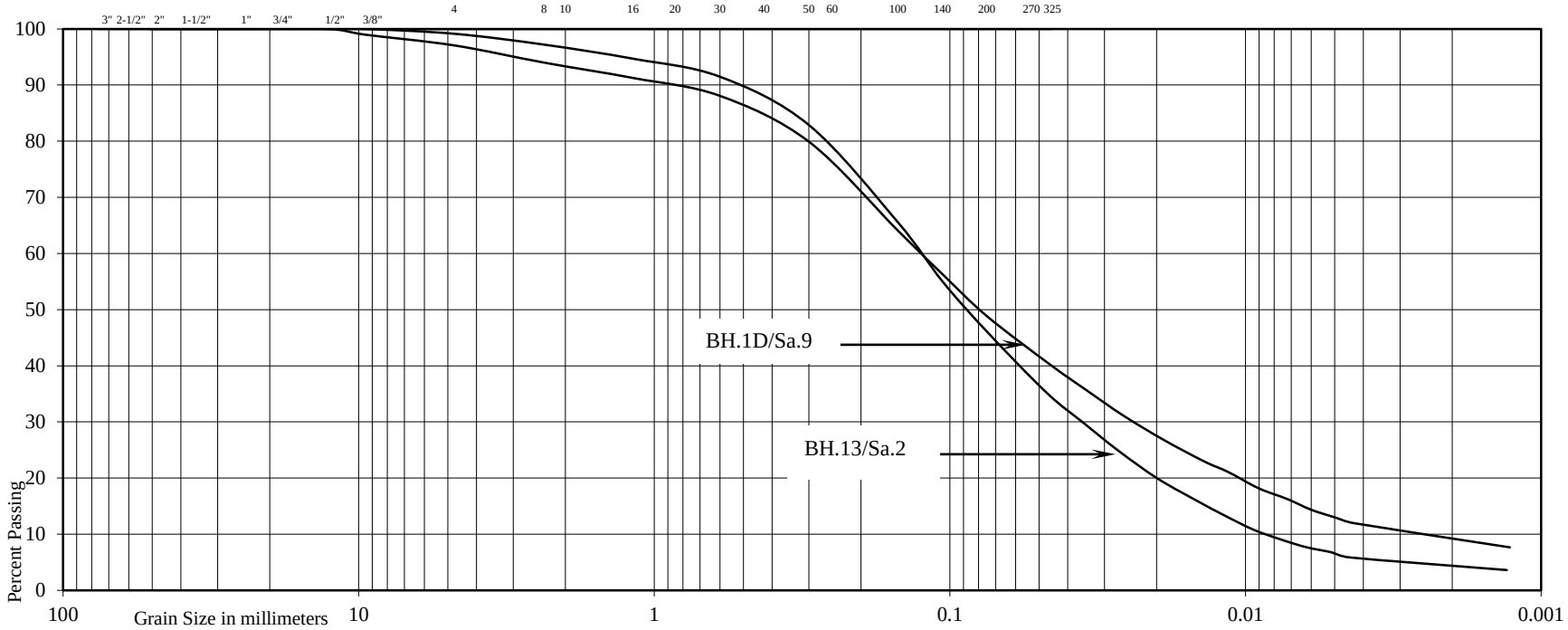
Reference No: 1111-S053

U.S. BUREAU OF SOILS CLASSIFICATION

GRAVEL		SAND				SILT	CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	V. FINE		

UNIFIED SOIL CLASSIFICATION

GRAVEL		SAND			SILT & CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	



Project: Proposed Residential Subdivision Estates of Glenway Newmarket

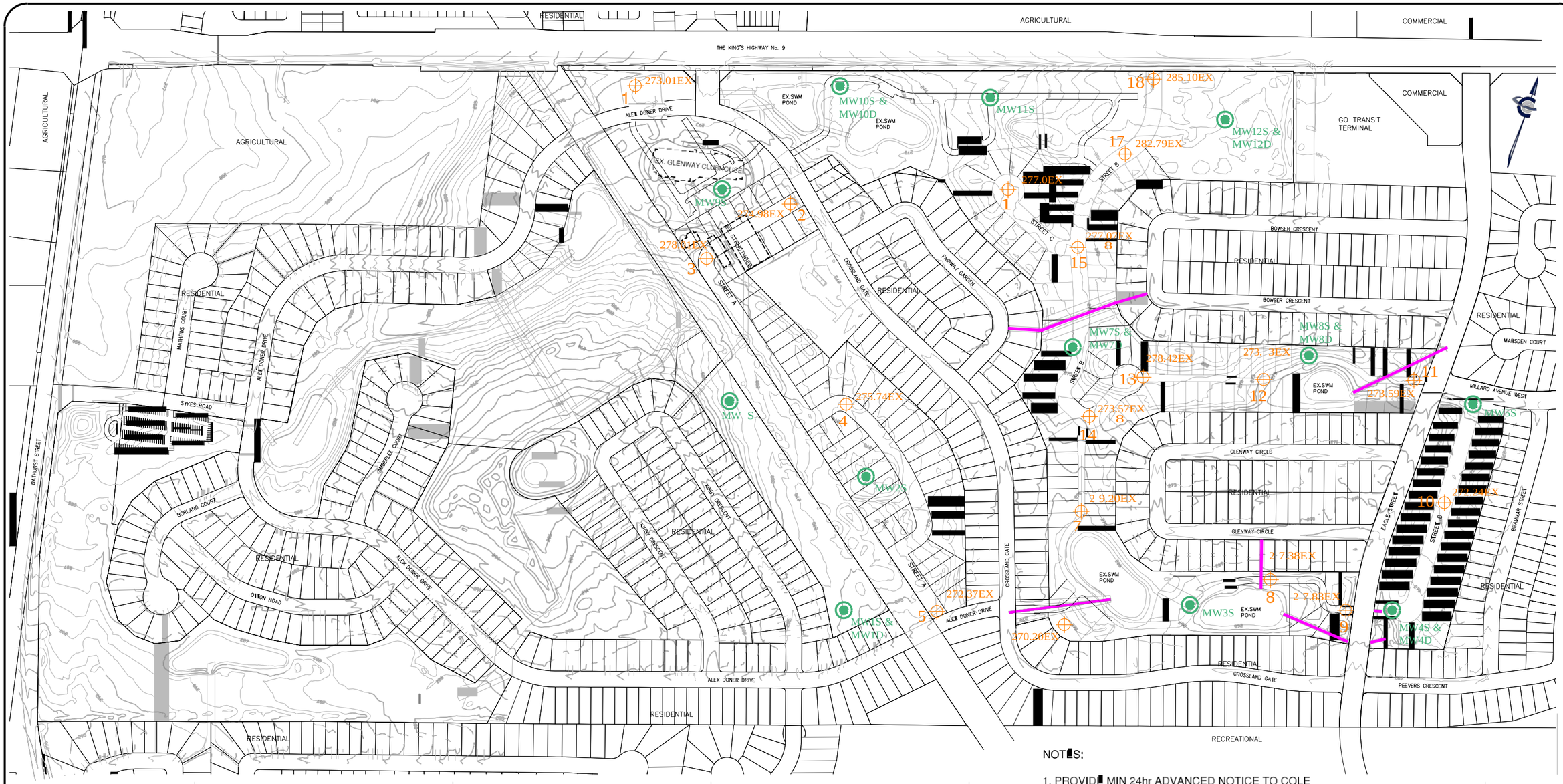
Location: Davis Drive West and Bathurst Street, Town of Newmarket

Borehole No:	1D	13
Sample No:	9	2
Depth (m):	9.3	1.0
Elevation (m):	267.7	277.4

BH./Sa.	1D/9	13/2
Liquid Limit (%) =	-	-
Plastic Limit (%) =	-	-
Plasticity Index (%) =	-	-
Moisture Content (%) =	11	9
Estimated Permeability (cm./sec.) =	10^{-6}	10^{-5}

Classification of Sample [& Group Symbol]: SILTY SAND, Till
traces to some clay and gravel

Figure: 40



COLE ENGINEERING
70 VALLEYWOOD DR., MARKHAM, ON L3R 4T5
T:416.987.6161 / 905.940.6161 F:905.940.2064

LEGEND

21 — PROPOSED BOREHOLE NUMBER LOCATION
243.88EX — EXISTING GROUND ELEVATION
PROPOSED BOREHOLE DEPTH

MW1S D — BOREHOLE & MONITORING WELL UNDER HYDROGEOLOGICAL PROGRAM (SHALLOW DEEP 5 10 DEPTH)

CAUTION UNDERGROUND PIPES

BOREHOLE LOCATION PLAN

MARIANNEVILLE,
NEWMARKET, ONTARIO

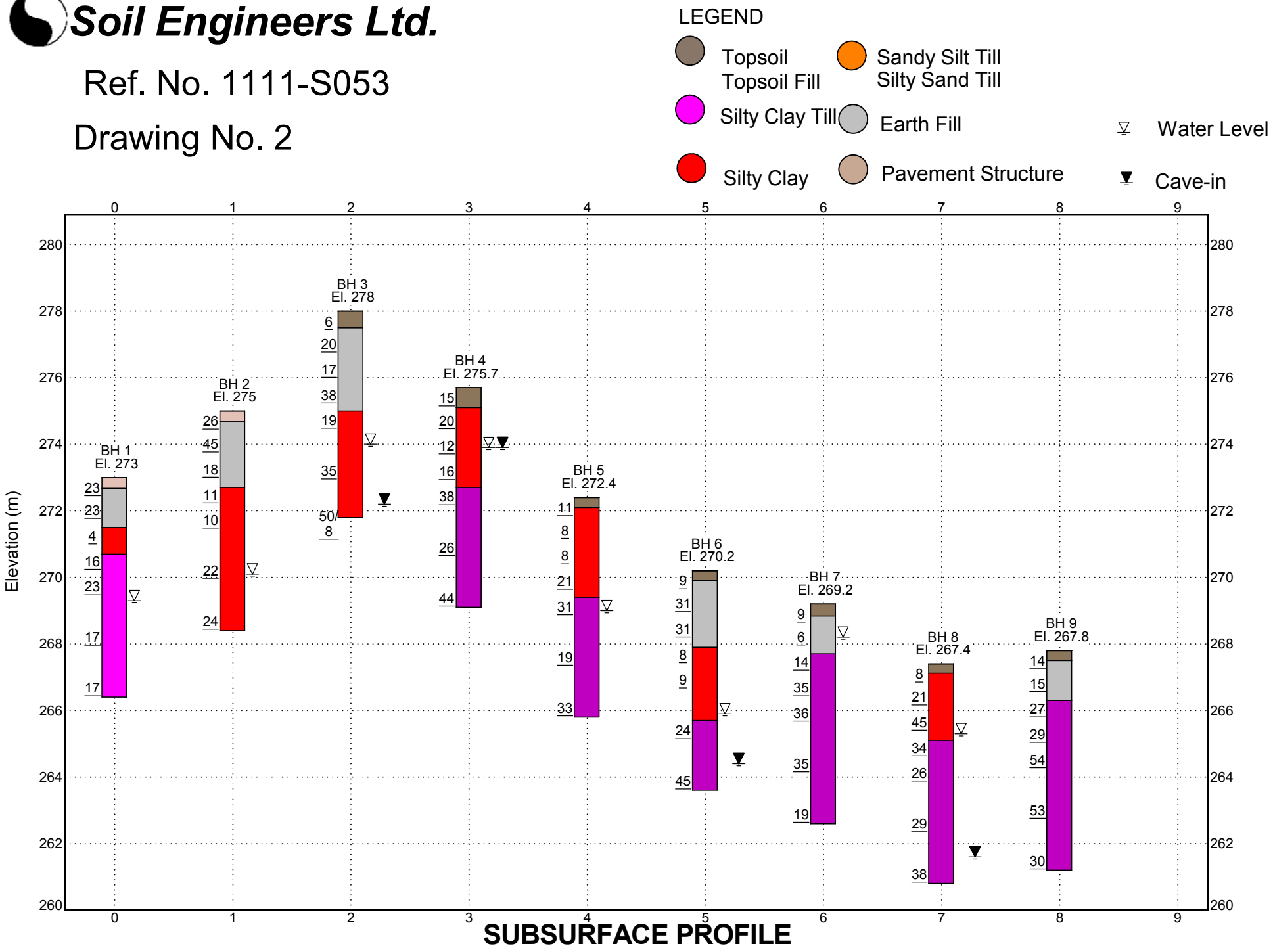
DATE: NOVEMBER 1 , 2011	PROJECT NO.: L09 301
SCALE: 1:5000	DRAWING NO.: 1

REF. NO.: 1111-S053

Soil Engineers Ltd.

Ref. No. 1111-S053

Drawing No. 2

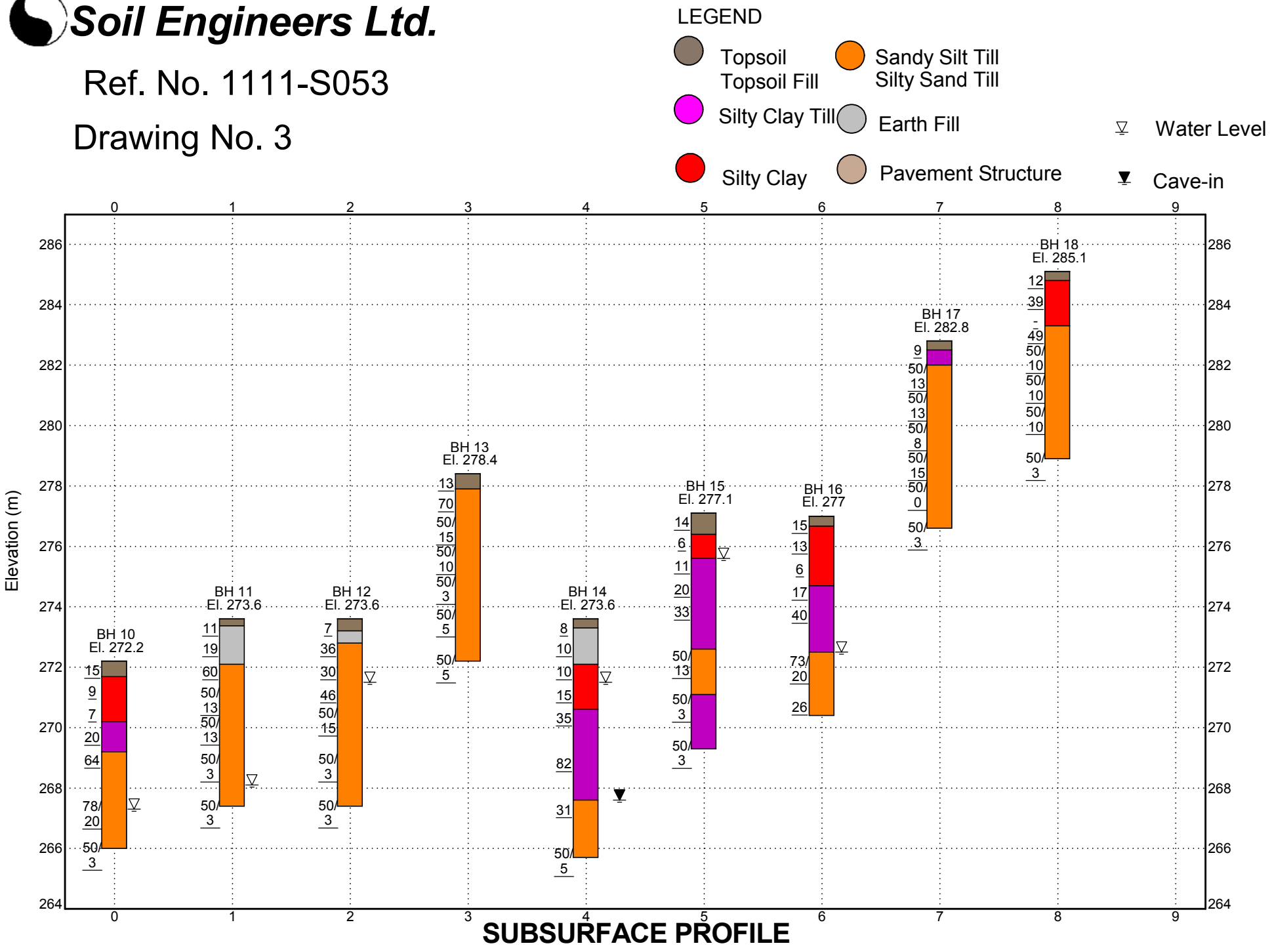


SUBSURFACE PROFILE

Soil Engineers Ltd.

Ref. No. 1111-S053

Drawing No. 3

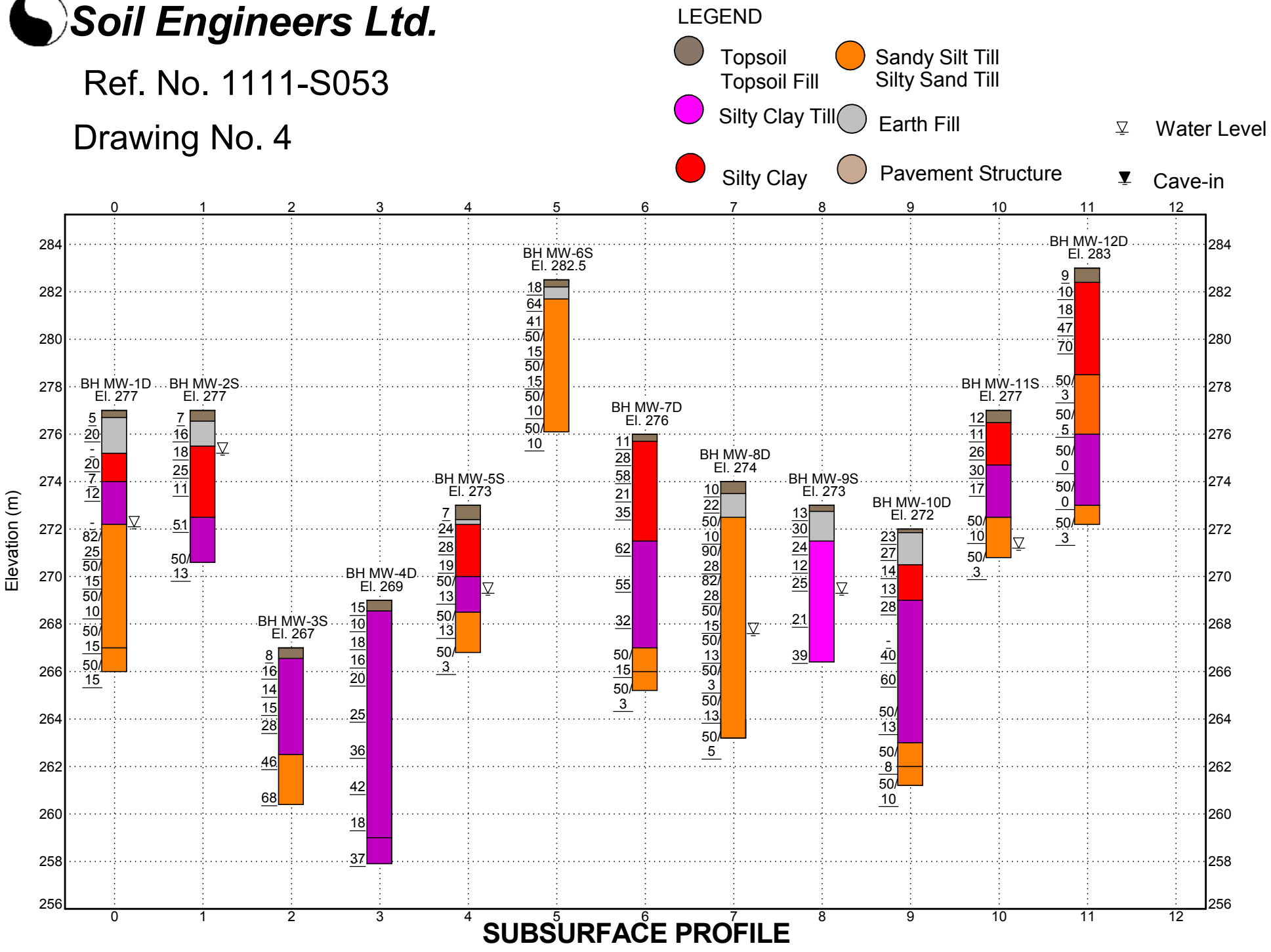


SUBSURFACE PROFILE

Soil Engineers Ltd.

Ref. No. 1111-S053

Drawing No. 4



SUBSURFACE PROFILE

Alston Associates Inc.

February 2012

Grain-Size Analyses

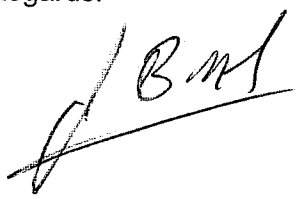
alston associates inc.
consulting engineers

EMAIL

Email to :	Alexandra Chan, Cole Engineering	Email Address :	achan@coleengineering.ca
From :	Jonathan Bond	Date :	10 February 2012
Ref. No. :	12-017	Page 1 of 4	
Subject :	Laboratory Testing Cole File L09-301		

Enclosed are the Grain Size Distribution Test Reports for the three samples received in our office on 6 February 2012. Originals will follow by mail.

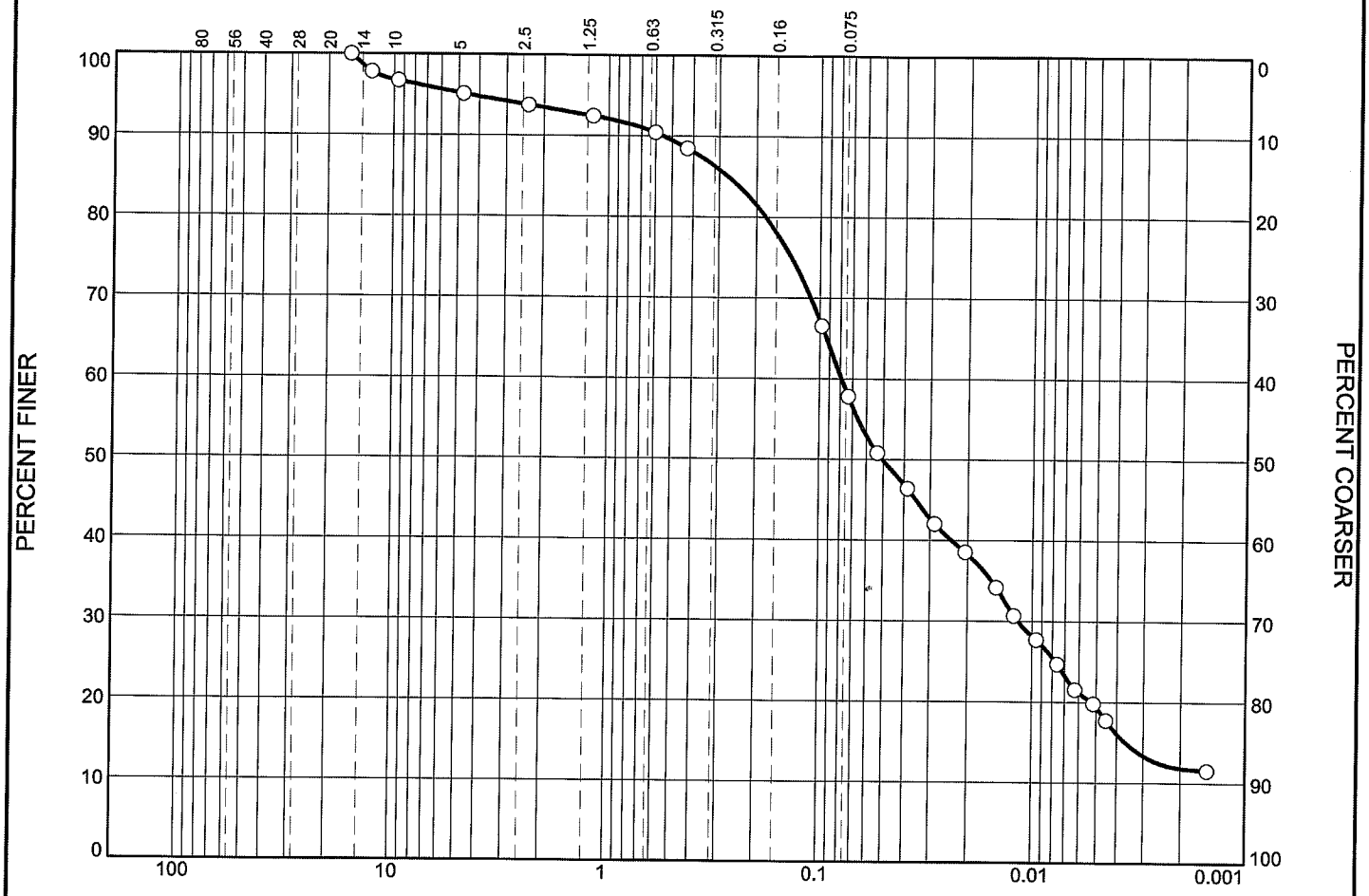
Regards.



85 citizen court, unit 1
markham, ontario
L6G 1A8

telephone (905) 474-5265
fax (905) 474-2825
e-mail alston.associates@alston.ca

Grain Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0	0	5	2	5	30	46	12

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			0.2719	0.0791	0.0505	0.0117	0.0036			

Material Description	USCS	AASHTO
○ SILT and fine SAND, some clay, trace gravel		

Project No. 12-017 **Client:** Cole Engineering

Project: Cole File L09-301
Marianneville Developments

○ **Sample Number:** MW-4D-9

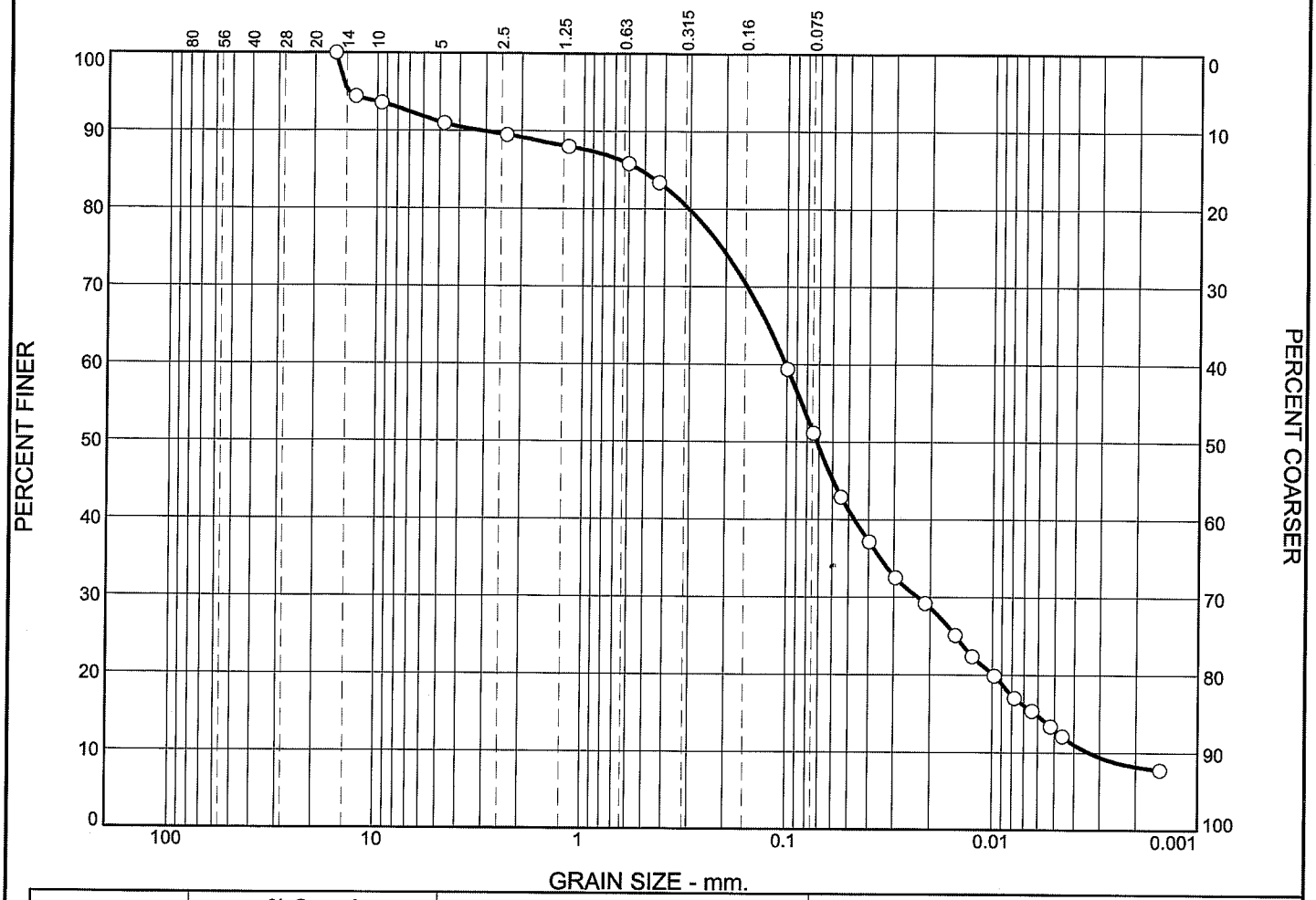
Remarks:

alston associates inc.
consulting engineers

Figure 1

Tested By: AR **Checked By:** JB

Grain Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0	0	9	2	6	32	43	8

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			0.5249	0.1019	0.0716	0.0229	0.0061	0.0034	1.52	30.11

Material Description	USCS	AASHTO
○ SILT and fine SAND, trace gravel, trace clay		

Project No. 12-017 **Client:** Cole Engineering

Project: Cole File L09-301

Marianneville Developments

○ **Sample Number:** MW-7D-9

Remarks:

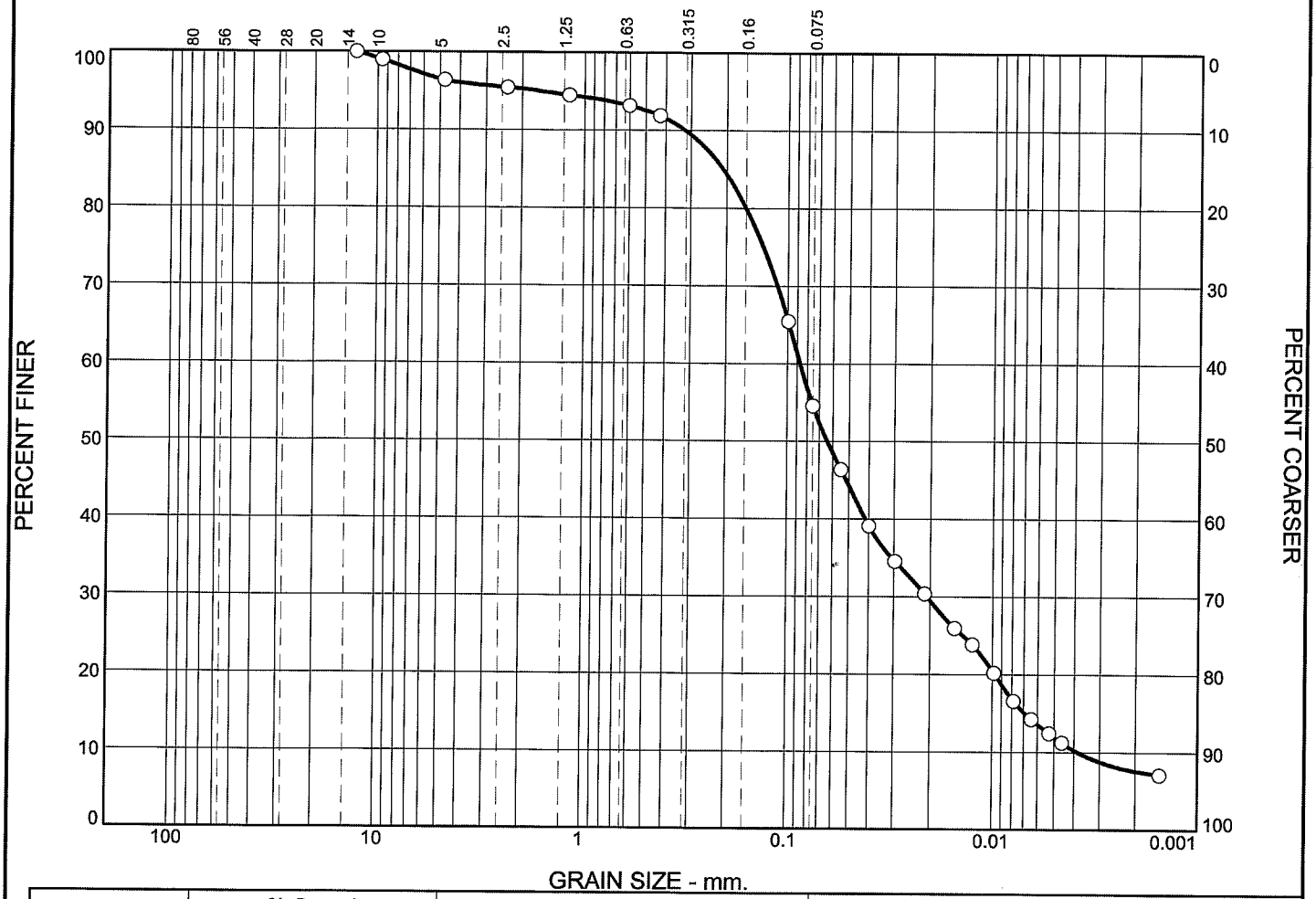
alston associates inc.

consulting engineers

Figure 2

Tested By: AR **Checked By:** JB

Grain Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0	0	4	1	3	38	46	8

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			0.2084	0.0870	0.0638	0.0206	0.0069	0.0038	1.28	22.64

Material Description	USCS	AASHTO
○ SILT and fine SAND, trace clay, trace gravel		

Project No. 12-017 **Client:** Cole Engineering

Project: Cole File L09-301

Marianneville Developments

○ **Sample Number:** MW-8D-9

Remarks:

alston associates inc.

consulting engineers

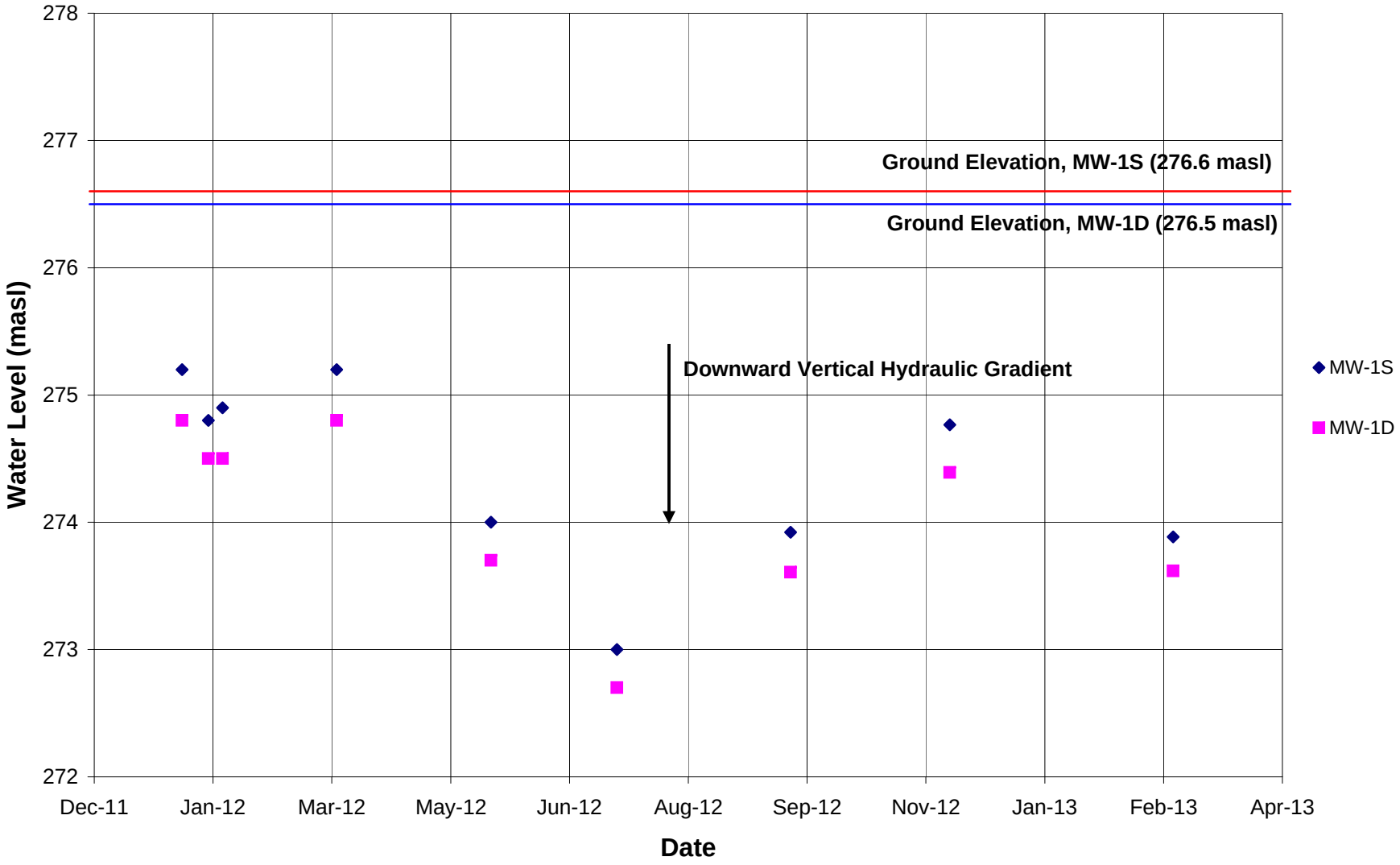
Figure 3

Tested By: AR **Checked By:** JB

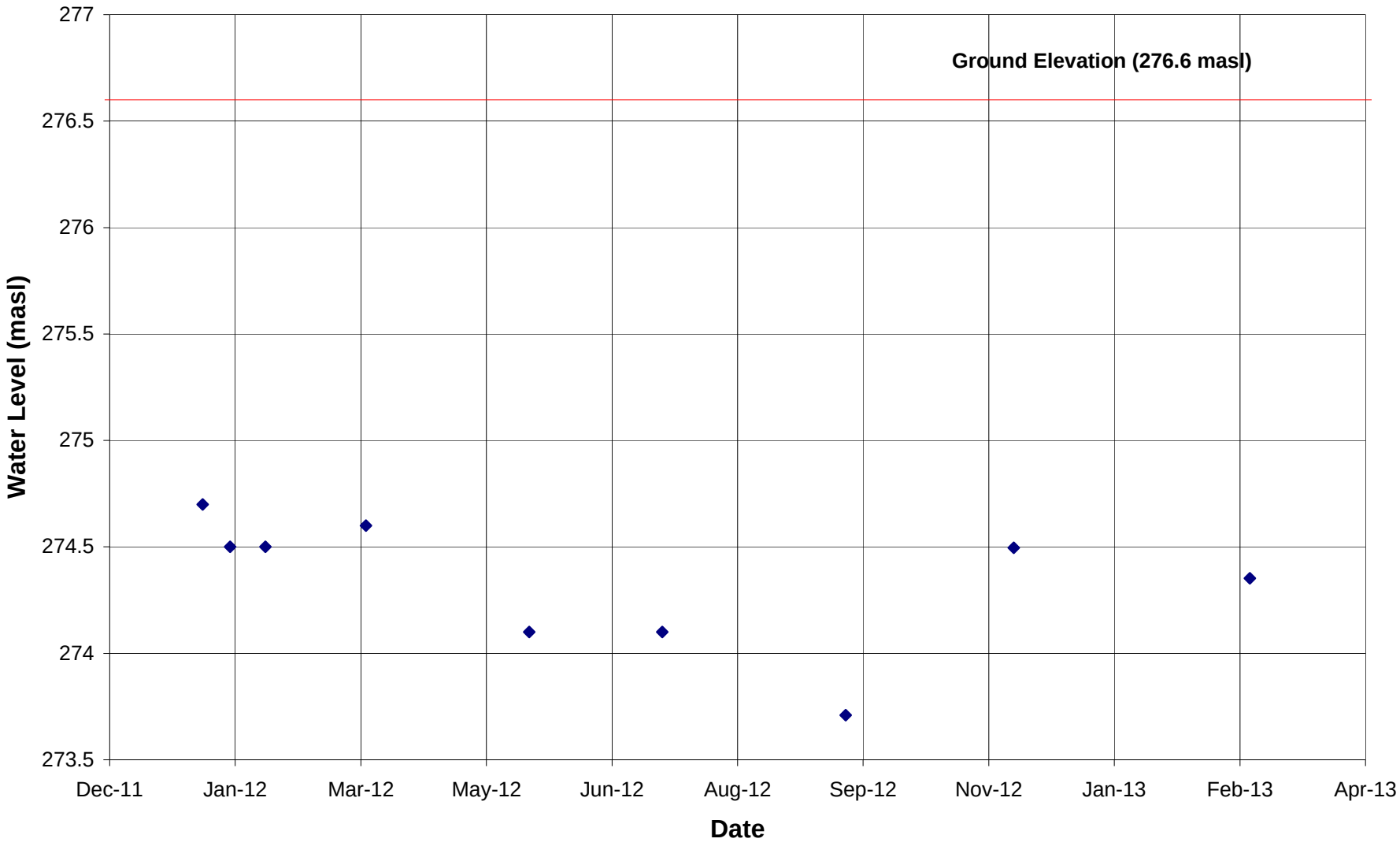
APPENDIX C

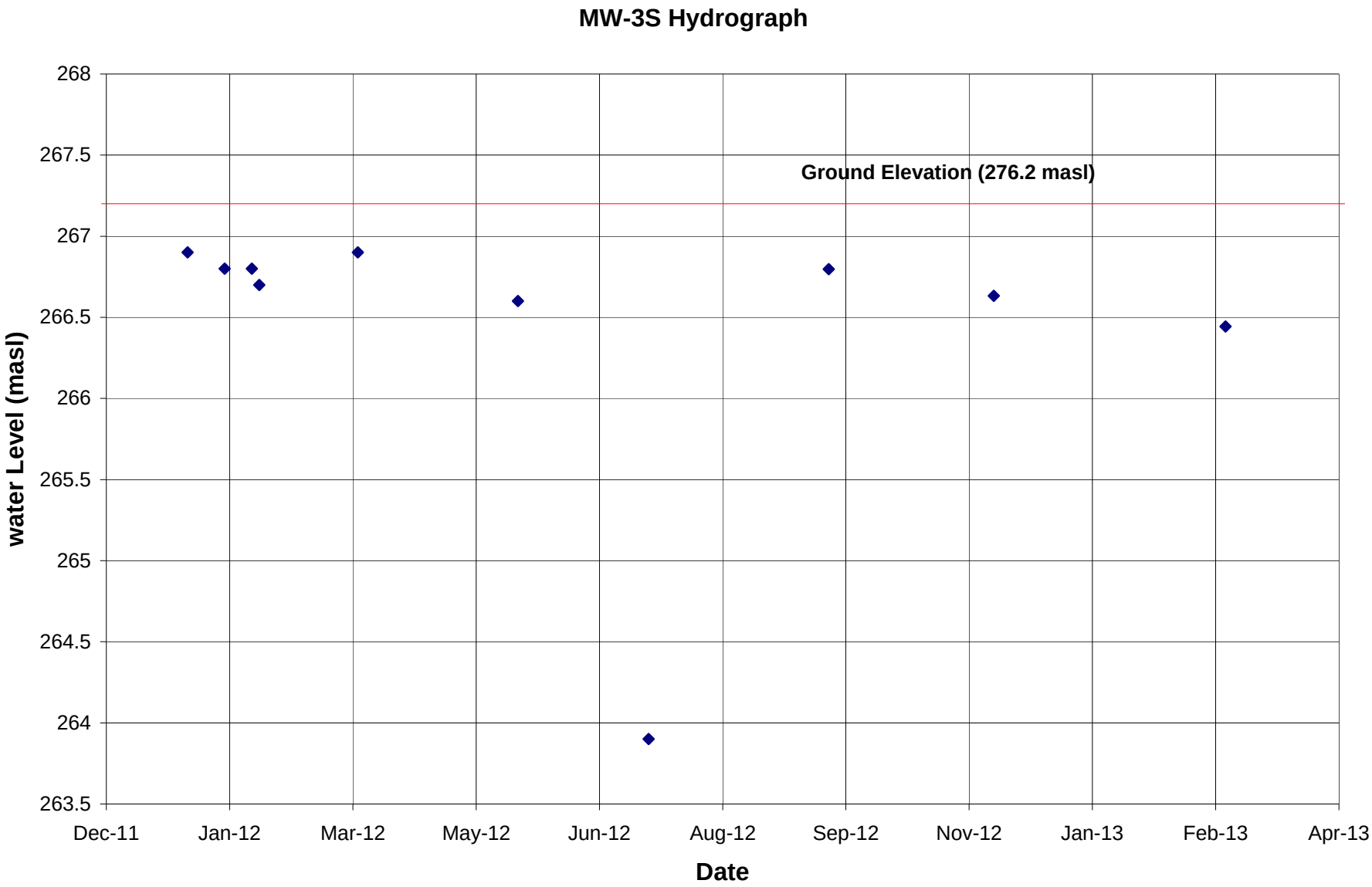
Hydrographs of Monitoring Wells

MW-1S and MW-1D Hydrograph

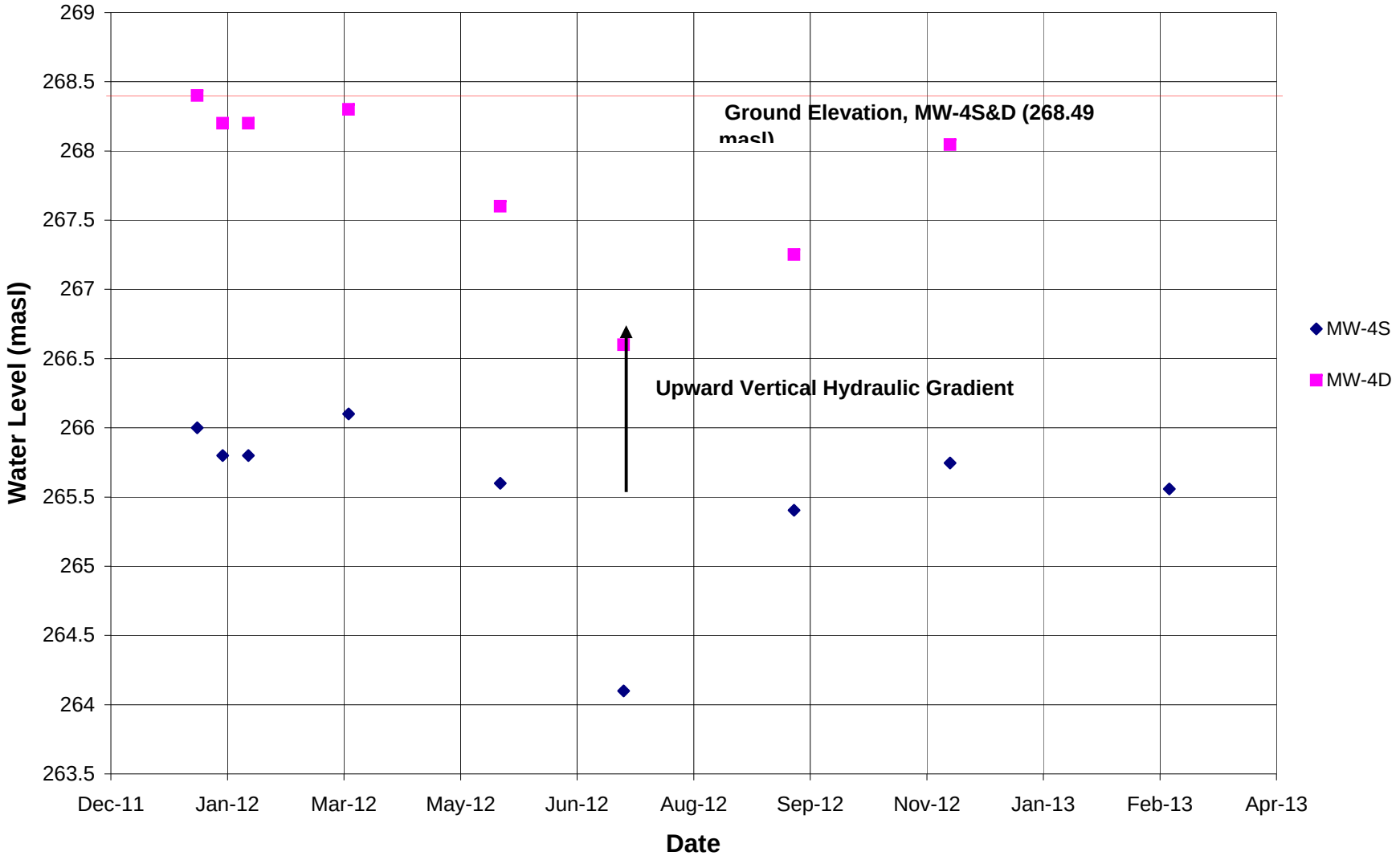


MW-2S Hydrograph

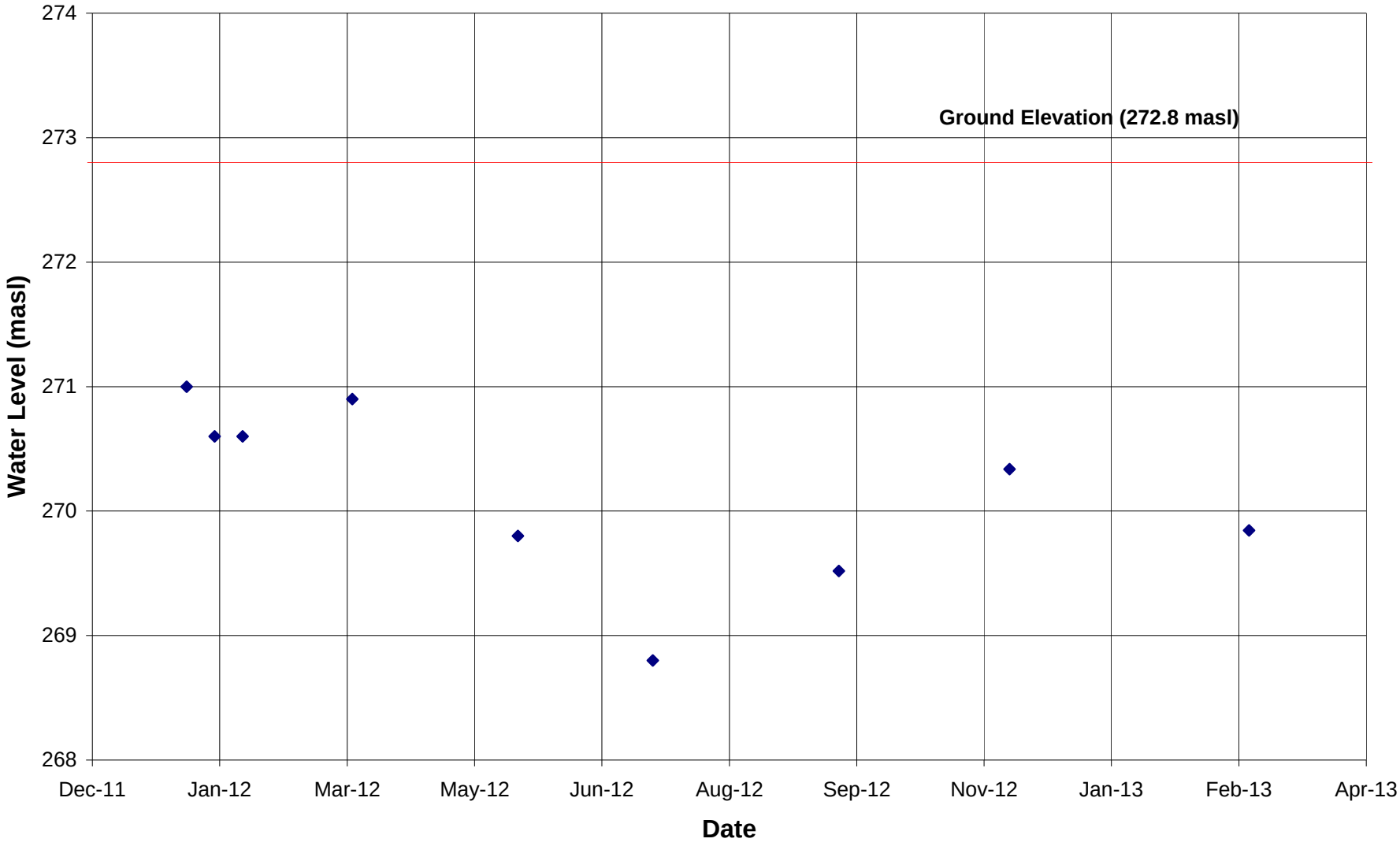


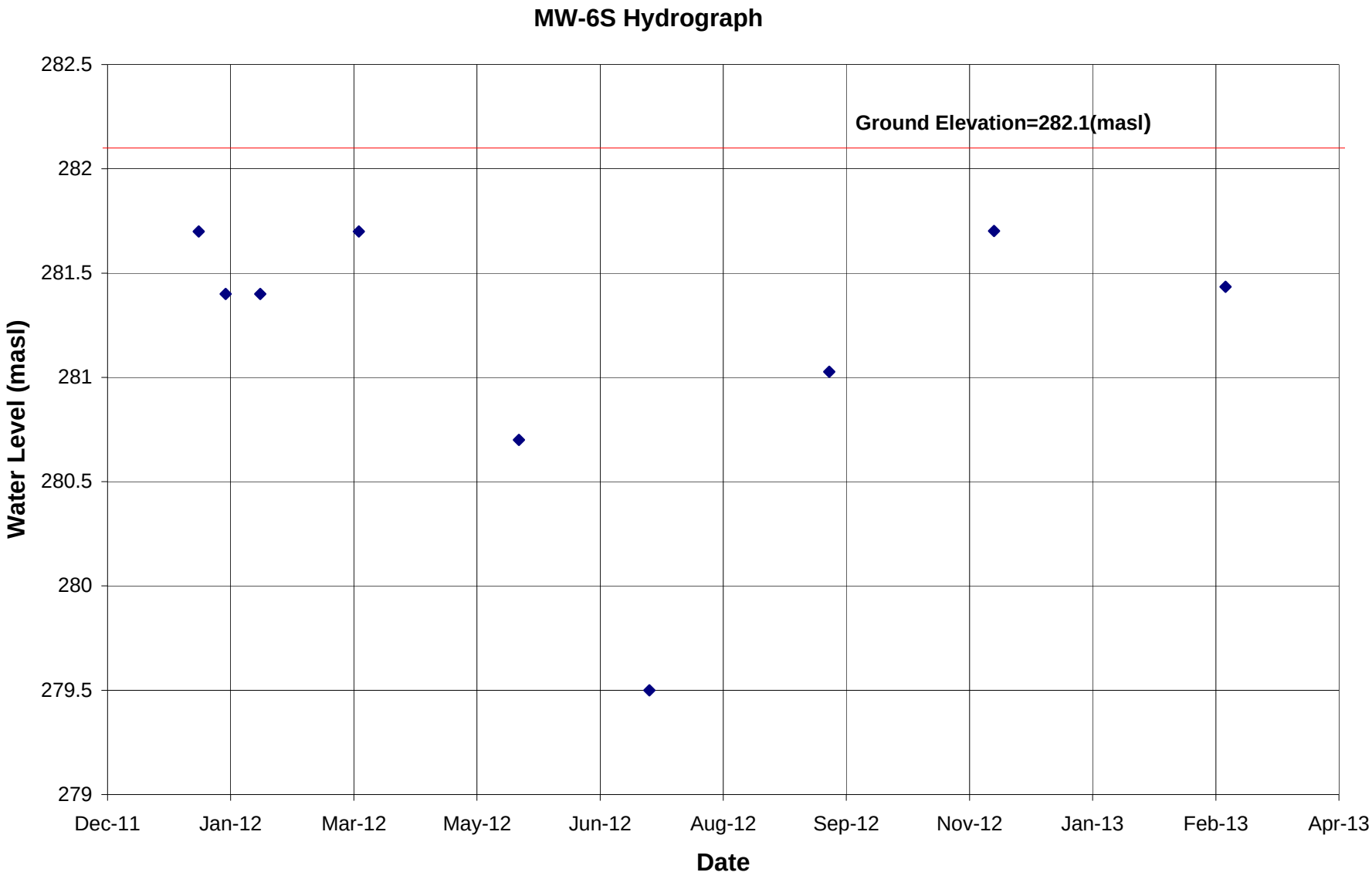

MW-3S Hydrograph
Ground Elevation (276.2 masl)
water Level (masl)
268
267.5
267
266.5
266
265.5
265
264.5
264
263.5
Dec-11
Jan-12
Mar-12
May-12
Jun-12
Aug-12
Sep-12
Nov-12
Jan-13
Feb-13
Apr-13
Date

