Landfill Impact Assessment

665 Albert Street
Ottawa, Ontario

Prepared for:

Dream Impact Master LP
30 Adelaide Street East
Toronto, Ontario M5C 3H1

April 22, 2022

Pinchin File: 308931.000

Issued To:	**Dream Impact Master LP**
Issued On:	**April 22, 2022**
Pinchin File:	**308931.000**
Issuing Office:	**Sudbury, ON**

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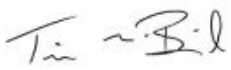

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EXECUTIVE SUMMARY

Pinchin Ltd. (Pinchin) was retained on April 12, 2022 through a standard engagement letter signed by Dream Impact Master LP (Client) to conduct a Landfill Impact Assessment for the property located at 665 Albert Street, Ottawa, Ontario (hereafter referred to as the Site).

The Site is currently industrial/vacant, free of any permanent buildings or structures.

Pinchin was advised by the Client that the purpose of the Landfill Impact Assessment was to assess potential issues of environmental concern in relation to the subject property and its proximity to nearby Waste Disposal Sites (WDS). It is Pinchin's understanding that the Site consists of a 1.11 hectare (ha) parcel (approximately 2.74-acre) property located in an urban area that is to be re-developed as a residential/commercial land use. It is Pinchin's understanding that the City of Ottawa has identified the subject property as being located within a designated area related to known/proximal waste deposits (former private waste disposal sites number 6124 and number 6108). The Landfill Impact Assessment area refers to any land considered to be potentially impacted by waste disposal (landfill) site operations, generally within 500 meters of a waste disposal site (active or closed). As such the Client has retained Pinchin to conduct an assessment of the above noted property to ensure that:

- The proximity to the waste disposal site (WDS) and potential nuisance effects associated with the location of the development are clearly outlined on the title of the property to accurately inform future owners;
- To guarantee that remedial measures are complied with; and
- To ensure that property owners understand that the Landfill Impact Assessment for one development may not apply to another.

Based on the results of the Landfill Impact Assessment completed by Pinchin, no potential contaminant pathway or nuisance source was identified that is likely to result in potential subsurface impacts at the Site, as a result of the presence of the former private waste disposal facilities #6124 and #6108. As such, no additional subsurface investigation work, remedial or mitigative measures are recommended at this time in relation to redevelopment of the Site and the former waste disposal sites; however, as per the recommendations within the 2022 Golder Phase II ESA Report, soil impacts at the Site would require remediation or a risk assessment as part of the redevelopment.

This Executive Summary is subject to the same standard limitations as contained in the report and must be read in conjunction with the entire report.

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1.0 INTRODUCTION

1.1 Background

Pinchin Ltd. (Pinchin) was retained on April 12, 2022 through a standard engagement letter signed by Dream Impact Master LP (Client) to conduct a Landfill Impact Assessment for the property located at 665 Albert Street, Ottawa, Ontario (hereafter referred to as the Site).

The Site consists of the municipal address 665 Albert Street and consists of the land listed at the following Property Identification Numbers:

- PIN 04112-0242(LT);
- PIN 04112-0244(LT);
- PIN 04112-0250(LT);
- PIN 04112-0251(LT); and
- PIN 04112-0263(LT).

The Site is currently vacant with the exception of the Pimisi LRT Station and associated LRT line, however; it is assumed that the land and structures associated with the LRT will not be transferred to the Client. Historic development at the Site and in the surrounding area was of mixed land use including residential, commercial, industrial and institutional land uses.

Pinchin was advised by the Client that the purpose of the landfill impact assessment was to assess potential issues of environmental concern in relation to the subject property and its proximity to nearby Waste Disposal Sites (WDS). It is Pinchin's understanding that the Site consists of a 1.11 hectares (ha) (2.74 acres) parcel located in an urban area that is to be re-developed as a residential/commercial land use. It is Pinchin's understanding that the City of Ottawa has identified the subject property as requiring a landfill impact assessment, as it located within a designated area related to known/proximal waste deposits. The landfill impact assessment has been based on the Guideline D-1, "Land Use Compatibility" (Guidelines), which specifies restrictions and controls on land use that the Ministry of the Environment, Conservation and Parks (MECP), formerly the Ontario Ministry of Environment and Climate Change, outlines for land use in the vicinity of landfills (active or closed). Typically, official plans require the application of the D-4 Guideline and extends that to proposals for land use changes on or near operating, or non-operating landfills. The Guideline D-4 assessment area refers to any land considered to be potentially impacted by waste disposal (landfill) site operations, generally within 500 meters of the waste disposal site.

Factors to be considered for land users in the vicinity of non-operating landfill sites include: (i) ground and surface water contamination by leachate, (ii) surface runoff, (iii) landfill-generated gases, (iv) ground

settlement, (v) visual impact and (vi) soil contamination and hazardous waste. The Guideline notes "particular attention shall be given to the production and migration of landfill gas".

The Client has retained Pinchin to conduct a Landfill Impact Assessment of the above noted property to ensure that:

- The proximity to the waste disposal site (WDS) and potential nuisance effects associated with the location of the development are clearly outlined on the title of the property to accurately inform future owners;
- To guarantee that remedial measures are complied with; and
- To ensure that property owners understand that the Landfill Impact Assessment for one development may not apply to another.

1.2 Scope of Work

The Landfill Impact Assessment was completed in general accordance with MECP Guideline D-4, "Land Use On or Near Landfills and Dumps" (1994), including the following activities, which are all subject to the limitations outlined in Section 8.0 of this report:

- Assessment of all factors listed above to evaluate the presence and impact of any adverse effects or risks to health and safety, nuisance impacts and degradation of the natural environment, taking into consideration the proposed land use(s) and the uses permitted by local zoning bylaws;
- Communication with the City of Ottawa, and the MECP to request documentation on the relevant landfill site and additional information as required; and
- Completion of a report outlining environmental considerations and, where necessary, propose appropriate engineered remedial / control measures to prevent or minimize adverse effects.

1.3 Key Personnel

The Competent Environmental Practitioner (CEP) for the Site is Mr. Tim McBride of Pinchin Ltd. Mr. McBride's contact information is provided below:

Mr. Tim McBride, B.Sc., P.Geo., Q.P$_{ESA}$

Pinchin Ltd.

662 Falconbridge Road Unit #3

Sudbury, ON P3A 4S4

1.4 Site Document Review

Data available to the public (i.e. Google Earth, Canada Atlas of Topographic Maps, and historic weather data) has been utilized to support the following sections of this report.

In addition, Pinchin has reviewed the following additional environmental reports prepared for the Site to assist in the development of a conceptual model for the subject Site:

- Report entitled "*Phase III Environmental Site Assessment, Risk Assessment, and Risk Management Strategy, South LeBreton, Ottawa, Ontario*" prepared by Intera Engineering Ltd. (Intera) for the Nation Capital Commission (NCC), dated January 18, 2007 (2007 Intera Phase III ESA Report);
- Report entitled "*Spring 2007 Groundwater Monitoring, South LeBreton, Ottawa Ontario*" prepared by Intera for the NCC, dated June 13, 2007 (2007 Spring Intera Groundwater Report);
- Report entitled "*Budget Cost Estimate for Remediation of South LeBreton*" prepared by Intera for the NCC, dated October 1, 2007 (2007 Intera Remediation Budget Estimate);
- Report entitled "*Fall 2007 Groundwater Monitoring, South LeBreton, Ottawa Ontario*" prepared by Intera for the NCC, dated March 4, 2008 (2007 Fall Intera Groundwater Report);
- Report entitled "*2008 Groundwater Monitoring, South LeBreton and Preston Extension, Ottawa Ontario*" prepared by Intera for the NCC, dated January 20, 2009 (2009 Fall Intera Groundwater Report);
- Report entitled "*2008 Groundwater Monitoring, South LeBreton and Preston Extension, Ottawa Ontario*" prepared by Intera for the NCC, dated January 20, 2009 (2009 Fall Intera Groundwater Report);
- Report entitled "*Supplemental Phase II Environmental Site Assessment, South LeBreton Flats Blocks B1, B2, C1, C2, E1, E2, E3, G, H1 and H2 Ottawa Ontario*" prepared by Intera for the NCC and dated February 2012 (2012 Intera Supplemental Phase II ESA Report);
- Memorandum entitled "*Remedial Options Review and Class D Remediation Cost Estimates, South LeBreton Flats, Blocks B1, B2, C1, C2, E1, E2, E3, G, H1 and H2, Ottawa, Ontario (Revised Draft #2)*" prepared by Golder Associates (Golder) for NCC, dated April 5, 2012 (2012 Golder Remedial Options Review);

- Report entitled "*2012 Groundwater Monitoring, South LeBreton Blocks B1, B2, C1, C2, E1, E2, E3, G, H1, and H2, Ottawa Ontario*" prepared by Intera Engineering Ltd. for the NCC, dated May 2012 (2012 Fall Intera Groundwater Report);
- Report entitled "*Geotechnical and Hydrogeologic Investigation Combined Sewage Storage Tunnel East-West Tunnel, Western Terminus Ottawa, Ontario*" prepared by Golder for the City of Ottawa, dated May 2013 (2013 Golder CSST Geotechnical and Hydrogeological Report);
- Document entitled "*OLRT Temporary Lease Property Report Card*" prepared for the City of Ottawa and dated April 15, 2015;
- Document entitled "*OLRT Temporary Lease Property Report Card*" prepared for the City of Ottawa and dated June 9, 2015;
- Report entitled "*Summary of Subsurface Conditions & Construction Considerations South LeBreton Flats, Block B, C, D, E, F, G, and H, Ottawa, Ontario*" prepared by Golder for the NCC and dated November 2015 (2015 Golder Subsurface Condition Summary Report);
- Memorandum entitled "*Geotechnical Desk-Top Study – NCC Property at 584 Wellington St. Potential Future Location of City of Ottawa Central Library, Ottawa, Ontario*" prepared by Stantec for the City of Ottawa and dated April 5, 2016 (2016 Stantec Geotechnical Study);
- Figure entitled "*LeBreton Flats: Library Parcel*" provided by the NCC and dated Mary 27, 2021;
- Report entitled "*Phase One Environmental Site Assessment, 665 Albert Street, LeBreton Flats, Ottawa, Ontario*" prepared by Golder for the Client and dated March 2022 (2022 Golder Phase I ESA); and
- Report entitled "Draft *Phase Two Environmental Site Assessment, 665 Albert Street, LeBreton Flats, Ottawa, Ontario*" prepared by Golder for the Client and dated March 14, 2022 (2022 Golder Phase II ESA).

2.0 SITE DESCRIPTION

2.1 Site Location and Physical Description

The Site property is located within the City of Ottawa within the area known as LeBreton Flats. The Site consists of five individual parcels and is bounded to the northwest by the LRT rail line and Pimisi Station, to the southwest by Booth Street, to the south/southwest by Albert Street. The northeast boundary of the Site is situated approximately 166 m northeast of Booth Street. The Site location is indicated on Figure 1

(all Figures are provided in Appendix I). The Site is currently vacant land and is situated in an urban area that predominantly consists of residential and commercial land uses. Figure 2 illustrates the Site and surrounding area.

2.2 Legal Description of Site

The Site is located at 665 Albert Street, Ottawa, Ontario and occupies approximately 1.11 hectares of vacant land located within the area known as LeBreton Flats. The Site is zoned as MD[2509] H(83)-h, intended to accommodate mixed use land uses within the downtown of the City of Ottawa. The legal description of each of the parcels making up the Site are listed in Table 1 below.

Table 1: Legal Land Descriptions

Information	Description
Property Identification Number	PIN 04112-0242(LT)
Legal Description	Part of Wellington Street (Closed by By-Law Inst. No. LT1243128), Plan No. 2, being Parts 1 to 4, ON Plan 4R-32303;
	Part of Wellington Street, Closed by By-LayLT1243128 & OC1457912, Plan No. 2, being Parts of 11 to 17, Plan 4R-32006; Subject to an Easement in Gross over Parts 15 & 16 4R32006 and Part 3 4R32303 as in OC2376918; City of Ottawa.
Property Identification Number	PIN 04112-0244(LT)
Legal Description	Part Lloyd Street, Plan No. 2, being Part 9, Plan 4R-32006; S/T LT 1243142; City of Ottawa
Property Identification Number	PIN 04112-0250(LT)
Legal Description	Parts of Lots 6 & 7, Part of the Water Works Reserve, Part Alley closed by By-Law LT1243120 Plan 9481, being Part 2 on 4R-32006; City of Ottawa.
Property Identification Number	PIN 04112-0251(LT)
Legal Description	Lots 1, 2, 3, 4, 5, 6, 7 & 8 Plan 9481, Water Works Reserve On Plan 9481, Alley ON Plan 9481 (Closed by By-law LT1243120), Except Part 40 Plan 5R12914, Part 10- Plan 4R23452, Part 1 4R30019, Parts 20, 21, 22, 25 & 41 ON 4R32151 and Parts 2, 23 & 25 ON 4R32006; Subject to an Easment in Gross Over Parts 3, 24 & 26 ON 4R32006 and Parts 23, 26, 27, 29, 37, 38 & 42 ON 4R32151 as in OC2177774; Subject to an Easement in Gross over Part Lots 1, 2, & 3 Plan 9481, Part 5, 4R32006 and Parts 27 & 28, 4R32151 as in OC2376919; City of Ottawa

Information	Description
Property Identification Number	Part of PIN 04112-0263(LT)
Legal Description	-

2.3 Site History

The history of the Site and surrounding area (LeBreton Flats South) has been well documented with numerous previous environmental investigations having been conducted since 2007. Based on a review of these previous reports the Site was first developed with residential, institutional and commercial land uses in 1878. The Site and surrounding area underwent a transition from predominantly residential land uses to industrial and commercial land uses in the early 1900's. Following the Great Fire in approximately 1902 the Site was redeveloped and occupied by Continental Paper Products Company Ltd. (then called The Continental Bag & Paper Co. Ltd.) and a historical laundry service until approximately 1966 when it was acquired by the NCC. By 1965 the majority of buildings at the Site had been cleared with Wellington Street running approximately southwest to northeast, through the Site and the remainder of the Site occupied by a parking lot. In the 1980's/90s a transit way, in the form of a bus lane occupied the north most portion of the Site, which, in the mid 2010's was replaced by the light rail transport (LRT) and Pimisi Station which currently occupies the north portion of the Site. Wellington Street was diverted south of the Site in the 2000's with the remaining pavement removed in the 2010's. Most recently the Site was leased and used as a laydown area for the construction of the LRT line and station. In its current state the Site consists of a gravel surfaced parking lot with the LRT line and Pimisi Station occupying the north portion.

Development of the Site and surrounding LeBreton Flats has been hindered by the presence contaminated soil and groundwater as a result of both the Great Fire in 1902, as well as previous land uses. Previous investigations have included the Site and surrounding area of LeBreton Flats and identified similar conditions. The majority of exceedances throughout the Site investigations appear to be within the surficial fill material. An investigation into the subsurface conditions at the Site was conducted and presented most recently within the 2022 Golder Phase II ESA. The findings of the 2022 Golder Phase II ESA Report identified elevated levels of PAHs, PHCs and metals relative to Table 3 of the MECP Site Condition Standards (SCS) for non-potable groundwater conditions. The exceedances listed were limited to the surficial two meters of soil. Groundwater samples at the Site, collected as part of the 2022 Golder Phase II ESA Report did not result in any exceedances of the MECP SCS Table 3 Guidelines. This report recommended the remediation of all fill materials at the Site prior to development. Several additional environmental investigations have included the characterization of the soil and groundwater conditions of the Site, as well as the surrounding area. The 2012 Intera Phase II ESA Report indicated two instances of elevated PHCs, benzene and ethylene, as well as six instances of elevated metals at the Site, in addition to similar exceedances in the surrounding area. An analysis of the

frequency of exceedances with respect was conducted with the results indicating a decrease in observed contamination with respect to depth. Based on a review of the historic reports provided to Pinchin, contamination at the Site is a result of previous land uses (i.e. industrial), as well as the use of contaminated fill following the decommissioning of the former Canadian National Railway line within the South LeBreton Flats area (2022 Golder Phase II ESA Report and 2012 Intera Supplemental Phase II ESA Report). In general, contamination appears to be limited to imported fill material overlying native soil in the area.

2.4 Physical Setting

2.4.1 Topography and Hydrology

The physical setting of the Site is dominated by the Ottawa River situated approximately 550 m northwest of the Site, which flows southwest to northeast. An open aqueduct is situated approximately 50 m north of the Site in addition to a covered aqueduct situated approximately 80 m to the north. According to topographic information obtained from geoOttawa, the Site and surrounding area generally slope towards the Ottawa River and associated aqueducts to the north and northwest of the Site. According to ground surface elevations observed in borehole logs provided in the 2012 Intera Phase II ESA Report, ground surface at historic borehole 11-39, situated near the southeast corner of the Site is 62.81 meters above sea level (masl) while elevation at monitoring well 22-04, as observed in the 2022 Golder Phase II ESA Report is 60.47. In general, the Site slopes to the north and northwest toward the Ottawa River and aqueducts. Surface runoff is expected to follow the natural contours at the Site and flow towards the north; however, natural flow may be intercepted by engineered structures such as the LRT may deviate from natural flow patterns.

2.4.2 Geology

According to the *Ontario Geological Survey (2000) Quaternary geology, seamless coverage of the Province of Ontario; Ontario Geological Survey, Data Set 14---Revised*, the quaternary geology at the Site is made up of glacial till consisting of undifferentiated, predominantly sandy silt to silt matrix, commonly rich in clasts, often high in total matrix carbonate content. The Site Specific surficial geology has been well documented and was summarized within the 2012 Intera Supplemental Phase II ESA as consisting of five distinct lithologies. Cross sections of the geology encountered throughout the investigations area presented in Figures 4. The surficial layer throughout the majority of the study area (consisting of the south portion of LeBreton Flats) consisting of construction debris/fill overlying black sand fill. Underlying black sand fill was a third category of fill that was interpreted to consist of a mixture of imported fill and reworked native glacial till. This layer predominantly consisted of sand and gravel with some silt, clay and/or cobbles and boulders. A layer of organics was identified in the north portion of

LeBreton Flats south and was found to be between layers of fill. The thickness of the various layers of fill at the Site was reported as being between 1.5 and 4.4 m. Underlying fill glacial till, characterized as being dense to very dense, sand, silty sand, gravel and occasional cobbles, was observed. This layer was identified between 2.1 to 8.0 meters below ground surface (mbgs).

Underlying the glacial till and fill stratum is bedrock of the Verulam Formation. Limestone observed within this formation was characterized as being weathered near the surface, with weathering and fractures decreasing with increased depth. Bedrock was described as being grey to black with thin to medium bedding, and intermittent shale layers (2022 Golder Phase II ESA Report). Bedrock at the Site was encountered between 11.2 mbgs and 14.7 mbgs in the 2022 Golder Phase II ESA Report. The 2012 Intera Phase II ESA Report reported bedrock between 2.9 mbgs and 10.1 mbgs. Based on the cross section provided in this report bedrock at the Site, located on the east portion of the LeBreton Flats South, lies at approximately 56 masl to 58 masl. The bedrock contact at the east portion of the South LeBreton Flats is situated approximately 53 masl, with bedrock between the east and west situated as low as approximately 48 masl.

Using the historic borehole logs provided by the Client, Pinchin constructed a conceptual model of the Site and surrounding areas. Three transects of the model are present in Figure 4a, b and c.

2.4.3 Hydrogeology

Groundwater elevations at the Site were most recently evaluated using the monitoring wells installed during the 2022 Golder Phase II ESA. The results indicated that the groundwater depth ranged between 2.6 to 3.3 mbgs. The 2007, 2008, 2009 and 2012 Intera Groundwater Monitoring Reports indicated that ground water elevations generally ranged from 1.4 mbgs to 5.7 mbgs within the South LeBreton Flats. The groundwater elevations provided indicate a groundwater flow direction generally directed towards the northwest, towards the open aqueduct and the Ottawa River throughout each of the monitoring reports. The hydraulic gradient for the Site was calculated using the EPA On-Line Hydraulic Gradient Calculator. A gradient of 0.14 was calculated with a direction of 331°, approximately north-northwest.

Natural groundwater flow paths my be interrupted by the presence of underground structures and utilities. The 2016 Stantec Geotechnical Study indicated a utility corridor (municipal sewer) running approximately southwest to northeast through the Site, trending along former Wellington Street. Additionally, utilities appear to run north-south along Booth Street, west of the Site. These utilities may provide a preferential flow pathway, altering groundwater flow from the expected, natural pathways.

An analysis of hydraulic conductivity of the various lithologies within the South LeBreton flats was conducted and presented within the 2015 Golder Construction Considerations Report. This analysis indicated the hydraulic conductivity within the undifferentiated fill layers ranged from $1.0E^{-03}$ m/s to $3.5E^{-06}$

m/s. Hydraulic conductivity within the glacial till ranged from $1E^{-05}$ m/s to $1E^{-07}$ m/s and $1E^{-06}$ m/s to $1E^{-09}$ m/s within the bedrock (below significant weathering at the bedrock contact). The porosity of each formation was estimated. Considering the poorly sorted nature of the fill material porosity was estimated to be 20%. Similar to fill porosity in the glacial till was estimated to be 15%. Porosity within unfractured limestone was estimated at 15%. Using the hydraulic conductivity provided within the 2015 Golder Construction Considerations Report, the calculated gradient and estimated porosity the groundwater velocity was estimated to be $7E^{-04}$ m/s to $7E^{-06}$ m/s within the undifferentiated fill, $9.33E^{-06}$ m/s to $9.33E^{-08}$ m/s in glacial till and $9.33E^{-07}$ m/s to $9.33E^{-10}$ m/s in unfractured limestone.

Based on the information provided groundwater at the Site behaves as an unconfined aquifer. Groundwater flow is generally directed towards the north-northwest with groundwater velocity decreasing with depth as the strata transitions from fill to glacial till, to limestone.

2.5 Proposed Site Operations

The Site currently consists of a vacant lot that is to be re-developed as residential/commercial land use. Detailed drawings of the proposed development were not provided to Pinchin however, based on information obtained from the 2022 Golder Phase I ESA Report, development is proposed to consist of two towers, one 30 storey and one 35 storey, mixed-use residential/commercial buildings.

2.6 Proposed Water and Wastewater Supply Systems

Topic	Findings
Water Supply Source	According to the 2022 Golder Phase I ESA the Site is situated in an area that is serviced by municipal drinking water.
Water Use	Water would primarily be used for domestic-related activities.
Sanitary/Process Wastewater Receptor	Wastewater would be disposed of via the municipal wastewater systems.
Pits, Sumps or Lagoons	None reported.
Storm Water Flow and Receptor	Storm water conveyance would consist of overland flows via diffuse overland runoff, roadside ditching and natural percolation through the soil. Paved roads and access ways would likely rely on and off Site catch basins discharging into the municipal storm sewer.
Wells	Pinchin completed a search of the MECP Water Well Records database and did not identify the presence of wells on Site or within 250 m of the Site that supply water for human consumption or for agricultural purposes. The results of the search of the Water Well Information System (WWIS) database records indicated that all records in the area were listed as monitoring or observation wells.

3.0 ACTIVITIES ON ADJACENT PROPERTIES

The Site is located in an urban area that predominantly consists of residential and commercial land. A description of the adjacent properties is summarized in the following table, based on Pinchin's observations from the Site and publicly accessible locations:

	North	East	South	West
Operation or Activity	Pimisi Station and LRT Line followed by an uncovered aqueduct then a paved parking lot	Vacant land the Albert Street and Slater Street.	Albert Street followed by residential dwellings.	Booth Street followed by Pimisi Station and vacant land.
Direction with Respect to Inferred Groundwater Flow	Upgradient.	Transgradient.	Downgradient.	Transgradient.

4.0 LANDFILLS LOCATED WITHIN GUIDELINE D-4 ASSESSMENT AREA

According to the City of Ottawa Former Landfill Database, the subject Site property is within 500 m of the following two non-operating Waste Disposal Sites (WDS):

- WDS Activity ID 6124; and
- WDS Activity ID 6108 (Nepean Bay Landfill).

In addition, Pinchin contacted the City of Ottawa Environmental Remediation Unit (ERU) to inquire about any information regarding former WDSs in the vicinity of LeBreton Flats. The ERU confirmed the presence of the two WDSs and provided additional information.

The location of these WDS relative to the subject property are indicated on Figure 2.

4.1 Landfill Background and Site Boundary Information

Waste Disposal Site, Activity No. 6124 (WDS# 6124)

According to the City of Ottawa's Old Landfill Management Strategy a historic landfill, WDS #6124, is located northwest of the Site. This landfill is bounded to the south by the open aqueduct, the Ottawa River to the west, Booth Street to the east. The north boundary of the historic landfill is situated approximately 90 m south of the Ottawa River. Information provided by the ERU indicated that this landfill operated from approximately 1910 to 1920. The 2022 Golder Phase I ESA Report for the Site identified two former facilities within the footprint of the WDS 6124. The Sachs Brothers Junk Yard operated from 1912 to 1956 and was situated approximately 215 m west-northwest of the Site and M. Levinson Salvage Co. Limited situated approximately 130 m west of the Site operated as a wholesaler of waste materials from 1920 to 1922 and 1960. Based on the information provided Pinchin is unable to determine the approximate

footprint of the facility, or the classification and quantity of the waste accepted at this facility. The footprint of the WDS # 6124, as specified by the City of Ottawa Former Landfills database, is currently bisected by the Sir John A Macdonald Parkway with vacant land and covered aqueduct in the south portion, and green space and Vimy Place followed by the Canadian War Museum in the north.

Nepean Bay Landfill, Activity No. 6108 (Nepean Bay Landfill)

The Nemean Landfill, Activity No. 6108 is a non operating landfill located approximately 400 m west of the Site. According to the summary of information provided by the ERU the Nepean Bay Landfill is located within UTM NAD Zone 27 Easting 443540 Northing 5028720 with an approximately area of 7.5 ha. The former landfill is bounded by the Ottawa River to the North, the LeBreton Flats aqueducts to the east, the Trillium pathway to the west and an LRT line to the south. Currently the Sir John A. Macdonald Parkway transects the former landfill with the remainder occupied by vacant greenspace. According to the City of Ottawa Former Landfills database, this facility operated between March 1963 to February 1964 and accepted domestic and industrial solid waste. In addition, the database specified an approximate waste depth of 3 to 12 mbgs and indicated that substantial fill cover consisting of sand or clay fill ranging in thickness from 0.5 to several meters was applied in approximately 1980. The database reported that during Site operation, a temporary dam was constructed across the bay with wastes deposited behind the dam face. The 2015 Golder Construction Considerations Report included the eastern most portion of the Nepean Bay Landfill (Block F) as well as the adjacent areas to the south and southeast (Blocks E and G, respectively). This report indicated that fill was present to a depth of approximately 12 mbgs within the footprint of the former Nepean Bay Landfill.

4.2 Topographic, Geologic and Hydrogeological Setting Relative to Landfill

The following is a description of the Site relative to private WDS # 6124 and the Nepean Bay Landfill, located north and northwest of the Site, respectively.

Topic	Findings	
	WDS # 6124	**Nepean Bay Landfill**
Topography of Site and Surrounding Area	WDS #6124 is situated hydraulically downgradient of the Site. Topography at this location varies, with the south portion of the property sloping south toward the uncovered aqueduct. The remainder of the Site slopes north or west towards the Ottawa River.	The Nepean Bay Landfill is situated hydraulically crossgradient relative to the Site. The ground surface at Nepean Bay Landfill generally slopes north, toward the Ottawa River.
Subsurface Soils	The subsurface conditions at the Site consist of varying layers of fill	Surficial cover ranges from 0.5 m to several m followed by varying

Topic	Findings	
	WDS # 6124	Nepean Bay Landfill
	overlying native glacial till.	depths of waste deposits.
Fill Materials	Fill ranges from 2.1 mbgs to 5.2 mbgs based on borehole logs MW01-07 and MW06-06.	Fill depth, included waste, ranges from 4 mbgs to 12 mbgs.
Bedrock Type	Bedrock is located at approximately 77 mbgs, based on the Ontario MECP well records database. The type of bedrock was not specified in the records.	Bedrock is located at approximately 76 mbgs, based on the Ontario MECP well records database. The type of bedrock was not specified in the records.
Nearest Open Water Body	The property is bounded to the west by the Ottawa River and to the south by an uncovered aqueduct.	The Site is bounded to the north by the Ottawa River.
Inferred Groundwater Flow Direction	Based on the proximity to the Ottawa River groundwater at this location is expected to flow east toward the Ottawa River or south toward the aqueducts depending on the area of the property.	North and west toward the Ottawa River and the aqueduct inlet.

4.3 Landfill Site Impacts – WDS # 6124

4.3.1 Groundwater Contamination by Leachate

Very little information is available regarding the subsurface conditions at this former landfill. A portion of the former landfill known as the Preston Street Extension underwent a Phase II ESA as reported in the 2009 Intera Groundwater Monitoring Report. The Preston Street Extension occupies the southwest portion of the former landfill footprint. This report identified wide-spread, low-level impacts of metals, and PAHs as well as localized PHC impacts. In addition, PAH and metals impacts were observed within groundwater monitoring wells during a previous Phase II ESA. The spatial extent of the impacts were not reported. Two monitoring wells were sampled on this portion of the property. MW06-13 was sampled once in 2006 and identified groundwater impacts including chromium, cobalt, copper, iron, manganese, sodium, vanadium and zinc. MW03-518 was sampled in 2006, 2008 and 2009 and identified impacts of various metals including boron, chromium, cobalt, copper, and sodium as well as PAHS in 2006 and 2009.

WDS #6124 is situated approximately 40 m northwest of the Site. The calculated hydraulic gradient at the Site indicated local groundwater flow was directed approximately north-northwest toward the uncovered aqueduct and the Ottawa River and placing the WDS #6124 hydraulically downgradient relative to the

Site. The Groundwater elevations presented in the 2009 Intera Groundwater Monitoring report indicate groundwater flow along the Preston Extension situated approximately 280 m west of the Site, was directed approximately south toward the uncovered aqueduct in 2006. Based on water levels observed at monitoring wells south of the uncovered aqueduct, which indicated a groundwater flow direction approximately north, the uncovered aqueduct creates a boundary condition for the shallow groundwater flow system. Deeper, regional groundwater flow is expected to be controlled by the Ottawa River, and flow towards the north.

The results of the 2022 Golder Phase II ESA Report no exceedances of the Table 3 SCS observed in groundwater. This report indicated that impacts at the Site are limited to soil in the south portion of the Site and are most prominent within the surficial 1-2 mbgs, above the observed water table. Based on the results of the 2022 Golder Phase II ESA as well as the groundwater flow patterns observed at the Site and in the surrounding area it is Pinchin's opinion that this historic landfill is unlikely to result in subsurface impacts at the Site. The results of the 2022 Golder Phase II ESA infer the observed soil impacts at the Site to be the result of poor quality fill placed at the Site.

4.3.2 Surface Water Contamination by Leachate/Surface Water Run-off

The WDS # 6124 is bounded to the west by the Ottawa River and to the south by the uncovered aqueduct, which separates this property and the Site. Based on topographic data obtained from geoOttawa the central and south portions of the WDS #6124 slope south, toward the uncovered aqueduct the west portion slopes west towards the Ottawa River and the east portion flows east towards the uncovered aqueduct. Surface water is anticipated to following topography and flow towards the uncovered aqueduct and/or the Ottawa River.

Surface water sampling was documented within the 2007 Intera Phase III ESA. A total of 13 surface water samples were collected from 12 locations within the uncovered aqueduct. Each of the samples were analyzed for metals, PAHs and PHCs. The results were compared to the CCME Guideline for Protection of Freshwater Aquatic Life (APV) and MOE Potable Water Quality Objectives (PWQO). Aluminum was found to exceed both guidelines in all samples, including the background sample, one exceedance of copper was considered to be an anomaly. One surface water sample collected from within the uncovered aqueduct adjacent the southeast boundary of the WDS # 6124 exceeded the PWQO for several PAHs. A follow up sample was collected from this location within which no PAHs were detected. The 2007 Intera Phase III ESA concluded that the surface water quality within the aqueduct was not impacted by PAHs and metals.

Based on the surface water flow direction, approximately southwest to northeast, and topography at the Site and the WDS #6124 (i.e. the Site and immediate surroundings slope towards the north while the WDS #6124 slope toward the south) it is Pinchin's opinion that the WDS #6124 is unlikely to results in surface water impacts at the Site.

4.3.3 Landfill Generated Gases

Based on a review of the available historic information regarding the landfill, the former waste disposal operations ceased in 1920. As the former landfill has now been closed for greater than 100 years, there does not appear to be any concerns arising as a result of the landfill generated gases, especially given the distance between the historic waste deposits and the subject Site.

4.3.4 Ground Settlement

Based on the location of the Site in relation to WDS #6124, ground settlement is not a concern.

4.3.5 Visual Impacts

The northern portion of the Site has been redeveloped to be of institutional land use. According to the 2022 Golder Phase I ESA Report this property has been redeveloped several times since landfill operations ceased in 1920. As a result, it is Pinchin's opinion that former landfilling activities at this property have not resulted in visual impacts with respect to the Site.

4.3.6 Soil Contamination and Hazardous Waste

Soil impacts of metals, PHCs and PAHs at this property as well as the Site have been well documented within previous environmental reports. These impacts have been concluded to be the result of poor quality fill used in the LeBreton Flats area. WDS #6124 has been redeveloped with an institutional building and landscaping on the north portion while the south portion appears to consist of a paved parking lot. Based on this information it is Pinchin's opinion that soil contamination at WDS #6124 is unlikely to result in adverse effects at the Site; however, existing soil impacts are present at the Site. As per the recommendations within the 2022 Golder Phase II ESA Report, soil impacts at the Site would require remediation of risk assessment as part of the redevelopment.

4.3.7 Dust, Odour, Noise, Vermin or Vector Impacts

As WDS #6124 is closed and has not received or deposited waste since 1920, there is no risk to the proposed development related to dust, odour, noise, vermin or vectors originating at this WDS. In addition, the risk of fire at the subject Site associated with the former WDS does not exist.

4.4 Landfill Site Impacts – Nepean Bay Landfill

4.4.1 Groundwater Contamination by Leachate

Groundwater sampling data at the Nepean Bay Landfill is limited; however, it is expected that landfilling activities at this landfill likely would have resulted in the development of a leachate plume. Based on the geology observed within boreholes advanced in the LeBreton Flats area and presented in cross section A-A' and C-C' a pathway for groundwater migration from the Nepean Bay Landfill to the Site is not present. Groundwater flow at the Site, as indicated by the calculated hydraulic gradient is towards the north-northwest while groundwater elevations collected on August 2007 and presented in the 2007 Intera Phase III ESA Report indicated a groundwater flow direction from north to northeast towards the Ottawa River and aqueducts. Based on these groundwater elevations and topography groundwater originating at the Nepean Bay Landfill likely discharged into the Ottawa River and aqueducts north of the Site. Based on surface water sampling conducted in 2007 and discussed in Section 4.4.2, as well as the groundwater sampling results at the Site, presented in the 2022 Golder Phase II ESA Report, the Nepean Bay landfill has not resulted in significant groundwater impacts to the groundwater at the Site.

4.4.2 Surface Water Contamination by Leachate/Surface Water Run-off

The Ottawa River is located immediately north of the former landfill site. Surface water drainage is anticipated to flow overland across the Nepean Bay Landfill from the south to the north and east. As per the database supplied by the ERU landfill cover consisting of clay and/or sand was applied in the 1980s. Surface water sampling data collected in 2007 and discussed in section 4.4.2 indicates that the former landfill did not have significant impacts to surface water in the vicinity of the Site at the time of sampling. As such, based on the inferred flow direction and the location of the former WDS #4111 with respect to the subject property, it is Pinchin's opinion that any leachate impacts to surface water are unlikely to impact the Site under review.

4.4.3 Landfill Generated Gases

The most recent reported monitoring in 2013, presented in the 2015 Golder Construction Considerations Report, reported a maximum methane concentration of 30% within the former landfill footprint and no detectable methane at Block E south of the former landfill and situated approximately 350 m southwest of the Site. According to the information provide by the ERU measured methane levels reportedly vary from 0 % to 88.7% across the footprint of the former landfill. While methane concentrations above the lower explosive limit (5%) present a concern locally, considering the separation distance between the Site and Nepean Bay Landfill, it is Pinchin's opinion that the generation of methane at this former landfill does not present a hazard at the Site.

4.4.4 Ground Settlement

Based on the location of the Site in relation to the Nepean Bay Landfill, ground settlement is not a concern.

4.4.5 Visual Impacts

As a result of the WDS being closed for over 55 years, natural vegetation and trees have created a natural buffer between the former WDS site and off-Site properties. In addition, majority of the former landfill is currently occupied by greenspace in addition to the Sir John A. Macdonald Parkway. Considering the redevelopment at the Site this former landfill does not contribute to adverse visual impacts at the Site.

4.4.6 Soil Contamination and Hazardous Waste

The City of Ottawa Former Landfills database indicated that impacts of metals (barium, beryllium, cadmium, copper, lead, nickel, molybdenum, and zinc were observed in soil local to the facility with impacts of PAHs in soil and groundwater. The 2015 Construction Considerations report indicated impacts of metals, PAHs and PHCs were present and ranged in depth from 2 mbgs to 7 mbgs. The source of these impacts were unable to be confirmed and are assumed to be a result of a combination of poor quality fill imported to the Site as well as former landfilling activities.

While similar soil impacts have been identified at the Site these impacts have been attributed to poor quality fill and are not the result of landfilling activities at the Nepean Bay Landfill. Additionally, the Nepean Bay Landfill has been redeveloped with landscaping and the Sir John A. Macdonald Parkway with little to no bare soil present, significantly reducing the probability of wind blown particulate to be deposited at the Site. Based on these considerations it is Pinchin's opinion the contaminated soil at the former landfill is unlikely to result in adverse effects at the Site; however, existing soil impacts are present at the Site. As per the recommendations within the 2022 Golder Phase II ESA Report, soil impacts at the Site would require remediation of risk assessment as part of the redevelopment.

4.4.7 Dust, Odour, Noise, Vermin or Vector Impacts

As the Nepean Bay Landfill last operated in 1964 and has since been redeveloped with greenspace and the Sir John A McDonald parkway, there is no risk to the proposed development related to dust, odour, noise, vermin or vectors originating at this WDS. In addition, an increased risk of fire as a result of the former WDS at the subject Site is not present.

5.0 REGULATORY INFORMATION AND CORRESPONDENCE

A Freedom of Information request was submitted to both the City of Ottawa and the MECP for information on file with respect to historic landfills in the vicinity of the Site. At the time of writing this report, no response had been received from the MECP. When a formal response is received, it will be reviewed by Pinchin. If there is any information that represents a potential issue of environmental concern, a copy of the response will be forwarded to the Client under separate cover. Our conclusions and recommendations may be amended based on this information. A copy of Pinchin's request submitted to the MECP is provided in Appendix II of this report.

Email correspondence with the County, the Town and the MECP are provided in Appendix III.

6.0 OVERVIEW

The following chart provides an overview of whether or not the Site located within the Guideline D-4 Assessment area will be impacted by the either of the landfills.

Impact of Landfill Operation On-Site	Private WDS 4113		Private WDS 4111	
	Yes	No	Yes	No
Groundwater Contamination by Leachate Generation		X		X
Landfill Generated Gases		X		X
Litter- As a result of natural sources such as wind or animals		X		X
Odours- As a result of downgradient wind effects		X		X
Surface Water Contamination by Leachate Generation/Surface Water Runoff		X		X
Contaminant Discharge from vehicular traffic		X		X
Dust Pollution		X		X
Noise Pollution		X		X
Visual Impacts		X		X
Soil Contamination and Hazardous Waste		X		X
Vermin or Vector Impacts		X		X
Impacts as a result of a fire		X		X

7.0 FINDINGS AND RECOMMENDATIONS

Based on the results of the Landfill Impact Assessment completed by Pinchin, no potential contaminant pathway or nuisance source was identified that is likely to result in potential subsurface impacts at the Site, as a result of the presence of the former private waste disposal facilities #6124 and the Nepean Bay Landfill. As such, no additional subsurface investigation work, remedial or mitigative measures are recommended at this time in relation to redevelopment of the Site and the waste disposal sites; however, existing soil impacts are present at the Site. As per the recommendations within the 2022 Golder Phase II ESA Report, soil impacts at the Site would require remediation or a risk assessment as part of the redevelopment.

8.0 TERMS AND LIMITATIONS

This Landfill Impact Assessment was performed, in order to identify potential issues of environmental concern associated with the property located at 665 Albert Street West, in Ottawa, Ontario. This Landfill Impact Assessment was performed in general compliance with currently acceptable practices for environmental site investigations, and specific Client requests, as applicable to this Site.

This report was prepared for the exclusive use of Dream Impact Master LP (Client), subject to the terms, conditions and limitations contained within master services agreement in place with the Client. Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, is the sole responsibility of such third parties. Pinchin accepts no responsibility for damages suffered by any third party as a result of decisions made or actions conducted.

If additional parties require reliance on this report, written authorization from Pinchin will be required. Such reliance will only be provided by Pinchin following written authorization from Client. Pinchin disclaims responsibility of consequential financial effects on transactions or property values, or requirements for follow-up actions and costs. No other warranties are implied or expressed. Furthermore, this report should not be construed as legal advice. Pinchin will not provide results or information to any party unless disclosure by Pinchin is required by law.

The information provided in this report is based upon analysis of available documents, records and drawings, and personal interviews. In evaluating the Site, Pinchin has relied in good faith on information provided by other individuals noted in this report. Pinchin has assumed that the information provided is factual and accurate. In addition, the findings in this report are based, to a large degree, upon information provided by the current owner/occupant. Pinchin accepts no responsibility for any deficiency, misstatement or inaccuracy contained in this report as a result of omissions, misinterpretations or fraudulent acts of persons interviewed or contacted, or contained in reports that were reviewed.

