Screening Level Risk Assessment and Remedial Option Feasibility Study - Former UST Area, 16 Tauvette Street, Ottawa, Ontario NCC Property Asset No. 6976

[redacted]

Revision: 0

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Title:	Screening Level Risk Assessment and Remedial Option Feasibility Study - Former UST Area, 16 Tauvette Street, Ottawa, Ontario NCC Property Asset No. 6976	
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EXECUTIVE SUMMARY

Intera Engineering Ltd. (INTERA) was retained by the National Capital Commission (NCC) to complete a Screening Level Risk Assessment (SLRA) and Remedial Option Feasibility Study for the former UST area at 16 Tauvette Street, Ottawa, Ontario (NCC Property Asset #6976). The SLRA is comprised of a human health risk assessment and ecological risk assessment for identified contamination by petroleum hydrocarbons (PHC) and benzene, toluene, ethylbenzene and xylenes (BTEX). The property is currently owned by the NCC and is a vacant commercial greenhouse operation.

A Phase I ESA completed for the property in 1998 by Environmental Ecological Enterprises identified an area of the site where two fuel-containing underground storage tanks (USTs), one gasoline and one diesel, had been located. Two above ground fuel storage tanks (ASTs) had also reportedly been located in this same area. Review of property management files by Environmental Ecological Enterprises indicated that the USTs and ASTs had been removed and no soil or groundwater contamination remained on site; however, no reports were available to verify soil and groundwater quality following the removal of the tanks.

Phase II ESAs were conducted on the property in 2005 and 2006 by INTERA. The results of these Phase II ESA reports identified petroleum hydrocarbon-contaminated soil and groundwater in the vicinity of the former UST area.

Supplementary sampling and testing of soil and groundwater were undertaken as part of this assignment to augment the database of soil and groundwater quality for use in SLRA of the site. The results of this supplementary investigation and SLRA of the site support the following conclusions and recommendations.

Chemicals that exceed applicable CCME and MOE guidelines and standards for commercial land use, fine-textured soils and non-potable groundwater conditions include PHC and BTEX parameters in soil and groundwater. The identified PHC and BTEX contamination is related to releases from the former UST. Soil and groundwater contamination covers a maximum area of approximately 780 m^2 at depths of about 1.0 to 4.0 m below a paved parking lot. The maximum volume of contaminated soil is about 2400 m^3 with a small volume of contaminated soil occurring below the north part of the Header House.

Supplementary site investigations including test pit inspection and sampling of storm sewers show that the extent of PHC and BTEX contamination at the site has been adequately delineated and is contained on site. The bedding backfill of the storm sewer and the storm sewer that transects the area of contamination do not appear to be pathways for off-site migration of PHC and BTEX.

Contaminants of concern in the SLRA are PHC: F1, PHC: F2 and benzene in soil and PHC: F1 to F4 in groundwater. COCs in groundwater are identified based on the lack of MOE or CCME standards or guidelines for PHC in non-potable groundwater. Results of the SLRA show that the PHC and BTEX contamination related to the former UST at 16 Tauvette St. do not pose any adverse health effect to human or ecological receptors for current site conditions and land uses, including ongoing commercial operation of the greenhouses.

[redacted]

Given the results of the SLRA and site and contaminant conditions, the recomm[redacted]nded risk management approach for this site is to undertake monitored natural attenuation, with re-evaluation of monitoring results at completion of the proposed five year groundwater and storm sewer water monitoring program.

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1 INTRODUCTION

Intera Engineering Ltd. (INTERA) was retained by the National Capital Commission (NCC) to complete a Screening Level Risk Assessment (SLRA) and Remedial Option Feasibility Study for a former UST area located at 16 Tauvette Street, Ottawa, Ontario (NCC Property Asset No. 6976). The SLRA is comprised of a human health risk assessment (HHRA) and ecological risk assessment (ERA) for identified contamination by petroleum hydrocarbons (PHC) and benzene, toluene, ethylbenzene and xylenes (BTEX).

The location of the 16 Tauvette Street (NCC Property Asset No. 6976) is illustrated in Figure 1.1.

This SLRA and Remedial Option Feasibility Study report was completed in accordance with INTERA's proposal dated July 5, 2007, as approved by the NCC on July 27, 2007. Work was completed under NCC Purchase Order #559669 as part of INTERA Standing Offer Agreement #543278 with the NCC.

1.1 Background

The former UST area, for which this SLRA and Remedial Option Feasibility Study applies, is located within an approximate 75 hectare (ha) agricultural property which was developed by the NCC as a nursery from the early 1970s to the mid 1990s, after which NCC leased the nursery property to various businesses. The use of the property as a nursery discontinued some time in the late 1990s or early 2000s.

Of the 75 ha property, approximately 70 ha were utilized as agricultural land/nursery fields with the remaining approximate 5 ha, located in the southeast corner, developed as a greenhouse complex. The greenhouse complex included a barn, a large greenhouse/office building and associated parking areas and service roads/driveways.