MW-4S and MW-4D Hydrograph

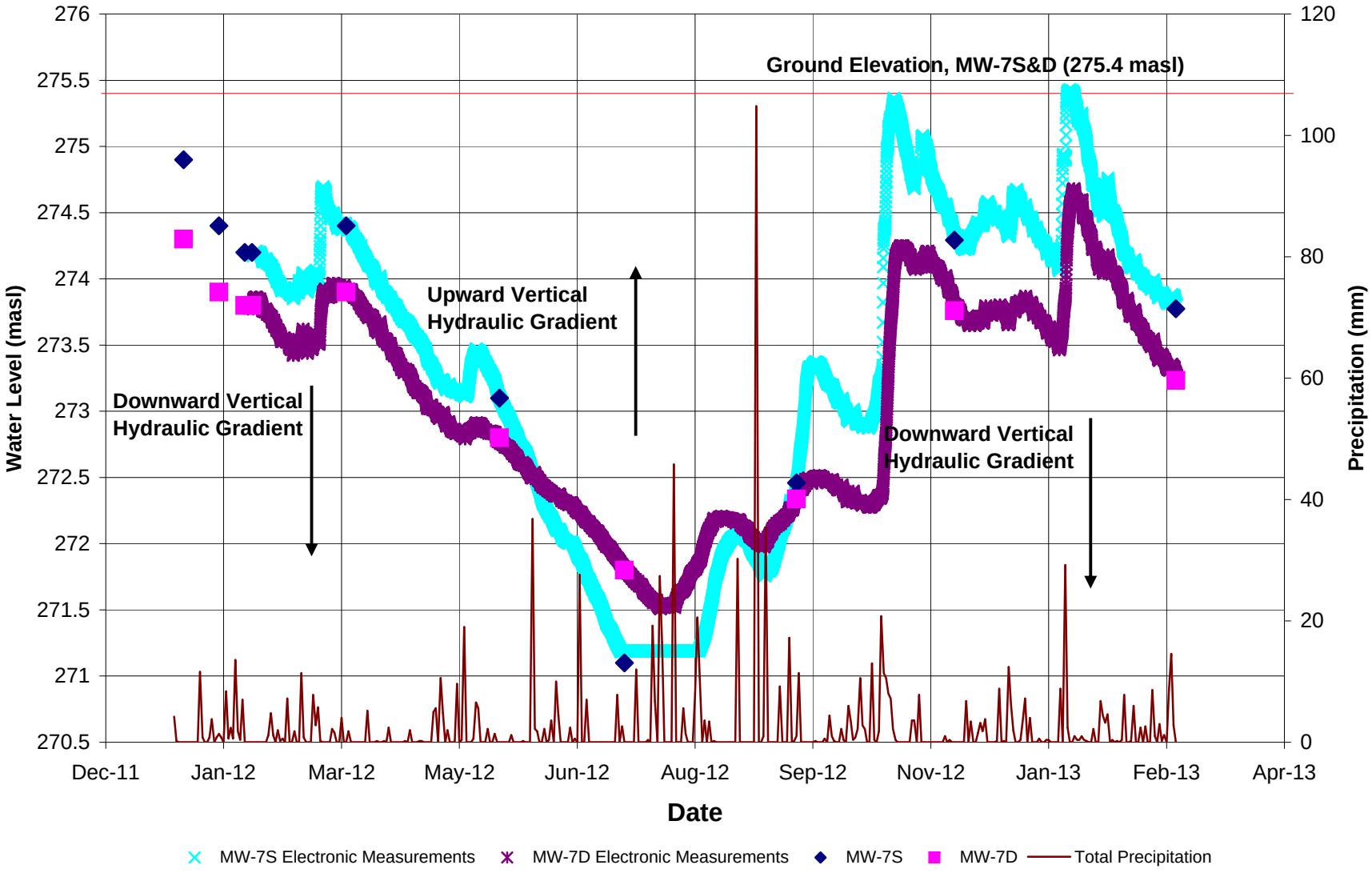


MW-5S Hydrograph

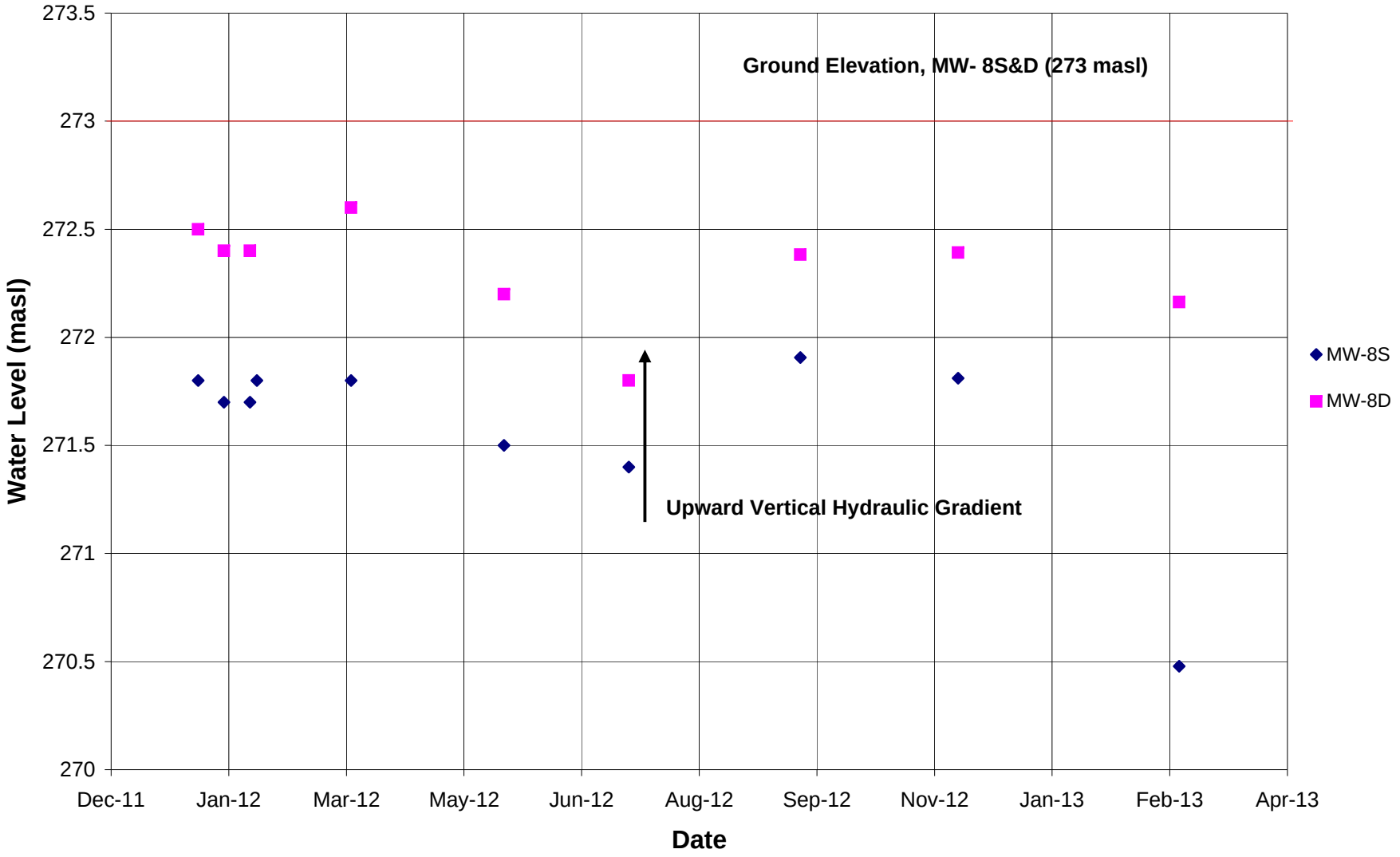


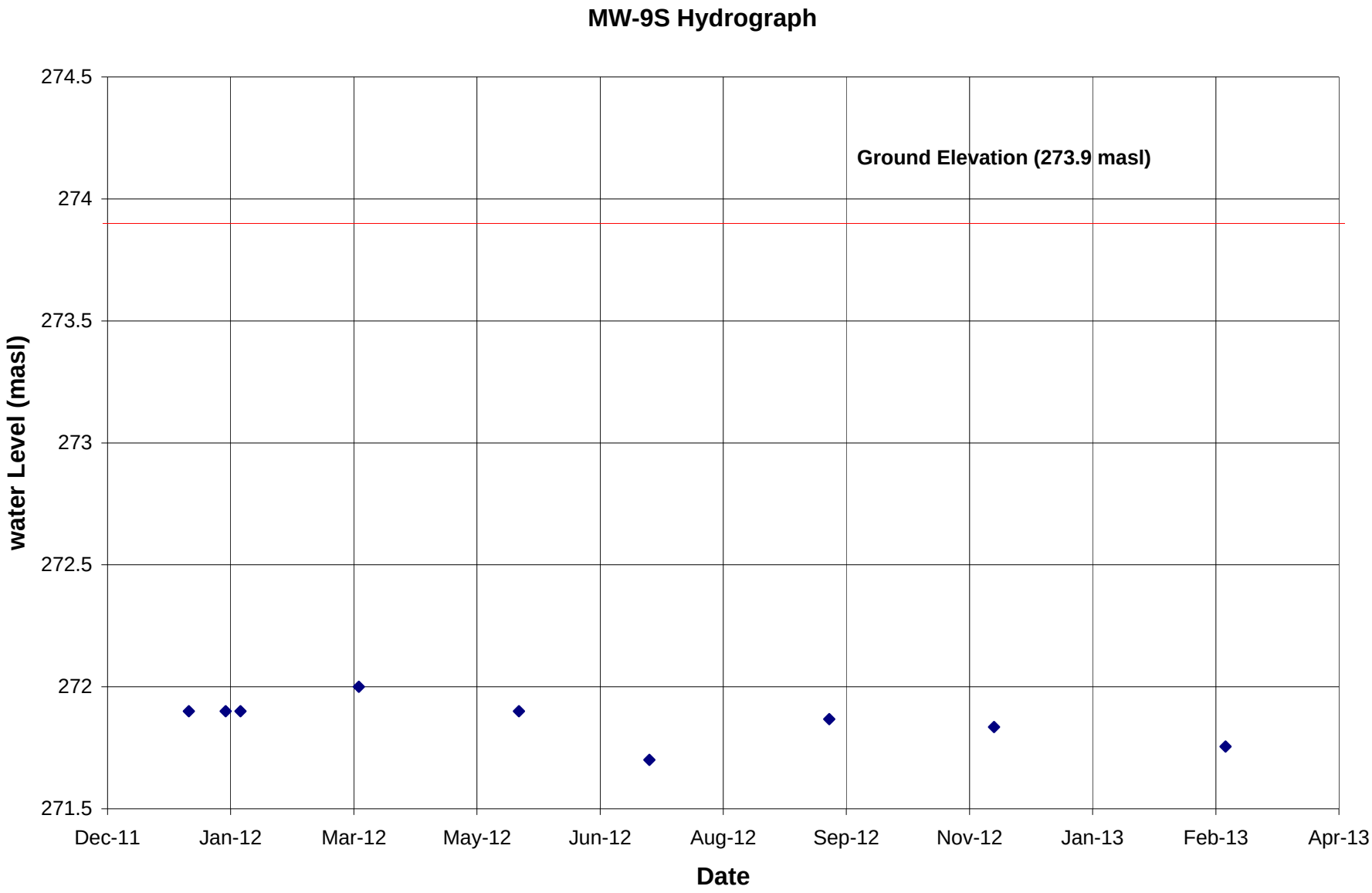

MW-6S Hydrograph
Ground Elevation=282.1(masl)
Water Level (masl)
282.5
282
281.5
281
280.5
280
279.5
279
Dec-11
Jan-12
Mar-12
May-12
Jun-12
Aug-12
Sep-12
Nov-12
Jan-13
Feb-13
Apr-13
Date

MW-7S and MW-7D Hydrograph

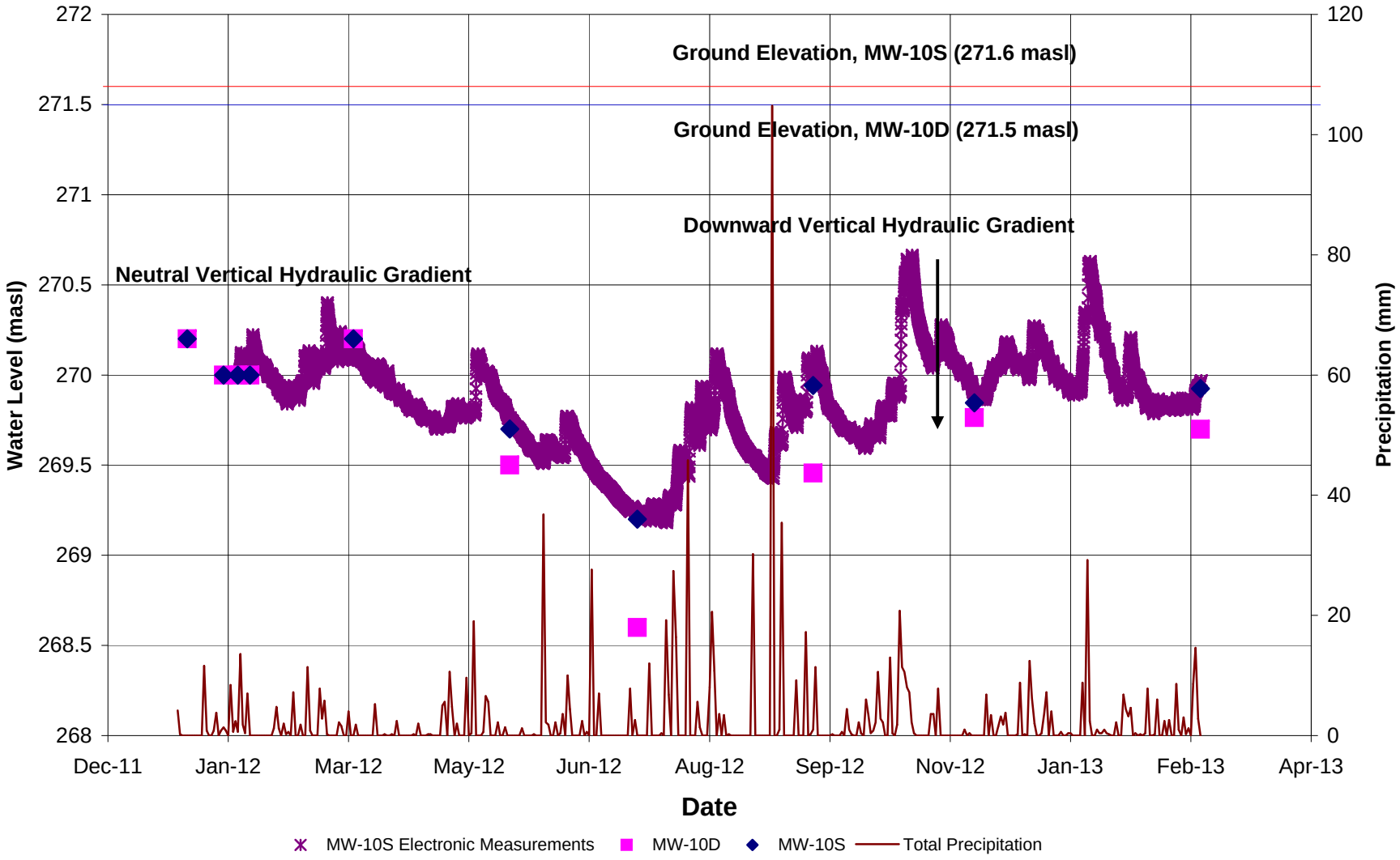


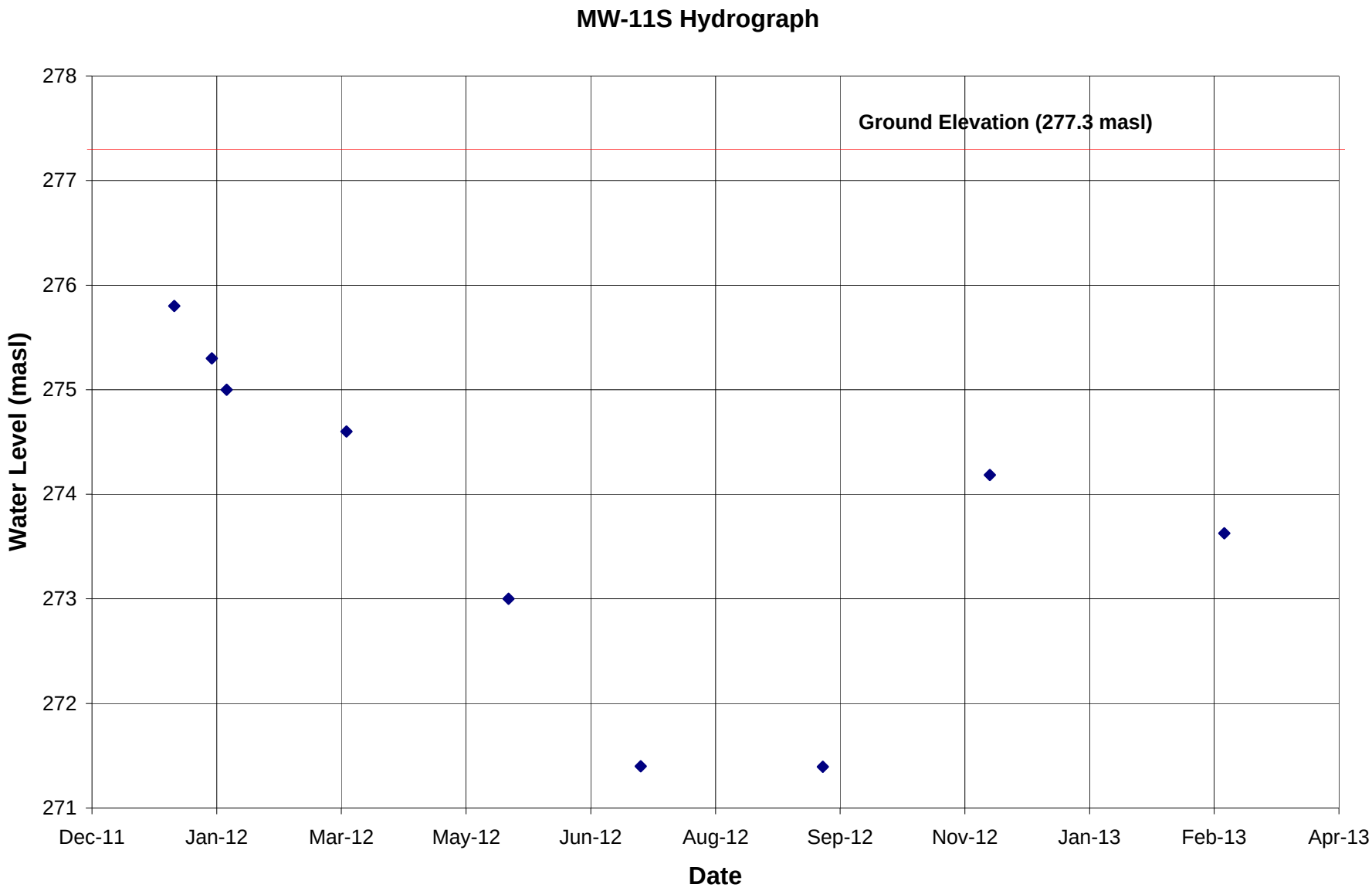
MW-8S and MW-8D Hydrograph



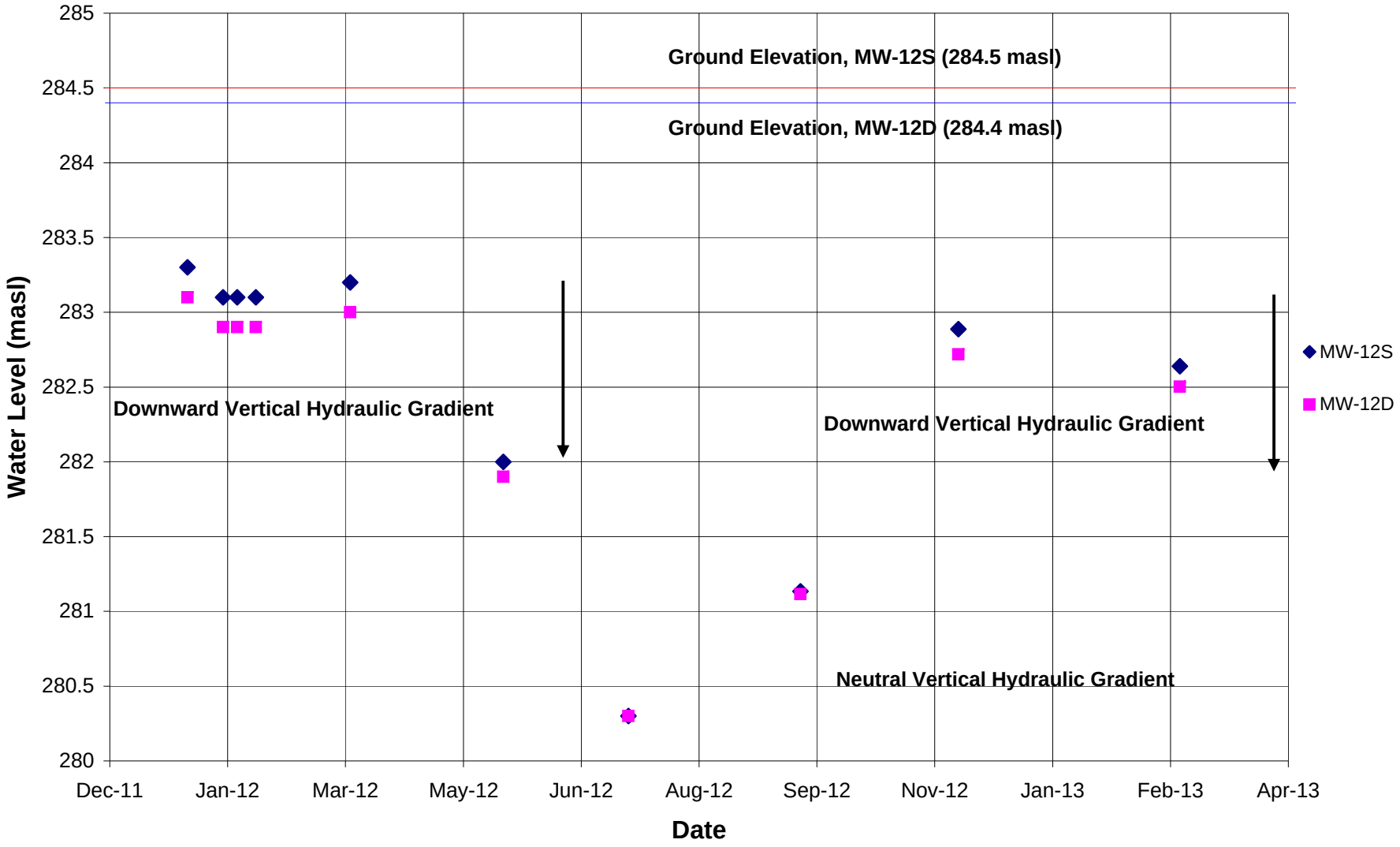

MW-9S Hydrograph
Ground Elevation (273.9 masl)
water Level (masl)
274.5
274
273.5
273
272.5
272
271.5
Dec-11
Jan-12
Mar-12
May-12
Jun-12
Aug-12
Sep-12
Nov-12
Jan-13
Feb-13
Apr-13
Date

MW-10S and MW-10D Hydrograph




MW-11S Hydrograph
Ground Elevation (277.3 masl)
Water Level (masl)
278
277
276
275
274
273
272
271
Dec-11
Jan-12
Mar-12
May-12
Jun-12
Aug-12
Sep-12
Nov-12
Jan-13
Feb-13
Apr-13
Date

MW-12S and MW-12D Hydrograph



APPENDIX D

In-situ Hydraulic Conductivity Analyses

In-Situ Hydraulic Conductivity Analyses - MW-1S

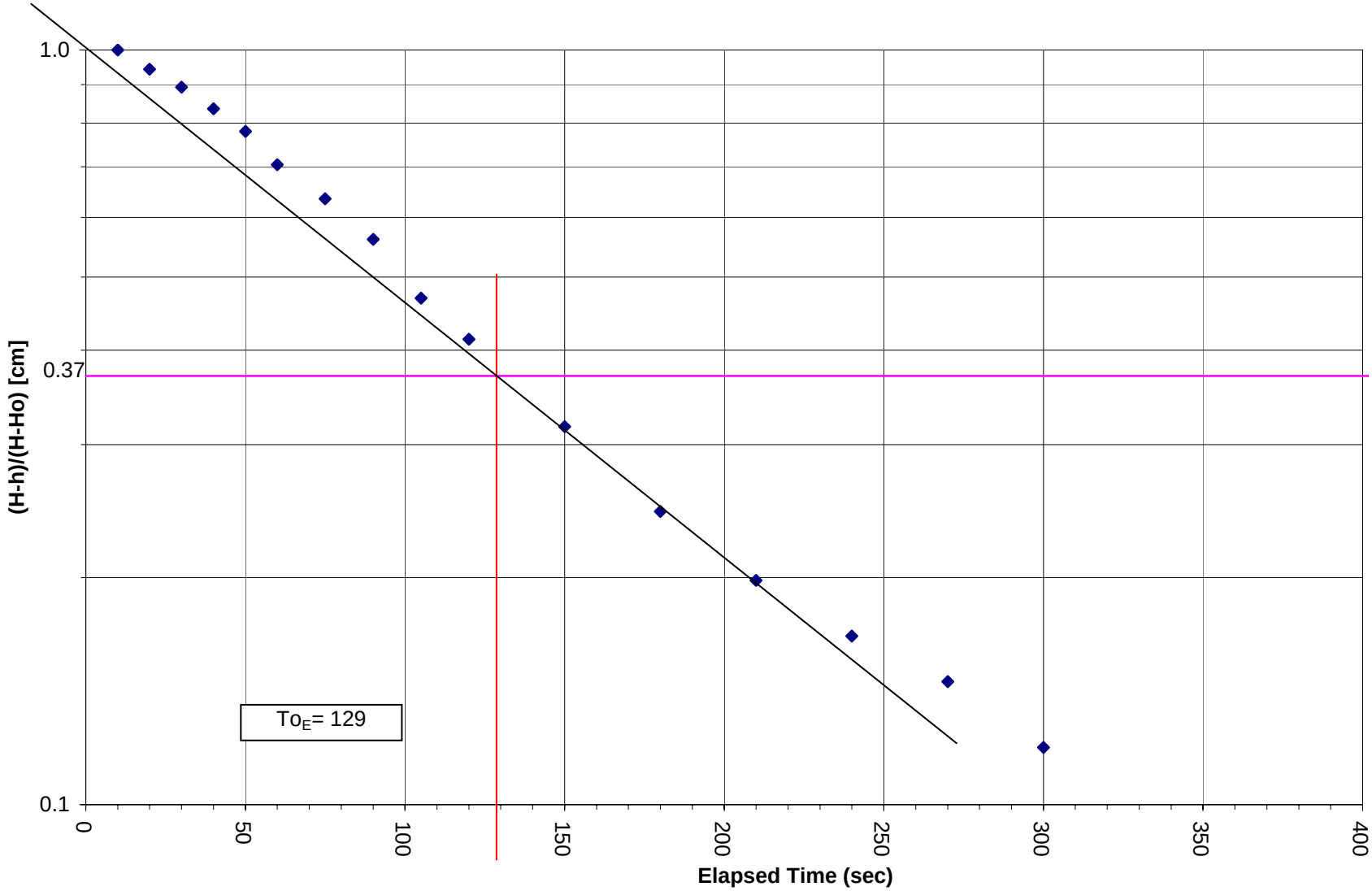
Date: 26-Jan-12

Conducted By:	A.C, X.X, M.S	
Well Depth:	7.05	mbtor
Stick Up:	1.040	m
Ground Elevation:	276.590	masl
Well Elevation:	277.630	masl
Initial Water Level:	2.76	mbtor
Static Water Level (H):	4.29	m
Head at time = 0 (Ho):	0.7	m
Screen Length (L):	3.048	m
Radius of Borehole (R):	0.1016	m
Radius of Monitoring Well (r):	0.0254	m

To(early):	2.2	min
To(late):	NA	min
K(early):	2.79E-06	m/s
K(late):	NA	m/s
K(average):	2.79E-06	m/s
Recovery:	95.7%	

Time (seconds)	WL (mtoc)	WL (masl)	H-h	H-Ho	(H-h)/(H-Ho)
10	6.344	271.286	3.586	3.586	1.000
20	6.140	271.490	3.382	3.586	0.943
30	5.960	271.670	3.202	3.586	0.893
40	5.755	271.875	2.997	3.586	0.836
50	5.555	272.075	2.797	3.586	0.780
60	5.285	272.345	2.527	3.586	0.705
75	5.036	272.594	2.278	3.586	0.635
90	4.770	272.860	2.012	3.586	0.561
105	4.440	273.190	1.682	3.586	0.469
120	4.242	273.388	1.484	3.586	0.414
150	3.894	273.736	1.136	3.586	0.317
180	3.635	273.995	0.877	3.586	0.245
210	3.469	274.161	0.711	3.586	0.198
240	3.358	274.272	0.600	3.586	0.167
270	3.280	274.350	0.522	3.586	0.146
300	3.185	274.445	0.427	3.586	0.119
360	3.091	274.539	0.333	3.586	0.093
420	3.003	274.627	0.245	3.586	0.068
480	2.968	274.662	0.210	3.586	0.059
540	2.951	274.679	0.193	3.586	0.054
600	2.944	274.686	0.186	3.586	0.052

Appendix D: In-Situ Hydraulic Conductivity Analyses - MW-1S



In-Situ Hydraulic Conductivity Analyses - MW-2S

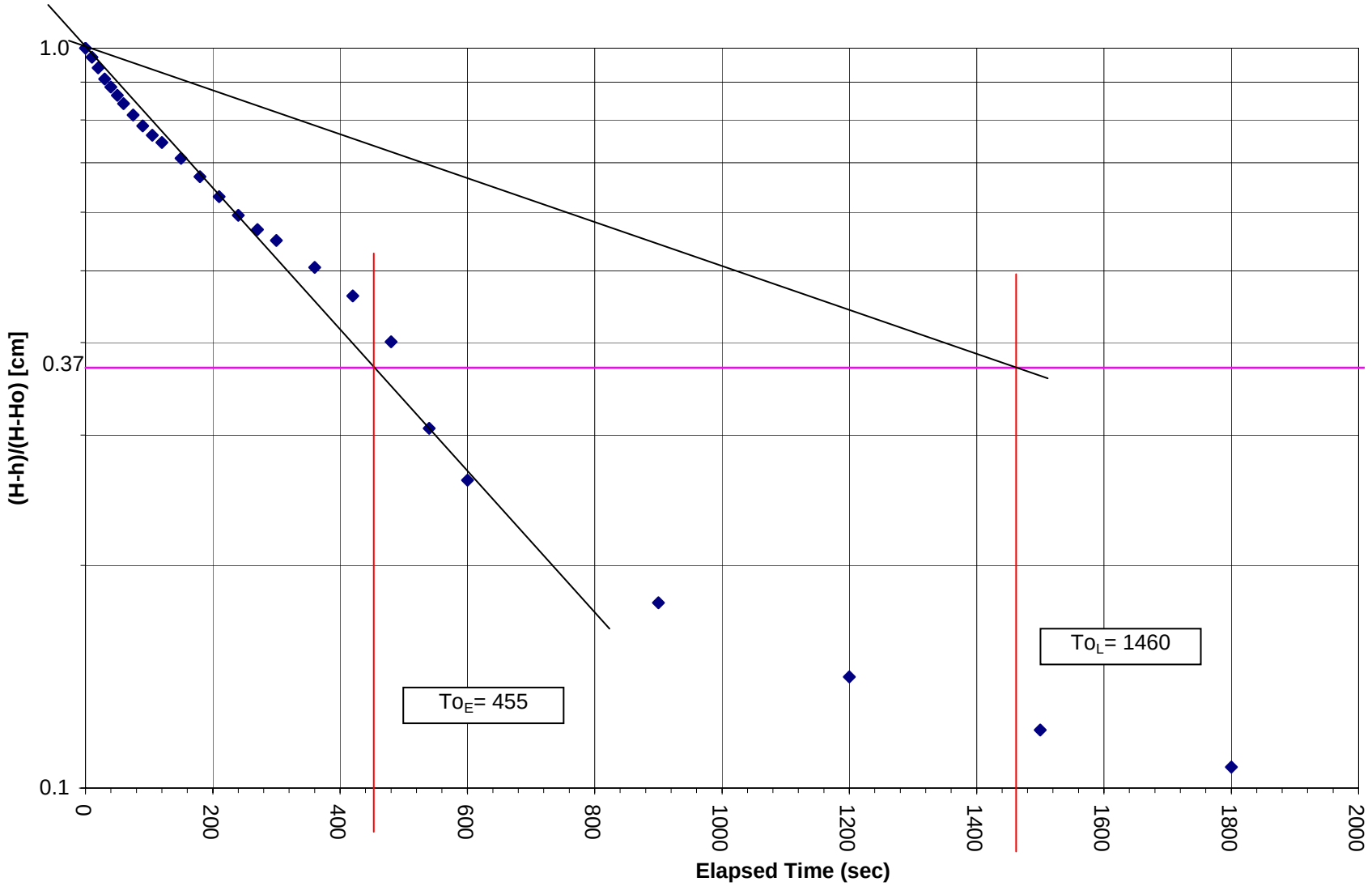
Date: 3-Feb-12

Conducted By:	A.C., B.S.	
Well Depth:	6.98	mbtor
Stick Up:	1.050	m
Ground Elevation:	276.620	masl
Well Elevation:	277.670	masl
Initial Water Level:	3.13	mbtor
Static Water Level (H):	3.85	m
Head at time = 0 (Ho):	1.9	m
Screen Length (L):	3.048	m
Radius of Borehole (R):	0.1016	m
Radius of Monitoring Well (r):	0.0254	m

To(early):	7.6	min
To(late):	24.33333333	min
K(early):	7.91E-07	m/s
K(late):	2.47E-07	m/s
K(average):	4.42E-07	m/s
Recovery:	95.1%	

Time (seconds)	WL (mtoc)	WL (masl)	H-h	H-Ho	(H-h)/(H-Ho)
0	5.126	272.544	1.995	1.995	1.000
10	5.070	272.600	1.939	1.995	0.972
20	5.007	272.663	1.876	1.995	0.940
30	4.944	272.726	1.813	1.995	0.909
40	4.899	272.771	1.768	1.995	0.886
50	4.853	272.817	1.722	1.995	0.863
60	4.810	272.860	1.679	1.995	0.842
75	4.751	272.919	1.620	1.995	0.812
90	4.697	272.973	1.566	1.995	0.785
105	4.652	273.018	1.521	1.995	0.762
120	4.618	273.052	1.487	1.995	0.745
150	4.547	273.123	1.416	1.995	0.710
180	4.468	273.202	1.337	1.995	0.670
210	4.388	273.282	1.257	1.995	0.630
240	4.317	273.353	1.186	1.995	0.594
270	4.265	273.405	1.134	1.995	0.568
300	4.228	273.442	1.097	1.995	0.550
360	4.139	273.531	1.008	1.995	0.505
420	4.054	273.616	0.923	1.995	0.463
480	3.931	273.739	0.800	1.995	0.401
540	3.742	273.928	0.611	1.995	0.306
600	3.651	274.019	0.520	1.995	0.261
900	3.486	274.184	0.355	1.995	0.178
1200	3.413	274.257	0.282	1.995	0.141
1500	3.370	274.300	0.239	1.995	0.120
1800	3.344	274.326	0.213	1.995	0.107
2100	3.319	274.351	0.188	1.995	0.094

Appendix D: In-Situ Hydraulic Conductivity Analyses - MW-2S



In-Situ Hydraulic Conductivity Analyses - MW-3S

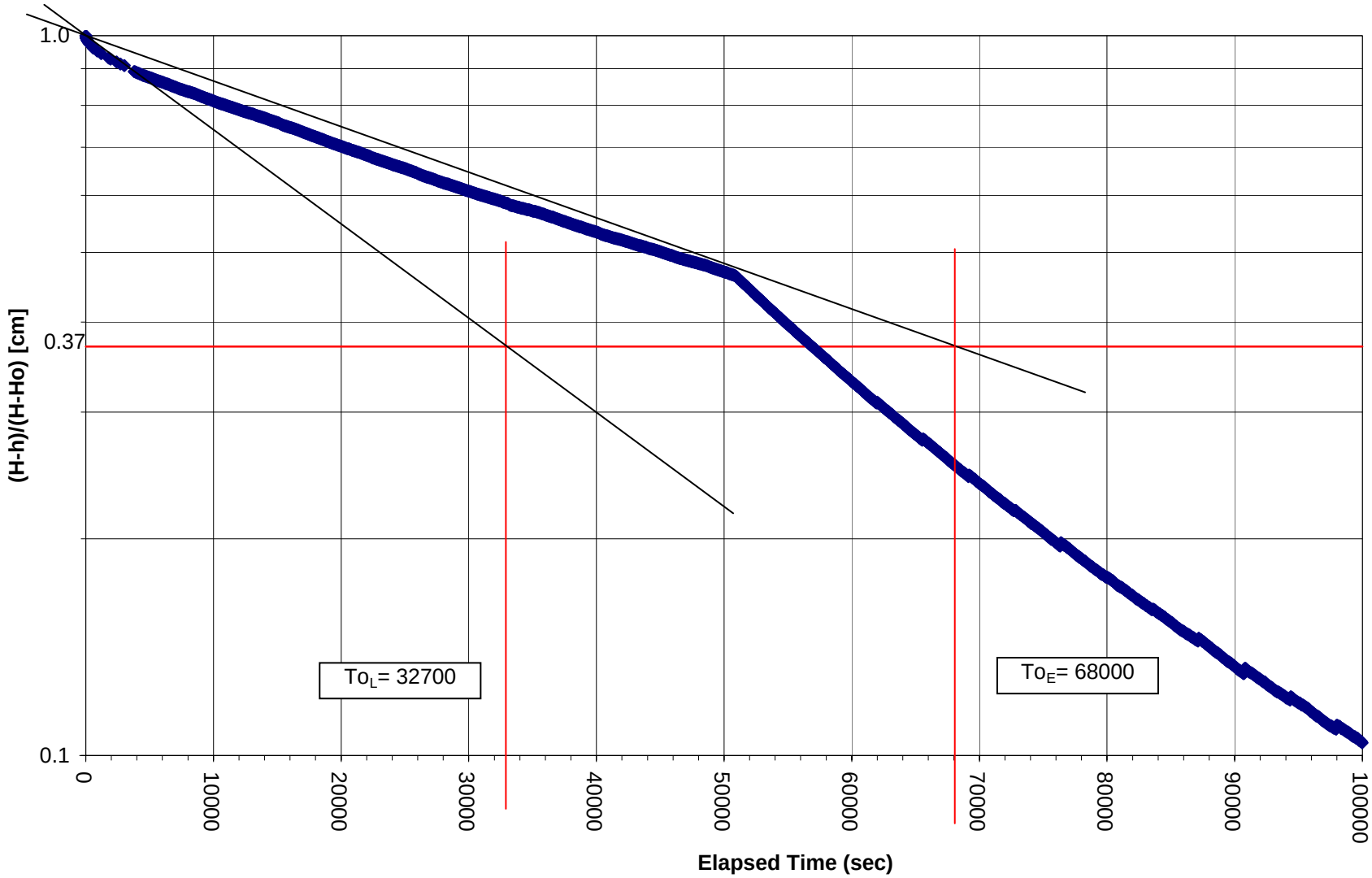
Date: 31-Jan-12

Conducted By:	A.C, A.R	
Well Depth:	7.15	mbtor
Stick Up:	1.260	m
Ground Elevation:	267.240	masl
Well Elevation:	268.500	masl
Initial Water Level:	1.72	mbtor
Static Water Level (H):	5.43	m
Head at time = 0 (Ho):	0.2	m
Screen Length (L):	3.048	m
Radius of Borehole (R):	0.1016	m
Radius of Monitoring Well (r):	0.0254	m

To(early):	1133.3	min
To(late):	545	min
K(early):	5.29E-09	m/s
K(late):	1.10E-08	m/s
K(average):	7.63E-09	m/s
Recovery:	91.1%	

Time (seconds)	WL (mtoc)	WL (masl)	H-h	H-Ho	(H-h)/(H-Ho)
10	6.970	261.530	5.254	5.254	1.000
20	6.940	261.560	5.224	5.254	0.994
30	6.935	261.565	5.219	5.254	0.993
40	6.930	261.570	5.214	5.254	0.992
50	6.925	261.575	5.209	5.254	0.991
60	6.920	261.580	5.204	5.254	0.990
75	6.913	261.587	5.197	5.254	0.989
90	6.904	261.596	5.188	5.254	0.987
105	6.898	261.602	5.182	5.254	0.986
120	6.894	261.606	5.178	5.254	0.986
150	6.881	261.619	5.165	5.254	0.983
180	6.870	261.630	5.154	5.254	0.981
210	6.861	261.639	5.145	5.254	0.979
240	6.851	261.649	5.135	5.254	0.977
270	6.843	261.657	5.127	5.254	0.976
300	6.834	261.666	5.118	5.254	0.974
360	6.820	261.680	5.104	5.254	0.971
420	6.805	261.695	5.089	5.254	0.969
480	6.792	261.708	5.076	5.254	0.966
540	6.778	261.722	5.062	5.254	0.963
600	6.766	261.734	5.050	5.254	0.961
900	6.718	261.782	5.002	5.254	0.952
1200	6.676	261.824	4.960	5.254	0.944
1800	6.606	261.894	4.890	5.254	0.931
1932	6.592	261.908	4.876	5.254	0.928
2412	6.545	261.955	4.829	5.254	0.919
2712	6.515	261.985	4.799	5.254	0.913
3012	6.489	262.011	4.773	5.254	0.908
3792	6.400	262.100	4.684	5.254	0.892
3852	6.396	262.104	4.680	5.254	0.891
3912	6.392	262.108	4.676	5.254	0.890
3972	6.386	262.114	4.670	5.254	0.889
4032	6.382	262.118	4.666	5.254	0.888

Appendix D: In-Situ Hydraulic Conductivity Analyses - MW-3S



In-Situ Hydraulic Conductivity Analyses - MW-4S

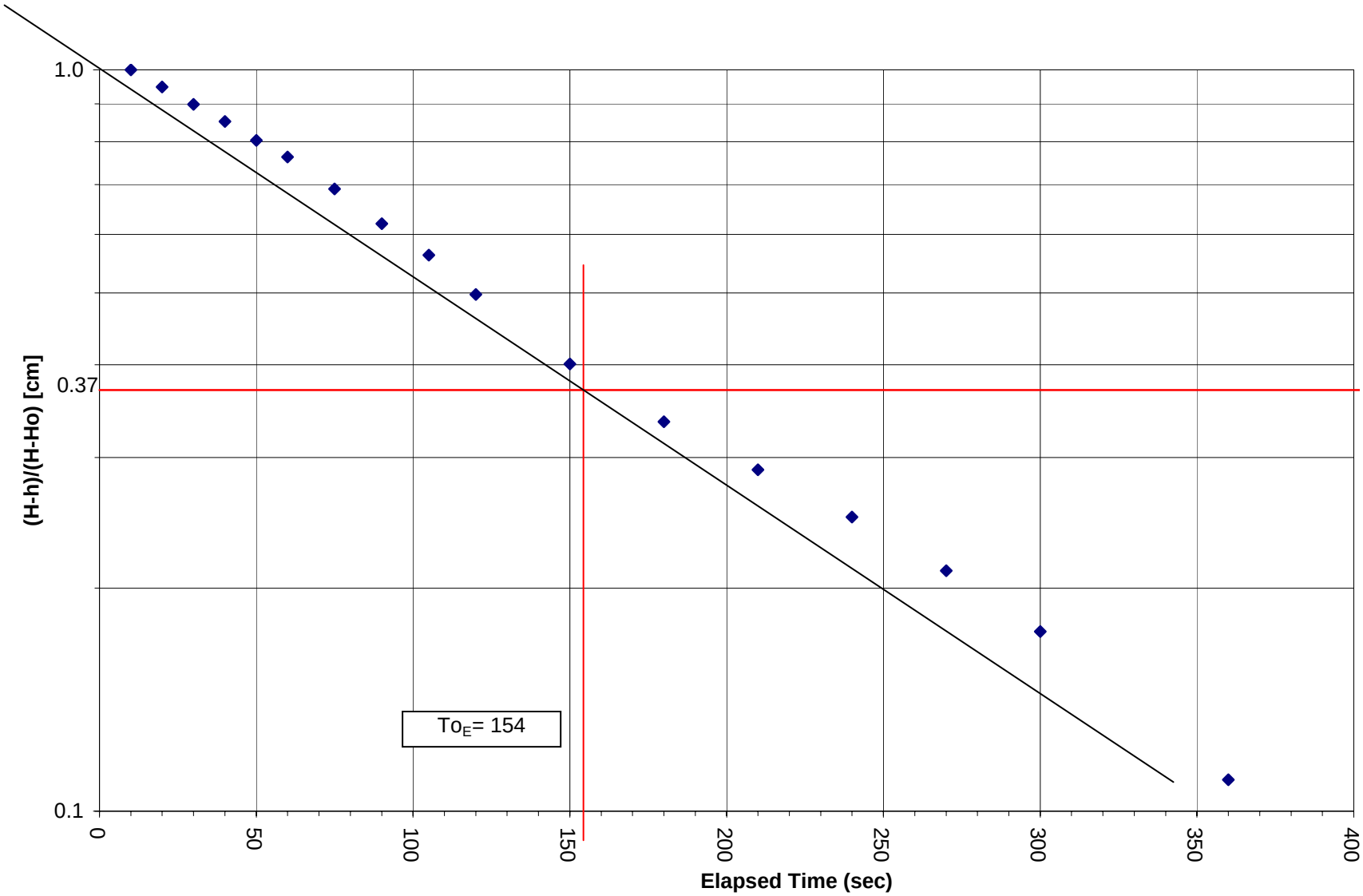
Date: 31-Jan-12

Conducted By:	A.C, A.R	
Well Depth:	6.96	mbtor
Stick Up:	1.020	m
Ground Elevation:	268.440	masl
Well Elevation:	269.460	masl
Initial Water Level:	3.68	mbtor
Static Water Level (H):	3.28	m
Head at time = 0 (Ho):	0.3	m
Screen Length (L):	3.048	m
Radius of Borehole (R):	0.1016	m
Radius of Monitoring Well (r):	0.0254	m