Pinchin makes no other representations whatsoever, including those concerning the legal significance of its findings, or as to other legal matters touched on in this report, including, but not limited to, ownership of any property, or the application of any law to the facts set forth herein. With respect to regulatory compliance issues, regulatory statutes are subject to interpretation and these interpretations may change over time.

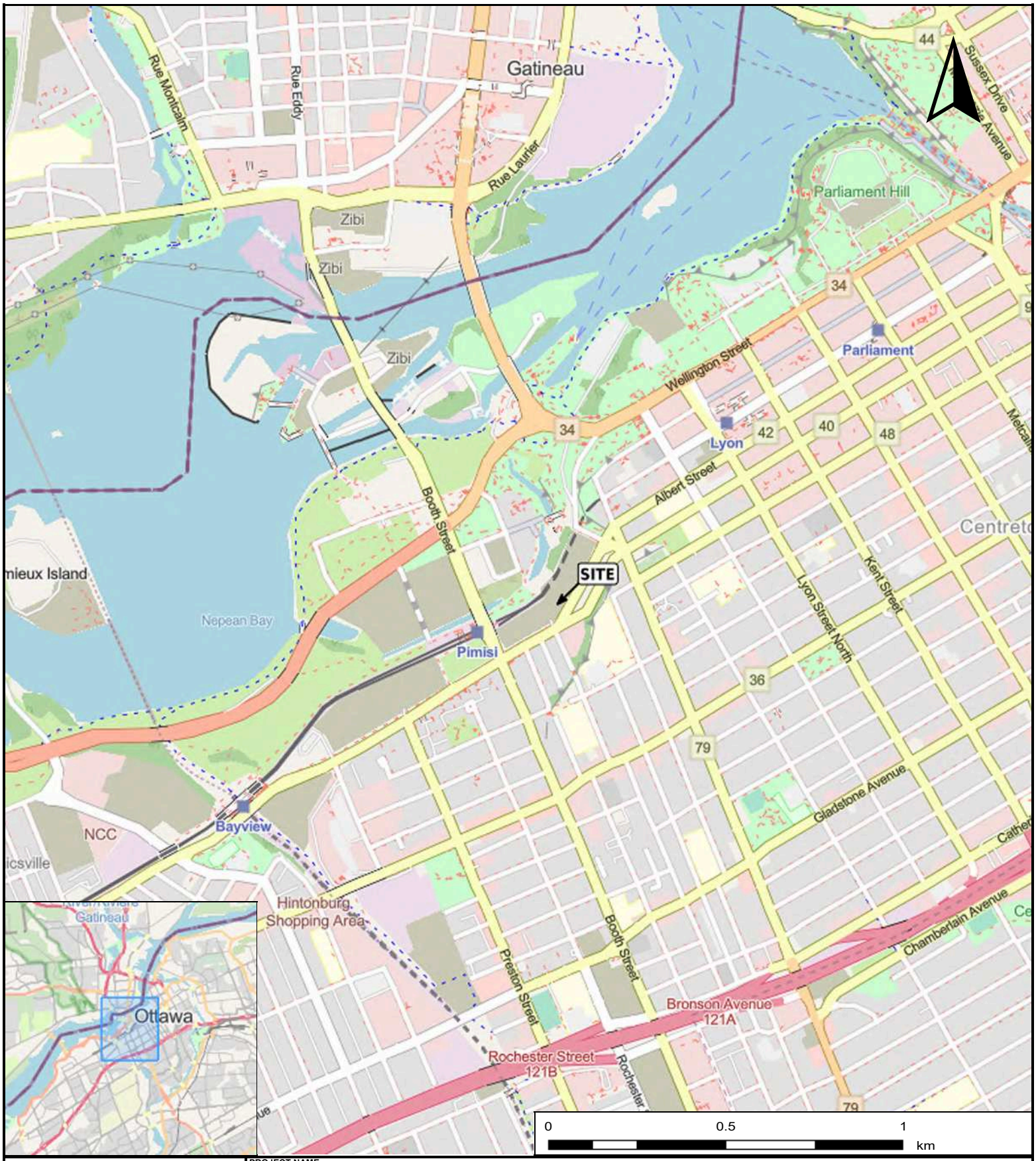
9.0 REFERENCES

The following documents, persons or organizations provided information used in this report:

1. "*Budget Cost Estimate for Remediation of South LeBreton*" prepared by Intera for the NCC, dated October 1, 2007.
2. City of Ottawa, Environmental Remediation Unit.
3. City of Ottawa – Former Landfills Database (https://open.ottawa.ca/datasets/8a6f5f176b484f2e83142e0008904e82/explore?location=45.241121%2C-75.752150%2C1.38). Accessed online on April 18, 2022.
4. Draft Phase Two Environmental Site Assessment, 665 Albert Street, LeBreton Flats, Ottawa, Ontario" prepared by Golder for the Client and dated March 14 2022.
5. "Fall 2007 Groundwater Monitoring, South LeBreton, Ottawa Ontario" prepared by Intera for the NCC, dated March 4, 2008.
6. geoOttawa (https://maps.ottawa.ca/geoottawa/). Accessed online on April 18, 2022.
7. "Geotechnical Desk-Top Study – NCC Property at 584 Wellington St. Potential Future Location of City of Ottawa Central Library, Ottawa, Ontario" prepared by Stantec for the City of Ottawa and dated April 5, 2016.
8. "Geotechnical and Hydrogeologic Investigation Combined Sewage Storage Tunnel East-West Tunnel, Western Terminus Ottawa, Ontario" prepared by Golder for the City of Ottawa, dated May 2013.
9. Google Earth™.
10. "LeBreton Flats: Library Parcel" provided by the NCC and dated Mary 27, 2021.
11. Ministry of the Environment, 1994 – "Guideline D-4 – Land Use On or Near Landfills and Dumps".
12. Ministry of the Environment, Conservation and Parks, January 24, 2020 – "Map: Well Records".
13. Ministry of the Environment, 1991 – "*Waste Disposal Site Inventory*".

14. "Old Landfill Management Strategy, Phase I – Identification of Sites, City of Ottawa Ontario" prepared by Golder Associates for the City of Ottawa and dated October 2003.
15. "OLRT Temporary Lease Property Report Card" prepared for the City of Ottawa and dated April 15, 2015;
16. "OLRT Temporary Lease Property Report Card" prepared for the City of Ottawa and dated June 9, 2015.
17. "Phase One Environmental Site Assessment, 665 Albert Street, LeBreton Flats, Ottawa, Ontario" prepared by Golder for the Client and dated March 2022.
18. "Phase III Environmental Site Assessment, Risk Assessment, and Risk Management Strategy, South LeBreton, Ottawa, Ontario" prepared by Intera Engineering Ltd. (Intera) for the Nation Capital Commission (NCC), dated January 18, 2007.
19. "Remedial Options Review and Class D Remediation Cost Estimates, South LeBreton Flats, Blocks B1, B2, C1, C2, E1, E2, E3, G, H1 and H2, Ottawa, Ontario (Revised Draft #2)" prepared by Golder Associates (Golder) for NCC, dated April 5, 2012.
20. "*Spring* 2007 Groundwater Monitoring, South LeBreton, Ottawa Ontario" prepared by Intera for the NCC, dated June 13, 2007.
21. "Summary of Subsurface Conditions & Construction Considerations South LeBreton Flats, Block B, C, D, E, F, G, and H, Ottawa, Ontario" prepared by Golder for the NCC and dated November 2015.
22. "Supplemental Phase II Environmental Site Assessment, South LeBreton Flats Blocks B1, B2, C1, C2, E1, E2, E3, G, H1 and H2 Ottawa Ontario" prepared by Intera for the NCC and dated February 2012.
23. "2008 Groundwater Monitoring, South LeBreton and Preston Extension, Ottawa Ontario" prepared by Intera for the NCC, dated January 20, 2009.
24. "2012 Groundwater Monitoring, South LeBreton Blocks B1, B2, C1, C2, E1, E2, E3, G, H1, and H2, Ottawa Ontario" prepared by Intera Engineering Ltd. for the NCC, dated May 2012.

APPENDIX I
Figures



PINCHIN

PROJECT NAME	D-4 LANDFILL IMPACT ASSESSMENT				
CLIENT NAME	DREAM IMPACT MASTER LP.				
PROJECT LOCATION	665 ALBERT STREET, OTTAWA, ONTARIO				
FIGURE NAME	KEY MAP				FIGURE NUMBER 1
PROJECT NUMBER 308931	SCALE 1:20000	DRAWN BY DM	REVIEWED BY EW	DATE APRIL 2022	

LEGEND

- NEPEAN WDS
- WDS 6124
- AQUEDUCT
- APPROXIMATE SITE BOUNDARY

LEGEND IS COLOUR DEPENDENT. NON-COLOUR COPIES MAY ALTER INTERPRETATION.

PINCHIN

PROJECT NAME:
LANDFILL IMPACT ASSESSMENT

CLIENT NAME:
DREAM IMPACT MASTER LP.

PROJECT LOCATION:
665 ALBERT STREET, OTTAWA, ONTARIO

FIGURE NAME:
SITE PLAN

PROJECT NUMBER:	SCALE:
308931	AS SHOWN
DRAWN BY:	REVIEWED BY:
DM	EW
DATE:	FIGURE NUMBER:
APRIL 2022	2

LEGEND

- NEPEAN WDS
- WDS 6124
- AQUEDUCT
- APPROXIMATE SITE BOUNDARY
- CROSS SECTION A-A'
- CROSS SECTION B-B'
- CROSS SECTION C-C'

0 80 160 Meters

LEGEND IS COLOUR DEPENDENT. NON-COLOUR COPIES MAY ALTER INTERPRETATION.

PINCHIN

PROJECT NAME:
LANDFILL IMPACT ASSESSMENT

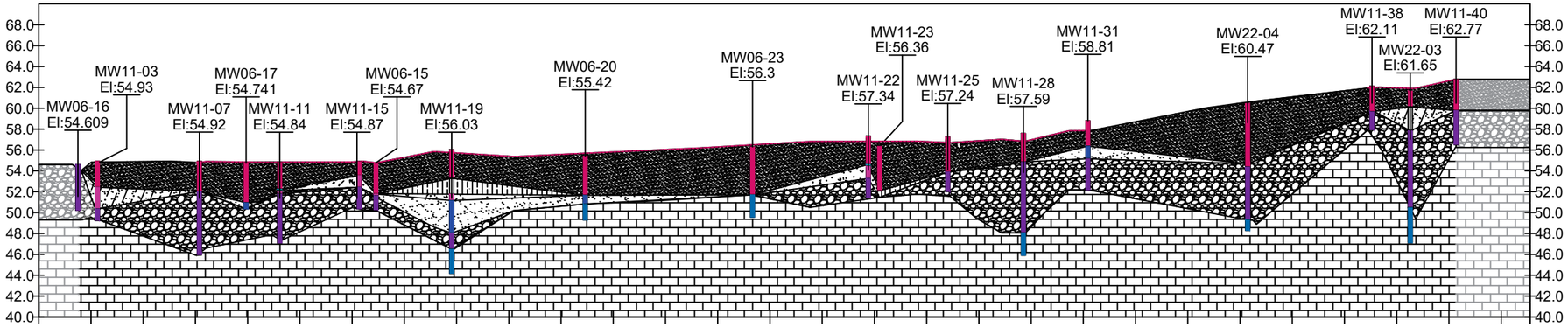
CLIENT NAME:
DREAM IMPACT MASTER LP.

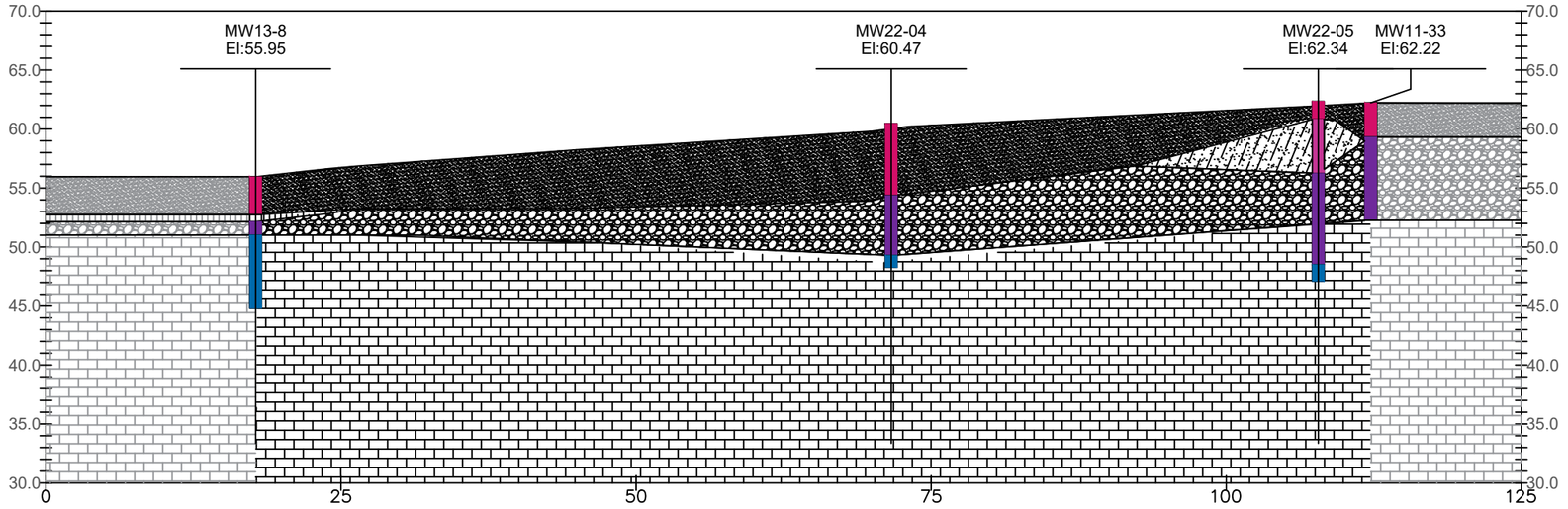
PROJECT LOCATION:
665 ALBERT STREET, OTTAWA, ONTARIO

FIGURE NAME:
CROSS SECTION SITE PLAN

PROJECT NUMBER:	SCALE:
308931	AS SHOWN
DRAWN BY:	REVIEWED BY:
DM	EW
DATE:	FIGURE NUMBER:
APRIL 2022	3

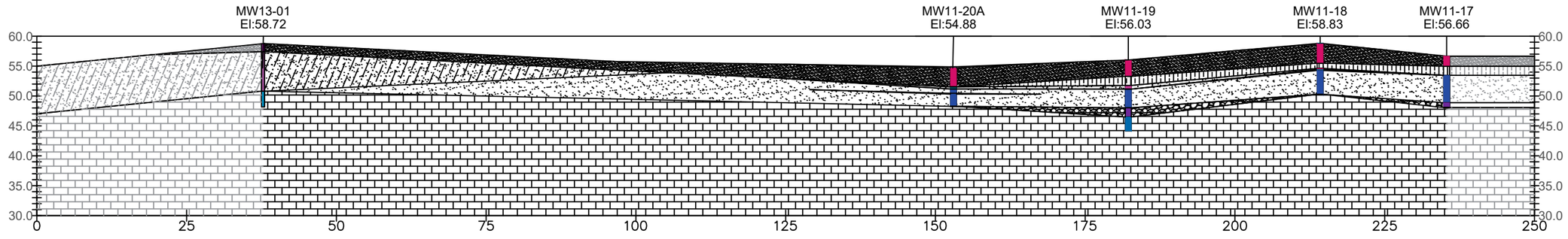
CROSS SECTION A-A'





CROSS SECTION B-B'

CROSS SECTION C-C'



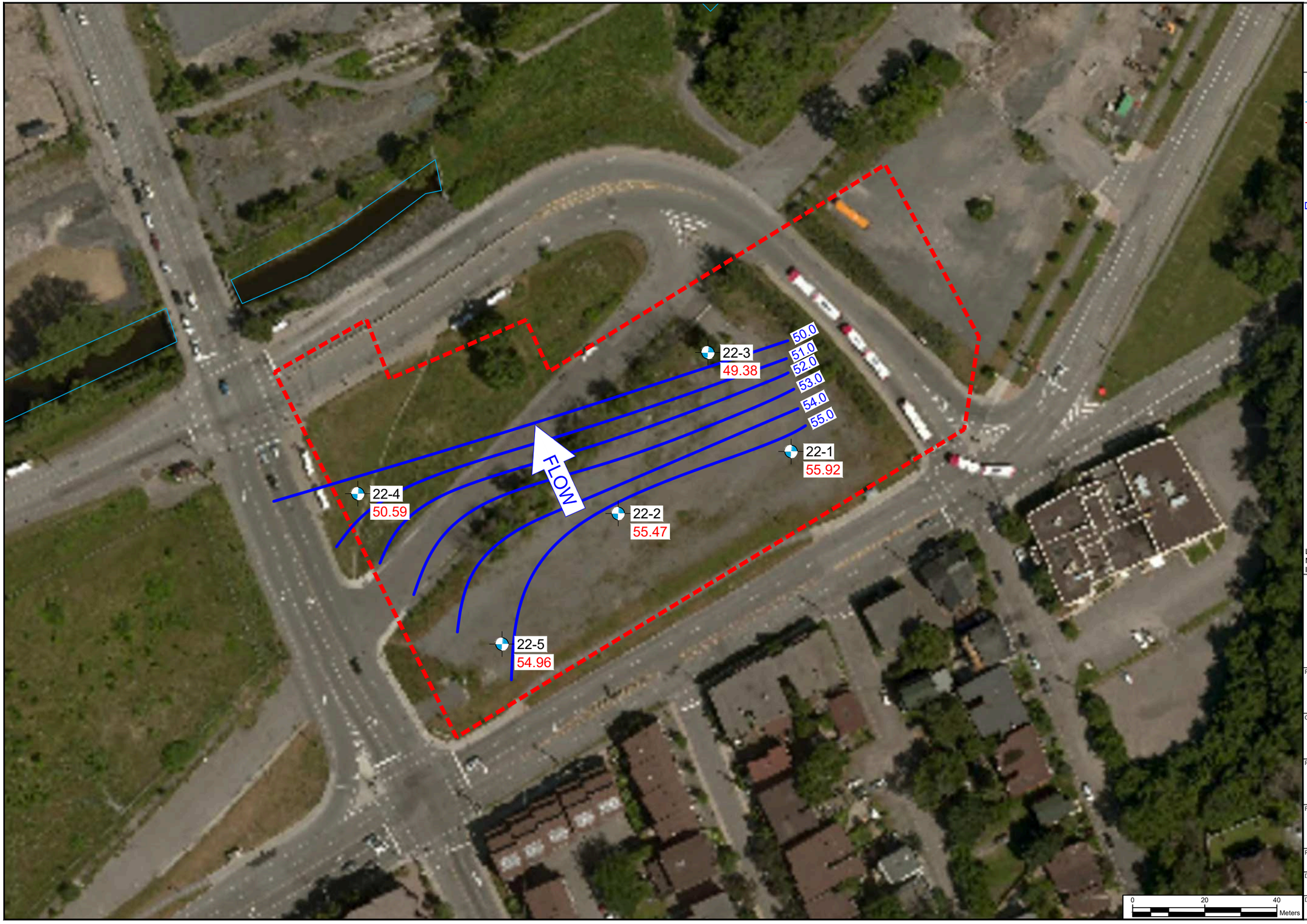
LEGEND

- CLAY
- FILL
- GLACIAL TILL
- LIMESTONE
- ORGANICS/PEAT
- SAND
- SILT
- INFERRED
- BOREHOLE

LEGEND IS COLOUR DEPENDENT. NON-COLOUR COPIES MAY ALTER INTERPRETATION.

PINCHIN

PROJECT NAME:	LANDFILL IMPACT ASSESSMENT
CLIENT NAME:	DREAM IMPACT MASTER LP.
PROJECT LOCATION:	665 ALBERT STREET, OTTAWA, ONTARIO
FIGURE NAME:	CROSS SECTIONS
PROJECT NUMBER: 308931	SCALE: AS SHOWN
DRAWN BY: DM	REVIEWED BY: EW
DATE: APRIL 2022	FIGURE NUMBER: 4



LEGEND

- AQUEDUCT
- APPROXIMATE SITE BOUNDARY
- 100.0 BOREHOLE ELEVATION (masl.)
- 100.0 GROUNDWATER CONTOUR ELEVATION (masl.)
- GROUNDWATER CONTOUR LINES
- FLOW GROUNDWATER FLOW DIRECTION
- MONITORING WELL

LEGEND IS COLOUR DEPENDENT. NON-COLOUR COPIES MAY ALTER INTERPRETATION.

PINCHIN

PROJECT NAME:
LANDFILL IMPACT ASSESSMENT

CLIENT NAME:
DREAM IMPACT MASTER LP.

PROJECT LOCATION:
665 ALBERT STREET, OTTAWA, ONTARIO

FIGURE NAME:
INFERRED GROUNDWATER CONTOUR PLAN

PROJECT NUMBER:	SCALE:
308931	AS SHOWN
DRAWN BY:	REVIEWED BY:
DM	EW
DATE:	FIGURE NUMBER:
APRIL 2022	5

APPENDIX II
Borehole Logs

PROJECT: 22511882

RECORD OF BOREHOLE: 22-01

SHEET 1 OF 3

LOCATION: N 5030733.9 ;E 366525.1

BORING DATE: February 14-15, 2022

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.30m	HEADSPACE COMBUSTIBLE VAPOUR CONCENTRATIONS [PPM] ⊕ (ND = Not Detected; 100 200 300 400) / HEADSPACE ORGANIC VAPOUR CONCENTRATIONS [PPM] □ (ND = Not Detected; 100 200 300 400)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp — W — Wl; 20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		62.92						
0	Power Auger 200 mm Diam. (Hollow Stem)	FILL - SILTY SAND, trace gravel; brown; compact		0.00	1	AS	-	ND		
1					2	SS	20			
2					3	SS	33	ND		
					4	SS	58	ND		
3				59.87						
		SILTY SAND, fine, trace gravel; brown; very dense		3.05	5	SS	43			Bentonite Seal
4					6	SS	72			
					7	SS	50/ 0.10			
5				57.59						
		SILTY SAND, fine, trace clay and gravel; grey (GLACIAL TILL); very dense		5.33	8	SS	50/ 0.13			
6					9	SS	77/ 0.15			
					10	SS	50/ 0.05			
7										Silica Sand
					11	SS	64/ 0.15			
8					12	SS	66/ 0.13			Screen
9					13	SS	50/ 0.05			
10					14	SS				
		CONTINUED NEXT PAGE								

DEPTH SCALE
1 : 50

WSP GOLDER

LOGGED: ALB
CHECKED:

MIS-BHS 001 22511882.GPJ GAL-MIS.GDT 3/8/22 ZS

PROJECT: 22511882

RECORD OF BOREHOLE: 22-01

SHEET 2 OF 3

LOCATION: N 5030733.9 ;E 366525.1

BORING DATE: February 14-15, 2022

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.30m	HEADSPACE COMBUSTIBLE VAPOUR CONCENTRATIONS [PPM] ⊕ (ND = Not Detected) 100 200 300 400 / HEADSPACE ORGANIC VAPOUR CONCENTRATIONS [PPM] □ (ND = Not Detected) 100 200 300 400	HYDRAULIC CONDUCTIVITY, k, cm/s 10^{-6} 10^{-5} 10^{-4} 10^{-3} / WATER CONTENT PERCENT Wp — W — Wl 20 40 60 80	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		--- CONTINUED FROM PREVIOUS PAGE ---								
10	Power Auger 200 mm Diam. (Hollow Stem)	SILTY SAND, fine, trace clay and gravel; grey (GLACIAL TILL); very dense			14	SS	50/ 0.08			Screen
11					15	SS	50/ 0.10			
					16	SS	50/ 0.10			
12					17	SS	50/ 0.13			
13					18	SS	50/ 0.08			
					19	SS	50/ 0.05			
14				48.21 / 14.71						
		Borehole continued on RECORD OF DRILLHOLE 22-01								
15										
16										
17										
18										
19										
20										

DEPTH SCALE
1 : 50

WSP GOLDER

LOGGED: ALB
CHECKED:

PROJECT: 22511882

RECORD OF DRILLHOLE: 22-01

SHEET 3 OF 3

LOCATION: N 5030733.9 ;E 366525.1

DRILLING DATE: February 14-15, 2022

DATUM: Geodetic

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 55

DRILLING CONTRACTOR: Downing Drilling

JN - Joint; FLT - Fault; SHR- Shear; VN - Vein; CJ - Conjugate
BD- Bedding; FO- Foliation; CO- Contact; OR- Orthogonal; CL - Cleavage
PL - Planar; CU- Curved; UN- Undulating; ST - Stepped; IR - Irregular
PO- Polished; K - Slickensided; SM- Smooth; Ro - Rough; MB- Mechanical Break
BR - Broken Rock
NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	RUN No.	COLOUR % RETURN / FLUSH	RECOVERY: TOTAL CORE %	RECOVERY: SOLID CORE %	R.Q.D. %	FRACT. INDEX PER 0.25 m	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	Jcon	Jr	Ja	HYDRAULIC CONDUCTIVITY K, cm/sec	Diametral Point Load Index (MPa)	RMC -Q' AVG.
		BEDROCK SURFACE		48.21														
15	Rotary Drill / NQ Core	Weathered, thin to medium bedded, grey black LIMESTONE and SHALE		14.71	1													
16				46.46														
		End of Drillhole		16.46														
		Note(s):																
17		1. Water level in screen measured at a depth of 7.78 m (Elev. 55.14 m) on February 25, 2022																
18																		
19																		
20																		
21																		
22																		
23																		
24																		

DEPTH SCALE
1 : 50

WSP GOLDER

LOGGED: ALB
CHECKED:

PROJECT: 22511882

RECORD OF BOREHOLE: 22-02

SHEET 1 OF 3

LOCATION: N 5030713.1 ;E 366476.0

BORING DATE: February 16, 2022

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.30m	HEADSPACE COMBUSTIBLE VAPOUR CONCENTRATIONS [PPM] ⊕ (ND = Not Detected; 100 200 300 400) / HEADSPACE ORGANIC VAPOUR CONCENTRATIONS [PPM] □ (ND = Not Detected; 100 200 300 400)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp W Wl; 20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0		GROUND SURFACE		62.47						
0	Power Auger 200 mm Diam. (Hollow Stem)	FILL - SILTY SAND, trace gravel; brown		0.00	1	AS	-	ND		
1					2	SS	28			
2					3	SS	16			
				60.18						
		SILTY SAND, fine, trace gravel, with cobbles and boulders; and boulders; brown		2.29	4	SS	20	ND		
3					5	SS	50/ 0.15			Bentonite Seal
4					6	SS	50/ 0.05			
				57.90						
		SILTY SAND, trace gravel; grey (GLACIAL TILL)		4.57	7	SS	50/ 0.08			
5					8	SS	50/ 0.13			
6					9	SS	50/ 0.10			
7		- Auger Refusal on boulder at 7.44 m depth			10	SS	50/ 0.13			Silica Sand
8										
9					11	SS	50/ 0.10			Screen
10		CONTINUED NEXT PAGE								

DEPTH SCALE
1 : 50

WSP GOLDER

LOGGED: ALB
CHECKED:

PROJECT: 22511882

RECORD OF BOREHOLE: 22-02

SHEET 2 OF 3

LOCATION: N 5030713.1 ;E 366476.0

BORING DATE: February 16, 2022

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.30m	HEADSPACE COMBUSTIBLE VAPOUR CONCENTRATIONS [PPM] ⊕ *ND = Not Detected* 100 200 300 400 / HEADSPACE ORGANIC VAPOUR CONCENTRATIONS [PPM] □ *ND = Not Detected* 100 200 300 400	HYDRAULIC CONDUCTIVITY, k, cm/s 10^{-6} 10^{-5} 10^{-4} 10^{-3} / WATER CONTENT PERCENT Wp W Wl 20 40 60 80	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		--- CONTINUED FROM PREVIOUS PAGE ---								
10	Power Auger 200 mm Diam. (Hollow Stem)	SILTY SAND, trace gravel; grey (GLACIAL TILL)								Screen
11					12	SS	50/ 0.03			
12										
13					13	SS	50/ 0.03			
14				48.27						
		Borehole continued on RECORD OF DRILLHOLE 22-02		14.2						
15										
16										
17										
18										
19										
20										

DEPTH SCALE
1 : 50

WSP GOLDER

LOGGED: ALB
CHECKED:

PROJECT: 22511882

RECORD OF DRILLHOLE: 22-02

SHEET 3 OF 3

LOCATION: N 5030713.1 ;E 366476.0

DRILLING DATE: February 16, 2022

DATUM: Geodetic

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 55

DRILLING CONTRACTOR: Downing Drilling

JN - Joint; FLT - Fault; SHR- Shear; VN - Vein; CJ - Conjugate
BD - Bedding; FO- Foliation; CO- Contact; OR- Orthogonal; CL - Cleavage
PL - Planar; CU- Curved; UN- Undulating; ST - Stepped; IR - Irregular
PO- Polished; K - Slickensided; SM- Smooth; Ro - Rough; MB- Mechanical Break
BR - Broken Rock
NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. DEPTH (m)	RUN No.	COLOUR % RETURN / FLUSH	RECOVERY TOTAL CORE %	RECOVERY SOLID CORE %	R.Q.D. %	FRACT. INDEX PER 0.25 m	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	Jcon	Jr	Ja	HYDRAULIC CONDUCTIVITY K, cm/sec	Diametral Point Load Index (MPa)	RMC -Q' AVG.
		BEDROCK SURFACE		48.27														
15	Rotary Drill / NQ Core	Grey, thin to medium bedded LIMESTONE and SHALE		14.20	1		80 60 40 20	80 60 40 20	80 60 40 20	5 10 15 20	0 30 60 90					10^{-6} 10^{-5} 10^{-4} 10^{-3}	2 4 6	
				46.62														
16		End of Drillhole		15.85														
		Note(s):																
		1. Water level in screen measured at a depth of 7.88 m (Elev. 54.59 m) on February 25, 2022																
17																		
18																		
19																		
20																		
21																		
22																		
23																		
24																		

DEPTH SCALE
1 : 50

WSP GOLDER

LOGGED: ALB
CHECKED:

PROJECT: 22511882

RECORD OF BOREHOLE: 22-03

SHEET 1 OF 3

LOCATION: N 5030756.8 ;E 366500.4

BORING DATE: February 22, 2022

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.30m	HEADSPACE COMBUSTIBLE VAPOUR CONCENTRATIONS [PPM] ⊕ (ND = Not Detected; 100 200 300 400) / HEADSPACE ORGANIC VAPOUR CONCENTRATIONS [PPM] □ (ND = Not Detected; 100 200 300 400)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl; 20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0		GROUND SURFACE		61.65						
0	Power Auger 200 mm Diam. (Hollow Stem)	FILL - SILTY SAND, trace gravel and brick; brown		0.00	1	AS	-	ND		
1					2	SS	8			
				60.13						
		SILTY SAND, fine, trace gravel; brown		1.52	3	SS	11	ND		
2					4	SS	43	ND		
3					5	SS	58			
				57.84						
		SILTY SAND, trace gravel; grey (GLACIAL TILL)		3.81	6	SS	50/ 0.10	ND		
4					7	SS	50/ 0.10			
5					8	SS	50/ 0.08			Bentonite Seal
6					9	SS	50/ 0.08			
7										
8					10	SS	50/ 0.05			
9					11	SS	50/ 0.08	ND		
10		*CONTINUED NEXT PAGE*								

DEPTH SCALE
1 : 50

WSP GOLDER

LOGGED: ALB
CHECKED:

PROJECT: 22511882

RECORD OF BOREHOLE: 22-03

SHEET 2 OF 3

LOCATION: N 5030756.8 ;E 366500.4

BORING DATE: February 22, 2022

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.30m	HEADSPACE COMBUSTIBLE VAPOUR CONCENTRATIONS [PPM] ⊕ *ND = Not Detected* 100 200 300 400 / HEADSPACE ORGANIC VAPOUR CONCENTRATIONS [PPM] □ *ND = Not Detected* 100 200 300 400	HYDRAULIC CONDUCTIVITY, k, cm/s 10^{-6} 10^{-5} 10^{-4} 10^{-3} / WATER CONTENT PERCENT Wp W Wl 20 40 60 80	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		--- CONTINUED FROM PREVIOUS PAGE ---								
10	Power Auger 200 mm Diam. (Hollow Stem)	SILTY SAND, trace gravel; grey (GLACIAL TILL)								Bentonite Seal
					12	SS	61/ 0.15			
11				50.48						
		Borehole continued on RECORD OF DRILLHOLE 22-03		11.17						
12										
13										
14										
15										
16										
17										
18										
19										
20										

DEPTH SCALE
1 : 50

WSP GOLDER

LOGGED: ALB
CHECKED:

MIS-BHS 001 22511882.GPJ GAL-MIS.GDT 3/8/22 ZS

PROJECT: 22511882

RECORD OF DRILLHOLE: 22-03

SHEET 3 OF 3

LOCATION: N 5030756.8 ;E 366500.4

DRILLING DATE: February 22, 2022

DATUM: Geodetic

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 55

DRILLING CONTRACTOR: Downing Drilling

JN - Joint; FLT - Fault; SHR- Shear; VN - Vein; CJ - Conjugate
BD- Bedding; FO- Foliation; CO- Contact; OR- Orthogonal; CL - Cleavage
PL - Planar; CU- Curved; UN- Undulating; ST - Stepped; IR - Irregular
PO- Polished; K - Slickensided; SM- Smooth; Ro - Rough; MB- Mechanical Break
BR - Broken Rock
NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. DEPTH (m)	RUN No.	FLUSH	COLOUR % RETURN	RECOVERY TOTAL CORE %	RECOVERY SOLID CORE %	R.Q.D. %	FRACT. INDEX PER 0.25 m	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	Jcon	Jr	Ja	HYDRAULIC CONDUCTIVITY K, cm/sec	Diametral Point Load Index (MPa)	RMC -Q' AVG.	
		BEDROCK SURFACE		50.48																
12	Rotary Drill / NQ Core	Slightly weathered to fresh, thin to medium bedded, grey black LIMESTONE and SHALE		11.17	1															Bentonite Seal Silica Sand
				49.38																
13		Fresh, thin to medium bedded, grey to black LIMESTONE and SHALE		12.27	2															Screen
14					3															
				47.10																
15		End of Drillhole Note(s): 1. Water level in screen measured at a depth of 13.00 m (Elev. 48.65 m) on February 25, 2022		14.55																
16																				
17																				
18																				
19																				
20																				
21																				

DEPTH SCALE
1 : 50

WSP GOLDER

LOGGED: ALB
CHECKED:

PROJECT: 22511882

RECORD OF BOREHOLE: 22-04

SHEET 1 OF 3

LOCATION: N 5030713.2 ;E 366411.4

BORING DATE: February 23, 2022

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80); SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}); WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		60.47							
0	Power Auger 200 mm Diam. (Hollow Stem)	SILTY SAND, trace gravel; brown		0.00	1	AS	-				
1					2	SS	10				
2					3	SS	6				
					4	SS	8				
3					5	SS	8				
											Bentonite Seal
4					6	SS	16				
					7	SS	7				
5					8	SS	14				
6				54.37							
		SILTY SAND, trace gravel; grey (GLACIAL TILL)		6.10	9	SS	27				
7											
											Silica Sand
8					10	SS	78				
											Screen
9					11	SS	47				
10		*CONTINUED NEXT PAGE*									

DEPTH SCALE
1 : 50

WSP GOLDER

LOGGED: ALB

CHECKED:

PROJECT: 22511882

RECORD OF BOREHOLE: 22-04

SHEET 2 OF 3

LOCATION: N 5030713.2 ;E 366411.4

BORING DATE: February 23, 2022

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m; SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○)	HYDRAULIC CONDUCTIVITY, k, cm/s; WATER CONTENT PERCENT (Wp, W, Wl)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
10		*--- CONTINUED FROM PREVIOUS PAGE ---*									
10	Power Auger 200 mm Diam. (Hollow Stem)	SILTY SAND, trace gravel; grey (GLACIAL TILL)			12	SS	50/ 0.05				Screen
11				49.29 / 11.18							Silica Sand
11		Borehole continued on RECORD OF DRILLHOLE 22-04									
12											
13											
14											
15											
16											
17											
18											
19											
20											

DEPTH SCALE

1 : 50

LOGGED: ALB

CHECKED:

PROJECT: 22511882

RECORD OF DRILLHOLE: 22-04

SHEET 3 OF 3

LOCATION: N 5030713.2 ;E 366411.4

DRILLING DATE: February 23, 2022

DATUM: Geodetic

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 55

DRILLING CONTRACTOR: Downing Drilling

JN - Joint; FLT - Fault; SHR- Shear; VN - Vein; CJ - Conjugate
BD - Bedding; FO- Foliation; CO- Contact; OR- Orthogonal; CL - Cleavage
PL - Planar; CU- Curved; UN- Undulating; ST - Stepped; IR - Irregular
PO- Polished; K - Slickensided; SM- Smooth; Ro - Rough; MB- Mechanical Break
BR - Broken Rock
NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	RUN No.	COLOUR % RETURN / FLUSH	RECOVERY: TOTAL CORE %	RECOVERY: SOLID CORE %	R.Q.D. %	FRACT. INDEX PER 0.25 m	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	Jcon	Jr	Ja	HYDRAULIC CONDUCTIVITY K, cm/sec	Diametral Point Load Index (MPa)	RMC -Q' AVG.
		BEDROCK SURFACE		49.29														
12	Rotary Drill / NQ Core	Fresh, thin to medium bedded, grey black LIMESTONE and SHALE		11.18	1													
				48.28														
13		End of Drillhole Note(s): 1. Water level in screen measured at a depth of 10.70 m (Elev. 49.77 m) on February 25, 2022		12.19														
14																		
15																		
16																		
17																		
18																		
19																		
20																		
21																		

DEPTH SCALE
1 : 50

LOGGED: ALB
CHECKED:

PROJECT: 22511882

RECORD OF BOREHOLE: 22-05

SHEET 1 OF 3

LOCATION: N 5030679.9 ;E 366442.7

BORING DATE: February 24, 2022

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.30m	HEADSPACE COMBUSTIBLE VAPOUR CONCENTRATIONS [PPM] ⊕ (ND = Not Detected; 100 200 300 400) / HEADSPACE ORGANIC VAPOUR CONCENTRATIONS [PPM] □ (ND = Not Detected; 100 200 300 400)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp W Wl; 20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0		GROUND SURFACE		62.34						
0	Power Auger 200 mm Diam. (Hollow Stem)	FILL - SILTY SAND, trace gravel; brown		0.00	1	AS	-	ND		
1					2	SS	33			
		SILTY SAND, trace gravel, with cobbles and boulders; brown		60.82 1.52	3	SS	31			
2					4	SS	84			Bentonite Seal
3					5	SS	94			
4					6	SS	50	ND		
		SILTY SAND, fine, trace gravel; brown		57.92 4.42	7	SS	50/ 0.05			
5					8	SS	50/ 0.03			Silica Sand
6		SILTY SAND, trace gravel; grey (GLACIAL TILL); very dense		56.24 6.10	9	SS	50/ 0.05			
7										Screen
8					10	SS	50/ 0.10	ND		
9					11	SS	50/ 0.13			
10		*CONTINUED NEXT PAGE*								

DEPTH SCALE
1 : 50

WSP GOLDER

LOGGED: ALB
CHECKED:

PROJECT: 22511882

RECORD OF BOREHOLE: 22-05

SHEET 2 OF 3

LOCATION: N 5030679.9 ;E 366442.7

BORING DATE: February 24, 2022

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.30m	HEADSPACE COMBUSTIBLE VAPOUR CONCENTRATIONS [PPM] ⊕ (ND = Not Detected; 100 200 300 400) / HEADSPACE ORGANIC VAPOUR CONCENTRATIONS [PPM] □ (ND = Not Detected; 100 200 300 400)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp — W — Wl; 20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		--- CONTINUED FROM PREVIOUS PAGE ---									
10	Power Auger 200 mm Diam. (Hollow Stem)	SILTY SAND, trace gravel; grey (GLACIAL TILL); very dense									
11					12	SS	50/ 0.13				
12					13	SS	86				
13											
				48.50	14	SS	50/ 0.13				
14		Borehole continued on RECORD OF DRILLHOLE 22-05		13.84							
15											
16											
17											
18											
19											
20											

DEPTH SCALE
1 : 50

WSP GOLDER

LOGGED: ALB
CHECKED:

PROJECT: 22511882

RECORD OF DRILLHOLE: 22-05

SHEET 3 OF 3

LOCATION: N 5030679.9 ;E 366442.7

DRILLING DATE: February 24, 2022

DATUM: Geodetic

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 55

DRILLING CONTRACTOR: Downing Drilling

JN - Joint; FLT - Fault; SHR- Shear; VN - Vein; CJ - Conjugate
BD - Bedding; FO- Foliation; CO- Contact; OR- Orthogonal; CL - Cleavage
PL - Planar; CU- Curved; UN- Undulating; ST - Stepped; IR - Irregular
PO- Polished; K - Slickensided; SM- Smooth; Ro - Rough; MB- Mechanical Break
BR - Broken Rock
NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. DEPTH (m)	RUN No.	COLOUR % RETURN / FLUSH	RECOVERY TOTAL CORE %	RECOVERY SOLID CORE %	R.Q.D. %	FRACT. INDEX PER 0.25 m	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	Jcon	Jr	Ja	HYDRAULIC CONDUCTIVITY K, cm/sec	Diametral Point Load Index (MPa)	RMC -Q' AVG.
		BEDROCK SURFACE		48.50														
14	Rotary Drill NQ Core	Slightly weathered to fresh, thin to medium bedded, grey black LIMESTONE and SHALE		13.84	1													
15				47.10														
		End of Drillhole		15.24														
16		Note(s):																
		1. Water level in screen measured at a depth of 8.22 m (Elev. 54.12 m) on February 25, 2022																
17																		
18																		
19																		
20																		
21																		
22																		
23																		