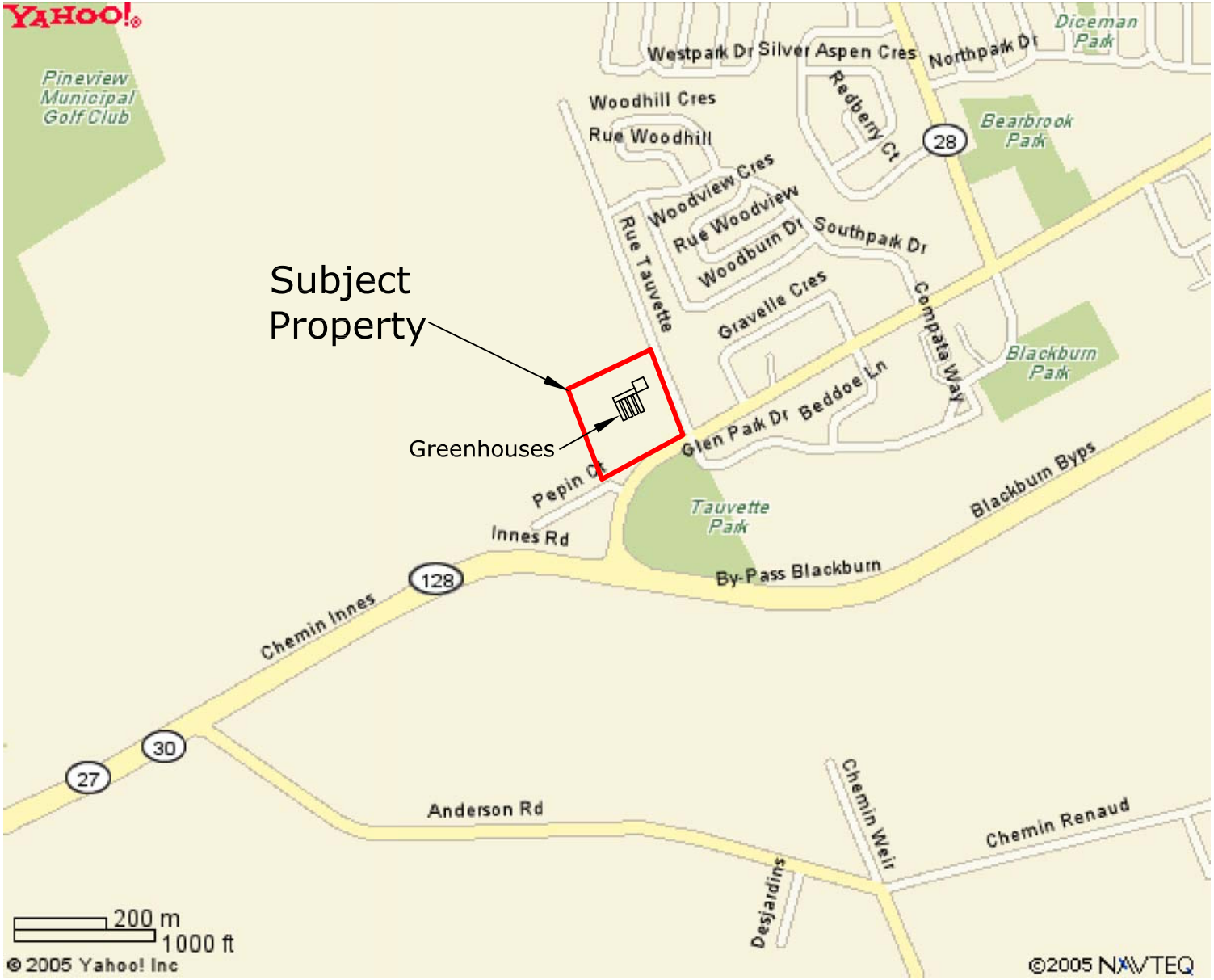
In addition to the growing operations, vehicle refuelling was conducted at the greenhouse complex. Fuel storage tanks, at first underground storage tanks (USTs) followed by aboveground storage tanks (ASTs), were historically present northwest of the greenhouse/office building.

The layout of the greenhouse complex and location of the former UST area are illustrated on Figure 1.2.

1.2 Previous Work

Phase I, Phase II and Supplemental Phase II Environmental Site Assessments (ESAs) were completed on sections of the property for the NCC in 1998, 2005 and 2006. The earlier Phase I and Phase II ESA reports include:

- *Phase I Environmental Site Assessment – 16 Tauvette Street and 2389 Pepin Court, NCC Property Asset #6976 and #418, Ottawa, Ontario.* Final Report prepared by Environmental Ecological Enterprises, for the National Capital Commission, November 1998.
- *Phase II Environmental Site Assessment – 16 Tauvette Street and 2389 Pepin Court, NCC Property Asset #6976 and #418, Ottawa, Ontario.* Final Report prepared by Intera Engineering Ltd. for the National Capital Commission, September 2005.



Site Location SLRA and Remedial Option Feasibility Study 16 Tauvette St., Ottawa, Ontario		Prepared by: NKP Reviewed by: KGR Date: July 2008
FIGURE 1.1	Doc. No.: 05-215-34_SiteLoc_R0.dwg	

Site Layout SLRA and Remedial Option Feasibility Study - 16 Tauvette St., Ottawa, Ontario		Prepared by: NKP Reviewed by: KGR Date: July 2008
FIGURE 1.2	Doc. No.: 05-215-34_Site Layout_R0.dwg	

- *Supplemental Phase II Environmental Site Assessment, Former UST Area – 16 Tauvette Street, NCC Property Asset #6976, Ottawa, Ontario.* Final Report prepared by Intera Engineering Ltd. for the National Capital Commission, November 6, 2006.

The Environmental Ecological Enterprises Phase I ESA report (E3, 1998) identified an area of the site where two fuel-containing underground storage tanks (USTs), one gasoline and one diesel, had been located. Two above ground fuel storage tanks (ASTs) had also reportedly been located in this same area. Review of property management files by E3 indicated that the USTs and ASTs had been removed and no soil or groundwater contamination remained on site; however, no reports were available to verify soil and groundwater quality following the removal of the tanks.

Following the Phase I ESA recommendations, a Phase II ESA was conducted on the property, by INTERA, in June 2005. The Phase II ESA investigated five areas of concern identified by the Phase I ESA and by INTERA during an initial site visit. Of the five areas investigated, soils significantly contaminated with hydrocarbons were identified in the former UST area located north of the header house. Hydrocarbon-contaminated soils extended north, east and south of the limits of this former UST excavation, from ground surface to potentially 6 metres below ground surface (mBGS). In addition, groundwater sampled from this area exceeded CCME and MOE standards for benzene and MOE standards for petroleum hydrocarbons. Additional Phase II work was recommended to delineate the extent of contaminated soil and groundwater in this former UST area.

INTERA was retained by the NCC in June 2006 to conduct a Supplemental Phase II ESA to delineate the extent of petroleum hydrocarbon contamination. The areal extent of soil and groundwater contamination was delineated to the west, east and north of the former UST area and was approximately 750 m^2. The thickness of soil contamination in the immediate vicinity of the former UST is about 4 m (over an approximate area of 400 m^2). The average thickness of soil contamination in the area surrounding the former UST excavation was approximately 2 m (over an approximate area of 350 m^2). The volume of soil contamination was estimated at 2,300 m^3, approximately 4,600 tonnes. It also appeared that a small amount of hydrocarbon contamination likely extends below the Header House. Based on the results of the Supplemental Phase II ESA, it was recommended that contaminated soil be excavated and disposed of off site at a licensed landfill.