To(early):	2.6	min
To(late):	NA	min
K(early):	2.34E-06	m/s
K(late):	NA	m/s
K(average)	2.34E-06	m/s
Recovery:	96.5%	

Time (seconds)	WL (mtoc)	WL (masl)	H-h	H-Ho	(H-h)/(H-Ho)
10	6.660	262.800	2.976	2.976	1.000
20	6.505	262.955	2.821	2.976	0.948
30	6.357	263.103	2.673	2.976	0.898
40	6.220	263.240	2.536	2.976	0.852
50	6.075	263.385	2.391	2.976	0.803
60	5.955	263.505	2.271	2.976	0.763
75	5.740	263.720	2.056	2.976	0.691
90	5.530	263.930	1.846	2.976	0.620
105	5.358	264.102	1.674	2.976	0.563
120	5.165	264.295	1.481	2.976	0.498
150	4.878	264.582	1.194	2.976	0.401
180	4.682	264.778	0.998	2.976	0.335
210	4.543	264.917	0.859	2.976	0.289
240	4.426	265.034	0.742	2.976	0.249
270	4.312	265.148	0.628	2.976	0.211
300	4.204	265.256	0.520	2.976	0.175
360	4.012	265.448	0.328	2.976	0.110
420	3.878	265.582	0.194	2.976	0.065
500	3.824	265.636	0.140	2.976	0.047
548	3.817	265.643	0.133	2.976	0.045
600	3.814	265.646	0.130	2.976	0.044
720	3.808	265.652	0.124	2.976	0.042
900	3.799	265.661	0.115	2.976	0.039

Appendix D: In-Situ Hydraulic Conductivity Analyses - MW-4S



In-Situ Hydraulic Conductivity Analyses - MW-5S-Test1

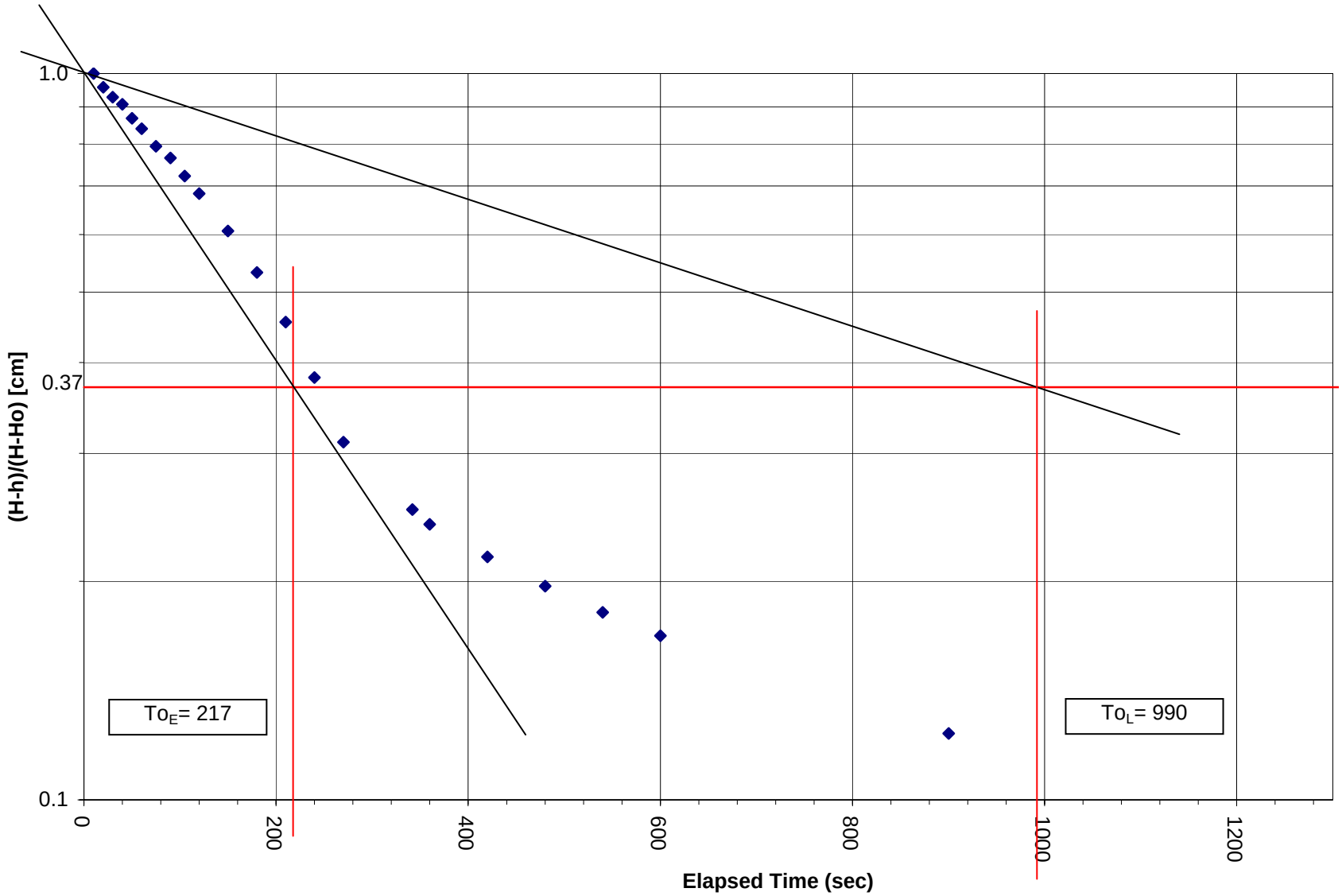
Date: 31-Jan-12

Conducted By:	A.C, A.R	
Well Depth:	7.08	mbtor
Stick Up:	1.120	m
Ground Elevation:	272.790	masl
Well Elevation:	273.910	masl
Initial Water Level:	3.36	mbtor
Static Water Level (H):	3.72	m
Head at time = 0 (Ho):	0.3	m
Screen Length (L):	3.048	m
Radius of Borehole (R):	0.1016	m
Radius of Monitoring Well (r):	0.0254	m

To(early):	3.6	min
To(late):	16.5	min
K(early):	1.66E-06	m/s
K(late):	3.64E-07	m/s
K(average):	7.77E-07	m/s
Recovery:	90.9%	

Time (seconds)	WL (mtoc)	WL (masl)	H-h	H-Ho	(H-h)/(H-Ho)
10	6.750	267.160	3.394	3.394	1.000
20	6.605	267.305	3.249	3.394	0.957
30	6.505	267.405	3.149	3.394	0.928
40	6.434	267.476	3.078	3.394	0.907
50	6.300	267.610	2.944	3.394	0.867
60	6.205	267.705	2.849	3.394	0.839
75	6.050	267.860	2.694	3.394	0.794
90	5.952	267.958	2.596	3.394	0.765
105	5.809	268.101	2.453	3.394	0.723
120	5.676	268.234	2.320	3.394	0.684
150	5.416	268.494	2.060	3.394	0.607
180	5.163	268.747	1.807	3.394	0.532
210	4.900	269.010	1.544	3.394	0.455
240	4.651	269.259	1.295	3.394	0.382
270	4.411	269.499	1.055	3.394	0.311
342	4.208	269.702	0.852	3.394	0.251
360	4.169	269.741	0.813	3.394	0.240
420	4.089	269.821	0.733	3.394	0.216
480	4.024	269.886	0.668	3.394	0.197
540	3.971	269.939	0.615	3.394	0.181
600	3.927	269.983	0.571	3.394	0.168
900	3.775	270.135	0.419	3.394	0.123
1200	3.694	270.216	0.338	3.394	0.100

Appendix D: In-Situ Hydraulic Conductivity Analyses - MW-5S - Test 1



In-Situ Hydraulic Conductivity Analyses - MW-5S - Test 2

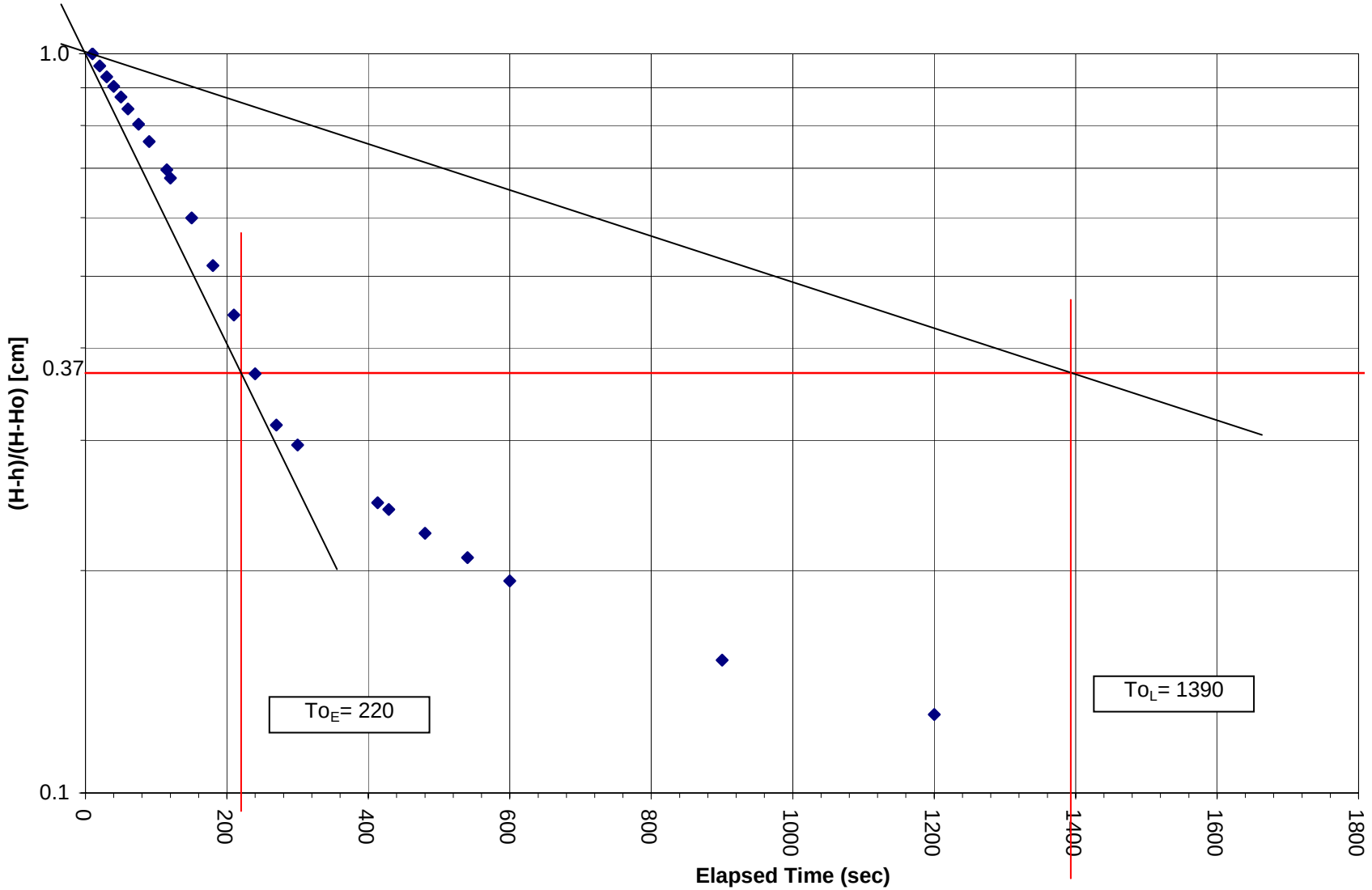
Date: 31-Jan-12

Conducted By:	A.C, A.R	
Well Depth:	7.08	mbtor
Stick Up:	1.120	m
Ground Elevation:	272.790	masl
Well Elevation:	273.910	masl
Initial Water Level:	3.36	mbtor
Static Water Level (H):	3.72	m
Head at time = 0 (Ho):	0.6	m
Screen Length (L):	3.048	m
Radius of Borehole (R):	0.1016	m
Radius of Monitoring Well (r):	0.0254	m

To(early):	3.7	min
To(late):	23.16666667	min
K(early):	1.64E-06	m/s
K(late):	2.59E-07	m/s
K(average):	6.51E-07	m/s
Recovery:	92.0%	

Time (seconds)	WL (mtoc)	WL (masl)	H-h	H-Ho	(H-h)/(H-Ho)
10	6.450	267.460	3.094	3.094	1.000
20	6.334	267.576	2.978	3.094	0.963
30	6.236	267.674	2.880	3.094	0.931
40	6.152	267.758	2.796	3.094	0.904
50	6.060	267.850	2.704	3.094	0.874
60	5.962	267.948	2.606	3.094	0.842
75	5.840	268.070	2.484	3.094	0.803
90	5.710	268.200	2.354	3.094	0.761
115	5.512	268.398	2.156	3.094	0.697
120	5.456	268.454	2.100	3.094	0.679
150	5.211	268.699	1.855	3.094	0.600
180	4.955	268.955	1.599	3.094	0.517
210	4.727	269.183	1.371	3.094	0.443
240	4.498	269.412	1.142	3.094	0.369
270	4.329	269.581	0.973	3.094	0.314
300	4.271	269.639	0.915	3.094	0.296
413	4.120	269.790	0.764	3.094	0.247
429	4.104	269.806	0.748	3.094	0.242
480	4.051	269.859	0.695	3.094	0.225
540	4.000	269.910	0.644	3.094	0.208
600	3.955	269.955	0.599	3.094	0.194
900	3.824	270.086	0.468	3.094	0.151
1200	3.751	270.159	0.395	3.094	0.128
1800	3.655	270.255	0.299	3.094	0.097

Appendix D: In-Situ Hydraulic Conductivity Analyses - MW-5S - Test 2



In-Situ Hydraulic Conductivity Analyses - MW-6S

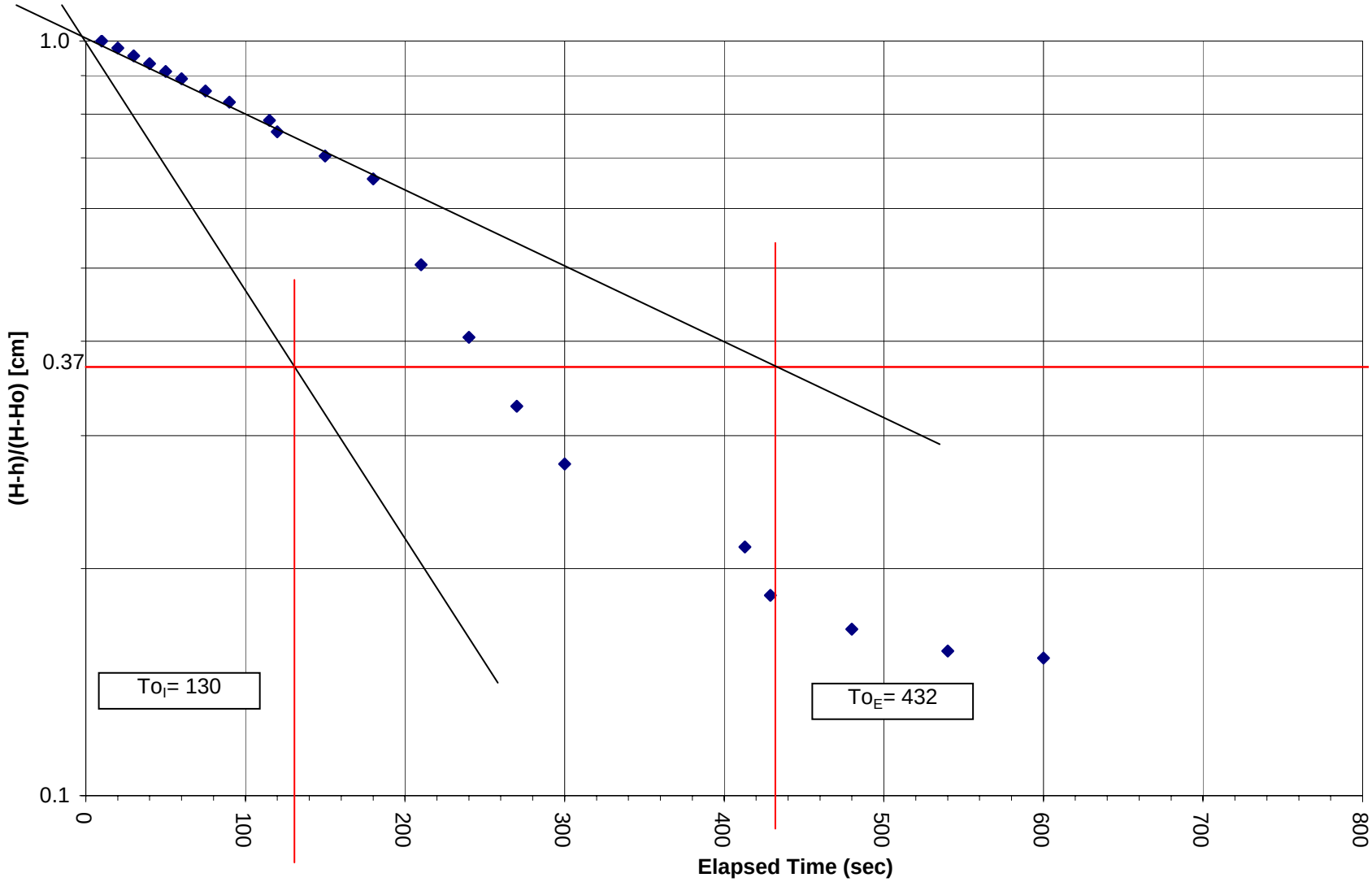
Date: 3-Feb-12

Conducted By:	A.C., B.S.	
Well Depth:	7.11	mbtor
Stick Up:	1.180	m
Ground Elevation:	282.140	masl
Well Elevation:	283.320	masl
Initial Water Level:	1.91	mbtor
Static Water Level (H):	5.20	m
Head at time = 0 (Ho):	1.8	m
Screen Length (L):	3.048	m
Radius of Borehole (R):	0.1016	m
Radius of Monitoring Well (r):	0.0254	m

To(early):	7.2	min
To(late):	2.166666667	min
K(early):	8.33E-07	m/s
K(late):	2.77E-06	m/s
K(average):	1.52E-06	m/s
Recovery:	95.5%	

Time (seconds)	WL (mtoc)	WL (masl)	H-h	H-Ho	(H-h)/(H-Ho)
10	5.280	278.040	3.370	3.370	1.000
20	5.208	278.112	3.298	3.370	0.979
30	5.130	278.190	3.220	3.370	0.955
40	5.056	278.264	3.146	3.370	0.934
50	4.981	278.339	3.071	3.370	0.911
60	4.913	278.407	3.003	3.370	0.891
75	4.804	278.516	2.894	3.370	0.859
90	4.707	278.613	2.797	3.370	0.830
115	4.556	278.764	2.646	3.370	0.785
120	4.465	278.855	2.555	3.370	0.758
150	4.282	279.038	2.372	3.370	0.704
180	4.123	279.197	2.213	3.370	0.657
210	3.613	279.707	1.703	3.370	0.505
240	3.275	280.045	1.365	3.370	0.405
270	3.016	280.304	1.106	3.370	0.328
300	2.837	280.483	0.927	3.370	0.275
413	2.630	280.690	0.720	3.370	0.214
429	2.531	280.789	0.621	3.370	0.184
480	2.470	280.850	0.560	3.370	0.166
540	2.434	280.886	0.524	3.370	0.155
600	2.423	280.897	0.513	3.370	0.152
900	2.144	281.176	0.234	3.370	0.069

Appendix D: In-Situ Hydraulic Conductivity Analyses - MW-6S



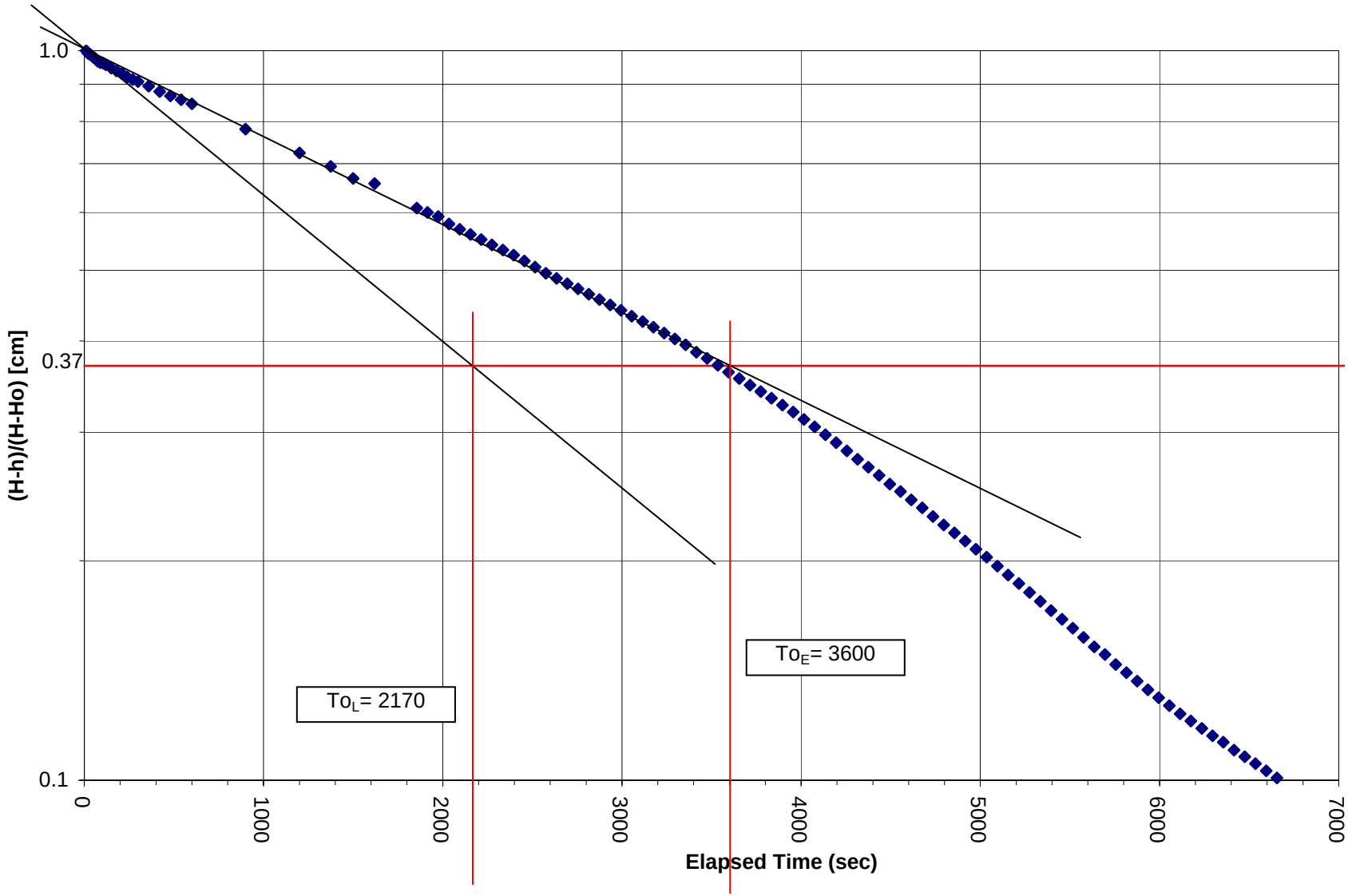
Date: 31-Jan-12

Conducted By:		
Well Depth:	7.07	mbtor
Stick Up:	1.020	m
Ground Elevation:	275.410	masl
Well Elevation:	276.430	masl
Initial Water Level:	2.26	mbtor
Static Water Level (H):	4.82	m
Head at time = 0 (Ho):	0.3	m
Screen Length (L):	3.048	m
Radius of Borehole (R):	0.1016	m
Radius of Monitoring Well (r):	0.0254	m

To(early):	60.0	min
To(late):	36.16666667	min
K(early):	1.00E-07	m/s
K(late):	1.66E-07	m/s
K(average):	1.29E-07	m/s
Recovery:	90.7%	

Time (seconds)	WL (mtoc)	WL (masl)	H-h	H-Ho	(H-h)/(H-Ho)
10	6.810	269.620	4.555	4.555	1.000
20	6.775	269.655	4.520	4.555	0.992
30	6.758	269.672	4.503	4.555	0.989
40	6.741	269.689	4.486	4.555	0.985
50	6.720	269.710	4.465	4.555	0.980
60	6.702	269.728	4.447	4.555	0.976
75	6.660	269.770	4.405	4.555	0.967
90	6.640	269.790	4.385	4.555	0.963
105	6.635	269.795	4.380	4.555	0.962
120	6.614	269.816	4.359	4.555	0.957
150	6.567	269.863	4.312	4.555	0.947
180	6.528	269.902	4.273	4.555	0.938
210	6.494	269.936	4.239	4.555	0.931
240	6.447	269.983	4.192	4.555	0.920
270	6.412	270.018	4.157	4.555	0.913
300	6.385	270.045	4.130	4.555	0.907
360	6.328	270.102	4.073	4.555	0.894
420	6.260	270.170	4.005	4.555	0.879
480	6.204	270.226	3.949	4.555	0.867
540	6.158	270.272	3.903	4.555	0.857
600	6.105	270.325	3.850	4.555	0.845
900	5.811	270.619	3.556	4.555	0.781
1200	5.554	270.876	3.299	4.555	0.724
1375	5.416	271.014	3.161	4.555	0.694
1500	5.299	271.131	3.044	4.555	0.668
1620	5.250	271.180	2.995	4.555	0.658
1855	5.026	271.404	2.771	4.555	0.608
1915	4.9882	271.442	2.733	4.555	0.600
1975	4.9546	271.475	2.700	4.555	0.593
2035	4.8916	271.538	2.637	4.555	0.579
2095	4.8475	271.583	2.593	4.555	0.569
2155	4.8055	271.625	2.551	4.555	0.560
2215	4.7656	271.664	2.511	4.555	0.551

Appendix D: In-Situ Hydraulic Conductivity Analyses - MW-7S



In-Situ Hydraulic Conductivity Analyses - MW-8S

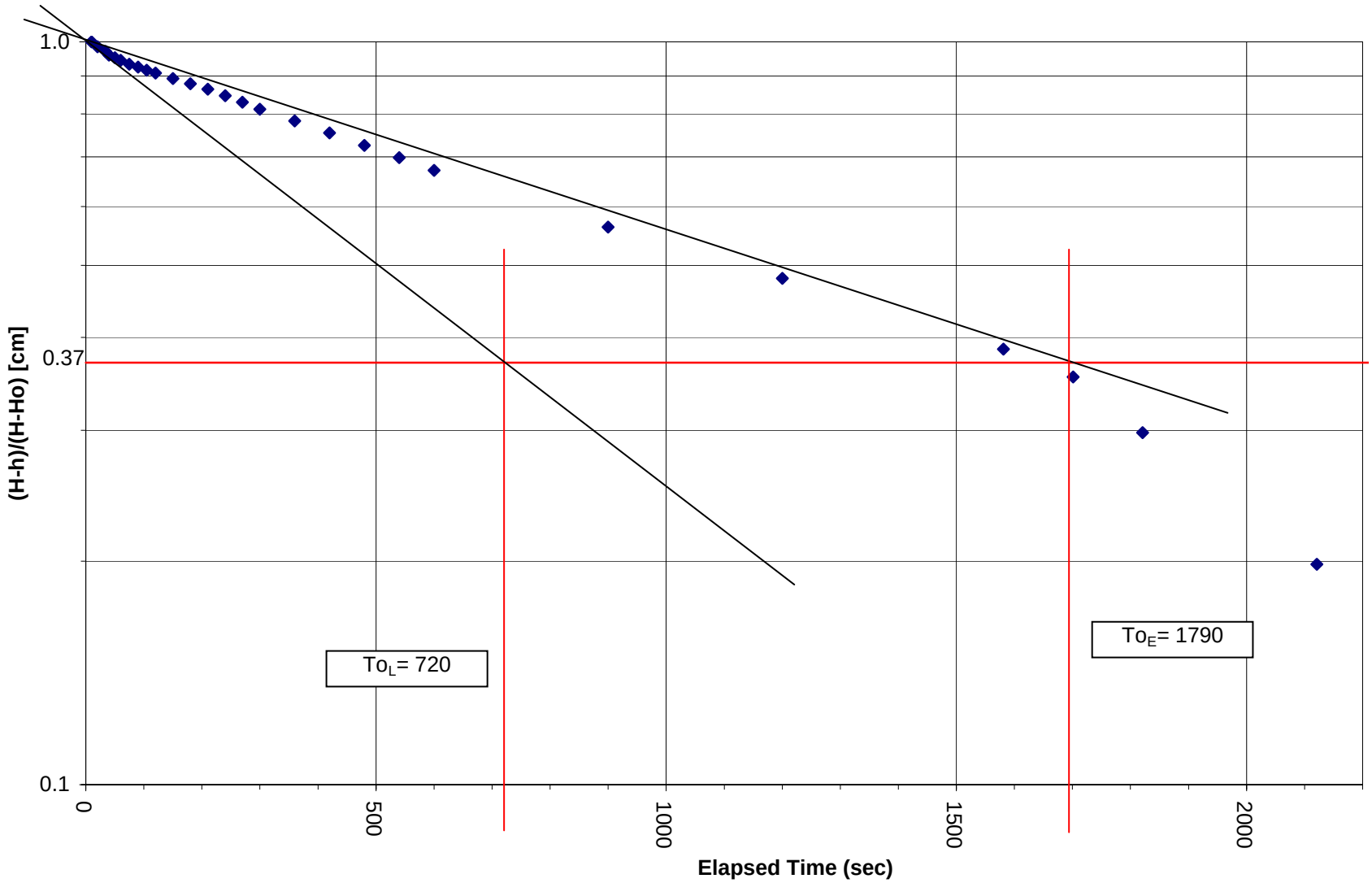
Date: 31-Jan-12

Conducted By:	A.C, A.R	
Well Depth:	6.94	mbtor
Stick Up:	1.060	m
Ground Elevation:	272.970	masl
Well Elevation:	274.030	masl
Initial Water Level:	2.32	mbtor
Static Water Level (H):	4.62	m
Head at time = 0 (Ho):	0.2	m
Screen Length (L):	3.048	m
Radius of Borehole (R):	0.1016	m
Radius of Monitoring Well (r):	0.0254	m

To(early):	29.8	min
To(late):	12	min
K(early):	2.01E-07	m/s
K(late):	5.00E-07	m/s
K(average):	3.17E-07	m/s
Recovery:	81.0%	

Time (seconds)	WL (mtoc)	WL (masl)	H-h	H-Ho	(H-h)/(H-Ho)
10	6.750	267.280	4.428	4.428	1.000
20	6.684	267.346	4.362	4.428	0.985
34	6.620	267.410	4.298	4.428	0.971
40	6.572	267.458	4.250	4.428	0.960
50	6.538	267.492	4.216	4.428	0.952
60	6.504	267.526	4.182	4.428	0.944
75	6.452	267.578	4.130	4.428	0.933
90	6.417	267.613	4.095	4.428	0.925
105	6.376	267.654	4.054	4.428	0.916
120	6.341	267.689	4.019	4.428	0.908
150	6.273	267.757	3.951	4.428	0.892
180	6.212	267.818	3.890	4.428	0.879
210	6.146	267.884	3.824	4.428	0.864
240	6.069	267.961	3.747	4.428	0.846
270	5.995	268.035	3.673	4.428	0.829
300	5.915	268.115	3.593	4.428	0.811
360	5.788	268.242	3.466	4.428	0.783
420	5.662	268.368	3.340	4.428	0.754
480	5.534	268.496	3.212	4.428	0.725
540	5.415	268.615	3.093	4.428	0.699
600	5.296	268.734	2.974	4.428	0.672
900	4.816	269.214	2.494	4.428	0.563
1200	4.449	269.581	2.127	4.428	0.480
1581	4.030	270.000	1.708	4.428	0.386
1701	3.889	270.141	1.567	4.428	0.354
1821	3.641	270.389	1.319	4.428	0.298
2121	3.199	270.831	0.877	4.428	0.198

Appendix D: In-Situ Hydraulic Conductivity Analyses - MW-8S



In-Situ Hydraulic Conductivity Analyses - MW-9S

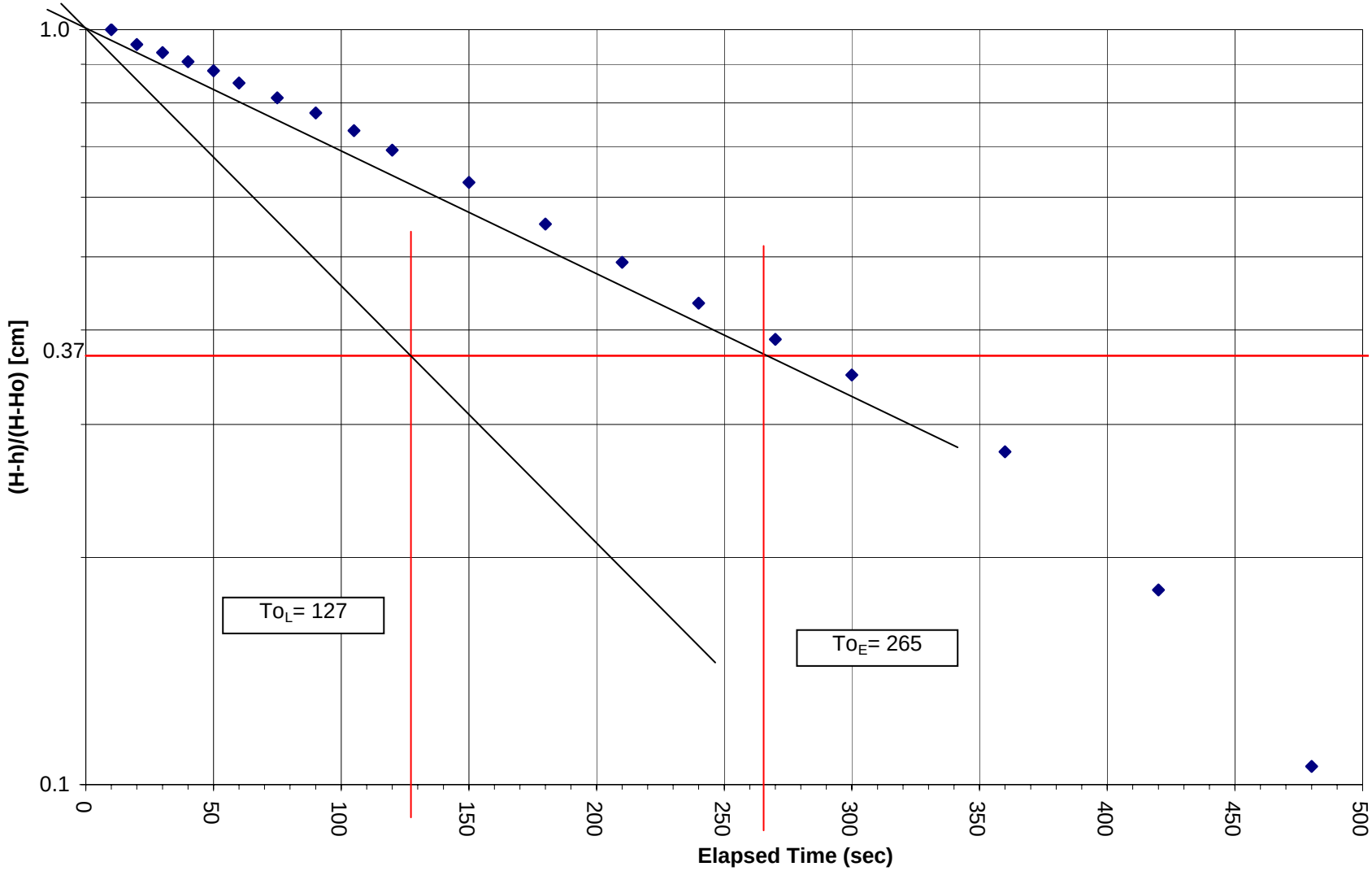
Date: 26-Jan-12

Conducted By:	A.C, X.X, M.S	
Well Depth:	6.70	mbtor
Stick Up:	1.040	m
Ground Elevation:	273.910	masl
Well Elevation:	274.950	masl
Initial Water Level:	3.04	mbtor
Static Water Level (H):	3.66	m
Head at time = 0 (Ho):	0.7	m
Screen Length (L):	3.048	m
Radius of Borehole (R):	0.1016	m
Radius of Monitoring Well (r):	0.0254	m

To(early):	4.4	min
To(late):	2.116666667	min
K(early):	1.36E-06	m/s
K(late):	2.83E-06	m/s
K(average):	1.96E-06	m/s
Recovery:	95.2%	

Time (seconds)	WL (mtoc)	WL (masl)	H-h	H-Ho	(H-h)/(H-Ho)
10	6.000	268.950	2.961	2.961	1.000
20	5.870	269.080	2.831	2.961	0.956
30	5.800	269.150	2.761	2.961	0.932
40	5.725	269.225	2.686	2.961	0.907
50	5.650	269.300	2.611	2.961	0.882
60	5.555	269.395	2.516	2.961	0.850
75	5.445	269.505	2.406	2.961	0.813
90	5.335	269.615	2.296	2.961	0.775
105	5.215	269.735	2.176	2.961	0.735
120	5.090	269.860	2.051	2.961	0.693
150	4.897	270.053	1.858	2.961	0.627
180	4.675	270.275	1.636	2.961	0.553
210	4.495	270.455	1.456	2.961	0.492
240	4.325	270.625	1.286	2.961	0.434
270	4.190	270.760	1.151	2.961	0.389
300	4.072	270.878	1.033	2.961	0.349
360	3.856	271.094	0.817	2.961	0.276
420	3.575	271.375	0.536	2.961	0.181
480	3.352	271.598	0.313	2.961	0.106
540	3.269	271.681	0.230	2.961	0.078
600	3.216	271.734	0.177	2.961	0.060

Appendix D: In-Situ Hydraulic Conductivity Analyses - MW-9S



In-Situ Hydraulic Conductivity Analyses - MW-10D

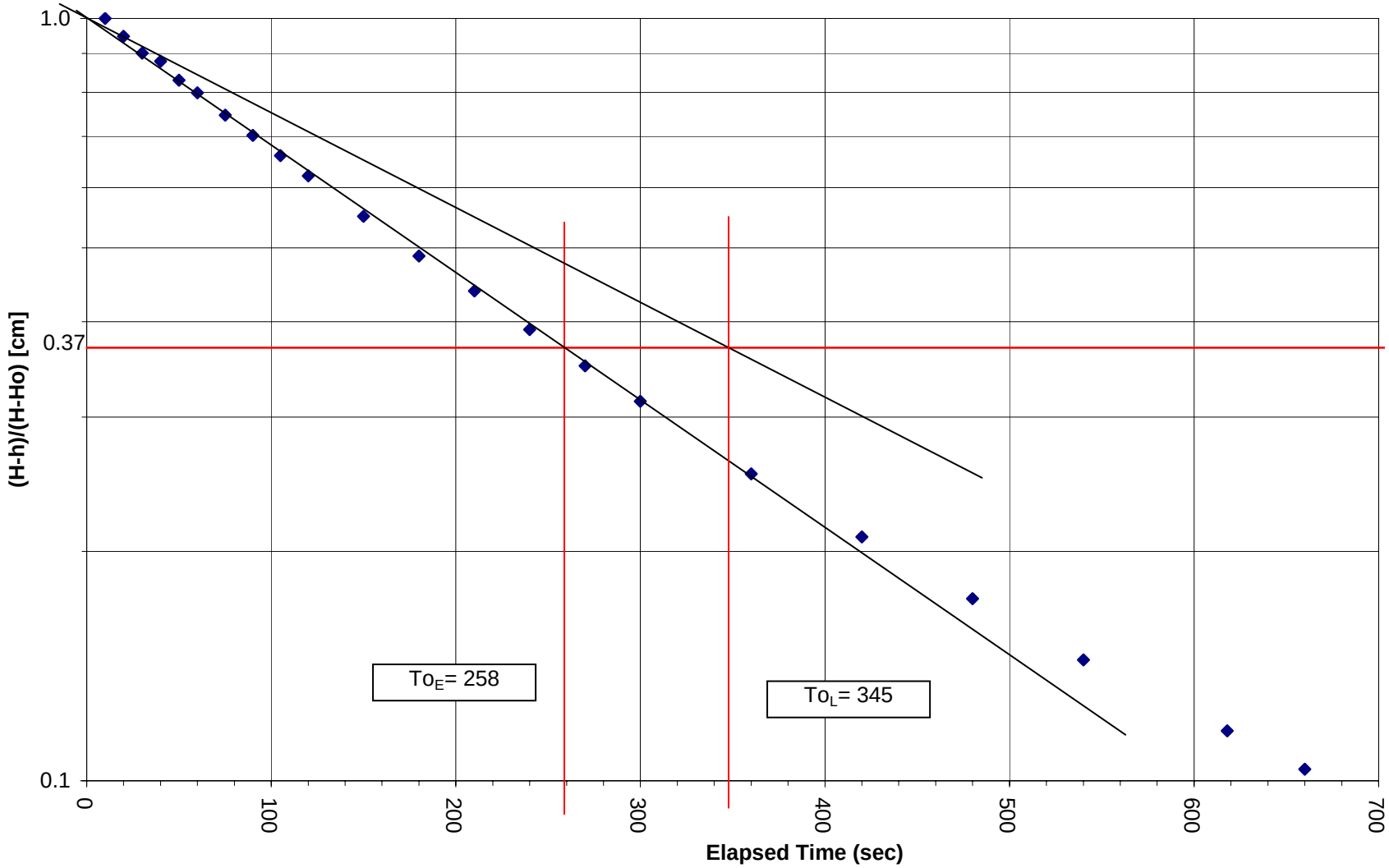
Date: 31-Jan-12

Conducted By:	A.C, A.R	
Well Depth:	11.72	mbtor
Stick Up:	1.080	m
Ground Elevation:	271.500	masl
Well Elevation:	272.580	masl
Initial Water Level:	2.59	mbtor
Static Water Level (H):	9.14	m
Head at time = 0 (Ho):	2.2	m
Screen Length (L):	1.524	m
Radius of Borehole (R):	0.1016	m
Radius of Monitoring Well (r):	0.0254	m

To(early):	4.3	min
To(late):	5.75	min
K(early):	2.22E-06	m/s
K(late):	1.66E-06	m/s
K(average):	1.92E-06	m/s
Recovery:	95.5%	

Time (seconds)	WL (mtoc)	WL (masl)	H-h	H-Ho	(H-h)/(H-Ho)
10	9.510	263.070	6.925	6.925	1.000
20	9.145	263.435	6.560	6.925	0.947
30	8.820	263.760	6.235	6.925	0.900
40	8.670	263.910	6.085	6.925	0.879
50	8.332	264.248	5.747	6.925	0.830
60	8.115	264.465	5.530	6.925	0.799
75	7.754	264.826	5.169	6.925	0.746
90	7.450	265.130	4.865	6.925	0.703
105	7.160	265.420	4.575	6.925	0.661
120	6.890	265.690	4.305	6.925	0.622
150	6.395	266.185	3.810	6.925	0.550
180	5.965	266.615	3.380	6.925	0.488
210	5.625	266.955	3.040	6.925	0.439
240	5.290	267.290	2.705	6.925	0.391
270	5.010	267.570	2.425	6.925	0.350
300	4.764	267.816	2.179	6.925	0.315
360	4.335	268.245	1.750	6.925	0.253
420	4.032	268.548	1.447	6.925	0.209
480	3.785	268.795	1.200	6.925	0.173
540	3.583	268.997	0.998	6.925	0.144
618	3.390	269.190	0.805	6.925	0.116
660	3.302	269.278	0.717	6.925	0.104
720	3.203	269.377	0.618	6.925	0.089
780	3.118	269.462	0.533	6.925	0.077
840	3.047	269.533	0.462	6.925	0.067
900	2.994	269.586	0.409	6.925	0.059

Appendix D: In-Situ Hydraulic Conductivity Analyses - MW-10D



In-Situ Hydraulic Conductivity Analyses - MW-10S

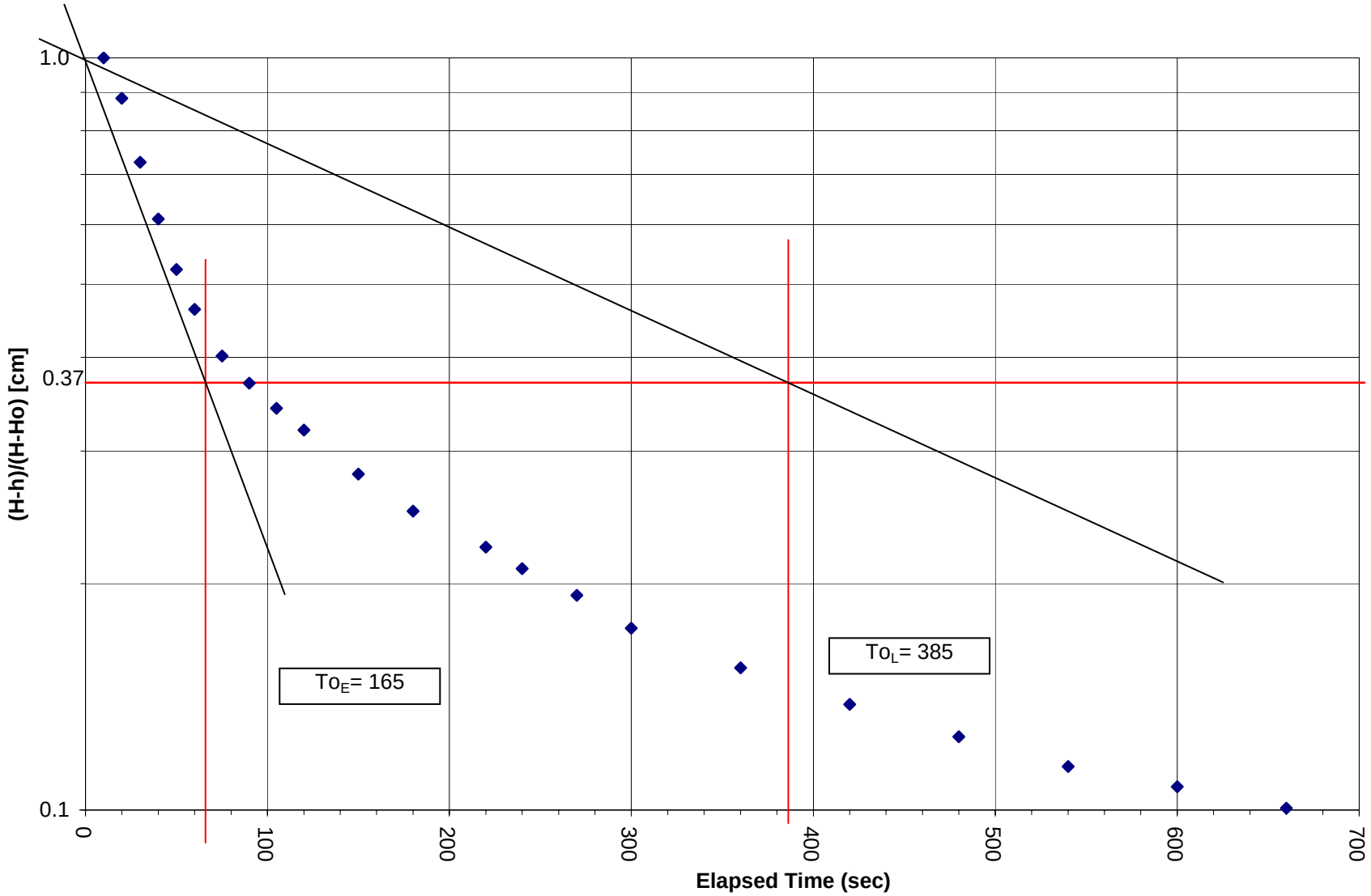
Date: 26-Jan-12

Conducted By:	A.C, X.X, M.S	
Well Depth:	6.97	mbtor
Stick Up:	1.020	m
Ground Elevation:	271.630	masl
Well Elevation:	272.650	masl
Initial Water Level:	2.66	mbtor
Static Water Level (H):	4.31	m
Head at time = 0 (Ho):	2.8	m
Screen Length (L):	3.048	m
Radius of Borehole (R):	0.1016	m
Radius of Monitoring Well (r):	0.0254	m

To(early):	2.8	min
To(late):	385	min
K(early):	2.18E-06	m/s
K(late):	1.56E-08	m/s
K(average):	1.84E-07	m/s
Recovery:	97.3%	