DEPTH SCALE
1 : 50

WSP GOLDER

LOGGED: ALB
CHECKED:

PROJECT: 11-1122-0199

RECORD OF BOREHOLE: 11-33

SHEET 1 OF 1

LOCATION: See Site Plan

BORING DATE: December 8, 2011

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		62.22							
0	Power Auger 200 mm Diam. (Hollow Stem)	Dense dark grey crushed stone (Gravel lot BASE)		0.08	1	50 DO	46				
		Dense brown fine to medium sand, some coarse sand, some gravel, trace silt (Gravel lot SUBBASE)		61.69							
1		Loose to very dense dark brown silty sand, trace to some gravel, brick, wood, organics, concrete, occasional grey silty clay layer (FILL)		0.53	2	50 DO	9				
					3	50 DO	60				
2					4	50 DO	12				
					5	50 DO	56				
				59.32							
3		Compact to very dense brown to grey brown SILTY SAND to SANDY SILT, trace to some gravel (GLACIAL TILL)		2.90	6	50 DO	23				
					7	50 DO	48				
4					8	50 DO	74				
					9	50 DO	49				
5					10	50 DO	55				
					11	50 DO	>89				
6					12	50 DO	>100				
					13	50 DO	>100				
7					14	50 DO	>100				
				54.60							
		Very dense grey brown SILTY SAND, trace to some gravel, occasional grey silt seam, occasional fine to medium sand seam (GLACIAL TILL)		7.62	15	50 DO	>111				
8					16	50 DO	>105				
					17	50 DO	>50				
9					18	50 DO	>100				
					19	50 DO	>50				
				52.26	20	50 DO	>110				
10		End of Borehole Split Spoon Refusal		9.96							
11											

DEPTH SCALE

1 : 55

Golder Associates

LOGGED: RI

CHECKED: GDC

PROJECT: 11-1122-0199

RECORD OF BOREHOLE: 11-35

SHEET 1 OF 1

LOCATION: See Site Plan

BORING DATE: December 12, 2011

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		62.56							
0	Power Auger 200 mm Diam. (Hollow Stem)	Dense grey sand and gravel (Gravel lot BASE)		0.00							
				62.25	1	50 DO	52				
		Compact brown medium to fine sand, trace gravel (Gravel lot SUBBASE)		0.31							
				61.65	2	50 DO	17				
1		Compact dark brown to black silty sand, trace gravel, ash, wood, brick, mortar (FILL)		0.91							
					3	50 DO	19				
				60.88							
		Compact brown fine to medium sand, trace gravel (FILL)		1.68							
2					4	50 DO	24				
				60.43							
		Dense to very dense light brown to brown SILTY SAND, occasional gravel and medium sand layers, trace gravel (GLACIAL TILL)		2.13	5	50 DO	45				
					6	50 DO	65				
3											
					7	50 DO	176				
4					8	50 DO	>50				
				58.16							
		End of Borehole Auger Refusal		4.40							
5											
6											
7											
8											
9											
10											

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: BM

CHECKED: GDC

PROJECT: 11-1122-0199

RECORD OF BOREHOLE: 11-37

SHEET 1 OF 1

LOCATION: See Site Plan

BORING DATE: December 12, 2011

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		62.76							
0	Power Auger 200 mm Diam. (Hollow Stem)	Compact sand and gravel (Gravel lot BASE)		0.00							
				62.46	1	50 DO	29				
		Compact brown medium to fine sand, trace gravel (Gravel lot SUBBASE)		0.30							
				61.85	2	50 DO	20				
1		Loose dark brown to black silty sand, trace gravel, occasional layers of ash, gravel, sandy mortar, glass, construction debris (FILL)		0.91	3	50 DO	6				
2				60.63	4	50 DO	34				
		Compact brown medium to fine sand, trace gravel (FILL)		2.13							
				60.32							
		Dense to very dense grey brown SILTY SAND, some gravel, trace cobbles (GLACIAL TILL)		2.44	5	50 DO	73				
3					6	50 DO	>75				
4					7	50 DO	>65				
					8	50 DO	>75				
5					9	50 DO	40				
6					10	50 DO	>50				
				56.23							
		End of Borehole Auger Refusal		6.53							
7											
8											
9											
10											

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: BM

CHECKED: GDC

PROJECT: 11-1122-0199

RECORD OF BOREHOLE: 11-38

SHEET 1 OF 1

LOCATION: See Site Plan

BORING DATE: December 19, 2011

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		62.11							
0	Power Auger 200 mm Diam. (Hollow Stem)	Compact to dense brown sand and gravel (Gravel lot BASE)		0.00							
		Loose to compact brown medium to fine sand, some gravel (Gravel lot SUBBASE)		0.10	1	50 DO	35				
1					2	50 DO	8				
				60.89							
		Compact to very dense grey brown sand, some gravel, trace silt (FILL)		1.22	3	50 DO	15				
2					4	50 DO	52				
				59.67							
		Very dense grey brown SILTY SAND, some gravel, medium brown sand seams (GLACIAL TILL)		2.44	5	50 DO	61				
3					6	50 DO	112				
					7	50 DO	148				
4				57.94							
		End of Borehole Auger Refusal		4.17							
5											
6											
7											
8											
9											
10											

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: JDR

CHECKED: GDC

PROJECT: 11-1122-0199

RECORD OF BOREHOLE: 11-39

SHEET 1 OF 1

LOCATION: See Site Plan

BORING DATE: December 15, 2011

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		62.81							
0	Power Auger 200 mm Diam. (Hollow Stem)	Compact sand and gravel (Gravel lot BASE)		0.00							
		Compact brown to red sandy silt, trace gravel (FILL)		0.15	1	50 DO	15				
				61.90	2	50 DO	20				
1		Compact to dense light brown fine to medium sand, trace gravel, silt, and mortar (FILL)		0.91	3	50 DO	40				
2				60.68	4	50 DO	120				
		Dense sandy gravel to brown fine to medium sand and gravel (FILL)		2.13	5	50 DO	67				
3					6	50 DO	99				
				59.15							
		Compact to very dense grey SILTY SAND, some gravel (GLACIAL TILL)		3.66	7	50 DO	34				
4					8	50 DO	27				
5					9	50 DO	33				
					10	50 DO	>50				
6					11	50 DO	>100				
				56.46	12	50 DO	>100				
		End of Borehole Auger Refusal		6.35							
7											
8											
9											
10											

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: BM/JD

CHECKED: GDC

PROJECT: 11-1122-0199

RECORD OF BOREHOLE: 11-40

SHEET 1 OF 1

LOCATION: See Site Plan

BORING DATE: December 16, 2011

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		62.77							
0	Power Auger 200 mm Diam. (Hollow Stem)	Compact red to fine brown sand, some gravel (Gravel lot BASE)		0.00 / 62.39	1	50 DO	13				
		Compact fine to medium brown sand, some gravel, red brick (FILL)		0.38 / 61.55	2	50 DO	19				
1		Compact light brown fine to medium sand, trace gravel, silt, red brick (FILL)		1.22 / 59.78	3	50 DO	15				
					4	50 DO	25				
2					5	50 DO	51				
		Very dense grey brown SAND, some gravel, trace silt (GLACIAL TILL)		2.99 / 59.11	6	50 DO	59				
3		Very dense grey brown SILTY SAND, some gravel (GLACIAL TILL)		3.66	7	50 DO	100				
					8	50 DO	>50				
4					9	50 DO	>100				
					10	50 DO	187				
5					11	50 DO	>50				
		End of Borehole Auger Refusal		56.52 / 6.25							
6											
7											
8											
9											
10											

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: JD

CHECKED: GDC

PROJECT: 11-1122-0199

RECORD OF BOREHOLE: 11-01

SHEET 1 OF 1

LOCATION: See Site Plan

BORING DATE: November 23, 2011

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80)	SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3})	WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		56.36									
0	Power Auger 200 mm Diam. (Hollow Stem)	TOPSOIL		0.00									
		Dark brown to black silty sand (FILL)		0.13	1	50 DO	22						
				55.95									
		Compact fine to medium brown silty sand, some gravel, trace brick (FILL)		0.41									
1					2	50 DO	51						
					3	50 DO	24						
				54.53									
		Gravel (FILL)		1.83									
2				54.23	4	50 DO	41						
		Dense medium to fine grey to brown sand, trace gravel and silt (FILL)		2.13									
				53.62	5	50 DO	>50						
		GRAVEL and COBBLES (GLACIAL TILL)		2.74									
3				53.44									
		End of Borehole Auger Refusal		2.92									
4													
5													
6													
7													
8													
9													
10													

DEPTH SCALE
1 : 50

Golder Associates

LOGGED: BM
CHECKED: JW

MIS-BHS 001 1111220199.GPJ GAL-MIS.GDT 1/28/13 JEM

PROJECT: 11-1122-0199

RECORD OF BOREHOLE: 11-02

SHEET 1 OF 2

LOCATION: See Site Plan

BORING DATE: November 24, 2011

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp — W — Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		55.00							
0	Power Auger 200 mm Diam. (Hollow Stem)	TOPSOIL		0.00							
		Compact black silty sand, trace ash and clay, occasinal layers of medium brown sand and gravel (FILL)		0.15	1	50 DO	12				
1				53.96	2	50 DO	35				
		Compact medium to fine brown sand, some gravel, trace silt (FILL)		1.04	3	50 DO	17				
2				52.61	4	50 DO	25				
		Coarse brown sand, some gravel, trace silt and brick, occasional layers of gravel (FILL)		2.39	5	50 DO	38				
3				51.34	6	50 DO	59				
		Compact to dense coarse grey sand, some gravel, trace silt, with cobbles and boulders (FILL)		3.66	7	50 DO	24				
4				50.78							
		COBBLES, BOULDERS, and GRAVEL (GLACIAL TILL)		4.22	C1	NQ RC	DD				
					C2	NQ RC	DD				
5				49.82							
		Very dense grey coarse SAND, some silt, some gravel (GLACIAL TILL)		5.18	8	50 DO	>50				
				49.23							
		COBBLES, BOULDERS, and GRAVEL		5.77	C3	NQ RC	DD				
6				48.90							
		Very dense grey coarse SAND and GRAVEL, trace cobbles		6.10	9	50 DO	78				
				48.29							
		End of Borehole		6.71							
7											
8											
9											
10											

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: BM

CHECKED: JW

MIS-BHS 001 1111220199.GPJ GAL-MIS.GDT 1/28/13 JEM

PROJECT: 11-1122-0199

RECORD OF DRILLHOLE: 11-02

SHEET 2 OF 2

LOCATION: See Site Plan

DRILLING DATE: November 24, 2011

DATUM: Geodetic

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 850

DRILLING CONTRACTOR: Marathon Drilling

JN - Joint, FLT - Fault, SHR- Shear, VN - Vein, CJ - Conjugate
BD- Bedding, FO- Foliation, CO- Contact, OR- Orthogonal, CL - Cleavage
PL - Planar, CU- Curved, UN- Undulating, ST - Stepped, IR - Irregular
PO- Polished, K - Slickensided, SM- Smooth, Ro - Rough, MB- Mechanical Break
BR - Broken Rock
NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	RUN No.	FLUSH	COLOUR % RETURN	RECOVERY: TOTAL CORE %	RECOVERY: SOLID CORE %	R.Q.D. %	FRACT. INDEX PER 0.3 m	DISCONTINUITY DATA: B Angle	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	Jr	Ja	Jn	HYDRAULIC CONDUCTIVITY K, cm/sec	Diametral Point Load Index (MPa)	RMC -Q' AVG.
		BEDROCK SURFACE		50.78																
5	Power Auger 200 mm Diam. (Hollow Stem)	COBBLES, BOULDERS, and GRAVEL (GLACIAL TILL)		4.22	C1															
					C2															
				49.82																
		Very dense grey coarse SAND, some silt, some gravel (GLACIAL TILL)		5.18																
				49.23																
6		COBBLES, BOULDERS, and GRAVEL		5.77	C3															
				48.90																
		Very dense grey coarse SAND and GRAVEL, trace cobbles		6.10																
				48.29																
		End of Borehole		6.71																
7																				
8																				
9																				
10																				
11																				
12																				
13																				
14																				

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: BM

CHECKED: JW

MIS-RCK 004 1111220199.GPJ GAL-MISS.GDT 1/28/13 JEM

PROJECT: 11-1122-0199

RECORD OF BOREHOLE: 11-03

SHEET 1 OF 1

LOCATION: See Site Plan

BORING DATE: November 28, 2011

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m
		GROUND SURFACE		54.93			
0	Power Auger 200 mm Diam. (Hollow Stem)	Compact dark brown silty sand, trace gravel, organics (TOPSOIL)		0.00 / 54.75			
		Compact black silty sand, some gravel, ash, slag (FILL)		0.18 / 54.32	1	50 DO	10
		Compact brown fine to medium sand, some gravel, some silt, brick (FILL)		0.61			
1		Compact to loose black silty sand, some gravel, ash, slag (FILL)		0.74 / 53.58	2	50 DO	14
		Loose brown fine to coarse sand, some gravel, trace silt (FILL)		1.35 / 53.10	3	50 DO	9
2		Compact brown medium to coarse sand, some gravel, some fine sand, trace silt (FILL)		1.83 / 52.49	4	50 DO	11
		Loose dark brown SILTY SAND, some gravel, trace to some clay, organics		2.51	5	50 DO	38
3		Dense to very dense grey brown to brown SILTY SAND, some gravel, with cobbles and boulders			6	50 DO	33
					7	50 DO	>50
4							
				50.36	8	50 DO	74
		Very dense grey SILTY SAND, some gravel, cobbles, boulders (GLACIAL TILL)		4.57			
5					9	50 DO	54
				49.24	10	50 DO	>50
		End of Borehole Auger Refusal Possible Bedrock		5.69			
6							
7							
8							
9							
10							

DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80)

SHEAR STRENGTH Cu, kPa (20 40 60 80) nat V. + Q - ● rem V. ⊕ U - ○

HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3})

WATER CONTENT PERCENT (20 40 60 80) Wp ⊖ W WI

ADDITIONAL LAB. TESTING

PIEZOMETER OR STANDPIPE INSTALLATION

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: RI

CHECKED: JW

MIS-BHS 001 1111220199.GPJ GAL-MIS.GDT 1/28/13 JEM

PROJECT: 11-1122-0199

RECORD OF BOREHOLE: 11-04

SHEET 1 OF 1

LOCATION: See Site Plan

BORING DATE: December 1, 2011

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		56.16							
0	Power Auger 200 mm Diam. (Hollow Stem)	TOPSOIL		0.00							
		Compact black silty sand, some gravel, trace brick, ash, slag, wood and glass (FILL)		0.15	1	50 DO	8				
					2	50 DO	16				
1					3	50 DO	10				
				54.33							
		Loose dark brown to red coarse sand, some gravel, trace brick, ash, silt and slag (FILL)		1.83	4	50 DO	5				
2											
				53.42	5	50 DO	3				
		Loose medium to fine orange sand, trace slag and silt (FILL)		2.74							
3				53.11							
		Very loose red coarse sand, trace silt (FILL)		3.05	6	50 DO	2				
				52.81							
		Very loose black crushed asphaltic concrete (FILL)		3.35							
				52.20	7	50 DO	2				
4		ORGANICS		3.96							
		Grey CLAY		4.11							
		Grey SILTY SAND, some gravel		4.27	8	50 DO	>50				
				51.59							
		Compact to dense grey to brown coarse SAND and GRAVEL, trace silt		4.57							
5					9	50 DO	49				
					10	50 DO	54				
6				49.96							
		Very dense SAND and GRAVEL, some cobbles, trace boulders (GLACIAL TILL)		6.20							
7											
					11	50 DO	112				
8					12	50 DO	>75				
					13	50 DO	58				
9											
					14	50 DO	27				
				46.46							
		End of Borehole Auger Refusal		9.70							
10											

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: BM

CHECKED: JW

MIS-BHS 001 1111220199.GPJ GAL-MIS.GDT 1/28/13 JEM

PROJECT: 11-1122-0199

RECORD OF BOREHOLE: 11-05

SHEET 1 OF 1

LOCATION: See Site Plan

BORING DATE: November 23, 2011

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp — W — Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		56.91							
0	Power Auger 200 mm Diam. (Hollow Stem)	TOPSOIL		0.00							
		Dark brown to black silty sand, some gravel, trace brick (FILL)		0.13	1	50 DO	24				
		Compact brown medium to fine sand, some silt, some gravel (FILL)		0.30							
		Dark brown to black silty sand, some gravel (FILL)		56.20 0.71 56.00	2	50 DO	15				
1		Loose to compact light brown fine sand, trace silt (FILL)		0.91	3	50 DO	7				
2				54.81	4	50 DO	24				
		Compact brown medium to fine SAND, trace silt, gravel		2.10	5	50 DO	21				
3					6	50 DO	>50				
				53.46							
		End of Borehole Auger Refusal Possible Boulder		3.45							
4											
5											
6											
7											
8											
9											
10											

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: BM

CHECKED: JW

MIS-BHS 001 1111220199.GPJ GAL-MIS.GDT 1/28/13 JEM

PROJECT: 11-1122-0199

RECORD OF BOREHOLE: 11-06

SHEET 1 OF 1

LOCATION: See Site Plan

BORING DATE: November 23, 2011

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp — W — Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0		GROUND SURFACE		54.79							
		Loose dark brown silty sand, trace gravel, organics (TOPSOIL)		0.00							
		Loose black silty sand, some gravel, ash, brick, clay (FILL)		0.13	1	50 DO	9				
				54.03							
1		Loose brown fine to medium sand, some gravel, trace silt (FILL)		0.76	2	50 DO	9				
				53.57							
		Loose black silty sand, some gravel, ash, organics (FILL)		1.22							
				53.27	3	50 DO	6				
		Loose brown SILTY SAND, some gravel		1.52							
2				52.66	4	50 DO	53				
		Very dense brown fine to coarse SAND, some gravel, some silt		2.13							
				52.33							
		End of Borehole Auger Refusal		2.46							
3											
4											
5											
6											
7											
8											
9											
10											

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: RI

CHECKED: JW

MIS-BHS 001 1111220199.GPJ GAL-MIS.GDT 1/28/13 JEM

PROJECT: 11-1122-0199

RECORD OF BOREHOLE: 11-07

SHEET 1 OF 1

LOCATION: See Site Plan

BORING DATE: November 25 & 28, 2011

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp — W — Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		54.92							
0	Power Auger 200 mm Diam. (Hollow Stem)	Compact dark brown silty sand, trace gravel, organics (TOPSOIL)		0.00 / 54.74							
		Compact black silty sand, some gravel, ash, slag, organics (FILL)		0.18	1	50 DO	12				
				54.01	2	50 DO	19				
1		Compact to loose brown fine to coarse sand, some gravel, trace silt, occasional brown silt pockets (FILL)		0.91	3	50 DO	6				
				53.09							
2		Loose dark brown silty sand, some gravel, trace to some clay, organics, wood, ash, with brown clayey silt layers (FILL)		1.83	4	50 DO	5				
				52.48							
		Loose dark grey silty clay to clayey silt, trace sand (FILL)		2.44							
				52.18	5	50 DO	8				
		Loose to very dense brown silty sand, some gravel (FILL)		2.74							
3				2.89							
		Very dense to dense grey to brown fine to coarse SAND, some gravel, trace to some silt, with brown medium to coarse sand, trace to some fine sand, trace silt layers, with cobbles and boulders			6	50 DO	94				
4					7	50 DO	127				
					8	50 DO	41				
5					9	50 DO	50				
					10	50 DO	51				
6					11	50 DO	43				
					12	50 DO	63				
7					13	50 DO	63				
					14	50 DO	46				
				46.38							
		Compact to dense brown medium to coarse SAND, some gravel, trace fine sand, trace silt		8.54	15	50 DO	>50				
8				45.95							
9		End of Borehole Auger Refusal Possible Bedrock		8.97							
10											

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: RI

CHECKED: JW

MIS-BHS 001 1111220199.GPJ GAL-MIS.GDT 1/28/13 JEM

PROJECT: 11-1122-0199

RECORD OF BOREHOLE: 11-08

SHEET 1 OF 1

LOCATION: See Site Plan

BORING DATE: November 30, 2011

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp — W — Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		54.29							
0	Power Auger 200 mm Diam. (Hollow Stem)	Loose dark brown silty sand and sandy silt, trace gravel, organics (TOPSOIL)		0.00							
				0.13	1	50 DO	8				
		Loose dark brown to black silty sand, some gravel, brick (FILL)		53.88							
				0.41							
		Loose brown silty sand to sandy silt, trace to some gravel (FILL)		53.68							
				0.61							
1		Compact brown fine to coarse sand, some gravel, trace to some silt, occasional silty sand seam (FILL)			2	50 DO	17				
					3	50 DO	16				
2					4	50 DO	15				
				51.85							
		Very loose black silty ORGANICS		2.44							
		Firm grey SILTY SAND, trace sand, trace gravel		2.59							
				2.74	5	50 DO	12				
3		Compact to very dense grey SILTY SAND, some gravel, with cobbles and boulders			6	50 DO	<100				
4					7	50 DO	59				
					8	50 DO	<100				
				49.77							
		End of Borehole Auger Refusal		4.52							
5											
6											
7											
8											
9											
10											

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: RI

CHECKED: JW

MIS-BHS 001 1111220199.GPJ GAL-MIS.GDT 1/28/13 JEM

PROJECT: 11-1122-0199

RECORD OF BOREHOLE: 11-09

SHEET 1 OF 1

LOCATION: See Site Plan

BORING DATE: November 23, 2011

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		56.83							
0	Power Auger 200 mm Diam. (Hollow Stem)	TOPSOIL		0.00							
		Dark brown to black silty sand (FILL)		0.13	1	50 DO	33				
		Compact dark brown silty sand (FILL)		0.30 / 56.22							
		Loose black silty sand, trace brick and glass (FILL)		0.61 / 55.84	2	50 DO	12				
1		Loose medium to fine brown sand, trace silt (FILL)		0.99	3	50 DO	9				
				54.95							
2		Compact medium to fine brown to grey sand, some silt and gravel, trace brick (FILL)		1.88	4	50 DO	39				
					5	50 DO	32				
3				53.78							
		Brown to grey SILTY SAND, trace gravel and clay		3.05 / 53.59	6	50 DO	>50				
		COBBLES and BOULDERS		3.24							
					7	50 DO	>60				
4				52.85							
		End of Borehole Auger Refusal		3.98							
5											
6											
7											
8											
9											
10											

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: BM

CHECKED: JW

MIS-BHS 001 1111220199.GPJ GAL-MIS.GDT 1/28/13 JEM

PROJECT: 11-1122-0199

RECORD OF BOREHOLE: 11-10

SHEET 1 OF 1

LOCATION: See Site Plan

BORING DATE: November 23, 2011

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		54.76							
0	Power Auger 200 mm Diam. (Hollow Stem)	Loose dark brown sandy silt, trace gravel, organics (TOPSOIL)		0.00 54.58							
		Loose black silty sand, some gravel, ash, slag (FILL)		0.18	1	50 DO	8				
1					2	50 DO	8				
				53.59							
		Very loose brown fine to medium sand, trace to some silt, some gravel, with black silty sand, organic layers (FILL)		1.17	3	50 DO	4				
				52.93							
2		Compact to very dense brown SILTY SAND, some gravel		1.83	4	50 DO	11				
					5	50 DO	41				
3					6	50 DO	>50				
				51.33							
		End of Borehole Auger Refusal		3.43							
4											
5											
6											
7											
8											
9											
10											

DEPTH SCALE

1 : 50

LOGGED: RI

CHECKED: JW

Golder Associates

MIS-BHS 001 1111220199.GPJ GAL-MIS.GDT 1/28/13 JEM

PROJECT: 11-1122-0199

RECORD OF BOREHOLE: 11-11

SHEET 1 OF 1

LOCATION: See Site Plan

BORING DATE: November 24 & 25, 2011

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp W Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		54.84							
0	Power Auger 200 mm Diam. (Hollow Stem)	Compact dark brown silty sand, trace gravel, organics (TOPSOIL)		0.00							
		Compact black silty sand, some gravel, mortar, ash, slag (FILL)		0.08	1	50 DO	13				
				54.21							
		Compact brown fine to medium sand, trace gravel, trace silt, some coarse sand, occasional brown silt pocket, occasional black silty sand layer (FILL)		0.63							
1				53.90	2	50 DO	6				
		Compact brown fine to coarse sand, trace silt, trace to some gravel, occasional brown silt pocket (FILL)		0.94	3	50 DO	26				
				53.01							
2		Loose grey silty clay, trace gravel, trace sand, black staining, occasional grey silty sand layer (FILL)		1.83	4	50 DO	8				
				52.25							
		Loose dark brown to black silty ORGANICS		2.59	5	50 DO	6				
				2.74							
3		Loose grey brown SILTY CLAY and CLAYEY SILT, trace sand		2.82							
				51.79							
		Loose grey SILTY SAND, some gravel		3.05							
		Compact to very dense brown to grey fine to coarse SAND, trace to some gravel, trace to some silt			6	50 DO	28				
4					7	50 DO	40				
					8	50 DO	36				
5					9	50 DO	36				
				49.35							
		Compact to very dense brown medium to coarse SAND, some gravel, trace fine sand, trace silt, occasional fine to medium sand layer, with cobbles and boulders		5.49	10	50 DO	21				
6				48.59							
		Very dense fine to coarse grey and brown SAND, some gravel, trace to some silt, with cobbles and boulders (GLACIAL TILL)		6.25	11	50 DO	53				
				47.98							
		Very dense brown silty fine SAND, occasional grey silt seam (GLACIAL TILL)		6.86	12	50 DO	100				
7				7.01							
		Very dense grey SILTY SAND, some gravel, with cobbles and boulders (GLACIAL TILL)			13	50 DO	>50				
				47.07							
		End of Borehole Auger Refusal		7.77							
8											
9											
10											

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: RI

CHECKED: JW

MIS-BHS 001 1111220199.GPJ GAL-MIS.GDT 1/28/13 JEM

PROJECT: 11-1122-0199

RECORD OF BOREHOLE: 11-12

SHEET 1 OF 1

LOCATION: See Site Plan

BORING DATE: December 1, 2011

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp — W — Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		54.55							
0	Power Auger 200 mm Diam. (Hollow Stem)	Loose dark silty sand to sandy silt, trace gravel, organics (TOPSOIL)		0.00							
		Loose black silty sand to sandy silt, some gravel, ash, slag (FILL)		0.12 / 53.94	1	50 DO	8				
		Compact brown silty sand, some gravel (FILL)		0.61 / 53.33	2	50 DO	19				
1		Compact to loose brown fine to medium sand, trace to some silt, trace to some gravel (FILL)		1.22	3	50 DO	13				
					4	50 DO	8				
2				51.96							
		Very loose dark brown to black silty ORGANICS		2.59 / 2.74	5	50 DO	4				
		Very loose grey SILTY CLAY to CLAY SILT, trace sand		2.90							
3		Very loose to compact grey SILTY SAND, some gravel			6	50 DO	24				
					7	50 DO	>50				
4				50.28							
		Very dense grey brown SILTY fine to course SAND, some gravel, occasional fine to coarse sand pockets (GLACIAL TILL)		4.27	8	50 DO	66				
5					9	50 DO	>50				
				49.37							
		End of Borehole Auger Refusal		5.18							
6											
7											
8											
9											
10											

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: RI

CHECKED: JW

MIS-BHS 001 1111220199.GPJ GAL-MIS.GDT 1/28/13 JEM

PROJECT: 11-1122-0199

RECORD OF BOREHOLE: 11-13

SHEET 1 OF 1

LOCATION: See Site Plan

BORING DATE: November 22, 2011

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		56.59							
0	Power Auger 200 mm Diam. (Hollow Stem)	TOPSOIL		0.00							
		Dark brown to black silty sand, trace gravel and brick (FILL)		0.15	1	50 DO	9				
1					2	50 DO	17				
				55.37							
		Loose to compact medium to fine brown sand, trace gravel and silt (FILL)		1.22	3	50 DO	4				
2					4	50 DO	14				
					5	50 DO	14				
3					6	50 DO	46				
				52.93							
		Dense coarse brown to black SAND and GRAVEL, trace cobbles and silt		3.66	7	50 DO	30				
4					8	50 DO	33				
					9	50 DO	55				
5					10	50 DO	50				
					11	50 DO	19				
6					12	50 DO	>80				
				49.63							
		Cobbles and boulders (GLACIAL TILL)		6.96							
7					13	50 DO	105				
				48.61	14	50 DO	>50				
8		End of Borehole Auger Refusal		7.98							
9											
10											

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: BM

CHECKED: JW

MIS-BHS 001 1111220199.GPJ GAL-MIS.GDT 1/28/13 JEM

PROJECT: 11-1122-0199

RECORD OF BOREHOLE: 11-14

SHEET 1 OF 1

LOCATION: See Site Plan

BORING DATE: November 22 & 23, 2011

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80)	SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕; Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3})	WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		55.28									
0	Power Auger 200 mm Diam. (Hollow Stem)	Compact dark brown silty sand, some gravel, organics (TOPSOIL)		0.00 / 54.95	1	50 DO	26						
		Compact dark brown fine to medium sand, some gravel, asphalt pieces (FILL)		0.33 / 54.54									
1		Compact black to dark brown silty sand, some gravel, ash, coal (FILL)		0.74 / 54.06	2	50 DO	22						
		Compact brown fine to medium sand, some silt (FILL)		1.22 / 53.66	3	50 DO	13						
		Compact black silty sand, some gravel, ash (FILL)		1.62 / 53.45									
2		Compact dark brown sandy silt, some clay, trace to some gravel, organics, occasional brown fine to medium sand, occasional grey brown clayey silt to silty clay layers (FILL)		1.83 / 52.84	4	50 DO	14						
		Very loose to dense grey brown fine to medium SAND, some silt, trace gravel		2.44 / 51.93	5	50 DO	2						
3					6	50 DO	33						
		Dense to compact to very dense brown medium to coarse SAND, some gravel, trace fine sand, trace silt		3.35 / 50.40	7	50 DO	15						
4					8	50 DO	85						
5		Very dense grey fine to coarse sand, some gravel, some silt, with cobbles and boulders (GLACIAL TILL)		4.88 / 49.77	9	50 DO	102						
		End of Borehole Auger Refusal		5.51									
6													
7													
8													
9													
10													

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: RI

CHECKED: JW

MIS-BHS 001 1111220199.GPJ GAL-MIS.GDT 1/28/13 JEM

PROJECT: 11-1122-0199

RECORD OF BOREHOLE: 11-15

SHEET 1 OF 1

LOCATION: See Site Plan

BORING DATE: November 24, 2011

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		54.87							
0	Power Auger 200 mm Diam. (Hollow Stem)	Compact dark brown silty sand, trace gravel, organics (TOPSOIL)		0.05							
		Compact black silty sand, some gravel, ash (FILL)		54.54	1	50 DO	10				
		Compact to very loose brown fine to medium sand, some coarse sand, trace to some gravel, trace to some silt, occasional brown silt pockets, occasional cobble (FILL)		0.33	2	50 DO	14				
1				53.55							
		Very loose dark brown and black silty sand, trace gravel, trace clay, occasional grey silty clay to clayey silt layers (ORGANICS)		1.32	3	50 DO	4				
					4	50 DO	4				
2				52.43							
		Loose dark brown to black fine to medium SAND, some silt, some gravel, organics		2.44	5	50 DO	9				
3				51.82							
		Very dense to compact grey to brown SILTY SAND, some gravel, occasional cobble and boulder, with fine to medium sand, some gravel, some silt layers		3.05	6	50 DO	57				
					7	50 DO	14				
4					8	50 DO	>50				
				50.35							
		End of Borehole Auger Refusal		4.52							
5											
6											
7											
8											
9											
10											

DEPTH SCALE

1 : 50

LOGGED: RI

CHECKED: JW

Golder Associates

MIS-BHS 001 1111220199.GPJ GAL-MIS.GDT 1/28/13 JEM

PROJECT: 11-1122-0199

RECORD OF BOREHOLE: 11-16

SHEET 1 OF 1

LOCATION: See Site Plan

BORING DATE: November 28 & 29, 2011

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		54.61							
0	Power Auger 200 mm Diam. (Hollow Stem)	TOPSOIL		0.00							
		Compact black silty sand, some gravel, trace ash, brick, occasional layers of fine to medium brown sand and gravel (FILL)		0.15	1	50 DO	12				
1					2	50 DO	22				
				53.39							
		Very loose black coarse sand, some ash, gravel, trace silt and brick (FILL)		1.22	3	50 DO	5				
				52.78							
2		Very loose brown to grey coarse sand, trace silt and gravel (FILL)		1.83	4	50 DO	4				
					5	50 DO	5				
3				51.26	6	50 DO	19				
		Compact medium to fine grey SAND, trace silt, trace gravel		3.35							
4					7	50 DO	18				
					8	50 DO	12				
5											
					9	50 DO	12				
6					10	50 DO	>50				
				48.18							
		End of Borehole Auger Refusal		6.43							
7											
8											
9											
10											

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: BM

CHECKED: JW

MIS-BHS 001 1111220199.GPJ GAL-MIS.GDT 1/28/13 JEM

PROJECT: 11-1122-0199

RECORD OF BOREHOLE: 11-17

SHEET 1 OF 1

LOCATION: See Site Plan

BORING DATE: November 21, 2011

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		56.66							
0	Power Auger 200 mm Diam. (Hollow Stem)	Compact dark grey crushed stone with organics (FILL)		0.00							
		Compact brown to dark brown silty sand, some gravel, trace clay, brick (FILL)		0.13 / 56.05	1	50 DO	17				
		Compact dark brown and black silty sand to sandy silt, some gravel, ash, brick (FILL)		0.61 / 55.67	2	50 DO	22				
1		Compact brown sand, some silt, some gravel, with grey brown silty clay layers (FILL)		0.99 / 54.98	3	50 DO	14				
		Loose to very loose grey brown SILTY CLAY, trace to some sand, trace gravel, occasional sand pockets		1.68	4	50 DO	7				
2					5	50 DO	4				
3				53.46							
		Very dense to loose brown SAND, trace to some silt, some gravel, occasional cobble and boulder, occasional coarse sand layers, occasional silty sand layers, occasional fine sand layers		3.20	6	50 DO	16				
4					7	50 DO	34				
					8	50 DO	46				
5					9	50 DO	26				
					10	50 DO	4				
6					11	50 DO	62				
					12	50 DO	27				
7					13	50 DO	104				
				48.89							
		Very dense grey SANDY SILT, some gravel, trace clay (GLACIAL TILL)		7.77	14	50 DO	>100				
8											
				48.07	15	50 DO	>70				
		End of Borehole Auger Refusal Possible Bedrock		8.59							
9											
10											

DEPTH SCALE

1 : 50

LOGGED: RI

CHECKED: JW

Golder Associates

MIS-BHS 001 1111220199.GPJ GAL-MIS.GDT 1/28/13 JEM

PROJECT: 11-1122-0199

RECORD OF BOREHOLE: 11-18

SHEET 1 OF 1

LOCATION: See Site Plan

BORING DATE: November 22, 2011

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp — W — Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		56.83							
0	Power Auger 200 mm Diam. (Hollow Stem)	Compact dark brown silty sand, trace gravel, organics (TOPSOIL)		0.00 / 0.13	1	50 DO	18				
		Compact dark brown to brown fine to medium sand, some gravel, some silt, ash, brick, with occasional brown clayey silt layers, some sand, trace gravel (FILL)			2	50 DO	22				
1				55.69							
		Compact to dense dark brown to black fine to medium sand, some gravel, some silt, brick, ash, organics, occasional grey brown silty clay layers (FILL)		1.14	3	50 DO	11				
2					4	50 DO	>50				
				54.39							
		Compact grey fine to medium sand, some gravel, some silt, brick (FILL)		2.44 / 2.59	5	50 DO	16				
		Compact black silty sand, some gravel, ash (FILL)		53.93 / 2.90							
3		Compact brown fine to coarse sand, some gravel, trace silt (FILL)		3.05	6	50 DO	14				
		Compact dark brown to black silty sand, some gravel, ash, coal (FILL)		53.48 / 3.35							
		Compact grey brown SILTY CLAY to CLAYEY SILT, some sand, trace gravel, occasional fine to coarse sand layer			7	50 DO	21				
4				52.61							
		Loose brown sandy silt, some clay, trace to some gravel (FILL)		4.22 / 52.41							
		Loose black silty ORGANICS		4.42	8	50 DO	7				
		Loose to dense brown fine to medium SAND, trace to some silt, trace gravel		4.57							
5				51.65	9	50 DO	30				
		Dense to loose brown medium to coarse SAND, trace gravel, trace silt, trace fine sand		5.18							
					10	50 DO	6				
6				50.73							
		Very loose brown fine to medium SAND, trace silt		6.10	11	50 DO	4				
					12	50 DO	19				
7				49.51							
		Very loose to compact brown medium to coarse SAND, trace fine sand, trace silt, occasional fine to medium sand layer		7.32	13	50 DO	1				
8					14	50 DO	11				
				48.29							
		End of Borehole Auger Refusal		8.54							
9											
10											

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: RI

CHECKED: JW

MIS-BHS 001 1111220199.GPJ GAL-MIS.GDT 1/28/13 JEM

PROJECT: 11-1122-0199

RECORD OF BOREHOLE: 11-19

SHEET 1 OF 3

LOCATION: See Site Plan

BORING DATE: November 25 & December 15, 2011

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0		GROUND SURFACE		56.03							
	Power Auger 200 mm Diam. (Hollow Stem)	TOPSOIL		0.00							
		Compact brown silty sand, some gravel, trace slag (FILL)		0.13 / 55.67	1	50 DO	11				
		Compact fine to medium brown sand, some gravel, trace silt (FILL)		0.36 / 55.47							
		Grey clay (FILL)		0.56							
1		Compact grey gravel, some sand, trace silt, slag, and brick (FILL)		0.69 / 54.71	2	50 DO	29				
		Black silty sand, trace brick (FILL)		1.32 / 54.51	3	50 DO	52				
		Grey to brown fine to medium sand, trace silt (FILL)		1.52 / 54.25							
		Grey to black clay (FILL)		1.78 / 54.05							
2		Compact brown coarse sand, some gravel and clay, trace silt and brick (FILL)		1.98 / 53.29	4	50 DO	20				
					5	50 DO	5				
		Grey to black CLAY		2.74							
3					6	50 DO	4				
					7	50 DO	4				
4				51.92							
		Grey to blue CLAY		4.11							
		Dark brown silty ORGANICS		4.27 / 51.15	8	50 DO	27				
5		Loose grey brown SAND and GRAVEL, trace silt		4.88	9	50 DO	9				
					10	50 DO	7				
6					11	50 DO	10				
				49.33							
		Loose, coarse to medium brown SAND, some silt		6.70	12	50 DO	6				
7				48.71							
		Loose medium to fine grey to brown SAND, trace silt		7.32 / 48.49	13	50 DO	>50				
		Coarse grey to brown SAND, some gravel, with cobbles and boulders		7.54 / 48.03							
8	Rotary Drill NQ Core	Cobbles and boulders (GLACIAL TILL)		8.00	C1	NQ RC	DD				
9					C2	NQ RC	DD				
				46.50							
		Fresh, grey LIMESTONE BEDROCK		9.53	C3	NQ RC	DD				
10											

CONTINUED NEXT PAGE

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: BM

CHECKED: JW

MIS-BHS 001 1111220199.GPJ GAL-MIS.GDT 1/28/13 JEM

PROJECT: 11-1122-0199

RECORD OF BOREHOLE: 11-19

SHEET 2 OF 3

LOCATION: See Site Plan

BORING DATE: November 25 & December 15, 2011

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		--- CONTINUED FROM PREVIOUS PAGE ---									
10	Rotary Drill NQ Core	Fresh, grey LIMESTONE BEDROCK			C3	NQ RC	DD				
11					C4	NQ RC	DD				
				44.17							
12		End of Borehole		11.86							
13											
14											
15											
16											
17											
18											
19											
20											

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: BM

CHECKED: JW

MIS-BHS 001 1111220199.GPJ GAL-MIS.GDT 1/28/13 JEM

PROJECT: 11-1122-0199

RECORD OF DRILLHOLE: 11-19

SHEET 3 OF 3

LOCATION: See Site Plan

DRILLING DATE: November 25 & December 15, 2011

DATUM: Geodetic

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 850

DRILLING CONTRACTOR: Marathon Drilling

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	ELEV. DEPTH (m)	RUN No.	COLOUR % RETURN / FLUSH	RECOVERY TOTAL CORE %	RECOVERY SOLID CORE %	R.Q.D. %	FRACT. INDEX PER 0.3 m	DISCONTINUITY DATA: B Angle	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	Jr	Ja	Jn	HYDRAULIC CONDUCTIVITY K, cm/sec	Diametral Point Load Index (MPa)	RMC -Q' AVG.
8		BEDROCK SURFACE	48.03															
	Rotary Drill NQ Core	Cobbles and boulders (GLACIAL TILL)	8.00	C1														
9				C2														
		Fresh, grey LIMESTONE BEDROCK	46.50 9.53	C3														
10																		
11				C4														
		End of Drillhole	44.17 11.86															
12																		
13																		
14																		
15																		
16																		
17																		
18																		

JN - Joint, FLT - Fault, SHR- Shear, VN - Vein, CJ - Conjugate

BD- Bedding, FO- Foliation, CO- Contact, OR- Orthogonal, CL - Cleavage

PL - Planar, CU- Curved, UN- Undulating, ST - Stepped, IR - Irregular

PO- Polished, K - Slickensided, SM- Smooth, Ro - Rough, MB- Mechanical Break

BR - Broken Rock

NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE

1 : 50

LOGGED: BM

CHECKED: JW

Golder Associates

MIS-RCK 004 1111220199.GPJ GAL-MISS.GDT 1/28/13 JEM

PROJECT: 11-1122-0199

RECORD OF BOREHOLE: 11-20

SHEET 1 OF 1

LOCATION: See Site Plan

BORING DATE: November 28, 2011

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80)	SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3})	WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		54.88									
0	Power Auger 200 mm Diam. (Hollow Stem)	TOPSOIL		0.00 / 54.70									
		Compact dark brown to black silty sand, some gravel, trace ash and brick (FILL)		0.18	1	50 DO	28						
1					2	50 DO	24						
					3	50 DO	>50						
				53.30									
		End of Borehole Auger Refusal		1.58									
2													
3													
4													
5													
6													
7													
8													
9													
10													