Indoor air sampling for volatile organic compounds (VOCs) was also completed in the greenhouse buildings in 2001 (Water and Earth Science Associates Ltd., 2001) as part of an industrial hygiene assessment of the property related to indoor chemical storage. Following remediation of identified indoor air VOC sources, BTE (benzene, toluene, ethylbenzene) and other volatile organic compounds commonly found in fuels were tested and found not to be present above background levels. However the testing was not completed within the current Header House building that may in part overly identified PHC soil contamination.

1.3 Study Objectives

The objectives of the SLRA and Remedial Option Feasibility Study described in this report are:

- To more accurately delineate the nature and extent of soil and groundwater contamination by PHC and BTEX for use in SLRA;
- To identify contaminants of concern (COCs) based on applicable guidelines and standards;

- To evaluate the risks to human and ecological receptors based on the continued use of the property as a commercial greenhouse; and
- To identify and assess the feasibility of potential soil and/or groundwater remedial options and, if remediation is not required, identify and assess the feasibility of various potential risk management options as may be required by the SLRA.

1.4 Scope of Work

The scope of work for this SLRA and Remedial Option Feasibility Study included the following general tasks or activities as outlined in the INTERA proposal dated July 5, 2007:

- Review of the available documentation for the site, including NCC and INTERA files, and development of a work plan including any additional sampling required for the screening level risk assessment.
- Advancement of 13 boreholes and soil sampling in the vicinity of the former UST area to further delineate and confirm the nature and extent of soil contamination.
- Installation of four new groundwater monitoring wells with follow-up groundwater sampling of all on-site monitoring wells in the vicinity of the former UST area to further delineate and confirm the nature and extent groundwater contamination and directions of groundwater flow in the shallow groundwater system
- Completion of hydraulic conductivity testing to quantify the hydraulic conductivity of the clay overburden.
- Assessment of the potential migration of contaminants away from the former UST area through storm sewers and storm sewer bedding that intersects the contaminated area.
- Analysis of contaminant concentrations and selection of site contaminants of concern (COCs) for use in SLRA.
- Selection of key potential human receptors for use in human health SLRA.
- Screening level evaluation of risk to casual site visitors and site workers.
- Identification of valued ecological receptors for the site.
- Screening level evaluation of risk to valued ecological receptors.
- Identification and evaluation of potential soil and groundwater remedial options, including cost estimates for the three most technically sound potential remedial/risk management options.

1.5 Report Organization

This report is organized into nine sections and five appendices.

Section 1 is an introductory section that provides a background to this work and describes previous work, study objectives, scope of work and report organization.

Section 2 describes the supplementary field investigations of the site undertaken to provide additional data on the nature and extent of soil and groundwater contamination for use in the SLRA.

Section 3 provides an overview of the physical and environmental conditions of the site that are relevant to the SLRA and Remedial Option Feasibility Study, based on current and previous site

investigations. Section 3 also identifies contaminants of concern for inclusion in the SLRA.

Sections 4 and 5 are the screening level human health and ecological risk assessments.

Section 6 provides the identification and evaluation of potential soil and groundwater remediation options.

Section 7 summarizes the conclusions and remedial option recommendation that comprise the risk management plan for the site.

Sections 8 and 9 provide a closure outlining limitations on the use of this report and listing of references cited in the report, respectively.

Appendix A contains the stratigraphic and instrumentation logs for all test pits, boreholes and monitoring wells completed at the site. Appendix B shows the results and analyses of hydraulic conductivity testing of groundwater monitoring wells. Appendix C lists the tables of soil and groundwater quality data compared to CCME and MOE guidelines and standards. Appendix D provides a selection of photographs of the site. Appendix E contains the laboratory analytical reports for soil and groundwater quality data collected in this study.

2 SUPPLEMENTARY FIELD INVESTIGATIONS

Additional field work was conducted by INTERA personnel between September 5 and October 27, 2007. The additional data obtained from this supplementary sampling and testing further delineated the extent of soil and groundwater contamination and augmented the database of soil and groundwater quality of the site for use in the SLRA.

The additional supplementary work included the following activities:

- Completing an investigation of the storm sewers and foundation drains associated with the greenhouse complex. Inspection, surveying, test pit excavation, dye testing and storm sewer sampling were completed as part of this investigation.
- This investigation included visual inspection, tracing and surveying of the storm sewers, via catchbasins and manholes, and was followed by the excavation of seven test pits to expose the storm sewers and foundation drains to verify alignment, depth, fill, and type of storm sewer and to inspect for evidence of contamination. Dye tracing of a floor drain connection within the boiler room was also completed to rule out a formerly reported stain/potential spill as an additional source of contamination.
- Drilling of 13 boreholes, soil sampling and installation of four new monitoring wells.
- Completing an elevation survey of well risers and collection of water level measurements from the four new wells and seven existing wells to more accurately delineate the direction of groundwater flow at the site.
- Collecting groundwater samples from the four new wells and six existing wells for PHC/BTEX parameters to assess groundwater quality.
- Conducting water level recovery tests to estimate well transmissivity and hydraulic conductivity.