Time (seconds)	WL (mtoc)	WL (masl)	H-h	H-Ho	(H-h)/(H-Ho)
10	4.120	268.530	1.462	1.462	1.000
20	3.950	268.700	1.292	1.462	0.884
30	3.720	268.930	1.062	1.462	0.726
40	3.551	269.099	0.893	1.462	0.611
50	3.423	269.227	0.765	1.462	0.523
60	3.335	269.315	0.677	1.462	0.463
75	3.245	269.405	0.587	1.462	0.402
90	3.198	269.452	0.540	1.462	0.369
105	3.158	269.492	0.500	1.462	0.342
120	3.126	269.524	0.468	1.462	0.320
150	3.067	269.583	0.409	1.462	0.280
180	3.023	269.627	0.365	1.462	0.250
220	2.985	269.665	0.327	1.462	0.224
240	2.964	269.686	0.306	1.462	0.209
270	2.940	269.710	0.282	1.462	0.193
300	2.913	269.737	0.255	1.462	0.174
360	2.884	269.766	0.226	1.462	0.155
420	2.860	269.790	0.202	1.462	0.138
480	2.841	269.809	0.183	1.462	0.125
540	2.825	269.825	0.167	1.462	0.114
600	2.815	269.835	0.157	1.462	0.107
660	2.805	269.845	0.147	1.462	0.101
900	2.776	269.874	0.118	1.462	0.081

Appendix D: In-Situ Hydraulic Conductivity Analyses - MW-10S



In-Situ Hydraulic Conductivity Analyses - MW-11S

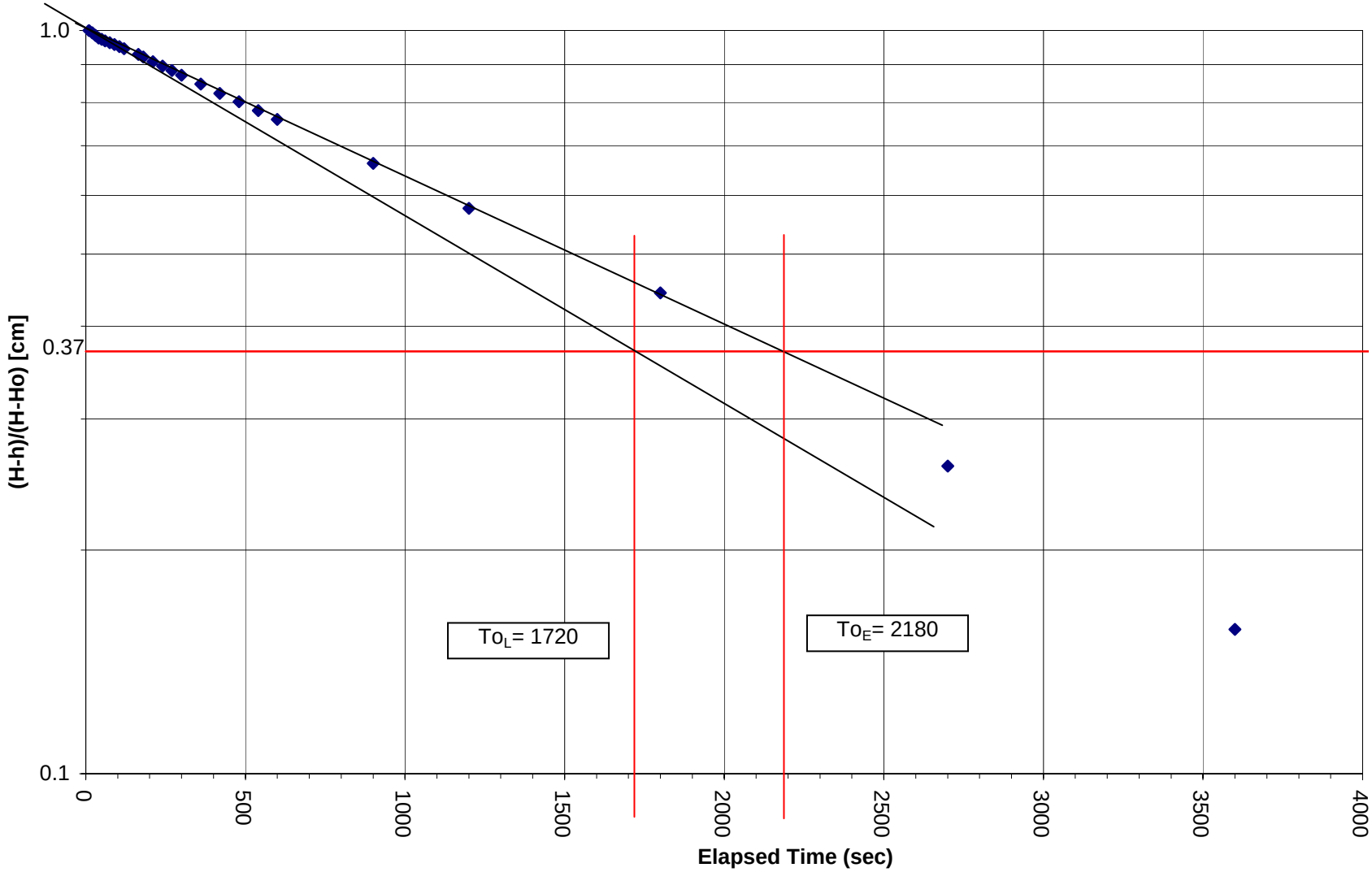
Date: 26-Jan-12

Conducted By:	A.C, X.X, M.S	
Well Depth:	7.02	mbtor
Stick Up:	1.080	m
Ground Elevation:	277.330	masl
Well Elevation:	278.410	masl
Initial Water Level:	3.39	mbtor
Static Water Level (H):	3.63	m
Head at time = 0 (Ho):	0.0	m
Screen Length (L):	3.048	m
Radius of Borehole (R):	0.1016	m
Radius of Monitoring Well (r):	0.0254	m

To(early):	36.3	min
To(late):	28.66666667	min
K(early):	1.65E-07	m/s
K(late):	2.09E-07	m/s
K(average):	1.86E-07	m/s
Recovery:	84.5%	

Time (seconds)	WL (mtoc)	WL (masl)	H-h	H-Ho	(H-h)/(H-Ho)
10	6.975	271.435	3.586	3.586	1.000
20	6.949	271.461	3.560	3.586	0.993
30	6.920	271.490	3.531	3.586	0.985
40	6.891	271.519	3.502	3.586	0.977
50	6.877	271.533	3.488	3.586	0.973
60	6.861	271.549	3.472	3.586	0.968
75	6.841	271.569	3.452	3.586	0.963
90	6.822	271.588	3.433	3.586	0.957
105	6.801	271.609	3.412	3.586	0.951
120	6.779	271.631	3.390	3.586	0.945
165	6.720	271.690	3.331	3.586	0.929
180	6.692	271.718	3.303	3.586	0.921
210	6.645	271.765	3.256	3.586	0.908
240	6.600	271.810	3.211	3.586	0.895
270	6.556	271.854	3.167	3.586	0.883
300	6.511	271.899	3.122	3.586	0.871
360	6.427	271.983	3.038	3.586	0.847
420	6.339	272.071	2.950	3.586	0.823
480	6.265	272.145	2.876	3.586	0.802
540	6.188	272.222	2.799	3.586	0.781
600	6.111	272.299	2.722	3.586	0.759
900	5.765	272.645	2.376	3.586	0.663
1200	5.456	272.954	2.067	3.586	0.576
1800	4.980	273.430	1.591	3.586	0.444
2700	4.319	274.091	0.930	3.586	0.259
3600	3.950	274.460	0.561	3.586	0.156

Appendix D: In-Situ Hydraulic Conductivity Analyses - MW-11S



In-Situ Hydraulic Conductivity Analyses - MW-12S

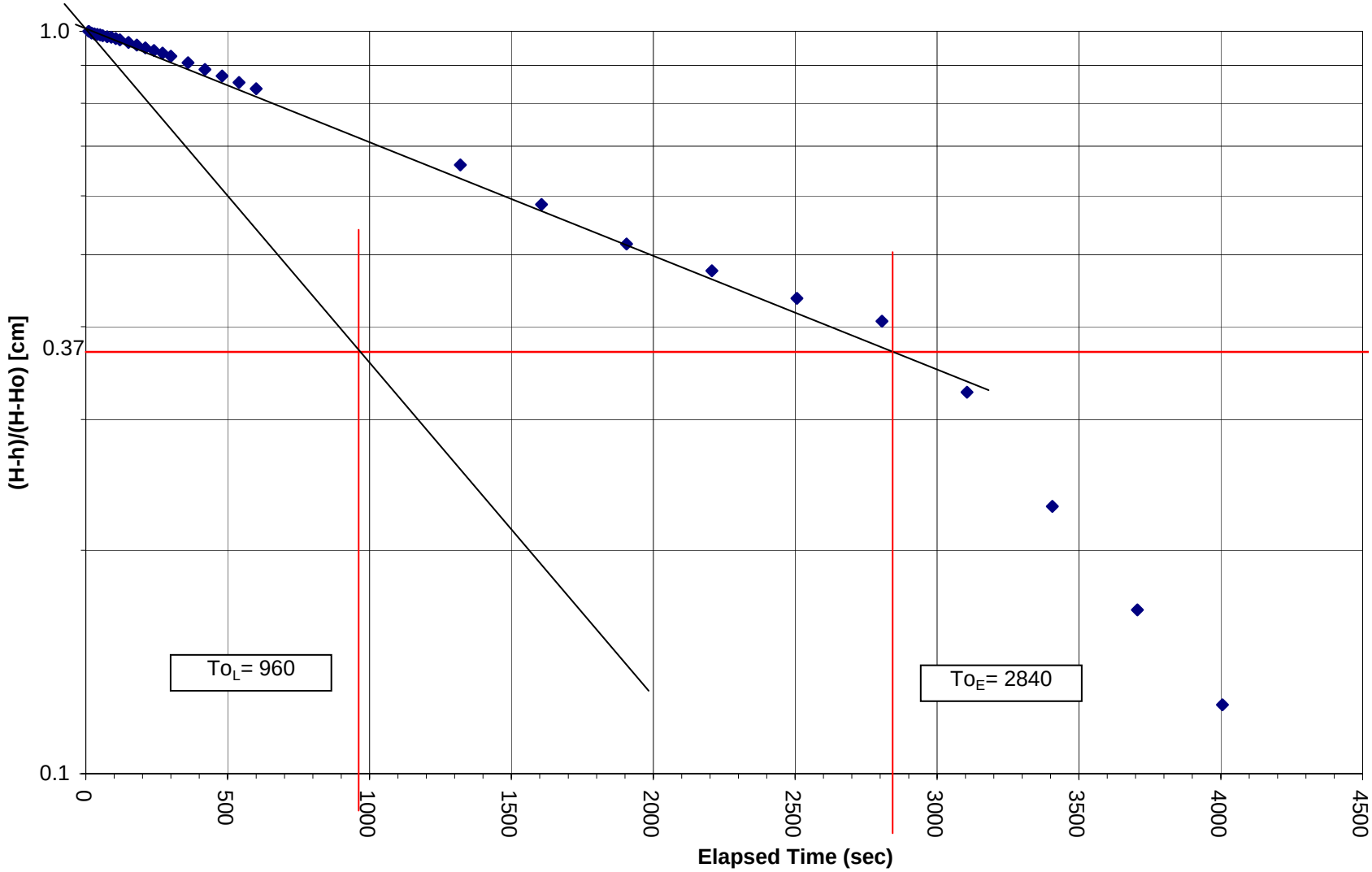
Date: 26-Jan-12

Conducted By:	A.C, X.X, M.S	
Well Depth:	7.19	mbtor
Stick Up:	1.030	m
Ground Elevation:	284.450	masl
Well Elevation:	285.480	masl
Initial Water Level:	2.42	mbtor
Static Water Level (H):	4.77	m
Head at time = 0 (Ho):	0.3	m
Screen Length (L):	3.048	m
Radius of Borehole (R):	0.1016	m
Radius of Monitoring Well (r):	0.0254	m

To(early):	47.3	min
To(late):	16	min
K(early):	1.27E-07	m/s
K(late):	3.75E-07	m/s
K(average):	2.18E-07	m/s
Recovery:	94.2%	

Time (seconds)	WL (mtoc)	WL (masl)	H-h	H-Ho	(H-h)/(H-Ho)
10	6.930	278.550	4.510	4.510	1.000
20	6.904	278.576	4.484	4.510	0.994
30	6.894	278.586	4.474	4.510	0.992
40	6.886	278.594	4.466	4.510	0.990
50	6.878	278.602	4.458	4.510	0.988
60	6.870	278.610	4.450	4.510	0.987
75	6.856	278.624	4.436	4.510	0.984
90	6.846	278.634	4.426	4.510	0.981
105	6.831	278.649	4.411	4.510	0.978
120	6.812	278.668	4.392	4.510	0.974
150	6.775	278.705	4.355	4.510	0.966
180	6.740	278.740	4.320	4.510	0.958
210	6.704	278.776	4.284	4.510	0.950
240	6.670	278.810	4.250	4.510	0.942
270	6.633	278.847	4.213	4.510	0.934
300	6.593	278.887	4.173	4.510	0.925
360	6.511	278.969	4.091	4.510	0.907
420	6.427	279.053	4.007	4.510	0.888
480	6.346	279.134	3.926	4.510	0.871
540	6.268	279.212	3.848	4.510	0.853
600	6.194	279.286	3.774	4.510	0.837
1320	5.400	280.080	2.980	4.510	0.661
1606	5.056	280.424	2.636	4.510	0.584
1906	4.751	280.729	2.331	4.510	0.517
2206	4.565	280.920	2.145	4.510	0.476
2506	4.390	281.090	1.970	4.510	0.437
2806	4.255	281.225	1.835	4.510	0.407
3106	3.892	281.588	1.472	4.510	0.326
3406	3.453	282.027	1.033	4.510	0.229
3706	3.170	282.310	0.750	4.510	0.166
4006	2.979	282.501	0.559	4.510	0.124
4306	2.848	282.632	0.428	4.510	0.095
4606	2.785	282.695	0.365	4.510	0.081

Appendix D: In-Situ Hydraulic Conductivity Analyses - MW-12S



In-Situ Hydraulic Conductivity Analyses - MW-12D

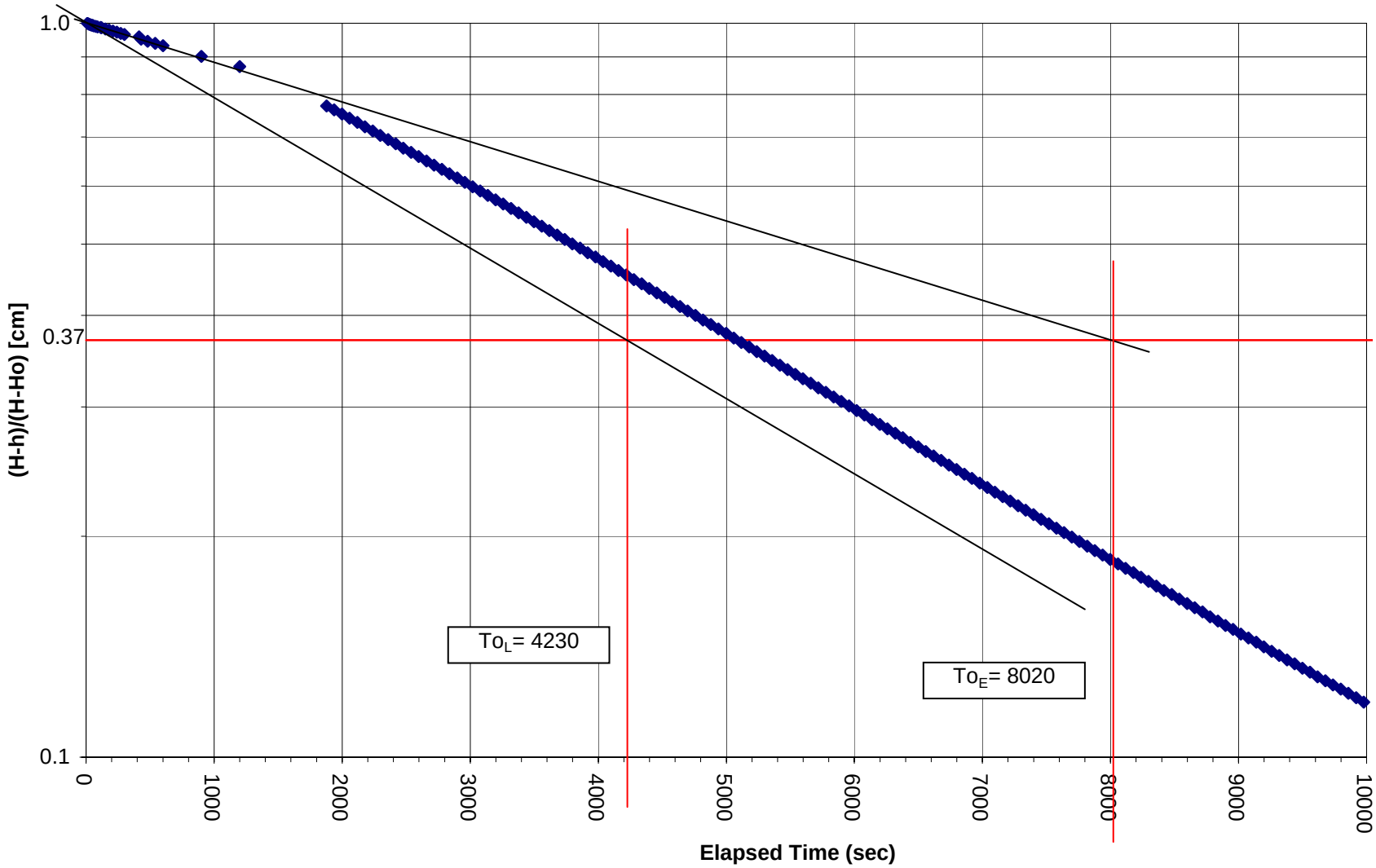
Date: 3-Feb-12

Conducted By:	A.C., B.S.	
Well Depth:	11.66	mbtor
Stick Up:	1.000	m
Ground Elevation:	284.420	masl
Well Elevation:	285.420	masl
Initial Water Level:	2.54	mbtor
Static Water Level (H):	9.12	m
Head at time = 0 (Ho):	0.1	m
Screen Length (L):	3.048	m
Radius of Borehole (R):	0.1016	m
Radius of Monitoring Well (r):	0.0254	m

To(early):	133.7	min
To(late):	70.5	min
K(early):	4.49E-08	m/s
K(late):	8.51E-08	m/s
K(average):	6.18E-08	m/s
Recovery:	90.5%	

Time (seconds)	WL (mtoc)	WL (masl)	H-h	H-Ho	(H-h)/(H-Ho)
10	11.520	273.900	8.984	8.984	1.000
20	11.501	273.919	8.965	8.984	0.998
30	11.480	273.940	8.944	8.984	0.996
40	11.470	273.950	8.934	8.984	0.994
50	11.458	273.962	8.922	8.984	0.993
60	11.450	273.970	8.914	8.984	0.992
75	11.433	273.987	8.897	8.984	0.990
90	11.420	274.000	8.884	8.984	0.989
115	11.406	274.014	8.870	8.984	0.987
120	11.393	274.027	8.857	8.984	0.986
150	11.362	274.058	8.826	8.984	0.982
180	11.331	274.089	8.795	8.984	0.979
210	11.299	274.121	8.763	8.984	0.975
240	11.270	274.150	8.734	8.984	0.972
270	11.238	274.182	8.702	8.984	0.969
300	11.208	274.212	8.672	8.984	0.965
413	11.145	274.275	8.609	8.984	0.958
429	11.084	274.336	8.548	8.984	0.951
480	11.028	274.392	8.492	8.984	0.945
540	10.969	274.451	8.433	8.984	0.939
600	10.911	274.509	8.375	8.984	0.932
900	10.635	274.785	8.099	8.984	0.901
1200	10.377	275.043	7.841	8.984	0.873
1878	9.466	275.954	6.930	8.984	0.771
1938	9.384	276.036	6.848	8.984	0.762
1998	9.293	276.127	6.757	8.984	0.752
2058	9.205	276.215	6.669	8.984	0.742
2118	9.117	276.303	6.581	8.984	0.732
2178	9.028	276.392	6.492	8.984	0.723
2238	8.942	276.478	6.406	8.984	0.713
2298	8.856	276.564	6.320	8.984	0.703
2358	8.774	276.646	6.238	8.984	0.694
2418	8.690	276.730	6.154	8.984	0.685

Appendix D: In-Situ Hydraulic Conductivity Analyses - MW-12D



APPENDIX E

Laboratory Certificates of Analyses of Groundwater

Your Project #: L09-301
Your C.O.C. #: 32124101, 321241-01-01

Attention: Alexandra Chan
Cole Engineering Group Ltd
70 Valleywood Dr
Markham, ON
CANADA L3R 4T5

Report Date: 2012/02/02

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B213206
Received: 2012/01/27, 13:55

Sample Matrix: Water
Samples Received: 4

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Method Reference
Alkalinity	4	N/A	2012/01/30	CAM SOP-00448	SM 2320B
Carbonate, Bicarbonate and Hydroxide	4	N/A	2012/01/31	CAM SOP-00102	APHA 4500-CO2 D
Chloride by Automated Colourimetry	4	N/A	2012/01/31	CAM SOP-00463	EPA 325.2
Conductivity	4	N/A	2012/01/30	CAM SOP-00448	SM 2510
Dissolved Organic Carbon (DOC)	1	N/A	2012/01/30	CAM SOP-00446	SM 5310 B
Dissolved Organic Carbon (DOC)	3	N/A	2012/01/31	CAM SOP-00446	SM 5310 B
Hardness (calculated as CaCO3)	4	N/A	2012/02/01	CAM SOP 00102	SM 2340 B
Dissolved Metals by ICPMS	4	N/A	2012/02/01	CAM SOP-00447	EPA 6020
Ion Balance (% Difference)	4	N/A	2012/02/01		
Anion and Cation Sum	4	N/A	2012/02/01		
Total Ammonia-N	4	N/A	2012/02/01	CAM SOP-00441	US GS I-2522-90
Nitrate (NO3) and Nitrite (NO2) in Water (1)	4	N/A	2012/01/31	CAM SOP-00440	SM 4500 NO3I/NO2B
pH	4	N/A	2012/01/30	CAM SOP-00448	SM 4500H+ B
Orthophosphate	4	N/A	2012/01/31	CAM SOP-00461	EPA 365.1
Sat. pH and Langelier Index (@ 20C)	4	N/A	2012/02/01		
Sat. pH and Langelier Index (@ 4C)	4	N/A	2012/02/01		
Sulphate by Automated Colourimetry	4	N/A	2012/01/31	CAM SOP-00464	EPA 375.4
Total Dissolved Solids (TDS calc)	4	N/A	2012/02/01		

Remarks:

Maxxam Analytics has performed all analytical testing herein in accordance with ISO 17025 and the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act. All methodologies comply with this document and are validated for use in the laboratory. The methods and techniques employed in this analysis conform to the performance criteria (detection limits, accuracy and precision) as outlined in the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act. Reporting results to two significant figures at the RDL is to permit statistical evaluation and is not intended to be an indication of analytical precision.

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

Maxxam Analytics is accredited by SCC (Lab ID 97) for all specific parameters as required by Ontario Regulation 153/04. Maxxam Analytics is limited in liability to the actual cost of analysis unless otherwise agreed in writing. There is no other warranty expressed or implied. Samples will be retained at Maxxam Analytics for three weeks from receipt of data or as per contract.

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

../2

Cole Engineering Group Ltd
Client Project #: L09-301

Maxxam Job #: B213206
Report Date: 2012/02/02

* Results relate only to the items tested.

(1) Values for calculated parameters may not appear to add up due to rounding of raw data and significant figures.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.

JOLANTA GORALCZYK, Project Manager
Email: JGoralczyk@maxxam.ca
Phone# (905) 817-5700

==========

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

Total cover pages: 2

Maxxam Job #: B213206
Report Date: 2012/02/02

Cole Engineering Group Ltd
Client Project #: L09-301

RCAP - COMPREHENSIVE (WATER)

Maxxam ID		MJ3577			MJ3578		MJ3579		MJ3580		
Sampling Date		2012/01/26 11:00			2012/01/26 15:20		2012/01/26 16:30		2012/01/26 16:30		
	Units	**MW-11S**	**RDL**	**QC Batch**	**MW-1S**	**QC Batch**	**MW-1D**	**QC Batch**	**DUPE**	**RDL**	**QC Batch**
Calculated Parameters											
Anion Sum	me/L	13.8	N/A	2748757	11.7	2748757	8.14	2748757	8.14	N/A	2748757
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	354	1.0	2748754	511	2748754	323	2748754	322	1.0	2748754
Calculated TDS	mg/L	808	1.0	2748762	620	2748762	432	2748762	433	1.0	2748762
Carb. Alkalinity (calc. as CaCO3)	mg/L	1.4	1.0	2748754	2.4	2748754	3.2	2748754	3.2	1.0	2748754
Cation Sum	me/L	15.7	N/A	2748757	12.1	2748757	8.46	2748757	8.45	N/A	2748757
Hardness (CaCO3)	mg/L	620	1.0	2749056	560	2749056	390	2749056	390	1.0	2749056
Ion Balance (% Difference)	%	6.63	N/A	2748756	1.95	2748756	1.91	2748756	1.89	N/A	2748756
Langelier Index (@ 20C)	N/A	0.966		2748758	1.14	2748758	0.950	2748758	0.960		2748758
Langelier Index (@ 4C)	N/A	0.719		2748760	0.889	2748760	0.702	2748760	0.711		2748760
Saturation pH (@ 20C)	N/A	6.66		2748758	6.56	2748758	7.07	2748758	7.07		2748758
Saturation pH (@ 4C)	N/A	6.91		2748760	6.81	2748760	7.32	2748760	7.32		2748760
Inorganics											
Total Ammonia-N	mg/L	0.06	0.05	2751615	0.38	2751615	0.16	2751615	0.15	0.05	2751615
Conductivity	umho/cm	1400	1	2750067	1040	2750067	749	2750067	748	1	2750067
Dissolved Organic Carbon	mg/L	1.8	0.2	2750276	3.9	2750276	1.0	2750276	1.1	0.2	2749893
Orthophosphate (P)	mg/L	ND	0.01	2749226	ND	2749226	ND	2749226	0.04	0.01	2749226
pH	pH	7.62		2750068	7.69	2750068	8.02	2750068	8.03		2750068
Dissolved Sulphate (SO4)	mg/L	110	1	2749227	38	2749227	49	2749227	50	1	2749227
Alkalinity (Total as CaCO3)	mg/L	355	1	2750065	514	2750065	326	2750065	325	1	2750065
Dissolved Chloride (Cl)	mg/L	150	2	2749224	21	2749224	21	2749224	21	1	2749224
Nitrite (N)	mg/L	ND	0.01	2749957	ND	2749994	ND	2749957	ND	0.01	2749994
Nitrate (N)	mg/L	2.4	0.1	2749957	0.3	2749994	ND	2749957	ND	0.1	2749994
Nitrate + Nitrite	mg/L	2.4	0.1	2749957	0.3	2749994	ND	2749957	ND	0.1	2749994

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

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

Maxxam Job #: B213206
Report Date: 2012/02/02

Cole Engineering Group Ltd
Client Project #: L09-301

RCAP - COMPREHENSIVE (WATER)

Maxxam ID		MJ3577			MJ3578		MJ3579		MJ3580		
Sampling Date		2012/01/26 11:00			2012/01/26 15:20		2012/01/26 16:30		2012/01/26 16:30		
	Units	**MW-11S**	**RDL**	**QC Batch**	**MW-1S**	**QC Batch**	**MW-1D**	**QC Batch**	**DUPE**	**RDL**	**QC Batch**
Metals											
Dissolved Aluminum (Al)	ug/L	ND	5.0	2751378	ND	2751378	ND	2751378	ND	5.0	2751378
Dissolved Antimony (Sb)	ug/L	ND	0.50	2751378	ND	2751378	ND	2751378	ND	0.50	2751378
Dissolved Arsenic (As)	ug/L	ND	1.0	2751378	1.9	2751378	1.1	2751378	1.1	1.0	2751378
Dissolved Barium (Ba)	ug/L	100	2.0	2751378	81	2751378	300	2751378	300	2.0	2751378
Dissolved Beryllium (Be)	ug/L	ND	0.50	2751378	ND	2751378	ND	2751378	ND	0.50	2751378
Dissolved Boron (B)	ug/L	47	10	2751378	28	2751378	23	2751378	23	10	2751378
Dissolved Cadmium (Cd)	ug/L	ND	0.10	2751378	ND	2751378	ND	2751378	ND	0.10	2751378
Dissolved Calcium (Ca)	ug/L	210000	200	2751378	170000	2751378	75000	2751378	75000	200	2751378
Dissolved Chromium (Cr)	ug/L	ND	5.0	2751378	ND	2751378	ND	2751378	ND	5.0	2751378
Dissolved Cobalt (Co)	ug/L	ND	0.50	2751378	2.5	2751378	ND	2751378	ND	0.50	2751378
Dissolved Copper (Cu)	ug/L	ND	1.0	2751378	ND	2751378	ND	2751378	ND	1.0	2751378
Dissolved Iron (Fe)	ug/L	ND	100	2751378	1100	2751378	390	2751378	340	100	2751378
Dissolved Lead (Pb)	ug/L	ND	0.50	2751378	ND	2751378	ND	2751378	ND	0.50	2751378
Dissolved Magnesium (Mg)	ug/L	26000	50	2751378	35000	2751378	49000	2751378	48000	50	2751378
Dissolved Manganese (Mn)	ug/L	26	2.0	2751378	6500	2751378	28	2751378	28	2.0	2751378
Dissolved Molybdenum (Mo)	ug/L	0.92	0.50	2751378	0.60	2751378	2.2	2751378	2.3	0.50	2751378
Dissolved Nickel (Ni)	ug/L	2.5	1.0	2751378	ND	2751378	ND	2751378	ND	1.0	2751378
Dissolved Phosphorus (P)	ug/L	ND	100	2751378	ND	2751378	ND	2751378	ND	100	2751378
Dissolved Potassium (K)	ug/L	1800	200	2751378	1300	2751378	3000	2751378	3000	200	2751378
Dissolved Selenium (Se)	ug/L	ND	2.0	2751378	ND	2751378	ND	2751378	ND	2.0	2751378
Dissolved Silicon (Si)	ug/L	8400	50	2751378	9500	2751378	12000	2751378	12000	50	2751378
Dissolved Silver (Ag)	ug/L	0.11	0.10	2751378	ND	2751378	ND	2751378	ND	0.10	2751378
Dissolved Sodium (Na)	ug/L	74000	100	2751378	19000	2751378	15000	2751378	14000	100	2751378
Dissolved Strontium (Sr)	ug/L	430	1.0	2751378	420	2751378	670	2751378	680	1.0	2751378
Dissolved Thallium (Tl)	ug/L	0.050	0.050	2751378	ND	2751378	ND	2751378	ND	0.050	2751378
Dissolved Titanium (Ti)	ug/L	ND	5.0	2751378	ND	2751378	ND	2751378	ND	5.0	2751378
Dissolved Uranium (U)	ug/L	1.1	0.10	2751378	0.95	2751378	ND	2751378	ND	0.10	2751378
Dissolved Vanadium (V)	ug/L	0.68	0.50	2751378	0.71	2751378	0.52	2751378	ND	0.50	2751378
Dissolved Zinc (Zn)	ug/L	ND	5.0	2751378	ND	2751378	ND	2751378	ND	5.0	2751378

ND = Not detected
RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam Job #: B213206
Report Date: 2012/02/02

Cole Engineering Group Ltd
Client Project #: L09-301

Test Summary

Maxxam ID MJ3577
Sample ID MW-11S
Matrix Water

Collected 2012/01/26
Shipped
Received 2012/01/27

Test Description	Instrumentation	Batch	Extracted	Analyzed	Analyst
Alkalinity	PH	2750065	N/A	2012/01/30	YOGESH PATEL
Carbonate, Bicarbonate and Hydroxide	CALC	2748754	N/A	2012/01/31	AUTOMATED STATCHK
Chloride by Automated Colourimetry	AC	2749224	N/A	2012/01/31	DEONARINE RAMNARINE
Conductivity	COND	2750067	N/A	2012/01/30	YOGESH PATEL
Dissolved Organic Carbon (DOC)	TOCV/NDIR	2750276	N/A	2012/01/31	CHARLES OPOKU-WARE
Hardness (calculated as CaCO3)		2749056	N/A	2012/02/01	AUTOMATED STATCHK
Dissolved Metals by ICPMS	ICP/MS	2751378	N/A	2012/02/01	JOHN BOWMAN
Ion Balance (% Difference)	CALC	2748756	N/A	2012/02/01	AUTOMATED STATCHK
Anion and Cation Sum	CALC	2748757	N/A	2012/02/01	AUTOMATED STATCHK
Total Ammonia-N	LACH/NH4	2751615	N/A	2012/02/01	ALINA DOBREANU
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	2749957	N/A	2012/01/31	BAVANI KAILAYA
pH	PH	2750068	N/A	2012/01/30	YOGESH PATEL
Orthophosphate	AC	2749226	N/A	2012/01/31	DEONARINE RAMNARINE
Sat. pH and Langelier Index (@ 20C)	CALC	2748758	N/A	2012/02/01	AUTOMATED STATCHK
Sat. pH and Langelier Index (@ 4C)	CALC	2748760	N/A	2012/02/01	AUTOMATED STATCHK
Sulphate by Automated Colourimetry	AC	2749227	N/A	2012/01/31	DEONARINE RAMNARINE
Total Dissolved Solids (TDS calc)	CALC	2748762	N/A	2012/02/01	AUTOMATED STATCHK

Maxxam ID MJ3578
Sample ID MW-1S
Matrix Water

Collected 2012/01/26
Shipped
Received 2012/01/27

Test Description	Instrumentation	Batch	Extracted	Analyzed	Analyst
Alkalinity	PH	2750065	N/A	2012/01/30	YOGESH PATEL
Carbonate, Bicarbonate and Hydroxide	CALC	2748754	N/A	2012/01/31	AUTOMATED STATCHK
Chloride by Automated Colourimetry	AC	2749224	N/A	2012/01/31	DEONARINE RAMNARINE
Conductivity	COND	2750067	N/A	2012/01/30	YOGESH PATEL
Dissolved Organic Carbon (DOC)	TOCV/NDIR	2750276	N/A	2012/01/31	CHARLES OPOKU-WARE
Hardness (calculated as CaCO3)		2749056	N/A	2012/02/01	AUTOMATED STATCHK
Dissolved Metals by ICPMS	ICP/MS	2751378	N/A	2012/02/01	JOHN BOWMAN
Ion Balance (% Difference)	CALC	2748756	N/A	2012/02/01	AUTOMATED STATCHK
Anion and Cation Sum	CALC	2748757	N/A	2012/02/01	AUTOMATED STATCHK
Total Ammonia-N	LACH/NH4	2751615	N/A	2012/02/01	ALINA DOBREANU

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Maxxam Job #: B213206
Report Date: 2012/02/02

Cole Engineering Group Ltd
Client Project #: L09-301

Test Summary

Nitrate (NO3) and Nitrite (NO2) in Water	LACH	2749994	N/A	2012/01/31	BAVANI KAILAYA
pH	PH	2750068	N/A	2012/01/30	YOGESH PATEL
Orthophosphate	AC	2749226	N/A	2012/01/31	DEONARINE RAMNARINE
Sat. pH and Langelier Index (@ 20C)	CALC	2748758	N/A	2012/02/01	AUTOMATED STATCHK
Sat. pH and Langelier Index (@ 4C)	CALC	2748760	N/A	2012/02/01	AUTOMATED STATCHK
Sulphate by Automated Colourimetry	AC	2749227	N/A	2012/01/31	DEONARINE RAMNARINE
Total Dissolved Solids (TDS calc)	CALC	2748762	N/A	2012/02/01	AUTOMATED STATCHK

Maxxam ID MJ3579
Sample ID MW-1D
Matrix Water

Collected 2012/01/26
Shipped
Received 2012/01/27

Test Description	Instrumentation	Batch	Extracted	Analyzed	Analyst
Alkalinity	PH	2750065	N/A	2012/01/30	YOGESH PATEL
Carbonate, Bicarbonate and Hydroxide	CALC	2748754	N/A	2012/01/31	AUTOMATED STATCHK
Chloride by Automated Colourimetry	AC	2749224	N/A	2012/01/31	DEONARINE RAMNARINE
Conductivity	COND	2750067	N/A	2012/01/30	YOGESH PATEL
Dissolved Organic Carbon (DOC)	TOCV/NDIR	2750276	N/A	2012/01/31	CHARLES OPOKU-WARE
Hardness (calculated as CaCO3)		2749056	N/A	2012/02/01	AUTOMATED STATCHK
Dissolved Metals by ICPMS	ICP/MS	2751378	N/A	2012/02/01	JOHN BOWMAN
Ion Balance (% Difference)	CALC	2748756	N/A	2012/02/01	AUTOMATED STATCHK
Anion and Cation Sum	CALC	2748757	N/A	2012/02/01	AUTOMATED STATCHK
Total Ammonia-N	LACH/NH4	2751615	N/A	2012/02/01	ALINA DOBREANU
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	2749957	N/A	2012/01/31	BAVANI KAILAYA
pH	PH	2750068	N/A	2012/01/30	YOGESH PATEL
Orthophosphate	AC	2749226	N/A	2012/01/31	DEONARINE RAMNARINE
Sat. pH and Langelier Index (@ 20C)	CALC	2748758	N/A	2012/02/01	AUTOMATED STATCHK
Sat. pH and Langelier Index (@ 4C)	CALC	2748760	N/A	2012/02/01	AUTOMATED STATCHK
Sulphate by Automated Colourimetry	AC	2749227	N/A	2012/01/31	DEONARINE RAMNARINE
Total Dissolved Solids (TDS calc)	CALC	2748762	N/A	2012/02/01	AUTOMATED STATCHK

Maxxam Job #: B213206
Report Date: 2012/02/02

Cole Engineering Group Ltd
Client Project #: L09-301

Test Summary

Maxxam ID MJ3580
Sample ID DUPE
Matrix Water

Collected 2012/01/26
Shipped
Received 2012/01/27

Test Description	Instrumentation	Batch	Extracted	Analyzed	Analyst
Alkalinity	PH	2750065	N/A	2012/01/30	YOGESH PATEL
Carbonate, Bicarbonate and Hydroxide	CALC	2748754	N/A	2012/01/31	AUTOMATED STATCHK
Chloride by Automated Colourimetry	AC	2749224	N/A	2012/01/31	DEONARINE RAMNARINE
Conductivity	COND	2750067	N/A	2012/01/30	YOGESH PATEL
Dissolved Organic Carbon (DOC)	TOCV/NDIR	2749893	N/A	2012/01/30	CHARLES OPOKU-WARE
Hardness (calculated as CaCO3)		2749056	N/A	2012/02/01	AUTOMATED STATCHK
Dissolved Metals by ICPMS	ICP/MS	2751378	N/A	2012/02/01	JOHN BOWMAN
Ion Balance (% Difference)	CALC	2748756	N/A	2012/02/01	AUTOMATED STATCHK
Anion and Cation Sum	CALC	2748757	N/A	2012/02/01	AUTOMATED STATCHK
Total Ammonia-N	LACH/NH4	2751615	N/A	2012/02/01	ALINA DOBREANU
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	2749994	N/A	2012/01/31	BAVANI KAILAYA
pH	PH	2750068	N/A	2012/01/30	YOGESH PATEL
Orthophosphate	AC	2749226	N/A	2012/01/31	DEONARINE RAMNARINE
Sat. pH and Langelier Index (@ 20C)	CALC	2748758	N/A	2012/02/01	AUTOMATED STATCHK
Sat. pH and Langelier Index (@ 4C)	CALC	2748760	N/A	2012/02/01	AUTOMATED STATCHK
Sulphate by Automated Colourimetry	AC	2749227	N/A	2012/01/31	DEONARINE RAMNARINE
Total Dissolved Solids (TDS calc)	CALC	2748762	N/A	2012/02/01	AUTOMATED STATCHK

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Maxxam Job #: B213206
Report Date: 2012/02/02

Cole Engineering Group Ltd
Client Project #: L09-301

QUALITY ASSURANCE REPORT

			Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	Units	Value (%)	QC Limits	% Recovery	QC Limits
2749224	Dissolved Chloride (Cl)	2012/01/31	110	75 - 125	102	80 - 120	ND, RDL=1	mg/L	NC	20		
2749226	Orthophosphate (P)	2012/01/31	109	75 - 125	101	80 - 120	ND, RDL=0.01	mg/L	NC	25		
2749227	Dissolved Sulphate (SO4)	2012/01/31	101	75 - 125	105	80 - 120	ND, RDL=1	mg/L	NC	20		
2749893	Dissolved Organic Carbon	2012/01/30	103	80 - 120	98	80 - 120	ND, RDL=0.2	mg/L	0.7	20		
2749957	Nitrite (N)	2012/01/31	99	80 - 120	100	85 - 115	ND, RDL=0.01	mg/L	NC	25		
2749957	Nitrate (N)	2012/01/31	106	80 - 120	102	85 - 115	ND, RDL=0.1	mg/L	NC	25		
2749994	Nitrite (N)	2012/01/31	102	80 - 120	98	85 - 115	ND, RDL=0.01	mg/L	NC	25		
2749994	Nitrate (N)	2012/01/31	107	80 - 120	101	85 - 115	ND, RDL=0.1	mg/L	NC	25		
2750065	Alkalinity (Total as CaCO3)	2012/01/30					ND, RDL=1	mg/L	1.2	25	97	85 - 115
2750067	Conductivity	2012/01/30					ND, RDL=1	umho/cm	0.1	25	102	85 - 115
2750276	Dissolved Organic Carbon	2012/01/31	94	80 - 120	97	80 - 120	ND, RDL=0.2	mg/L	0	20		
2751378	Dissolved Aluminum (Al)	2012/02/01	106	80 - 120	106	80 - 120	ND, RDL=5.0	ug/L				
2751378	Dissolved Antimony (Sb)	2012/02/01	112	80 - 120	103	80 - 120	0.70, RDL=0.50	ug/L	NC	20		
2751378	Dissolved Arsenic (As)	2012/02/01	105	80 - 120	100	80 - 120	ND, RDL=1.0	ug/L	0.3	20		
2751378	Dissolved Barium (Ba)	2012/02/01	103	80 - 120	100	80 - 120	ND, RDL=2.0	ug/L	1.3	20		
2751378	Dissolved Beryllium (Be)	2012/02/01	109	80 - 120	104	80 - 120	ND, RDL=0.50	ug/L	NC	20		
2751378	Dissolved Boron (B)	2012/02/01	109	80 - 120	104	80 - 120	ND, RDL=10	ug/L	2.8	20		
2751378	Dissolved Cadmium (Cd)	2012/02/01	108	80 - 120	104	80 - 120	ND, RDL=0.10	ug/L	NC	20		
2751378	Dissolved Calcium (Ca)	2012/02/01	NC	80 - 120	101	80 - 120	ND, RDL=200	ug/L				
2751378	Dissolved Chromium (Cr)	2012/02/01	105	80 - 120	100	80 - 120	ND, RDL=5.0	ug/L	NC	20		
2751378	Dissolved Cobalt (Co)	2012/02/01	102	80 - 120	99	80 - 120	ND, RDL=0.50	ug/L	NC	20		
2751378	Dissolved Copper (Cu)	2012/02/01	98	80 - 120	97	80 - 120	ND, RDL=1.0	ug/L	NC	20		
2751378	Dissolved Iron (Fe)	2012/02/01	105	80 - 120	103	80 - 120	ND, RDL=100	ug/L				
2751378	Dissolved Lead (Pb)	2012/02/01	103	80 - 120	100	80 - 120	ND, RDL=0.50	ug/L	NC	20		
2751378	Dissolved Magnesium (Mg)	2012/02/01	NC	80 - 120	106	80 - 120	ND, RDL=50	ug/L				
2751378	Dissolved Manganese (Mn)	2012/02/01	NC	80 - 120	101	80 - 120	ND, RDL=2.0	ug/L	0.3	20		
2751378	Dissolved Molybdenum (Mo)	2012/02/01	113	80 - 120	106	80 - 120	ND, RDL=0.50	ug/L	2.3	20		
2751378	Dissolved Nickel (Ni)	2012/02/01	99	80 - 120	98	80 - 120	ND, RDL=1.0	ug/L	NC	20		
2751378	Dissolved Phosphorus (P)	2012/02/01	108	80 - 120	99	80 - 120	ND, RDL=100	ug/L				
2751378	Dissolved Potassium (K)	2012/02/01	NC	80 - 120	103	80 - 120	ND, RDL=200	ug/L				
2751378	Dissolved Selenium (Se)	2012/02/01	107	80 - 120	102	80 - 120	ND, RDL=2.0	ug/L	NC	20		
2751378	Dissolved Silicon (Si)	2012/02/01	106	80 - 120	105	80 - 120	ND, RDL=50	ug/L				
2751378	Dissolved Silver (Ag)	2012/02/01	91	80 - 120	101	80 - 120	0.10, RDL=0.10	ug/L	NC	20		
2751378	Dissolved Sodium (Na)	2012/02/01	NC	80 - 120	107	80 - 120	ND, RDL=100	ug/L	0.3	20		
2751378	Dissolved Strontium (Sr)	2012/02/01	NC	80 - 120	104	80 - 120	ND, RDL=1.0	ug/L				
2751378	Dissolved Thallium (Tl)	2012/02/01	103	80 - 120	100	80 - 120	ND, RDL=0.050	ug/L	NC	20		
2751378	Dissolved Titanium (Ti)	2012/02/01	109	80 - 120	102	80 - 120	ND, RDL=5.0	ug/L				
2751378	Dissolved Uranium (U)	2012/02/01	104	80 - 120	99	80 - 120	ND, RDL=0.10	ug/L	1.2	20		
2751378	Dissolved Vanadium (V)	2012/02/01	106	80 - 120	101	80 - 120	ND, RDL=0.50	ug/L	NC	20		

Maxxam Job #: B213206
Report Date: 2012/02/02

Cole Engineering Group Ltd
Client Project #: L09-301

QUALITY ASSURANCE REPORT

			Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	Units	Value (%)	QC Limits	% Recovery	QC Limits
2751378	Dissolved Zinc (Zn)	2012/02/01	101	80 - 120	103	80 - 120	ND, RDL=5.0	ug/L	NC	20		
2751615	Total Ammonia-N	2012/02/01	NC	80 - 120	102	85 - 115	ND, RDL=0.05	mg/L	0.7	20		

N/A = Not Applicable
RDL = Reportable Detection Limit
RPD = Relative Percent Difference
Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.
Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.
QC Standard: A blank matrix to which a known amount of the analyte has been added. Used to evaluate analyte recovery.
Spiked Blank: A blank matrix to which a known amount of the analyte has been added. Used to evaluate analyte recovery.
Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.
NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spiked amount was not sufficiently significant to permit a reliable recovery calculation.
NC (RPD): The RPD was not calculated. The level of analyte detected in the parent sample and its duplicate was not sufficiently significant to permit a reliable calculation.