DEPTH SCALE
1 : 50

Golder Associates

LOGGED: BM
CHECKED: JW

MIS-BHS 001 1111220199.GPJ GAL-MIS.GDT 1/28/13 JEM

PROJECT: 11-1122-0199

RECORD OF BOREHOLE: 11-20A

SHEET 1 OF 1

LOCATION: See Site Plan

BORING DATE: December 1, 2011

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp — W — Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		54.88							
0	Power Auger 200 mm Diam. (Hollow Stem)	TOPSOIL		0.00 / 54.70							
		Compact dark brown to black silty sand, some gravel, trace ash and brick (FILL)		0.18 / 53.66							
1		Compact to dense brown to grey fine to medium sand, trace silt, some gravel, concrete, asphalt (FILL)		1.22 / 52.75	1	50 DO	21				
2		Dense to loose dark brown with black silty sand, trace to some gravel, trace clay, ash, mica, organics, brick (FILL)		2.13 / 51.83	2	50 DO	35				
					3	50 DO	9				
3		Compact grey brown clayey silt to silty clay, trace to some sand, trace gravel, wood, sheen, odours (FILL)		3.05 / 51.53	4	50 DO	10				
		Compact black fine to medium sand, trace silt, trac egravel, black staining, odours, sheens (ORGANICS)		3.35 / 51.22							
		Compact grey brown fine SAND, with fine to medium sand seams/layers, trace silt		3.66 / 50.46	5	50 DO	12				
4		Compact grey CLAYEY SILT, some silt		4.42	6	50 DO	14				
		Compact grey brown medium to coarse SAND, trace fine sand		4.57 / 50.00							
5		Loose to very dense grey to brown fine to medium SAND, trace to some coarse sand, trace silt		4.88	7	50 DO	7				
					8	50 DO	36				
6					9	50 DO	35				
		Very dense grey fine to coarse SAND, some gravel, trace silt		6.33 / 48.27							
		End of Borehole Auger Refusal		6.61							
7											
8											
9											
10											

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: RI

CHECKED: JW

MIS-BHS 001 1111220199.GPJ GAL-MIS.GDT 1/28/13 JEM

PROJECT: 11-1122-0199

RECORD OF BOREHOLE: 11-21

SHEET 1 OF 1

LOCATION: See Site Plan

BORING DATE: December 6, 2011

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		59.07							
0	Power Auger 200 mm Diam. (Hollow Stem)	Loose dark brown silty sand, organics (TOPSOIL)		0.00 / 58.71	1	50 DO	5				
		Compact dark brown silty sand, some gravel, brick, organics, ash (FILL)		0.36	2	50 DO	>50				
1					3	50 DO	18				
				57.24	4	50 DO	15				
2		Compact to very dense grey brown SILTY SAND, trace to some gravel		1.83	5	50 DO	54				
3					6	50 DO	35				
				55.11	7	50 DO	76				
4		Very dense grey brown SILTY SAND, trace to some gravel (GLACIAL TILL)		3.96	8	50 DO	>75				
					9	50 DO	>150				
5				53.89							
		Very dense grey SILTY SAND to SANDY SILT, trace to some gravel (GLACIAL TILL)		5.18	10	50 DO	>102				
					11	50 DO	>100				
6					12	50 DO	>85				
				52.62							
		End of Borehole Auger Refusal		6.45							
7											
8											
9											
10											

DEPTH SCALE

1 : 50

LOGGED: RI

CHECKED: JW

Golder Associates

MIS-BHS 001 1111220199.GPJ GAL-MIS.GDT 1/28/13 JEM

PROJECT: 11-1122-0199

RECORD OF BOREHOLE: 11-22

SHEET 1 OF 1

LOCATION: See Site Plan

BORING DATE: December 7, 2011

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp — W — Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		57.34							
0	Power Auger 200 mm Diam. (Hollow Stem)	Very loose dark brown silty sand, organics (TOPSOIL)		0.00							
		Very loose grey brown silty sand to sandy silt, trace to some gravel, trace clay, bricks, organics (FILL)		0.13	1	50 DO	3				
1					2	50 DO	4				
					3	50 DO	4				
				55.51							
2		Loose grey brown silty clay, some sand, trace gravel (FILL)		1.83	4	50 DO	6				
				54.60	5	50 DO	7				
		Loose dark brown to black silty ORGANICS		2.74							
3		Loose to dense brown silty fine SAND, trace gravel, black staining (odours)		2.90	6	50 DO	48				
				53.83							
		Dense to very dense grey brown SILTY SAND, trace to some gravel, trace clay, black staining (odours), occasional black fine to medium sand layer		3.51	7	50 DO	>80				
4				53.27							
		Very dense grey brown silty sand to sandy silt, trace to some gravel, occasional fine to course sand layer (GLACIAL TILL)		4.07	8	50 DO	42				
					9	50 DO	170				
5					10	50 DO	>130				
					11	50 DO	>160				
				51.45							
6		End of Borehole Auger Refusal		5.89							
7											
8											
9											
10											

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: RI

CHECKED: JW

MIS-BHS 001 1111220199.GPJ GAL-MIS.GDT 1/28/13 JEM

PROJECT: 11-1122-0199

RECORD OF BOREHOLE: 11-23

SHEET 1 OF 1

LOCATION: See Site Plan

BORING DATE: December 6, 2011

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		56.36							
0	Power Auger 200 mm Diam. (Hollow Stem)	TOPSOIL		0.00							
		Compact brown fine to medium sand, trace silt, gravel, clay, brick, ash and mortar (FILL)		0.15	1	50 DO	13				
1					2	50 DO	11				
					3	50 DO	15				
2				54.23	4	50 DO	46				
		Compact gravel layer (FILL)		2.13							
		Compact light brown to grey fine to medium sand, some gravel, trace brick, ash and mortar (FILL)		2.29	5	50 DO	18				
3				53.31							
		Loose layers of brick, brown silty sand, mortar, ash, fine to medium dark brown sand, and concrete, construction debris (FILL)		3.05	6	50 DO	6				
				52.75							
		Loose black silty sand, trace ash, slag, occasional layers of medium brown sand, gravel, brick, clay (FILL)		3.61	7	50 DO	7				
4				52.09							
		Compact dark grey SILTY CLAY, trace gravel, trace brick		4.27	8	50 DO	32				
				51.46							
5		End of Borehole Auger Refusal		4.90							
6											
7											
8											
9											
10											

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: BM

CHECKED: JW

MIS-BHS 001 1111220199.GPJ GAL-MIS.GDT 1/28/13 JEM

PROJECT: 11-1122-0199

RECORD OF BOREHOLE: 11-24

SHEET 1 OF 1

LOCATION: See Site Plan

BORING DATE: December 5 & 6, 2011

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ●, rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp — W — Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0		GROUND SURFACE		59.48							
	Power Auger 200 mm Diam. (Hollow Stem)	Very loose dark brown silty sand, trace clay, organics (TOPSOIL)		0.00 / 0.10	1	50 DO	4				
		Very loose to very dense dark brown silty sand, trace clay, trace gravel, brick, concrete, mortar, ash, metal, slag, concrete slab, grey crushed stone (FILL)			2	50 DO	8				
1					3	50 DO	4				
					4	50 DO	53				
2				57.35							
		Very dense to dense brown grey SILTY SAND, some gravel, ashes on top of layer		2.13	5	50 DO	34				
				56.43							
3		Dense to very dense grey SILTY SAND, trace to some gravel, black staining (strong odours) (GLACIAL TILL)		3.05	6	50 DO	43				
					7	50 DO	>70				
4					8	50 DO	175				
				54.60							
		Very dense grey SILTY SAND to SANDY SILT, trace to some gravel, odours (GLACIAL TILL)		4.88	9	50 DO	>150				
5					10	50 DO	180				
					11	50 DO	>150				
6					12	50 DO	>100				
					13	50 DO	>50				
7				51.86							
		Very dense grey SILTY SAND to SANDY SILT, trace to some gravel, slight odours (GLACIAL TILL)		7.62	14	50 DO	>100				
8					15	50 DO	134				
					16	50 DO	125				
9					17	50 DO	>100				
					18	50 DO	>50				
10				49.37							
		End of Borehole Auger Refusal		10.11							
11											

DEPTH SCALE

1 : 55

Golder Associates

LOGGED: RI

CHECKED: JW

MIS-BHS 001 1111220199.GPJ GAL-MIS.GDT 1/28/13 JEM

PROJECT: 11-1122-0199

RECORD OF BOREHOLE: 11-25

SHEET 1 OF 1

LOCATION: See Site Plan

BORING DATE: December 7, 2011

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		57.24							
0	Power Auger 200 mm Diam. (Hollow Stem)	TOPSOIL		0.00							
		Loose to compact brown fine to medium sand, trace silt, gravel, ash, brick and mortar (FILL)		0.15	1	50 DO	7				
1					2	50 DO	9				
				55.72	3	50 DO	14				
		Compact grey clay (FILL)		1.52							
		Compact dark brown to black silty sand (FILL)		1.68	4	50 DO	40				
2				54.80							
		Compact brown fine to medium sand, trace gravel, trace concrete (FILL)		2.44							
				54.50	5	50 DO	14				
		Compact dark brown to black silty sand, some mica fragments (FILL)		2.74							
3				53.89	6	50 DO	8				
		Compact to dense grey fine to medium SAND, some gravel, trace silt (GLACIAL TILL)		3.35	7	50 DO	>50				
4					8	50 DO	68				
					9	50 DO	>50				
5				52.01							
		End of Borehole Auger Refusal		5.23							
6											
7											
8											
9											
10											

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: BM

CHECKED: JW

MIS-BHS 001 1111220199.GPJ GAL-MIS.GDT 1/28/13 JEM

PROJECT: 11-1122-0199

RECORD OF BOREHOLE: 11-26

SHEET 1 OF 1

LOCATION: See Site Plan

BORING DATE: December 6, 2011

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		55.78							
0	Power Auger 200 mm Diam. (Hollow Stem)	TOPSOIL		0.00							
		Loose grey clay, some sand (FILL)		0.13 / 55.32	1	50 DO	9				
		Compact dark brown silty sand, some gravel, trace ash, brick and mortar, occasional layers of fine to coarse sand (FILL)		0.46	2	50 DO	38				
1					3	50 DO	25				
2					4	50 DO	14				
				53.04	5	50 DO	8				
		Very loose black silty sand, trace ash, brick, wood and gravel, occasional layers of fine sand (FILL)		2.74							
3					6	50 DO	4				
					7	50 DO	9				
4				51.51							
		Very dense grey brown fine to medium SAND, some silt and gravel (GLACIAL TILL)		4.27	8	50 DO	110				
				50.78	9	50 DO	>75				
5		End of Borehole Auger Refusal		5.00							
6											
7											
8											
9											
10											

DEPTH SCALE
1 : 50

Golder Associates

LOGGED: BM
CHECKED: JW

MIS-BHS 001 1111220199.GPJ GAL-MIS.GDT 1/28/13 JEM

PROJECT: 11-1122-0199

RECORD OF BOREHOLE: 11-28

SHEET 1 OF 3

LOCATION: See Site Plan

BORING DATE: December 8, 2011

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		57.59							
0	Power Auger 200 mm Diam. (Hollow Stem)	Very loose brown medium to fine sand (FILL)		0.00 / 57.13	1	50 DO	2				
		Compact black silty sand, some gravel, trace ash (FILL)		0.46 / 56.37	2	50 DO	17				
1		Loose to compact brown medium to fine SAND, some gravel, trace silt and brick		1.22 / 54.85	3	50 DO	13				
					4	50 DO	5				
2		Very dense brown to grey fine to medium SAND, trace gravel and silt (GLACIAL TILL)		2.74	5	50 DO	70				
					6	50 DO	>50				
3					7	50 DO	112				
					8	50 DO	119				
4					9	50 DO	>60				
					10	50 DO	108				
5					11	50 DO	>100				
					12	50 DO	>90				
6		Compact grey SILTY CLAY, some sand, trace gravel (GLACIAL TILL)		7.62 / 49.97	13	50 DO	80				
					14	50 DO	42				
7	Rotary Drill NQ Core	Grey CLAYEY SILT, some sand, trace gravel, with cobbles and boulders (GLACIAL TILL)		8.84 / 48.75	C1	NQ RC	DD				
		Fresh, medium bedded, grey LIMESTONE BEDROCK, with thin beds of black shale		9.53 / 48.06	C2	NQ RC	DD				
8											
9											
10		*CONTINUED NEXT PAGE*									

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: BM

CHECKED: JW

MIS-BHS 001 1111220199.GPJ GAL-MIS.GDT 1/28/13 JEM

PROJECT: 11-1122-0199

RECORD OF BOREHOLE: 11-28

SHEET 2 OF 3

LOCATION: See Site Plan

BORING DATE: December 8, 2011

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80)	SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3})	WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		--- CONTINUED FROM PREVIOUS PAGE ---											
10	Rotary Drill NQ Core	Fresh, medium bedded, grey LIMESTONE BEDROCK, with thin beds of black shale			C2	NQ RC	DD						
11					C3	NQ RC	DD						
				45.90									
		End of Borehole Auger Refusal		11.69									
12													
13													
14													
15													
16													
17													
18													
19													
20													

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: BM

CHECKED: JW

MIS-BHS 001 1111220199.GPJ GAL-MIS.GDT 1/28/13 JEM

PROJECT: 11-1122-0199

RECORD OF DRILLHOLE: 11-28

SHEET 3 OF 3

LOCATION: See Site Plan

DRILLING DATE: December 8, 2011

DATUM: Geodetic

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 850

DRILLING CONTRACTOR: Marathon Drilling

JN - Joint, FLT - Fault, SHR- Shear, VN - Vein, CJ - Conjugate; BD- Bedding, FO- Foliation, CO- Contact, OR- Orthogonal, CL - Cleavage; PL - Planar, CU- Curved, UN- Undulating, ST - Stepped, IR - Irregular; PO- Polished, K - Slickensided, SM- Smooth, Ro - Rough, MB- Mechanical Break; BR - Broken Rock

NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	RUN No.	COLOUR / % RETURN / FLUSH	RECOVERY: TOTAL CORE %	RECOVERY: SOLID CORE %	R.Q.D. %	FRACT. INDEX PER 0.3 m	DISCONTINUITY DATA: B Angle	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	Jr	Ja	Jn	HYDRAULIC CONDUCTIVITY K, cm/sec	Diametral Point Load Index (MPa)	RMC -Q' AVG.
		BEDROCK SURFACE		48.75															
9	Rotary Drill / NQ Core	Grey CLAYEY SILT, some sand, trace gravel, with cobbles and boulders (GLACIAL TILL)		8.84	C1														
				48.06															
		Fresh, medium bedded, grey LIMESTONE BEDROCK, with thin beds of black shale		9.53	C2														
10																			
11					C3														
				45.90															
		End of Drillhole		11.69															
12																			
13																			
14																			
15																			
16																			
17																			
18																			

DEPTH SCALE

1 : 50

LOGGED: BM

CHECKED: JW

Golder Associates

MIS-RCK 004 1111220199.GPJ GAL-MISS.GDT 1/28/13 JEM

PROJECT: 11-1122-0199

RECORD OF BOREHOLE: 11-29

SHEET 1 OF 1

LOCATION: See Site Plan

BORING DATE: December 5, 2011

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		55.66							
0	Power Auger 200 mm Diam. (Hollow Stem)	ORGANICS/TOPSOIL		0.00							
		Compact brown fine to medium sand, trace silt, gravel and ash (FILL)		0.15 55.05	1	50 DO	11				
1		Loose to compact dark brown to black silty sand, trace ash and gravel (FILL)		0.61	2	50 DO	11				
					3	50 DO	3				
				53.98							
2		Loose to very loose brown fine to medium SAND		1.68 53.37	4	50 DO	5				
		Compact dark brown to black SILTY SAND, trace gravel and clay		2.29	5	50 DO	14				
3				52.61							
		Loose dark brown SAND and GRAVEL		3.05 52.05	6	50 DO	6				
		Compact dark grey to grey SILTY SAND, trace gravel		3.61	7	50 DO	28				
4					8	50 DO	49				
				50.78							
5		Dense dark grey to grey SILTY SAND, trace gravel (GLACIAL TILL)		4.88	9	50 DO	90				
					10	50 DO	42				
6				49.49							
		End of Borehole Auger Refusal		6.17							
7											
8											
9											
10											

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: BM

CHECKED: JW

MIS-BHS 001 1111220199.GPJ GAL-MIS.GDT 1/28/13 JEM

PROJECT: 11-1122-0199

RECORD OF BOREHOLE: 11-31

SHEET 1 OF 1

LOCATION: See Site Plan

BORING DATE: December 2, 2011

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		58.81							
0	Power Auger 200 mm Diam. (Hollow Stem)	TOPSOIL		0.00 / 58.61							
		Compact fine to medium light brown sand, trace silt (FILL)		0.20 / 58.20	1	50 DO	12				
1		Loose dark brown silty sand, trace gravel, ash and brick (FILL)		0.61 / 57.64	2	50 DO	7				
		Very loose construction debris made up of layers of brick, ash, slag, mortar, insulation, and wood (FILL)		1.17 / 56.37	3	50 DO	2				
2					4	50 DO	9				
		Compact light brown to grey fine to medium SAND, trace silt and gravel		2.44 / 55.15	5	50 DO	15				
3					6	50 DO	42				
		Dense to very dense grey brown fine to medium SAND, trace silt and gravel (GLACIAL TILL)		3.66 / 53.32	7	50 DO	75				
4					8	50 DO	65				
5					9	50 DO	84				
		Very dense grey fine to coarse SAND, some silt, trace gravel (GLACIAL TILL)		5.49 / 52.18	10	50 DO	97				
6					11	50 DO	69				
		End of Borehole Auger Refusal		6.63							
7											
8											
9											
10											

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: BM

CHECKED: JW

MIS-BHS 001 1111220199.GPJ GAL-MIS.GDT 1/28/13 JEM

PROJECT: 11-1122-0199

RECORD OF BOREHOLE: 11-32

SHEET 1 OF 1

LOCATION: See Site Plan

BORING DATE: December 5, 2011

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		56.18							
0	Power Auger 200 mm Diam. (Hollow Stem)	TOPSOIL		0.00							
		Loose brown silty sand, some gravel (FILL)		0.15 / 55.57	1	50 DO	8				
1		Loose to compact brown fine to medium sand, some gravel, trace brick, mortar and slag (FILL)		0.61	2	50 DO	9				
					3	50 DO	20				
2					4	50 DO	4				
		Loose brown to black fine to medium silty sand, occasional wood, brick, mortar, ceramic, trace clay (FILL)		53.74 / 2.44	5	50 DO	4				
3					6	50 DO	8				
		Compact grey SANDY SILT, trace gravel and clay		52.83 / 3.35	7	50 DO	42				
4					8	50 DO	34				
		Dense grey SANDY SILT, trace gravel and clay (GLACIAL TILL)		51.30 / 4.88	9	50 DO	>50				
5					10	50 DO	63				
		End of Borehole		50.21 / 5.97							
6											
7											
8											
9											
10											

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: BM

CHECKED: JW

MIS-BHS 001 1111220199.GPJ GAL-MIS.GDT 1/28/13 JEM

PROJECT: 11-1122-0199

RECORD OF BOREHOLE: 11-33

SHEET 1 OF 1

LOCATION: See Site Plan

BORING DATE: December 8, 2011

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ●, rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp W Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		62.22							
0	Power Auger 200 mm Diam. (Hollow Stem)	Dense dark grey crushed stone (Gravel lot BASE)		0.08	1	50 DO	46				
		Dense brown fine to medium sand, some coarse sand, some gravel, trace silt (Gravel lot SUBBASE)		61.69							
1		Loose to very dense dark brown silty sand, trace to some gravel, brick, wood, organics, concrete, occasional grey silty clay layer (FILL)		0.53	2	50 DO	9				
					3	50 DO	60				
2					4	50 DO	12				
					5	50 DO	56				
				59.32							
3		Compact to very dense brown to grey brown SILTY SAND to SANDY SILT, trace to some gravel (GLACIAL TILL)		2.90	6	50 DO	23				
					7	50 DO	48				
4					8	50 DO	74				
					9	50 DO	49				
5					10	50 DO	55				
					11	50 DO	>89				
6					12	50 DO	>100				
					13	50 DO	>100				
7					14	50 DO	>100				
				54.60							
		Very dense grey brown SILTY SAND, trace to some gravel, occasional grey silt seam, occasional fine to medium sand seam (GLACIAL TILL)		7.62	15	50 DO	>111				
8					16	50 DO	>105				
					17	50 DO	>50				
9					18	50 DO	>100				
					19	50 DO	>50				
				52.26	20	50 DO	>110				
10		End of Borehole Split Spoon Refusal		9.96							
11											

DEPTH SCALE

1 : 55

Golder Associates

LOGGED: RI

CHECKED: JW

MIS-BHS 001 1111220199.GPJ GAL-MIS.GDT 1/28/13 JEM

PROJECT: 11-1122-0199

RECORD OF BOREHOLE: 11-35

SHEET 1 OF 1

LOCATION: See Site Plan

BORING DATE: December 12, 2011

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp — W — Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		62.56							
0	Power Auger 200 mm Diam. (Hollow Stem)	Dense grey sand and gravel (Gravel lot BASE)		0.00 / 62.25	1	50 DO	52				
		Compact brown medium to fine sand, trace gravel (Gravel lot SUBBASE)		0.31 / 61.65	2	50 DO	17				
1		Compact dark brown to black silty sand, trace gravel, ash, wood, brick, mortar (FILL)		0.91 / 60.88	3	50 DO	19				
		Compact brown fine to medium sand, trace gravel (FILL)		1.68 / 60.43	4	50 DO	24				
2		Dense to very dense light brown to brown SILTY SAND, occasional gravel and medium sand layers, trace gravel (GLACIAL TILL)		2.13	5	50 DO	45				
					6	50 DO	65				
3					7	50 DO	176				
4					8	50 DO	>50				
				58.16							
		End of Borehole Auger Refusal		4.40							
5											
6											
7											
8											
9											
10											

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: BM

CHECKED: JW

MIS-BHS 001 1111220199.GPJ GAL-MIS.GDT 1/28/13 JEM

PROJECT: 11-1122-0199

RECORD OF BOREHOLE: 11-37

SHEET 1 OF 1

LOCATION: See Site Plan

BORING DATE: December 12, 2011

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp — W — Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		62.76							
0	Power Auger 200 mm Diam. (Hollow Stem)	Compact sand and gravel (Gravel lot BASE)		0.00							
				62.46	1	50 DO	29				
		Compact brown medium to fine sand, trace gravel (Gravel lot SUBBASE)		0.30							
				61.85	2	50 DO	20				
1		Loose dark brown to black silty sand, trace gravel, occasional layers of ash, gravel, sandy mortar, glass, construction debris (FILL)		0.91	3	50 DO	6				
2				60.63	4	50 DO	34				
		Compact brown medium to fine sand, trace gravel (FILL)		2.13							
				60.32							
		Dense to very dense grey brown SILTY SAND, some gravel, trace cobbles (GLACIAL TILL)		2.44	5	50 DO	73				
3					6	50 DO	>75				
4					7	50 DO	>65				
					8	50 DO	>75				
5					9	50 DO	40				
6					10	50 DO	>50				
				56.23							
		End of Borehole Auger Refusal		6.53							
7											
8											
9											
10											

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: BM

CHECKED: JW

MIS-BHS 001 1111220199.GPJ GAL-MIS.GDT 1/28/13 JEM

PROJECT: 11-1122-0199

RECORD OF BOREHOLE: 11-38

SHEET 1 OF 1

LOCATION: See Site Plan

BORING DATE: December 19, 2011

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		62.11							
0	Power Auger 200 mm Diam. (Hollow Stem)	Compact to dense brown sand and gravel (Gravel lot BASE)		0.00							
		Loose to compact brown medium to fine sand, some gravel (Gravel lot SUBBASE)		0.10	1	50 DO	35				
1					2	50 DO	8				
				60.89							
		Compact to very dense grey brown sand, some gravel, trace silt (FILL)		1.22	3	50 DO	15				
2					4	50 DO	52				
				59.67							
		Very dense grey brown SILTY SAND, some gravel, medium brown sand seams (GLACIAL TILL)		2.44	5	50 DO	61				
3					6	50 DO	112				
					7	50 DO	148				
4				57.94							
		End of Borehole Auger Refusal		4.17							
5											
6											
7											
8											
9											
10											

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: JDR

CHECKED: JW

MIS-BHS 001 1111220199.GPJ GAL-MIS.GDT 1/28/13 JEM

PROJECT: 11-1122-0199

RECORD OF BOREHOLE: 11-39

SHEET 1 OF 1

LOCATION: See Site Plan

BORING DATE: December 15, 2011

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		62.81							
0	Power Auger 200 mm Diam. (Hollow Stem)	Compact sand and gravel (Gravel lot BASE)		0.00							
		Compact brown to red sandy silt, trace gravel (FILL)		0.15	1	50 DO	15				
				61.90	2	50 DO	20				
1		Compact to dense light brown fine to medium sand, trace gravel, silt, and mortar (FILL)		0.91	3	50 DO	40				
2				60.68	4	50 DO	120				
		Dense sandy gravel to brown fine to medium sand and gravel (FILL)		2.13	5	50 DO	67				
3					6	50 DO	99				
				59.15							
		Compact to very dense grey SILTY SAND, some gravel (GLACIAL TILL)		3.66	7	50 DO	34				
4					8	50 DO	27				
5					9	50 DO	33				
					10	50 DO	>50				
6					11	50 DO	>100				
				56.46	12	50 DO	>100				
		End of Borehole Auger Refusal		6.35							
7											
8											
9											
10											

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: BM/JD

CHECKED: JW

MIS-BHS 001 1111220199.GPJ GAL-MIS.GDT 1/28/13 JEM

PROJECT: 11-1122-0199

RECORD OF BOREHOLE: 11-40

SHEET 1 OF 1

LOCATION: See Site Plan

BORING DATE: December 16, 2011

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		62.77							
0	Power Auger 200 mm Diam. (Hollow Stem)	Compact red to fine brown sand, some gravel (Gravel lot BASE)		0.00 / 62.39	1	50 DO	13				
		Compact fine to medium brown sand, some gravel, red brick (FILL)		0.38 / 61.55	2	50 DO	19				
1		Compact light brown fine to medium sand, trace gravel, silt, red brick (FILL)		1.22 / 59.78	3	50 DO	15				
					4	50 DO	25				
2					5	50 DO	51				
		Very dense grey brown SAND, some gravel, trace silt (GLACIAL TILL)		2.99 / 59.11	6	50 DO	59				
3		Very dense grey brown SILTY SAND, some gravel (GLACIAL TILL)		3.66 / 56.52	7	50 DO	100				
					8	50 DO	>50				
4					9	50 DO	>100				
					10	50 DO	187				
5					11	50 DO	>50				
		End of Borehole Auger Refusal		6.25							
6											
7											
8											
9											
10											

DEPTH SCALE

1 : 50

LOGGED: JD

CHECKED: JW

Golder Associates

MIS-BHS 001 1111220199.GPJ GAL-MIS.GDT 1/28/13 JEM

Log of Borehole 2-218

Trow

Auger Sample ⊠
SPT (N) Value ○○ ▨ Natural Moisture ✖
Dynamic Cone Test —— Plastic & Liquid Limit ⊢—⊣
Shelby Tube ●● ■ Undrained Triaxial at 0
Rock Core ▩ Overburden Pressure 15 ⊕ 5
Field Vane Test + S % Strain at Failure 10
Penetrometer ▲
Water Level: Est.: ▽ Measured: ▼ Perched: ▼

Project Geotechnical Investigation Dwg. No. 19

Lebreton Flats Infrastructure and Rehabilation Project

Ottawa, Ontario Project No. MA15510A

Borehole Location Refer to Drawing No. 1

GWL	SYMBOL	Soil Description	Geodetic Elev. m	Depth	N Value / Shear Strength (20 40 60 80)	Natural Moisture Content and Atterberg Limits % Dry Weight (10 20 30)	Natural Unit Weight KN/m³
		TOPSOIL ~ 75mm **FILL** Silty sand with some gravel, trace concrete and brick pieces, occasional cobbles and boulders, grey, wet (compact)	58.1	0	○		
				1			
				2	○		
			55.1	3	○		
		FILL Silty sand and gravel, occasional cobbles and boulders, some clay , moist, grey to dark grey (loose to compact)		4	○ Bouncing		
				5			
▽			52.7	6	○		
				7			
		-Sand blow-up into augers from 8.2 to 7.2m depth		8	○		
				9	○		
				10			

Log of Borehole 2-218

Trow

Auger Sample ⊠
SPT (N) Value ○○ ▨ Natural Moisture ✖
Dynamic Cone Test —— Plastic & Liquid Limit ⊢——
Shelby Tube ●● ■ Undrained Triaxial at 0
Rock Core ▩ Overburden Pressure 15 ⊕ 5
Field Vane Test + S % Strain at Failure 10
Penetrometer ▲
Water Level: Est.: ▽ Measured: ▼ Perched: ▼

Project Geotechnical Investigation Dwg. No. 19(cont)

Lebreton Flats Infrastructure and Rehabilation Project

Ottawa, Ontario Project No. MA15510A

Borehole Location Refer to Drawing No. 1

GWL	SYMBOL	Soil Description	Geodetic Elev. m	Depth	N Value / Shear Strength (20 40 60 80)	Natural Moisture Content and Atterberg Limits % Dry Weight (10 20 30)	Natural Unit Weight KN/m³
			47.0	11			
		LIMESTONE BEDROCK Refer to core log on next page		12			
				13			
				14			
				15			
			42.1	16			
		Terminated @16.0m					

NOTES:
1. Borehole data requires interpretation assistance from Trow before use by others
2. Borehole drilled on May 9, 2002 using a CME-55 truck/track mounted drill rig to a termination depth at 15.9m.
3. A 13 mm slotted standpipe was installed in the borehole
4. See Notes on Sample Descriptions
5. This Drawing to be read with Trow Consulting Engineers report MA15510A

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
18days	5.5	
26days	5.4	

CORE DRILLING RECORD

Run No.	Depth (m)	% Rec.	RQD %
1			
2			
3			
4			

Notes: Borehole core drilled using NQ core barrel from 9.1 to 16.0m

JACQUES WHITFORD
ENVIRONMENT LIMITED

MONITORING WELL RECORD

MW03-22

CLIENT Robinson Consultants Inc. PROJECT No. ONO11359-4 ORIGINATED BY CM/EK

LOCATION Lemieux Island Low Pressure Transmission Main, Ottawa, ON DATUM Geodetic COMPILED BY JF

DATES: BORING 05-30-03 WATER LEVEL 06-26-03 TPC ELEV. 54.55 CHECKED BY CM

DEPTH (m)	ELEVATION (m)	STRATA DESCRIPTION	STRATA PLOT	WATER LEVEL	DEPTH (ft)	VAPOUR CONCENTRATIONS ● %LEL ▲ ppmv	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES N-VALUE	WELL CONSTRUCTION
						● 20 40 60 80 ▲ 100 200 300 400				
0	**54.63**									
	54.5	100 mm ASPHALT					GS	1	---	Protective Casing and Bentonite Seal
	54.4	Granulars								
1		Compact to loose, grey to brown sand and gravel, some brick, some wood: FILL		▽	2	▲	SS	2	21	Bentonite Seal
					4	▲	SS	3	9	51 mm, Schedule 40, PVC Casing, with Sandpack
2					6		SS	4	6	Protective Casing and Concrete Seal
					8	▲	SS	5	7	
3					10		SS	6	7	
	51.0				12		SS	7	3	
4		Very loose, sandy gravel, trace organics, wood: FILL								
	50.4				14	▲	SS	8	2	
		Very loose to compact, grey clay, trace gravel, wood: FILL			16					
5						▲	SS	9	15	
	49.1				18					
		Compact to dense, grey silty sand, some clay: GLACIAL TILL					SS	10	21	
6					20					Backfill of Auger Cuttings
							SS	11	25	
					22					
7	47.4						SS	12	50/80mm	
		End of Borehole			24					
		Auger Refusal on Inferred Bedrock								
8					26					
		Monitoring Well Installed								
					28					
9										
					30					
					32					
10										

LABORATORY ANALYSES: MW03-22 SS8 submitted for analysis of BTEX, TPH (g, d, ho), and VOCs. MW03-22 SS6 submitted for PAHs. MW03-22 SS2 submitted for analysis of general inorganics. Groundwater sample submitted for analysis of BTEX, TPH (g, d, ho), VOCs, PAHs and general inorganics.

▽ Groundwater Level

JWE ...4.GP ...GDT ...

JACQUES WHITFORD
ENVIRONMENT LIMITED

MONITORING WELL RECORD

MW03-23

CLIENT: Robinson Consultants Inc.
PROJECT No. ONO11359-4
ORIGINATED BY: CM/EK

LOCATION: Lemieux Island Low Pressure Transmission Main, Ottawa, ON
DATUM: Geodetic
COMPILED BY: JF

DATES: BORING 05-30-03
WATER LEVEL 06-26-03
TPC ELEV. 55.669
CHECKED BY: CM

Ground surface elevation: 55.76

DEPTH (m)	ELEVATION (m)	STRATA DESCRIPTION
0	55.7	100 mm ASPHALT
	55.6	Grey sand and gravel: FILL
		Compact, brown sand: FILL
	54.5	Compact, grey sand, brick, wood: FILL
	53.9	Dense to loose, brown to grey sand and gravel: FILL
	52.1	Loose to very loose, grey gravel, some sand, some rock fragments: FILL
	49.7	Loose to compact, grey silty sand: GLACIAL TILL
	48.1	Compact to dense, grey to brown silty sand, trace gravel: GLACIAL TILL
	46.0	

Water level (▽) recorded at approximately 2.7 m depth.

VAPOUR CONCENTRATIONS: ● %LEL (20, 40, 60, 80); ▲ ppmv (100, 200, 300, 400)

SAMPLE TYPE	NUMBER	N-VALUE
GS	1	---
SS	2	12
SS	3	29
SS	4	45
SS	5	5
SS	6	11
SS	7	8
SS	8	3
SS	9	3
SS	10	7
SS	11	6
SS	12	14
SS	13	32
SS	14	70
SS	15	50/ 100mm

WELL CONSTRUCTION:
- Protective Casing and Bentonite Seal
- Bentonite Seal
- 51 mm, Schedule 40, PVC Casing, with Auger Cuttings
- Bentonite Seal

LABORATORY ANALYSES: MW03-23 SS12 submitted for analysis of BTEX, TPH (g, d, ho), and VOCs. MW03-23 SS3 submitted for analysis of Regulation 347, PAHs and general inorganics.
Groundwater sample submitted for analysis of BTEX, TPH (g, d, ho), VOCs, PAHs and general inorganics.

▽ Groundwater Level

A-

JACQUES WHITFORD
ENVIRONMENT LIMITED

MONITORING WELL RECORD

MW03-23

CLIENT Robinson Consultants Inc. PROJECT No. ONO11359-4 ORIGINATED BY CM/EK

LOCATION Lemieux Island Low Pressure Transmission Main, Ottawa, ON DATUM Geodetic COMPILED BY JF

DATES: BORING 05-30-03 WATER LEVEL 06-26-03 TPC ELEV. 55.669 CHECKED BY CM

DEPTH (m)	ELEVATION (m)	STRATA DESCRIPTION	STRATA PLOT	WATER LEVEL	DEPTH (ft)	VAPOUR CONCENTRATIONS ● %LEL ▲ ppmv (● 20 40 60 80; ▲ 100 200 300 400)	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES N-VALUE	WELL CONSTRUCTION
10	55.76	Poor to good, light grey limestone with occasional shale interbeds: BEDROCK			34		HQ	16	49 %	51 mm, Schedule 40, PVC Casing, with Sandpack
11					36		HQ	17	80 %	51 mm, Schedule 40, slot #10, PVC Screen with Sandpack
	44.0	End of Borehole			38					
12		Monitoring Well Installed			40					
13					42, 44					
14					46, 48					
15					50					
16					52, 54					
17					56, 58					
18					60					
19					62, 64					
20										

LABORATORY ANALYSES: MW03-23 SS12 submitted for analysis of BTEX, TPH (g, d, ho), and VOCs. MW03-23 SS3 submitted for analysis of Regulation 347, PAHs and general inorganics. Groundwater sample submitted for analysis of BTEX, TPH (g, d, ho), VOCs, PAHs and general inorganics.

∇ Groundwater Level

A-

BOREHOLE STRATIGRAPHIC AND INSTRUMENTATION LOG

Borehole Number: BH06-9/MW06-9

MOE Well ID: A029553

Project Number: 05-215-20

Date Completed: June 21, 2006

Client: National Capital Commission

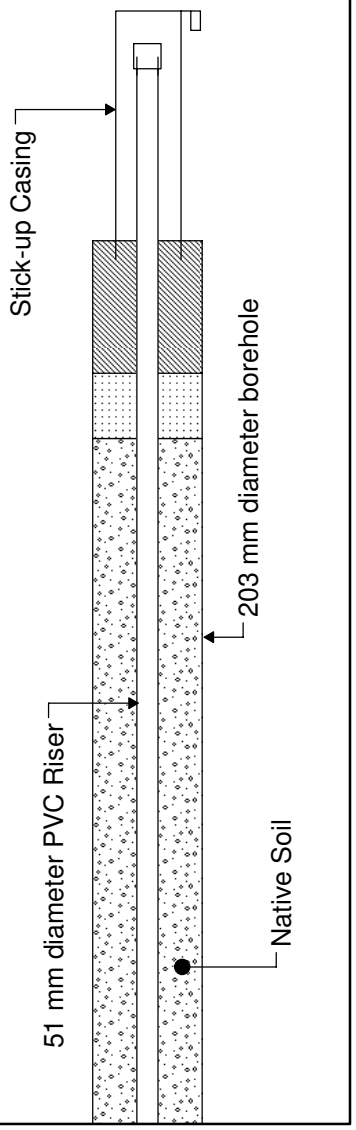
Supervisor: ADG/SNG

Site Location: Municipal Lands

Ground Surface Elevation: 61.58 mASL

Coordinates: MTM NAD83 - 365843 E, 5030527N

Drilling Method: Hollow stem auger with split spoon

DEPTH BGS (ft / m)	SAMPLES	LAB SAMPLE	BLOW COUNT	CGI (ppm)	PID (ppm)	LOG	STRATIGRAPHIC DESCRIPTION	INSTALLATION
-4 to 13 ft; 0 to 3 m							GROUND SURFACE	
0 m			9 50	0			FILL Brown topsoil.	
							Brown silty sand fill with organic material near surface. Dry, no odour.	
1 m			7 21 15 11	0			Brown silty sand fill with some clay and trace gravel. Moist, no odour.	
			7 14 10 6	2			Dark brown sand and gravel fill. Dry, no odour.	
2 m			5 7 10 10	0			Brown silty sand fill with trace gravel. Dry, no odour.	
3 m			8 24 9 5	3			Grey silt fill with some clay. Moist, no odour.	
							Black sand fill with some silt and gravel. Wet, landfill odour.	