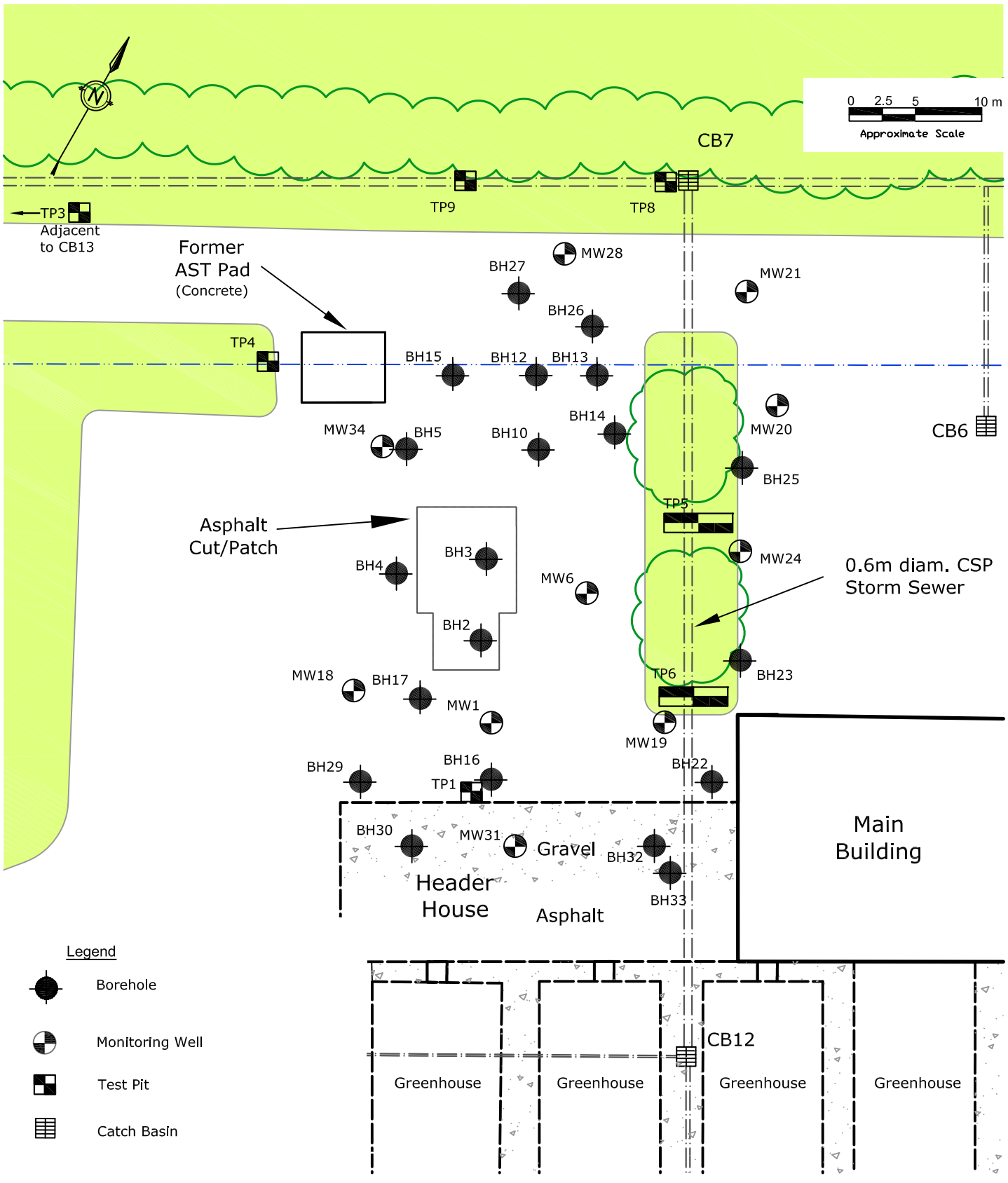
2.1 Drilling and Soil Sampling

Thirteen boreholes (BH22 to BH34) were drilled on September 10, 2007. Borehole drilling was completed by Strata Soil Sampling Inc. (Strata) to average depths of 4.3 m using track-mounted GeoProbe™ drilling equipment; all drilling was completed under the supervision of INTERA personnel. The main objective of the borehole drilling program was to supplement the investigative work completed by INTERA in 2006 in order to more accurately delineate the full extent of soil and groundwater contamination.

Borehole locations are shown on Figure 2.1. Borehole stratigraphic logs are provided in Appendix A.

Continuous soil samples were collected and logged for stratigraphy and visual/olfactory evidence of contamination. Soil samples were collected and placed in two re-sealable plastic bags. One sample bag was placed on ice for possible laboratory submission and the other sample bag was allowed to reach ambient temperature in order to measure concentrations of organic vapours in the sample headspace. Sample headspace vapours were measured using a Gastech combustible gas indicator (CGI) operated in methane elimination mode.

Soil samples were selected for laboratory submission based on visual, olfactory and/or field instrument evidence of contamination, and to aid in the delineation of hydrocarbon contamination in the investigation area. Samples selected for laboratory analyses of PHC and BTEX parameters were



Borehole and Monitoring Well Locations SLRA and Remedial Option Feasibility Study - 16 Tauvette St., Ottawa, Ontario		Prepared by: NKP Reviewed by: KGR Date: July 2008
FIGURE 2.1	Doc. No.: 05-215-34_BH+TP Locations_R0.dwg	

collected in appropriate containers supplied by the analytical laboratory, Paracel Laboratories Ltd. (Paracel) of Ottawa, Ontario, a CAEAL-certified analytical laboratory. All samples were stored and shipped in coolers with ice packs and hand-delivered to the laboratories by local couriers under chain-of-custody procedures, in accordance with INTERA QA/QC procedures.

Ten soil samples plus one blind field duplicate, for a total of eleven soil samples were submitted for PHC and BTEX analyses.

The results of the soil sampling are discussed in Section 3.4.

2.2 Monitoring Well Installation

Four of the new boreholes were completed as groundwater monitoring wells (MW24, MW28, MW31 and MW34) to supplement the monitoring wells installed in June 2005 and June 2006. The new monitoring well installations were completed on September 10, 2007, in conjunction with the borehole drilling, by Strata, a licensed MOE well driller, in accordance with provincial regulations.

Monitoring wells were constructed of 31.8 mm diameter, Schedule 40 PVC with factory-slotted screen 3.05 m in length, and flush-jointed riser pipe to extend to ground surface. Silica sand backfill was placed around the screened interval and bentonite hole plug was used to seal the borehole to ground surface. The monitoring wells were finished at surface with flushmount protective casings. Monitoring well instrumentation details are included on the borehole stratigraphic logs in Appendix A.

Each new monitoring well was surveyed for both horizontal and vertical location. A Garmin Etrex Vista Global Positioning System (GPS) was used to provide a geo-referenced location accurate to within 5 metres for each monitoring well location. Coordinates (MTM NAD83) for the monitoring wells are provided in Figure 3.4. Relative horizontal location was recorded using a measuring tape, while vertical position was measured relative to an arbitrary site benchmark (site datum) established at an elevation of 100.00 metres. The selected site benchmark was located on the southeast corner of the elevated concrete pad where the former aboveground storage tanks were located.

2.3 Water Level Monitoring

Water levels in all monitoring wells were measured with an electric contact water level tape, accurate to 0.01 m, relative to the top of each well casing. Complete sets of water levels were recorded on September 19, 2007, and expressed as elevations above site datum. Water level results are discussed in Section 3.5.