Validation Signature Page

Maxxam Job #: B213206

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

CRISTINA CARRIERE, Scientific Services

==========

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

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

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27-Jan-12 13:55
JOLANTA GORALCZYK
B213206
SEL ENV-645

CHAIN OF CUS

Page 1 of 1

INVOICE INFORMATION:

Company Name: #24008 Cole Engineering Group Ltd
Contact Name: Alexandra Chan
Address: 70 Valleywood Dr
Markham ON L3R 4T5
Phone: (905)940-6161 x435 Fax: (905)940-2064
Email: achan@coleengineering.ca

REPORT INFORMATION (if differs from invoice):

Company Name:
Contact Name: Alexandra Chan
Address:
Phone: (905)940-6161 x435 Fax:
Email: achan@coleengineering.ca

PROJECT INFORMATION:

Quotation #: B02064
P.O. #:
Project #: L09-301
Project Name: Macamenille
Site #:
Sampled By: AC, MS, XX

Lab Use Only:

BOTTLE ORDER #: 321241
CHAIN OF CUSTODY #: C#321241-01-01
PROJECT MANAGER: JOLANTA GORALCZYK

Regulation 153 (2011)

- [ ] Table 1
- [X] Table 2
- [ ] Table 3
- [ ] Table ___
- [X] Res/Park
- [X] Ind/Comm
- [ ] Agri/Other
- [ ] Medium/Fine
- [X] Coarse
- [ ] For RSC

Other Regulations

- [ ] CCME
- [ ] Reg. 558
- [ ] MISA
- [ ] PWQO
- [ ] Other ___
- [ ] Sanitary Sewer Bylaw
- [ ] Storm Sewer Bylaw
- Municipality ___

SPECIAL INSTRUCTIONS

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

Note: For MOE regulated drinking water samples - please use the Drinking Water Chain of Custody Form

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

ANALYSIS REQUESTED (Please be specific):

TURNAROUND TIME (TAT) REQUIRED:

PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS

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

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

	Sample Barcode Label	Sample (Location) Identification	Date Sampled	Time Sampled	Matrix	Regulated Drinking Water ? (Y / N)	Metals Field Filtered ? (Y / N)	RCAp - Comprehensive	# of Bottles	Comments
1		MW-11S	Jan26'12	11:00 AM	GW	N	Y	X	4	
2		MW-1S		3:20PM	GW	N	Y	X	4	
3		MW-1D		4:30PM	GW	N	Y	X	4	
4		DUPE		4:30PM	GW	N	Y	X	4	
5										
6										
7										
8										
9										
10										

*RELINQUISHED BY: (Signature/Print)	Date: (YY/MM/DD)	Time:	RECEIVED BY: (Signature/Print)	Date: (YY/MM/DD)	Time:	# Jars Used and Not Submitted
Alexandra Chan Alexandra Chan	12/01/27		MS ACKN PATH	2012/01/27	13:55	

Laboratory Use Only

Time Sensitive	Temperature (°C) on Receipt	Custody Seal	Yes	No
1	8/0.1°C	Present	✓	
		Intact	✓	

White: Maxxam Yellow: Client

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

APPENDIX F

Surrounding Private Wells Records

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 # DEPTHS TO WHICH FORMATIONS EXTEND[5,11]
CHATHAM CITY ()	17 621806 4877691[W]	2007/07 6607	02	FR 0004			10	7048432 (Z72465) A059203 BRWN FILL 0003 BRWN CLAY 0010
TBD ()	17 621951 4879129[W]	2006/04 7241	01				8 9	6930191 (Z45971) A039313 BRWN SAND GRVL LOOS 0003 BRWN SILT CLAY WBRG 0009 GREY SILT CLAY WBRG 0017
EAST GWILLIMBURY TOW YS W 01(100)	17 620334 4880552[L]	2002/08 6418				NU		6926583 (251055)
EAST GWILLIMBURY TOW YS W 01(100)	17 620334 4880552[L]	2002/08 6418				NU		6926582 (251054)
EAST GWILLIMBURY TOW YS W 01(100)	17 621366 4880748[W]	1969/11 3414	06	FR 0412	112 / 250 025 / 10:0	CO	412 13	6909571 () YLLW CLAY 0056 BLUE CLAY GRVL 0077 GREY SILT MSND GRVL 0084 BLUE CLAY SILT 0150 BLUE CLAY 0291 GREY MSND GRVL SILT 0312 BLUE CLAY GRVL STNS 0375 GREY SILT MSND 0377 GREY CLAY GRVL 0412 GREY MSND SILT 0425
EAST GWILLIMBURY TOW YS W 01(100)	17 619851 4880611[W]	1972/07 4102	30	FR 0024	024 / / :0	DO		6911322 () BRWN CLAY STNS 0020 BRWN CSND 0032 BLUE CLAY 0037
EAST GWILLIMBURY TOW YS W 01(100)	17 620115 4880673[W]	1976/06 3109	30	FR 0056	018 / / :0	DO		6913840 () LOAM 0002 BRWN CLAY 0018 BLUE CLAY 0032 BLUE CLAY STNY 0056 FGVL 0058
EAST GWILLIMBURY TOW 02(006)	17 619340 4880766[W]	2006/07 1350	06	FR 0151	123 / 128 012 / 1:0	DO		6930547 (Z30567) A028547 YLLW CLAY GRVL 0025 BRWN GRVL HARD 0051 GREY CLAY 0059 GREY CLAY GRVL 0070 GREY CLAY DNSE 0139 GREY GRVL SAND CLAY 0151 BRWN GRVL 0153
KING TOWNSHIP CON 02(027)	17 618420 4875893[W]	1988/09 1413	06	FR 0392	252 / 045 / 4:15	NU	388 4	6919866 (27558) BRWN CLAY STNS SNDY 0004 BRWN SAND CLAY PCKD 0017 BRWN SAND STNS LOOS 0023 GREY CLAY STNS PCKD 0076 GREY CLAY STNS BLDR 0117 GREY CLAY SLTY 0191 GREY CLAY DNSE 0214 GREY CLAY SOFT SLTY 0226 GREY CLAY DNSE 0334 GREY CLAY SLTY SOFT 0346 BRWN SAND LOOS 0350 GREY CLAY PCKD 0369 BRWN GRVL SAND CLN 0392 GREY CLAY PCKD 0395

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 # DEPTHS TO WHICH FORMATIONS EXTEND[5,11]
KING TOWNSHIP CON 02(027)	17 618395 4875878[W]	1988/09 1413	06	FR 0400	255 / 060 / 6:50	DO	390 10	6919867 (27557) BRWN CLAY STNS SNDY 0005 BRWN SAND GRVL LOOS 0018 BRWN SAND GRVL LOOS 0022 GREY CLAY STNS BLDR 0079 GREY CLAY STNS DNSE 0121 GREY CLAY STNS SLTY 0193 GREY CLAY DNSE 0344 GREY CLAY SNDY 0360 GREY CLAY DNSE 0366 GREY CLAY SILT SOFT 0386 BRWN GRVL SAND CLN 0400 GREY CLAY SILT PCKD 0466 GREY CLAY DNSE 0497 BRWN SAND PCKD 0500 GREY CLAY PCKD 0539 GREY CLAY SLTY 0572 BLCK SHLE HARD 0580
KING TOWNSHIP CON 02(029)	17 619910 4875912[W]	1966/04 3519	06	FR 0130	090 / 110 015 / 4:0	DO	133 4	6901698 () LOAM 0002 BRWN MSND CLAY 0060 HPAN 0130 CSND 0137
KING TOWNSHIP CON 02(030)	17 619056 4875854[L]	1996/08 1350	64	FR 0050	035 / 043 015 / 1:0	DO	46 6	6923683 (163603) BRWN SAND BLDR VERY 0015 BRWN CLAY SAND GRVL 0032 BRWN CLAY 0037 GREY CLAY 0040 BRWN SAND 0056
KING TOWNSHIP CON 02(030)	17 619903 4876243[W]	1990/05 1413	06 06	FR 0520	320 / 035 / 2:0	DO	513 8	6921021 (70917) BRWN SAND CLAY SNDY 0009 BRWN CLAY STNS PCKD 0036 BRWN CLAY STNS SNDY 0091 GREY CLAY PCKD 0126 GREY CLAY DNSE 0138 GREY CLAY STNS PCKD 0241 GREY CLAY SAND 0284 GREY CLAY DNSE 0318 GREY CLAY SILT 0358 BRWN SAND SILT 0374 GREY CLAY SILT 0510 GREY GRVL SAND 0520 GREY CLAY SLTY 0539
KING TOWNSHIP CON 02(030)	17 619380 4876060[W]	1988/05 3108	06	FR 0094	070 / 080 010 / 1:0	DO	102 9	6919597 (26283) LOAM 0002 BRWN SAND 0018 GRVL 0022 BRWN CLAY GRVL 0040 BRWN SAND 0052 BRWN CLAY SNDY GRVL 0065 BRWN SAND 0112 BLUE SAND VERY 0114
KING TOWNSHIP CON 02(030)	17 619248 4876038[W]	1975/06 3903	04	FR 0053	030 / 057 003 / 3:0	DO		6913248 () BRWN CLAY SAND STNS 0053 BRWN SAND STNS 0065
KING TOWNSHIP CON 02(030)	17 619056 4875854[L]	1997/08 3108	06 05	FR 0464	390 / 465 005 / 3:0	DO	468 6	6924045 (166689) BRWN CLAY SAND GRVL 0070 BRWN CLAY SAND 0080 BLUE SILT 0180 BLUE SILT SAND 0196 BLUE CLAY 0444 BLUE SAND 0454 BLUE CLAY 0464 BLUE SAND 0474
KING TOWNSHIP CON 02(030)	17 619078 4875964[W]	1964/06 3414	04	FR 0172	126 / 136 005 / 3:0	DO	168 4	6901701 () PRDG 0060 BRWN FSND 0150 GREY SILT 0168 MSND 0172
KING TOWNSHIP CON 02(030)	17 619513 4876301[W]	1962/05 4102	30	FR 0055	055 / 002 / :0	DO		6901700 () MSND 0063
KING TOWNSHIP CON 02(030)	17 619236 4876111[W]	1956/01 1413	06	FR 0201	080 / 200 001 / 2:0	DO	193 8	6901699 () RED CLAY MSND 0060 MSND CLAY 0065 CLAY 0095 BLUE CLAY 0100 MSND CLAY 0165 BLUE CLAY FSND 0178 QSND 0184 FSND 0201

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 # DEPTHS TO WHICH FORMATIONS EXTEND[5,11]
KING TOWNSHIP CON 02(030)	17 619056 4875854[L]	1997/12 1350	06	MN 0183 FR	162 / 180 004 / 1:0	DO	183 6	6924223 (181078) BRWN CLAY FSND VERY 0012 YLLW CLAY 0034 BRWN CLAY FSND VERY 0104 BRWN SAND 0108 BRWN CLAY SAND 0160 BRWN CLAY 0172 BRWN SILT CLAY 0182 BRWN SAND 0189
KING TOWNSHIP CON 02(030)	17 618965 4875862[W]	1966/08 3414	04	FR 0287	215 / 245 005 / 4:0	DO	265 12	6901702 () BLDR CLAY 0027 MSND 0070 GRVL MSND 0075 SILT CLAY 0175 FSND 0201 CLAY 0275 FSND 0287
KING TOWNSHIP CON 02(031)	17 619027 4876269[L]	1997/12 3108	05 06	FR 0417	268 / 400 060 / 1:0	DO	409 8	6924142 (184903) BRWN SAND 0019 BLUE CLAY SOFT 0085 BLUE CLAY GRVL 0141 SILT 0204 BLUE CLAY HARD 0356 BLUE FSND 0371 BLUE CLAY 0408 BLUE SAND 0417
KING TOWNSHIP CON 02(031)	17 619025 4876269[L]	2002/02 3108	06 05	FR 0130	094 / 121 009 / 12:0	DO	130 14	6926336 (210863) LOAM 0002 BRWN CLAY SAND 0053 BRWN SILT CLAY 0129 BRWN SAND 0145 BRWN SAND SILT CLAY 0149 BLUE CLAY SILT 0151
KING TOWNSHIP CON 02(031)	17 619357 4876257[W]	2011/03 7108						7161866 (Z121522)
KING TOWNSHIP CON 02(031)	17 619333 4876291[W]	2011/03 7108						7161867 (Z121520) A113049
KING TOWNSHIP CON 02(031)	17 619520 4876526[W]	1948/08 2310	02	FR 0155	125 / 006 / 4:0	DO	147 8	6901703 () CLAY MSND 0145 MSND 0155
KING TOWNSHIP CON 02(031)	17 619625 4876508[W]	1948/07 2310	02	FR 0145	125 / 006 / 4:0	DO	135 8	6901704 () CLAY MSND 0135 MSND 0145
KING TOWNSHIP CON 02(031)	17 619500 4875812[W]	1966/03 3108	06	FR 0125	095 / 125 005 / 3:0	DO	126 4	6901705 () LOAM 0001 STNS CLAY MSND 0015 BLUE CLAY MSND 0069 FSND 0125 MSND 0130 BLUE CLAY 0132
KING TOWNSHIP CON 02(031)	17 619255 4876173[W]	1971/08 3414	05	FR 0145	145 / 164 003 / 2:0	DO	169 5	6910431 () BRWN FSND 0090 MSND CLAY 0169 FSND 0174
KING TOWNSHIP CON 02(031)	17 619237 4876241[W]	1973/01 2310	05	FR 0116	100 / 120 005 / 1:0	DO	116 4	6911500 () GREY SAND CLAY 0055 GREY SAND 0115 WHIT CLAY 0116 FSND 0123
KING TOWNSHIP CON 02(031)	17 618215 4875923[W]	1983/05 3108	06	FR 0152	100 / 145 010 / 3:0	DO	152 6	6916702 () BRWN LOAM SNDY 0005 YLLW CLAY GRVL 0054 BRWN FSND CLAY 0152 SAND 0159
KING TOWNSHIP CON 02(031)	17 619315 4876423[W]	1984/08 1413	06	FR 0153	125 / 140 007 / 2:30	DO	150 3	6917196 () BRWN SAND PCKD 0125 BRWN SAND LOOS 0153

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 # DEPTHS TO WHICH FORMATIONS EXTEND[5,11]
KING TOWNSHIP CON 02(032)	17 618951 4876667[L]	2001/11 7156	06 08 06	MN 0475	308 / 470 005 / 2:0	DO	471 4	6926127 (236585) BLCK LOAM 0001 BRWN SAND SLTY PCKD 0014 GREY CLAY SLTY SAND 0030 GREY SILT CLAY HARD 0345 GREY CLAY SILT STNS 0473 BRWN SAND GRVL HARD 0475
KING TOWNSHIP CON 02(033)	17 618363 4877251[W]	1986/01 3108	06	FR 0193	139 / 190 030 / 1:0	DO	198 3	6918071 () BRWN LOAM 0003 BRWN SAND 0029 BRWN CLAY SAND 0045 BLUE CLAY 0141 BLUE SAND CLAY 0150 BLUE CLAY SNDY 0193 BLUE SAND 0201
KING TOWNSHIP CON 02(034)	17 618803 4877484[L]	1996/08 3108	05			NU		6923694 (156518)
KING TOWNSHIP CON 02(034)	17 618803 4877484[L]	1998/10 5459	06	FR 0296	154 / 185 004 / 3:0	DO	296 6	6924691 (195391) BRWN CLAY SAND STNS 0021 GREY CLAY SAND STNS 0032 GREY CLAY SLTY 0087 GREY CLAY SNDY STNS 0155 GREY CLAY SLTY 0176 GREY SAND SILT 0179 GREY CLAY SAND STNS 0190 GREY SAND STNS SILT 0206 GREY CLAY SAND STNS 0295 WHIT SAND STNS CLAY 0303 GREY CLAY SLTY 0310
KING TOWNSHIP CON 02(034)	17 618267 4877212[W]	1967/05 3519	04	FR 0200	160 / 190 010 / 6:0	DO	220 4	6901706 () MSND 0020 CLAY STNS 0035 GREY CLAY 0055 BRWN SILT 0085 CLAY MSND STNS 0200 MSND 0225
KING TOWNSHIP CON 02(034)	17 618340 4877323[W]	1972/08 1350	06	FR 0175	110 / 120 010 / 4:0	DO	176 3	6911099 () BLCK LOAM 0001 GREY CLAY 0012 GREY SILT SAND 0027 GREY CLAY 0175 GREY SAND 0179
KING TOWNSHIP CON 02(034)	17 618115 4877123[W]	1980/06 1350	06	FR 0221	180 / 200 015 / 1:0	DO	224 3	6915672 () BRWN SAND 0028 GREY CLAY 0065 BRWN SILT SNDY 0105 GREY CLAY 0224 BRWN SAND 0229
KING TOWNSHIP CON 02(034)	17 618803 4877484[L]	1990/05 1413	06	FR 0321	221 / 010 / 4:30	DO	317 4	6921023 (70925) BRWN CLAY STNS PCKD 0013 GREY CLAY STNS PCKD 0031 GREY CLAY SAND SNDY 0045 GREY CLAY STNS PCKD 0058 GREY CLAY DNSE 0064 GREY CLAY SLTY 0117 GREY CLAY DNSE 0157 GREY CLAY SLTY 0163 GREY CLAY DNSE 0270 GREY GRVL SAND LOOS 0272 GREY CLAY STNS PCKD 0315 BRWN SAND GRVL CLN 0321
KING TOWNSHIP CON 02(034)	17 618155 4877198[W]	1991/09 3108	06 05	FR 0284	219 / 280 012 / 6:0	DO	285 6	6921578 (74273) LOAM 0001 BRWN SAND 0015 BRWN CLAY 0036 BLUE CLAY SOFT 0163 BLUE CLAY GRVL 0220 SAND FSND 0231 BLUE CLAY GRVL 0269 GRVL 0272 BLUE SAND CLAY FSND 0284 BLUE SAND 0292

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 # DEPTHS TO WHICH FORMATIONS EXTEND[5,11]
KING TOWNSHIP CON 02(034)	17 618803 4877484[L]	1996/08 3108	06 05	FR 0367	295 / 365 030 / 20:0	DO	370 6	6923692 (166656) BRWN SAND CLAY 0007 BRWN CLAY 0049 CLAY SAND 0077 BLUE CLAY HARD 0278 SAND 0305 SAND CLAY 0318 SAND 0417 SAND CLAY 0438
KING TOWNSHIP CON 02(035)	17 619375 4878173[W]	1971/08 1350	06	FR 0053	008 / 035 008 / 30:0	ST DO		6910539 () LOAM 0001 YLLW CLAY 0005 BLUE CLAY BLDR GRVL 0053 GREY GRVL CSND 0054
KING TOWNSHIP CON 02(035)	17 618416 4877951[W]	1965/05 3414	04	FR 0199	140 / 180 003 / 5:0	DO	195 4	6901707 () SILT 0006 CLAY 0040 SILT 0125 CLAY 0165 SILT 0197 CSND 0199
KING TOWNSHIP CON 02(035)	17 619665 4878173[W]	1970/03 4231	30	FR 0053	050 / 057 003 / 1:0	DO		6909827 () LOAM 0003 BRWN CLAY 0020 BLUE CLAY 0053 BLUE GRVL MSND 0055 BLUE CLAY GRVL MSND 0062
KING TOWNSHIP CON 02(035)	17 618731 4877897[L]	1992/06 3414	06 06	FR 0226	187 / 190 008 / 24:0	DO	236 4	6921957 (095219) BRWN CLAY SAND 0004 BRWN SAND 0011 BLUE SAND 0082 GRVL 0083 HPAN 0218 FSND 0224 CLAY 0226 GRVL SAND 0240
KING TOWNSHIP CON 02(035)	17 618731 4877897[L]	1991/10 5528	05 06 05	FR 0270 FR 0200	226 / 270 010 / 4:0	DO	277 6	6921675 (105665) BRWN CLAY 0012 GREY CLAY SILT 0038 BRWN SAND VERY FSND 0095 GREY CLAY 0176 GREY SAND 0201 GREY CLAY 0270 GREY SAND GRVL 0285 GREY CLAY 0288
KING TOWNSHIP CON 02(035)	17 618315 4877773[W]	1978/09 4006	05	FR 0250 FR 0109 FR 0230	109 / 345 012 / 4:0	DO	299 12	6914886 () BRWN CLAY SAND STNS 0015 GREY CLAY STNS SAND 0382
KING TOWNSHIP CON 02(035)	17 618805 4877893[W]	1971/06 2310	04	FR 0329	150 / 160 008 / 1:30	DO	336 6 342 6	6910380 () GREY CLAY MSND BLDR 0020 GREY MSND CLAY 0083 BLUE CLAY 0290 BLUE CLAY SILT 0324 GREY MSND CLAY 0329 GREY MSND 0348
KING TOWNSHIP CON 03(030)	17 619571 4876249[W]	1989/07 1663	06	FR 0316	269 / 326 018 / 2:0	DO	329 10	6921102 (26943) BRWN LOAM 0003 BRWN CLAY GRVL 0005 BRWN SAND GRVL 0015 BRWN CLAY GRVL SAND 0026 BLUE CLAY SOFT 0073 GREY SAND FSND 0090 BLUE CLAY SAND 0105 BLUE CLAY 0146 BLUE CLAY SAND 0180 BLUE CLAY 0316 GREY SAND GRVL CSND 0364 BLUE CLAY 0365
KING TOWNSHIP OS 02(001)	17 619187 4878430[W]	1999/09 1350	06	FR 0067	021 / 057 005 / 1:30	DO	62 5	6924979 (200780) BRWN LOAM 0001 YLLW CLAY GRVL 0021 GREY CLAY GRVL SAND 0053 GREY CLAY 0062 BRWN GRVL SAND 0067
KING TOWNSHIP OS 02(001)	17 619109 4878447[W]	1958/10 2310	04	FR 0063	020 / 020 006 / 1:0	ST DO		6902648 () MSND CLAY 0063 MSND 0066

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 # DEPTHS TO WHICH FORMATIONS EXTEND[5,11]
KING TOWNSHIP OS 02(001)	17 618651 4878302[L]	1990/11 3108	06 05	FR 0234	120 / 242 020 / 3:0	DO	235 6	6921296 (74218) FILL 0003 BLCK MUCK 0005 BRWN CLAY SNDY GRVL 0009 BRWN CLAY GRVL 0018 BLUE CLAY GRVL HARD 0108 BLUE CLAY SAND SOFT 0122 BLUE CLAY GRVL HARD 0149 BLUE CLAY SAND 0156 BLUE CLAY GRVL SAND 0234 BLUE SAND 0242
KING TOWNSHIP OS 02(001)	17 618648 4878301[L]	2001/05 1350	06	FR 0226	120 / 198 003 / 5:0	DO	226 4	6925818 (227291) BRWN CLAY 0018 GREY CLAY GRVL 0035 GREY CLAY 0110 WHIT CLAY 0143 GREY CLAY SILT 0150 BRWN SILT GRVL 0154 GREY CLAY 0198 GREY SILT 0220 BRWN GRVL CLAY SILT 0225 BRWN SAND 0230
KING TOWNSHIP OS 02(001)	17 618425 4877590[W]	1988/04 2214	30	FR 0025	025 / 016 006 / 1:0	DO		6919500 (25275) BLCK LOAM 0001 BRWN SAND 0008 BRWN SAND SILT PCKD 0025 BRWN SAND WBRG 0026 BRWN CLAY SLTY HARD 0035 BLCK SAND CSND WBRG 0038 BRWN CLAY SLTY HARD 0039
KING TOWNSHIP OS 02(001)	17 618651 4878302[L]	1970/03 3519	04	FR 0300	140 / 250 005 / 48:0	DO	321 4	6909929 () BLCK LOAM 0002 GREY CLAY STNS 0020 BRWN SILT 0060 GRVL 0075 GREY CLAY STNS 0195 GREY CLAY 0300 GREY QSND 0310 MSND GRVL 0325
KING TOWNSHIP OS 02(001)	17 618651 4878302[L]	1987/01 1350	06	FR 0145	095 / 140 008 / 2:0	DO	145 6	6918432 (06935) GREY CLAY 0007 BRWN SAND GRVL 0012 GREY CLAY 0040 GREY SILT CLAY SOFT 0072 GREY CLAY 0145 BRWN SAND 0151
KING TOWNSHIP OS 02(001)	17 619445 4878623[W]	1972/04 2310	05	FR 0097	067 / 100 012 / 2:30	DO	96 9	6910910 () GREY CLAY 0017 BLUE CLAY 0035 BLUE CLAY SAND 0053 BLUE CLAY GRVL 0097 GREY SAND GRVL 0106
KING TOWNSHIP OS 02(001)	17 618415 4878123[W]	1976/04 2801				NU		6913933 () BRWN CLAY 0028 GREY CLAY 0149 GREY CLAY SNDY GRVL 0160 GREY CLAY SAND GRVL 0206 GRVL SAND BLDR 0218 SAND GRVL 0221 GREY CLAY GRVL LYRD 0230 SAND GRVL CMTD 0232 GRVL SAND CLAY 0239 GREY CLAY HARD 0241 GREY CLAY GRVL HARD 0296 SAND GRVL CMTD 0298 GREY CLAY GRVL LYRD 0395 BRWN CLAY SHLE HARD 0405 BLCK SHLE 0409
KING TOWNSHIP OS 02(001)	17 618648 4878301[L]	2001/10 1350	06	FR 0233	161 / 195 015 / 1:0	DO	230 3	6926047 (227325) BRWN LOAM 0001 YLLW CLAY 0014 BRWN SAND GRVL 0029 GREY CLAY GRVL 0096 GREY CLAY 0155 GREY SAND CLAY 0177 GREY CLAY 0198 BRWN CLAY SAND 0216 BRWN SILT SAND 0230 BLCK SAND 0233

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 # DEPTHS TO WHICH FORMATIONS EXTEND[5,11]
KING TOWNSHIP OS 02(001)	17 619415 4878523[W]	1984/06 2407	06	FR 0264	032 / 202 017 / 12:0	DO	262 5	6917319 () LOAM 0003 GREY HPAN STNS 0062 BLUE SAND CLAY HARD 0131 BLUE CLAY SAND 0182 BLUE CLAY SOFT 0264 BRWN CSND 0269
KING TOWNSHIP OS 02(001)	17 619196 4878414[W]	1985/09 4919	30 30	UK 0040 UK 0060	020 / 075 / :30	DO		6917965 () BRWN LOAM HARD 0001 BRWN CLAY HARD 0020 GREY SNDY LYRD 0080
KING TOWNSHIP OS 02(003)	17 618489 4879103[L]	2002/07 3406	02	UK 0149		NU	152 10	6926874 (236998) BLCK LOAM 0002 YLLW CLAY STNS 0018 BRWN CLAY GRVL SNDY 0027 GREY CLAY SLTY FGVL 0149 GREY CLAY SAND LYRD 0163 GREY CLAY SLTY FGVL 0170
KING TOWNSHIP OS 02(003)	17 618489 4879103[L]	2001/08 3406	06 06	UK 0097	023 / / :0	NU	112 10	6926887 (236956) YLLW CLAY STNS 0013 GREY SILT SAND CLAY 0017 GREY CLAY GRVL 0097 GREY SAND SILT UNKN 0100 GREY CLAY STNS 0111 BRWN FSND 0126 GREY SAND CLAY 0143 GREY CLAY GRVL SAND 0146 GREY CLAY STNS 0155
KING TOWNSHIP OS 02(004)	17 619221 4879906[W]	1961/04 1413	06	FR 0145	122 / 126 050 / 4:0	ST DO	137 8	6902652 () CLAY 0035 HPAN BLDR 0128 GRVL 0130 MSND GRVL 0145
KING TOWNSHIP OS 02(004)	17 619161 4879850[W]	1953/11 1413	06	FR 0136	116 / 120 004 / 1:0	DO ST		6902651 () CLAY 0012 HPAN 0035 SILT 0042 BLUE CLAY STNS 0110 BLUE CLAY 0130 CSND GRVL 0136
KING TOWNSHIP OS 02(004)	17 619153 4879750[W]	1950/08 1413	05	FR 0138	110 / 118 004 / 2:0	ST DO		6902650 () CLAY 0010 CLAY BLDR 0050 BLUE CLAY 0110 MSND GRVL 0138
KING TOWNSHIP OS 02(004)	17 619199 4879976[W]	1948/09 3560	06 06	FR 0171	040 / 003 / 48:0	DO ST		6902649 () CLAY STNS 0108 YLLW MSND 0130 CLAY 0134 CLAY MSND 0150 STNS 0152 CLAY MSND 0170 CSND 0171
KING TOWNSHIP OS 02(004)	17 618410 4879503[L]	2003/03 3406	02	UK 0085		NU	80 10	6926886 (236995) LOAM 0001 YLLW CLAY 0012 YLLW CLAY STNS 0026 GREY CLAY STNS 0085 GREY CLAY GRVL 0090 GREY CLAY 0091
KING TOWNSHIP OS 02(004)	17 618410 4879503[L]	2003/03 3406	02	UK 0209 UK 0133 UK 0157		NU	247 10	6926885 (236983) LOAM 0001 BRWN CLAY SILT GRVL 0034 GREY CLAY GRVL SAND 0133 GREY CLAY SILT GRVL 0152 GREY CLAY 0157 GREY CLAY SILT 0209 GREY CLAY SAND GRVL 0279
KING TOWNSHIP OS 02(004)	17 618410 4879503[L]	2003/03 3406	02	UK 0063		NU	66 10	6926884 (236984) LOAM 0001 YLLW CLAY SILT 0017 YLLW CLAY SILT STNS 0029 BLDR 0030 YLLW CLAY SILT STNS 0048 GREY CLAY SILT 0051 GREY CLAY SILT SAND 0063 SAND GRVL 0076 GREY CLAY 0078

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 # DEPTHS TO WHICH FORMATIONS EXTEND[5,11]
KING TOWNSHIP OS 02(004)	17 618410 4879503[L]	2003/03 3406	02	UK 0175		NU	185 10	6926883 (236985) LOAM 0001 BRWN SAND CLAY 0024 GREY CLAY GRVL 0127 GREY CLAY 0147 GREY CLAY SILT 0175 GREY SAND 0183 GREY CLAY 0185 BRWN SAND 0197
KING TOWNSHIP OS 02(004)	17 618410 4879503[L]	2003/03 3406	02	UK 0147		NU	308 10	6926882 (236986) LOAM 0001 BRWN SAND CLAY 0024 GREY CLAY GRVL 0127 GREY CLAY 0147 GREY CLAY SILT 0175 GREY SAND 0183 BRWN SAND 0197 GREY CLAY GRVL SAND 0308 GREY CLAY GRVL 0317 GREY CLAY 0318
KING TOWNSHIP OS 02(004)	17 618410 4879503[L]	2003/03 3406	02	UK 0112		NU	123 10	6926881 (236987) LOAM 0001 YLLW CLAY 0021 YLLW CLAY GRVL 0039 BRWN CLAY STNS 0049 GRVL CLAY 0054 GREY CLAY SILT 0056 GREY CLAY GRVL 0060 GREY CLAY SILT 0123 GREY CLAY SILT 0125
KING TOWNSHIP OS 02(004)	17 618410 4879503[L]	2001/10 3406	02	UK 0121 UK 0258		NU		6926880 (236988) LOAM 0001 YLLW CLAY 0018 YLLW SAND CLAY STNS 0025 GREY CLAY SAND 0062 GREY CLAY 0121 GREY CLAY STNS 0127 GREY CLAY 0159 GREY CLAY SAND GRVL 0190 GREY CLAY GRVL 0258 GREY CLAY SAND LYRD 0266 GREY CLAY 0270
KING TOWNSHIP OS 02(004)	17 618410 4879503[L]	2001/08 3406	02	UK 0097 UK 0189		NU	189 10	6926879 (236970) LOAM 0001 YLLW CLAY 0018 GREY CLAY 0097 SAND UNKN 0112 GREY CLAY 0126 GREY CLAY GRVL 0189 GRVL CLAY 0205
KING TOWNSHIP OS 02(004)	17 618410 4879503[L]	2002/08 3406	02	UK 0114	/ / 2:0		125 10	6926878 (237009) BLCK LOAM 0002 YLLW CLAY FGVL 0015 GREY CLAY GRVL SLTY 0049 GREY STNS 0114 BRWN SAND SLTY 0121 GREY CLAY GRVL LYRD 0137 GREY CLAY 0138
KING TOWNSHIP OS 02(004)	17 618410 4879503[L]	2002/08 3406	02	UK 0052	/ / 1:15			6926877 (237003) BLCK LOAM 0003 YLLW CLAY STNS GRNT 0028 GREY CLAY SILT 0042 BLCK BLDR GRNT 0052 BRWN GRVL CSND 0071 GREY CLAY SOFT 0075
KING TOWNSHIP OS 02(004)	17 618410 4879503[L]	2002/05 3406	02	UK 0092		NU	99 10	6926876 (236990) LOAM 0001 YLLW CLAY SAND 0014 BRWN SAND 0037 GREY CLAY 0064 BLDR CLAY 0092 GREY CLAY SILT LYRD 0110
KING TOWNSHIP OS 02(004)	17 618410 4879503[L]	2002/05 3406	02	UK 0111		NU	111 10	6926875 (236989) LOAM 0001 YLLW CLAY SILT 0026 GREY CLAY STNS 0086 GRVL CLAY STNS 0089 GREY CLAY SILT STNS 0095 GREY CLAY SILT LYRD 0103 GREN CLAY SILT FSND 0111 BRWN SAND 0121 BRWN CLAY 0138

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 # DEPTHS TO WHICH FORMATIONS EXTEND[5,11]
KING TOWNSHIP OS 02(004)	17 618410 4879503[L]	2002/10 3406	02	UK 0160		NU	167 10	6926873 (237007) BLCK LOAM 0002 YLLW CLAY STNS 0018 BRWN CLAY SAND GRVL 0032 GREY SAND CLAY 0071 GREY CLAY DNSE 0116 GREY SAND SILT 0121 GREY CLAY SILT LYRD 0135 GREY CLAY DNSE 0156 GREY SAND SILT 0160 GREY SAND 0180
KING TOWNSHIP OS 02(004)	17 618410 4879503[L]	2002/07 3406	02				119 10	6926872 (237014) BLCK LOAM LOOS 0002 BRWN CLAY STNS 0018 GREY CLAY FSND CMTD 0032 GREY CLAY FGVL SNDY 0071 GREY CLAY DNSE 0116 GREY SILT SAND CLAY 0135
KING TOWNSHIP OS 02(004)	17 618410 4879503[L]	2002/08 3406	02		/ 003 / 1:0		156 10	6926871 (237013) BLCK LOAM 0002 BRWN CLAY GRVL 0063 GREY CLAY SILT GRVL 0117 BRWN GRVL CLAY IRFM 0127 BRWN GRVL SAND SNDY 0141 BRWN GRVL SAND CMTD 0146 BRWN FSND BLDR CMTD 0157
KING TOWNSHIP OS 02(004)	17 618410 4879503[L]	2002/05 3406	02	UK 0166		NU		6926870 (236994) LOAM 0001 YLLW CLAY STNS 0017 BRWN CLAY SAND STNS 0050 BRWN SAND CGVL 0058 BRWN SILT SAND 0074 BRWN GRVL SAND CMTD 0102 GREY SILT 0148 GREY CLAY 0166 GRVL SAND 0178 GREY CLAY 0179
KING TOWNSHIP OS 02(004)	17 618410 4879503[L]	2002/05 3406	02	UK 0074		NU	76 10	6926869 (236993) LOAM 0001 YLLW CLAY STNS 0017 BRWN CLAY SAND STNS 0038 BRWN SAND GRVL CMTD 0041 BRWN CLAY STNS 0050 BRWN SAND CGVL 0058 BRWN SAND SILT 0074 BRWN SAND GRVL CMTD 0087 GREY CLAY 0088
KING TOWNSHIP OS 02(004)	17 619463 4879404[W]	1993/11 1413				DO ST		6922465 (140498) BRWN CLAY STNS BLDR 0035 GREY CLAY STNS BLDR 0125 GREY SAND FSND 0128 GREY GRVL CGVL 0140 GREY CLAY SILT HARD 0194 GREY SILT SOFT 0215 GREY CLAY DNSE 0260 GREY CLAY STNS HARD 0284 GREY GRVL CLAY CMTD 0287 GREY CLAY SILT HARD 0410 GREY CLAY STNS HARD 0462 BLCK SHLE HARD 0470
KING TOWNSHIP OS 02(004)	17 619463 4879404[W]	1993/11 1413				ST DO		6922466 (140499) BRWN CLAY STNS HARD 0035 GREY CLAY STNS HARD 0128 GREY GRVL CGVL 0140 GREY CLAY SILT LYRD 0194 GREY SILT SOFT 0206
KING TOWNSHIP OS 02(006)	17 618840 4880378[W]	1997/07 1350	06	FR MN 0094	050 / 090 004 / 2:0	DO	91 6	6923966 (181049) BRWN CLAY SAND 0028 BRWN GRVL SAND 0031 BRWN CLAY GRVL 0058 BRWN SILT SAND 0062 BRWN CLAY SAND LYRD 0073 GREY CLAY 0092 BRWN SAND 0100

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 # DEPTHS TO WHICH FORMATIONS EXTEND[5,11]
KING TOWNSHIP OS 02(006)	17 619015 4880533[W]	1968/07 3108	07	FR 0129	073 / 127 005 / 2:0	DO	131 3	6909024 () FILL 0002 BLUE CLAY STNS 0065 BLUE CLAY 0115 CLAY GRVL 0129 CSND 0134
KING TOWNSHIP OS 02(006)	17 618615 4880573[W]	1981/06 3108	06	UK 0160	068 / 160 100 / 0:30	DO	167 4	6915890 () LOAM 0002 BRWN CLAY 0040 GREY CLAY 0083 BLUE CLAY GVLY SNDY 0116 GRVL SAND CLAY 0127 BLUE SILT CLAY 0160 BLUE CSND 0171
KING TOWNSHIP OS 02(007)	17 618605 4880763[W]	1971/12 4539		FR 0156 FR 0162	061 / 081 012 / 1:30	DO		6910703 () PRDG 0005 BRWN CLAY STNS 0055 BLUE CLAY STNS 0120 BLUE CLAY 0156 GREY CSND 0162
KING TOWNSHIP OS (001)	17 618617 4878006[W]	1999/06 1350	06	FR 0233	137 / 205 007 / 2:0	DO		6924915 (200758) BRWN SAND GRVL CLAY 0004 YLLW CLAY 0018 YLLW CLAY GRVL 0032 GREY CLAY GRVL 0110 WHIT CLAY 0165 BRWN CLAY GRVL 0174 GREY CLAY GRVL 0225 BRWN SAND LOOS 0229 BRWN GRVL SAND 0233
KING TOWNSHIP 02(001)	17 619275 4878719[W]	2005/08 1350	06	FR 0246	183 / 229 007 / 1:0	DO	248 6	6930543 (Z51442) A045841 BRWN SAND CLAY 0004 YLLW CLAY 0012 GREY CLAY SAND HARD 0124 GREY CLAY 0164 BRWN CLAY GRVL SILT 0168 GREY CLAY SOFT 0246 BRWN FSND MSND 0253
KING TOWNSHIP 02(006)	17 618339 4880419[W]	1987/10 1413	06	FR 0254	161 / 210 040 / 2:10	DO	250 4	6919094 () BRWN CLAY STNS SLTY 0049 GREY CLAY STNS DNSE 0070 GREY CLAY SLTY 0092 BRWN SAND LOOS 0116 GREY CLAY SLTY 0146 GREY CLAY STNS DNSE 0208 GREY CLAY SLTY 0218 BRWN SAND SILT 0238 GREY CLAY SNDY 0242 BRWN SAND GRVL CLN 0254 BRWN SAND SLTY 0258 GREY CLAY STNS SNDY 0278
KING TOWNSHIP 02(030)	17 619845 4876195[W]	1988/05 1350	06	FR 0078	060 / 070 010 / 1:0	DO	78 3	6919600 (13524) YLLW CLAY GRVL SAND 0016 BRWN SAND 0022 GREY GRVL CLAY 0035 BRWN SAND DRY 0075 BRWN SAND 0081
KING TOWNSHIP 03(030)	17 619571 4876249[W]	1985/06 1663	06 06	FR 0340	256 / 340 012 / 2:0	DO	346 4	6917975 () BLCK LOAM 0001 BRWN CLAY SAND 0058 BRWN FSND CLAY 0094 BLUE CLAY 0136 GREY FSND 0157 BLUE CLAY 0196 GREY FSND SILT 0223 BLUE CLAY SILT GRVL 0337 GREY MSND 0352 BLUE CLAY GRVL 0365
KING TOWNSHIP 03(035)	17 618175 4877413[W]	1986/02 3903	06	FR 0275	111 / 265 005 / 8:0	DO	271 4	6917948 () BRWN SAND SILT LYRD 0047 GREY CLAY STNS LYRD 0098 GREY CLAY DNSE 0230 GREY CLAY STNS LYRD 0256 GREY CLAY SAND LYRD 0265 GREY SAND GRVL BLDR 0277

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 # DEPTHS TO WHICH FORMATIONS EXTEND[5,11]
MARKHAM TOWN (MARKHA ()	17 620310 4877026[W]	2009/11 7241	02					7136658 (M05272) A084160 BRWN FILL SAND LOOS 0004 BRWN SILT CLAY DNSE 0031 GREY SILT CLAY DNSE 0024
TORONTO CITY ()	17 621384 4880061[W]	1995/02 1508	05			NU	8 10	6923044 (56716) BRWN FILL 0008 GREN SAND 0009 GREY TILL 0018
NEWMARKET TOWN YS E 01(093)	17 622866 4878470[W]	1949/01 1337	04	FR	013 / / :0	DO		6907459 () CLAY STNS 0136 HPAN 0149
NEWMARKET TOWN YS E 01(095)	17 621865 4879073[W]	1968/09 3109	30	FR 0032	012 / / :0	DO		6908916 () LOAM 0002 BRWN CLAY STNS 0016 BLUE CLAY STNS 0031 MSND 0035
NEWMARKET TOWN 01(001)	17 622988 4879579[W]	2008/01 4102						7101698 (Z67933)
NEWMARKET TOWN 01(090)	17 620894 4876520[W]	2008/03 4102						7109938 (Z67941)
NEWMARKET TOWN (090)	17 620970 4876375[W]	2008/06 2801						7108420 (Z68144)
NEWMARKET TOWN ()	17 621802 4877666[W]	2007/06 6607	02	FR 0010			5 10	7047550 (Z72446) A053571 BRWN FILL 0003 BRWN SILT CLAY 0015
NEWMARKET TOWN ()	17 620325 4877120[W]	2007/03 7247	02	0011		NU	16 -5	7050022 (Z70002) A056048 BRWN FSND DNSE 0007 BRWN SAND SILT PCKD 0016
NEWMARKET TOWN ()	17 623073 4879664[W]	1951/08 2801	06			NU		6904183 () LOAM 0001 BRWN CLAY 0021 BRWN CLAY MSND GRVL 0068 BLUE CLAY MSND GRVL 0154 BLUE CLAY MSND GRVL 0156 BLUE CLAY MSND GRVL 0321 BLUE CLAY MSND GRVL 0326 BLCK SHLE 0330
NEWMARKET TOWN ()	17 622554 4879763[W]	1955/10 2801	08					6904186 () LOAM MSND 0003 YLLW CLAY GRVL 0008 GREY CLAY BLDR 0069 GREY CLAY 0181 GREY CLAY GRVL 0238 GREY CLAY MSND 0282 GREY CLAY GRVL 0296 GREY CLAY 0308
NEWMARKET TOWN ()	17 622722 4879658[W]	1955/10 2801	08			NU		6904187 () LOAM MSND 0002 YLLW CLAY MSND GRVL 0018 GREY CLAY BLDR 0043 GREY CLAY 0066 GREY CLAY STNS 0192 GREY CLAY GRVL 0216 GRVL 0217 GREY CLAY GRVL 0333 GRVL 0383

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 # DEPTHS TO WHICH FORMATIONS EXTEND[5,11]
NEWMARKET TOWN ()	17 621925 4878516[W]	1956/06 2801	04	FR	045 / 047 132 / 18:0	MN		6904189 () LOAM 0001 BRWN CLAY 0006 BRWN CLAY MSND GRVL 0028 BLUE CLAY MSND GRVL 0203 BLUE CLAY SILT 0270 MSND GRVL 0284 GRVL MSND CLAY 0286 BLUE CLAY MSND GRVL 0291 GRVL MSND CLAY 0293 BLUE CLAY MSND GRVL 0296 GRVL MSND CLAY 0298 MSND GRVL 0299 CLAY GRVL MSND 0303 GRVL MSND CLAY 0315 CLAY MSND GRVL 0337 MSND GRVL CLAY 0343 CLAY MSND GRVL 0387 GRVL MSND BLDR 0393 CLAY MSND GRVL 0400 GRVL MSND CLAY 0404 CLAY MSND GRVL 0422 BLUE CLAY 0425 BLUE CLAY GRVL SHLE 0454
NEWMARKET TOWN ()	17 621926 4878613[W]	1956/06 2801	04	FR	045 / 048 110 / :0	MN	284 32	6904190 () LOAM 0001 BRWN CLAY GRVL BLDR 0022 BLUE CLAY MSND GRVL 0086 MSND GRVL BLDR 0088 BLUE CLAY MSND GRVL 0204 BLUE CLAY SILT 0268 BLUE CLAY MSND GRVL 0273 MSND GRVL CLAY 0284 GRVL MSND CLAY 0288 GRVL MSND CLAY 0290 CLAY GRVL MSND 0298 GRVL MSND CLAY 0313 CLAY MSND GRVL 0322 GRVL MSND CLAY 0341 CLAY MSND GRVL 0379 MSND GRVL BLDR 0384 GRVL MSND CLAY 0387 BLUE CLAY MSND GRVL 0389 GRVL MSND CLAY 0394 BLUE CLAY MSND GRVL 0415 CLAY MSND GRVL 0432 MSND GRVL 0433 BRWN CLAY 0444 SHLE 0450
NEWMARKET TOWN ()	17 622008 4878028[W]	1958/11 2801	02	FR 0333		NU		6904195 () BRWN CLAY 0005 BRWN CLAY GRVL BLDR 0021 GREY CLAY MSND GRVL 0036 BLUE CLAY MSND GRVL 0157 MSND GRVL 0158 BLUE CLAY MSND GRVL 0229 BLUE CLAY MSND GRVL 0232 BLUE CLAY MSND GRVL 0298 BLUE CLAY 0329 GRVL MSND CLAY 0333 CLAY MSND GRVL 0342 CLAY MSND 0352 GREY CLAY MSND GRVL 0356 GREY CLAY MSND 0394 GREY CLAY MSND GRVL 0409 BLUE CLAY MSND 0420 CLAY MSND GRVL 0436
NEWMARKET TOWN ()	17 622530 4878110[W]	1958/12 2801	02	FR 0183	003 / 012 035 / 8:0	NU	186 10	6904196 () LOAM 0001 BRWN CLAY MSND 0007 BRWN CLAY 0016 BLUE CLAY 0074 BLUE CLAY MSND GRVL 0090 BLUE CLAY MSND 0183 GRVL BLDR MSND 0197 BLUE CLAY MSND GRVL 0200 MSND GRVL 0202 BLUE CLAY MSND GRVL 0206 GRVL MSND 0208 BLUE CLAY MSND GRVL 0257 BLUE CLAY 0271

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NEWMARKET TOWN ()	17 622552 4878159[W]	1959/01 2801	02	FR 0187	004 / / :0	NU	202 7	6904197 () FILL 0001 BRWN CLAY 0003 BRWN CLAY GRVL 0007 BRWN CLAY 0014 BLUE CLAY 0074 BLUE CLAY GRVL 0077 BLUE CLAY MSND GRVL 0182 GRVL MSND 0184 BLUE CLAY MSND GRVL 0187 GRVL MSND BLDR 0188 BLUE CLAY MSND GRVL 0195 BLUE CLAY MSND 0202 BLDR GRVL CLAY 0205 GRVL CLAY MSND 0212 BLUE CLAY SILT 0228 BLUE CLAY MSND GRVL 0251 GRVL MSND CLAY 0252 BLUE CLAY 0254 BLUE CLAY MSND GRVL 0261 BLUE CLAY MSND 0313
NEWMARKET TOWN ()	17 622574 4878118[W]	1959/01 2801	02	FR 0204	004 / 009 038 / 8:0	NU	205 16	6904198 () LOAM 0001 BRWN CLAY MSND 0015 BLUE CLAY 0076 BLUE CLAY MSND GRVL 0087 BLUE CLAY MSND 0181 BLUE CLAY MSND GRVL 0184 MSND GRVL 0186 GRVL MSND CLAY 0193 BLUE CLAY MSND 0195 GRVL MSND CLAY 0202 CLAY GRVL 0204 GRVL MSND CLAY 0223 BLUE CLAY MSND GRVL 0241
NEWMARKET TOWN ()	17 622445 4879215[W]	1960/02 1413	05	FR 0203	037 / 047 055 / 10:0	IN	199 4	6904199 () RED CLAY STNS 0050 HPAN 0155 BLUE CLAY 0173 HPAN 0198 GRVL 0203
NEWMARKET TOWN ()	17 622162 4877359[W]	1962/10 4102	30	FR 0010	005 / 010 / :0	DO		6904201 () MSND GRVL 0018
NEWMARKET TOWN ()	17 621967 4878427[W]	1965/12 2801	05			NU		6904203 () BRWN CLAY MSND GRVL 0018 GREY CLAY MSND GRVL 0206 BLUE CLAY SILT 0268 GREY CLAY MSND 0273 MSND GRVL BLDR 0284 BLDR GRVL MSND 0287 MSND GRVL BLDR 0293 GRVL MSND BLDR 0300 MSND GRVL BLDR 0310 CLAY MSND GRVL 0327 CLAY MSND 0335
NEWMARKET TOWN ()	17 621946 4878526[W]	1966/10 2801	20 10	FR 0285	080 / 093 600 / 24:0	MN	283 26	6904204 () CLAY MSND GRVL 0279 GRVL BLDR 0285 GRVL MSND 0308 GRVL MSND CLAY 0316
NEWMARKET TOWN ()	17 622522 4877169[W]	1967/09 3414	06	FR 0297	065 / 068 015 / 4:0	CO	290 6	6904205 () YLLW CLAY 0074 GRVL CLAY 0110 SILT 0132 BLUE CLAY 0160 CLAY GRVL MSND 0191 FSND 0193 BLUE CLAY GRVL 0290 CSND 0297
NEWMARKET TOWN ()	17 622245 4878823[W]	1968/09 3414	04	FR 0349	025 / 140 005 / 4:0	DO		6908598 () CLAY 0015 MSND 0032 GRVL SILT 0202 SILT 0224 GRVL 0348 BRWN SHLE 0357

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NEWMARKET TOWN ()	17 621915 4879523[W]	1976/07 5459	02			DO	285 10	6914090 () BRWN CLAY STNS 0027 BLUE CLAY STNS 0140 BLUE CLAY SOFT 0247 BLUE CLAY HARD 0261 BLUE FSND 0272 BLUE CLAY STNS 0285 BLUE FSND CLAY 0309 BLUE CLAY STNS 0423 BRWN LMSN 0423
NEWMARKET TOWN ()	17 622165 4879623[W]	1976/08 5459				DO NU		6914091 () BRWN CLAY 0016 BRWN CLAY STNS 0032 BRWN GRVL 0043 BLUE CLAY 0174 BLUE CLAY STNY HARD 0207 BLUE CLAY SOFT 0233 BLUE CLAY HARD 0291 BLUE FSND 0342 BLUE CLAY STNY 0373 BLUE MSND 0421 BLCK SHLE 0425
NEWMARKET TOWN ()	17 621815 4879473[W]	1976/09 5459	02			NU DO		6914093 () BRWN CLAY 0006 BLUE CLAY 0074 BLUE GRVL FSND 0076 BLUE CLAY STNS 0187 BLUE CLAY SOFT 0240 BLUE SAND GRVL CLAY 0287 BLUE GRVL CLAY 0300 BLUE CGVL 0315 BLUE CLAY 0378 BLUE SHLE CLAY 0395
NEWMARKET TOWN ()	17 622460 4879190[W]	2005/05 6607	02	FR 0014			8 10	6929060 (Z27814) A026593 BRWN GRVL 0001 BRWN SILT 0017
NEWMARKET TOWN ()	17 622460 4879190[W]	2005/08 7241	02				9 10	6929362 (Z34268) A027916 BRWN SAND FILL LOOS 0012 GREY SILT CLAY HARD 0019
NEWMARKET TOWN ()	17 622424 4879183[W]	2007/01 7241						7041346 (Z58161) A027916
NEWMARKET TOWN ()	17 621857 4878612[W]	2008/05 7215	01				20 -10	7112690 (Z92271) A068092 BRWN FILL DRY 0004 BRWN CLAY WBRG 0010 GREY CLAY WBRG 0016 BRWN CLAY WBRG 0020
NEWMARKET TOWN ()	17 621840 4878610[W]	2008/07 7215					20 -10	7116740 (Z81508) A068062 GREY STNS DRY 0008 GREY SILT CLAY WBRG 0015 BRWN CLAY WBRG 0020
NEWMARKET TOWN ()	17 621895 4878506[W]	2009/07 6032					10 10	7129493 (Z095863) A068242 BRWN LOAM LOOS 0001 BRWN FILL PRDG 0008 GREY CLAY SILT GRVL 0015 GREY SILT GRVL FSND 0020
NEWMARKET TOWN ()	17 622026 4878145[W]	2009/09 7241	02				10 10	7132692 (Z104887) A090917 BRWN SAND TILL 0016 BRWN SAND CLAY 0020
NEWMARKET TOWN ()	17 622211 4878217[W]	2009/09 7241	02				10 10	7132693 (Z104886) A090918 BRWN SAND TILL 0016 BLUE SAND CLAY 0020
NEWMARKET TOWN ()	17 622451 4879196[W]	2009/10 7241	12				0 15	7133778 (Z104772)
NEWMARKET TOWN ()	17 622106 4879264[W]	2009/10 7241	02					7133950 (M05318) A090996 GREY SILT TILL SOFT 0022