BOREHOLE STRATIGRAPHIC AND INSTRUMENTATION LOG

Borehole Number: BH06-9/MW06-9

MOE Well ID: A029553

Project Number: 05-215-20

Date Completed: June 21, 2006

Client: National Capital Commission

Supervisor: ADG/SNG

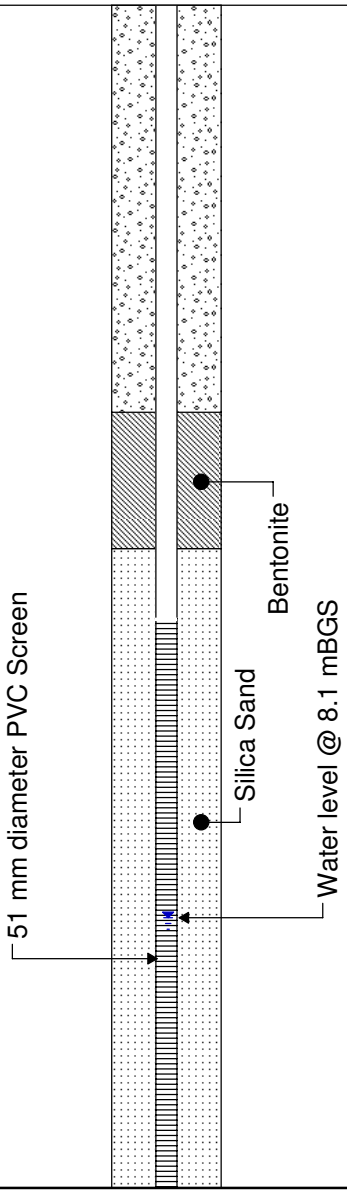
Site Location: Municipal Lands

Ground Surface Elevation: 61.58 mASL

Coordinates: MTM NAD83 - 365843 E, 5030527N

Drilling Method: Hollow stem auger with split spoon

DEPTH BGS	SAMPLES	LAB SAMPLE	BLOW COUNT	CGI (ppm)	PID (ppm)	LOG	STRATIGRAPHIC DESCRIPTION	INSTALLATION
4			3 3 4 3	2				
14								
15			4 4 50	2			Silty sand fill with some clay and wood fragments. Wet, no odour.	
16								
5								
17								
18			50				Boulder (no recovery)	
19								
6								
20			46 20 12 50	4			Grey sand fill with some gravel. Slightly moist, landfill odour.	
21								
22								
23			25 32 43 14	3				
7								
24								
25								
26		X	8 6 4 8	35			Minor brick fragments.	
8								
27								
28			15 7 5 9	25			Hydrocarbon odour.	
29								
9								
30								



BOREHOLE STRATIGRAPHIC AND INSTRUMENTATION LOG

Borehole Number: BH06-9/MW06-9

MOE Well ID: A029553

Project Number: 05-215-20

Date Completed: June 21, 2006

Client: National Capital Commission

Supervisor: ADG/SNG

Site Location: Municipal Lands

Ground Surface Elevation: 61.58 mASL

Coordinates: MTM NAD83 - 365843 E, 5030527N

Drilling Method: Hollow stem auger with split spoon

DEPTH BGS	SAMPLES	LAB SAMPLE	BLOW COUNT	CGI (ppm)	PID (ppm)	LOG	STRATIGRAPHIC DESCRIPTION	INSTALLATION
31			2 1 1 1	50			Sandy fill with glass and paper debris. Wet, landfill odour. Borehole terminated at 9.8 mBGS.	
32							BOREHOLE TERMINATED	Depth of MW06-9 = 9.8 mBGS
33 – 10								
34								
35								
36 – 11								
37								
38								
39 – 12								
40								
41								
42								
43 – 13								
44								
45								
46 – 14								
47								

BOREHOLE STRATIGRAPHIC AND INSTRUMENTATION LOG

Borehole Number: BH06-11/MW06-11

MOE Well ID: A029553

Project Number: 05-215-20

Date Completed: June 21, 2006

Client: National Capital Commission

Supervisor: ADG

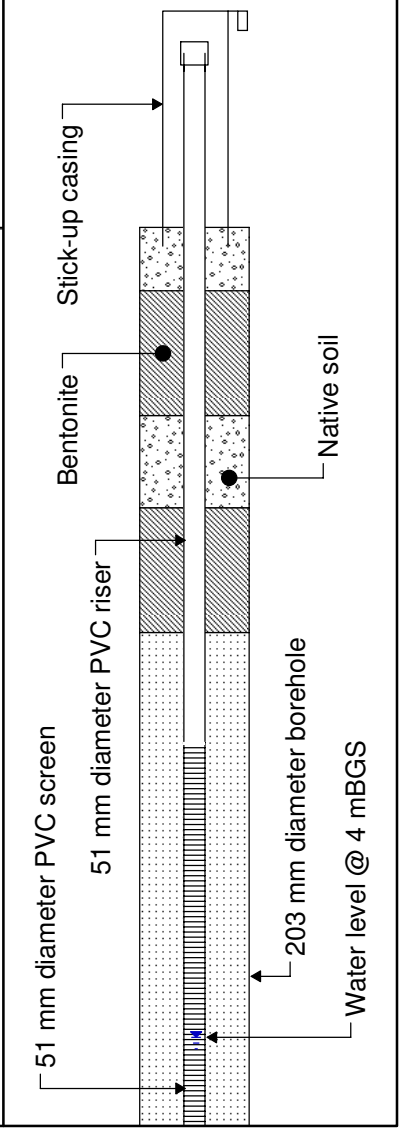
Site Location: Municipal Lands

Ground Surface Elevation: 56.80 mASL

Coordinates: MTM NAD83 - 365928 E, 5030683 N

Drilling Method: Hollow stem auger with split spoon

DEPTH BGS (ft / m)	SAMPLES	LAB SAMPLE	BLOW COUNT	CGI (ppm)	PID (ppm)	LOG	STRATIGRAPHIC DESCRIPTION	INSTALLATION
0 ft / 0 m							GROUND SURFACE	
0 – 1 ft			7 11 50	0			FILL Brown sand fill with gravel and brick. Dry, no odour.	
2 – 3 ft			16 14 22 27	0				
4 – 5 ft			1 5 5 10	0				
6 – 7 ft			6 9 6 10	0				
8 – 9 ft			4 4 21 19	0			Brown sand fill with gravel and minor silt. 12 cm of rock fragments. Dry, no odour.	
10 – 11 ft			20 50	0			Brown sand and gravel fill. Dry, no odour.	
12 – 13 ft								
14 ft								



BOREHOLE STRATIGRAPHIC AND INSTRUMENTATION LOG

Borehole Number: BH06-11/MW06-11

MOE Well ID: A029553

Project Number: 05-215-20

Date Completed: June 21, 2006

Client: National Capital Commission

Supervisor: ADG

Site Location: Municipal Lands

Ground Surface Elevation: 56.80 mASL

Coordinates: MTM NAD83 - 365928 E, 5030683 N

Drilling Method: Hollow stem auger with split spoon

DEPTH BGS	SAMPLES	LAB SAMPLE	BLOW COUNT	CGI (ppm)	PID (ppm)	LOG	STRATIGRAPHIC DESCRIPTION	INSTALLATION
15								
16			1					
5			9					
17			5	0			Gravel fill with minor sand. Wet, no odour.	
			50					
18							Borehole terminated at 5.6 mBGS.	
19							BOREHOLE TERMINATED	Silica sand
6								Depth of MW06-11 =5.6 mBGS
20								
21								
22								
7								
23								
24								
25								
26								
8								
27								
28								
29								
9								
30								
31								
32								

PROJECT: 11-1121-0229

RECORD OF BOREHOLE: 13-1

SHEET 1 OF 2

LOCATION: See Site Plan

BORING DATE: March 8, 2013

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-8} 10^{-6} 10^{-4} 10^{-2}) / WATER CONTENT PERCENT (Wp — W — Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		58.72							MON. WELL
0	Power Auger 200 mm Diam. (Hollow Stem)	(SP/GP) SAND and GRAVEL, crushed, inferred presence of cobbles and/or boulders; grey, (FILL); non-cohesive, moist, compact		0.00							Silica Sand
1					1	SS	28				
				57.35							
		(SM) SILTY SAND, some gravel; grey brown; non-cohesive, moist, compact		1.37							
2					2	SS	12				
					3	SS	30		○	MH	Native Backfill and Bentonite Mix
				55.67							
3		(SM) SILTY SAND, some gravel to gravelly, inferred presence of cobbles and/or boulders; grey brown, (GLACIAL TILL); non-cohesive, moist, dense to very dense		3.05							
					4	SS	55		○	MH	
4											
					5	SS	>50				
5											Bentonite Seal
6											
					6	SS	>50				Silica Sand
7	RD NQ										32 mm Diam. PVC #10 Slot Screen
					C1	NQ RC	DD				
				50.75							
8		Borehole continued on RECORD OF DRILLHOLE 13-1									
9											
10											

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: HEC

CHECKED: MJK

MIS-BHS 001 1111210229-1000.GPJ GAL-MIS.GDT 06/07/13 PLG

PROJECT: 11-1121-0229

RECORD OF DRILLHOLE: 13-1

SHEET 2 OF 2

LOCATION: See Site Plan

DRILLING DATE: March 8, 2013

DATUM: Geodetic

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 75

DRILLING CONTRACTOR: Downing Drilling

JN - Joint, FLT - Fault, SHR- Shear, VN - Vein, CJ - Conjugate
BD- Bedding, FO- Foliation, CO- Contact, OR- Orthogonal, CL - Cleavage
PL - Planar, CU- Curved, UN- Undulating, ST - Stepped, IR - Irregular
PO- Polished, K - Slickensided, SM- Smooth, Ro - Rough, MB- Mechanical Break
BR - Broken Rock
NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	RUN No.	COLOUR % RETURN / FLUSH	RECOVERY: TOTAL CORE %	RECOVERY: SOLID CORE %	R.Q.D. %	FRACT. INDEX PER 0.3 m	DISCONTINUITY DATA: B Angle	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	Jr	Ja	Jn	ROCK STRENGTH INDEX: R4	R3	R2	R1	WEATHERING INDEX: W1	W2	W3	W4	Q AVG.	
		BEDROCK SURFACE		50.75																						MON. WELL
8	Rotary Drill / NQ Core	Fresh thinly to medium bedded grey fine to medium grained non-porous strong to very strong nodular LIMESTONE, with black shale partings occasional interlaminates		7.97	1	100							,BD,PL,Ro	1.5	1											
													,BD,IR,Ro	3	1											
													,BD,PL,Ro	1.5	1											
													,BD,PL,Ro	1.5	1											
													,BD,CU,Ro	1.5	1											
9					2	100							,BD,PL,Ro	1.5	1											
													,BD,PL,Ro	1.5	1											
													,BD,PL,Ro	1.5	1											
													,BD,PL,SM	1.5	1											
													,BD,PL,Ro													UCS = 140.8 MPa Bentonite Seal
10		- Broken core from 9.94 m to 9.97 m											,BD,PL,Ro	1.5	1											
					3	100							,BD,PL,Ro	1.5	1											
				48.11									,BD,PL,Ro	1.5	1											
		End of Drillhole		10.61																						W.L. in Screen at Elev. 52.12 m on April 18, 2013
11																										
12																										
13																										
14																										
15																										
16																										
17																										

DEPTH SCALE

1 : 50

LOGGED: HEC

CHECKED: MJK

Golder Associates

MIS-RCK 004 1111210229-1000.GPJ GAL-MISS.GDT 06/07/13 PLG

PROJECT: 11-1121-0229

RECORD OF BOREHOLE: 13-2

SHEET 1 OF 2

LOCATION: See Site Plan

BORING DATE: March 8, 2013

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-8} 10^{-6} 10^{-4} 10^{-2}) / WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		57.40							
0	Power Auger 200 mm Diam. (Hollow Stem)	(SM/SP) gravelly SILTY SAND; grey brown, (FILL); non-cohesive, moist, compact		0.00	1	SS	31				
1					2	SS	28		○	M	
				55.88							
		(SP) SAND, some low to medium plasticity fines, inferred presence of cobbles and/or boulders; grey brown to brown, (FILL); non-cohesive, moist, loose		1.52	3	SS	6			MH	
2				55.27							
		(SM) SILTY SAND, some gravel, inferred presence of cobbles and/or boulders; grey brown, (GLACIAL TILL); non-cohesive, moist to wet, dense to very dense		2.13	4	SS	>50		○	MH	
3					5	SS	>50				
4											
					6	SS	>50				
5											
6											
				51.08	7	SS	>50				
	RD NQ	COBBLES and BOULDERS		6.32	C1	NQ RC	DD				
				50.75							
7		Borehole continued on RECORD OF DRILLHOLE 13-2									
8											
9											
10											

MIS-BHS 001 1111210229-1000.GPJ GAL-MIS.GDT 06/07/13 PLG

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: HEC

CHECKED: MJK

PROJECT: 11-1121-0229

RECORD OF DRILLHOLE: 13-2

SHEET 2 OF 2

LOCATION: See Site Plan

DRILLING DATE: March 8, 2013

DATUM: Geodetic

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 75

DRILLING CONTRACTOR: Downing Drilling

JN - Joint, FLT - Fault, SHR- Shear, VN - Vein, CJ - Conjugate
BD- Bedding, FO- Foliation, CO- Contact, OR- Orthogonal, CL - Cleavage
PL - Planar, CU- Curved, UN- Undulating, ST - Stepped, IR - Irregular
PO- Polished, K - Slickensided, SM- Smooth, Ro - Rough, MB- Mechanical Break
BR - Broken Rock
NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	RUN No.	COLOUR % RETURN FLUSH	RECOVERY TOTAL CORE %	RECOVERY SOLID CORE %	R.Q.D. %	FRACT. INDEX PER 0.3 m	DISCONTINUITY DATA: B Angle	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	DISCONTINUITY DATA: Jr	DISCONTINUITY DATA: Ja	DISCONTINUITY DATA: Jn	ROCK STRENGTH INDEX R4	ROCK STRENGTH INDEX R3	ROCK STRENGTH INDEX R2	ROCK STRENGTH INDEX R1	WEATHERING INDEX W1	WEATHERING INDEX W2	WEATHERING INDEX W3	WEATHERING INDEX W4	Q AVG.	
		BEDROCK SURFACE		50.75																						
7	Rotary Drill / NQ Core	Fresh thinly to medium bedded grey fine to medium grained non-porous strong nodular LIMESTONE, with black shale partings and interlaminates		6.65	1	100							,BD,CU,Ro	1.5	1											
													,BD,CU,Ro	1.5	1											
													,BD,PL,Ro	1.5	1											
													,BD,PL,Ro	1.5	1											
													,BD,PL,Ro	1.5	1											
													,BD,PL,SM	1	1											
													,BD,PL,Ro	1.5	1											
8					2	100							,BD,PL,Ro	1.5	1											
													,BD,PL,SM	1	1											
													,BD,PL,SM	1	1											
													,BD,PL,Ro	1.5	1											
													,BD,CU,Ro	1.5	1											
													,BD,CU,Ro	1.5	1											UCS = 84.1 MPa
9																										
					3	100							,BD,CU,Ro	1.5	1											
				48.06																						
		End of Drillhole		9.34																						
10																										
11																										
12																										
13																										
14																										
15																										
16																										

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: HEC

CHECKED: MJK

MIS-RCK 004 1111210229-1000.GPJ GAL-MISS.GDT 06/07/13 PLG

PROJECT: 11-1121-0229

RECORD OF BOREHOLE: 13-3

SHEET 1 OF 2

LOCATION: See Site Plan

BORING DATE: March 7, 2013

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-8} 10^{-6} 10^{-4} 10^{-2}) / WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		55.43							
0	Power Auger 200 mm Diam. (Hollow Stem)	(SP) SAND, some gravel and non-plastic fines; grey brown, contains orange brick fragments, (FILL); non-cohesive, moist, loose to compact		0.00	1	GRAB					
1					2	SS	12			M	
					3	SS	7				
2				53.30							
		(SM) SILTY SAND; grey brown, contains fly ash, coal, glass, and orange brick fragments, (FILL); non-cohesive, moist, compact		2.13	4	SS	17				
3				52.31	5	SS	>50				
		(SM) SILTY SAND, trace gravel, inferred presence of cobbles and/or boulders; grey brown, (GLACIAL TILL); non-cohesive, moist, dense to very dense		3.12							
				51.52	6	SS	>50				
4		Borehole continued on RECORD OF DRILLHOLE 13-3									
5											
6											
7											
8											
9											
10											

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: HEC

CHECKED: MJK

MIS-BHS 001 1111210229-1000.GPJ GAL-MIS.GDT 06/07/13 PLG

PROJECT: 11-1121-0229

RECORD OF DRILLHOLE: 13-3

SHEET 2 OF 2

LOCATION: See Site Plan

DRILLING DATE: March 7, 2013

DATUM: Geodetic

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 75

DRILLING CONTRACTOR: Downing Drilling

JN - Joint; FLT - Fault; SHR- Shear; VN - Vein; CJ - Conjugate

BD- Bedding; FO- Foliation; CO- Contact; OR- Orthogonal; CL - Cleavage

PL - Planar; CU- Curved; UN- Undulating; ST - Stepped; IR - Irregular

PO- Polished; K - Slickensided; SM- Smooth; Ro - Rough; MB- Mechanical Break

BR - Broken Rock

NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	RUN No.	COLOUR % RETURN / FLUSH	RECOVERY: TOTAL CORE %	RECOVERY: SOLID CORE %	R.Q.D. %	FRACT. INDEX PER 0.3 m	DISCONTINUITY DATA: B Angle	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	DISCONTINUITY DATA: Jr	DISCONTINUITY DATA: Ja	DISCONTINUITY DATA: Jn	ROCK STRENGTH INDEX: R4	ROCK STRENGTH INDEX: R3	ROCK STRENGTH INDEX: R2	ROCK STRENGTH INDEX: R1	WEATHERING INDEX: W1	WEATHERING INDEX: W2	WEATHERING INDEX: W3	WEATHERING INDEX: W4	Q AVG.	
		BEDROCK SURFACE		51.52																						
4	Rotary Drill / NQ Core	Slightly weathered thinly bedded grey non-porous fine grained medium strong LIMESTONE, thin black shale laminates		3.91	1	100							,BD,PL,Ro ,BD,IR,Ro ,BD,IR,Ro ,BD,IR,Ro ,BD,CU,Ro ,BD,PL,Ro ,BD,CU,Ro ,BD,IR,Ro ,BD,PL,Ro ,FR,PL,Ro ,BD,IR,Ro ,BD,IR,Ro ,BD,CU,Ro ,BD,IR,Ro ,BD,PL,SM ,BD,PL,Ro ,BD,PL,SM ,BD,CU,Ro ,BD,PL,Ro ,BD,PL,Ro	1.5 3 3 3 1.5 1.5 1.5 3 1.5 1.5 3 3 1.5 3 1 1.5 1 1.5 1.5	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1											
5		Fresh thinly to medium bedded grey fine to medium grained non-porous strong to very strong LIMESTONE, with black shale partings and interlaminates, occasional nodules		51.19 4.24	2	100-0																				
6					3	0							,BD,PL,Ro ,BD,IR,Ro	1.5 3	1 1											UCS = 122.1 MPa
7													,BD,CU,SM ,BD,PL,Ro	1.5 1.5	1 1											
8					4	0							,BD,PL,SM ,BD,PL,Ro	1 1.5	1 1											
				46.83									,BD,PL,Ro ,BD,PL,SM	1.5 1	1 1											
		End of Drillhole		8.60																						
9																										
10																										
11																										
12																										
13																										

DEPTH SCALE

1 : 50

LOGGED: HEC

CHECKED: MJK

Golder Associates

MIS-RCK 004 1111210229-1000.GPJ GAL-MISS.GDT 06/07/13 PLG

PROJECT: 11-1121-0229

RECORD OF BOREHOLE: 13-4

SHEET 1 OF 2

LOCATION: See Site Plan

BORING DATE: March 15, 2013

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ●, rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-8} 10^{-6} 10^{-4} 10^{-2}) / WATER CONTENT PERCENT (Wp — W — Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		55.36							MON. WELL
0	Power Auger 200 mm Diam. (Hollow Stem)	(SM) SILTY SAND, trace gravel; grey brown, contains organic matter, (FILL); non-cohesive, moist, loose		0.00	1	SS	9				
				54.60							
1		(SM/ML) SILTY SAND to SANDY SILT; dark brown, contains organic matter, (FILL); non-cohesive, moist, loose		0.76	2	SS	5				
				53.68							
2		(SP/GP) SAND and GRAVEL, crushed; grey, (FILL); non-cohesive, moist, loose to compact		1.68	3	SS	10				
				53.00							Bentonite Seal
		(CI) SILTY CLAY; grey brown; cohesive, moist, stiff to very stiff		2.36	4	SS	7				
				52.62							
3		(SM) SILTY SAND, trace gravel; grey brown; non-cohesive, moist, loose		2.74							
				52.16							
		(OL) ORGANIC SILT; dark brown; non-cohesive, moist, loose		3.20	5	SS	>50				
				51.98							
		Grey LIMESTONE									
		Borehole continued on RECORD OF DRILLHOLE 13-4									
4											
5											
6											
7											
8											
9											
10											

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: HEC

CHECKED: MJK

MIS-BHS 001 1111210229-1000.GPJ GAL-MIS.GDT 06/07/13 PLG

PROJECT: 11-1121-0229

RECORD OF DRILLHOLE: 13-4

SHEET 2 OF 2

LOCATION: See Site Plan

DRILLING DATE: March 15, 2013

DATUM: Geodetic

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 75

DRILLING CONTRACTOR: Downing Drilling

JN - Joint; FLT - Fault; SHR- Shear; VN - Vein; CJ - Conjugate
BD- Bedding; FO- Foliation; CO- Contact; OR- Orthogonal; CL - Cleavage
PL - Planar; CU- Curved; UN- Undulating; ST - Stepped; IR - Irregular
PO- Polished; K - Slickensided; SM- Smooth; Ro - Rough; MB- Mechanical Break
BR - Broken Rock
NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	RUN No.	COLOUR % RETURN / FLUSH	RECOVERY: TOTAL CORE %	RECOVERY: SOLID CORE %	R.Q.D. %	FRACT. INDEX PER 0.3 m	DISCONTINUITY DATA: B Angle	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	DISCONTINUITY DATA: Jr	DISCONTINUITY DATA: Ja	DISCONTINUITY DATA: Jn	ROCK STRENGTH INDEX: R4	ROCK STRENGTH INDEX: R3	ROCK STRENGTH INDEX: R2	ROCK STRENGTH INDEX: R1	WEATHERING INDEX: W1	WEATHERING INDEX: W2	WEATHERING INDEX: W3	WEATHERING INDEX: W4	Q AVG.	
		BEDROCK SURFACE		51.93																						MON. WELL
4	Rotary Drill / NQ Core	Fresh thinly to medium bedded grey fine to coarse grained non-porous strong to very strong LIMESTONE, with black shale partings and interlaminates, occasional nodules - Broken core from 3.55 m to 3.63 m - Broken core from 3.78 m to 3.82 m		3.43	1	100							,BD,PL,SM ,BD,PL,Ro ,BD,PL,Ro	1 1.5 1.5	1 1 1											
5					2	100							,BD,PL,SM ,BD,PL,Ro ,BD,PL,Ro ,BD,PL,SM ,BD,PL,Ro ,BD,PL,Ro	1 1.5 1.5 1 1.5 1.5	1 1 1 1 1 1											
6					3	100							,BD,PL,Ro ,BD,PL,Ro ,BD,PL,Ro ,BD,PL,Ro ,BD,PL,Ro	1.5 1.5 1.5 1.5 1.5	1 1 1 1 1											
7				47.66	4	100							,BD,PL,Ro ,BD,PL,Ro	1.5 1	1 1											
		End of Drillhole		7.70																						
8																										
9																										
10																										
11																										
12																										
13																										

Bentonite Seal

Silica Sand

32 mm Diam. PVC #10 Slot Screen

UCS = 125.3 MPa

Bentonite Seal

W.L. in Screen at Elev. 51.60 m on April 18, 2013

DEPTH SCALE

1 : 50

LOGGED: HEC

CHECKED: MJK

Golder Associates

MIS-RCK 004 1111210229-1000.GPJ GAL-MISS.GDT 06/07/13 PLG

PROJECT: 11-1121-0229

RECORD OF BOREHOLE: 13-5

SHEET 1 OF 2

LOCATION: See Site Plan

BORING DATE: March 13, 2013

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-8} 10^{-6} 10^{-4} 10^{-2}) / WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		55.39							
0	Power Auger 200 mm Diam. (Hollow Stem)	(SM) SILTY SAND, trace gravel; brown, (TOPSOIL); non-cohesive, moist		0.00							
		(SP/GP) SILTY SAND and GRAVEL, crushed; grey, (FILL); non-cohesive, moist, dense to loose		0.15	1	SS	12				
1					2	SS	54		○	M	
2					3	SS	13				
					4	SS	9				
				52.49							
3		(SM) SILTY SAND, fine; grey brown, (FILL); non-cohesive, moist, very loose		2.90							
				52.19							
		(OL) ORGANIC SILT; dark brown; non-cohesvie, moist, very loose		3.20	5	SS	3		○	OC = 24.0%	
				51.86							
		LIMESTONE		3.53							
		Borehole continued on RECORD OF DRILLHOLE 13-5									
4											
5											
6											
7											
8											
9											
10											

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: HEC

CHECKED: MJK

MIS-BHS 001 1111210229-1000.GPJ GAL-MIS.GDT 06/07/13 PLG

PROJECT: 11-1121-0229

RECORD OF DRILLHOLE: 13-5

SHEET 2 OF 2

LOCATION: See Site Plan

DRILLING DATE: March 13, 2013

DATUM: Geodetic

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 75

DRILLING CONTRACTOR: Downing Drilling

JN - Joint; FLT - Fault; SHR- Shear; VN - Vein; CJ - Conjugate
BD- Bedding; FO- Foliation; CO- Contact; OR- Orthogonal; CL - Cleavage
PL - Planar; CU- Curved; UN- Undulating; ST - Stepped; IR - Irregular
PO- Polished; K - Slickensided; SM- Smooth; Ro - Rough; MB- Mechanical Break
BR - Broken Rock
NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	RUN No.	COLOUR % RETURN / FLUSH	RECOVERY: TOTAL CORE %	RECOVERY: SOLID CORE %	R.Q.D. %	FRACT. INDEX PER 0.3 m	DISCONTINUITY DATA: B Angle	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	Jr	Ja	Jn	ROCK STRENGTH INDEX: R4	R3	R2	R1	WEATH-ERING INDEX: W1	W2	W3	W4	Q AVG.	
		BEDROCK SURFACE		51.78																						
4	Rotary Drill / NQ Core	Fresh thinly to medium bedded grey fine to medium grained non-porous strong to very strong LIMESTONE, with black shale partings and interlaminates, occasional nodules - Broken core from 3.62 m to 3.68 m		3.61	1	100							,BD,IR,Ro	3	1											
													,BD,CU,SM	1	1											
					2	100							,BD,PL,Ro	1.5	1											
													,BD,PL,SM	1	1											
													,BD,PL,Ro	1.5	1											
													,BD,IR,Ro	3	1											
													,BD,PL,Ro	1.5	1											
													,BD,PL,Ro	3	1											
													,BD,IR,Ro	1.5	1											
													,BD,PL,Ro	1	1											
													,BD,PL,Ro													
													,BD,PL,SM													
5					3	100-0							,BD,PL,Ro	1.5	1											
													,BD,PL,SM	1	1											UCS = 151.4 MPa
													,BD,PL,Ro	1.5	1											
													,BD,PL,Ro	1.5	1											
													,BD,PL,SM	1	1											
													,BD,PL,SM	1	1											
6													,BD,PL,SM	1	1											
													,BD,PL,Ro	1.5	1											
													,BD,PL,Ro	1.5	1											
													,BD,PL,SM	1	1											
					4	0							,BD,PL,SM	1	1											
													,BD,PL,Ro	1.5	1											
7													,BD,CU,Ro	1.5	1											
													,BD,IR,Ro	3	1											
													,BD,PL,Ro	1.5	1											
													,BD,PL,SM	1	1											
					5	0							,BD,PL,Ro	1.5	1											
				47.54									,BD,PL,SM	1	1											
													,BD,PL,SM	1	1											
8		End of Drillhole		7.85																						
9																										
10																										
11																										
12																										
13																										

DEPTH SCALE

1 : 50

LOGGED: HEC

CHECKED: MJK

Golder Associates

MIS-RCK 004 1111210229-1000.GPJ GAL-MISS.GDT 06/07/13 PLG

PROJECT: 11-1121-0229

RECORD OF BOREHOLE: 13-6

SHEET 1 OF 2

LOCATION: See Site Plan

BORING DATE: March 14, 2013

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ●, rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-8} 10^{-6} 10^{-4} 10^{-2}) / WATER CONTENT PERCENT (Wp W WI) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		55.70							MON. WELL
0	Power Auger 200 mm Diam. (Hollow Stem)	ASPHALTIC CONCRETE		0.00							
		(SP/GP) SAND and GRAVEL, crushed; grey, (FILL); non-cohesive, moist, compact to dense		0.08	1	SS	20				
1					2	SS	45				
				54.33							
		(CI) SILTY CLAY; grey brown, (FILL); cohesive, moist, very stiff		1.37							Bentonite Seal
		(SM) SILTY SAND and GRAVEL; grey brown, contains orange brick fragments, (FILL); non-cohesive, moist, loose to compact		1.52	3	SS	9				
2					4	SS	9		○	M	
3					5	SS	14				Silica Sand
				52.04							
		(SM) SILTY SAND, some gravel; grey brown, (FILL); non-cohesive, wet, compact		3.66	6	SS	20				32 mm Diam. PVC #10 Slot Screen
4											
				51.05							
		(OL) ORGANIC SILT, dark brown; non-cohesive, most, loose		4.65	7	SS	>50		○	OC = 16.2%	
		LIMESTONE		4.80							
5		Borehole continued on RECORD OF DRILLHOLE 13-6									
6											
7											
8											
9											
10											

DEPTH SCALE

1 : 50

LOGGED: HEC

CHECKED: MJK

Golder Associates

MIS-BHS 001 1111210229-1000.GPJ GAL-MIS.GDT 06/07/13 PLG

PROJECT: 11-1121-0229

RECORD OF DRILLHOLE: 13-6

SHEET 2 OF 2

LOCATION: See Site Plan

DRILLING DATE: March 14, 2013

DATUM: Geodetic

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 75

DRILLING CONTRACTOR: Downing Drilling

JN - Joint, FLT - Fault, SHR- Shear, VN - Vein, CJ - Conjugate
BD- Bedding, FO- Foliation, CO- Contact, OR- Orthogonal, CL - Cleavage
PL - Planar, CU- Curved, UN- Undulating, ST - Stepped, IR - Irregular
PO- Polished, K - Slickensided, SM- Smooth, Ro - Rough, MB- Mechanical Break
BR - Broken Rock
NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	RUN No.	COLOUR % RETURN / FLUSH	RECOVERY: TOTAL CORE %	RECOVERY: SOLID CORE %	R.Q.D. %	FRACT. INDEX PER 0.3 m	DISCONTINUITY DATA: B Angle	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	Jr	Ja	Jn	ROCK STRENGTH INDEX: R4	R3	R2	R1	WEATHERING INDEX: W1	W2	W3	W4	Q AVG.	
		BEDROCK SURFACE		50.80																						MON. WELL
5	Rotary Drill NQ Core	Fresh thinly to medium bedded grey fine to coarse grained non-porous strong to very strong nodular LIMESTONE, with black shale partings and interlaminates		4.90	1	100							,BD,PL,Ro	1.5	1											
													,BD,PL,Ro	1.5	1											
													,BD,PL,SM	1	1											
													,BD,PL,SM	1	1											
													,BD,PL,Ro	1.5	1											
6													,BD,PL,SM	1	1											
													,BD,PL,Ro	1.5	1											
					2	100							,BD,PL,Ro	1.5	1											
													,BD,PL,SM	1	1											
													,BD,PL,SM	1	1											
7													,BD,PL,SM	1	1											
													,BD,PL,SM	1	1											Bentonite Seal
													,BD,PL,Ro	1.5	1											
													,BD,PL,SM	1	1											
													,BD,PL,SM	1	1											
													,BD,PL,Ro	1.5	1											
8					3								,BD,PL,SM	1	1											UCS = 170.6 MPa
													,BD,PL,Ro	1.5	1											
													,BD,IR,Ro	3	1											
													,BD,PL,Ro	1.5	1											
													,BD,IR,Ro	3	1											
													,BD,PL,Ro	1.5	1											
9													,BD,CU,Ro	1.5	1											
					4	100							,BD,PL,Ro													
				46.45																						
		End of Drillhole		9.25																						W.L. in Screen at Elev. 51.84 m on April 18, 2013
10																										
11																										
12																										
13																										
14																										

DEPTH SCALE

1 : 50

LOGGED: HEC

CHECKED: MJK

Golder Associates

MIS-RCK 004 1111210229-1000.GPJ GAL-MISS.GDT 06/07/13 PLG

PROJECT: 11-1121-0229

RECORD OF BOREHOLE: 13-7

SHEET 1 OF 2

LOCATION: See Site Plan

BORING DATE: March 11, 2013

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-8} 10^{-6} 10^{-4} 10^{-2}) / WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		55.71							
0	Power Auger 200 mm Diam. (Hollow Stem)	(SP/GP) SAND and GRAVEL, crushed; grey, (FILL); non-cohesive, moist, compact		0.00	1	GRAB					
1					2	SS	32				
2					3	SS	20		○		
				53.58							
		(SM) SILTY SAND; grey brown, contains fly ash and orange brick fragments, (FILL); non-cohesive, moist, loose to compact		2.13	4	SS	10		○		
3					5	SS	7				
				52.05							
		(SM) SILTY SAND, some gravel, inferred presence of cobbles and/or boulders; brown, (GLACIAL TILL); non-cohesive, moist to wet, compact		3.66							
4					6	SS	20		○		
					7	SS	>50				
5											
				50.21							
		Borehole continued on RECORD OF DRILLHOLE 13-7									
6											
7											
8											
9											
10											

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: HEC

CHECKED: MJK

MIS-BHS 001 1111210229-1000.GPJ GAL-MIS.GDT 06/12/13 PLG

PROJECT: 11-1121-0229

RECORD OF DRILLHOLE: 13-7

SHEET 2 OF 2

LOCATION: See Site Plan

DRILLING DATE: March 11, 2013

DATUM: Geodetic

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 75

DRILLING CONTRACTOR: Downing Drilling

JN - Joint; FLT - Fault; SHR- Shear; VN - Vein; CJ - Conjugate

BD- Bedding; FO- Foliation; CO- Contact; OR- Orthogonal; CL - Cleavage

PL - Planar; CU- Curved; UN- Undulating; ST - Stepped; IR - Irregular

PO- Polished; K - Slickensided; SM- Smooth; Ro - Rough; MB- Mechanical Break

BR - Broken Rock

NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	RUN No.	COLOUR % RETURN / FLUSH	RECOVERY: TOTAL CORE %	RECOVERY: SOLID CORE %	R.Q.D. %	FRACT. INDEX PER 0.3 m	DISCONTINUITY DATA: B Angle	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	DISCONTINUITY DATA: Jr	DISCONTINUITY DATA: Ja	DISCONTINUITY DATA: Jn	ROCK STRENGTH INDEX: R4	ROCK STRENGTH INDEX: R3	ROCK STRENGTH INDEX: R2	ROCK STRENGTH INDEX: R1	WEATHERING INDEX: W1	WEATHERING INDEX: W2	WEATHERING INDEX: W3	WEATHERING INDEX: W4	Q AVG.	
		BEDROCK SURFACE		50.21																						
	Rotary Drill / NQ Core	Fresh thinly to medium bedded grey fine to coarse grained non-porous strong nodular LIMESTONE, with black shale partings and interlaminates		5.50	1	100							,BD,PL,Ro	1.5	1											
													,BD,PL,Ro	1.5	1											
6													,BD,PL,Ro	1.5	1											
													,BD,PL,Ro	1.5	1											
		- Broken core from 6.13 m to 6.18 m											,BD,PL,Ro	1.5	1											
													,BD,IR,Ro	3	1											
		- Broken core from 6.34 m to 6.39 m											,BD,PL,Ro	1.5	1											
					2	100							,BD,PL,Ro	1.5	1											
		- Broken core from 6.78 m to 6.84 m											,BD,PL,SM	1	1											
7													,BD,PL,Ro	1.5	1											
													,BD,PL,Ro	1.5	1											
																										UCS = 75.9 MPa
8					3	100							,BD,PL,Ro	1.5	1											
													,BD,PL,Ro	1.5	1											
													,BD,PL,SM	1	1											
													,BD,PL,Ro	1.5	1											
													,BD,PL,Ro	1.5	1											
													,BD,CU,Ro	1.5	1											
9													,BD,PL,Ro	1.5	1											
													,BD,PL,Ro	1.5	1											
													,BD,CU,Ro	1.5	1											
													,BD,PL,Ro	1.5	1											
					4	100							,BD,PL,Ro	1.5	1											
													,BD,PL,Ro	1.5	1											
													,BD,PL,Ro	1.5	1											
10													,,,													
					5	100							,BD,PL,Ro	1.5	1											
													,BD,PL,Ro	1.5	1											
					6	100							,BD,PL,Ro	1.5	1											
11		- Mud seam and vertical fracture from 10.98 m to 11.23 m		44.48									,BD,IR,Ro	3	1											
		End of Drillhole		11.23																						
12																										
13																										
14																										
15																										

DEPTH SCALE

1 : 50

LOGGED: HEC

CHECKED: MJK

Golder Associates

MIS-RCK 004 1111210229-1000.GPJ GAL-MISS.GDT 06/07/13 PLG

PROJECT: 11-1121-0229

RECORD OF BOREHOLE: 13-8

SHEET 1 OF 2

LOCATION: See Site Plan

BORING DATE: March 5, 2013

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-8} 10^{-6} 10^{-4} 10^{-2}) / WATER CONTENT PERCENT (Wp W Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		55.95							MON. WELL
0	Power Auger 200 mm Diam. (Hollow Stem)	ASPHALTIC CONCRETE		0.00 / 55.75							
		(SP/GP) SAND and GRAVEL, crushed; grey, (BASE); non-cohesive		0.20 / 55.57							
		(SP/GP) SAND and GRAVEL; brown, (FILL); non-cohesive		0.38 / 55.19							
1		(SM) SILTY SAND, some gravel, inferred presence of cobbles and/or boulders; grey, contains asphalt fragments, (FILL); non-cohesive, moist, compact		0.76	1	SS	>50				
					2	SS	18		○		
2											
					3	SS	11				
3				52.75							
		(Cl) SILTY CLAY; grey brown; cohesive, moist, stiff to very stiff		3.20	4	SS	7		⊕——		
				52.14							Bentonite Seal
4		(SM) SILTY SAND, some gravel to gravelly, inferred presence of cobbles and/or boulders; grey, (GLACIAL TILL); non-cohesive, moist, dense to very dense		3.81	5	SS	32		○	MH	
					6	SS	33				
				51.01							
5		Borehole continued on RECORD OF DRILLHOLE 13-8									
6											
7											
8											
9											
10											

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: HEC

CHECKED: MJK

MIS-BHS 001 1111210229-1000.GPJ GAL-MIS.GDT 06/07/13 PLG

PROJECT: 11-1121-0229

RECORD OF DRILLHOLE: 13-8

SHEET 2 OF 2

LOCATION: See Site Plan

DRILLING DATE: March 5, 2013

DATUM: Geodetic

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 75

DRILLING CONTRACTOR: Downing Drilling

JN - Joint; FLT - Fault; SHR- Shear; VN - Vein; CJ - Conjugate
BD- Bedding; FO- Foliation; CO- Contact; OR- Orthogonal; CL - Cleavage
PL - Planar; CU- Curved; UN- Undulating; ST - Stepped; IR - Irregular
PO- Polished; K - Slickensided; SM- Smooth; Ro - Rough; MB- Mechanical Break
BR - Broken Rock
NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	RUN No.	COLOUR % RETURN / FLUSH	RECOVERY: TOTAL CORE %	RECOVERY: SOLID CORE %	R.Q.D. %	FRACT. INDEX PER 0.3 m	DISCONTINUITY DATA: B Angle	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	Jr	Ja	Jn	ROCK STRENGTH INDEX: R4	R3	R2	R1	WEATH-ERING INDEX: W1	W2	W3	W4	Q AVG.	
		BEDROCK SURFACE		51.01																						MON. WELL
5	Rotary Drill NQ Core	Fresh thinly to medium bedded grey fine to coarse grained non-porous strong to very strong nodular LIMESTONE, with black shale partings and interlaminates		4.94	1	0							,BD,CU,SM ,BD,CU,Ro ,BD,PL,Ro ,BD,PL,SM	1 1.5 1.5 1	1 1 1 1									
6					2	0							,BD,PL,Ro ,BD,PL,Ro ,BD,PL,Ro ,BD,PL,Ro ,BD,PL,Ro ,BD,CU,SM	1.5 1.5 1.5 1.5 1.5 1	1 1 1 1 1 1										Bentonite Seal
7		- Mud seam from 7.11 m to 7.12 m											,BD,PL,Ro ,BD,PL,Ro ,BD,PL,SM	1.5 1.5 1	2 1 1										
8					3	0							,BD,PL,Ro	1.5	1										Silica Sand
9					4	0							,BD,ST,Ro ,BD,PL,Ro ,BD,PL,Ro ,BD,PL,SM ,BD,PL,Ro ,BD,PL,Ro	3 1.5 1.5 1 1.5 1.5	1 1 1 1 1 1										32 mm Diam. PVC #10 Slot Screen UCS = 127.9 MPa
10													,BD,IR,Ro ,BD,IR,Ro ,BD,PL,Ro	3 3 1.5	1 1 1										
11				44.80	5	0							,BD,PL,Ro ,BD,PL,Ro	1.5 1.5	1 1										Bentonite Seal
		End of Drillhole		11.15																						W.L. in Screen at Elev. 49.24 m on March 25, 2013
12																										
13																										
14																										

DEPTH SCALE

1 : 50

LOGGED: HEC

CHECKED: MJK

Golder Associates

MIS-RCK 004 1111210229-1000.GPJ GAL-MISS.GDT 06/07/13 PLG

PROJECT: 10-1122-0044

RECORD OF BOREHOLE: 10-01

SHEET 1 OF 2

LOCATION: See Site Plan

BORING DATE: March 17, 2010

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	Headspace Org. Vapour Conc. [PPM] ppm (6, 12, 18, 24) / Headspace Comb. Vapour Conc. [%LEL] ppm (20, 40, 60, 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6}, 10^{-5}, 10^{-4}, 10^{-3}) / WATER CONTENT PERCENT Wp, W, Wl (10, 20, 30, 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		Ground Surface		58.26							
0	Power Auger 200 mm Diam. (Hollow Stem)	TOPSOIL		58.11							
		Compact brown to dark brown silty sand, some gravel, trace clay with brick and concrete (FILL)		0.15	1	50 DO	16				
1					2	50 DO	21				
					3	50 DO	21				
2					4	50 DO	19				
				55.82							
		Very loose black sand, some gravel (FILL)		2.44							
				55.52	5	50 DO	2				
		Loose grey brown silty clay, trace brick (FILL)		2.74							
3					6	50 DO	15				
				54.91							
		Loose to compact grey SILTY SAND, some gravel, trace clay		3.35	7	50 DO	12				
4					8	50 DO	5				
					9	50 DO	5				
5					10	50 DO	1				
				52.16							
6		Compact brown fine SAND		6.10	11	50 DO	16				
				51.55							
		Compact grey fine SAND		6.71	12	50 DO	13				
7											
				50.64							
		Very dense grey SILTY SAND, some gravel, trace clay		7.62	13	50 DO	64				
8											
				49.75	14	50 DO	50				
	Rotary Drill NW Casing	COBBLES and BOULDERS		8.51	15	NQ RC	DD				
9					16	NQ RC	DD				
10					17		DD				
		CONTINUED NEXT PAGE									

BOREHOLE 1011220044.GPJ HYDROGEO.GDT 7/27/10

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: D.G.

CHECKED: K.P.H.