2.4 Well Hydraulic Testing

Hydraulic testing of groundwater monitoring wells was undertaken in the study to quantify the hydraulic conductivity of the clay overburden.

Hydraulic tests were performed as bail and slug (water removal and addition, respectively) tests and analyzed for hydraulic conductivity following the method of Hvorslev (1951) based on a graphical determination of basic time lag (T_0) for each well. Summaries of the hydraulic testing data, water level recovery plot and T_0 for each test are given in Appendix B. Tabular summaries of basic time lag and hydraulic conductivity are given for the bail and slug tests in Table 3.1 in Section 3.5.

2.5 Groundwater Purging and Sampling

Groundwater purging and sampling was conducted on September 19 and 20, 2007. Groundwater samples were collected from the monitoring wells using dedicated polyethylene tubing and foot valves. As these monitoring wells are low-yield wells, they were purged to dry once and allowed to recover prior to sampling.

Groundwater samples for laboratory analyses of PHC and BTEX parameters were collected in laboratory-prepared sample containers supplied by the analytical laboratory, Paracel. All samples were stored and shipped in coolers with ice packs and hand-delivered to the laboratories by local couriers under chain-of-custody procedures, in accordance with INTERA QA/QC procedures.

Groundwater samples were collected from 10 monitoring wells present on site plus one blind field duplicate, for a total of 11 groundwater samples, and submitted for analyses of PHC and BTEX parameter.

The results of the groundwater sampling are discussed in Section 3.6.

2.6 Storm Sewer and Foundation Drain Investigation

The storm sewers and foundation drains associated with the greenhouse complex were investigated to assess whether they presented a migration pathway for contaminants. This investigation included visual inspection, tracing, surveying and sampling of the storm sewers, via catchbasins and manholes, and was followed by the excavation of seven test pits to expose the storm sewers and foundation drains to verify alignment, depth, fill, and type of storm sewer and to inspect for evidence of contamination in bedding materials. Dye tracing of a floor drain connection within the boiler room was also completed to rule out a formerly reported stain/spill as an additional potential source of contamination.

2.6.1 Storm Sewer Inspection and Tracing

The storm sewer system associated with the greenhouse complex was visually traced by inspecting each catchbasin and documenting the size and direction of inlet and outlet pipes. Whether the observed pipes were inlets or outlets was later verified by completing a vertical elevation survey of all pipe inverts to confirm the direction(s) of flow in and out of the catchbasins. In addition, observations with respect to sediment, standing water and/or evidence of potential PHC contamination were recorded at each catchbasin.

Additional tracing of storm sewers was accomplished during the buried utility locates which were required for the planned test pit excavation and borehole drilling activities.

The results of the storm sewer inspection and tracing are provided in Section 3.2.

2.6.2 Test Pit Excavation and Soil Sampling

Seven test pits (TP1, TP3, TP4, TP5, TP6, TP8 and TP9) were excavated on September 7, 2007 using a rubber-tired backhoe operated by Glenn Wright Excavating of Manotick, Ontario, under the supervision of INTERA personnel. The objective of the test pitting program was to expose foundation

drains and storm sewers to verify the alignment, depth, fill and type of storm sewer and to inspect for evidence of contamination.

Soil samples were collected and logged for stratigraphy and visual/olfactory evidence of contamination. Soil samples were collected, placed in re-sealable plastic bags and allowed to reach ambient temperature in order to measure concentrations of organic vapours in the sample headspace. Sample headspace vapours were measured using a Gastech CGI operated in methane elimination mode. A laboratory-supplied soil sample jar was filled concurrent with placing soil in a re-sealable plastic bag for soil intervals that presented some visual and/or olfactory evidence of contamination. Samples were then placed on ice for possible laboratory submission.

Soil samples were selected for laboratory submission based on visual, olfactory and/or field instrument evidence of contamination. Samples selected for laboratory analyses of PHC and BTEX parameters were collected in appropriate containers supplied by the analytical laboratory, Paracel. All samples were stored and shipped in coolers with ice packs and hand-delivered to the laboratories by local couriers under chain-of-custody procedures, in accordance with INTERA QA/QC procedures.

Test pit stratigraphic tables are included in Appendix A and test pit locations are shown on Figure 2.1.

The results of this soil sampling are discussed in Section 3.4 together with the results of the soil sampling conducted during the borehole drilling.

2.6.3 Floor Drain Dye Tracing

Dye tracing of the building's floor drains was conducted on October 19, 2007. The objective of the dye tracing was to verify that the building floor drains connected to the municipal sanitary system to rule out a formerly reported stain/spill as an additional potential source of contamination in the greenhouse complex stormwater system.

The dye tracing was completed using a non-toxic, biodegradable fluorescein dye (green). The dye was flushed down the floor drains located in the boiler room while INTERA personnel observed the sanitary sewer located on the east side of Tauvette Street at a point downgradient of the building's connection.

2.6.4 Storm Sewer Sampling

Three storm sewer samples were collected to determine whether PHC/BTEX compounds are currently being leaking to the storm sewer/foundation drain system. At the time of sampling, it was raining and there was a low volume of flow through the storm sewers. The storm sewer samples were collected on October 19, 2007, from catchbasins located to the north and south of the header house/greenhouse and the former UST area (CB7 and CB12, respectively). Catchbasin locations are shown on Figure 1.2.

Storm sewer samples were collected for laboratory analyses of PHC and BTEX parameters using a peristaltic pump. Samples were collected in appropriate containers supplied by the analytical laboratory, Paracel. All samples were stored and shipped in coolers with ice packs and hand-delivered to the laboratories by local couriers under chain-of-custody procedures, in accordance with INTERA QA/QC procedures.

The results of the storm sewer sampling are discussed in Section 3.7.

3 SUMMARY OF SITE CONDITIONS

3.1 Land Use and Physical Setting

NCC Property Asset No. 6976 was developed as a vacant commercial greenhouse operation located at 16 Tauvette Street, Ottawa, Ontario. The subject property is approximately 75 hectares in size and includes agricultural fields, eight greenhouses and office area. This SLRA and Remedial Option Feasibility Study include the former UST area only, which is a paved area located north of the header house/greenhouses. A tributary of Green's Creek is located on the subject property, approximately 200 m from the former UST area.