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NEWMARKET TOWN ()	17 621865 4879147[W]	2009/12 7215					20 -10	7136868 (Z107491) A093094 BRWN FILL ROCK 0004 BRWN CLAY SILT 0016 GREY CLAY SILT 0020
NEWMARKET TOWN ()	17 622262 4879276[W]	2009/12 7215					10 15	7136872 (Z107501) A093145 BRWN FILL GRVL LOOS 0005 BRWN SILT SAND 0015 GREY SILT CLAY 0025
NEWMARKET TOWN ()	17 621931 4879180[W]	2009/12 7215					15 -10	7136874 (Z107452) A075197 BRWN FILL ROCK SAND 0003 BRWN CLAY 0015
NEWMARKET TOWN ()	17 622433 4879217[W]	2009/11 7215					10 10	7136890 (Z107500) A090315 BRWN GRVL FILL LOOS 0005 BRWN SILT TILL ROCK 0015 GREY SILT WBRG 0020
NEWMARKET TOWN ()	17 622224 4879366[W]	2009/12 7215					20 -15	7139918 (Z110018) A093100 BRWN FILL ROCK SAND 0004 BRWN SILT CLAY ROCK 0020
NEWMARKET TOWN ()	17 622188 4879264[W]	2010/01 7215					10 10	7139929 (Z110054) A095353 BRWN FILL FILL LOOS 0010 GREY SAND CLAY WBRG 0020
NEWMARKET TOWN ()	17 622240 4879237[W]	2010/01 7215					30 -15	7139995 (Z110068) A095363 BRWN FILL ---- 0004 BRWN TILL SLTY DRY 0016 BRWN TILL DRY 0026 BRWN CLAY SLTY WBRG 0030
NEWMARKET TOWN ()	17 622884 4878310[W]	2010/01 7241	01				10 10	7140535 (Z111799) A081084 GREY GRVL DNSE 0001 BRWN SAND SILT DNSE 0016 GREY SILT CLAY DNSE 0020
NEWMARKET TOWN ()	17 622468 4879206[W]	2010/01 7241	04				1 6	7140609 (Z098136) A085572 BRWN SAND GRVL LOOS 0001 BRWN SILT FSND HARD 0007
NEWMARKET TOWN ()	17 622445 4879198[W]	2010/01 7241	02				3 13	7140610 (Z098137) A092382 BRWN SAND GRVL LOOS 0003 BRWN SILT FSND SOFT 0016
NEWMARKET TOWN ()	17 622531 4879188[W]	2010/01 7241	02				5 10	7140611 (Z106490) A084219 BRWN SAND GRVL LOOS 0003 BRWN SILT FSND SOFT 0015
NEWMARKET TOWN ()	17 622812 4878292[W]	2010/01 7241	01				10 10	7140693 (Z111211) A091078 BRWN FILL ROCK LOOS 0003 BRWN CLAY SILT DNSE 0012 GREY CLAY WBRG DNSE 0020
NEWMARKET TOWN ()	17 622372 4879194[W]	2010/03 7215					25 -15	7141727 (Z110084) A095315 BRWN FILL 0008 BRWN TILL DRY 0016 BRWN TILL CLAY 0022 GREY CLAY SLTY WBRG 0025
NEWMARKET TOWN ()	17 622034 4879212[W]	2010/02 7215					16 -10	7141728 (Z110086) A095306 BRWN 0004 BRWN DRY 0010 BRWN 0016
NEWMARKET TOWN ()	17 622563 4878368[W]	2010/04 7241	02					7144313 (M07004) A091040 BRWN SAND GRVL FILL 0004 GREY CLAY SILT SOFT 0015
NEWMARKET TOWN ()	17 622284 4879276[W]	2010/03 7215					25 -10	7144736 (Z112591) A097533 BRWN FILL ---- 0002 BRWN MSND ---- 0020 GREY SILT SAND ---- 0025

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NEWMARKET TOWN ()	17 622309 4879301[W]	2010/03 7215					15 15	7144738 (Z112578) A097546 BRWN GRVL SAND LOOS 0005 BRWN SAND SILT SOFT 0010 BRWN SILT SAND ---- 0025 GREY SAND SILT WBRG 0030
NEWMARKET TOWN ()	17 622815 4878262[W]	2010/01 7215					10 15	7144740 (Z110056) A095351 BRWN GRVL FILL LOOS 0007 GREY CLAY CLAY ---- 0025
NEWMARKET TOWN ()	17 622827 4878429[W]	2010/01 7215					20 -10	7144741 (Z110060) A095341 BRWN FILL ---- 0002 BRWN CLAY SAND 0015 GREY CLAY SAND 0020
NEWMARKET TOWN ()	17 622617 4878386[W]	2010/05 7241						7145153 (M07123) A091040
NEWMARKET TOWN ()	17 622369 4879194[W]	2010/05 7241	01				10 5	7145221 (Z114225) A099914 GREY SAND SILT DRY 0004 GREY SILT SAND 0014 GREY SILT SAND 0015
NEWMARKET TOWN ()	17 622425 4879340[W]	2010/05 7241	01 01					7146920 (M07133) A099871 BLCK 0001 BRWN SAND GRVL LOOS 0001 BRWN SILT SAND DNSE 0015 BLCK SILT CLAY DNSE 0018 GREY CLAY SILT DNSE 0021
NEWMARKET TOWN ()	17 621882 4878615[W]	2010/08 7241	01				3 5	7150386 (Z113342) A102898 BRWN SAND WBRG 0003 GREY SILT CLAY WBRG 0008
NEWMARKET TOWN ()	17 621868 4878610[W]	2010/08 7241	01				8 10	7150387 (Z113343) A102904 BRWN SAND DRY 0004 GREY SILT CLAY WBRG 0018
NEWMARKET TOWN ()	17 622335 4879271[W]	2010/01 6809						7154732 (M05900) A089247
NEWMARKET TOWN ()	17 622148 4879062[W]	 7241						7167636 (M10901) A116597
AURORA TOWN (WHITCHU YS E 01(085)	17 622580 4875820[W]	1987/01 1413	06	FR 0395	070 / 150 050 / 8:0	NU	400 12	6918439 () BRWN CLAY DNSE 0012 GREY CLAY SILT SOFT 0065 BRWN GRVL SAND PCKD 0075 GREY CLAY STNS HARD 0105 GREY CLAY STNS HARD 0177 GREY CLAY DNSE 0225 BRWN SAND CLN LOOS 0265 GREY CLAY SAND PCKD 0282 GREY SAND CLN LOOS 0285 GREY GRVL SAND CLN 0312 GREY GRVL PCKD 0358 GREY GRVL CLN LOOS 0365 GREY GRVL 0372 GREY CLAY DNSE 0375 GREY GRVL SAND PCKD 0380 GREY GRVL SAND CLN 0385 GREY GRVL SAND PCKD 0392 GREY CLAY SAND PCKD 0395 GREY SAND CLN 0398 GREY GRVL SAND CGRD 0408 GREY CLAY STNS CMTD 0415
NEWMARKET TOWN (EAST YS E 01(096)	17 621849 4879307[W]	1956/08 1622	04	FR 0240	022 / 200 012 / :0	DO		6900686 () FILL 0006 CLAY 0075 MSND 0105 BLUE CLAY 0240 GRVL 0244

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NEWMARKET TOWN (EAST YS E 01(096)	17 621954 4879337[W]	1950/05 1622	02	FR 0110	030 / 030 / 2:30	DO	105 5	6900679 () LOAM 0001 YLLW CLAY 0035 FSND 0070 BLUE CLAY 0102 CSND 0110
NEWMARKET TOWN (EAST YS E 01(096)	17 622302 4879484[W]	1957/09 1413	06	FR 0333	063 / 185 020 / 24:0	MN	311 22	6900687 () LOAM 0003 BRWN CLAY 0030 HPAN 0070 BLDR 0075 HPAN 0105 BLDR 0114 HPAN 0215 BLUE CLAY 0238 FSND 0240 HPAN 0304 BLCK FSND 0333
NEWMARKET TOWN (EAST YS E 01(096)	17 622028 4879293[W]	1957/10 1413	06	FR 0248	035 / 160 040 / 24:0	MN	240 8	6900688 () CLAY 0087 CLAY GRVL 0095 HPAN STNS 0238 SILT 0240 GRVL 0248
NEWMARKET TOWN (EAST YS E 01(096)	17 622123 4879610[W]	1958/06 1413	07	FR 0287	054 / 060 090 / 28:0	MN	267 20	6900690 () CLAY 0020 BLUE CLAY 0048 SILT BLDR 0066 BLUE CLAY 0080 HPAN 0188 BLUE CLAY 0245 HPAN 0266 GRVL 0270 CSND 0287
NEWMARKET TOWN (EAST YS E 01(096)	17 621774 4879228[W]	1958/06 3414	04	FR 0257	039 / 220 008 / 6:0	CO	257 4	6900691 () CLAY SILT 0081 CLAY 0257 GRVL MSND CLAY 0261
NEWMARKET TOWN (EAST YS E 01(096)	17 621881 4879244[W]	1959/04 1413	07	FR 0385	070 / 102 060 / 24:0	MN	365 20	6900693 () CLAY 0015 CLAY MSND 0068 HPAN 0150 BLUE CLAY 0220 HPAN 0360 CSND 0385
NEWMARKET TOWN (EAST YS E 01(096)	17 621996 4879215[W]	1958/02 4813	06	FR 0189	030 / 040 030 / 4:30	CO	190 4	6900689 () FILL MSND 0007 BRWN CLAY 0015 GREY CLAY 0051 GRVL 0109 MSND STNS 0116 BLUE CLAY 0182 HPAN 0189 GRVL 0195
NEWMARKET TOWN (EAST YS E 01(096)	17 622456 4879349[W]	2010/09 7215	02				20 -10	7152526 (Z121735) A103155 BRWN FILL LOOS 0001 BRWN CLAY SILT DNSE 0014 GREY CLAY SILT SOFT 0020
NEWMARKET TOWN (EAST YS E 01(097)	17 622584 4879985[L]	2002/11 4102						6926806 (245414)
NEWMARKET TOWN (EAST YS E 01(097)	17 621615 4879823[W]	1978/03 2801	02	FR 0253	093 / 099 020 / 3:0	NU MN	308 15	6914462 () BRWN CLAY STNS 0023 GREY CLAY 0056 GREY CLAY GRVL LYRD 0099 GREY FSND CLAY FGVL 0117 GREY CLAY FGVL LYRD 0253 FSND PCKD 0272 FGVL SAND 0273 GREY CLAY FSND LYRD 0277 FSND FGVL 0310 GRVL SAND 0317 SAND GRVL CMTD 0329 GRVL SAND BLDR 0337 BLDR 0338
NEWMARKET TOWN (EAST YS E 01(097)	17 621646 4879749[W]	1960/05 4102	30	FR 0010	010 / 002 / :0	DO		6900696 () BLUE CLAY 0010 FSND 0020
NEWMARKET TOWN (EAST YS E 01(097)	17 621765 4879523[W]	1978/07 2801	16 10 10	FR 0254	100 / 147 008 / 24:0	MN	276 5	6915134 () CLAY 0023 CLAY SAND 0040 FSND 0044 CLAY SAND 0082 CLAY SAND GRVL 0100 CLAY GRVL PCKD 0119 GRVL CMTD 0133 CLAY GRVL 0144 GRVL CMTD 0149 CLAY GRVL 0254 SAND PCKD 0264 GRVL SAND 0273 GRVL SAND CLAY 0283 SAND GRVL 0321 SAND GRVL PCKD 0325 GRVL SHLE CMTD 0327

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NEWMARKET TOWN (EAST YS E 01(098)	17 621553 4880244[W]	1951/09 2310	02	FR 0174	040 / 005 / 6:0	DO	174 8	6907461 () CLAY STNS 0040 GREY CLAY 0135 CLAY STNS 0174 GRVL MSND 0182
NEWMARKET TOWN (EAST YS E 01(098)	17 621615 4879973[W]	1970/05 3109	30	FR 0048	008 / / :0	DO		6909964 () LOAM 0002 BRWN CLAY STNS 0023 BLUE CLAY STNS 0056
NEWMARKET TOWN (EAST YS E 01(099)	17 621674 4880495[W]	1964/10 1413	05	FR 0142	048 / 061 009 / 7:0	DO ST	138 4	6900702 () BRWN CLAY 0023 BLUE CLAY 0070 BLUE CLAY STNS 0104 BLUE CLAY SILT 0125 MSND 0142
NEWMARKET TOWN (EAST YS E 01(099)	17 621669 4880490[W]	1964/09 4102	30					6900701 () BLUE CLAY 0060
NEWMARKET TOWN (EAST YS W 01(096)	17 619635 4879059[W]	1987/10 3108	06	FR 0465	172 / 445 015 / 2:0	PS		6919042 (13860) BRWN CLAY STNS 0014 BLUE CLAY SNDY STNS 0078 SAND 0084 BLUE CLAY SNDY 0132 BLUE CLAY 0208 BLUE CLAY SNDY 0425 BRWN CLAY 0440 BLUE SHLE 0470
NEWMARKET TOWN (EAST YS W 01(096)	17 621015 4879023[W]	1979/08 1711	05	FR 0120	045 / 070 010 / 3:0	DO	131 4	6915175 () GREY CLAY STNS 0027 BLUE CLAY STNS 0102 BLUE CLAY 0120 GREY SAND CLAY STNS 0137
NEWMARKET TOWN (EAST YS W 01(097)	17 621249 4879575[W]	2004/09 1663	36		012 / / :0			6928240 (Z13110) YLLW 0029 BRWN SAND CLAY SILT 0006 YLLW 0005 BRWN CLAY SAND SILT 0000 0000
NEWMARKET TOWN (EAST YS W 01(097)	17 621375 4879620[W]	2000/04 4102						6925386 (140333) CLAY 0008 UNKN 0010 SAND CLAY 0014 UNKN 0016 GRVL 0022 CLAY SAND 0031
NEWMARKET TOWN (EAST YS W 01(097)	17 621559 4879735[W]	1963/08 3109	30	FR 0038	022 / 001 / :0	DO		6900762 () LOAM 0002 CLAY 0023 BLUE CLAY STNS 0038 MSND 0039 BLUE CLAY STNS 0053
NEWMARKET TOWN (EAST YS W 01(097)	17 621464 4879649[W]	1959/04 3414	04	FR 0436	120 / 232 003 / 7:0	DO	428 8	6900761 () LOAM 0001 BRWN CLAY BLDR 0120 MSND CLAY 0190 BLUE CLAY 0250 MSND CLAY 0428 MSND 0436 BLUE CLAY 0445 BRWN SHLE 0465
NEWMARKET TOWN (EAST YS W 01(098)	17 621349 4879790[W]	1999/05 1663				NU		6925045 (206271) BRWN CLAY SNDY 0000 YLLW UNKN 0005 BRWN CLAY SNDY 0012 YLLW UNKN 0024 BRWN CLAY SNDY 0032 YLLW UNKN 0090
NEWMARKET TOWN (EAST YS W 01(098)	17 621405 4879893[W]	1970/08 2310	05					6910045 () GREY CLAY 0020 BLUE CLAY 0046 BLUE CLAY GRVL 0080 BLUE CLAY MSND 0250
NEWMARKET TOWN (EAST YS W 01(098)	17 622507 4880407[L]	1999/05 1663				NU		6925044 (206266) BRWN CLAY CMTD 0000 YLLW UNKN 0007 BRWN CLAY SNDY 0008 YLLW UNKN 0019
NEWMARKET TOWN (EAST YS W 01(098)	17 620499 4879744[L]	1947/09 1337	02	FR 0080	006 / 026 002 / 4:0	ST DO		6900763 () LOAM 0001 CLAY 0012 GRVL 0040 GRVL MSND 0079 SHLE 0080

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NEWMARKET TOWN (EAST YS W 01(099)	17 621115 4880523[W]	1983/09 5459						6917028 () BRWN CLAY SNDY 0011 BLUE CLAY SILT 0052 BLUE CLAY STNS DRY 0282 GREY SAND SILT DRTY 0305 WHIT CLAY STNS GRVL 0331 BLUE CLAY SILT 0378 BLUE CLAY STNS SNDY 0428 BLUE CLAY STNS 0436 BLUE CLAY STNS SNDY 0438 BLCK SHLE 0455
NEWMARKET TOWN (EAST YS W 01(099)	17 621115 4880523[W]	1983/09 5459	06	FR 0430	149 / 432 005 / 5:0	IN	432 6	6917029 () BRWN CLAY SNDY 0017 BLUE CLAY SNDY 0044 BLUE CLAY STNS DRY 0298 WHIT CLAY STNS SAND 0319 BLUE CLAY SAND STNS 0397 WHIT CLAY STNS GRVL 0425 BLUE CLAY STNS 0430 GREY SAND STNS CLN 0439 BLUE CLAY SAND STNS 0443
NEWMARKET TOWN (EAST YS W 01(099)	17 620417 4880148[L]	1991/11 1663						6921804 (110083)
NEWMARKET TOWN (EAST YS W 01(099)	17 621285 4879960[W]	2000/05 1663				NU		6925428 (213505)
NEWMARKET TOWN (EAST ()	17 621665 4879707[W]	2005/11 7215					20 -10	6929751 (Z33975) A019797
NEWMARKET TOWN (EAST ()	17 621296 4880440[W]	2011/08 7241						7171608 (Z138777) A116591
NEWMARKET TOWN (EAST ()	17 621295 4880439[W]	2011/08 7241						7171607 (Z138779) A112755
NEWMARKET TOWN (EAST ()	17 621367 4880580[W]	2011/08 7241						7168033 (M10138) A086640
NEWMARKET TOWN (EAST ()	17 621670 4879647[W]	2005/08 7215	01				20 -15	6929453 (Z33963) A019776
NEWMARKET TOWN (EAST ()	17 622803 4879470[W]	2010/07 7215	02				18 -10	7153271 (Z116355) A103100 BRWN FILL 0001 BRWN SAND SILT WBRG 0003 BRWN SILT SAND WBRG 0010 BRWN SILT SAND PCKD 0018
NEWMARKET TOWN (EAST ()	17 621170 4879324[W]	2010/04 7215	02				25.5 - 15.5	7153331 (Z112568) A097570 BRWN FILL ROCK SAND 0004 BRWN SILT CLAY WBRG 0020 GREY SILT CLAY WBRG 0026
NEWMARKET TOWN (EAST ()	17 622444 4879337[W]	2011/04 7215						7162961 (Z129059) A112008
NEWMARKET TOWN (EAST ()	17 621294 4880438[W]	2011/08 7241						7171609 (Z138776) A116592

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 # DEPTHS TO WHICH FORMATIONS EXTEND[5,11]
NEWMARKET TOWN (EAST ()	17 622407 4879315[W]	7215						7164308 (Z133639) A113896
NEWMARKET TOWN (EAST ()	17 621702 4879474[W]	2010/12 7230						7163453 (M08064) A106818
NEWMARKET TOWN (KING YS W 01(088)	17 622185 4875906[W]	1963/09 2310	04	FR 0065	025 / 035 010 / 0:30	DO ST	65 4	6901591 () FILL 0002 GREY CLAY 0025 BLUE CLAY 0060 MSND GRVL 0070
NEWMARKET TOWN (KING YS W 01(088)	17 622134 4875908[W]	2004/05 1663						6927841 (Z13070)
NEWMARKET TOWN (KING YS W 01(088)	17 622123 4875900[W]	2004/05 1663				NU		6927840 (Z13069)
NEWMARKET TOWN (KING YS W 01(089)	17 620914 4875795[W]	2005/09 6607	02	0039			61 5	6929487 (Z35447) A031685 BRWN SILT SNDY GRVL 0014 GREY SILT CLAY WBRG 0038 GREY FSND SILT LOOS 0044 GREY SILT CLAY WBRG 0066
NEWMARKET TOWN (KING YS W 01(089)	17 621139 4876076[L]	2003/07 1663				NU		6927213 (253155)
NEWMARKET TOWN (KING YS W 01(089)	17 621139 4876076[L]	2003/07 1663				NU		6927214 (253156)
NEWMARKET TOWN (KING YS W 01(089)	17 620155 4875883[W]	1971/07 3519	05 04 07	FR 0550	205 / 310 020 / 30:0	DO	550 4	6910635 () BLCK LOAM 0002 GREY CLAY STNS 0065 GREY QSND 0110 GREY STNS CLAY 0300 GREY CLAY 0350 GREY QSND 0410 GREY CLAY 0440 GREY CLAY STNS 0550 GREY CSND 0560
NEWMARKET TOWN (KING YS W 01(089)	17 620129 4875990[W]	1966/01 3414	05					6901594 () LOAM 0001 BRWN MSND 0079
NEWMARKET TOWN (KING YS W 01(089)	17 620104 4875990[W]	1966/01 3414	04					6901593 () LOAM 0001 BRWN MSND 0078 SILT 0170 CLAY 0175 SILT 0204
NEWMARKET TOWN (KING YS W 01(089)	17 622110 4876574[W]	1963/10 3108	04	FR 0064	041 / 056 005 / 2:0	DO	65 3	6901592 () PRDG 0040 BLUE CLAY STNS 0054 CSND 0059 FSND MSND 0061 MSND 0068
NEWMARKET TOWN (KING YS W 01(090)	17 620015 4876273[W]	1977/04 1350	06	FR 0078	071 / 081 006 / 0:35	DO	78 3	6914294 () BRWN CLAY SNDY 0017 BRWN SAND DRY 0078 BRWN SAND WBRG 0084
NEWMARKET TOWN (KING YS W 01(090)	17 621792 4876913[W]	1975/10 2801						6913277 () BRWN CLAY 0014 GREY CLAY 0032 GREY CLAY 0040 GREY BLDR LMSN 0041 GREY CLAY GRVL 0253 GREY CLAY GRVL 0296 GREY LMSN 0300 GREY LMSN GRVL 0347
NEWMARKET TOWN (KING YS W 01(090)	17 622046 4876386[W]	2002/07 1663				NU		6926553 (240103)

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 # DEPTHS TO WHICH FORMATIONS EXTEND[5,11]
NEWMARKET TOWN (KING YS W 01(090)	17 620660 4876178[W]	1989/06 5206	05	FR 0108	/ 112 003 / 21:0	DO	109 3	6920813 (66851) BRWN FSND 0008 GREY SAND CLAY 0020 BLUE CLAY SNDY 0070 SAND SLTY CLAY 0090 GREY CLAY SLTY 0108 GREY FSND SLTY 0112 BLUE CLAY 0200
NEWMARKET TOWN (KING YS W 01(090)	17 620660 4876178[W]	1989/06 5206	06	UK 0315	225 / 245 025 / 5:0	DO	315 3	6920811 (66852) BRWN SAND 0030 BLUE CLAY SNDY 0080 SAND SLTY DRTY 0098 BLUE CLAY 0110 FSND SLTY DRTY 0114 BLUE CLAY 0305 SAND DRTY 0309 BLUE CLAY 0315 SAND CLN 0318
NEWMARKET TOWN (KING YS W 01(090)	17 620886 4876296[W]	2006/04 7230	02	0010		NU	10 10	6930359 (Z44346) A027557 LOAM 0002 BRWN SAND SILT DNSE 0023 GREY CLAY SILT HARD 0027
NEWMARKET TOWN (KING YS W 01(090)	17 620072 4876095[W]	1955/11 3414	05	FR 0091	066 / 067 005 / 8:0	DO	87 4	6901595 () PRDG 0066 MSND 0072 BRWN FSND 0091
NEWMARKET TOWN (KING YS W 01(090)	17 622057 4876900[W]	1962/04 2310	04	FR 0132	040 / 100 005 / 20:0	DO	132 4	6901596 () LOAM 0004 CLAY STNS 0130 GRVL 0136
NEWMARKET TOWN (KING YS W 01(090)	17 620660 4876178[W]	1989/06 5206	06	UK 0296	219 / 248 010 / 1:35	DO	297 3	6920812 (66853) BRWN FILL SAND 0010 GREY CLAY SNDY 0030 BLUE CLAY 0113 FSND SLTY SAND 0116 BLUE CLAY 0292 FSND SLTY SAND 0295 BLUE CLAY 0296 GREY FSND SILT MSND 0301 BLUE CLAY 0305
NEWMARKET TOWN (KING YS W 01(090)	17 620078 4875927[W]	1994/03 1663	06	FR 0067	056 / 080 004 / 1:0	DO	77 3	6923102 (140649) BRWN LOAM 0002 BRWN SAND 0007 YLLW CLAY 0021 BRWN CLAY GRVL SAND 0036 BRWN SAND GRVL STNS 0067 BRWN SAND FSND 0079 GREY SAND FSND 0084 GREY SAND SILT 0089 BLUE CLAY SILT 0110
NEWMARKET TOWN (KING YS W 01(093)	17 621434 4878064[W]	1975/10 2801						6913276 () GREY CLAY 0003 BLCK MUCK 0005 GREY CLAY 0022 GREY SILT GRVL 0025 GREY CLAY SILT SAND 0030 BRWN GRVL BLDR SAND 0035 GREY CLAY GRVL 0264 GREY CLAY GRVL 0321 GREY LMSN 0325
NEWMARKET TOWN (KING YS W 01(093)	17 620344 4877581[W]	1965/04 3108	04	FR 0302	130 / 140 010 / 2:0	DO	310 7	6901597 () PRDG 0017 BLUE CLAY STNS 0022 BLUE CLAY 0045 BLUE CLAY 0060 FSND 0079 BLUE CLAY 0087 MSND 0302 MSND GRVL 0317
NEWMARKET TOWN (KING YS W 01(093)	17 620885 4877717[L]	2002/07 4743				NU		6926463 (246937)
NEWMARKET TOWN (KING YS W 01(093)	17 620885 4877717[L]	2002/07 4743				NU		6926464 (246938)
NEWMARKET TOWN (KING ()	17 622132 4876686[W]	2006/07 6607				NU		6930457 (Z49096) A036816

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 # DEPTHS TO WHICH FORMATIONS EXTEND[5,11]
NEWMARKET TOWN (KING ()	17 622124 4876671[W]	2005/11 6607	02	FR 0030			20 21	6929732 (Z40333) A036816 BRWN SAND FILL 0010 GREY SILT CLAY 0041
NEWMARKET TOWN (KING 01(089)	17 620200 4875812[W]	2006/11 3108				NU		7039928 (Z30627) 0008
NEWMARKET TOWN (KING 01(093)	17 621905 4878053[W]	2007/03 7147	01			NU	12 5	7042864 (Z64344) A052027 BRWN SILT SAND 0017
NEWMARKET TOWN (KING 02(089)	17 620206 4875824[W]	2006/11 3108				NU		7039927 (Z30629) 0008
NEWMARKET TOWN (KING ()	17 622170 4876676[W]	2011/07 7215						7166985 (Z137009) A113880
RICHMOND HILL TOWN (YS E 01(085)	17 622570 4875820[W]	1986/12 1413	06	FR 0295	070 / 075 200 / 8:0	MN	295 35	6918411 () BRWN CLAY DNSE 0012 GREY CLAY SILT SOFT 0065 BRWN GRVL SAND PCKD 0075 GREY CLAY STNS HARD 0105 GREY CLAY STNS HARD 0177 GREY CLAY DNSE 0226 GREY SAND MGRD CLN 0268 GREY SAND PCKD 0282 GREY SAND LOOS 0290 GREY GRVL STNS HARD 0295 GREY GRVL CLN LOOS 0310 GREY GRVL SAND CLN 0316
NEWMARKET TOWN (WHIT YS E 01(087)	17 622354 4876083[W]	1954/06 2613	05	FR 0353	056 / 061 012 / 8:0	ST DO		6907450 () YLLW CLAY 0030 BRWN MSND 0040 BLUE CLAY 0085 BLDR 0095 BLUE CLAY STNS 0185 BLDR CLAY STNS 0219 BLUE CLAY STNS 0265 BLUE CLAY 0299 BLUE QSND 0345 CSND 0350 GRVL 0353
NEWMARKET TOWN (WHIT YS E 01(088)	17 622352 4876450[W]	1964/12 2310	03	FR 0184	060 / 080 010 / 2:0	ST DO	280 11	6907452 () FILL 0008 GREY CLAY MSND 0025 GREY CLAY STNS 0120 BLUE CLAY MSND STNS 0284 CSND 0291
NEWMARKET TOWN (WHIT YS E 01(089)	17 622282 4876309[W]	1966/11 3519	07					6907455 () LOAM 0002 CLAY BLDR 0215
NEWMARKET TOWN (WHIT YS E 01(089)	17 622235 4876523[W]	1977/05 2801	16 10		106 / 124 #### / 24:0	NU MN	329 26	6914314 () BRWN CLAY 0016 BRWN CLAY BLDR HARD 0024 BRWN SAND GRVL BLDR 0026 BRWN CLAY BLDR HARD 0030 GREY CLAY GRVL BLDR 0278 GREY GRVL SAND CLAY 0295 GREY CLAY GRVL HARD 0324 GREY GRVL SAND CLAY 0356 GREY CLAY GRVL HARD 0358
NEWMARKET TOWN (WHIT YS E 01(089)	17 622485 4876343[W]	1976/03 2801	07		091 / 093 150 / 24:0	PS MN	343 20	6913292 () BRWN CLAY 0036 GREY CLAY 0066 GREY CLAY SAND GRVL 0135 GREY CLAY SAND GRVL 0276 GREY CLAY SAND GRVL 0334 GRVL SAND BLDR 0363 GREY CLAY SILT GRVL 0375

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 # DEPTHS TO WHICH FORMATIONS EXTEND[5,11]
NEWMARKET TOWN (WHIT YS E 01(089)	17 622724 4876367[W]	1975/12 2801	02		099 / 016 / 2:0	PS		6913279 () YLLW CLAY 0017 YLLW CLAY GRVL 0026 GREY CLAY GRVL 0039 GREY GRVL LMSN CLAY 0086 GREY CLAY GRVL 0336 BRWN GRVL SAND CLAY 0367 GREY CLAY GRVL 0397
NEWMARKET TOWN (WHIT YS E 01(089)	17 622249 4876685[W]	1950/03 3422	04					6907453 () GRVL STNS 0035
NEWMARKET TOWN (WHIT YS E 01(089)	17 622162 4876921[W]	1961/11 2310	04	FR 0062	035 / 040 005 / 2:0	DO	59 4	6907454 () PRDG 0028 CLAY STNS 0062 MSND 0063
NEWMARKET TOWN (WHIT YS E 01(089)	17 622315 4876423[W]	1983/07 2801	16 10		091 / 124 #### / 24:0	MN	324 26	6916976 () BRWN CLAY BLDR 0028 CLAY GRVL BLDR 0257 GREY CLAY SLTY 0275 CLAY GRVL 0303 MSND CLAY 0313 MSND GRVL 0320 GRVL CLAY 0331 GRVL BLDR 0335 GRVL CLAY 0351 CLAY GRVL 0353
NEWMARKET TOWN (WHIT YS E 01(089)	17 622895 4876500[W]	1975/11 2801	02		089 / 090 016 / 6:0	PS		6913278 () BRWN CLAY GRVL 0035 BRWN CLAY GRVL 0200 BRWN CLAY GRVL 0240 BRWN CLAY GRVL 0268 BRWN CLAY GRVL 0300 BRWN SAND SILT CLAY 0336 BRWN SAND GRVL CLAY 0360
NEWMARKET TOWN (WHIT YS E 01(090)	17 622469 4876888[W]	1957/11 2318	06	FR 0214	/ 012 / 48:0	ST DO		6907456 () PRDG 0022 BLUE CLAY 0214 GRVL 0215
NEWMARKET TOWN (WHIT YS E 01(090)	17 622944 4877278[W]	1976/01 2801				PS		6913280 () BRWN CLAY 0019 GREY CLAY 0066 GREY CLAY GRVL 0081 GREY GRVL CLAY 0090 GREY CLAY GRVL 0186 GREY GRVL CLAY 0189 GREY CLAY 0237 GREY CLAY GRVL 0255 BRWN SAND GRVL CLAY 0276 GREY CLAY GRVL 0329 GREY CLAY GRVL 0395 BLCK SHLE CLAY 0396
NEWMARKET TOWN (WHIT YS E 01(090)	17 622241 4876763[W]	2004/10 6607	02	0018			12 13	6928264 (Z19521) A016932 BRWN SAND GRVL SILT 0002 BRWN SILT SAND CLAY 0010 GREY SILT SAND 0020 GREY SILT SAND 0025
NEWMARKET TOWN (WHIT YS E 01(091)	17 623022 4877550[L]	2002/10 4102				NU		6926686 (245408)
NEWMARKET TOWN (WHIT YS E 01(093)	17 622866 4878366[L]	2002/02 6571	02	UK 0007		NU	5 10	6926596 (244753) BRWN LOAM 0002 BRWN SAND 0007 GREY CLAY SAND DNSE 0008 GREY CLAY DNSE 0015
NEWMARKET TOWN (WHIT YS E 01(093)	17 622866 4878366[L]	2002/02 6571	02	FR 0004		NU	2 10	6926597 (244748) BRWN LOAM 0002 BRWN CLAY SAND PORS 0004 GREY CLAY SILT DNSE 0006 GREY CLAY DNSE 0012

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 # DEPTHS TO WHICH FORMATIONS EXTEND[5,11]
NEWMARKET TOWN (WHIT YS E 01(093)	17 622866 4878366[L]	2002/02 6571	07	FR 0004		NU	2 10	6926598 (244749) BRWN LOAM 0002 BRWN CLAY SAND PORS 0004 GREY CLAY SILT DNSE 0006 GREY CLAY DNSE 0012
NEWMARKET TOWN (WHIT YS E 01(093)	17 622866 4878366[L]	2002/02 6571	02	FR 0005		NU	3 10	6926599 (244750) BRWN LOAM 0001 BRWN SAND CLAY PORS 0004 GREY CLAY SILT DNSE 0013
NEWMARKET TOWN (WHIT YS E 01(093)	17 622866 4878366[L]	2002/02 6571	02	FR 0006		NU	3 10	6926600 (244751) BRWN LOAM 0005 BRWN SAND PORS 0007 GREY CLAY DNSE 0013
NEWMARKET TOWN (WHIT YS E 01(093)	17 622866 4878366[L]	2002/02 6571	02	FR 0008		NU	5 10	6926601 (244754) BRWN LOAM 0001 BRWN SAND PORS 0007 GREY CLAY SAND DNSE 0008 GREY CLAY DNSE 0015
NEWMARKET TOWN (WHIT YS E 01(093)	17 622866 4878366[L]	2002/02 6571	02	FR 0005		NU	3 10	6926602 (244755) BRWN LOAM 0002 BRWN SAND PORS 0010 GREY CLAY SILT DNSE 0013
NEWMARKET TOWN (WHIT YS E 01(093)	17 622866 4878366[L]	2002/02 6571	02	FR 0004		NU	3 5	6926603 (244756) BLCK SAND STNS 0002 BLCK SAND CLAY PORS 0006 GREY CLAY SILT DNSE 0008
NEWMARKET TOWN (WHIT YS E 01(093)	17 622866 4878366[L]	2002/02 6571	02	FR 0004		NU	2 5	6926604 (244757) BLCK SAND 0003 BRWN SAND STNS 0004 GREY CLAY SILT DNSE 0007
NEWMARKET TOWN (WHIT YS E 01(093)	17 622866 4878366[L]	2002/02 6571	02	FR 0004		NU	2 5	6926605 (244758) BLCK SAND 0001 BRWN FSND PORS 0003 BRWN SAND STNS PORS 0004 BRWN CLAY SILT DNSE 0007
NEWMARKET TOWN (WHIT YS E 01(093)	17 622866 4878366[L]	2002/02 6571	02	FR 0004		NU	2 5	6926606 (244759) BLCK SAND 0001 BRWN SAND PORS 0004 BRWN CLAY SILT DNSE 0007
NEWMARKET TOWN (WHIT YS E 01(093)	17 622866 4878366[L]	2002/02 6571	04	FR 0003		NU	2 10	6926607 (244775) BRWN SAND 0002 BRWN FSND PORS 0003 BRWN SAND STNS PORS 0008 GREY CLAY SILT DNSE 0012
NEWMARKET TOWN (WHIT YS E 01(093)	17 622867 4878367[L]	2003/07 6571				NU		6927705 (Z09630)
NEWMARKET TOWN (WHIT YS E 01(093)	17 622867 4878367[L]	2003/07 6571				NU		6927706 (Z09629)
NEWMARKET TOWN (WHIT YS E 01(093)	17 622867 4878367[L]	2003/07 6571				NU		6927707 (Z09640)
NEWMARKET TOWN (WHIT YS E 01(093)	17 622867 4878367[L]	2003/07 6571				NU		6927708 (Z09639)
NEWMARKET TOWN (WHIT YS E 01(093)	17 622867 4878367[L]	2003/07 6571				NU		6927709 (Z09638)
NEWMARKET TOWN (WHIT YS E 01(093)	17 622867 4878367[L]	2003/07 6571				NU		6927710 (Z09637)

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 # DEPTHS TO WHICH FORMATIONS EXTEND[5,11]
NEWMARKET TOWN (WHIT YS E 01(093)	17 622867 4878367[L]	2003/07 6571				NU		6927711 (Z09636)
NEWMARKET TOWN (WHIT YS E 01(093)	17 622867 4878367[L]	2003/07 6571				NU		6927712 (Z09635)
NEWMARKET TOWN (WHIT YS E 01(093)	17 622867 4878367[L]	2003/07 6571				NU		6927714 (Z09634)
NEWMARKET TOWN (WHIT YS E 01(093)	17 622866 4878366[L]	2002/02 6571	02	FR 0008		NU	5 10	6926592 (244745) BRWN SAND 0006 BRWN CLAY SAND PORS 0009 GREY CLAY SILT DNSE 0015
NEWMARKET TOWN (WHIT YS E 01(093)	17 622866 4878366[L]	2002/02 6571	02	FR 0007		NU	3 10	6926593 (244746) BRWN CLAY SAND PORS 0007 GREY CLAY SILT DNSE 0013
NEWMARKET TOWN (WHIT YS E 01(093)	17 622866 4878366[L]	2002/02 6571	02	FR 0007		NU	3 10	6926594 (244747) BRWN LOAM 0001 BRWN CLAY SAND PORS 0007 GREY CLAY SILT DNSE 0013
NEWMARKET TOWN (WHIT YS E 01(093)	17 622866 4878366[L]	2002/02 6571	02	FR 0006		NU	3 10	6926595 (244752) BRWN LOAM 0002 BRWN SAND PORS 0009 GREY CLAY SILT DNSE 0013
NEWMARKET TOWN (WHIT YS E 01(094)	17 622484 4878365[W]	1950/05 2310	02	FR 0130	015 / 004 / 6:0	DO	130 4	6907460 () RED CLAY 0020 BLUE CLAY 0050 BLUE CLAY STNS 0130 GRVL 0134
NEWMARKET TOWN (WHIT ()	17 622156 4878214[W]	2011/03 7230						7163458 (M08069) A018141
NEWMARKET TOWN (WHIT ()	17 622880 4877224[W]	2011/09 7241						7169855 (Z140159) A115717
NEWMARKET TOWN (WHIT ()	17 622437 4877222[W]	2011/09 7241						7169856 (Z140160) A115716
NEWMARKET TOWN (WHIT ()	17 621797 4879348[W]	2004/01 6607	02	FR 0007			2 10	6927802 (Z07563) A007304 UNKN 0000 SAND FILL 0002 GREY CLAY SILT SOFT 0006 BRWN SILT GRVL HARD 0012
NEWMARKET TOWN (WHIT ()	17 622411 4877161[W]	2011/09 7241						7169853 (Z140157) A122457

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

1. Core Material and Descriptive terms

Code	Description	…	Code	Description	…	Code	Description	…	Code	Description	…	Code	Description
BLDR	BOULDERS		FCRD	FRACTURED		IRFM	IRON FORMATION		PORS	POROUS		SOFT	SOFT
BSLT	BASALT		FGRD	FINE-GRAINED		LIMY	LIMY		PRDG	PREVIOUSLY DUG		SPST	SOAPSTONE
CGRD	COARSE-GRAINED		FGVL	FINE GRAVEL		LMSN	LIMESTONE		PRDR	PREV. DRILLED		STKY	STICKY
CGVL	COARSE GRAVEL		FILL	FILL		LOAM	TOPSOIL		QRTZ	QUARTZITE		STNS	STONES
CHRT	CHERT		FLDS	FELDSPAR		LOOS	LOOSE		QSND	QUICKSAND		STNY	STONEY
CLAY	CLAY		FLNT	FLINT		LTCL	LIGHT-COLOURED		QTZ	QUARTZ		THIK	THICK
CLN	CLEAN		FOSS	FOSILIFEROUS		LYRD	LAYERED		ROCK	ROCK		THIN	THIN
CLYY	CLAYEY		FSND	FINE SAND		MARL	MARL		SAND	SAND		TILL	TILL
CMTD	CEMENTED		GNIS	GNEISS		MGRD	MEDIUM-GRAINED		SHLE	SHALE		UNKN	UNKNOWN TYPE
CONG	CONGLOMERATE		GRNT	GRANITE		MGVL	MEDIUM GRAVEL		SHLY	SHALY		VERY	VERY
CRYS	CRYSTALLINE		GRSN	GREENSTONE		MRBL	MARBLE		SHRP	SHARP		WBRG	WATER-BEARING
CSND	COARSE SAND		GRVL	GRAVEL		MSND	MEDIUM SAND		SHST	SCHIST		WDFR	WOOD FRAGMENTS
DKCL	DARK-COLOURED		GRWK	GREYWACKE		MUCK	MUCK		SILT	SILT		WTHD	WEATHERED
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
GREN	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		
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 G

Water Well Survey

COLE ENGINEERING

Experience Enhancing Excellence

January 25th, 2012

Dear Resident:

Cole Engineering Group Ltd. (CEG) is conducting a water well survey in your area as part of the planning process requested by Marianneville Development Limited. Our company representatives will be conducting a door-to-door survey from Monday, January 30th, 2012 to Friday, February 3rd, 2012 to collect information on any water wells that may be on your property. We need this information to determine if any future changes in land use in your area will impact groundwater resources.

Well information collected from you will be used to assess the current groundwater usage and flow patterns in your area. Information about your well will not be used for any other purpose and will not be made available to the public. Your participation in this survey is voluntary; however, if you do use a private well, your participation is encouraged as it will help CEG to assess and protect groundwater resources in your area.

Please take a few minutes to review the attached well survey form. We ask that you please fill out any information that you may have knowledge of and return the form using the prepaid self addressed envelope. If you provide permission for CEG to collect a water sample from an outdoor tap, CEG will contact you to arrange a time for sample collection at your convenience. Please note that the water monitoring program will be conducted at no cost to you.

If you have any questions, please do not hesitate to call Alexandra Chan at 905-940-6161 or e-mail achan@coleengineering.ca. Your cooperation is very much appreciated.

Sincerely,

Tabitha Lee, M.A.Sc., P.Eng.
Senior Hydrogeologist
Environmental Management
Cole Engineering Group Ltd.

COLE ENGINEERING

Well Survey

Well Owner Information

Name: First Last

Address: Street

City Province Postal Code

Phone No: ( )

Other Details

Date: M M / D D / Y Y Y Y

Surveyor(s):

Other:

Well Details

Type: ☐ Drilled ☐ Dug ☐ Other, specify:

Total Depth: ☐ meters ☐ feet

Depth to Water: ☐ meters ☐ feet

Screening Interval: ☐ meters ☐ feet

Diameter: ☐ meters ☐ feet

Stickup: ☐ meters ☐ feet

MOE Well Number:

Casing Material: ☐ Metal ☐ Plastic / PVC ☐ Other, specify:

Security: ☐ Proper Seal ☐ Cap ☐ Other, specify / Comments: (Check all that apply)

Water Usage Details

Is the well in use? ☐ Yes ☐ No ☐ Other, specify:

Type of Use: ☐ Residential ☐ Irrigation ☐ Livestock ☐ Commercial ☐ Other, specify: (Check all that apply)

Pump Type: ☐ Submersible ☐ Jet ☐ Other, specify:

Number of Users: Adults: Children:

Influences on Groundwater Quality

Onsite Influences:		Neighbouring Influences:	
☐ Storage Tanks ☐ Fertilizer ☐ Pesticides ☐ Road Salt ☐ Uncontained Waste ☐ Livestock ☐ Uncontained Chemicals ☐ Automotive Fluids ☐ Others, specify: (Check all that apply)	Comments/Description:	☐ Storage Tanks ☐ Fertilizer ☐ Pesticides ☐ Road Salt ☐ Uncontained Waste ☐ Livestock ☐ Uncontained Chemicals ☐ Automotive Fluids ☐ Others, specify: (Check all that apply)	Comments/Description:

Notes

Site Plan or Figure

Well Sampling (for CEG use only)

Well sampled for:

☐ Microbiological Parameters

- Total Coliform
- E. Coli
- Bkg
- Heterotrophic Plate Count

☐ Inorganic Parameters

- Dissolved Calcium
- Dissolved Copper
- Dissolved Iron
- Dissolved Magnesium
- Dissolved Manganese
- Dissolved Potassium
- Dissolved Sodium
- Dissolved Zinc
- Ammonia as N
- Dissolved Organic Carbon
- Alkalinity as $CaCO_3$
- Conductivity
- pH
- Chloride
- Nitrate as N
- Nitrite as N
- Phosphate as P
- Sulphate as P
- Sulphate as SO_4

COLE ENGINEERING

Well Survey

Well Owner Information	Other Details
Name:	Date: Feb 13 2012
Address:	Surveyor(s): BS, AC
	Other:
Phone No:	

Well Details

Type: ☒ Drilled ☐ Dug ☐ Other, specify:

Total Depth: 35.5 ☒ meters ☐ feet Depth to Water: 14.167 ☒ meters ☐ feet Screening Interval: ☐ meters ☐ feet

Diameter: 0.14 ☒ meters ☐ feet Stickup: 0.22 ☒ meters ☐ feet MOE Well Number:

Casing Material: ☒ Metal ☐ Plastic / PVC ☐ Other, specify:

Security: ☒ Proper Seal ☐ Cap ☐ Other, specify / Comments: old well Not properly covered

Water Usage Details

Is the well in use? ☒ Yes ☐ No ☐ Other, specify:

Type of Use: ☒ Residential ☐ Irrigation ☐ Livestock ☐ Commercial ☐ Other, specify:

Pump Type: ☒ Submersible ☐ Jet ☐ Other, specify:

Number of Users: Adults: 1 Children:

Influences on Groundwater Quality

Onsite Influences:		Neighbouring Influences:	
☐ Storage Tanks ☒ Fertilizer ☒ Pesticides ☐ Road Salt ☐ Uncontained Waste ☐ Livestock ☐ Uncontained Chemicals ☐ Automotive Fluids ☐ Others, specify:	Comments/Description: Old cow barn	☐ Storage Tanks ☐ Fertilizer ☐ Pesticides ☐ Road Salt ☐ Uncontained Waste ☐ Livestock ☐ Uncontained Chemicals ☐ Automotive Fluids ☐ Others, specify:	Comments/Description:

Notes	Site Plan or Figure

Well Sampling (for CEG use only)

Well sampled for:

☒ Microbiological Parameters

- Total Coliform
- E. Coli
- Bkg
- Heterotrophic Plate Count

☒ Inorganic Parameters

- Dissolved Calcium
- Dissolved Copper
- Dissolved Iron
- Dissolved Magnesium
- Dissolved Manganese
- Dissolved Potassium
- Dissolved Sodium
- Dissolved Zinc
- Ammonia as N
- Dissolved Organic Carbon
- Alkalinity as $CaCO_3$
- Conductivity
- pH
- Chloride
- Nitrate as N
- Nitrite as N
- Phosphate as P
- Sulphate as P
- Sulphate as SO_4

Maxxam

Success Through Science®

Your Project #: L09-301 / MARIANNEVILLE
Your C.O.C. #: 32247101, 322471-01-01

Attention: Alexandra Chan
Cole Engineering Group Ltd
70 Valleywood Dr
Markham, ON
CANADA L3R 4T5

Report Date: 2012/02/09

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B216762
Received: 2012/02/04, 08:20

Sample Matrix: Water
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Method Reference
Coliform/ E. coli, CFU/100mL	1	N/A	2012/02/04	CAM SOP-00551	MOE E3407
Heterotrophic plate count, (CFU/mL)	1	N/A	2012/02/04	CAM SOP-00512	SM 9215B
Nitrate (NO3) and Nitrite (NO2) in Water (1)	1	N/A	2012/02/06	CAM SOP-00440	SM 4500 NO3I/NO2B
Orthophosphate	1	N/A	2012/02/08	CAM SOP-00461	EPA 365.1

Remarks:

Maxxam Analytics has performed all analytical testing herein in accordance with ISO 17025 and the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act. All methodologies comply with this document and are validated for use in the laboratory. The methods and techniques employed in this analysis conform to the performance criteria (detection limits, accuracy and precision) as outlined in the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act. Reporting results to two significant figures at the RDL is to permit statistical evaluation and is not intended to be an indication of analytical precision.

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

Maxxam Analytics is accredited by SCC (Lab ID 97) for all specific parameters as required by Ontario Regulation 153/04. Maxxam Analytics is limited in liability to the actual cost of analysis unless otherwise agreed in writing. There is no other warranty expressed or implied. Samples will be retained at Maxxam Analytics for three weeks from receipt of data or as per contract.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
* Results relate only to the items tested.

(1) Values for calculated parameters may not appear to add up due to rounding of raw data and significant figures.

../2

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

Maxxam Job #: B216762
Report Date: 2012/02/09

Cole Engineering Group Ltd
Client Project #: L09-301 / MARIANNEVILLE

Encryption Key

Antonella Brasil

09 Feb 2012 13:30:10 -05:00

Please direct all questions regarding this Certificate of Analysis to your Project Manager.