PROJECT: 10-1122-0044

RECORD OF BOREHOLE: 10-01

SHEET 2 OF 2

LOCATION: See Site Plan

BORING DATE: March 17, 2010

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	Headspace Org. Vapour Conc. [PPM] ppm (6, 12, 18, 24) / Headspace Comb. Vapour Conc. [%LEL] ppm (20, 40, 60, 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6}, 10^{-5}, 10^{-4}, 10^{-3}) / WATER CONTENT PERCENT Wp, W, Wl (10, 20, 30, 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
10	Rotary Drill / NW Casing	COBBLES and BOULDERS *(continued)*			17	NQ RC	DD				
					18	NQ RC	DD				
11				47.26							
	Rotary Drill / NQ Core	Fresh grey LIMESTONE BEDROCK with interbedded shale		11.00	19	NQ RC	DD	T.C.R. (%) 100; S.C.R. (%) 86; R.Q.D. (%) 94			
				46.37							
12		End of Borehole		11.89							
13											
14											
15											
16											
17											
18											
19											
20											

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: D.G.

CHECKED: K.P.H.

BOREHOLE 1011220044.GPJ HYDROGEO.GDT 7/27/10

PROJECT: 10-1122-0044

RECORD OF BOREHOLE: 10-02

SHEET 1 OF 1

LOCATION: See Site Plan

BORING DATE: March 16, 2010

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	Headspace Org. Vapour Conc. [PPM] ppm (6, 12, 18, 24) / Headspace Comb. Vapour Conc. [%LEL] ppm (20, 40, 60, 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6}, 10^{-5}, 10^{-4}, 10^{-3}) / WATER CONTENT PERCENT Wp W Wl (10, 20, 30, 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		Ground Surface		57.54							
0	Power Auger 200 mm Diam. (Hollow Stem)	Black sandy silt with organic matter (TOPSOIL)		57.39							
		Compact brown silty sand, some gravel, trace clay with cobbles and boulders (FILL)		0.15	1	50 DO	16				
					2	50 DO	55				
1					3	50 DO	8				
					4	50 DO	8				
2					5	50 DO	13				
				54.80							
		Compact black sand, some gravel, trace silt (FILL)		2.74	6	50 DO	22				
3				54.49							
		Compact brown silty clay and brown silty sand layers (FILL)		3.05	7	50 DO	20				
					8	50 DO	8				
4				53.27							
		PEAT		4.34							
		Loose grey SILTY fine SAND, trace gravel			9	50 DO	6				
5					10	50 DO	4				
					11	50 DO	1				
6											
				50.83	12	50 DO	3				
		Loose rusty fine SAND, trace gravel		50.68							
		Loose grey SANDY SILT		50.53							
7		Loose to dense brown coarse SAND		7.01	13	50 DO	1				
					14	50 DO	73				
8				49.34							
		Very dense grey SANDY SILT, some gravel, trace clay		8.20	15	50 DO	65				
				48.80							
		End of Borehole Auger Refusal		8.74							
9											
10											

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: D.G.

CHECKED: K.P.H.

BOREHOLE 1011220044.GPJ HYDROGEO.GDT 7/27/10

PROJECT: 10-1122-0044

RECORD OF BOREHOLE: 10-03

SHEET 1 OF 1

LOCATION: See Site Plan

BORING DATE: March 9, 2010

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/0.3m	Headspace Org. Vapour Conc. [PPM] ppm (6 12 18 24) / Headspace Comb. Vapour Conc. [%LEL] ppm (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT Wp W Wl (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		Ground Surface		57.06							
0	Power Auger 200 mm Diam. (Hollow Stem)	Loose black silty clay with organic matter (FILL)		0.00	1	50 DO	13				
				56.60							
		Brick (FILL)		56.45							
		Compact brown sand, some gravel, trace clay with some brick and concrete (FILL)		0.61	2	50 DO	21				
1				55.84							
		Very dense to compact brown to dark grey sandy silt with cobbles and organic matter (FILL)		1.22	3	50 DO	70				
					4	50 DO	14				
2				54.62							
		Compact black sand, some gravel, trace silt (FILL)		2.44	5	50 DO	15				
				54.32							
		Compact, brown, medium to coarse sand (FILL)		2.74							
3				53.71	6	50 DO	13				
		Compact black sand, some gravel, trace silt (FILL)		3.35							
				53.40							
		Compact, brown, medium to coarse sand (FILL)		3.66	7	50 DO	14				
4				52.79							
		Compact grey sand and gravel (FILL)		4.27	8	50 DO	18				
				52.39							
		PEAT		52.28							
		Compact grey SILTY CLAY									
5		Compact grey fine SAND		4.88	9	50 DO	18				
				51.73							
		Compact grey SILTY SAND, some gravel, trace clay		5.33							
					10	50 DO	11				
6				50.96							
		Loose to compact, brown, medium to coarse SAND		6.10	11	50 DO	5				
7				49.74	12	50 DO	16				
		End of Borehole		7.32							
8											
9											
10											

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: D.G.

CHECKED: K.P.H.

BOREHOLE 1011220044.GPJ HYDROGEO.GDT 7/27/10

PROJECT: 10-1122-0044

RECORD OF BOREHOLE: 10-04

SHEET 1 OF 1

LOCATION: See Site Plan

BORING DATE: March 8, 2010

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	Headspace Org. Vapour Conc. [PPM] ppm (⊕) 6 12 18 24 / Headspace Comb. Vapour Conc. [%LEL] ppm (□) 20 40 60 80	HYDRAULIC CONDUCTIVITY, k, cm/s 10^{-6} 10^{-5} 10^{-4} 10^{-3} / WATER CONTENT PERCENT Wp W Wl 10 20 30 40	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		Ground Surface		56.57							
0	Power Auger 200 mm Diam. (Hollow Stem)	Black sandy silt with organic matter (TOPSOIL)		56.42							
		Dense grey brown silty sand, some gravel (FILL)		0.15	1	50 DO	45 ⊕				
		Compact black sandy silt, some gravel (FILL)		55.99 0.58	2	50 DO	21 ⊕				
1		Loose brown silty sand, some gravel (FILL)		55.35 1.22	3	50 DO	7 ⊕				
		Loose to dense black sandy silt, some gravel (FILL)		54.82 1.75	4	50 DO	47 ⊕				
2		Compact, brown, medium to coarse sand, some gravel (FILL)		54.44 2.13	5	50 DO	13 ⊕				
					6	50 DO	16 ⊕				
3		Stiff grey silty clay (FILL)		53.06 3.51	7	50 DO	5 ⊕				
					8	50 DO	5 ⊕				
4		PEAT		51.77							
		Stiff grey SILTY CLAY		4.88	9	50 DO	13 ⊕				
5		Compact grey SANDY SILT, some gravel		51.39 5.18							
		Compact grey fine SAND		51.08 5.49	10	50 DO	17 ⊕				
6		End of Borehole Auger Refusal		50.65 5.92							
7											
8											
9											
10											

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: D.G.

CHECKED: K.P.H.

BOREHOLE 1011220044.GPJ HYDROGEO.GDT 7/27/10

PROJECT: 10-1122-0044

RECORD OF BOREHOLE: 10-05

SHEET 1 OF 1

LOCATION: See Site Plan

BORING DATE: March 10, 2010

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	Headspace Org. Vapour Conc. [PPM] ppm (6, 12, 18, 24) / Headspace Comb. Vapour Conc. [%LEL] ppm (20, 40, 60, 80)	T.C.R. (%)	S.C.R. (%)	R.Q.D. (%)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6}, 10^{-5}, 10^{-4}, 10^{-3}) / WATER CONTENT PERCENT Wp W Wl (10, 20, 30, 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		Ground Surface		55.61										
0	Power Auger 200 mm Diam. (Hollow Stem)	Compact to dense black silty sand, some gravel, trace brick with cobbles and boulders (FILL)		0.00	1	50 DO	25							
					2	50 DO	42							
1				54.39										
		Dense grey brown sand, trace silt with cobbles and boulders (FILL)		1.22	3	50 DO	36							
2					4	50 DO	42							
				53.17										
		Compact dark brown sandy silt, some gravel (FILL)		2.44	5	50 DO	18							
3				52.59										
		Loose black sandy silt, some gravel, trace wood (FILL)		3.02	6	50 DO	8							
				51.95										
		Loose dark grey fine SAND, some gravel		3.66	7	50 DO	6							
4				51.42										
		COBBLES and BOULDERS		4.19	8	NQ RC	DD		69		17		17	
5					9	NQ RC	DD							
					10	NQ RC	DD							
				50.00										
	Rotary Drill NQ Core	Grey LIMESTONE BEDROCK with interbedded shale		5.61	11	NQ RC	DD		100		32		9	
6				48.90										
		End of Borehole		6.71										
7														
8														
9														
10														

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: D.G.

CHECKED: K.P.H.

BOREHOLE 1011220044.GPJ HYDROGEO.GDT 7/27/10

PROJECT: 10-1122-0044

RECORD OF BOREHOLE: 10-06

SHEET 1 OF 1

LOCATION: See Site Plan

BORING DATE: March 8, 2010

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/0.3m	Headspace Org. Vapour Conc. [PPM] ppm / Headspace Comb. Vapour Conc. [%LEL] ppm	HYDRAULIC CONDUCTIVITY, k, cm/s / WATER CONTENT PERCENT Wp W Wl	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		Ground Surface		55.04							
0	Power Auger 200 mm Diam. (Hollow Stem)	Grey sandy silt, some gravel, trace brick (FILL)		0.00	1	50 DO	52				
				54.51							
		Black silty sand (FILL)									
1		Loose to compact, brown, medium to coarse sand (FILL)		0.61	2	50 DO	13				
					3	50 DO	5				
				53.21							
2		Compact coarse grey crushed stone (FILL)		1.83	4	50 DO	29				
				52.30	5	50 DO	76				
		Grey silty clay (FILL)		2.74							
3				51.97	6	50 DO					
		End of Borehole Auger Refusal		3.07							
4											
5											
6											
7											
8											
9											
10											

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: D.G.

CHECKED: K.P.H.

BOREHOLE 1011220044.GPJ HYDROGEO.GDT 7/27/10

PROJECT: 10-1122-0044

RECORD OF BOREHOLE: 10-07

SHEET 1 OF 1

LOCATION: See Site Plan

BORING DATE: March 8, 2010

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m
		Ground Surface		55.38			
0	Power Auger 200 mm Diam. (Hollow Stem)	Black sandy silt with organic matter (TOPSOIL)		0.05	1	50 DO	23
		Compact black sand, some gravel (FILL)		54.77			
		Loose to compact, brown, medium to coarse sand, some gravel (FILL)		0.61	2	50 DO	20
1					3	50 DO	12
2					4	50 DO	7
					5	50 DO	22
3					6	50 DO	17
		PEAT		51.93 51.82			
		Compact grey SILTY CLAY			7	50 DO	50
		Dense grey GRAVEL		51.55			
4		End of Borehole Auger Refusal		3.83			
5							
6							
7							
8							
9							
10							

Headspace Org. Vapour Conc. [PPM] ppm ⊕
6 12 18 24
Headspace Comb. Vapour Conc. [%LEL] ppm □
20 40 60 80

HYDRAULIC CONDUCTIVITY, k, cm/s
10^{-6} 10^{-5} 10^{-4} 10^{-3}
WATER CONTENT PERCENT
Wp ⊖W WI
10 20 30 40

ADDITIONAL LAB. TESTING

PIEZOMETER OR STANDPIPE INSTALLATION

DEPTH SCALE
1 : 50

LOGGED: D.G.

CHECKED: K.P.H.

Golder Associates

BOREHOLE 1011220044.GPJ HYDROGEO.GDT 7/27/10

PROJECT: 10-1122-0044

RECORD OF BOREHOLE: 10-08

SHEET 1 OF 1

LOCATION: See Site Plan

BORING DATE: March 11, 2010

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	Headspace Org. Vapour Conc. [PPM] ppm (6, 12, 18, 24) / Headspace Comb. Vapour Conc. [%LEL] ppm (20, 40, 60, 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6}, 10^{-5}, 10^{-4}, 10^{-3}) / WATER CONTENT PERCENT Wp W Wl (10, 20, 30, 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		Ground Surface		55.98							
0	Power Auger 200 mm Diam. (Hollow Stem)	Loose brown fine sand, some silt, trace gravel, brick (FILL)		0.00 / 55.37	1	50 DO	8				
1		Compact brown silty fine sand, some gravel with cobbles and boulders (FILL)		0.61 / 54.76	2	50 DO	69				
		Compact black sand, some gravel, trace silt, pieces of wood (FILL)		1.22 / 53.54	3	50 DO	27				
2					4	50 DO	47				
		Firm grey brown SILTY CLAY, some sandy gravel, organic layer from 3.66 to 3.73 m depth		2.44 / 52.25	5	50 DO	6				
3					6	50 DO	11				
		Compact grey SANDY SILT, trace gravel		3.73 / 50.49	7	50 DO	9				
4					8	50 DO	23				
					9	50 DO	26				
5		Dense grey SANDY SILT, some gravel, trace clay		5.49 / 50.16	10	50 DO	35				
	Rotary Drill NW Casing	Boulders		5.82 / 49.63	11	NQ RC	DD				
6	Rotary Drill NQ Core	Grey LIMESTONE BEDROCK with interbedded shale		6.35 / 48.36	12	NQ RC	DD	T.C.R. (%) 100 / S.C.R. (%) 23 / R.Q.D. (%) 0			
7					13	NQ RC	DD	T.C.R. (%) 100 / S.C.R. (%) 20 / R.Q.D. (%) 0			
		End of Borehole		7.62							
8											
9											
10											

DEPTH SCALE

1 : 50

LOGGED: D.G.

CHECKED: K.P.H.

Golder Associates

BOREHOLE 1011220044.GPJ HYDROGEO.GDT 7/27/10

PROJECT: 10-1122-0044

RECORD OF BOREHOLE: 10-09

SHEET 1 OF 1

LOCATION: See Site Plan

BORING DATE: March 9, 2010

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	Headspace Org. Vapour Conc. [PPM] ppm	Headspace Comb. Vapour Conc. [%LEL] ppm	HYDRAULIC CONDUCTIVITY, k, cm/s / WATER CONTENT PERCENT	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		Ground Surface		56.97								
0	Power Auger 200 mm Diam. (Hollow Stem)	Compact to dense grey brown sandy silt, some gravel, trace clay (FILL)		0.00	1	50 DO	9					
1					2	50 DO	11					
					3	50 DO	45					
2					4	50 DO	47					
				54.68								
		Compact black sand, some gravel, trace clay (FILL)		2.29								
				54.33	5	50 DO	36					
		Dense brown medium sand with cobbles (FILL)		2.64								
3				53.95								
		Loose grey to black SILTY CLAY, trace gravel with organic matter		3.02	6	50 DO	9					
				53.16								
		Compact brown medium to coarse SAND		53.01	7	50 DO	15					
4		Compact to dense grey SANDY SILT, some gravel, trace clay		3.96	8	50 DO	20					
					9	50 DO	89					
5					10	50 DO	39					
					11	50 DO	49					
6					12	50 DO	39					
				49.83								
7		End of Borehole Auger Refusal		7.14								
8												
9												
10												

Headspace Org. Vapour Conc. [PPM] ppm: 6, 12, 18, 24

Headspace Comb. Vapour Conc. [%LEL] ppm: 20, 40, 60, 80

HYDRAULIC CONDUCTIVITY, k, cm/s: 10^{-6}, 10^{-5}, 10^{-4}, 10^{-3}

WATER CONTENT PERCENT: Wp — W — Wl; 10, 20, 30, 40

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: D.G.

CHECKED: K.P.H.

BOREHOLE 1011220044.GPJ HYDROGEO.GDT 7/27/10

PROJECT: 10-1122-0044

RECORD OF BOREHOLE: 10-10

SHEET 1 OF 1

LOCATION: See Site Plan

BORING DATE: March 18, 2010

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	Headspace Org. Vapour Conc. [PPM] ppm (6, 12, 18, 24) / Headspace Comb. Vapour Conc. [%LEL] ppm (20, 40, 60, 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6}, 10^{-5}, 10^{-4}, 10^{-3}) / WATER CONTENT PERCENT Wp, W, Wl (10, 20, 30, 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		Ground Surface		57.82							
0	Power Auger 200 mm Diam. (Hollow Stem)	Black sandy silt with organic matter (TOPSOIL)		0.05	1	50 DO	14				
		Compact grey brown silty sand, some gravel with brick (FILL)			2	50 DO	16				
1				56.60							
		Compact black sand, some gravel, with brick and ashes (FILL)		1.22	3	50 DO	23				
				55.99							
2		Compact brown to dark brown SAND, some gravel, trace silt		1.83	4	50 DO	16				
					5	50 DO	10				
3				54.77							
		Compact brown SAND and GRAVEL		3.05	6	50 DO	16				
				54.16							
		Dense brown coarse SAND		3.66	7	50 DO	50				
				53.88							
4		End of Borhole Auger Refusal		3.94							
5											
6											
7											
8											
9											
10											

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: D.G.

CHECKED: K.P.H.

BOREHOLE 1011220044.GPJ HYDROGEO.GDT 7/27/10

PROJECT: 10-1122-0044

RECORD OF BOREHOLE: 10-11

SHEET 1 OF 1

LOCATION: See Site Plan

BORING DATE: March 18, 2010

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	Headspace Org. Vapour Conc. [PPM] ppm (6 12 18 24) / Headspace Comb. Vapour Conc. [%LEL] ppm (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT Wp W Wl (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		Ground Surface		57.86							
0	Power Auger 200 mm Diam. (Hollow Stem)	Black sandy silt with organic matter (TOPSOIL)		0.08	1	50 DO	15	⊕			
		Compact brown silty sand, some gravel (FILL)		56.87	2	50 DO	38	⊕			
1		Dense to loose brown and black sand, some gravel with brick, trace concrete and wood (FILL)		0.99	3	50 DO	57	⊕			
2					4	50 DO	6	⊕			
				55.42							
		Compact brown silty sand layers, some clay, trace gravel with cobbles and boulders (FILL)		2.44	5	50 DO	24	⊕			
3					6	50 DO	28	⊕			
				54.20							
		Very dense grey CLAYEY SILT, trace very fine sand with cobbles and boulders		3.66	7	50 DO	53	⊕			
4					8	50 DO	34	⊕			
5					9	50 DO	80	⊕			
					10	50 DO	74				
6					11	50 DO	50				
					12	50 DO	50				
7					13	50 DO	79				
				49.96							
8	Rotary Drill NQ Core	Fresh grey LIMESTONE BEDROCK with interbedded shale		7.90	14	NQ RC	DD	T.C.R. (%) 100	S.C.R. (%) 29	R.Q.D. (%) 0	
					15	NQ RC	DD	100	44	28	
9					16	NQ RC	DD	100	50	36	
				48.36							
		End of Borehole		9.50							
10											

DEPTH SCALE

1 : 50

LOGGED: D.G.

CHECKED: K.P.H.

Golder Associates

BOREHOLE 1011220044.GPJ HYDROGEO.GDT 7/27/10

PROJECT: 10-1122-0044

RECORD OF BOREHOLE: 10-12

SHEET 1 OF 1

LOCATION: See Site Plan

BORING DATE: March 15, 2010

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	Headspace Org. Vapour Conc. [PPM] ppm (6 12 18 24) / Headspace Comb. Vapour Conc. [%LEL] ppm (20 40 60 80)	T.C.R. (%)	S.C.R. (%)	R.Q.D. (%)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT Wp W Wl (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		Ground Surface		56.68										
0	Power Auger 200 mm Diam. (Hollow Stem)	Black sandy silt, with organic matter (TOPSOIL)		0.08	1	50 DO	15							
		Dense grey brown silty sand, some gravel, with cobbles and boulders, trace wood at 1.22 m depth (FILL)			2	50 DO	25							
1					3	50 DO	16							
2				54.55	4	50 DO	60							
		Very dense black sand, some gravel, trace silt (FILL)		2.13										
				54.17										
		Compact light brown sandy silt (FILL)		2.59										
		Compact grey silty clay, trace sand (FILL)		53.71	5	50 DO	17							
3		Dense dark grey silty clay to dark brown sandy silt with organic matter (FILL)		2.97	6	50 DO	33							
				53.10										
	Rotary Drill NQ Core	Weathered LIMESTONE BEDROCK with interbedded shale		3.58	7	NQ RC	DD		100	26	17			
4					8	NQ RC	DD		100	30	20			
					9	NQ RC	DD		100	26	21			
5				51.52										
		End of Borehole		5.16										
6														
7														
8														
9														
10														

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: D.G.

CHECKED: K.P.H.

BOREHOLE 1011220044.GPJ HYDROGEO.GDT 7/27/10

PROJECT: 10-1122-0044

RECORD OF BOREHOLE: 10-13

SHEET 1 OF 1

LOCATION: See Site Plan

BORING DATE: March 9, 2010

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	Headspace Org. Vapour Conc. [PPM] ppm (6, 12, 18, 24) / Headspace Comb. Vapour Conc. [%LEL] ppm (20, 40, 60, 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6}, 10^{-5}, 10^{-4}, 10^{-3}) / WATER CONTENT PERCENT Wp W Wl (10, 20, 30, 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		Ground Surface		56.19							
0	Power Auger 200 mm Diam. (Hollow Stem)	Black silty clay with organic matter (TOPSOIL)		0.05	1	50 DO	14				
		Compact brown sand, some gravel, trace brick with cobbles (FILL)			2	50 DO	20				
1				54.97							
		Compact black sand, some gravel, trace silt (FILL)		1.22	3	50 DO	26				
				54.36							
2		Compact brown sand, some gravel (FILL)		54.21							
		Compact black sand, some gravel, trace silt (FILL)		1.98	4	50 DO	24				
				53.68							
		Loose brown SANDY SILT, some gravel, trace clay		2.51	5	50 DO	9				
3					6	50 DO	3				
					7	50 DO	6				
4				52.18							
				4.01							
5											
6											
7											
8											
9											
10											

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: D.G.

CHECKED: K.P.H.

BOREHOLE 1011220044.GPJ HYDROGEO.GDT 7/27/10

PROJECT: 10-1122-0044

RECORD OF BOREHOLE: 10-14

SHEET 1 OF 1

LOCATION: See Site Plan

BORING DATE: March 12, 2010

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	Headspace Org. Vapour Conc. [PPM] ppm / Headspace Comb. Vapour Conc. [%LEL] ppm	HYDRAULIC CONDUCTIVITY, k, cm/s / WATER CONTENT PERCENT Wp W Wl	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0		Ground Surface		55.85							
		Dark brown sandy silt with organic matter (TOPSOIL)		0.10	1	50 DO	8				
		Compact dark brown sand, some gravel, trace silt and brick (FILL)			2	50 DO	26				
1				54.63							
		Compact, brown, medium to coarse sand, some gravel, trace silt (FILL)		1.22	3	50 DO	16				
2	Power Auger 200 mm Diam. (Hollow Stem)				4	50 DO	17				
					5	50 DO	17				
3				52.50	6	50 DO	12				
		Compact light brown SANDY SILT		3.35							
				52.19							
		Dense coarse SAND, some gravel		3.66	7	50 DO	50				
4	RD NW			51.86							
		Fresh LIMESTONE BEDROCK with interbedded shale		3.99	8	NQ RC	DD	T.C.R. (%): 96 / S.C.R. (%): 28 / R.Q.D. (%): 16			
5	Rotary Drill NQ Core				9	NQ RC	DD	T.C.R. (%): 100 / S.C.R. (%): 96 / R.Q.D. (%): 96			
6				49.85							
		End of Borehole		6.00							
7											
8											
9											
10											

Headspace Org. Vapour Conc. [PPM] ppm: 6, 12, 18, 24

Headspace Comb. Vapour Conc. [%LEL] ppm: 20, 40, 60, 80

HYDRAULIC CONDUCTIVITY, k, cm/s: 10^{-6}, 10^{-5}, 10^{-4}, 10^{-3}

WATER CONTENT PERCENT: 10, 20, 30, 40

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: D.G.

CHECKED: K.P.H.

BOREHOLE 1011220044.GPJ HYDROGEO.GDT 7/27/10

PROJECT: 10-1122-0044

RECORD OF BOREHOLE: 10-15

SHEET 1 OF 1

LOCATION: See Site Plan

BORING DATE: March 12, 2010

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/0.3m	Headspace Org. Vapour Conc. [PPM] ppm / Headspace Comb. Vapour Conc. [%LEL] ppm	HYDRAULIC CONDUCTIVITY, k, cm/s / WATER CONTENT PERCENT Wp W Wl	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		Ground Surface		55.34							
0	Power Auger 200 mm Diam. (Hollow Stem)	Dark grey silty sand with organic matter (TOPSOIL)		55.14							
		Compact grey silty sand, some gravel, trace clay with cobbles (FILL)		0.20	1	50 DO	40				
				54.63							
		Compact black sand, some gravel, trace silt (FILL)		0.81	2	50 DO	14				
1		Loose, brown, fine to medium sand, trace gravel (FILL)			3	50 DO	7				
2					4	50 DO	6				
				52.90							
		Compact dark brown to black silt, trace brick and paper (FILL)		2.44	5	50 DO	20				
3				52.29							
		Loose coarse GRAVEL with dark brown to black silt		3.05	6	50 DO	9				
				51.96							
		End of Borehole Auger Refusal		3.38							
4											
5											
6											
7											
8											
9											
10											

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: D.G.

CHECKED: K.P.H.

BOREHOLE 1011220044.GPJ HYDROGEO.GDT 7/27/10

PROJECT: 10-1122-0044

RECORD OF BOREHOLE: 10-16

SHEET 1 OF 1

LOCATION: See Site Plan

BORING DATE: March 12, 2010

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	Headspace Org. Vapour Conc. [PPM] ppm (6, 12, 18, 24) / Headspace Comb. Vapour Conc. [%LEL] ppm (20, 40, 60, 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6}, 10^{-5}, 10^{-4}, 10^{-3}) / WATER CONTENT PERCENT Wp W Wl (10, 20, 30, 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		Ground Surface		55.72							
0	Power Auger 200 mm Diam. (Hollow Stem)	Black sandy silt with organic matter (TOPSOIL)		0.08	1	50 DO	22				
		Compact dark brown to brown sand, some gravel, trace silt with pieces of concrete (FILL)			2	50 DO	53				
1				54.50							
		Loose to compact brown fine sand (FILL)		1.22	3	50 DO	13				
2					4	50 DO	4				
					5	50 DO	3				
3				52.70							
		Peat with sand and wood (FILL)		3.02	6	50 DO	2				
					7	50 DO	1				
4	Rotary Drill NQ Core	Fresh grey LIMESTONE BEDROCK with interbedded shale		51.73 3.99	8	NQ RC	DD	T.C.R. (%) 100	S.C.R. (%) 91	R.Q.D. (%) 83	
5					9	NQ RC	DD	100	100	100	
				50.21							
		End of Borehole		5.51							
6											
7											
8											
9											
10											

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: D.G.

CHECKED: K.P.H.

BOREHOLE 1011220044.GPJ HYDROGEO.GDT 7/27/10

PROJECT: 10-1122-0044

RECORD OF BOREHOLE: 10-17

SHEET 1 OF 1

LOCATION: See Site Plan

BORING DATE: March 15, 2010

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	Headspace Org. Vapour Conc. [PPM] ppm (6, 12, 18, 24) / Headspace Comb. Vapour Conc. [%LEL] ppm (20, 40, 60, 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6}, 10^{-5}, 10^{-4}, 10^{-3}) / WATER CONTENT PERCENT Wp, W, Wl (10, 20, 30, 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		Ground Surface		56.19							
0	Power Auger 200 mm Diam. (Hollow Stem)	Dark brown silty sand with organic material (TOPSOIL)		56.06							
		Loose to compact dark brown silty sand, some gravel with brick, cobbles and boulders (FILL)		0.13	1	50 DO	13				
1					2	50 DO	9				
		Compact black sand, some gravel, trace silt (FILL)		55.05 1.14							
				54.67	3	50 DO	18				
2		Loose to compact, brown, medium to coarse SAND, trace gravel with cobbles and boulders		1.52	4	50 DO	7				
					5	50 DO	20				
3				53.14							
		Compact coarse GRAVEL with dark brown silty sand		3.05	6	50 DO	18				
					7	50 DO	23				
4				52.08							
		End of Borehole Auger Refusal		4.11							
5											
6											
7											
8											
9											
10											

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: D.G.

CHECKED: K.P.H.

BOREHOLE 1011220044.GPJ HYDROGEO.GDT 7/27/10

PROJECT: 10-1122-0044

RECORD OF BOREHOLE: 10-18

SHEET 1 OF 1

LOCATION: See Site Plan

BORING DATE: March 15, 2010

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	Headspace Org. Vapour Conc. [PPM] ppm (6, 12, 18, 24) / Headspace Comb. Vapour Conc. [%LEL] ppm (20, 40, 60, 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6}, 10^{-5}, 10^{-4}, 10^{-3}) / WATER CONTENT PERCENT Wp W Wl (10, 20, 30, 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0		Ground Surface		56.35							
	Power Auger 200 mm Diam. (Hollow Stem)	Black sandy silt with organic matter (TOPSOIL)		56.22							
		Loose black to dark brown sand, some clay, trace gravel (FILL)		0.13	1	50 DO	8				
				55.74							
1		Dense grey brown silty sand, some gravel, trace clay with cobbles and boulders (FILL)		0.61	2	50 DO	44				
				54.90	3	50 DO	14				
		Wood (FILL)		1.52							
		Compact black sand, some gravel, trace silt (FILL)		54.47							
2		Compact brown fine sand, some silt (FILL)		1.88	4	50 DO	29				
				54.06							
		Compact black sand (FILL)		2.36							
		Compact grey brown silty sand with cobbles and boulders (FILL)			5	50 DO	16				
3				53.30							
		Compact grey brown clayey sand with wood (FILL)		3.05	6	50 DO	12				
					7	NQ RC	DD				
				52.46							
4	Rotary Drill NQ Core	Fractured LIMESTONE BEDROCK with interbedded shale		3.89	8	NQ RC	DD	T.C.R. (%): 100 / S.C.R. (%): 29 / R.Q.D. (%): 0			
				52.01							
		Fresh LIMESTONE BEDROCK with interbedded shale		4.34	9	NQ RC	DD	T.C.R. (%): 100 / S.C.R. (%): 98 / R.Q.D. (%): 94			
5				50.84							
		End of Borehole		5.51							
6											
7											
8											
9											
10											

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: D.G.

CHECKED: K.P.H.

BOREHOLE 1011220044.GPJ HYDROGEO.GDT 7/27/10

PROJECT: 10-1122-0044

RECORD OF BOREHOLE: 10-19

SHEET 1 OF 1

LOCATION: See Site Plan

BORING DATE: March 16, 2010

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		Ground Surface		56.42							
0	Power Auger 200 mm Diam. (Hollow Stem)	Black sandy silt with organic matter (TOPSOIL)		0.10	1	50 DO	14				
		Compact to very dense grey brown silty sand, some gravel with brick, concrete, and asphalt (FILL)			2	50 DO	50				
1					3	50 DO	10				
				54.74							
		Compact black sand, some gravel (FILL)		54.59							
2		Compact brown silty sand, some gravel, trace black sand (FILL)		1.83	4	50 DO	18				
				53.98							
		Dense grey brown silty clay, trace gravel (FILL)		2.44	5	50 DO	36				
3				53.45							
		Dense black SANDY SILT with organic matter		53.17	6	50 DO	50				
		Dense brown fine SAND, some silt		3.25							
		End of Borehole Auger Refusal									
4											
5											
6											
7											
8											
9											
10											

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: D.G.

CHECKED: K.P.H.

BOREHOLE 1011220044.GPJ HYDROGEO.GDT 7/27/10

PROJECT: 10-1122-0044

RECORD OF BOREHOLE: 10-20

SHEET 1 OF 1

LOCATION: See Site Plan

BORING DATE: March 22, 2010

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/0.3m	Headspace Org. Vapour Conc. [PPM] ppm (6, 12, 18, 24) / Headspace Comb. Vapour Conc. [%LEL] ppm (20, 40, 60, 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6}, 10^{-5}, 10^{-4}, 10^{-3}) / WATER CONTENT PERCENT Wp — W — Wl (10, 20, 30, 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		Ground Surface		57.94							
0	Power Auger 200 mm Diam. (Hollow Stem)	Black sandy silt with organic matter (TOPSOIL)		0.08	1	50 DO	18				
		Compact dark brown silty sand and brick (FILL)		57.33							
		Compact sand, some gravel, trace concrete and brick (FILL)		0.61	2	50 DO	39				
1					3	50 DO	16				
				56.11							
2		Loose to compact brown SILTY SAND with cobbles and boulders		1.83	4	50 DO	8				
				55.20	5	50 DO	30				
		Dense grey SILTY SAND, some gravel, trace clay		2.74							
3					6	50 DO	66				
				54.28							
		Very dense grey CLAYEY SILT, some very fine sand, trace gravel		3.66	7	50 DO	97				
4					8	50 DO	86				
				52.86							
5		End of Borehole Auger Refusal		5.08							
6											
7											
8											
9											
10											

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: D.G.

CHECKED: K.P.H.

BOREHOLE 1011220044.GPJ HYDROGEO.GDT 7/27/10

PROJECT: 10-1122-0044

RECORD OF BOREHOLE: 10-21

SHEET 1 OF 1

LOCATION: See Site Plan

BORING DATE: March 22, 2010

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	Headspace Org. Vapour Conc. [PPM] ppm (⊕) 6 12 18 24 / Headspace Comb. Vapour Conc. [%LEL] ppm (□) 20 40 60 80	HYDRAULIC CONDUCTIVITY, k, cm/s 10^{-6} 10^{-5} 10^{-4} 10^{-3} / WATER CONTENT PERCENT Wp W Wl 10 20 30 40	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		Ground Surface		58.02							
0	Power Auger 200 mm Diam. (Hollow Stem)	Black sandy silt with organic matter (TOPSOIL)		0.00	1	50 DO	11	⊕			
				57.26							
1		Compact brown silty sand, some gravel, trace clay (FILL)		0.76	2	50 DO	18	⊕			
		Compact black sand, some gravel (FILL)		1.22	3	50 DO	19	⊕			
				56.19							
2		Compact brown to dark brown sandy silt, some gravel with cobbles and boulders (FILL)		1.83	4	50 DO	13	⊕			
				55.28	5	50 DO	10	⊕			
3		Compact grey silty sand, some clay (FILL)		2.74							
				54.97							
		Dense grey clayey silt, some very fine sand (FILL)		3.05	6	50 DO	33	⊕			
				54.36							
4		Dense to very dense, grey SANDY SILT, some gravel, trace clay with cobbles and boulders		3.66	7	50 DO	42	⊕			
					8	50 DO	54	⊕			
5					9	50 DO		⊕			
					10	50 DO	50	⊕			
6				51.85	11	50 DO	50	⊕			
		End of Borehole Auger Refusal		6.17							
7											
8											
9											
10											

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: D.G.

CHECKED: K.P.H.

BOREHOLE 1011220044.GPJ HYDROGEO.GDT 7/27/10

PROJECT: 10-1122-0044

RECORD OF BOREHOLE: 10-22

SHEET 1 OF 1

LOCATION: See Site Plan

BORING DATE: March 16, 2010

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	Headspace Org. Vapour Conc. [PPM] ppm / Headspace Comb. Vapour Conc. [%LEL] ppm	HYDRAULIC CONDUCTIVITY, k, cm/s / WATER CONTENT PERCENT Wp W Wl	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		Ground Surface		56.80							
0	Power Auger 200 mm Diam. (Hollow Stem)	Black sandy silt with organic matter (TOPSOIL)		0.10	1	50 DO	10				
		Compact grey brown silty clay, trace gravel (FILL)		56.19							
		Compact brown sand, some gravel, trace silt and cobbles (FILL)		0.61	2	50 DO	50				
1				55.58	3	50 DO	32				
		Compact black sand, some gravel, trace silt (FILL)		1.22							
				54.97	4	50 DO	80				
2		Very dense grey coarse gravel with cobbles (FILL)		1.83							
				54.67							
		Compact dark brown sand, some silt, trace gravel, cobbles and boulders (FILL)		2.13	5	50 DO	23				
				54.13							
		PEAT		2.74							
3		Compact grey brown SILTY CLAY		53.75	6	50 DO	17				
		Dense grey SILTY SAND, some gravel, trace clay with cobbles and boulders		3.05							
					7	50 DO	65				
				52.84							
4		End of Borehole Auger Refusal		3.96							
5											
6											
7											
8											
9											
10											

Headspace Org. Vapour Conc. [PPM] ppm: 6, 12, 18, 24

Headspace Comb. Vapour Conc. [%LEL] ppm: 20, 40, 60, 80

HYDRAULIC CONDUCTIVITY, k, cm/s: 10^{-6}, 10^{-5}, 10^{-4}, 10^{-3}

WATER CONTENT PERCENT: 10, 20, 30, 40

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: D.G.

CHECKED: K.P.H.

BOREHOLE 1011220044.GPJ HYDROGEO.GDT 7/27/10

PROJECT: 10-1122-0044

RECORD OF BOREHOLE: 10-23

SHEET 1 OF 1

LOCATION: See Site Plan

BORING DATE: March 16, 2010

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	Headspace Org. Vapour Conc. [PPM] ppm (6 12 18 24) / Headspace Comb. Vapour Conc. [%LEL] ppm (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT Wp W Wl (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		Ground Surface		56.24							
0	Power Auger 200 mm Diam. (Hollow Stem)	Dark grey silty sand with organic matter, trace brick (FILL)		0.00	1	50 DO	11				
				55.63							
1		Dense black crushed shale (FILL)		0.61	2	50 DO	49				
				54.72	3	50 DO	16				
2		Compact, brown, medium to coarse sand, some gravel with cobbles and boulders (FILL)		1.52	4	50 DO	11				
					5	50 DO	13				
3					6	50 DO	15				
				52.89							
		Compact to dense dark grey silty clay with organic matter (FILL)		3.35	7	50 DO	50				
				52.30							
4		End of Borehole Auger Refusal		3.94							
5											
6											
7											
8											
9											
10											

BOREHOLE 1011220044.GPJ HYDROGEO.GDT 7/27/10

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: D.G.

CHECKED: K.P.H.

PROJECT: 10-1122-0044

RECORD OF BOREHOLE: 10-24

SHEET 1 OF 1

LOCATION: See Site Plan

BORING DATE: March 16, 2010

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/0.3m	Headspace Org. Vapour Conc. [PPM] ppm / Headspace Comb. Vapour Conc. [%LEL] ppm	HYDRAULIC CONDUCTIVITY, k, cm/s / WATER CONTENT PERCENT Wp W Wl	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		Ground Surface		56.93							
0	Power Auger 200 mm Diam. (Hollow Stem)	Black sandy silt with organic matter (FILL)		0.10	1	50 DO	18				
1		Compact to very dense black and brown sand, some gravel with asphalt and brick (FILL)			2	50 DO	80				
				55.71							
		Compact to very dense black sand, some gravel, with asphalt, trace brick (FILL)		1.22	3	50 DO	29				
2					4	50 DO	51				
				54.49							
		Dense to compact dark brown and grey brown silty clay with some sand and brown silty sand, some gravel layers (FILL)		2.44	5	50 DO	38				
3					6	50 DO	12				
4					7	50 DO	13				
				52.64							
		End of Borehole Auger Refusal		4.29							
5											
6											
7											
8											
9											
10											

Headspace Org. Vapour Conc. [PPM] ppm: 6, 12, 18, 24

Headspace Comb. Vapour Conc. [%LEL] ppm: 20, 40, 60, 80

HYDRAULIC CONDUCTIVITY, k, cm/s: 10^{-6}, 10^{-5}, 10^{-4}, 10^{-3}

WATER CONTENT PERCENT: 10, 20, 30, 40

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: D.G.

CHECKED: K.P.H.

BOREHOLE 1011220044.GPJ HYDROGEO.GDT 7/27/10

PROJECT: 10-1122-0044

RECORD OF BOREHOLE: 10-25

SHEET 1 OF 1

LOCATION: See Site Plan

BORING DATE: March 10, 2010

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	Headspace Org. Vapour Conc. [PPM] ppm / Headspace Comb. Vapour Conc. [%LEL] ppm	HYDRAULIC CONDUCTIVITY, k, cm/s / WATER CONTENT PERCENT (Wp, W, Wl)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		Ground Surface		55.79							
0	Power Auger 200 mm Diam. (Hollow Stem)	Dark brown silty sand with organic matter (TOPSOIL)		55.64 / 0.15							
		Dense grey brown to brown sand, some gravel, trace silt with cobbles and boulders, trace brick from 1.22 to 1.52 m depth (FILL)			1	50 DO	29				
1					2	50 DO	46				
				54.27	3	50 DO	15				
		Loose brown fine to medium sand (FILL)		1.52							
2					4	50 DO	3				
				52.89	5	50 DO	4				
		Wood (FILL)		2.90							
3					6	50 DO	15				
				52.13							
		Very dense coarse GRAVEL with dark brown silt (FILL)		3.66	7	50 DO	53				
4				51.65							
		End of Borehole Auger Refusal		4.14							
5											
6											
7											
8											
9											
10											

Headspace Org. Vapour Conc. [PPM] ppm: 6, 12, 18, 24

Headspace Comb. Vapour Conc. [%LEL] ppm: 20, 40, 60, 80

HYDRAULIC CONDUCTIVITY, k, cm/s: 10^{-6}, 10^{-5}, 10^{-4}, 10^{-3}

WATER CONTENT PERCENT: Wp, W, Wl; 10, 20, 30, 40

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: D.G.

CHECKED: K.P.H.