Although the site was vacant at the time of field investigations since 2005, a tenant has since occupied the buildings and commenced renovations in anticipation of resuming commercial greenhouse operations in the near future.

The two mature maple trees located on the grassed area east of the former UST area appeared to be in poor condition at the time of INTERA's site visits in the fall of 2007. However subsequent inspections of these trees suggest that the observed vegetative stress is due to environmental factors other than fuel releases from the former USTs. There were no signs of vegetative stress in the areas immediately surrounding the former UST area.

3.2 Storm Sewer Inspection and Tracing

Based on the storm sewer inspection and tracing, the layout of the storm sewers in the vicinity of the greenhouse complex are illustrated on Figure 1.2.

The following major observations were noted from the storm sewer inspection and tracing program:

- All storm sewer piping is non-perforated corrugated steel pipe (CSP) of varying diameter depending on the respective flow capacities.
- The last point on the storm sewer system traced was at the northwest corner of the greenhouse complex. All stormwater captured from around the greenhouse complex flows north from the northwest corner of the complex. Based on a review of regional mapping, it likely discharges to a tributary to Green's Creek approximately 200 m northwest of the greenhouses.
- A section of the storm sewer system, which carries stormwater flow from the southwest half of the greenhouse complex, is installed in a south to north direction approximately 15 m east of the former USTs. This section of storm sewer is an approximate 0.6 m diameter CSP. The granular bedding material for this storm sewer does not appear to be a migration pathway for PHC/BTEX contamination.
- Hydrocarbon (fuel) odours were detected emanating from catchbasins CB12 and CB7, on several occasions during the field activities. Catchbasin CB7 is likely the source of odours reported to the NCC by a pedestrian.
- The floor drain in the boiler room within the main building was confirmed to connect to municipal sanitary system, as dye poured into the drain was observed in the sanitary sewer, as it should be, and not to the site storm sewer or foundation drain system.

- The pipe installed in an east to west direction, approximately 10 m north of the former USTs which was indicated on previous INTERA figures as a storm sewer was confirmed to be a water main that services irrigation systems in the nursery fields.

3.3 Site Stratigraphy

Soils encountered on the subject property consisted of primarily shallow weathered brown and deeper un-weathered grey clay to depths of at least 6.0 m. Sandy gravel fill material was encountered between ground surface (asphalt surfaced) and approximately 0.8 mBGS. Stratigraphy of the site is based on intrusive investigations conducted by INTERA in 2005, 2006 and 2007 (see Appendix A – test pit and borehole stratigraphic logs).

Stratigraphic cross-sections were generated for the former UST area. The location of Section A-A' and Section B-B', drawn through the former UST area, are illustrated on Figure 3.1. Section A-A' and Section B-B' are illustrated on Figures 3.2 and 3.3, respectively.

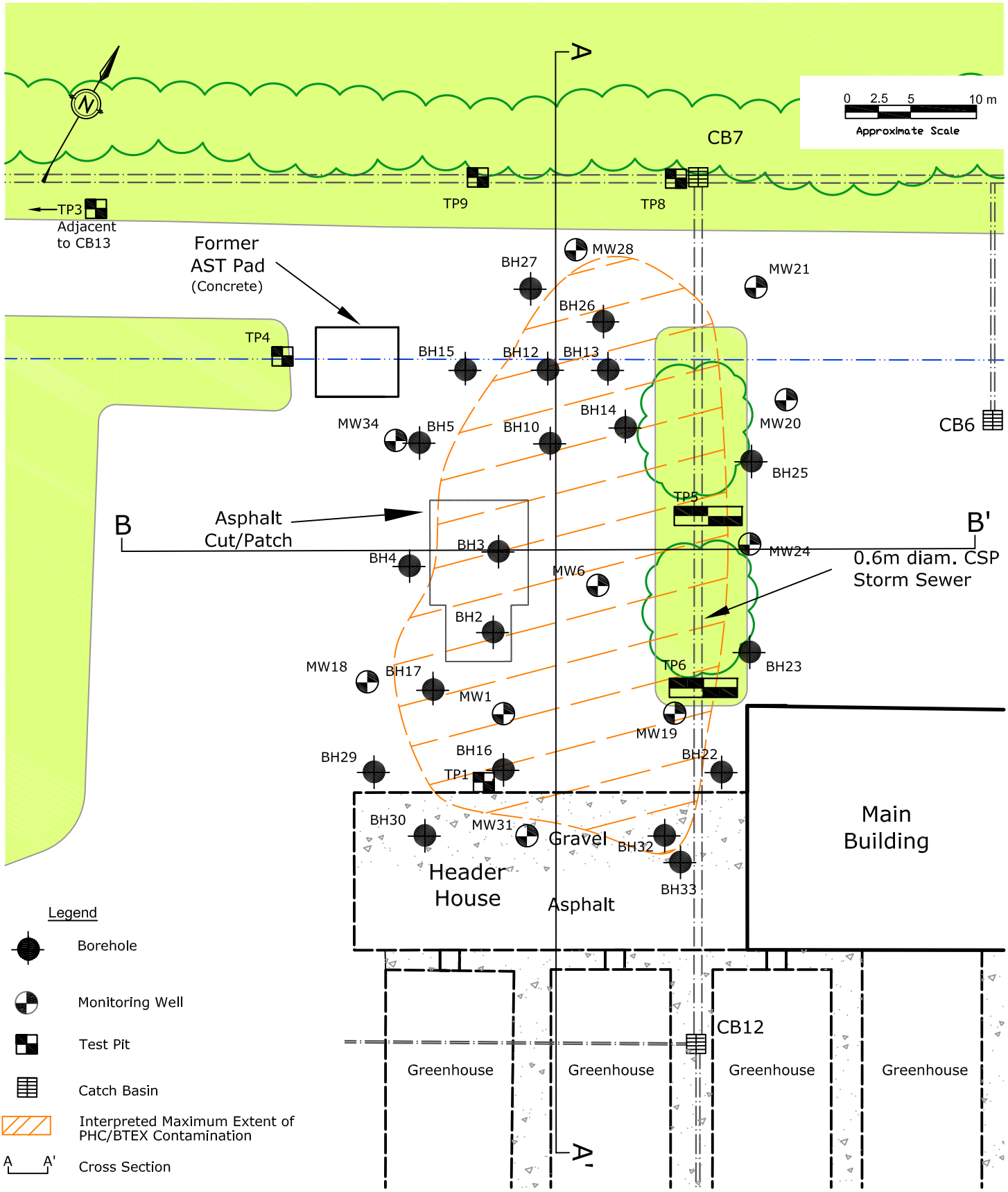
3.4 Regulatory Guidelines, Criteria and Standards

Soil, groundwater and storm sewer water analytical results were compared to the following federal and provincial guidelines, criteria and standards.