JOLANTA GORALCZYK, Project Manager
Email: JGoralczyk@maxxam.ca
Phone# (905) 817-5700

==========

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Total cover pages: 2

Maxxam Job #: B216762
Report Date: 2012/02/09

Cole Engineering Group Ltd
Client Project #: L09-301 / MARIANNEVILLE

RESULTS OF ANALYSES OF WATER

Maxxam ID			ML0658		
Sampling Date			2012/02/03 15:00		
	Units	MAC	[redacted]	RDL	QC Batch
Inorganics					
Orthophosphate (P)	mg/L		ND	0.01	2756909
Nitrite (N)	mg/L	1	ND	0.01	2756625
Nitrate (N)	mg/L	10	1.8	0.1	2756625
Nitrate + Nitrite	mg/L	10	1.8	0.1	2756625

MICROBIOLOGY (WATER)

Maxxam ID			ML0658	ML0658		
Sampling Date			2012/02/03 15:00	2012/02/03 15:00		
	Units	MAC	[redacted]	[redacted]	RDL	QC Batch
Microbiological						
Heterotrophic plate count	CFU/mL		26	20	N/A	2755900
Background	CFU/100mL		56	50	N/A	2755899
Total Coliforms	CFU/100mL	0	6	5	N/A	2755899
Escherichia coli	CFU/100mL	0	0	0	N/A	2755899

N/A = Not Applicable
ND = Not detected
RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
MAC: Ontario Drinking Water Standards - Maximum Acceptable Concentration [Criteria / MAC], Interim Maximum Acceptable Concentration [IMC] & Table 4-Chemical/Physical Objectives [A/O] - Not Health Related, respectively
(Made under the Ontario Safe Drinking Water Act, 2002)

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Maxxam Job #: B216762
Report Date: 2012/02/09

Cole Engineering Group Ltd
Client Project #: L09-301 / MARIANNEVILLE

Test Summary

Maxxam ID ML0658
Sample ID 219 DAVIS
Matrix Water

Collected 2012/02/03
Shipped
Received 2012/02/04

Test Description	Instrumentation	Batch	Extracted	Analyzed	Analyst
Coliform/ E. coli, CFU/100mL	PL	2755899	N/A	2012/02/04	KRISHNARL SUNTHARESAN
Heterotrophic plate count, (CFU/mL)	PL	2755900	N/A	2012/02/04	
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	2756625	N/A	2012/02/06	BAVANI KAILAYA
Orthophosphate	AC	2756909	N/A	2012/02/08	DEONARINE RAMNARINE

Maxxam ID ML0658 Dup
Sample ID 219 DAVIS
Matrix Water

Collected 2012/02/03
Shipped
Received 2012/02/04

Test Description	Instrumentation	Batch	Extracted	Analyzed	Analyst
Coliform/ E. coli, CFU/100mL	PL	2755899	N/A	2012/02/05	KRISHNARL SUNTHARESAN
Heterotrophic plate count, (CFU/mL)	PL	2755900	N/A	2012/02/06	

Maxxam Job #: B216762
Report Date: 2012/02/09

Cole Engineering Group Ltd
Client Project #: L09-301 / MARIANNEVILLE

QUALITY ASSURANCE REPORT

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	Units	Value (%)	QC Limits
2755899	Background	2012/02/05							11.3	N/A
2755899	Total Coliforms	2012/02/05							18.2	N/A
2755899	Escherichia coli	2012/02/05							NC	N/A
2756625	Nitrite (N)	2012/02/06	107	80 - 120	110	85 - 115	ND, RDL=0.01	mg/L	NC	25
2756625	Nitrate (N)	2012/02/06	101	80 - 120	94	85 - 115	ND, RDL=0.1	mg/L	NC	25
2756909	Orthophosphate (P)	2012/02/08	101	75 - 125	97	80 - 120	ND, RDL=0.01	mg/L	NC	25

N/A = Not Applicable
RDL = Reportable Detection Limit
RPD = Relative Percent Difference
Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.
Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.
Spiked Blank: A blank matrix to which a known amount of the analyte has been added. Used to evaluate analyte recovery.
Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.
NC (RPD): The RPD was not calculated. The level of analyte detected in the parent sample and its duplicate was not sufficiently significant to permit a reliable calculation.

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

Validation Signature Page

Maxxam Job #: B216762

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

EWA PRANJIC, M.Sc., C.Chem, Scientific Specialist

KRISHNARL SUNTHARESAN, Senior Analyst

THARMINI SIVALINGAM, Team Leader

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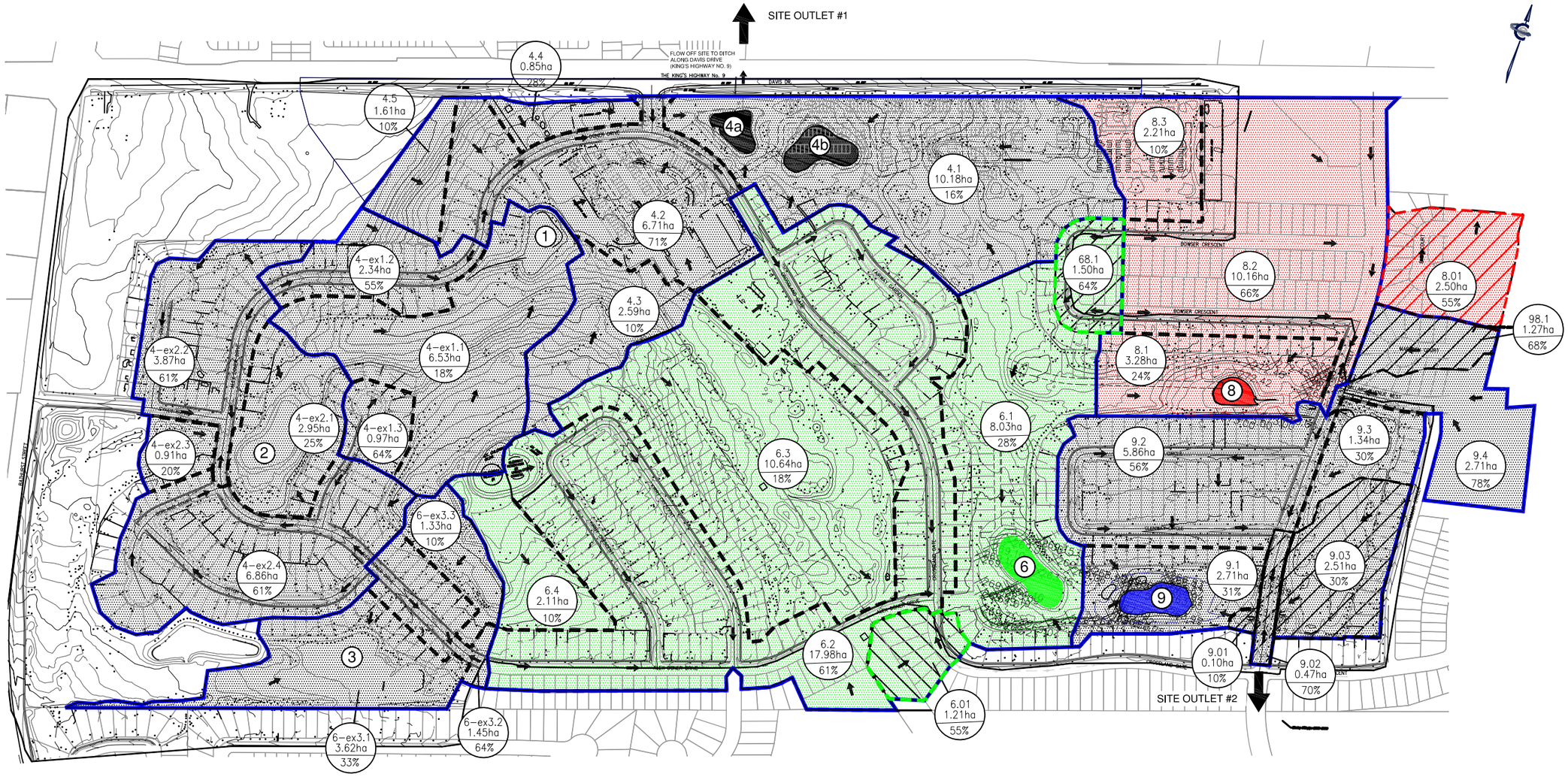
APPENDIX H

Water Balance



COLE ENGINEERING
70 VALLEYWOOD DR., MARKHAM, ON L3R 4T5
T:416.987.6161 / 905.940.6161 F:905.940.2064

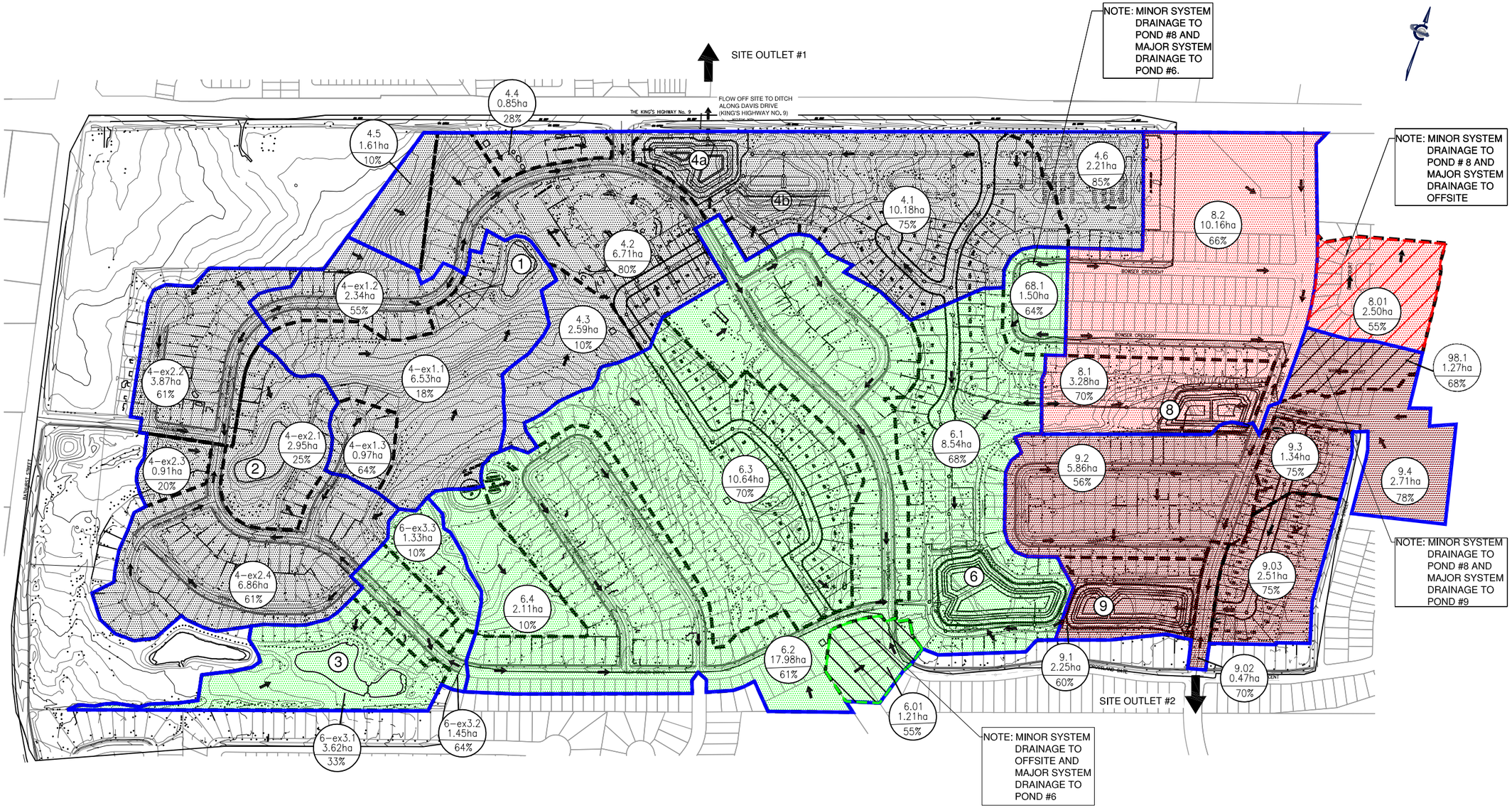
LEGEND

- A2pre 5.60ha 61% — DRAINAGE AREA ID, AREA, RUNOFF COEFFICIENT (#) OR % IMPERVIOUS (#%)
- EXISTING POND PERMANENT WATER LEVEL
- EXISTING 100 YEAR EVENT POND WATER LEVEL
- EXISTING POND DRAINAGE AREA
- EXISTING POND SUB-CATCHMENT DRAINAGE AREA
- (6) POND ID
- DIRECTION OF OVERLAND FLOW
- EXISTING STORM SEWER

PRE-DEVELOPMENT STORM DRAINAGE AREA PLAN

MARIANNEVILLE DEVELOPMENTS LTD.
ESTATES OF GLENWAY NEWMARKET
TOWN OF NEWMARKET

DATE:	JULY, 2013	PROJECT No.:	L09-301
SCALE:	1:6000	FIGURE No.:	7-1



COLE ENGINEERING
70 VALLEYWOOD DR., MARKHAM, ON L3R 4T5
T:416.987.6161 / 905.940.6161 F:905.940.2064

LEGEND

- A2pre 5.60ha 61% — DRAINAGE AREA ID, AREA, RUNOFF COEFFICIENT (#) OR % IMPERVIOUS (#%)
- PROPOSED POND PERMANENT WATER LEVEL
- PROPOSED 100 YEAR EVENT POND WATER LEVEL
- PROPOSED POND DRAINAGE AREA
- PROPOSED POND SUB-CATCHMENT DRAINAGE AREA
- (6) POND ID
- DIRECTION OF OVERLAND FLOW
- EXISTING STORM SEWER

POST-DEVELOPMENT STORM DRAINAGE AREA PLAN

MARIANNEVILLE DEVELOPMENTS LTD.
ESTATES OF GLENWAY NEWMARKET
TOWN OF NEWMARKET

DATE:	JULY, 2013	PROJECT No.:	L09-301
SCALE:	1:6000	FIGURE No.:	7-2

TABLE 1
CLIMATIC WATER BUDGET: CLIMATE NORMAL 1981-2010 (KING SMOKE TREE ID#6154142)
Potential Evapotranspiration

Month	Mean Temperature (°C)	Heat Index	Potential Evapotranspiration (mm)	Daylight Correction Value	Adusted PET (mm)	Total Precipitation (mm)	Surplus (mm)	Deficit (mm)
January	-7.37	0.0	0.0	0.80	0.0	51.65	51.7	0.0
February	-6.10	0.0	0.0	0.81	0.0	45.97	46.0	0.0
March	-1.54	0.0	0.0	1.03	0.0	51.18	51.2	0.0
April	5.96	1.3	27.2	1.13	30.6	64.90	34.3	0.0
May	12.50	4.0	60.3	1.28	76.9	87.10	10.2	0.0
June	17.68	6.8	87.5	1.29	113.3	84.83	0.0	28.4
July	20.47	8.4	102.4	1.31	134.2	86.39	0.0	47.8
August	19.58	7.9	97.6	1.21	118.0	88.38	0.0	29.6
September	15.30	5.4	74.9	1.05	78.5	84.19	5.7	0.0
October	8.62	2.3	40.4	0.94	38.1	72.93	34.8	0.0
November	2.17	0.3	9.2	0.80	7.3	84.57	77.2	0.0
December	-3.71	0.0	0.0	0.77	0.0	55.49	55.5	0.0
TOTALS		**36.4**			**597.0**	**857.58**	**366.5**	**105.9**
				TOTAL WATER SURPLUS		**260.6**	mm	

Latitude 44.0

TABLE 2
WATER BUDGET - PRE-DEVELOPMENT
WATER BALANCE / WATER BUDGET ASSESSMENT

Catchment Designation	Site																																	
	4-ex1.1	4-ex1.2	4-ex1.3	4-ex2.1	4-ex2.2	4-ex2.3	4-ex2.4	4.1	4.2	4.3	4.4	4.5	6-ex3.1	6-ex3.2	6-ex3.3	6.01	6.1	6.2	6.3	6.4	68.1	8.01	8.1	8.2	8.3	9.01	9.02	9.03	9.1	9.2	9.3	9.4	98.1	Site - Totals
Area (m²)	65300	23400	9700	29500	38700	9100	68600	101800	67100	25900	8500	16100	36200	14500	13300	12100	80300	179800	106400	21100	15000	25000	32800	101600	22100	1000	4700	25100	27100	58600	13400	27100	12700	1293600
Pervious Area (m²)	53546	10530	3492	22125	15093	7280	26754	85512	19459	23310	6120	14490	24254	5220	11970	5445	57816	70122	87248	18990	5400	11250	24928	34544	19890	900	1410	17570	18699	25784	9380	5962	4064	748557
Impervious Area (m²)	11754	12870	6208	7375	23607	1820	41846	16288	47641	2590	2380	1610	11946	9280	1330	6655	22484	109678	19152	2110	9600	13750	7872	67056	2210	100	3290	7530	8401	32816	4020	21138	8636	545043
Infiltration Factors																																		
Topography Infiltration Factor	0.1	0.1	0.15	0.15	0.2	0.15	0.15	0.1	0.15	0.1	0.1	0.1	0.1	0.2	0.15	0.3	0.1	0.1	0.1	0.1	0.15	0.15	0.1	0.15	0.15	0.1	0.15	0.15	0.15	0.15	0.15	0.1	0.15	
Soil Infiltration Factor	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	
Land Cover Infiltration Factor	0.1	0.05	0.05	0.075	0.05	0.075	0.05	0.1	0.05	0.1	0.05	0.15	0.075	0.05	0.075	0.05	0.075	0.05	0.1	0.1	0.05	0.05	0.075	0.05	0.075	0.1	0	0.075	0.075	0.05	0.075	0	0.05	
MOE Infiltration Factor	0.3	0.25	0.3	0.325	0.35	0.325	0.3	0.3	0.3	0.3	0.25	0.35	0.275	0.35	0.325	0.45	0.275	0.25	0.3	0.3	0.3	0.3	0.275	0.3	0.325	0.3	0	0.325	0.325	0.3	0.325	0	0.3	
Run-Off Coefficient	0.7	0.75	0.7	0.675	0.65	0.675	0.7	0.7	0.7	0.7	0.75	0.65	0.725	0.65	0.675	0.55	0.725	0.75	0.7	0.7	0.7	0.7	0.725	0.7	0.675	0.7	1	0.675	0.675	0.7	0.675	1	0.7	
Runoff from Impervious Surfaces*	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	
Inputs (per Unit Area)																																		
Precipitation (mm/yr)	858	858	858	858	858	858	858	858	858	858	858	858	858	858	858	858	858	858	858	858	858	858	858	858	858	858	858	858	858	858	858	858	858	858
Run-On (mm/yr)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Other Inputs (mm/yr)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Inputs (mm/yr)	**858**	**858**	**858**	**858**	**858**	**858**	**858**	**858**	**858**	**858**	**858**	**858**	**858**	**858**	**858**	**858**	**858**	**858**	**858**	**858**	**858**	**858**	**858**	**858**	**858**	**858**	**858**	**858**	**858**	**858**	**858**	**858**	**858**	**858**
Outputs (per Unit Area)																																		
Precipitation Surplus (mm/yr)	337	495	533	367	520	346	520	329	563	303	380	303	401	533	303	495	380	520	337	303	533	495	363	541	303	303	558	388	392	499	388	592	550	440
Net Surplus (mm/yr)	337	495	533	367	520	346	520	329	563	303	380	303	401	533	303	495	380	520	337	303	533	495	363	541	303	303	558	388	392	499	388	592	550	440
Evapotranspiration (mm/yr)	520	363	325	491	337	512	337	529	295	554	478	554	457	325	554	363	478	337	520	554	325	363	495	316	554	554	299	469	465	359	469	265	308	418
Infiltration (mm/yr)	83	56	58	89	71	90	61	83	49	82	68	95	74	67	89	100	75	51	83	82	58	67	76	55	89	82	0	88	88	66	88	0	53	68
Rooftop Infiltration (mm/yr)**	5	18	28	8	30	6	26	4	32	2	7	3	10	32	3	33	8	21	5	2	28	22	6	29	3	2	0	10	11	23	10	0	30	15
Total Infiltration (mm/yr)	88	74	85	97	101	96	87	87	81	84	76	98	84	99	91	133	83	72	88	84	85	89	82	84	91	84	0	99	99	88	99	0	83	84
Runoff Pervious Areas	194	167	134	186	132	187	142	193	114	191	205	177	195	125	184	122	198	152	194	191	134	156	200	129	184	191	168	183	183	154	183	130	123	166
Runoff Impervious Areas	56	254	313	84	287	63	292	48	367	28	99	27	123	309	28	239	98	296	56	28	313	250	81	328	28	28	391	106	111	257	106	462	344	191
Total Runoff (mm/yr)	249	421	448	269	419	250	434	242	481	219	304	205	317	434	212	361	297	448	249	219	448	406	280	457	212	219	558	290	294	410	290	592	467	356
Total Outputs (mm/yr)	**858**	**858**	**858**	**858**	**858**	**858**	**858**	**858**	**858**	**858**	**858**	**858**	**858**	**858**	**858**	**858**	**858**	**858**	**858**	**858**	**858**	**858**	**858**	**858**	**858**	**858**	**858**	**858**	**858**	**858**	**858**	**858**	**858**	**858**
Difference (Inputs - Outputs)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Inputs (Volumes)																																		
Precipitation (m³/yr)	56000	20067	8319	25299	33188	7804	58830	87302	57544	22211	7289	13807	31044	12435	11406	10377	68864	154193	91247	18095	12864	21440	28129	87130	18953	858	4031	21525	23240	50254	11492	23240	10891	1109365
Run-On (m³/yr)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Other Inputs (m³/yr)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Inputs (m³/yr)	**56000**	**20067**	**8319**	**25299**	**33188**	**7804**	**58830**	**87302**	**57544**	**22211**	**7289**	**13807**	**31044**	**12435**	**11406**	**10377**	**68864**	**154193**	**91247**	**18095**	**12864**	**21440**	**28129**	**87130**	**18953**	**858**	**4031**	**21525**	**23240**	**50254**	**11492**	**23240**	**10891**	**1109365**
Outputs (Volumes)																																		
Precipitation Surplus (m³/yr)	22018	11574	5169	10826	20129	3146	35681	33459	37756	7852	3228	4881	14516	7727	4032	5985	30493	93520	35877	6396	7993	12365	11897	55007	6700	303	2625	9745	10637	29233	5202	16056	6984	569011
Net Surplus (m³/yr)	22018	11574	5169	10826	20129	3146	35681	33459	37756	7852	3228	4881	14516	7727	4032	5985	30493	93520	35877	6396	7993	12365	11897	55007	6700	303	2625	9745	10637	29233	5202	16056	6984	569011
Evapotranspiration (m³/yr)	33982	8494	3149	14473	13059	4658	23149	53842	19788	14360	4062	8926	16528	4708	7374	4392	38371	60673	55370	11698	4870	9074	16232	32123	12253	554	1406	11780	12604	21021	6289	7185	3907	540355
Infiltration (m³/yr)	5416	1302	558	2639	2748	818	4175	8432	3285	2120	581	1537	2675	974	1179	1212	6038	9118	8826	1727	863	1669	2486	5611	1960	82	0	2217	2385	3859	1184	0	670	88345
Rooftop Infiltration (m³/yr)	321	430	268	237	1160	55	1763	434	2171	64	61	46	356	467	35	400	634	3851	523	52	414	551	212	2941	59	2	0	257	289	1326	137	0	385	19901
Total Infiltration (m³/yr)	5738	1732	826	2876	3908	873	5938	8865	5456	2184	642	1584	3030	1441	1215	1612	6671	12969	9349	1779	1278	2220	2698	8551	2018	84	0	2473	2675	5185	1321	0	1055	108246
Runoff Pervious Areas	12638	3906	1303	5480	5103	1699	9741	19674	7664	4946	1743	2855	7051	1808	2449	1481	15917	27355	20593	4030	2014	3895	6555	13092	4070	191	787	4604	4954	9004	2458	3532	1564	214160
Runoff Impervious Areas	3642	5936	3040	2469	11118	574	20003	4920	24635	722	843	442	4435	4478	368	2892	7904	53197	5935	588	4701	6250	2643	33364	611	28	1837	2667	3008	15045	1424	12523	4364	246605
Total Runoff (m³/yr)	16281	9842	4343	7949	16221	2273	29744	24594	32300	5668	2586	3297	11486	6286	2817	4373	23821	80551	26528	4618	6716	10145	9199	46456	4681	219	2625	7271	7962	24048	3882	16056	5929	460765
Total Outputs (m³/yr)	**56000**	**20067**	**8319**	**25299**	**33188**	**7804**	**58830**	**87302**	**57544**	**22211**	**7289**	**13807**	**31044**	**12435**	**11406**	**10377**	**68864**	**154193**	**91247**	**18095**	**12864**	**21440**	**28129**	**87130**	**18953**	**858**	**4031**	**21525**	**23240**	**50254**	**11492**	**23240**	**10891**	**1109365**
Difference (Inputs - Outputs)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

*Evaporation from impervious areas was assumed to be: 20% of preciptation
**Assume 30% of lot area is roof area, which is disconnected, allowing for 90% of rooftop runoff to infiltrate

TABLE 3
WATER BUDGET, POST-DEVELOPMENT
WATER BALANCE / WATER BUDGET ASSESSMENT

Catchment Designation	Site																															
	4-ex1.1	4-ex1.2	4-ex1.3	4-ex2.1	4-ex2.2	4-ex2.3	4-ex2.4	4.1	4.2	4.3	4.4	4.5	4.6	6-ex3.1	6-ex3.2	6-ex3.3	6.01	6.1	6.2	6.3	6.4	68.1	8.01	8.1	8.2	9.02	9.03	9.1	9.2	9.3	9.4	98.1	Total
Area (m²)	65300	23400	9700	29500	38700	9100	68600	101800	67100	25900	8500	16100	22100	36200	14500	13300	12100	85400	179800	106400	21100	15000	25000	32800	101600	4700	25100	22500	58600	13400	27100	12700	1293100
Pervious Area (m²)	53546	10530	3492	22125	15093	7280	26754	25450	13420	23310	6120	14490	3315	24254	5220	11970	5445	27328	70122	31920	18990	5400	11250	9840	34544	1410	6275	9000	25784	3350	5962	4064	537053
Impervious Area (m²)	11754	12870	6208	7375	23607	1820	41846	76350	53680	2590	2380	1610	18785	11946	9280	1330	6655	58072	109678	74480	2110	9600	13750	22960	67056	3290	18825	13500	32816	10050	21138	8636	756047
Infiltration Factors																																	
Topography Infiltration Factor	0.1	0.1	0.15	0.15	0.2	0.15	0.15	0.15	0.15	0.1	0.15	0.1	0.2	0.1	0.2	0.15	0.3	0.1	0.1	0.1	0.1	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.1	0.15	
Soil Infiltration Factor	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	
Land Cover Infiltration Factor	0.1	0.05	0.05	0.075	0.05	0.075	0.05	0.05	0.05	0.1	0.05	0.15	0.05	0.075	0.05	0.075	0.05	0.05	0.05	0.05	0.1	0.05	0.05	0.05	0.05	0	0.05	0.05	0.05	0.05	0	0.05	
MOE Infiltration Factor	0.3	0.25	0.3	0.325	0.35	0.325	0.3	0.3	0.3	0.3	0.3	0.35	0.35	0.275	0.35	0.325	0.45	0.25	0.25	0.25	0.3	0.3	0.3	0.3	0.3	0	0.3	0.3	0.3	0.3	0	0.3	
Run-Off Coefficient	0.7	0.75	0.7	0.675	0.65	0.675	0.7	0.7	0.7	0.7	0.7	0.65	0.65	0.725	0.65	0.675	0.55	0.75	0.75	0.75	0.7	0.7	0.7	0.7	0.7	1	0.7	0.7	0.7	0.7	1	0.7	
Runoff from Impervious Surfaces*	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	
Inputs (per Unit Area)																																	
Precipitation (mm/yr)	858	858	858	858	858	858	858	858	858	858	858	858	858	858	858	858	858	858	858	858	858	858	858	858	858	858	858	858	858	858	858	858	858
Run-On (mm/yr)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Other Inputs (mm/yr)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Inputs (mm/yr)	**858**	**858**	**858**	**858**	**858**	**858**	**858**	**858**	**858**	**858**	**858**	**858**	**858**	**858**	**858**	**858**	**858**	**858**	**858**	**858**	**858**	**858**	**858**	**858**	**858**	**858**	**858**	**858**	**858**	**858**	**858**	**858**	**858**
Outputs (per Unit Area)																																	
Precipitation Surplus (mm/yr)	337	495	533	367	520	346	520	580	601	303	380	303	622	401	533	303	495	550	520	558	303	533	495	558	541	558	580	516	499	580	592	550	509
Net Surplus (mm/yr)	337	495	533	367	520	346	520	580	601	303	380	303	622	401	533	303	495	550	520	558	303	533	495	558	541	558	580	516	499	580	592	550	509
Evapotranspiration (mm/yr)	520	363	325	491	337	512	337	278	257	554	478	554	235	457	325	554	363	308	337	299	554	325	363	299	316	299	278	342	359	278	265	308	348
Infiltration (mm/yr)	83	56	58	89	71	90	61	43	36	82	82	95	33	74	67	89	100	44	51	42	82	58	67	50	55	0	43	62	66	43	0	53	56
Rooftop Infiltration (mm/yr)	5	18	28	8	30	6	26	35	39	2	9	3	50	10	32	3	33	25	21	26	2	28	22	32	29	0	35	25	23	35	0	30	24
Total Infiltration (mm/yr)	88	74	85	97	101	96	87	79	75	84	91	98	83	84	99	91	133	69	72	68	84	85	89	82	84	0	79	87	88	79	0	83	79
Runoff Pervious Areas	194	167	134	186	132	187	142	101	84	191	191	177	61	195	125	184	122	132	152	126	191	134	156	117	129	168	101	144	154	101	130	123	139
Runoff Impervious Areas	56	254	313	84	287	63	292	400	442	28	98	27	479	123	309	28	239	349	296	365	28	313	250	359	328	391	400	284	257	400	462	344	291
Total Runoff (mm/yr)	249	421	448	269	419	250	434	501	526	219	289	205	540	317	434	212	361	481	448	490	219	448	406	477	457	558	501	429	410	501	592	467	430
Total Outputs (mm/yr)	**858**	**858**	**858**	**858**	**858**	**858**	**858**	**858**	**858**	**858**	**858**	**858**	**858**	**858**	**858**	**858**	**858**	**858**	**858**	**858**	**858**	**858**	**858**	**858**	**858**	**858**	**858**	**858**	**858**	**858**	**858**	**858**	**858**
Difference (Inputs - Outputs)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Inputs (Volumes)																																	
Precipitation (m³/yr)	56000	20067	8319	25299	33188	7804	58830	87302	57544	22211	7289	13807	18953	31044	12435	11406	10377	73237	154193	91247	18095	12864	21440	28129	87130	4031	21525	19296	50254	11492	23240	10891	1108937
Run-On (m³/yr)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Other Inputs (m³/yr)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Inputs (m³/yr)	**56000**	**20067**	**8319**	**25299**	**33188**	**7804**	**58830**	**87302**	**57544**	**22211**	**7289**	**13807**	**18953**	**31044**	**12435**	**11406**	**10377**	**73237**	**154193**	**91247**	**18095**	**12864**	**21440**	**28129**	**87130**	**4031**	**21525**	**19296**	**50254**	**11492**	**23240**	**10891**	**1108937**
Outputs (Volumes)																																	
Precipitation Surplus (m³/yr)	22018	11574	5169	10826	20129	3146	35681	59013	40325	7852	3228	4881	13752	14516	7727	4032	5985	46963	93520	59417	6396	7993	12365	18316	55007	2625	14550	11607	29233	7768	16056	6984	658654
Net Surplus (m³/yr)	22018	11574	5169	10826	20129	3146	35681	59013	40325	7852	3228	4881	13752	14516	7727	4032	5985	46963	93520	59417	6396	7993	12365	18316	55007	2625	14550	11607	29233	7768	16056	6984	658654
Evapotranspiration (m³/yr)	33982	8494	3149	14473	13059	4658	23149	28288	17218	14360	4062	8926	5201	16528	4708	7374	4392	26274	60673	31830	11698	4870	9074	9812	32123	1406	6975	7688	21021	3724	7185	3907	450282
Infiltration (m³/yr)	5416	1302	558	2639	2748	818	4175	4426	2420	2120	697	1537	722	2675	974	1179	1212	3757	9118	4456	1727	863	1669	1648	5611	0	1091	1393	3859	583	0	670	72064
Rooftop Infiltration (m³/yr)	321	430	268	237	1160	55	1763	3585	2613	64	73	46	1105	356	467	35	400	2156	3851	2807	52	414	551	1039	2941	0	884	564	1326	472	0	385	30419
Total Infiltration (m³/yr)	5738	1732	826	2876	3908	873	5938	8011	5033	2184	770	1584	1827	3030	1441	1215	1612	5913	12969	7264	1779	1278	2220	2687	8551	0	1975	1957	5185	1055	0	1055	102483
Runoff Pervious Areas	12638	3906	1303	5480	5103	1699	9741	10327	5646	4946	1627	2855	1341	7051	1808	2449	1481	11271	27355	13369	4030	2014	3895	3846	13092	787	2546	3250	9004	1359	3532	1564	180318
Runoff Impervious Areas	3642	5936	3040	2469	11118	574	20003	40675	29647	722	831	442	10584	4435	4478	368	2892	29779	53197	38784	588	4701	6250	11783	33364	1837	10029	6400	15045	5354	12523	4364	375854
Total Runoff (m³/yr)	16281	9842	4343	7949	16221	2273	29744	51002	35293	5668	2457	3297	11925	11486	6286	2817	4373	41050	80551	52153	4618	6716	10145	15629	46456	2625	12575	9650	24048	6713	16056	5929	556171
Total Outputs (m³/yr)	**56000**	**20067**	**8319**	**25299**	**33188**	**7804**	**58830**	**87302**	**57544**	**22211**	**7289**	**13807**	**18953**	**31044**	**12435**	**11406**	**10377**	**73237**	**154193**	**91247**	**18095**	**12864**	**21440**	**28129**	**87130**	**4031**	**21525**	**19296**	**50254**	**11492**	**23240**	**10891**	**1108937**
Difference (Inputs - Outputs)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

*Evaporation from impervious areas was assumed to be: 20% of preciptation
**Assume 30% of lot area is roof area, which is disconnected, allowing for 90% of rooftop runoff to infiltrate

TABLE 4
WATER BUDGET SUMMARY
WATER BALANCE / WATER BUDGET ASSESSMENT

Characteristic	Site		
	Pre-Development	Post-Development	Change (Pre- to Post-)
Inputs (Volumes)			
Precipitation (m^3/yr)	1109365	1108937	0.0%
Run-On (m^3/yr)	0	0	0.0%
Other Inputs (m^3/yr)	0	0	0.0%
Total Inputs (m^3/yr)	**1109365**	**1108937**	**0.0%**
Outputs (Volumes)			
Precipitation Surplus (m^3/yr)	569011	658654	15.8%
Net Surplus (m^3/yr)	569011	658654	15.8%
Evapotranspiration (m^3/yr)	540355	450282	-16.7%
Infiltration (m^3/yr)	88345	72064	-18.4%
Rooftop Infiltration (m^3/yr)	19901	30419	52.9%
Total Infiltration (m^3/yr)	108246	102483	-5.3%
Runoff Pervious Areas	214160	180318	-15.8%
Runoff Impervious Areas	246605	375854	52.4%
Total Runoff (m^3/yr)	460765	556171	20.7%
Total Outputs (m^3/yr)	**1109365**	**1108937**	**0.0%**

APPENDIX I

Source Water Impact Assessment and Mitigation Plan

COLE ENGINEERING

Experience Enhancing Excellence

November 20, 2013
Our Ref: L09-301

Marianneville Developments Limited
(c/o: The Kerbel Group Inc.)
Ms. Joanne Barnett
26 Lesmill Road, Unit 3
Toronto, ON
M3B 2T5

Dear Ms. Barnett:

Re: Source Water Impact Assessment and Mitigation Plan
Estates of Glenway
Town of Newmarket, Ontario

Cole Engineering Group Ltd. is pleased to submit the enclosed Source Water Impact Assessment and Mitigation Plan for 470 Crossland Gate, Estates of Glenway, Marianneville Development Limited, Town of Newmarket, Ontario. The investigation includes a review of existing hydrogeological information for the study area, characterization of the geological and hydrogeological setting, and identification of vulnerable areas and threats to the quantity and quality of drinking water. This review was used to develop potential mitigation measures, a monitoring program, emergency response plan, and implementation plan. Findings of our study are summarized in the following report.

Should you have any questions or comments, please do not hesitate to contact the undersigned.

Yours truly,

COLE ENGINEERING GROUP LTD.

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Executive Summary

Cole Engineering Group Ltd. (CEG) was retained by Marianneville Developments Limited (c/o The Kerbel Group) to complete a Risk Assessment and Risk Management Plan in support of the Zoning By-law and Draft Plan of Subdivision approval applications for the proposed Estates of Glenway mixed use development in Newmarket, Ontario. The 36 hectare site is bounded by King Road to the south, and surrounded by residential developments. The property was historically used as a golf course, half of which is now slated for development. The proposed development is for a combination of low, medium and high density residential units, and a small commercial block.

Based on regional physiographic cross-section mapping, the most relevant regional geological units underneath the site are as follows, from the top:

- Silty clay till glaciolacustrine deposits, in which the expected depth of excavation is proposed to occur;
- Halton Till/Kettleby Till, a regional aquitard
- Oak Ridges Moraine (ORM) complex which acts as a regional aquifer;
- Newmarket Till, a thick regional aquitard;
- Channel sediments, which are eroded material with a high hydraulic conductivity, and hydraulically connects the ORM complex with the Thorncliffe Formation; and
- Thorncliffe Formation, a regional aquifer;
- Sunnybrook Drift, a regional aquitard;
- Scarbrough Formation, the deepest regional overburden aquifer in which the nearby municipal wells are screened.

Based on a review of the regional cross section, there is approximately 15 m of till cover overlying the ORM complex. The site lies within the 5 to 25-year Wellhead Protection Area (WHPA) of Newmarket Wells No. 1, 2 and 15, which have an intrinsic vulnerability score ranging from 2 (low) to 6 (medium). The majority of the site falls within an area of low intrinsic vulnerability.

There are current on-site concerns relating to the application of commercial fertilizer and pesticides to land, the application, handling and storage of road salt and the on-site stormwater management system. Environmental Site Assessments and a Record of Site Condition (RSC) have been completed and filed by CEG.

Water quality threats to the site from the proposed development include the application of road salt, operation of a system that transmits sewage, and the installation of a retail fuel station within a commercial block along Davis Drive. Additionally, potential dewatering operations and the handling and storage of fuel are considered threats during site construction. Analysis of the water quality threats of the proposed development using the Clean Water Act Threat Assessment Tables show that the risk associated with the identified threats are low.

CEG completed a hydrogeological investigation for the site in July 2012. The information from the hydrogeological study will need to be incorporated into the detailed design to determine if dewatering is required and a Permit to Take Water (PTTW) application to the Ministry of the Environment (MOE) has to be made. Generally, construction dewatering is considered to have short term localized impacts to the groundwater system and recovery of the system is expected with the termination of the dewatering operations; therefore, it is predicted that the drinking water quantity threat would be low.

A monitoring program and dewatering response plan will be developed as part of the PTTW application (if required).

Fuel handling and storage is considered to be a risk during and after the proposed development is completed. During construction, it is recommended that this risk be managed via best management practices through the contractor's environmental management policies and commitments. Additionally, fuel should be stored in accordance with the requirements of the MOE, Technical Safety and Standards Authority (TSSA) and other relevant authorities. Refuelling must not occur in areas that can impact the watercourse or storm water ponds; refuelling should be avoided near the stormwater ponds, storm sewer catch basins, the watercourse crossing the northwest corner of the site and graded drainage areas (swales etc.).

The retail fuel station located in part of the commercial block along Davis Drive can pose a risk after development for fuel handling and storage. It is located within the 25 year wellhead protection area and will require a stand alone emergency protocol in case of spills. Construction of the station should incorporate best management practices such as double wall fibreglass storage tanks and leak detection/monitoring systems. A stand alone environmental management plan should be developed for the site to encompass both surface and groundwater protection and include the establishment of a long-term monitoring and maintenance program.

Salt application should be managed through optimizing road salt application efficiency, using chemical-free options to remove snow and ice pack, or using alternatives to salt. Due to salt primarily being applied on roadways, the asphalt cap will assist in preventing the introduction of sodium and chloride into the groundwater system.

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1.0 Introduction

Cole Engineering Group Ltd (CEG) was retained by Marianneville Development Limited (c/o The Kerbel Group) (the "Client") to prepare a Source Water Impact Assessment and Mitigation Plan (SWIAMP) for a proposed mixed use development (site). A SWIAMP was required due to the changing site use within a municipal wellhead protection area. As per the York Region Official Plan, this document was prepared using the "Guidance for Proposed Developments in Wellhead Protection Areas in The Regional Municipality of York" (York Region, 2013). The site is located at 470 Crossland Gate, at the southwest quadrant of Davis Drive and Eagle Street, Town of Newmarket. The location of the site is shown in **Figure 1**.

1.1 Site Location

The site represents an irregularly shaped lot, comprising of 6 separate parcels covering approximately 36 hectares, located at the southwest quadrant of Davis Drive and Eagle Street, Town of Newmarket. The legal addresses of the parcels composing the site are as follows:

- Block 89, Plan 65M2263, PIN 03581-0027(LT);
- Block 144, Plan 65M2261, PIN 03581-0179(LT);
- Part Block 92, Plan 65M2212 Pts 1, 4-7 65R7939, PIN 03581-0209(LT);
- Block 155, Plan 65M2205, PIN 03580-0293(LT),
- Block 73, Plan 65M2284, PIN 03584-0003(LT).

For the purposes of this report, the "Property" is defined as the area bounded to the north by Davis Drive; to the west by Bathurst Street, Sykes Road, Alex Doner Drive and property boundaries for 470 Crossland Gate; and to the east, south, and central boundaries by the property boundaries for 470 Crossland Gate. The "site" includes all portions of the Property to the east of the hydro corridor, the lands east of Kirby Crescent, and the north portion of the site bordering Alex Doner Drive on the west side of the hydro corridor between the existing residential properties.

Mapping coordinates of the approximate centre of the site are as follows using the Universal Transverse Mercator system - NAD 1983, Zone 17 N:

Northing: 4878415

Easting: 620904

1.2 Property Owner Contact Information

The property is currently owned by Marianneville Developments Limited. The contact information for the current property owner is as follows:

Marianneville Developments Limited
(c/o: The Kerbel Group Inc.)
Ms. Joanne Barnett
26 Lesmill Road, Unit 3
Toronto, ON
M3B 2T5

1.3 Objectives

The objectives of the SWIAMP are to identify and assess the risks associated with the current and proposed uses of the site in relation to potential impacts to the municipal wellheads located near the site. The objective of the Mitigation Plan is to address the identified risks in order to mitigate/prevent/manage them. This SWIAMP is provided to meet the objectives at the Draft Plan of Subdivision and Re-zoning approval stage.

1.4 Regulatory Framework

The following provides a discussion on the regulatory framework guiding the preparation of Risk Assessment and Risk Management Plans.

Clean Water Act: The Clean Water Act defines "vulnerable areas" as:

- a significant groundwater recharge area;
- a highly vulnerable aquifer;
- a surface water intake protection zone; or
- a wellhead protection area

Within vulnerable areas, potential drinking water threats (defined in O.Reg. 287/07) are identified and policies are enacted to monitor the condition and activity to assist in preventing the activity from becoming a significant drinking water threat.

Oak Ridges Moraine Conservation Plan: The Oak Ridges Moraine Conservation Plan was established by the Ontario provincial government to establish land and water use guidelines to preserve the unique ecological and important hydrogeological characteristics of the Oak Ridges Moraine.

Greenbelt Plan: The Greenbelt Plan is an Ontario provincial initiative to permanently preserve certain specified properties ecologically sensitive and agricultural land.

York Region Official Plan: The York Region Official Plan is a broad strategic municipal plan that guides the development based on economic, environmental and social factors. The current plan was approved in 2010.

1.5 Scope of Work

1.5.1 Background Review

A thorough understanding of the hydrogeological, natural, and environmental setting will be developed through the review of existing reports and available geological information including the following:

- Existing Site Survey by JD Barnes, 2012;
- Ministry of Natural Resources (MNR) Natural Heritage Information Centre (NHIC) database;
- EcoLog ERIS database;
- Geological and hydrological mapping from the MNR, LSRCA, and York Region;
- East Holland River Subwatershed Plan, LSRCA, 2010;
- Draft Source Protection Plan, LSRCA, NVCA, SSEA, 2011;
- Approved Assessment Report: Lake Simcoe and Couchiching-Black River Source Protection Area, Part 1: Lake Simcoe Watershed, LSRCA, NVCA, SSEA, 2011;
- York Region Official Plan, September 2010;
- Town of Newmarket Official Plan, 2006;

- MOE permitted water users;
- MOE well records database;
- Proposed development plans;
- Clean Water Act and associated tables;
- Functional Servicing Report, Estates of Glenway Newmarket, Cole Engineering Group Limited, 2012;
- Hydrogeological Investigation, Estates of Glenway, Town of Newmarket, Cole Engineering Group Limited, 2013;
- Phase I and II Environmental Site Assessment for 470 Crossland Gate, Marianneville Development Limited, Town of Newmarket, ON, Cole Engineering Group Limited, 2012.
- Phase I Environmental Site Assessment Update for 470 Crossland Gate, Marianneville Development Limited, Town of Newmarket, ON, Cole Engineering Group Limited, 2013.

1.5.2 Characterization of the Existing Geological and Hydrogeological Setting

A conceptual understanding of the geological and hydrogeological system was developed through the review of existing reports, available geological information and field investigations.

1.5.3 Identification of Vulnerable Areas

A desktop review of the York Region Official Plan (YROP) and Town of Newmarket Official Plan (TNOP) was carried out to with respect to wellhead protection areas and areas of high aquifer vulnerability within or near the proposed development to determine whether the subject site falls within a Vulnerable Area.

1.5.4 Identification of Potential Drinking Water Quality Threats

The proposed development plans were reviewed to identify the potential condition or activity which could result in a drinking water quality threat. This information was correlated with the Clean Water Act (CWA) to rate the potential water quality threats. Changes to groundwater and surface water quality and increases to aquifer vulnerability were also considered.

1.5.5 Identification of Potential Drinking Water Quantity Threats

The proposed development plans were reviewed to identify potential impacts to the drinking water quantity, in particular, the potential need for dewatering activities during construction and the long-term impacts as a result of site development. Additionally, the potential impacts of development on regional and local groundwater systems as well as the effects on existing well users and the natural environment, including reduction in recharge and impacts to the natural flow system were assessed.

2.0 Site Description

The site represents an irregularly shaped lot, approximately 36 hectares in area, located at the southwest quadrant of Davis Drive and Eagle Street, Town of Newmarket. The site was historically used as a golf course and is composed of 6 discrete parcels of land. A Record of Site Condition (RSC) will not be required for filing by the Ministry of the Environment (MOE).

The site had municipal water and sanitary servicing for the club house, which has now been demolished. Stormwater management is achieved via four storm ponds around site, which outlet into the surrounding municipal stormwater management system.

2.1 Proposed Development

The proposed development consists of a combination of low, medium and high density residential units (total 730 units) and a small commercial block. The proposed development plan includes a combination of new public right-of-ways (Streets A, B, C and D) and private roads within the Medium Density and Condo Blocks. Access will be from Street A off Crossland Gate, Street B off of Davis Drive and Street D off Eagle St. The commercial block is proposed to include a gas station. The proposed Draft Plan of Subdivision for the development is included in Appendix A.

2.2 Site Servicing

The site will be serviced by municipal water, sewer and stormwater management systems. Municipal water supply will be achieved by connecting to the existing infrastructure in the area surrounding the site. Two Regional pressure districts are located within the proposed development, namely the North Central District and North West District. Based on the elevation range serviced by each pressure district, the majority of proposed development will connect to the higher pressure district (North West) with the remaining, lower elevation development in the southeast corner of the site connected to the North Central district.

Stormwater management will be achieved using a combination of minor sewers, the existing stormwater management ponds which will be upgraded for capacity and water quality needs as required, and oil/grit separators (OGS) to achieve the necessary water quality and quantity control.

Sanitary servicing will utilize connections to the existing surrounding sanitary sewer network. New sewers will be constructed along the proposed roadways, with all the sanitary flow to outlet into the existing 450 mm sewer at the southeast corner of Peevers Crescent.

2.3 Location of Relevant Risk Assessment Items

CEG was retained by Marianneville Developments Limited to conduct Phase I and II Environmental Site Assessments (ESAs) for the site. The Phase I ESA identified potential contamination related to on-site pesticide usage as well as off-site fuel storage tanks, vehicle maintenance and fertilizer and pesticide usage. CEG conducted a Phase II investigation to assess the soil and groundwater quality at these potentially contaminating areas. Soil and groundwater samples were submitted for analysis for organichlorine pesticides, volatile organic compounds and petroleum hydrocarbon fractions F1-F4 and compared against the applicable *Soil and Groundwater Standards – Table 2 Potable Groundwater - as amended April 15, 2011* for Residential/Parkland/Institutional Property Use for Coarse-grained materials. All samples were found to meet the standard. Based on the findings of the soil and groundwater sampling program, contamination was not identified on the property. Fuel storage was found to be on the adjacent golf course property, not on the proposed development site and therefore not considered a threat associated with the development site.

3.0 Regional Setting

3.1 Surrounding Land Use

Land use surrounding the site is primarily residential subdivisions to the north, east and south and parkland to the west. The site is near the western extent of the Town of Newmarket.

3.2 Topography and Drainage

The site is located to the south of Holland's Landing, north of the Oak Ridges Moraine, and falls within the jurisdiction of the Lake Simcoe Region Conservation Authority (LSRCA). The site is located across a watershed divide, with the north-western portion of the site within the West Holland Subwatershed and the south-eastern portion within the East Holland Subwatershed. Both of these are part of the larger Lake Simcoe Watershed. There are no natural watercourses traversing the site. The regional topography undulates gently and slopes northerly toward the Holland Marsh, which eventually empties into Lake Simcoe. A regional topographic map showing the boundaries of the subwatershed is presented in **Figure 2.**

3.3 Physiography

The site is located within the Simcoe Lowlands physiographic region. The Simcoe Lowlands physiographic region is characterized by lower elevations and flat-floored valley features that generally correspond to current river systems (Sharpe et al., 1999). The floor materials in the lowlands consist of sand, silt and clay, as a result of flooding from glacial Lake Algonquin (Chapman and Putnam, 1984). The valley of Holland Marsh is covered by organic deposits, and has been one of the most intensively cultivated areas of the Province since the early 1900s.

To the east of the Simcoe Lowlands Physiographic Region is the Schomberg Clay Plains Physiographic Region, and to the west is the north slope of the Oak Ridges Moraine Physiographic Region. **Figure 4** shows the general physiography.

3.4 Regional Geology and Hydrogeology

The current understanding of the geologic and hydrogeologic environment was based on scientific work conducted by the Geological Survey of Canada (GSC), Conservation Authorities Moraine Coalition (CAMC) and Lake Simcoe Region Conservation Authority (LSRCA). The regional geology and hydrogeology discussed in this report builds on information obtained from the above noted studies.

The regional geology in this area consists of Paleozoic sedimentary bedrock overlain by Pleistocene unconsolidated sedimentary materials that have been deposited and modified by glacial, fluvial and lacustrine processes over the last 135,000 years (Kassenaar & Wexler, 2006). **Figure 5** shows the regional cross section obtained from the *Approved Assessment Report: Lake Simcoe and Couchiching-Black River Source Protection Area* (LSRCA, NVCA & SSEA, 2011). The depth of the bedrock in this area is expected to be approximately 150 metres below ground surface (mbgs). The different stratigraphic units that overlie the bedrock from the top include:

A. Recent Deposits;
B. Halton Till / Kettleby Till;
C. Oak Ridges Moraine;
D. Newmarket Till and Channel Sediments;
E. Thorncliffe Formation;
F. Sunnybrook Drift;
G. Scarborough Formation; and
H. Bedrock.