BOREHOLE 1011220044.GPJ HYDROGEO.GDT 7/27/10

PROJECT: 10-1122-0044

RECORD OF BOREHOLE: 10-26

SHEET 1 OF 1

LOCATION: See Site Plan

BORING DATE: March 24, 2010

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	Headspace Org. Vapour Conc. [PPM] ppm / Headspace Comb. Vapour Conc. [%LEL] ppm	HYDRAULIC CONDUCTIVITY, k, cm/s / WATER CONTENT PERCENT Wp W Wl	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		Ground Surface		55.27							
0	Power Auger 200 mm Diam. (Hollow Stem)	Black sandy silt with organic matter (TOPSOIL)		0.08	1	50 DO	20				
		Compact grey crushed stone, some sand (FILL)		54.81							
		Compact black sand, some gravel (FILL)		54.66							
1		Compact to dense grey crushed stone, some sand (FILL)		0.61	2	50 DO	27				
					3	50 DO	37				
				53.44							
2		Compact, brown, medium to coarse sand, trace crushed stone (FILL)		1.83	4	50 DO	14				
				52.83							
		Loose grey brown silty sand, trace crushed stone (FILL)		2.44	5	50 DO	6				
3				52.22							
		Peat, trace wood (FILL)		3.05	6	50 DO	50				
				51.97							
		Highly weathered LIMESTONE BEDROCK		51.79							
	RD / NW	Grey LIMESTONE BEDROCK with interbedded shale		3.48							
4	Rotary Drill NQ Core				7	NQ RC	DD	T.C.R. (%) 100; S.C.R. (%) 59; R.Q.D. (%) 27			
					8	NQ RC	DD	T.C.R. (%) 100; S.C.R. (%) 100; R.Q.D. (%) 100			
5				50.22							
		End of Borehole		5.05							
6											
7											
8											
9											
10											

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: D.G.

CHECKED: K.P.H.

BOREHOLE 1011220044.GPJ HYDROGEO.GDT 7/27/10

PROJECT: 10-1122-0044

RECORD OF BOREHOLE: 10-27

SHEET 1 OF 1

LOCATION: See Site Plan

BORING DATE: March 24, 2010

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	Headspace Org. Vapour Conc. [PPM] ppm / Headspace Comb. Vapour Conc. [%LEL] ppm	HYDRAULIC CONDUCTIVITY, k, cm/s / WATER CONTENT PERCENT Wp W Wl	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		Ground Surface		55.59							
0	Power Auger 200 mm Diam. (Hollow Stem)	Black sandy silt with organic matter (TOPSOIL)		0.05							
		Compact grey crushed stone, some sand, trace concrete (FILL)		55.06	1	50 DO	17				
1		Loose black sand, some silt, trace ash and brick (FILL)		0.53	2	50 DO	6				
				54.37							
		Compact brown silty sand, some clay, trace gravel (FILL)		1.22	3	50 DO	25				
2				53.76							
		Compact grey brown silty clay (FILL)		1.83	4	50 DO	10				
				53.15							
		Loose brown coarse sand, trace gravel (FILL)		2.44	5	50 DO	8				
3				52.54							
		Compact grey brown SILTY CLAY		3.05	6	50 DO	12				
				52.03							
		Weathered LIMESTONE BEDROCK		3.56							
				51.73							
4		End of Borehole Auger Refusal		3.86							
5											
6											
7											
8											
9											
10											

Headspace Org. Vapour Conc. [PPM] ppm: 6, 12, 18, 24

Headspace Comb. Vapour Conc. [%LEL] ppm: 20, 40, 60, 80

HYDRAULIC CONDUCTIVITY, k, cm/s: 10^{-6}, 10^{-5}, 10^{-4}, 10^{-3}

WATER CONTENT PERCENT: Wp W Wl; 10, 20, 30, 40

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: D.G.

CHECKED: K.P.H.

BOREHOLE 1011220044.GPJ HYDROGEO.GDT 7/27/10

PROJECT: 10-1122-0044

RECORD OF BOREHOLE: 10-28

SHEET 1 OF 1

LOCATION: See Site Plan

BORING DATE: March 22, 2010

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	Headspace Org. Vapour Conc. [PPM] ppm / Headspace Comb. Vapour Conc. [%LEL] ppm	HYDRAULIC CONDUCTIVITY, k, cm/s / WATER CONTENT PERCENT	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		Ground Surface		56.33							
0	Power Auger 200 mm Diam. (Hollow Stem)	Black sandy silt with organic matter (TOPSOIL)		56.20							
		Compact brown coarse sand, some gravel (FILL)		0.13	1	50 DO	17				
				55.42	2	50 DO	22				
1		Loose to compact black sand, some gravel, some glass, trace wood from 1.83 m depth (FILL)		0.91	3	50 DO	10				
2					4	50 DO	4				
				53.89							
		Loose brown to grey brown SILTY CLAY		2.44	5	50 DO	9				
3					6	50 DO	6				
				52.67	7	50 DO					
		Dense brown SILTY SAND, some gravel with cobbles and boulders		3.66	8	50 DO	60				
4				52.09							
		End of Borehole Auger Refusal		4.24							
5											
6											
7											
8											
9											
10											

Headspace Org. Vapour Conc. [PPM] ppm: 6, 12, 18, 24

Headspace Comb. Vapour Conc. [%LEL] ppm: 20, 40, 60, 80

HYDRAULIC CONDUCTIVITY, k, cm/s: 10^{-6}, 10^{-5}, 10^{-4}, 10^{-3}

WATER CONTENT PERCENT: Wp — W — Wl; 10, 20, 30, 40

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: D.G.

CHECKED: K.P.H.

BOREHOLE 1011220044.GPJ HYDROGEO.GDT 7/27/10

PROJECT: 10-1122-0044

RECORD OF BOREHOLE: 10-29

SHEET 1 OF 1

LOCATION: See Site Plan

BORING DATE: March 22, 2010

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	Headspace Org. Vapour Conc. [PPM] ppm (6, 12, 18, 24) / Headspace Comb. Vapour Conc. [%LEL] ppm (20, 40, 60, 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6}, 10^{-5}, 10^{-4}, 10^{-3}) / WATER CONTENT PERCENT Wp — W — Wl (10, 20, 30, 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0	Power Auger 200 mm Diam. (Hollow Stem)	Ground Surface		56.80							
		Black sandy silt with organic matter (TOPSOIL)		56.67							
		Compact brown silty clay, some sand, trace gravel (FILL)		0.13	1	50 DO	10				
				56.19							
		Compact brown silty sand, some gravel, trace concrete (FILL)		0.61	2	50 DO	28				
1				55.58							
		Very dense black sand, some gravel, trace brick (FILL)		1.22	3	50 DO	55				
				54.97							
		Compact brown coarse sand (FILL)		1.83							
2				54.67	4	50 DO	18				
		Compact grey brown silty clay (FILL)		2.13							
				54.21							
		Loose dark brown silty sand with organic matter (FILL)		2.59	5	50 DO	8				
3				53.75							
		Hard grey CLAYEY SILT, some very fine sand		3.05	6	50 DO	28				
					7	50 DO	49				
4				52.37							
		End of Borehole Auger Refusal		4.43							
5											
6											
7											
8											
9											
10											

BOREHOLE 1011220044.GPJ HYDROGEO.GDT 7/27/10

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: D.G.

CHECKED: K.P.H.

PROJECT: 10-1122-0044

RECORD OF BOREHOLE: 10-30

SHEET 1 OF 1

LOCATION: See Site Plan

BORING DATE: March 25, 2010

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	Headspace Org. Vapour Conc. [PPM] ppm / Headspace Comb. Vapour Conc. [%LEL] ppm	HYDRAULIC CONDUCTIVITY, k, cm/s / WATER CONTENT PERCENT Wp W Wl	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0		Ground Surface		57.87							
	Power Auger 200 mm Diam. (Hollow Stem)	Black sandy silt with organic matter (TOPSOIL)		57.72							
		Loose brown silty sand, some gravel (FILL)		0.15	1	50 DO	6				
1					2	50 DO	4				
				56.65							
		Compact to dense light brown silty sand, some gravel, trace clay (FILL)		1.22	3	50 DO	17				
2					4	50 DO	35				
				55.43							
		Dense to very dense grey SILTY SAND, some gravel, trace clay with cobbles and boulders		2.44	5	50 DO	49				
3					6	50 DO	49				
					7	50 DO	86				
4					8	50 DO	92				
5					9	50 DO	99				
	RD NW				10	50 DO	50				
6					11	NQ RC	DD				
				51.19							
	Rotary Drill NQ Core	Fresh grey LIMESTONE BEDROCK with interbedded shale		6.68	12	NQ RC	DD	T.C.R. (%) 100	S.C.R. (%) 100	R.Q.D. (%) 100	
7					13	NQ RC	DD	T.C.R. (%) 100	S.C.R. (%) 97	R.Q.D. (%) 91	
8				49.62							
		End of Borehole		8.25							
9											
10											

BOREHOLE 1011220044.GPJ HYDROGEO.GDT 7/27/10

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: D.G.

CHECKED: K.P.H.

PROJECT: 10-1122-0044

RECORD OF BOREHOLE: 10-31

SHEET 1 OF 1

LOCATION: See Site Plan

BORING DATE: April 15, 2010

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	Headspace Org. Vapour Conc. [PPM] ppm (6, 12, 18, 24) / Headspace Comb. Vapour Conc. [%LEL] ppm (20, 40, 60, 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6}, 10^{-5}, 10^{-4}, 10^{-3}) / WATER CONTENT PERCENT Wp — W — Wl (10, 20, 30, 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		Ground Surface		56.66							
0	Power Auger 200 mm Diam. (Hollow Stem)	Dark brown sandy silt with organic matter (TOPSOIL)		56.51							
		Compact brown sand, some gravel with concrete and brick (FILL)		0.15	1	50 DO	25				
1					2	50 DO	28				
				55.44							
		Dense black sand, some gravel (FILL)		1.22	3	50 DO	46				
2					4	50 DO	42				
				54.22							
		Stiff brown SILTY CLAY, trace sand		2.44	5	50 DO	32				
3					6	50 DO	7				
					7	50 DO	12				
4				52.39							
		End of Borehole Auger Refusal		4.27							
5											
6											
7											
8											
9											
10											

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: D.G.

CHECKED: K.P.H.

BOREHOLE 1011220044.GPJ HYDROGEO.GDT 7/27/10

PROJECT: 10-1122-0044

RECORD OF BOREHOLE: 10-32

SHEET 1 OF 1

LOCATION: See Site Plan

BORING DATE: April 15, 2010

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/0.3m	Headspace Org. Vapour Conc. [PPM] ppm / Headspace Comb. Vapour Conc. [%LEL] ppm	HYDRAULIC CONDUCTIVITY, k, cm/s / WATER CONTENT PERCENT Wp W Wl	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		Ground Surface		56.32							
0	Power Auger 200 mm Diam. (Hollow Stem)	Dark brown sandy silt with organic matter (TOPSOIL)		0.05							
		Compact to dense brown sand, some gravel, trace brick (FILL)			1	50 DO	12	⊕			
1					2	50 DO	40	⊕			
				55.10							
		Compact black sand, some gravel, trace brick (FILL)		1.22	3	50 DO	18	⊕			
2				54.49							
		Dense brown fine sand (FILL)		1.83	4	50 DO	25	⊕			
				53.88							
		Firm grey brown to grey SILTY CLAY		2.44	5	50 DO	12	⊕			
3					6	50 DO	5	⊕			
					7	50 DO	6	⊕			
4				52.05							
		Weathered SHALE BEDROCK		4.27	8	50 DO	12	⊕			
				51.82							
		End of Borehole Auger Refusal		4.50							
5											
6											
7											
8											
9											
10											

Headspace Org. Vapour Conc. [PPM] ppm: 6, 12, 18, 24

Headspace Comb. Vapour Conc. [%LEL] ppm: 20, 40, 60, 80

HYDRAULIC CONDUCTIVITY, k, cm/s: 10^{-6}, 10^{-5}, 10^{-4}, 10^{-3}

WATER CONTENT PERCENT: 10, 20, 30, 40

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: D.G.

CHECKED: K.P.H.

BOREHOLE 1011220044.GPJ HYDROGEO.GDT 7/27/10

PROJECT: 10-1122-0044

RECORD OF BOREHOLE: 10-33

SHEET 1 OF 1

LOCATION: See Site Plan

BORING DATE: April 15, 2010

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/0.3m	Headspace Org. Vapour Conc. [PPM] ppm (6, 12, 18, 24) / Headspace Comb. Vapour Conc. [%LEL] ppm (20, 40, 60, 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6}, 10^{-5}, 10^{-4}, 10^{-3}) / WATER CONTENT PERCENT Wp W Wl (10, 20, 30, 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		Ground Surface		56.23							
0	Power Auger 200 mm Diam. (Hollow Stem)	Black sandy silt with organic matter (TOPSOIL)		56.08							
		Compact brown silty sand to sandy silt, some gravel with concrete (FILL)		0.15	1	50 DO	24				
1					2	50 DO	38				
		Compact black and brown sand (FILL)		55.16 1.07	3	50 DO	28				
				54.40							
2		Compact brown coarse sand, some gravel with cobbles (FILL)		1.83	4	50 DO	14				
					5	50 DO	30				
3					6	50 DO	12				
				52.27	7	50 DO	22				
4		PEAT		3.96							
				51.96							
		Weathered SHALE BEDROCK		4.27	8	50 DO	26				
				51.56							
		End of Borehole Auger Refusal		4.67							
5											
6											
7											
8											
9											
10											

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: D.G.

CHECKED: K.P.H.

BOREHOLE 1011220044.GPJ HYDROGEO.GDT 7/27/10

PROJECT: 10-1122-0044

RECORD OF BOREHOLE: 10-34

SHEET 1 OF 1

LOCATION: See Site Plan

BORING DATE: April 15, 2010

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	Headspace Org. Vapour Conc. [PPM] ppm / Headspace Comb. Vapour Conc. [%LEL] ppm	HYDRAULIC CONDUCTIVITY, k, cm/s / WATER CONTENT PERCENT (Wp, W, Wl)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		Ground Surface		55.90							
0	Power Auger 200 mm Diam. (Hollow Stem)	Black sandy silt with organic matter (TOPSOIL)		0.05	1	50 DO	18				
		Compact to dense brown sand, some gravel with brick, concrete and asphalt (FILL)			2	50 DO	39				
1				54.68							
		Compact brown sand, some gravel (FILL)		1.22	3	50 DO	12				
2					4	50 DO	10				
					5	50 DO	15				
3				52.85							
		Compact sand, some gravel with cobbles and boulders (FILL)		3.05	6	50 DO	16				
				52.09							
		PEAT		3.81	7	50 DO	5				
4				51.76							
		End of Borehole Auger Refusal		4.14							
5											
6											
7											
8											
9											
10											

Headspace Org. Vapour Conc. [PPM] ppm: 6, 12, 18, 24

Headspace Comb. Vapour Conc. [%LEL] ppm: 20, 40, 60, 80

HYDRAULIC CONDUCTIVITY, k, cm/s: 10^{-6}, 10^{-5}, 10^{-4}, 10^{-3}

WATER CONTENT PERCENT: Wp — W — Wl; 10, 20, 30, 40

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: D.G.

CHECKED: K.P.H.

BOREHOLE 1011220044.GPJ HYDROGEO.GDT 7/27/10

PROJECT: 10-1122-0044

RECORD OF BOREHOLE: 10-35

SHEET 1 OF 1

LOCATION: See Site Plan

BORING DATE: April 16, 2010

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	Headspace Org. Vapour Conc. [PPM] ppm (⊕) 6 12 18 24 / Headspace Comb. Vapour Conc. [%LEL] ppm (□) 20 40 60 80	HYDRAULIC CONDUCTIVITY, k, cm/s 10^{-6} 10^{-5} 10^{-4} 10^{-3} / WATER CONTENT PERCENT Wp W Wl 10 20 30 40	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		Ground Surface		55.66							
0	Power Auger 200 mm Diam. (Hollow Stem)	Dark brown sandy silt with organic matter (TOPSOIL)		55.51							
		Compact grey silty sand, some gravel, trace brick (FILL)		0.15	1	50 DO	20 ⊕				
1					2	50 DO	18 ⊕				
				54.44							
		Loose to compact brown medium sand, some gravel (FILL)		1.22	3	50 DO	8 ⊕				
2					4	50 DO	11 ⊕				
				53.22							
		Loose dark brown sand, some gravel with wood (FILL)		2.44	5	50 DO	10 ⊕				
3				52.61							
		Firm grey silty clay (FILL)		3.05	6	50 DO	5 ⊕				
				52.15							
		PEAT		3.51	7	50 DO	4 ⊕				
				51.77							
4		End of Borehole Auger Refusal		3.89							
5											
6											
7											
8											
9											
10											

BOREHOLE 1011220044.GPJ HYDROGEO.GDT 7/27/10

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: D.G.

CHECKED: K.P.H.

PROJECT: 10-1122-0044

RECORD OF BOREHOLE: 10-36

SHEET 1 OF 1

LOCATION: See Site Plan

BORING DATE: April 16, 2010

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/0.3m	Headspace Org. Vapour Conc. [PPM] ppm / Headspace Comb. Vapour Conc. [%LEL] ppm	HYDRAULIC CONDUCTIVITY, k, cm/s / WATER CONTENT PERCENT Wp W Wl	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		Ground Surface		55.96							
0	Power Auger 200 mm Diam. (Hollow Stem)	Dark brown sandy silt with organic matter (TOPSOIL)		0.08	1	50 DO	21				
		Compact dark brown medium sand, some gravely shale, trace brick (FILL)			2	50 DO	21				
1				54.74							
		Compact brown sand, some gravel (FILL)		1.22	3	50 DO	20				
				54.21							
2		Compact brown fine to medium sand (FILL)		1.75	4	50 DO	16				
				53.52							
		Loose dark brown silty sand, some wood (FILL)		2.44	5	50 DO	4				
3											
				52.61	6	50 DO	5				
		PEAT		3.35							
				52.30							
		Firm grey SILTY CLAY		3.66	7	50 DO	7				
4				51.69							
		Compact black SILTY CLAY, trace gravel		4.27	8	50 DO	11				
				51.08							
5		Compact grey SILTY SAND, some gravel, trace clay with cobbles and boulders		4.88	9	50 DO	15				
					10	50 DO	6				
				50.12							
6		End of Borehole Auger Refusal		5.84							
7											
8											
9											
10											

Headspace Org. Vapour Conc. [PPM] ppm: 6, 12, 18, 24

Headspace Comb. Vapour Conc. [%LEL] ppm: 20, 40, 60, 80

HYDRAULIC CONDUCTIVITY, k, cm/s: 10^{-6}, 10^{-5}, 10^{-4}, 10^{-3}

WATER CONTENT PERCENT: 10, 20, 30, 40

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: D.G.

CHECKED: K.P.H.

BOREHOLE 1011220044.GPJ HYDROGEO.GDT 7/27/10

PROJECT: 10-1122-0044

RECORD OF BOREHOLE: 10-37

SHEET 1 OF 1

LOCATION: See Site Plan

BORING DATE: April 19, 2010

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	Headspace Org. Vapour Conc. [PPM] ppm (⊕) 6 12 18 24 / Headspace Comb. Vapour Conc. [%LEL] ppm (□) 20 40 60 80	HYDRAULIC CONDUCTIVITY, k, cm/s 10^{-6} 10^{-5} 10^{-4} 10^{-3} / WATER CONTENT PERCENT Wp W Wl 10 20 30 40	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		Ground Surface		55.69							
0	Power Auger 200 mm Diam. (Hollow Stem)	Black sandy silt with organic matter (TOPSOIL)		0.10							
		Compact dark brown silty sand, some gravel (FILL)			1	50 DO	16 ⊕				
1					2	50 DO	26 ⊕				
				54.47							
		Compact brown medium sand, some gravel with cobbles (FILL)		1.22	3	50 DO	8 ⊕				
				54.01							
		Dense black sand, some gravel (FILL)		1.68	4	50 DO	80 ⊕				
2				53.56							
		Compact brown silty sand, some gravel (FILL)		2.13	5	50 DO	12 ⊕				
					6	50 DO	10 ⊕				
3				52.49							
		Compact grey CLAYEY SILT		52.34							
		Compact grey SILTY SAND, some gravel, trace clay with cobbles and boulders		3.35	7	50 DO	18 ⊕				
4					8	50 DO	7 ⊕				
				51.35							
		End of Borehole Auger Refusal		4.34							
5											
6											
7											
8											
9											
10											

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: D.G.

CHECKED: K.P.H.

BOREHOLE 1011220044.GPJ HYDROGEO.GDT 7/27/10

PROJECT: 10-1122-0044

RECORD OF BOREHOLE: 10-38

SHEET 1 OF 1

LOCATION: See Site Plan

BORING DATE: April 19, 2010

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	Headspace Org. Vapour Conc. [PPM] ppm / Headspace Comb. Vapour Conc. [%LEL] ppm	HYDRAULIC CONDUCTIVITY, k, cm/s / WATER CONTENT PERCENT Wp W Wl	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		Ground Surface		56.00							
0	Power Auger 200 mm Diam. (Hollow Stem)	Black sandy silt with organic matter (TOPSOIL)		0.10	1	50 DO	13				
		Compact dark brown silty sand, some gravel with brick and concrete (FILL)			2	50 DO	7				
1				54.78							
		Compact black sand, some gravel (FILL)		1.22	3	50 DO	23				
				54.32							
2		Compact brown medium sand, some gravel (FILL)		1.68	4	50 DO	23				
				53.56							
		Loose brown silty sand, some clay (FILL)		2.44	5	50 DO	7				
3				52.95							
		Loose dark brown gravel (FILL)		3.05	6	50 DO	7				
				52.34							
		Wood			7	50 DO	6				
		End of Borehole Auger Refusal		3.76							
4											
5											
6											
7											
8											
9											
10											

DEPTH SCALE

1 : 50

LOGGED: D.G.

CHECKED: K.P.H.

Golder Associates

BOREHOLE 1011220044.GPJ HYDROGEO.GDT 7/27/10

PROJECT: 10-1122-0044

RECORD OF BOREHOLE: 10-39

SHEET 1 OF 1

LOCATION: See Site Plan

BORING DATE: April 19, 2010

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	Headspace Org. Vapour Conc. [PPM] ppm (⊕) 6 12 18 24 / Headspace Comb. Vapour Conc. [%LEL] ppm (□) 20 40 60 80	HYDRAULIC CONDUCTIVITY, k, cm/s 10^{-6} 10^{-5} 10^{-4} 10^{-3} / WATER CONTENT PERCENT Wp W Wl 10 20 30 40	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0		Ground Surface		57.30							
	Power Auger 200 mm Diam. (Hollow Stem)	Black sandy silt with organic matter (TOPSOIL)		57.15							
		Compact dark brown silty sand, some gravel (FILL)		0.15	1	50 DO	11 ⊕				
1					2	50 DO	14 ⊕				
				56.16							
		Compact black sand, some gravel (FILL)		1.22							
		Compact brown medium sand, some gravel (FILL)			3	50 DO	29 ⊕				
				55.47							
2		Compact grey silty sand and silty clay layers (FILL)		1.83	4	50 DO	17 ⊕				
					5	50 DO	8 ⊕				
3				54.25							
		Firm grey SILT, some very fine sand		3.05	6	50 DO	19 ⊕				
					7	50 DO	31 ⊕				
4					8	50 DO	20 ⊕				
5					9	50 DO	28 ⊕				
					10	50 DO	81 ⊕				
6				51.26							
		End of Borehole Auger Refusal		6.04							
7											
8											
9											
10											

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: D.G.

CHECKED: K.P.H.

BOREHOLE 1011220044.GPJ HYDROGEO.GDT 7/27/10

PROJECT: 10-1122-0044

RECORD OF BOREHOLE: 10-40

SHEET 1 OF 1

LOCATION: See Site Plan

BORING DATE: April 19, 2010

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	Headspace Org. Vapour Conc. [PPM] ppm (⊕) 6 12 18 24 / Headspace Comb. Vapour Conc. [%LEL] ppm (□) 20 40 60 80	HYDRAULIC CONDUCTIVITY, k, cm/s 10^{-6} 10^{-5} 10^{-4} 10^{-3} / WATER CONTENT PERCENT Wp W Wl 10 20 30 40	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		Ground Surface		57.58							
0	Power Auger 200 mm Diam. (Hollow Stem)	Black sandy silt with organic matter (TOPSOIL)		0.10	1	50 DO	11	⊕			
		Compact dark brown silty sand, some gravel (FILL)			2	50 DO	10	⊕			
1				56.36							
		Dense black sand, some gravel (FILL)		1.22	3	50 DO	50	⊕			
				55.78							
		Wood (FILL)		1.80	4	50 DO	11	⊕			
2				55.45							
		Compact grey SILTY CLAY		2.13							
				55.14							
		Compact to very dense grey shale in brown SAND and GRAVEL		2.44	5	50 DO	22	⊕			
3					6	50 DO	89	⊕			
				53.62	7	50 DO	32	⊕			
4		Compact grey SILTY SAND, some gravel, trace clay		3.96	8	50 DO	20	⊕			
				52.70							
		Dense grey SILT, some very fine sand		4.88	9	50 DO	36	⊕			
5					10	50 DO	26	⊕			
6					11	50 DO	39	⊕			
					12	50 DO	54	⊕			
7				50.21							
		End of Borehole Auger Refusal		7.37							
8											
9											
10											

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: D.G.

CHECKED: K.P.H.

BOREHOLE 1011220044.GPJ HYDROGEO.GDT 7/27/10

BOREHOLE STRATIGRAPHIC AND INSTRUMENTATION LOG

Borehole Number: BH06-1/MW06-1

MOE Well ID: A029553

Project Number: 05-215-20

Date Completed: June 19, 2006

Client: National Capital Commission

Supervisor: ADG

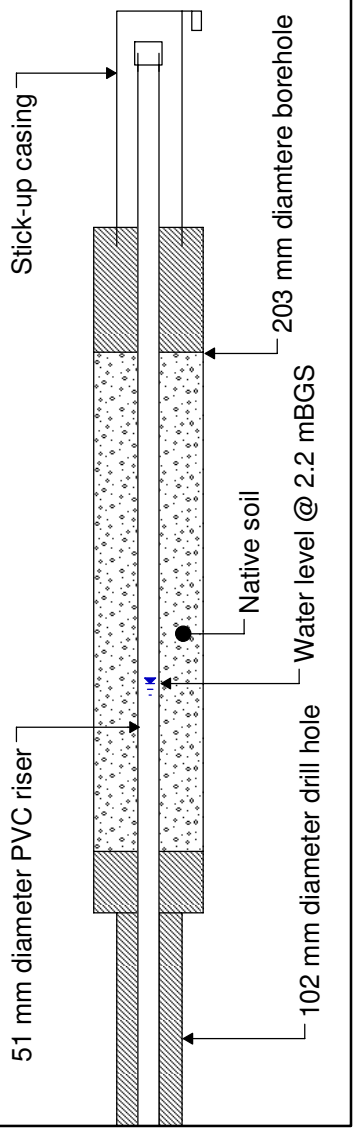
Site Location: Municipal Lands

Ground Surface Elevation: 54.09 mASL

Coordinates: MTM NAD83 - 366313 E, 5030755 N

Drilling Method: Hollow stem auger with split spoon and air hammer

DEPTH BGS (ft / m)	SAMPLES	LAB SAMPLE	BLOW COUNT	CGI (ppm)	PID (ppm)	LOG	STRATIGRAPHIC DESCRIPTION
0 ft / 0 m							GROUND SURFACE
0 – 1 ft			2 3 50				**FILL** Brown sand fill with gravel and wood debris. Dry, no odour.
1 – 2 ft			22 34 50				Brown sand with grey/black silt fill and gravel. Minor iron staining. Dry, no odour.
2 – 3 ft			18 15 10 50				Gravel fill with grey sand, minor silt. Dry, no odour.
3 – 4 ft			14 7 5 7				**PEAT** Black peat. Moist, no odour.
4 ft			50				**BEDROCK** Grey limestone bedrock.



BOREHOLE STRATIGRAPHIC AND INSTRUMENTATION LOG

Borehole Number: BH06-1/MW06-1

MOE Well ID: A029553

Project Number: 05-215-20

Date Completed: June 19, 2006

Client: National Capital Commission

Supervisor: ADG

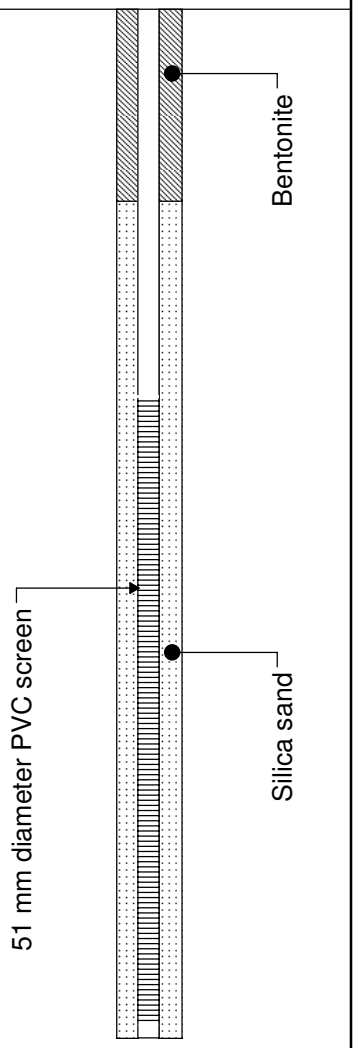
Site Location: Municipal Lands

Ground Surface Elevation: 54.09 mASL

Coordinates: MTM NAD83 - 366313 E, 5030755 N

Drilling Method: Hollow stem auger with split spoon and air hammer

DEPTH BGS	SAMPLES	LAB SAMPLE	BLOW COUNT	CGI (ppm)	PID (ppm)	LOG	STRATIGRAPHIC DESCRIPTION	INSTALLATION
15								
16								
17	5							
18								
19								
20	6							
21								
22								
23	7							
24								
25								
26	8							
27								
28								
29							Borehole terminated at 9.1 mBGS.	
30	9							
31							BOREHOLE TERMINATED	Depth of MW06-1 = 9.1 mBGS
32								



BOREHOLE STRATIGRAPHIC AND INSTRUMENTATION LOG

Borehole Number: BH06-2/MW06-2

MOE Well ID: A029553

Project Number: 05-215-20

Date Completed: June 19, 2006

Client: National Capital Commission

Supervisor: ADG

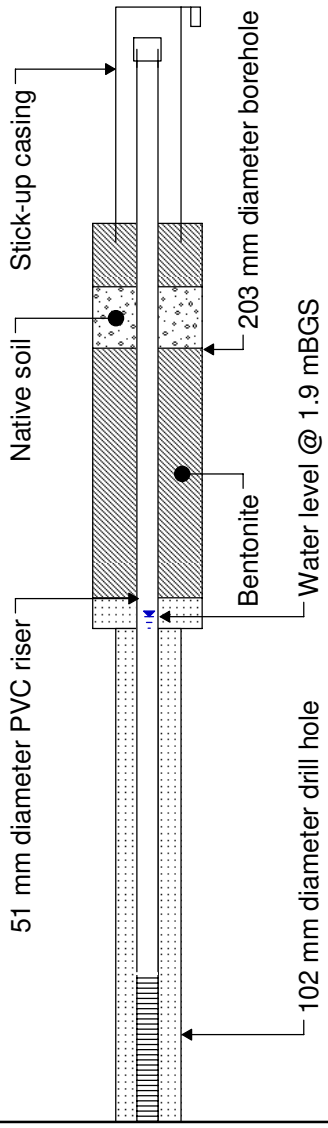
Site Location: Municipal Lands

Ground Surface Elevation: 54.33 mASL

Coordinates: MTM NAD83 - 366240 E, 5030732 N

Drilling Method: Hollow stem auger with split spoon and air hammer

DEPTH BGS (ft / m)	SAMPLES	LAB SAMPLE	BLOW COUNT	CGI (ppm)	PID (ppm)	LOG	STRATIGRAPHIC DESCRIPTION
0 ft / 0 m							GROUND SURFACE
0 – 2 ft			15, 10, 8, 10	5			**FILL** Brown silty sand fill. Dry, no odour.
2 – 5 ft			7, 6, 4, 7	0			Grey/brown silt and sand fill with gravel. Dry, no odour.
5 – 7 ft			2, 6, 2, 25	0			Grey/brown silt and sand fill with brick and wood fragments. Slightly moist, no odour.
7 ft / 2 m							**BEDROCK** Grey limestone bedrock.



BOREHOLE STRATIGRAPHIC AND INSTRUMENTATION LOG

Borehole Number: BH06-2/MW06-2

MOE Well ID: A029553

Project Number: 05-215-20

Date Completed: June 19, 2006

Client: National Capital Commission

Supervisor: ADG

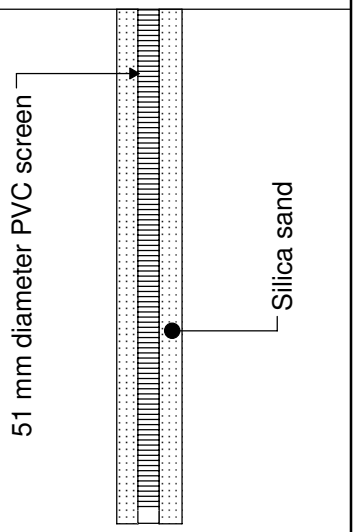
Site Location: Municipal Lands

Ground Surface Elevation: 54.33 mASL

Coordinates: MTM NAD83 - 366240 E, 5030732 N

Drilling Method: Hollow stem auger with split spoon and air hammer

DEPTH BGS	SAMPLES	LAB SAMPLE	BLOW COUNT	CGI (ppm)	PID (ppm)	LOG	STRATIGRAPHIC DESCRIPTION	INSTALLATION
15								
16								
17	5							
18								
19								
20	6							
21							Borehole terminated at 6.7 mBGS.	
22							BOREHOLE TERMINATED	Depth of MW06-2 = 6.7 mBGS
23	7							
24								
25								
26	8							
27								
28								
29	9							
30								
31								
32								



BOREHOLE STRATIGRAPHIC AND INSTRUMENTATION LOG

Borehole Number: BH06-3/MW06-3

MOE Well ID: A029553

Project Number: 05-215-20

Date Completed: June 19, 2006

Client: National Capital Commission

Supervisor: ADG

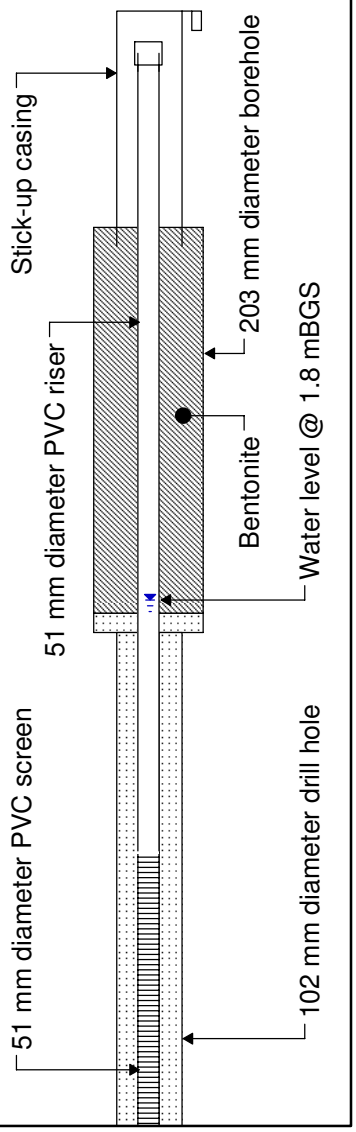
Site Location: Municipal Lands

Ground Surface Elevation: 55.0 mASL

Coordinates: MTM NAD 83 - 366190 E, 5030708 N

Drilling Method: Hollow stem auger with split spoon and air hammer

DEPTH BGS (ft / m)	SAMPLES	LAB SAMPLE	BLOW COUNT	CGI (ppm)	PID (ppm)	LOG	STRATIGRAPHIC DESCRIPTION
0 / 0							GROUND SURFACE
0 – 2 / 0 – 0.6			2, 9, 50	0			**FILL** Brown silty sand fill with gravel. Dry, no odour.
2 – 3 / 0.6 – 1			9, 23, 50	0			Grey/brown silt and sand fill with gravel. Dry, no odour. 12 cm of black shale fragments at 0.9 mBGS.
4 – 5 / 1.2 – 1.5			18, 32, 50	0			Dark grey sand and gravel fill. Dry, no odour.
7 / 2.1							**BEDROCK** Grey limestone bedrock.



BOREHOLE STRATIGRAPHIC AND INSTRUMENTATION LOG

Borehole Number: BH06-3/MW06-3

MOE Well ID: A029553

Project Number: 05-215-20

Date Completed: June 19, 2006

Client: National Capital Commission

Supervisor: ADG

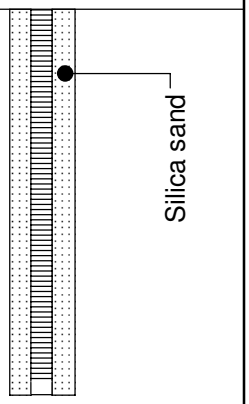
Site Location: Municipal Lands

Ground Surface Elevation: 55.0 mASL

Coordinates: MTM NAD 83 - 366190 E, 5030708 N

Drilling Method: Hollow stem auger with split spoon and air hammer

DEPTH BGS	SAMPLES	LAB SAMPLE	BLOW COUNT	CGI (ppm)	PID (ppm)	LOG	STRATIGRAPHIC DESCRIPTION	INSTALLATION
15								
16								
5								
17								
18								
19							Borehole terminated at 6.1 mBGS.	
6								
20							BOREHOLE TERMINATED	Depth of MW06-3 = 6.1 mBGS
21								
22								
23								
7								
24								
25								
26								
8								
27								
28								
29								
9								
30								
31								
32								



BOREHOLE STRATIGRAPHIC AND INSTRUMENTATION LOG

Borehole Number: BH06-4/MW06-4

MOE Well ID: A029553

Project Number: 05-215-20

Date Completed: June 20, 2006

Client: National Capital Commission

Supervisor: ADG/TLJ

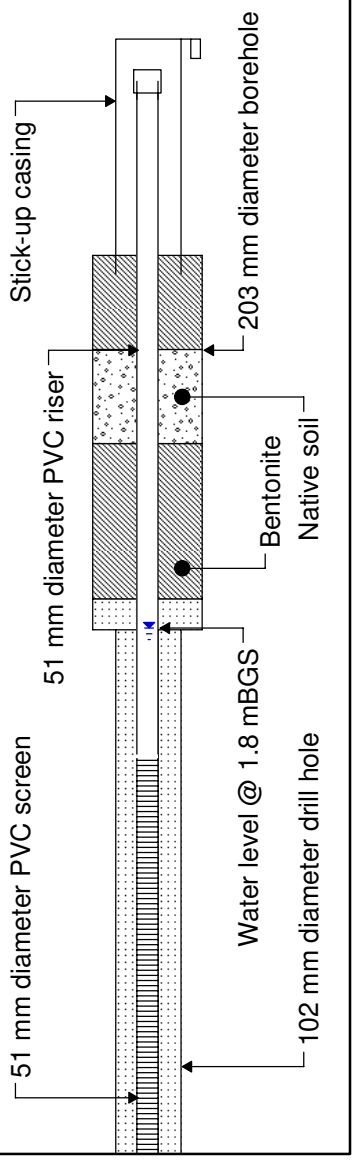
Site Location: Municipal Lands

Ground Surface Elevation: 54.54 mASL

Coordinates: MTM NAD83 - 366116 E, 5030662 N

Drilling Method: Hollow stem auger with split spoon and air hammer

DEPTH BGS (ft / m)	SAMPLES	LAB SAMPLE	BLOW COUNT	CGI (ppm)	PID (ppm)	LOG	STRATIGRAPHIC DESCRIPTION
0 / 0							GROUND SURFACE
0 – 2 / 0 – 1			4 11 10 18	5			**FILL** Brown silty sand fill with trace clay and gravel, slag and wood fragments. Minor iron staining. Dry, no odour.
2 – 5 / 1			14 15 14 14	n/a			
5 – 6 / 1 – 2			15 25	0			Grey/brown silt and sand fill with gravel. Dry, no odour.
6 / 2							**BEDROCK** Grey limestone bedrock.