- Canadian Council of Ministers of the Environment (CCME, 1999 with updates to 2007): *Canadian Environmental Quality Guidelines, Soil Quality Guidelines* (Commercial Land Use, Fine Textured Soil), Community Water Use Guidelines and Guidelines for the Protection of Aquatic Life.
- CCME (2008a): *Canada-Wide Standards for Petroleum Hydrocarbons in Soil, Soil Criteria for Commercial Land Use.*
- Ontario Ministry of the Environment (MOE, 2004), *Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act,* Table 3: Full Depth Generic Site Condition Standards in a Non-Potable Ground Water Condition (Industrial/Commercial /Community Property Use).
- Ontario Ministry of the Environment (MOE, 1994) *Water Management Policies, Guidelines, Provincial Water Quality Objectives of the Ministry of the Environment,* July.

Application of commercial land use guidelines/standards and non-potable water guidelines/standards to the site is based on the continued use of the site as a commercial greenhouse and the fact that the site groundwater is not a source of drinking water. Soils at the site are predominately clay, invoking use of guidelines/standards based on fine to medium textured soil.

Although CCME soil quality guidelines for benzene are provided for incremental risk levels of 10^{-6} and10^{-5}, the CCME soil quality guideline listed in CCME (1999) and Table C.1 is derived from protection of drinking water quality according to Canadian Drinking Water Quality Guidelines. The CCME criteria for groundwater for a community water condition were used for reference/comparison purposes only and are not directly applicable to a non-potable groundwater condition, as they reflect the criteria for drinking water.

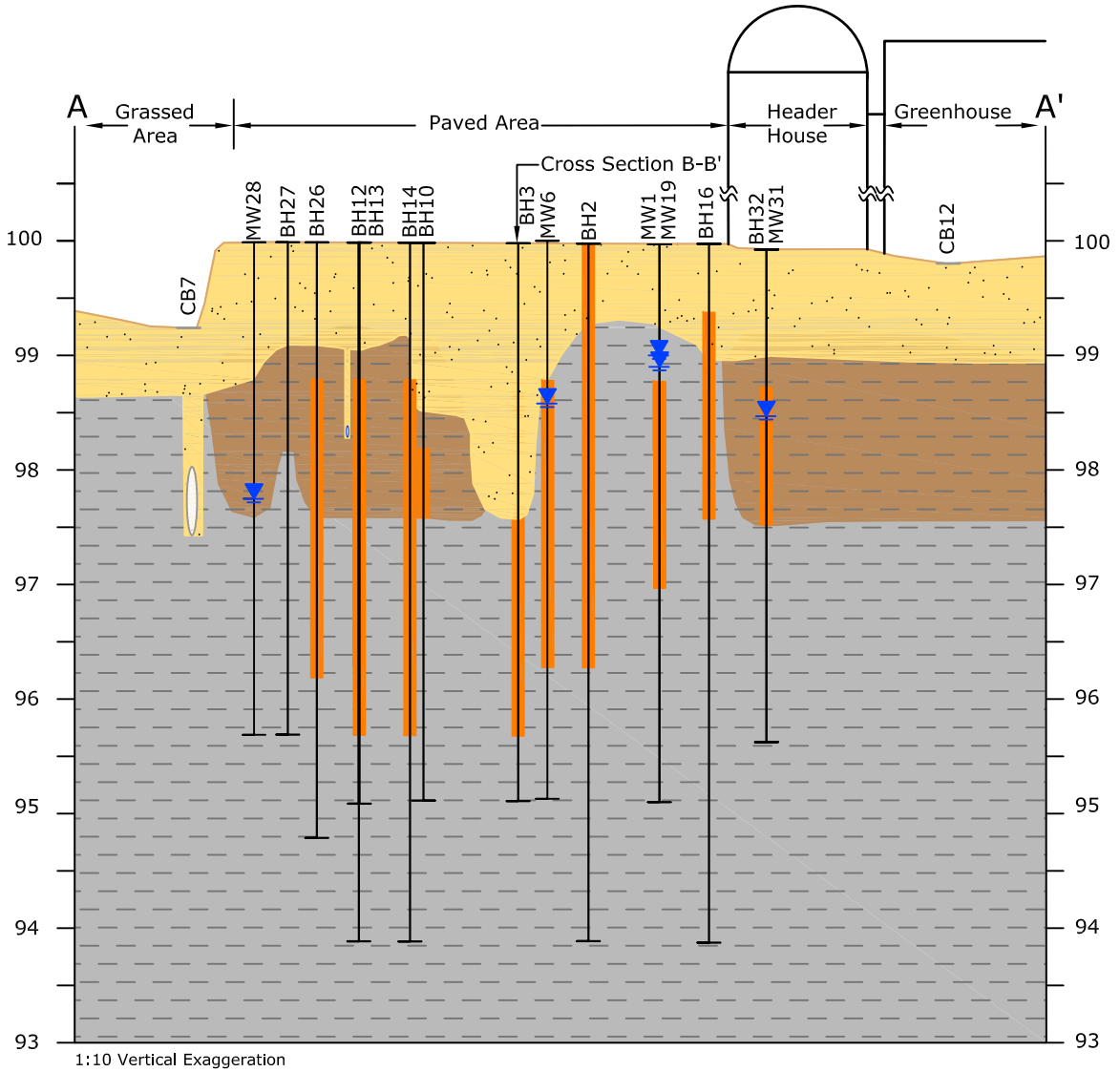


Cross Sections and Extent of PHC/BTEX Soil Contamination
SLRA and Remedial Option Feasibility Study -
16 Tauvette St., Ottawa, Ontario