Based on a review of the regional cross section, it appears that there is approximately 15 m of till cover overlying the ORM complex which will act as a contaminant barrier for the drinking water.

Recent Deposits – The Recent Deposits are sediments deposited since the final retreat of the Pleistocene Glaciers. These are mostly glaciolacustrine silts and clays.

Halton Till/Kettleby Till – The Halton Till was deposited approximately 13,000 years before present (B.P.), due to the last glacial advance in the area. The thickness of Halton Till is typically 3 m to 6 m; however, it can locally exceed 15 m in thickness. The Halton Till consists of silt to silty clay with occasional gravel. This till acts as an aquitard of regional extent.

Oak Ridges Moraine – The Oak Ridges Moraine (ORM) is an extensive stratified sediment complex, 160 km long and 5 km to 20 km wide, located to the south of the site. The deposits consist mainly of sand and gravel. The ORM Complex is a major groundwater recharge area. The sediments in this area are around 100 m thick beneath the crest of the moraine but thins out rapidly towards its margins. The unit is water bearing and occurs at elevations between 230 masl and 260 masl.

The Oak Ridges Moraine is a regionally significant recharge area. It is known to be unconfined near the crest of the moraine, while it is confined by the till units both to the north and south of the highland. This unit serves as the main source of water for creeks as nearly 90% of the recharge via the ORM sediments discharges to the stream networks flowing north and south from the regional topographic divide. The ORM complex forms a regional aquifer and is commonly used for water supply.

Newmarket Till and Channel Sediments – The Newmarket Till is regionally extensive and is typically a massive, frequently over-consolidated, stony and dense silty sand diamicton deposited approximately 18,000 to 20,000 years B.P., when the Laurentide ice sheet was at its maximum extent. It acts as a regional aquitard separating the ORM Aquifer from the underlying Thorncliffe Aquifer. The thickness of Newmarket till typically varies between 20 m to 30 m but locally can exceed 60 m in thickness.

Sections of Newmarket Till were subject to erosional processes by glacial meltwater which occurred beneath glacial ice. The eroded channels were infilled with higher hydraulic conductivity material including sand and silt. This phenomenon created the potential for hydraulic connections between the shallow Oak Ridges Moraine Aquifer and deeper Thorncliffe Aquifer. Mapping from Earthfx Inc. (2006) shows that the site is north of the eroded channel. The location of eroded channel is presented in **Figure 6**.

Thorncliffe Formation – The Thorncliffe Formation was deposited approximately 45,000 years B.P. and is made up of glaciofluvial and lacustrine deposits containing sand, silt, and clay. The Thorncliffe Formation shows a considerable variation in grain size and thickness regionally, and locally can vary between 10 m to 30 m in thickness. It acts as an aquifer of regional extent.

Sunnybrook Drift – The Sunnybrook Drift is a clast-poor silt to silty clay unit and is a regionally extensive aquitard. The thickness of the Sunnybrook Drift is generally less than 10 m to 20 m, although locally it can reach a thickness of 30 m. It was deposited in close proximity to an ice sheet as it finally reached the West Holland River Subwatershed approximately 45,000 B.P. (Earthfx & Gerber, 2008).

Scarborough Formation – The Scarborough Formation marks the beginning of the Wisconsin glaciation, approximately 100,000 years B.P. It is composed of graduated materials that vary from fine silts and clays to sand in a deltaic sequence. However, within the East and West Holland Subwatersheds, the Scarborough Formation is mainly comprised of sand. This unit is mostly found within bedrock valleys and thins laterally away from the valleys (Earthfx & Gerber, 2008). It acts as an aquifer of regional extent.

Bedrock – Underlying the unconsolidated sedimentary material at depths of over 150 m are regional scale, limestone and shale bedrock. These bedrock units were deposited on the Canadian Shield over a

period of 200 million years, beginning approximately 550 million years B.P. (Kassenaar & Wexler, 2006). The bedrock underlying the majority of the site is known as the Georgian Bay Formation and Blue Mountain Formation, although the Simcoe Group underlies the north portion of the site (Earthfx, 2009). The Georgian Bay and Blue Mountain Formations were formed in the Upper Ordovician age approximately 455 to 460 million years B.P., and the Simcoe Group and was formed during the Middle Ordovician age, approximately 450 million years B.P. **Figure 7** illustrates the bedrock geology underlying the site.

4.0 Local Setting

4.1 Above-Ground Site Characterization

The site has historically been under usage as a golf course. The proposed development involves re-development of approximately half of the area of the golf course.

4.2 Local Topography and Drainage

The site has a landscaped rolling topography, with elevations ranging from approximately 265 metres above sea level (masl) near the pond in the southeast portion of the site, to a local high point of approximately 286 masl near the northeast corner of the site. A detailed topographic survey for the site was obtained from J.D. Barnes and is presented in **Figure 3**.

According to mapping provided by the Ministry of Natural Resources (MNR), a small, intermittent watercourse (Ansnorveldt Creek) traverses between two parcels in the northwest corner of the site. This was not observed during the site visit, although the creek was observed in a channel north of Davis Drive. One permanent tributary of the East Holland River (Western Creek) flows within approximately 150 m south east of the site.

4.3 Below-Ground Site Characterization

4.3.1 Site Geology

As part of the hydrogeological investigation, a geotechnical investigation was conducted on-site which consisted of borehole advancement and monitoring well installation. A total of 36 boreholes were advanced to depths ranging from 3.0 to 10.6 mbgs. **Figure 8** shows the boreholes and monitoring wells installed as part of the drilling program.

The geotechnical borehole logs were reviewed and used to construct geological cross-sections across the site. Locations of the cross-sections are shown in **Figure 8**; **Figures 9A-F** show the geological cross sections. The fill at the site is predominantly composed of silty clay with some sandy silt and gravel. Glacial lake deposits of silty clay compose the uppermost overburden unit on the site. It ranges in thickness from approximately 8.5 m in the central northern area of the site, and becomes locally thin (approximately 0.5 m) near the central eastern portion of the site. The glacial lake deposits are underlain by silty clay till or sandy silt till. Due to the nature of the till, it is expected that sand pockets will be occasionally found throughout it. The silty clay and silty clay till was found to be cohesive and exhibit low permeability, with an estimated coefficient of permeability of $1x10^{-7}$ cm/sec. The sandy silt and sandy silt till was found to have low to relatively low permeability, with an estimated coefficient of permeability of $1x10^{-5}$ to $1x10^{-6}$ cm/sec.

Discontinuous layers of fine to medium sand were encountered during the drilling of boreholes, which are anticipated to be sandy pockets within the till layer. The ORM is expected to be locally discontinuous under the site, thus the main aquifer is the Thorncliffe Aquifer.

4.3.2 Hydraulic Conductivity

CEG conducted an on-site hydrogeological investigation in January and February 2012. As part of the hydrogeological investigation, rising-head tests were conducted by CEG staff for twelve on-site monitoring wells to estimate the in-situ hydraulic conductivity of the screened materials. The monitoring wells are screened in various materials including silty clay till, and silty sand/sandy silt till. Based on the rising head test results, the highest hydraulic conductivity was found to be 2.8×10^{-6} m/s, from a well screened in a silty sand and sandy silt till formation. The lowest hydraulic conductivity was found to be to 7.6×10^{-9} m/s, from a well screened in a silty clay till to silty sand till formation. Wells were screened between approximately 2.6 and 10.8 mbgs. Rising head test results and hydraulic conductivity calculations for the monitoring wells are given in Appendix D.

From the grain size analyses conducted, samples of silty sand/sandy silt till were estimated to have a maximum hydraulic conductivity of $1.4x10^{-7}$ m/s. A sample of silty clay till had a hydraulic conductivity of $1x10^{-8}$ m/s.

4.3.3 Groundwater Levels

Based on the hydrogeological investigation conducted by CEG on site; the shallow water table on site ranges in depth from 263.9 to 280.3 masl (3.39 to 4.17 mbgs). Groundwater levels from all on-site monitoring wells are being monitored on a bimonthly basis. In general, the observed water levels indicate a decreasing trend during the summer months, resulting in a difference of 0.41 m to 4.34 m across the site between the winter/spring months and summer months.

4.3.4 Groundwater Flow Direction

At a regional scale, groundwater flows generally northerly towards Lake Simcoe. Based on the hydrogeological investigation conducted on the property, it appears that generally there is a local groundwater flow divide across the middle of the site, from which groundwater flows northwesterly and southeasterly. No significant seasonal variation was observed in the flow pattern throughout the monitoring events. This flow divide is shown in **Figures 10A and 10B**.

4.4 Anthropogenic Transport Pathways

Existing on-site wells could act as anthropogenic transport pathways, including wells from the hydrogeological investigation. Any wells not included in the monitoring program should be decommissioned prior to site redevelopment to minimize anthropogenic transport pathways. Wells should be inspected regularly for damage and ensure the seal is functioning. Once the monitoring program has been completed, all monitoring wells should be decommissioned.

The existing municipal infrastructure on site could act as anthropogenic transport pathways. This includes catch basins, storm, sanitary and water piping and the stormwater ponds, particularly where they outlet. Care must be taken to manage runoff from the site, especially during construction. It is anticipated that stormwater quality will be improved once the existing stormwater ponds have been upgraded reducing risk associated with this pathway.

5.0 Risk Assessment

The Risk Assessment was conducted for the subject site for the following key stages:

- Existing land-use and activities;
- During construction activities; and
- Proposed future land-use and activities.

5.1 Identification of Vulnerable Areas

The site is predominantly zoned as Parks and Open Space and as Stable Residential land use in Schedule A of the Town of Newmarket Official Plan. Schedule A also designates a natural heritage system approximately 100 m northwest of the proposed development, and one associated with Ansnorveldt Creek within 50 m north of the site. There are floodplains bounding Ansnorveldt Creek and Western Creek, within approximately 50 m and 85 m of the site, respectively.

Based on a review of the applicable planning documents, the Site is not within the Oak Ridges Moraine Conservation Plan or the Greenbelt Plan Area. However, the Greenbelt Protected Country Side is located just to the west of the site, as is the Oak Ridges Moraine Conservation Plan Area (ORMCP Area). Based on the information available in the *Lake Simcoe and Couchiching-Black River Source Protection Area Assessment Report* (South Georgian Bay-Lake Simcoe Source Protection Committee, 2011), three (3) municipal water wells were identified within a 1 km radius from the site: Well 1, Well 2, and Well 15. The site is located within the 5 to 25-year WHPA of Newmarket Wells No. 1, 2 and 15, which therefore triggers the need for a Risk Assessment and Risk Management Plan (YROP, 2012). **Figure 11** shows a map of the site in relation to the Newmarket Wells' WHPAs.

The Newmarket municipal wells are grouped together with the Aurora, Holland Landing, Queensville and Yonge Street Area wells, which are part of a larger regional flow system that is locally influenced by a topographic basin, tunnel channel, and bedrock valley. Most of the Newmarket wells are located near the margins of the north-south tunnel channel that connects aquifer zones vertically and horizontally between the ORM and Scarborough Formation. **Figure 12** shows the intrinsic vulnerability scoring of Newmarket wells No. I, 2 and 15. Most of the site, including the commercial block, falls within an area of low intrinsic vulnerability.

Table 5-1 summarizes details on all municipal groundwater wells in the area:

Table 5-1 Municipal Groundwater Well Detail

Name	Screened Depth (mbgs)	Permitted Capacity (m^3/day)	Aquifer Formation	Distance from Site
Well 1	84.3 – 91.9	2,290	Thorncliffe Formation	~ 428 m E
Well 2	86.2 – 94.2	4,580	Thorncliffe Formation	~ 422 m E
Well 15	84.12 – 85.65	3,270	Scarborough Formation	~ 885 m NE

Surrounding Water Users

As part of the hydrogeological investigation, a search of permitted water takers within 3 km of the site was conducted. The MOE Permit To Take Water (PTTW) database identified eleven (11) permits for surface water and/or groundwater takings. The takings are primarily for municipal purposes (6 permits).

The other water-taking purposes include construction (2 permits), and golf course irrigation (3 permits, including 2 permitted takings on the site). Table 5-2 summarizes the nearby permitted water takers.

Table 5-2 Permitted Water Takers

Permit Number	Permit Owner	Purpose	Issue Date	Expiry Date	Maximum Permitted Rate (L/day)	Permitted Number of Days (days/year)	Water Source
1314-8ACS4J	Peter Kiewit Infrastructure Co.	Construction	21/10/2010	21/12/2016	110,000	365	Surface Water
2848-82TPMT	St. Andrews Valley Golf Club Ltd.	Golf Course Irrigation	9/6/2010	30/04/2013	1,514,165	150	Surface Water
7122-8MENRF	Housing York Inc.	Construction	20/10/2011	15/10/2012	2,180,160	60	Surface Water
96-P-3016	Glenway Country Club	Golf Course Irrigation	2/7/1996	1/1/5000	1,089,600	140	Surface Water
96-P-3016	Glenway Country Club	Golf Course Irrigation	2/7/1996	1/1/5000	378,000	50	Surface Water
6623-68QQ6L	The Regional Municipality of York	Municipal	31/3/2005	31/3/2015	5,891,760	365	Ground Water
6623-68QQ6L	The Regional Municipality of York	Municipal	31/3/2005	31/3/2015	2,291,184	365	Ground Water
6623-68QQ6L	The Regional Municipality of York	Municipal	31/3/2005	31/3/2015	4,582,512	365	Ground Water
6623-68QQ6L	The Regional Municipality of York	Municipal	31/3/2005	31/3/2015	5,891,760	365	Ground Water
6623-68QQ6L	The Regional Municipality of York	Municipal	31/3/2005	31/3/2015	3,273,120	365	Ground Water
6623-68QQ6L	The Regional Municipality of York	Municipal	31/3/2005	31/3/2015	5,629,824	365	Ground Water

Other than the 2 permitted takings on the site, two (2) other permitted water takers were identified within 500 m of the site, which were Newmarket Wells 1 and 2.

In addition, a residential water well survey was conducted as part of the hydrogeological investigation to gain a better understanding of the usage of the local aquifer system. A search of the available MOE water well records was conducted for a radius of 1 km around the site. Search results are provided in Appendix F. The results indicate that approximately 63 wells have been drilled or dug in the area. Well usage based on the MOE water well record search is summarized in Table 5-3.

Table 5-3 MOE Well Record Search Results

Name	Number of Wells within 1 km Radius of Site	Percentage of Total Wells	Number of Wells on Site (Participating Properties)
Municipal/Public	5	7.9%	0
Domestic	13	20.6%	0
Commercial	2	3.2%	0
Livestock/Irrigation	1	1.6%	0
Abandoned/Not Used	5	7.9%	0
Observation/Monitoring/Test Hole	32	50.8%	0
Unknown	5	7.9%	0

5.2 Identification of Drinking Water Quality Threats

Drinking water quality threats were identified as per the Clean Water Act, 2006, using the *Tables of Drinking Water Threats* (as set out in Clean Water Act - Technical Rules: Assessment Report), amended November 2009. Drinking water quality threats were determined to be both chemical and pathogenic in nature due to the nature of existing site activities and the proposed development. Based on the intrinsic vulnerability of the site, and the threat score given in the Tables of Drinking Water Threats, all the drinking water quality threats were evaluated and assigned a threat rating. Table 5-4 and Table 5-5 summarize the drinking water quality threats assessment for the current and proposed site usage.

5.2.1 Existing Land-use and Activities

Threats associated with existing site activities include:

- The storage and application of commercial fertilizer to land.
- The storage and application of pesticides to land
- The application of road salt.
- The handling and storage of road salt
- The establishment, operation or maintenance of a system that collects, stores, transmits, treats or disposes of sewage.

The application of commercial fertilizer and pesticides to land is considered a threat due to historical site usage as a golf course where it is highly likely that these substances were used extensively. Fertilizers and pesticides have a number of compounds which could be threats if introduced into the drinking water system. The concentration of Atrazine, Dicamba, Dichlorophenoxy Acetic Acid, Glyphosate, and Metolachlor are regulated by the Ontario Drinking Water Quality Standards (ODWS) (*O.Reg. 169/03).*

Fuel handling and storage is considered to be a threat as any spills or leaks can introduce benzene, toluene, ethylbenzene, xylene (BTEX), and petroleum hydrocarbon F1-F4 fractions into the surface or groundwater. The concentration of benzene is regulated by the ODWS.

The application of road salt is considered to be a threat as it can impact the groundwater and surface water systems with sodium and chloride. Sodium and chloride only have aesthetic objectives for

drinking water. It is assumed that a certain amount of road salt is used on site to ensure easy access during the winter months.

The four stormwater ponds on site are considered to be potential threats, classified as systems that collect, store transmit, treat or dispose of sewage. It is assumed that the current ponds have limited ability to improve influent water quality, and discharged water has the potential to contain elevated nutrients, metals and other parameters of concern.

5.2.2 During Construction Activities

Threats associated with construction activities during site development include:

- The handling and storage of fuel.
- The potential need for construction dewatering.

Fuel for on-site generators and earthwork machinery may be stored on-site during construction and the handling and storage of fuel would be considered a threat.

Construction dewatering is considered a threat because it will impact the shallow groundwater on site and in the surrounding area.

5.2.3 Proposed Future Land-use and Activities

Threats associated with the proposed development include:

- The application of road salt.
- The establishment, operation or maintenance of a system that collects, stores, transmits treats or disposes of sewage.
- The handling and storage of fuel.

The application of road salt is considered to be a threat as it can impact the groundwater and surface water systems with sodium and chloride. Sodium and chloride only have aesthetic objectives for drinking water. For safety purposes, road salt would continue to be applied at the site.

As part of municipal servicing, the sanitary sewer system for the proposed development is considered a threat as it can potentially introduce pathogens into the groundwater if leakage in the piping occurs.

Stormwater ponds currently exist, and will be expanded to accommodate the proposed development. Discharged water from these ponds has the potential to contain elevated nutrients, metals and other parameters of concern.

The handling and storage of fuel is considered a threat due to plans to potentially construct a gas station on the commercial block located along Davis Drive. This would include the installation of underground fuel storage tanks and a fuel dispensing station. Surface water would be at risk due to spills occurring during vehicle fuelling, or tank re-filling. In addition to this, stormwater runoff can wash minor spills or drips into the adjacent swales or stormwater system. Groundwater risks are associated with tanks that leak. As the retail fuel station is located within the 25 year wellhead protection area, best management practices to prevent leaks and spills will be need to be implemented and a long-term monitoring and maintenance program will need to be established.

Table 5-4 Potential Drinking Water Quality Threats of Proposed Development

WHPA Zone on the Property	Intrinsic Vulnerability Score	Identified Prescribed Drinking Water Threat	Short Form Name	Type of Threat	Applicable Circumstances	Reference Number	CWA Rating of the Drinking Water Threat
WHPA-C WHPA-D	6 4 & 2	The application of road salt.	Application of Road Salt	Chemical	1. The road salt is applied in an area where the percentage of total impervious surface area, as set out on a total impervious surface area map, is more than 8, but less than 80 percent. 2. The application may result in the presence of Chloride and/or Sodium in groundwater or surface water.	92-93	Low
		The handling and storage of fuel.	Handling of Fuel	Chemical	1. The above and below grade handling of liquid fuel in relation to its storage at a facility as defined in section 1 of O. Reg. 213/01 (Fuel Oil) made under the *Technical Standards and Safety Act, 2000* or a facility as defined in section 1 of O. Reg. 217/01 (Liquid Fuels) made under the *Technical Standards and Safety Act, 2000*, but not including a bulk plant. 2. The quantity of liquid fuel stored is more than 2,500 litres. 3. A spill of the fuel may result in the presence of BTEX, Petroleum Hydrocarbons F1 (>nC6-nC10), and/or Petroleum Hydrocarbons F2 (>nC10-nC16), Petroleum Hydrocarbons F3 (>nC16-nC34), and/or Petroleum Hydrocarbons F4 (>nC34) in groundwater or surface water.	177-181 187-191	Low
		The handling and storage of fuel.	Storage of Fuel	Chemical	1. The storage of liquid fuel in a tank at, above or below grade at a facility as defined in section 1 of O. Reg. 213/01 (Fuel Oil) made under the *Technical Standards and Safety Act, 2000* or a facility as defined in section 1 of O. Reg. 217/01 (Liquid Fuels) made under the *Technical Standards and Safety Act, 2000*, but not including a bulk plant. 2. The fuel stored is in a quantity that is not more than 25 litres, and/or more than 250 but not more than 2,500 litres. 3. A spill of the fuel may result in the presence of BTEX,	1384-1393	Low

Table 5-4 Potential Drinking Water Quality Threats of Proposed Development

WHPA Zone on the Property	Intrinsic Vulnerability Score	Identified Prescribed Drinking Water Threat	Short Form Name	Type of Threat	Applicable Circumstances	Reference Number	CWA Rating of the Drinking Water Threat
					Petroleum Hydrocarbons F1 (nC6-nC10), Petroleum Hydrocarbons F4 (>nC34), Petroleum Hydrocarbons F2 (>nC10-nC16) and/or Petroleum Hydrocarbons F3 (>nC16-nC34) in groundwater or surface water.		
		The establishment, operation or maintenance of a system that collects, stores, transmits treats or disposes of sewage.	Sewage collection and transmission system	Pathogen	1. The system is a wastewater collection facility that collects or transmits sewage containing human waste, but does not include any part of the facility that is a sewage storage tank or works used to carry out a designed bypass. 2. The discharge from the system may result in the presence of one or more pathogens in groundwater or surface water.	1958	Low
		The establishment, operation or maintenance of a system that collects, stores, transmits treats or disposes of sewage.	Sewage collection and transmission system	Chemical	1. The system is part of a wastewater collection facility that collects or transmits sewage containing human waste, but does not include a sewage storage tank or a designed bypass. 2. The system is designed to convey more than 1,000, but not more than 10,000 cubic metres of sewage per day. 3. The discharge from the system may result in the presence of Nitrogen in groundwater or surface water.	663	Low
		The establishment, operation or maintenance of a system that collects, stores, transmits treats or disposes of sewage.	Discharge of untreated stormwater from a stormwater retention pond	Chemical	1. The system is a storm water management facility designed to discharge storm water to land or surface water. 2. The drainage area associated with the storm water management facility is more than 10 but not more than 100 hectares and the predominant land uses in the area are industrial or commercial. 3. The discharge may result in the presence of Aluminum or one or more of its compounds containing Aluminum in groundwater or surface water.	467-485	low

Table 5-4 Potential Drinking Water Quality Threats of Proposed Development

WHPA Zone on the Property	Intrinsic Vulnerability Score	Identified Prescribed Drinking Water Threat	Short Form Name	Type of Threat	Applicable Circumstances	Reference Number	CWA Rating of the Drinking Water Threat
					4. The discharge may result in the presence of Arsenic or one or more of its compounds containing Arsenic in groundwater or surface water. 5. The discharge may result in the presence of Cadmium or one or more of its compounds containing Cadmium in groundwater or surface water. 6. The discharge may result in the presence of Chloride in groundwater or surface water. 7. The discharge may result in the presence of Chromium VI in groundwater or surface water. 8. The discharge may result in the presence of Copper or one or more of its compounds containing Copper in groundwater or surface water. 9. The discharge may result in the presence of Glyphosate in groundwater or surface water. 10. The discharge may result in the presence of Lead or one or more of its compounds containing Lead in groundwater or surface water. 11. The discharge may result in the presence of Mecoprop in groundwater or surface water. 12. The discharge may result in the presence of Mercury or one or more of its compounds containing Mercury in groundwater or surface water. 13. The discharge may result in the presence of Nickel or one or more of its compounds containing Nickel in groundwater or surface water. 14. The discharge may result in the presence of Nitrogen in groundwater or surface water. 15. The discharge may result in the presence of one or more Polycyclic Aromatic Hydrocarbons (PAHs) in groundwater or surface water.		

Table 5-4 Potential Drinking Water Quality Threats of Proposed Development

WHPA Zone on the Property	Intrinsic Vulnerability Score	Identified Prescribed Drinking Water Threat	Short Form Name	Type of Threat	Applicable Circumstances	Reference Number	CWA Rating of the Drinking Water Threat
					16. The discharge may result in the presence of Petroleum Hydrocarbons F1 (nC6-nC10) in groundwater or surface water. 17. The discharge may result in the presence of Petroleum Hydrocarbons F4 (>nC34) in groundwater or surface water. 18. The discharge may result in the presence of Petroleum Hydrocarbons F2 (>nC10-nC16) in groundwater or surface water. 19. The discharge may result in the presence of Petroleum Hydrocarbons F3 (>nC16-nC34) in groundwater or surface water 20. The discharge may result in the presence of Phosphorus (total) in groundwater or surface water. 21. The discharge may result in the presence of Zinc or one or more of its compounds containing Zinc in groundwater or surface water.		
		The establishment, operation or maintenance of a system that collects, stores, transmits, treats or disposes of sewage.	Stormwater collection and transmission system	Pathogen	1. The system is a storm water management facility designed to discharge storm water to land or surface water. 2. The discharge may result in the presence of one or more pathogens in groundwater or surface water.	1949	Low

Table 5-5 Potential Drinking Water Quality Threats of Existing Development

WHPA Zone on the Property	Intrinsic Vulnerability Score	Identified Prescribed Drinking Water Threat	Short Form Name	Type of Threat	Applicable Circumstances	Reference Number	CWA Rating of the Drinking Water Threat
WHPA-C WHPA-D	6 4 & 2	The application of commercial fertilizer to land.	The application of commercial fertilizer to land	Chemical	1. The commercial fertilizer is applied to land located in a vulnerable area, where the managed land map shows a managed land percentage for the applicable area that is less than 40% and the livestock density map shows a livestock density for the applicable area that is sufficient to annually apply agricultural source material at a rate that is than 0.5 nutrient units per acre. 2. The application may result in the presence of Nitrogen and/or Phosphorus (total) in groundwater or surface water.	19-20	low
WHPA-C WHPA-D	6 4 & 2	The handling and storage of commercial fertilizer.	The storage of commercial fertilizer	Chemical	1. The commercial fertilizer is stored for retail sale or in relation to its application. 2. The total mass of all materials stored that contain the commercial fertilizer, in any form including liquid or solid, is more than25 but not more than 2,500 kilograms. 3. A spill of the fertilizer or material containing the fertilizer may result in the presence of Nitrogen in groundwater or surface water.	1279,1283	low
WHPA-C WHPA-D	6 4 & 2	The application of pesticide to land.	The application of pesticide to land.	Chemical	1. The area of land to which the pesticide is applied is more than 10 hectares. 2. The application may result in the presence of Atrazine, Dicamba, Dichlorophenoxy Acetic Acid (D-2,4), Dichloropropene-1,3, Glyphosate, MCPA (2-methyl-4-chlorophenoxyacetic acid), MCPB (4-(4-chloro-2-methylphenoxy)butanoic acid), Mecoprop, Metalaxyl, Metolachlor or s-Metolachlor, Pendimethalin, in groundwater or surface water.	77-87	low
WHPA-C WHPA-D	6 4 & 2	The establishment, operation or maintenance of a system that collects, stores, transmits treats or disposes of	Discharge of untreated stormwater from a stormwater retention pond	Chemical	1. The system is a storm water management facility designed to discharge storm water to land or surface water. 2. The drainage area associated with the storm water management facility is more than 10 but not more than 100 hectares and the predominant land uses in the area are industrial or commercial. 3. The discharge may result in the presence of Aluminum or	467-485	low

Table 5-5 Potential Drinking Water Quality Threats of Existing Development

WHPA Zone on the Property	Intrinsic Vulnerability Score	Identified Prescribed Drinking Water Threat	Short Form Name	Type of Threat	Applicable Circumstances	Reference Number	CWA Rating of the Drinking Water Threat
		sewage.			one or more of its compounds containing Aluminum in groundwater or surface water. 4. The discharge may result in the presence of Arsenic or one or more of its compounds containing Arsenic in groundwater or surface water. 5. The discharge may result in the presence of Cadmium or one or more of its compounds containing Cadmium in groundwater or surface water. 6. The discharge may result in the presence of Chloride in groundwater or surface water. 7. The discharge may result in the presence of Chromium VI in groundwater or surface water. 8. The discharge may result in the presence of Copper or one or more of its compounds containing Copper in groundwater or surface water. 9. The discharge may result in the presence of Glyphosate in groundwater or surface water. 10. The discharge may result in the presence of Lead or one or more of its compounds containing Lead in groundwater or surface water. 11. The discharge may result in the presence of Mecoprop in groundwater or surface water. 12. The discharge may result in the presence of Mercury or one or more of its compounds containing Mercury in groundwater or surface water. 13. The discharge may result in the presence of Nickel or one or more of its compounds containing Nickel in groundwater or surface water. 14. The discharge may result in the presence of Nitrogen in groundwater or surface water. 15. The discharge may result in the presence of one or more Polycyclic Aromatic Hydrocarbons (PAHs) in groundwater or surface water. 16. The discharge may result in the presence of Petroleum Hydrocarbons F1 (nC6-nC10) in groundwater or surface		

Table 5-5 Potential Drinking Water Quality Threats of Existing Development

WHPA Zone on the Property	Intrinsic Vulnerability Score	Identified Prescribed Drinking Water Threat	Short Form Name	Type of Threat	Applicable Circumstances	Reference Number	CWA Rating of the Drinking Water Threat
					water. 17. The discharge may result in the presence of Petroleum Hydrocarbons F4 (>nC34) in groundwater or surface water. 18. The discharge may result in the presence of Petroleum Hydrocarbons F2 (>nC10-nC16) in groundwater or surface water. 19. The discharge may result in the presence of Petroleum Hydrocarbons F3 (>nC16-nC34) in groundwater or surface water 20. The discharge may result in the presence of Phosphorus (total) in groundwater or surface water. 21. The discharge may result in the presence of Zinc or one or more of its compounds containing Zinc in groundwater or surface water.		
WHPA-C WHPA-D	6 4 & 2	The application of road salt.	Application of Road Salt	Chemical	1. The road salt is applied in an area where the percentage of total impervious surface area, as set out on a total impervious surface area map, is more than 8, but less than 80 percent. 2. The application may result in the presence of Chloride and/or Sodium in groundwater or surface water.	92-93	Low
		The establishment, operation or maintenance of a system that collects, stores, transmits, treats or disposes of sewage.	Stormwater collection and transmission system	Pathogen	1. The system is a storm water management facility designed to discharge storm water to land or surface water. 2. The discharge may result in the presence of one or more pathogens in groundwater or surface water.	1949	Low

5.3 Identification of Drinking Water Quantity Threats

5.3.1 Conceptual Water Balance

A water balance was calculated using the drainage area plan developed in the Functional Servicing report (FSR) (CEG, 2012). The post-development scenario increases the impervious area from approximately 42% to 58%. Assuming that all dwellings have disconnected roof leaders (including existing dwellings as well as those to be constructed), this results in a decrease in infiltration by approximately 5,763 m^3/year, and an increase in runoff by approximately 95,406 m^3/year. Further work will be done to address the infiltration imbalance under the FSR update report using various best management practices (BMP) to enhance on-site infiltration. Details of the water balance calculations are included in Appendix H.

5.3.2 Identification of Water Quantity Threats

Based on the FSR (CEG, 2012) and assuming a minimum pipe diameter of 300 mm, the minimum depth of excavation for the installation of servicing for the development is 3.0 m (measured to invert) within the overburden layer. Based on this, as well as the depth of the water table, the potential for construction dewatering exists. Due to the potential for construction dewatering, the potential drinking water quantity threat identified for the proposed development is defined as: taking water from an aquifer or a surface water body without returning the water taken to the same aquifer or surface water body. According to Section 34 of the Ontario Water Resources Act (OWRA), any groundwater taking greater than 50,000 L/day will require a Permit to Take Water (PTTW) from the Ontario MOE. Review of the detailed design plans will be required to determine if a PTTW application will be necessary for construction dewatering.

The surrounding area is a mixture of urban developments, serviced by municipal water, and rural properties. A water well survey conducted by CEG in support of the hydrogeological investigation indicated that there are 63 groundwater wells within 1 km of the site, of which the Town of Newmarket identified three wells to be in use for domestic purposes. Survey results indicate that one of the wells was completed to a depth of 35.5 m. Appendix F contains a summary of the MOE well records within 1 km of the site. Should a PTTW be required, detailed zone of influence calculations will be performed to evaluate potential impacts to these and other surrounding wells.

The thickness of confining aquitards, Newmarket Till (~15 m) and Sunnybrook Drift (~23 m) between Thorncliffe and Scarborough aquifers, indicates hydraulic separation of the units. This suggests that the Thorncliffe and Scarborough aquifers are not at risk from threats to the shallow groundwater. Based on the regional cross section, the site is to the west of the Tunnel Channel deposits, which are not anticipated to impact potential dewatering.

Dewatering Effects

Dewatering can result in a decline in the groundwater level in the shallow unconfined aquifer, reducing the available groundwater for nearby groundwater takers. Additionally, lowering of the shallow groundwater level could potentially reduce the groundwater input into on-site/nearby natural ecosystem features. Ansnorveldt Creek to the north of the site is considered intermittent and therefore unlikely to be groundwater dependent. Western Creek to the southeast of the site is classified as a permanent warmwater watercourse and therefore unlikely to be groundwater dependent.

In addition, dewatering discharge is frequently directed to nearby watercourses (indirectly via the storm sewer), and could potentially alter the physical, chemical and thermal regime of the receiving watercourses.

Generally, construction dewatering is considered to have short term localized impacts to the groundwater system and recovery of the groundwater system is expected once the dewatering operation ceases; therefore it is predicted that the drinking water quantity threat during construction would be low.

Table 5-6 summarizes the potential drinking water quantity threats.

Table 5-6 Potential Drinking Water Quantity Threats

Identified Prescribed Drinking Water Threat	Description of the Drinking Water Threat	WHPA Zone	Approximate Distance From Municipal Well	Type of Assessment Conducted	Qualitative Rating of the Drinking Water Threat
An activity that takes water from an aquifer or a surface water body without returning the water taken to the same aquifer or surface water body.	Construction Dewatering	C & D	430 m, 420 m , 890 m	Hydrogeological Investigation Report	Anticipated to be low

6.0 Conceptual Risk Management Plan

Based on the guidance document published by the Region of York titled "Guidance for Proposed Developments in Wellhead Protection Areas in the Regional Municipality of York" there are a number of activities which are either prohibited or require a detailed risk management plan in order to occur with a WHPA.

The Region generally prohibits the following new land uses on the ORM. If these activities are off the ORM, a SWIAMP and Risk Mitigation Plan are generally necessary for activities associated with the manufacture, storage and use of:

- Inorganic chemicals
- Construction and agricultural equipment
- Petroleum-based fuels or solvents
- Road Salt
- Hazardous or liquid industrial waste
- Waste disposal sites
- Contaminants identified by the Province
- Organic soil conditioning sites
- Snow
- Pathogen threats such as stormwater management ponds and rapid infiltration basins (prohibited within 100 m of a municipal well)

Based on the land usage of the proposed development, fuel storage and handling associated with construction and the proposed gas station, application of road salt for safety purposes, pathogen threats

associated with the sanitary and stormwater systems are considered activities requiring a SWIAMP and Risk Mitigation Plan.

6.1 Water Quality Management Measures

6.1.1 Fuel Handling and Storage

Fuel handling and storage was identified as one of the existing drinking water quality threats on the site. In addition there are threats relating to fuel handling and storage during construction for development of the site.

Construction Fuel Storage

During construction, the contractor should provide copies of their environmental management policies and commitments. Fuel must be stored in accordance with the requirements of the MOE, TSSA and other applicable authorities. Refuelling must not occur in areas that can impact the watercourse or stormwater ponds; refuelling should be avoided near the stormwater ponds, storm sewer catch basins, and graded drainage areas (swales etc.).

Proposed Gas Station

Gas stations pose risks to both surface and groundwater. A review of the regional cross section shows that there is over 10 m of till cover overlying the Thorncliffe Aquifer in the vicinity of the site. This till cap can act as a barrier to contaminant transport to the lower aquifer units. In addition to this, the commercial block is located within an area of low intrinsic vulnerability within the WHPA.

Risk management measures for surface and groundwater will be addressed separately. In general, construction of a gas station should be conducted in accordance to all MOE and TSSA specifications.

Surface Water

There are three main sources of surface water contamination associated with a gas station: spills associated with vehicle filling, spills associated with tank refilling, and uncontrolled surface water runoff.

Spills associated with vehicle filling can be managed in the following manner:

- Design spill contingency plans
- Spill kits containing absorbent pillows, spreadable granules and booms in a clearly marked and accessible manner.
- Vehicle filling area graded to direct spills to containment areas

Spills associated with tank refilling can be managed in the following manner:

- Design spill contingency plans
- Spill kits containing absorbent pillows, spreadable granules and booms in a clearly marked and accessible manner.
- Each tank fill point to have dedicated spill containment.
- Use underground storage tanks (USTs) with built-in overfill protection.

Surface water runoff can be managed in the following manner:

- Canopies over the entire filling area to reduce rain/snow runoff surrounding the filling stations
- Site grading to direct clean runoff outside the filling area to the stormwater system, while runoff from within the filling area can be directed to a pre-treatment facility (e.g. OGS)

Ground Water

The main source of groundwater contamination associated with gas stations is leaks from the fuel storage tanks. This risk can be managed in the following ways:

- Double wall fuel storage tanks to reduce the likelihood of a spill due to punctured tank
- Reduction of the number of piping joints between tank and dispenser. Leaking joints are a common source of groundwater contamination.
- Fuel inventory management in order to assess potential leaks
- Monitoring of the annular space between storage tank walls to assess potential rupture in primary tank wall
- Monitoring wells around the site to annually monitor the state of the groundwater.

An environmental management plan should be developed for the site to encompass both surface and groundwater protection and include the establishment of a long-term monitoring and maintenance program.

6.1.2 Application of Road Salt

The threat associated with the application of road salt can be managed through optimizing road salt application efficiency. This can significantly reduce the amount of de-icing materials applied and its associated adverse impacts on water sources. Snow ploughing could be used as a chemical-free option to keep roads clear of snow and ice, and thus fewer chemicals would be needed to melt the remaining snow and ice pack. An alternative to salt, such as sand, can also be used. The proposed OGS and storm pond upgrades (forebays, etc.) could effectively remove the sand from the stormwater system, given proper maintenance.

Salt storage on site should be kept to a minimum. Any storage units should be kept away from exposure to water, and in a system with back up containment.

The areas in which salt would be applied in the proposed development are all paved. Paving will keep the underlying soils under a hard cap, preventing the introduction of sodium and chloride into the groundwater system. In addition to the cap, the low permeability of the silty clay soils found on-site should prevent most of the salt from reaching the shallow aquifer. The underlying Kettleby Till, and Newmarket Till and Sunnybrook Drift aquitard units provide further barriers for salt migration to the Thorncliffe and Scarborough aquifers, which the nearby municipal wells are screened in.

6.1.3 Sewage Collection and Transmission System

The sewage collection and transmission system have the potential to leak over time. The risk to the nearby domestic and municipal wells is low due to the natural geologic barriers provided by the Newmarket Till and Sunnybrook Drift aquitard units to the Thorncliffe and Scarborough aquifers. The presence of municipal servicing on site (water and sanitary sewers) were found to be low risk, and since sewers have to be installed as per provincial specifications, are not

anticipated to cause any adverse effects. As such, they do not require a monitoring or management plan.

6.1.4 Stormwater Collection and Transmission System

The existing stormwater ponds are inline with the existing storm sewer system and provide limited stormwater runoff controls or water quality treatment. With the proposed development, the ponds will be expanded to provide Enhanced (Level 1) Quality Control with outlet controls and quality treatment for existing and proposed development within the contributing drainage areas, which decreases the risk for discharge to carry parameters of concern.

6.2 Water Quantity Management Measures

Construction Dewatering

A hydrogeological study was conducted in order to characterize the existing geological and hydrogeological settings, assess potential impacts to the natural environment and other water well users as a result of the proposed development, and provide recommendations on management measures to mitigate potential impacts. The results of this study, in conjunction with the detailed design, will help determine if a PTTW is needed.

If a PTTW is needed, a dewatering discharge plan will be prepared which assesses the quantity and quality of dewatering discharge as well as the assimilative capacity of the receiving water bodies. To minimize potential impacts to nearby tributaries of the East Holland River, any dewatering should be conducted during the warmwater timing window for construction which is from July 1st to March 31st As part of the PTTW application, risk management measures will be addressed in the Environmental Management Plan which will identify and determine mitigation methods for short term impacts during construction, and provide for monitoring before, during, and post-construction.

6.3 Monitoring

CEG has conducted bi-monthly groundwater water level monitoring on site for one year as part of the hydrogeological investigation, which was completed in March 2013.

A monitoring program for the impacts to the groundwater flow system will be established as part of the Environmental Management Plan in the PTTW application. Monitoring programs generally involve a combination of:

- installation of dedicated monitoring wells,
- higher frequency during, pre and post-construction water level monitoring,
- dewatering discharge sampling and water quality sampling.

All sampling is expected to follow the *MOE Guidance on Sampling and Analytical Methods for Use at Contaminated Sites in Ontario, 1996.*

6.4 Emergency Response Plan

6.4.1 Spills Response

The threats to drinking water quality after the development is completed primarily involve the use of road salt. Road salt is typically applied in a solid form so if a spill occurs, immediate clean-up can be conducted by site maintenance staff.

For fuel spills that may occur during construction, the following steps can be taken:

1. Prior to beginning construction, spill kits should be available on the site with absorbent material for spills containment. Contractors should be properly trained in the use of the spill kit materials. Equipment and materials to handle spills should be properly maintained at all times.
2. If a spill occurs, it should be reported to the contractor's on-site supervisor. The contractor should assess if the spill could be of environmental significance (based on material, quantity, spill-receiving body, and potential sensitive receptors).
3. If there is an injury on site, a 911 call should be made in addition to notifying any site-emergency personnel.
4. All steps should be taken to contain the liquid at the source. If it has already entered (or has the potential to enter) any existing ditch, the ditch should be blocked further downstream to contain the spill and ensure it does not migrate offsite.
5. The MOE Spills Action Centre (1-800-268-6060) should be contacted immediately.
6. If the spill has the potential of reaching the stormwater system, the Town of Newmarket Public Works Department (905-895-5193) should be contacted. If Regional systems have the potential to be affected, contact the Emergency Water and Wastewater Department from York Region (905-895-1231 x5820).
7. Contact a remediation company to clean up the spill. The remediation contractor will also be responsible for the removal and disposal of hazardous materials from the site.

As part of the development of a portion of the commercial block into a gas station, a stand-alone spill response protocol should be developed. This protocol should include remedial actions, contact with the MOE and applicable municipal departments as well as training required for the facility operators. Routine monitoring reports can be submitted to the Region of York on an annual basis as a due diligence measure.

6.4.2 Dewatering Response Plan

The dewatering rate and duration is governed by the PTTW. A response plan should be developed under the PTTW Application to address potential impacts on nearby wells, as well as potential impacts of dewatering discharge water quality.

6.4.3 Fire Response Plan

The proposed development is designed to meet applicable fire codes. This includes ensuring smoke detectors and fire alarms are operational, and appropriate signage is prominently displayed. In the event of a fire, the following services should be contacted:

- Emergency Services (911)

- Central York Fire Services - Newmarket Fire Department (905-895-9222)

6.4.4 Review Schedule

The Emergency Response Plan should be reviewed annually and after any incidents, for as long as it is to remain effective.

6.5 Implementation Plan

The Spills and Dewatering Response protocols are to be implemented prior to beginning construction of the site. PTTW water taking results should be reported annually to the MOE's Water Taking Reporting System (WTRS).

6.6 Termination of Plan

This mitigation plan is to be implemented during construction and for as long as there is a gas station and road salt application present on the site. If there are no longer fuel storage and handling and road salt application activities, the plan no longer needs to be reinforced.

7.0 Conclusion

This report makes the following conclusions:

- The site was historically used as a golf course and a portion is now proposed for re-development as a residential subdivision, as well as a small commercial block.
- A Phase I and Phase II Environmental Site Assessment was conducted for the site by CEG in January and April 2012 respectively. The Phase I ESA report was updated November 2013. No evidence of soil or groundwater contamination was found on site.
- A site specific hydrogeological investigation was conducted by CEG in July 2012 and updated November 2013.
- The site is not located in the Oak Ridges Moraine Conservation Plan Area or the Greenbelt Plan Area. The site is considered a Vulnerable Area because the site falls in the 5 to 25-year Wellhead Protection Area (WHPA) of Newmarket Wells No. 1, 2 and 15 and has intrinsic vulnerability scores ranging from 2 (low) to 6 (medium).
- For the completed proposed development, the water quality threats to the site include application of road salt, handling and storage of fuel, the existence of stormwater management ponds, and the proposed municipal sanitary servicing. The handling and storage of fuel would be considered threats during construction. Threats associated with the existing site include the application of road salt, the application of commercial fertilizer and pesticides to land, the handling of fuel, and the existence of an on-site stormwater management system. All threats were determined to be low.
- During construction, it is recommended that the fuel handling and storage risk be managed via practices in the contractor's environmental management policies and commitments. Additionally, fuel should be stored in accordance with the requirements of the MOE and other applicable authorities. Refuelling should be avoided near any onsite stormwater drainage features, as well as the watercourse crossing the northwest corner of the site. The post-

development fuel handling and storage risk can be managed with spills planning including the presence of spills kits and containment, as well as fuel inventory and monitoring for leaks. The gas station should be constructed in accordance with MOE and TSSA specifications.

- Salt application should be managed through optimizing road salt application efficiency, using chemical-free options to remove snow and ice pack, or using alternatives to salt. The area where salt is applied should be paved or kept under a cap to prevent the introduction of sodium and chloride into the groundwater system.
- A water balance was completed, showing that the overall pervious area of the site is decreasing from the pre-development case; thus runoff will be increased and infiltration will be decreased after development is complete. This should be addressed during the detailed design stage, using innovative design to increase infiltration to ensure hydrogeological balance.
- Drinking water quantity threats identified for the proposed development include an activity that takes water from an aquifer without returning the water taken to the same aquifer, via construction dewatering. A PTTW will be required if a taking of 50,000 L/day or greater is needed during construction. Generally, construction dewatering is considered to have short term localized impacts to the groundwater system and recovery of the groundwater system is expected once the dewatering operation ceases; therefore it is predicted that the drinking water quantity threat would be low.
- Water quantity threats due to construction dewatering will be managed through the Environmental Management Plan, which will be prepared in support of the PTTW application (if necessary)
- An Emergency Response Plan involving Spills and Fire Response has been developed as part of the Risk Management Plan. This plan is to be reviewed annually or after any incidents may occur.

8.0 Recommendations

- Results of the hydrogeological investigation should be used in conjunction with the detailed design to assess the need for construction dewatering. If it is necessary, the zone of influence and anticipated dewatering rates and volumes as a result of construction related dewatering should be estimated. These findings will be used to prepare a PTTW Application for dewatering during construction. A dewatering permit should be obtained prior to the commencement of construction.
- A dewatering monitoring plan must be developed for the PTTW Application (if required).
- A dewatering response plan must also be developed to address any potential negative impacts of dewatering on water quality and quantity (if required).
- The contractor's environmental policies and contingency plans should be reviewed prior to construction commencement.
- Regular site inspections should be scheduled to ensure environmental compliance of site construction activities.

- An environmental management plan should be developed for the site to encompass both surface and groundwater and include the establishment of a long-term monitoring and maintenance program.

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APPENDIX J

Statement of Limiting Conditions

Statement of Limiting Conditions and Assumptions

1. This Report/Study (the "Work") has been prepared at the request of, and for the exclusive use of, the Owner, and its affiliates (the "Intended Users"). No one other than the Intended Users has the right to use and rely on the Work without first obtaining the written authorization of Cole Engineering Group Ltd. (Cole Engineering) and its Owner.

2. Cole Engineering expressly excludes liability to any party except the Intended Users for any use of, and/or reliance upon, the Work.

3. Cole Engineering notes that the following assumptions were made in completing the Work:

   a) the land use description(s) supplied to us are correct;
   b) the surveys and data supplied to Cole Engineering by the Owner are accurate;
   c) market timing, approval delivery and secondary source information is within the control of Parties other than Cole Engineering; and
   d) there are no encroachments, leases, covenants, binding agreements, restrictions, pledges, charges, liens or special assessments outstanding, or encumbrances which would significantly affect the use or servicing.

   Investigations have not been carried out to verify these assumptions. Cole Engineering deems the sources of data and statistical information contained herein to be reliable, but we extend no guarantee of accuracy in these respects.

4. Cole Engineering accepts no responsibility for legal interpretations, questions of survey, opinion of title, hidden or inconspicuous conditions of the property, toxic wastes or contaminated materials, soil or sub-soil conditions, environmental, engineering or other factual and technical matters disclosed by the Owner, the Client, or any public agency, which by their nature, may change the outcome of the Work. Such factors, beyond the scope of this Work, could affect the findings, conclusions and opinions rendered in the Work. We have made disclosure of related potential problems that have come to our attention. Responsibility for diligence with respect to all matters of fact reported herein rests with the Intended Users.

5. Cole Engineering practices engineering in the general areas of infrastructure and transportation. It is not qualified to and is not providing legal or planning advice in this Work.

6. The legal description of the property and the area of the site were based upon surveys and data supplied to us by the Owner. The plans, photographs, and sketches contained in this report are included solely to aide in visualizing the location of the property, the configuration and boundaries of the site, and the relative position of the improvements on the said lands.

7. We have made investigations from secondary sources as documented in the Work, but we have not checked for compliance with by-laws, codes, agency and governmental regulations, etc., unless specifically noted in the Work.

8. Because conditions, including capacity, allocation, economic, social, and political factors change rapidly and, on occasion, without notice or warning, the findings of the Work expressed herein, are as of the date of the Work and cannot necessarily be relied upon as of any other date without subsequent advice from Cole Engineering.

9. The value of proposed improvements should be applied only with regard to the purpose and function of the Work, as outlined in the body of this Work. Any cost estimates set out in the Work are based on construction averages and subject to change.

10. Neither possession of the Work, nor a copy of it, carries the right of publication. All copyright in the Work is reserved to Cole Engineering. The Work shall not be disclosed, produced or reproduced, quoted from, or referred to, in whole or in part, or published in any manner, without the express written consent of Cole Engineering and the Owner.

11. The Work is only valid if it bears the professional engineer's seal and original signature of the author, and if considered in its entirety. Responsibility for unauthorized alteration to the Work is denied.