BOREHOLE STRATIGRAPHIC AND INSTRUMENTATION LOG

Borehole Number: BH06-4/MW06-4

MOE Well ID: A029553

Project Number: 05-215-20

Date Completed: June 20, 2006

Client: National Capital Commission

Supervisor: ADG/TLJ

Site Location: Municipal Lands

Ground Surface Elevation: 54.54 mASL

Coordinates: MTM NAD83 - 366116 E, 5030662 N

Drilling Method: Hollow stem auger with split spoon and air hammer

DEPTH BGS	SAMPLES	LAB SAMPLE	BLOW COUNT	CGI (ppm)	PID (ppm)	LOG	STRATIGRAPHIC DESCRIPTION	INSTALLATION
15								
16								
17	5						Borehole terminated at 5.5 mBGS.	
18							BOREHOLE TERMINATED	Silica sand
19								Depth of MW06-4 = 5.5 mBGS
20	6							
21								
22								
23	7							
24								
25								
26	8							
27								
28								
29	9							
30								
31								
32								

BOREHOLE STRATIGRAPHIC AND INSTRUMENTATION LOG

Borehole Number: BH06-6/MW06-6

MOE Well ID: A029553

Project Number: 05-215-20

Date Completed: June 20, 2006

Client: National Capital Commission

Supervisor: ADG/TLJ

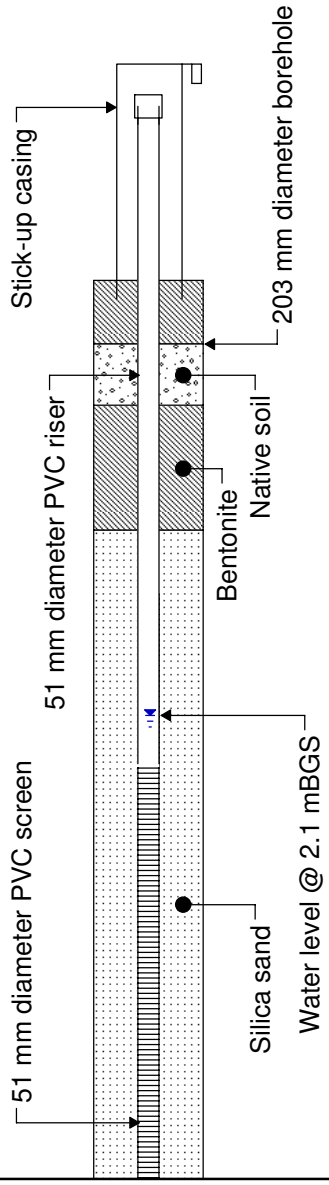
Site Location: Municipal Lands

Ground Surface Elevation: 54.96 mASL

Coordinates: MTM NAD83 - 366010 E, 5030649 N

Drilling Method: Hollow stem auger with split spoon

DEPTH BGS (ft / m)	SAMPLES	LAB SAMPLE	BLOW COUNT	CGI (ppm)	PID (ppm)	LOG	STRATIGRAPHIC DESCRIPTION
0 / 0							GROUND SURFACE
0 / 0			4 12 15 20	0			**FILL** Topsoil near surface, underlain by dark brown silty sand fill with trace gravel. Dry, no odour.
3 / 1			5 9 10 8	5			Brown silt and sand fill with brick fragments and minor iron staining. Slightly moist, no odour.
5 / 2			2 4 6 18	5			Brown silt and sand fill. Dry, no odour. 9 cm of black slag fill with rock fragments at 2.1 mBGS. Moist, no odour.
8 / 3			7 11 1 5	0			Dark brown silt and sand fill with trace gravel and roots. Wet, no odour.
10 / 3			5 12 6 4	0			



BOREHOLE STRATIGRAPHIC AND INSTRUMENTATION LOG

Borehole Number: BH06-6/MW06-6

MOE Well ID: A029553

Project Number: 05-215-20

Date Completed: June 20, 2006

Client: National Capital Commission

Supervisor: ADG/TLJ

Site Location: Municipal Lands

Ground Surface Elevation: 54.96 mASL

Coordinates: MTM NAD83 - 366010 E, 5030649 N

Drilling Method: Hollow stem auger with split spoon

DEPTH BGS	SAMPLES	LAB SAMPLE	BLOW COUNT	CGI (ppm)	PID (ppm)	LOG	STRATIGRAPHIC DESCRIPTION	INSTALLATION
15							Borehole terminated at 4.6 mBGS.	
							BOREHOLE TERMINATED	Depth of MW06-6 = 4.6 mBGS
16								
5								
17								
18								
19								
6								
20								
21								
22								
23								
7								
24								
25								
26								
8								
27								
28								
29								
9								
30								
31								
32								

BOREHOLE STRATIGRAPHIC AND INSTRUMENTATION LOG

Borehole Number: BH06-7/MW06-7

MOE Well ID: A029553

Project Number: 05-215-20

Date Completed: June 20, 2006

Client: National Capital Commission

Supervisor: ADG/TLJ

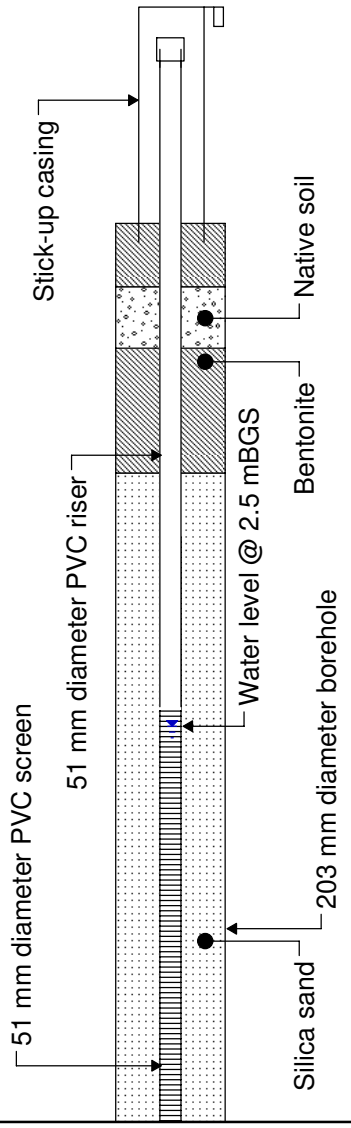
Site Location: Municipal Lands

Ground Surface Elevation: 55.24 mASL

Coordinates: MTM NAD83 - 365882 E, 5030604 N

Drilling Method: Hollow stem auger with split spoon

DEPTH BGS (ft / m)	SAMPLES	LAB SAMPLE	BLOW COUNT	CGI (ppm)	PID (ppm)	LOG	STRATIGRAPHIC DESCRIPTION
							GROUND SURFACE
0 / 0			3 5 10 12	0			FILL Brown topsoil. Grey/brown silt and sand fill with trace gravel. Slightly moist, no odour.
3 / 1			4 10 9 7	0			
6 / 2			3 7 13 9	10			Brown silt and sand fill with black slag, brick and gravel. Slightly moist, no odour.
8			50	0			Dark brown silt and sand fill. Dry, no odour.
10 / 3			11 18 18 50	0			Dark brown silt and sand fill with black slag fragments. Wet, no odour.
12							Grey and black sand with rock fragments.
13 / 4			7 16 23 13	0			



INSTALLATION

BOREHOLE STRATIGRAPHIC AND INSTRUMENTATION LOG

Borehole Number: BH06-7/MW06-7

MOE Well ID: A029553

Project Number: 05-215-20

Date Completed: June 20, 2006

Client: National Capital Commission

Supervisor: ADG/TLJ

Site Location: Municipal Lands

Ground Surface Elevation: 55.24 mASL

Coordinates: MTM NAD83 - 365882 E, 5030604 N

Drilling Method: Hollow stem auger with split spoon

DEPTH BGS	SAMPLES	LAB SAMPLE	BLOW COUNT	CGI (ppm)	PID (ppm)	LOG	STRATIGRAPHIC DESCRIPTION	INSTALLATION
15							Borehole terminated at 4.6 mBGS.	
							BOREHOLE TERMINATED	Depth of MW06-7 = 4.6 mBGS
16								
5								
17								
18								
19								
6								
20								
21								
22								
23								
7								
24								
25								
26								
8								
27								
28								
29								
9								
30								
31								
32								

BOREHOLE STRATIGRAPHIC AND INSTRUMENTATION LOG

Borehole Number: BH06-9/MW06-9

MOE Well ID: A029553

Project Number: 05-215-20

Date Completed: June 21, 2006

Client: National Capital Commission

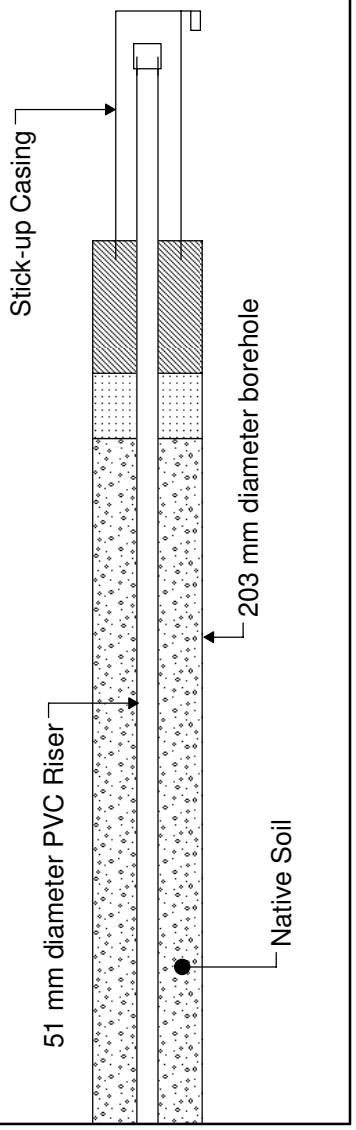
Supervisor: ADG/SNG

Site Location: Municipal Lands

Ground Surface Elevation: 61.58 mASL

Coordinates: MTM NAD83 - 365843 E, 5030527N

Drilling Method: Hollow stem auger with split spoon

DEPTH BGS (ft / m)	SAMPLES	LAB SAMPLE	BLOW COUNT	CGI (ppm)	PID (ppm)	LOG	STRATIGRAPHIC DESCRIPTION	INSTALLATION
-4 to 13 ft; 0 to 3 m							GROUND SURFACE	
0 m			9 50	0			FILL Brown topsoil.	
							Brown silty sand fill with organic material near surface. Dry, no odour.	
1 m			7 21 15 11	0			Brown silty sand fill with some clay and trace gravel. Moist, no odour.	
			7 14 10 6	2			Dark brown sand and gravel fill. Dry, no odour.	
2 m			5 7 10 10	0			Brown silty sand fill with trace gravel. Dry, no odour.	
3 m			8 24 9 5	3			Grey silt fill with some clay. Moist, no odour.	
							Black sand fill with some silt and gravel. Wet, landfill odour.	

BOREHOLE STRATIGRAPHIC AND INSTRUMENTATION LOG

Borehole Number: BH06-9/MW06-9

MOE Well ID: A029553

Project Number: 05-215-20

Date Completed: June 21, 2006

Client: National Capital Commission

Supervisor: ADG/SNG

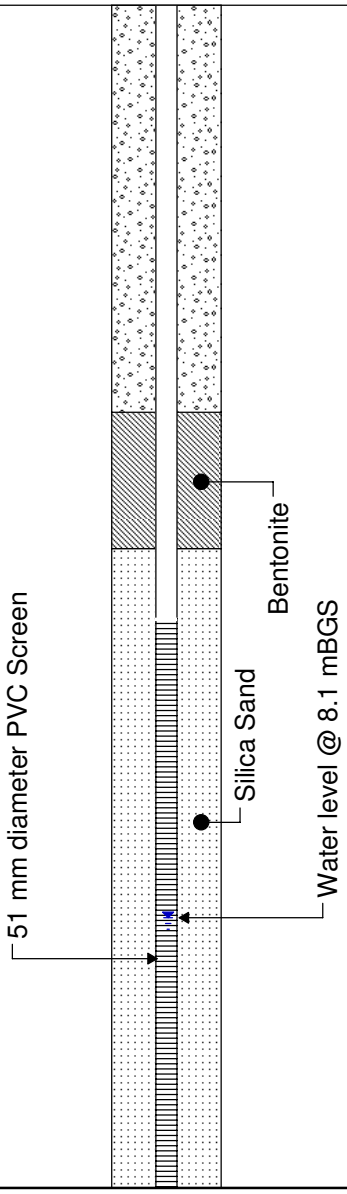
Site Location: Municipal Lands

Ground Surface Elevation: 61.58 mASL

Coordinates: MTM NAD83 - 365843 E, 5030527N

Drilling Method: Hollow stem auger with split spoon

DEPTH BGS	SAMPLES	LAB SAMPLE	BLOW COUNT	CGI (ppm)	PID (ppm)	LOG	STRATIGRAPHIC DESCRIPTION	INSTALLATION
4			3 3 4 3	2				
14								
15			4 4 50	2			Silty sand fill with some clay and wood fragments. Wet, no odour.	
16								
5								
17								
18			50				Boulder (no recovery)	
19								
6								
20			46 20 12 50	4			Grey sand fill with some gravel. Slightly moist, landfill odour.	
21								
22								
23			25 32 43 14	3				
7								
24								
25								
26		X	8 6 4 8	35			Minor brick fragments.	
8								
27								
28			15 7 5 9	25			Hydrocarbon odour.	
29								
9								
30								



BOREHOLE STRATIGRAPHIC AND INSTRUMENTATION LOG

Borehole Number: BH06-9/MW06-9

MOE Well ID: A029553

Project Number: 05-215-20

Date Completed: June 21, 2006

Client: National Capital Commission

Supervisor: ADG/SNG

Site Location: Municipal Lands

Ground Surface Elevation: 61.58 mASL

Coordinates: MTM NAD83 - 365843 E, 5030527N

Drilling Method: Hollow stem auger with split spoon

DEPTH BGS	SAMPLES	LAB SAMPLE	BLOW COUNT	CGI (ppm)	PID (ppm)	LOG	STRATIGRAPHIC DESCRIPTION	INSTALLATION
31			2 1 1 1	50			Sandy fill with glass and paper debris. Wet, landfill odour. Borehole terminated at 9.8 mBGS.	
32							BOREHOLE TERMINATED	Depth of MW06-9 = 9.8 mBGS
33 – 10								
34								
35								
36 – 11								
37								
38								
39 – 12								
40								
41								
42								
43 – 13								
44								
45								
46 – 14								
47								

BOREHOLE STRATIGRAPHIC AND INSTRUMENTATION LOG

Borehole Number: BH06-10/MW06-10

MOE Well ID: A029553

Project Number: 05-215-20

Date Completed: June 21, 2006

Client: National Capital Commission

Supervisor: ADG

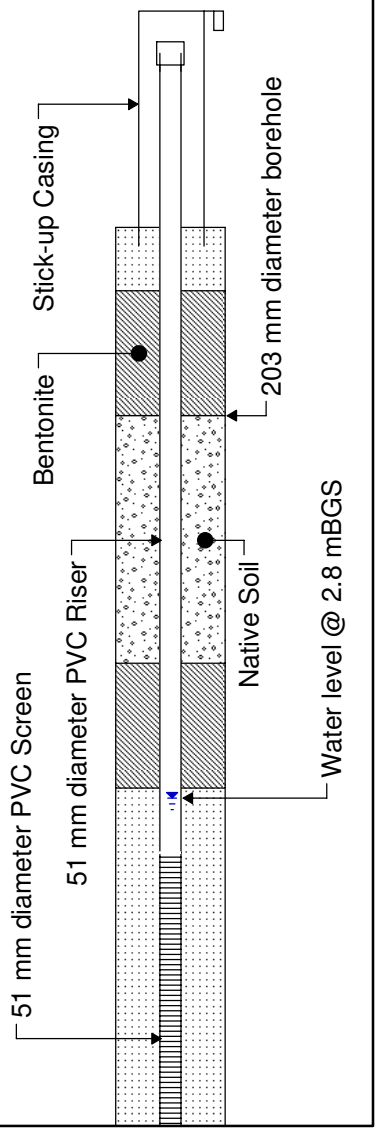
Site Location: LeBreton Flats

Ground Surface Elevation: 55.56 mASL

Coordinates: MTM NAD83 - 365965 E, 5030592 N

Drilling Method: Hollow stem auger with split spoon

DEPTH BGS (ft / m)	SAMPLES	LAB SAMPLE	BLOW COUNT	CGI (ppm)	PID (ppm)	LOG	STRATIGRAPHIC DESCRIPTION	INSTALLATION
0 / 0							GROUND SURFACE	
0 – 2 / 0 – 1			6, 22, 30, 38	0			FILL Brown sandy topsoil underlain by brown silt and sand fill with trace gravel and brick fragments. Dry, no odour.	
3 – 4 / 1			19, 48, 41, 36	0			Grey/brown silty sand fill with gravel and cobbles. Dry, no odour.	
5 – 7 / 2			5, 5, 12, 7	0			Grey and black silty sand fill with gravel and wood debris. Dry, no odour.	
8 – 9 / 3			3, 2, 3, 6	0			Grey/brown silty sand fill with trace wood debris. Dry, no odour.	
10 – 12 / 3			6, 3, 3, 7	20			Sand fill with garbage, paper, and plastic. Dry, landfill odour.	
13 – 14 / 4			8, 5, 8, 22	0			Brown/black silty sand fill with wood debris. Moist, landfill odour.	



BOREHOLE STRATIGRAPHIC AND INSTRUMENTATION LOG

Borehole Number: BH06-10/MW06-10

MOE Well ID: A029553

Project Number: 05-215-20

Date Completed: June 21, 2006

Client: National Capital Commission

Supervisor: ADG

Site Location: LeBreton Flats

Ground Surface Elevation: 55.56 mASL

Coordinates: MTM NAD83 - 365965 E, 5030592 N

Drilling Method: Hollow stem auger with split spoon

DEPTH BGS	SAMPLES	LAB SAMPLE	BLOW COUNT	CGI (ppm)	PID (ppm)	LOG	STRATIGRAPHIC DESCRIPTION	INSTALLATION
15								
16			23				Grey clay fill with trace silt and gravel. Wet.	
5			11	0				
17			3					
18			1					
			3				SAND	
19			9	0			Grey sand fill with silt seams. Wet, no odour.	
6			14					
20			15				Borehole terminated at 6.1mBGS.	
21							BOREHOLE TERMINATED	Silica Sand
22								
23								Depth of MW06-10 = 6.1 mBGS
7								
24								
25								
26								
8								
27								
28								
29								
9								
30								
31								
32								

BOREHOLE STRATIGRAPHIC AND INSTRUMENTATION LOG

Borehole Number: BH06-11/MW06-11

MOE Well ID: A029553

Project Number: 05-215-20

Date Completed: June 21, 2006

Client: National Capital Commission

Supervisor: ADG

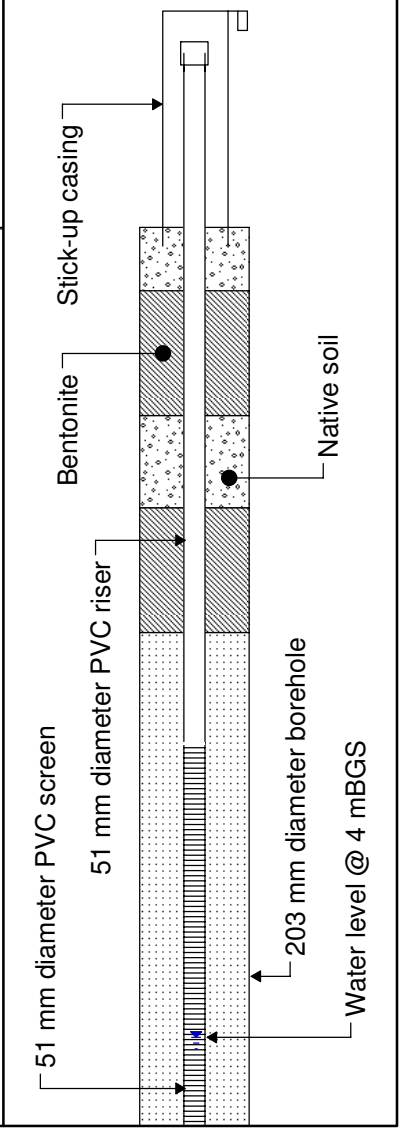
Site Location: Municipal Lands

Ground Surface Elevation: 56.80 mASL

Coordinates: MTM NAD83 - 365928 E, 5030683 N

Drilling Method: Hollow stem auger with split spoon

DEPTH BGS (ft / m)	SAMPLES	LAB SAMPLE	BLOW COUNT	CGI (ppm)	PID (ppm)	LOG	STRATIGRAPHIC DESCRIPTION	INSTALLATION
0 ft / 0 m							GROUND SURFACE	
0 – 1 ft			7 11 50	0			FILL Brown sand fill with gravel and brick. Dry, no odour.	
2 – 3 ft			16 14 22 27	0				
4 – 5 ft			1 5 5 10	0				
6 – 7 ft			6 9 6 10	0				
8 – 9 ft			4 4 21 19	0			Brown sand fill with gravel and minor silt. 12 cm of rock fragments. Dry, no odour.	
10 – 11 ft			20 50	0			Brown sand and gravel fill. Dry, no odour.	
12 – 13 ft								
14 ft								



BOREHOLE STRATIGRAPHIC AND INSTRUMENTATION LOG

Borehole Number: BH06-11/MW06-11

MOE Well ID: A029553

Project Number: 05-215-20

Date Completed: June 21, 2006

Client: National Capital Commission

Supervisor: ADG

Site Location: Municipal Lands

Ground Surface Elevation: 56.80 mASL

Coordinates: MTM NAD83 - 365928 E, 5030683 N

Drilling Method: Hollow stem auger with split spoon

DEPTH BGS	SAMPLES	LAB SAMPLE	BLOW COUNT	CGI (ppm)	PID (ppm)	LOG	STRATIGRAPHIC DESCRIPTION	INSTALLATION
15								
16			1					
5			9					
17			5	0			Gravel fill with minor sand. Wet, no odour.	
			50					
18							Borehole terminated at 5.6 mBGS.	
19							BOREHOLE TERMINATED	Silica sand
6								Depth of MW06-11 =5.6 mBGS
20								
21								
22								
7								
23								
24								
25								
26								
8								
27								
28								
29								
9								
30								
31								
32								

BOREHOLE STRATIGRAPHIC AND INSTRUMENTATION LOG

Borehole Number: BH06-14/MW06-14

MOE Well ID: A029553

Project Number: 05-215-20

Date Completed: June 22, 2006

Client: National Capital Commission

Supervisor: ADG

Site Location: Municipal Lands

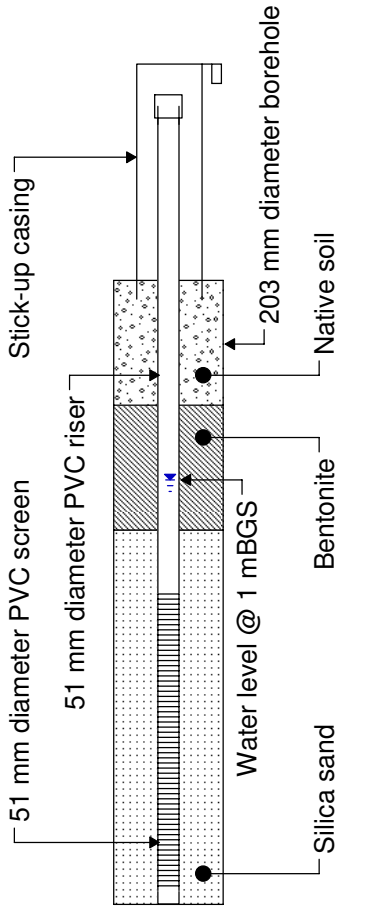
Ground Surface Elevation: 53.86 mASL

Coordinates: MTM NAD83 - 366033 E, 5030715 N

Drilling Method: Hollow stem auger with split spoon

DEPTH BGS (ft / m)	SAMPLES	LAB SAMPLE	BLOW COUNT	CGI (ppm)	PID (ppm)	LOG	STRATIGRAPHIC DESCRIPTION
							GROUND SURFACE
0 ft / 0 m			3 12 15 50	0			**FILL** Brown sandy topsoil underlain by brown silty sand fill with gravel. Dry, no odour.
2 ft							
3 ft / 1 m			10 37 28 38	10			Rock fragments and minor sand. Wet, no odour.
5 ft							
6 ft			1 1 1 2	15			**SAND** Brown sand and organics. Wet, no odour.
7 ft / 2 m							
8 ft			50	n/a			
9 ft							Borehole terminated (bedrock) at 3.0 mBGS
10 ft / 3 m							BOREHOLE TERMINATED
12 ft							
13 ft / 4 m							
14 ft							

INSTALLATION



Depth of MW06-14 = 3.0 mBGS

JACQUES, WHITFORD AND ASSOCIATES LIMITED

MONITORING WELL RECORD

CLIENT Robinson Consultants Inc.

LOCATION LeBretons Flats, ABC Lines, Ottawa, Ontario

DATES: BORING 01 04 06 WATER LEVEL 01 04 18

BOREHOLE No. MW01-6

PROJECT No. ONO11359

DATUM Geodetic

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	NUMBER	RECOVERY (mm)	N-VALUE OR RQD
0	56.08							
	56.0	TOPSOIL						
		Compact, brown silt and sand, trace gravel, trace organics, trace clay: FILL			AS	1	---	---
1					SS	2	200	10
	54.6			▽				
		Stiff, grey brown silty clay, trace gravel, trace organics: FILL			SS	3	250	11
2	54.0							
		Dense, grey brown silty sand and gravel: FILL			SS	4	200	27
		Frequent cobbles and boulders						
3				▼	SS	5	150	36
					SS	6	150	50/ 280 mm
4	52.0							
		Grey black limestone and shale boulders			NQ	7	100%	63%
					SS	8	0	50/ 200 mm
5					NQ	9	100%	100%
	50.8							
		Void						
	50.1							
6	49.8	Compact, black silty sand and gravel, trace organics (wood chips): FILL			SS	10	300	19
		Loose, grey SAND, trace to some silt and gravel			SS	11	510	7
7	48.9							
		Installed Well						
		End of Borehole						
8								
9								
10								

UNDRAINED SHEAR STRENGTH - kPa

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m *

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90

A-

▽ Inferred Groundwater Level

▼ Groundwater Level Measured in Standpipe

□ Field Vane Test, kPa

□ Remoulded Vane Test, kPa

△ Pocket Penetrometer Test, kPa

JACQUES, WHITFORD AND ASSOCIATES LIMITED

MONITORING WELL RECORD

CLIENT Robinson Consultants Inc.

LOCATION LeBretons Flats, ABC Lines, Ottawa, Ontario

DATES: BORING 01 04 06 WATER LEVEL 01 04 18

BOREHOLE No. MW01-7

PROJECT No. ONO11359

DATUM Geodetic

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	NUMBER	RECOVERY (mm)	N-VALUE OR RQD
0	54.65							
	54.6	TOPSOIL			AS	1	---	---
	53.9	Loose, brown black silty sand, trace gravel, trace to some clay: FILL						
1		Loose, grey black silty sand, trace clay, debris (plastic): FILL		▽	SS	2	330	4
				▼	SS	3	400	2
2	52.5	Soft, black peat, some silt, some sand: ORGANICS			SS	4	260	13
3					SS	5	270	9
	51.0	Compact, grey SILTY SAND, some clay, trace gravel			SS	6	530	10
4								
5					SS	7	410	16
	49.2	Severely fractured, grey limestone: BEDROCK			NQ	8	100%	0%
6								
7					NQ	9	79%	36%
	47.2	Installed Well						
8		End of Borehole						
9								
10								

UNDRAINED SHEAR STRENGTH - kPa

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m ★

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90

A-

▽ Inferred Groundwater Level

▼ Groundwater Level Measured in Standpipe

□ Field Vane Test, kPa

□ Remoulded Vane Test, kPa

△ Pocket Penetrometer Test, kPa

JACQUES, WHITFORD AND ASSOCIATES LIMITED

MONITORING WELL RECORD

CLIENT Robinson Consultants Inc.

LOCATION LeBretons Flats, ABC Lines, Ottawa, Ontario

DATES: BORING 01 04 06 WATER LEVEL 01 04 18

BOREHOLE No. MW01-8

PROJECT No. ONO11359

DATUM Geodetic

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm)	SAMPLES N-VALUE OR RQD
0	62.63							
	62.6	TOPSOIL			AS	1	---	---
	61.9	Firm, brown silty clay, trace gravel, trace organics, trace debris (wood fragments): FILL			SS	2	400	10
1		Firm to stiff, brown grey sandy clay, some silt, trace gravel, trace debris (rubber, brick, wood): FILL			SS	3	520	4
2					SS	4	270	4
3					SS	5	530	35
4					SS	6	140	3
5					SS	7	90	8
	57.3	Stiff, grey silty clay, some sand, trace gravel, rock fragments, trace debris (wood, plastic) : FILL			SS	8	170	3
6					SS	9	310	8
7					SS	10	440	13
8		Sand seam			SS	11	470	8
					SS	12	470	17
9	53.6	Compact, grey silty sand, rock fragments, trace debris (glass, brick, wood): FILL		▼	SS	13	460	19
	52.7							
10								

UNDRAINED SHEAR STRENGTH - kPa

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m ★

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90

A-

▽ Inferred Groundwater Level

▼ Groundwater Level Measured in Standpipe

□ Field Vane Test, kPa

□ Remoulded Vane Test, kPa

△ Pocket Penetrometer Test, kPa

JACQUES, WHITFORD AND ASSOCIATES LIMITED

MONITORING WELL RECORD

CLIENT Robinson Consultants Inc.

LOCATION LeBretons Flats, ABC Lines, Ottawa, Ontario

DATES: BORING 01 04 06 WATER LEVEL 01 04 18

BOREHOLE No. MW01-8

PROJECT No. ONO11359

DATUM Geodetic

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	NUMBER	RECOVERY (mm)	N-VALUE OR RQD
10		Decomposed paper, trace wood fragments: FILL		▽	SS	14	540	50/330 mm
		Few cobbles			SS	15	170	27
11	51.5	Auger Refusal at 10.52 m, hammered spoon, then continued augering			SS	16	280	50/430 mm
	51.1	Dense, grey SILTY SAND, some to trace gravel, trace clay						
12		Auger Refusal Inferred Bedrock at 11.55 m Installed Well End of Borehole						
13								
14								
15								
16								
17								
18								
19								
20								

UNDRAINED SHEAR STRENGTH - kPa

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m ★

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90

A-

▽ Inferred Groundwater Level

▼ Groundwater Level Measured in Standpipe

□ Field Vane Test, kPa

□ Remoulded Vane Test, kPa

△ Pocket Penetrometer Test, kPa

BOREHOLE STRATIGRAPHIC AND INSTRUMENTATION LOG

Borehole Number: MW06-5

Project Number: 05-215-22

Date Completed: June 20, 2006

Client: National Capital Commission

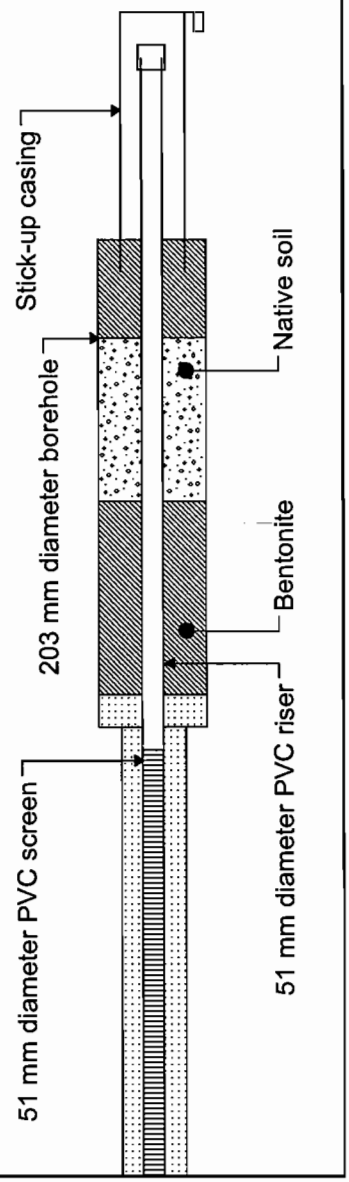
Supervisor: ADG/TLJ

Site Location: Preston St. Extension

Ground Surface Elevation: 54.72 mASL

Drilling Method: Hollow stem auger with split spoons and air hammer

DEPTH BGS (ft / m)	SAMPLES	LAB SAMPLE	BLOW COUNT	CGI (ppm)	PID (ppm)	LOG	STRATIGRAPHIC DESCRIPTION
							GROUND SURFACE
0 / 0			7 10 9 21	0			**FILL** Topsoil near surface, underlain by dark brown silty sand fill with trace gravel. Dry, no odour.
3 / 1			10 14 6 13	0			Brown sand fill with gravel and trace clay. Minor iron staining. Dry, no odour.
5 / 2			4 50	0			Dark brown and black silt and sand fill with gravel and cobble. Dry, no odour.
7 / 2							**BEDROCK**



BOREHOLE STRATIGRAPHIC AND INSTRUMENTATION LOG

Borehole Number: MW06-5

Project Number: 05-215-22

Date Completed: June 20, 2006

Client: National Capital Commission

Supervisor: ADG/TLJ

Site Location: Preston St. Extension

Ground Surface Elevation: 54.72 mASL

Drilling Method: Hollow stem auger with split spoons and air hammer

DEPTH BGS	SAMPLES	LAB SAMPLE	BLOW COUNT	CGI (ppm)	PID (ppm)	LOG	STRATIGRAPHIC DESCRIPTION	INSTALLATION
15								
16								
5								
17							Borehole terminated at 5.4 mBGS.	
18							BOREHOLE TERMINATED	Silica sand Depth of MW06-5 = 5.4 mBGS
19								
6								
20								
21								
22								
23								
7								
24								
25								
26								
8								
27								
28								
29								
9								
30								
31								
32								

BOREHOLE STRATIGRAPHIC AND INSTRUMENTATION LOG

Borehole Number: MW06-8

Project Number: 05-215-22

Date Completed: June 21, 2006

Client: National Capital Commission

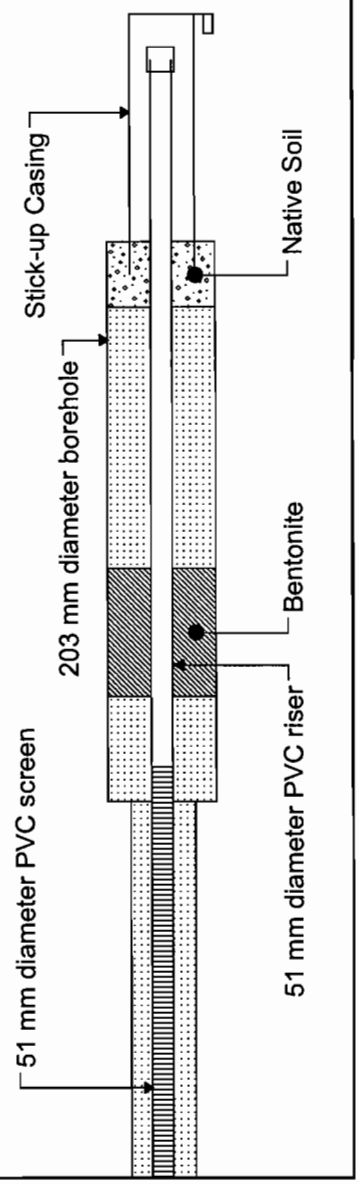
Supervisor: ADG/SNG

Site Location: Preston St. Extension

Ground Surface Elevation: 62.50 mASL

Drilling Method: Hollow stem auger with split spoons and air hammer

DEPTH BGS (ft / m)	SAMPLES	LAB SAMPLE	BLOW COUNT	CGI (ppm)	PID (ppm)	LOG	STRATIGRAPHIC DESCRIPTION
							GROUND SURFACE
0 / 0			8 15 20 18	0			FILL Dark brown silty sand fill with trace gravel and brick fragments. Dry, no odour.
3 / 1			10 12 9 15	0			Brown sand fill. Dry, no odour.
5 / 2			11 16 50	0			Dark brown silty sand fill with trace brick fragments. Dry, no odour.
8			10 24 50	2			
9 / 3							BEDROCK



BOREHOLE STRATIGRAPHIC AND INSTRUMENTATION LOG

Borehole Number: MW06-8

Project Number: 05-215-22

Client: National Capital Commission

Site Location: Preston St. Extension

Drilling Method: Hollow stem auger with split spoons and air hammer

Date Completed: June 21, 2006

Supervisor: ADG/SNG

Ground Surface Elevation: 62.50 mASL

DEPTH BGS	SAMPLES	LAB SAMPLE	BLOW COUNT	CGI (ppm)	PID (ppm)	LOG	STRATIGRAPHIC DESCRIPTION	INSTALLATION
15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 (5, 6, 7, 8, 9)							Borehole terminated at 5.4 mBGS. BOREHOLE TERMINATED	Silica Sand Depth of MW06-8 = 5.5 mBGS

APPENDIX III
Correspondence with Regulatory Agencies

Evan Westad

From: ERU /UAE <ERU-UAE@ottawa.ca>
Sent: Tuesday, April 19, 2022 2:16 PM
To: Evan Westad
Cc: ERU /UAE
Subject: RE: LeBreton Flats Landfill
Attachments: OLMS Phase 1 Ur-06. Oct2004.pdf

Hi Evan,

I have attached a summary of information for the Former Nepean Bay Landfill from the Old Landfill Management Strategy 2004 study prepared by Golder Associated for the City in 2004.

I was also able to locate some information in the Federal Contaminated Sites Inventory here:
Site 00000015 - LeBreton Flats - Nepean Bay (tbs-sct.gc.ca)

The only information our Unit has on the unnamed landfill identified as activity ID 6124 is that it reportedly operated between 1910 and 1920.

I hope this is helpful,

Regards,

Rich Barker | Specialist, Environmental Remediation (A)
Environmental Remediation Unit
Corporate Real Estate Office
Planning, Real Estate and Economic Development

City of Ottawa | 110 Laurier Avenue West, 5th Floor West | Ottawa ON K1P 1J1
T. 613.580.2424 x. 12567 | F. 613.580.6051 | richard.barker@ottawa.ca

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From: Evan Westad <ewestad@Pinchin.com>
Sent: April 14, 2022 3:23 PM
To: ERU /UAE <ERU-UAE@ottawa.ca>
Subject: LeBreton Flats Landfill

Good afternoon,
I'm completing a study on a property in LeBreton Flats in Ottawa and am looking for information on two waste disposal Sites. I have submitted an FOI request but don't think that will return information in time. I'm wondering if you can direct me to any publicly available information regarding the Nepean Bay Dump (Ottawa River Pkwy East of CPR Prince of Wales Bridge) activity ID 6108 and an adjacent Site with activity id 6124 (as per https://open.ottawa.ca/datasets/former-landfills/explore?location=45.412533%2C-75.720958%2C6.55). Any information available would be greatly appreciated.

Evan Westad, B.Sc., GIT
Project Technologist, Environmental Due Diligence & Remediation

Pinchin Ltd.
662 Falconbridge Road, Unit 3, Sudbury, Ontario P3A 4S4
C: 705.207.0748 | pinchin.com

Site ID # Ur-06	**AND Record #** 080	**MOE Site #** x 1011	**Category of Owner** Government	**HLUI Activity ID #** 6108	
Other References	Gartner Lee, 1980 (Site #6); Intera, 1988 (Lf #6); City of Ottawa Operations Branch, 1980 (Site 6); Dillon, 1984 (Site No. D-123); AMEC, April 2002 (Parcel E); AMEC, excerpts 2002				
Site Name	Nepean Bay				
Landfill Monitoring/ Remediation	Extensive groundwater and soil monitoring program conducted by AMEC (report dated April 2002) for the City of Ottawa at the site and at other sites to the west; further monitoring was recommended. - NCC fax dated October 1, 2002 indicates a preliminary remediation feasibility study was conducted in 1994, domestic and industrial solid waste was found 1 to 4 m below the surface and some heavy metals, chlorides and petroleum hydrocarbons that reach significant concentrations upon spring thaw. No NCC files were reviewed as part of this investigation.				
Site Location	open green space between Ottawa Parkway (N), CP railway (W), Scott St. (S) and LeBreton Flats Aqueducts (E)				
Easting (UTM NAD 27)	443540		**Northing (UTM NAD 27)** 5028720		
Ward #	14				
Size of Site	area approx. 7.5 ha				
Waste Thickness	from approx. 3 to 12 m [AMEC, 2002]				
Active Time Period	March 1963 - Feb. 1964				
Current Ownership	NCC				
PIN (s)	040970100, 040970062, 040970059, 040970046, 040970101				

Area Served	City of Ottawa
Type of Waste	domestic and industrial solid waste [NCC fax, Oct. 1, 2002]; concrete, glass, paper, wood, ashes, cinders, asphalt, plastic, rubber, metal and brick observed in fill [AMEC, April 2002]
Nearby Industries	Canadian Pacific Railway Yards, West of Broad St. to Ottawa River [Intera #75]
Operator	City of Ottawa
Parameters of Concern	heavy metals (barium, beryllium, cadmium, copper, lead, nickel, molybdenum, zinc) in soil; PAHs (benzo(a)pyrene and dibenzo(a,h)anthracene) in soil and groundwater; Trace levels of DCE, VC detected in limited number of sampling locations. [AMEC, April 2002]
Concentrations	in excess of applicable remediation criteria [AMEC, April 2002]
Magnitude	heavy metals not found near surface; volume of heavy-metal impacted soil evaluated at 312,000 m3; PAH impacts occur sporadically [AMEC, April 2002]
Methane (landfill gas)	up to 81.2 % methane v/v in December 2001 [AMEC, April 2002]; methane levels varied from 0 to 88.7% v/v in October 2002 [AMEC, excerpts 2002]; site studied in landfill gas utilization feasibility study but did not make it to extraction test screening level. Low levels of gas generation rates combined with a cover permeable to the atmosphere does not lend this site to gas collection [AMEC, excerpts 2002]
Ecological Receptors	ecosystem of Nepean Bay/Ottawa River
Distance to Nearest Human Receptor	closest existing houses are approx. 160 m south of site; site is immediately adjacent to LeBreton Flats where there is proposed residential development
Adjacent Land Use and Zoning	commercial and institutional (municipal facilities) on west side and currently undeveloped in all other directions; historical landfill Ur-5 (Bayview and Slidell) is located immediately west of site; the zoning is LI (major open space) and EW Sch.225 (waterway corridor) in the general area of the site
Adjacent Land Owners	City of Ottawa
Site Access	vacant land not used for recreational purposes; site is not fenced but access to the site is limited due to its location
Water Supply	municipally supplied water
Depth to Bedrock	between approx. 6 m at periphery to over 16 m in mid-west section [AMEC, 2002] to interbedded bioclastic limestone, crystalline limestone and shale
Depth to Groundwater	within the fill deposits, from 13.77m BGL on north side to 9.31 m BGL on southeast side and 4.55 m BGL on southwest side [AMEC, Dec. 3, 2001]
Distance to Surface Water	site is adjacent to Ottawa River on south side and to LeBreton Flats Aqueducts on east side
Topography	steeply sloping on the south and west sides to moderately inclined across the central, northern and eastern portions of the site [AMEC, April 2002]
Soil Cover Thickness	considerable earth fill placed over the waste for the construction of the Ottawa Parkway [GLL, 1980]; cover thickness varies from approx. 0.05 m (topsoil only) to several metres (topsoil underlain by sand or clay fill) [AMEC, April 2002]
Type of Overburden	topsoil, fill and native clay and/or till overlying limestone bedrock; estimated K = 4.2E-6 cm/s [AMEC, April 2002]
Direction of Groundwater Flow	radially south (towards Ottawa River), west and north [AMEC, April 2002]
Physical Setting	open green space with grass cover and tree plantings
Other Information	During site operation, a dyke was built across the bay and wastes filled in behind. [Dillon, 1984]