Prepared by: NKP
Reviewed by: KGR
Date: July 2008

FIGURE 3.1

Doc. No.: 05-215-34_BH+TP Locations_R0.dwg



LEGEND

- Sand and Gravel Fill
- Brown and Grey Clay
- Grey Clay
- Borehole or Monitoring Well
- Zone of PHC/BTEX Contamination
- Water Level (September 19, 2007)
- Storm Sewer
- Water Main

Cross Section A - A'
SLRA and Remedial Option Feasibility Study -
16 Tauvette St., Ottawa, Ontario

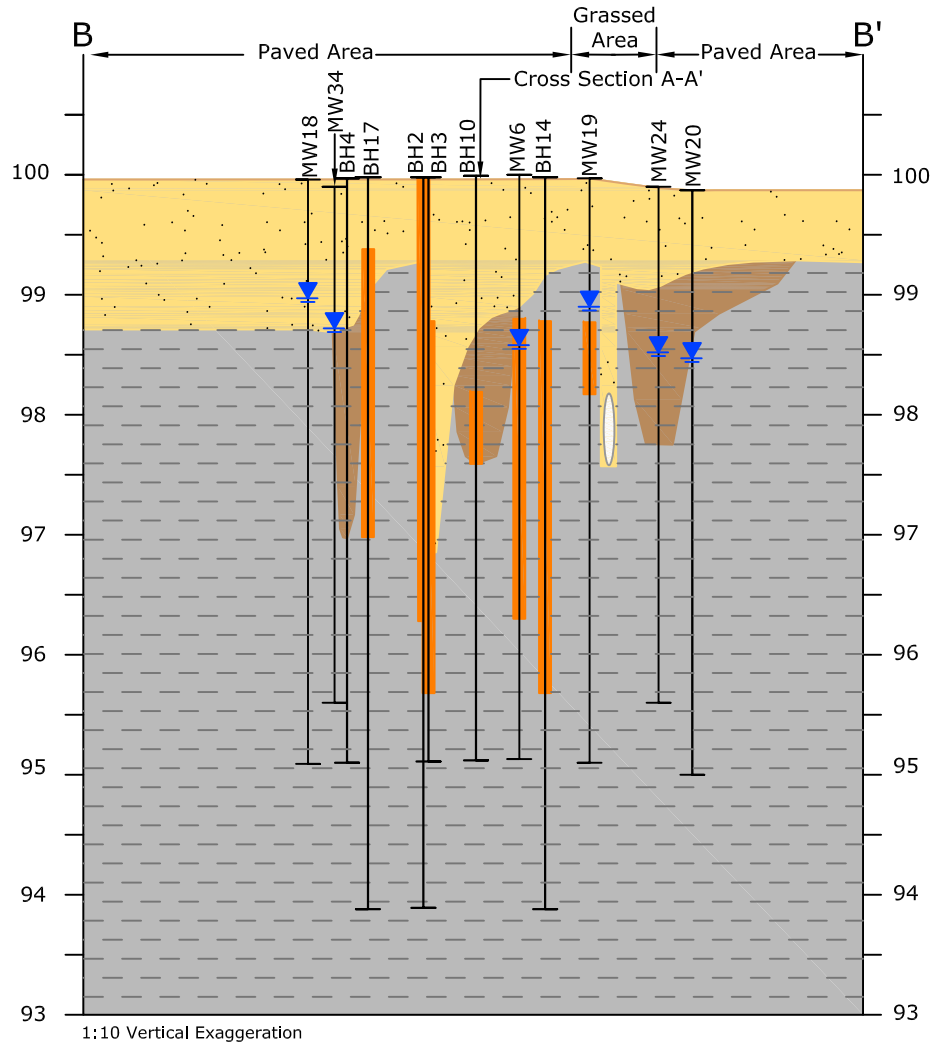
FIGURE 3.2

Doc. No.: 05-215-34_Cross Sections_R0.dwg

Prepared by: NKP
Reviewed by: KGR
Date: July 2008

APPROXIMATE SCALE
0 5 10 20 m

INTERA



LEGEND

- Sand and Gravel Fill
- Brown and Grey Clay
- Grey Clay
- Borehole or Monitoring Well
- Zone of PHC/BTEX Contamination
- Water Level (September 19, 2007)
- Storm Sewer

Cross Section B - B'
SLRA and Remedial Option Feasibility Study -
16 Tauvette St., Ottawa, Ontario

FIGURE 3.3

Doc. No.: 05-215-34_Cross Sections_R0.dwg

Prepared by: NKP
Reviewed by: KGR
Date: July 2008

APPROXIMATE SCALE
0 5 10 20 m

CCME (2008a) has recently released new soil quality criteria for PHCs that update those developed in CCME (2001) and adopted by MOE (2004). Because MOE has not updated their 2004 soil quality standards for PHCs, there are differences between current MOE (2004) PHC soil quality standards and those of CCME, that simply reflect timing update issues.

3.5 Soil Quality

Soil quality data for the site are taken from the previous INTERA studies (2005 and 2006) and the current study. Soil samples were collected for analysis of petroleum hydrocarbons (PHC) and benzene, toluene, ethylbenzene and xylenes (BTEX) during the borehole and test pit investigations. PHC and BTEX were identified as potential contaminants of concern for the property based on a review of historical land use and previous intrusive investigation and testing undertaken for the NCC by INTERA (2005 and 2006).

3.5.1 Soil Quality Results

The soil analytical results from previous investigations, and the supplementary sampling conducted as part of this SLRA, are presented in Appendix C as Table C.1.

Review of Table C.1 for PHC and BTEX parameters indicates the following soil quality information:

- Of 25 soil samples analyzed for PHC parameters, five samples exceeded CCME standards and three samples exceeded MOE standards
- PHC parameters in soil that exceeded CCME and/or MOE standards included the F1 and F2 fractions.
- Of 25 soil samples analyzed for BTEX parameters, nine samples exceeded CCME guidelines and no samples exceeded MOE standards.
- BTEX parameters in subsurface soil that exceeded CCME guidelines included benzene, toluene, ethylbenzene and total xylenes.
- Inspection of the available duplicate analyses indicates that the relative percent differences in detected parameters in soil were within accepted norms and hence the laboratory soil quality analytical data are generally judged suitable for use in this SLRA.

3.5.2 Soil Quality Summary

Based on soil quality exceedences of CCME standards/guidelines and MOE standards, potential contaminants of concern for soil at the site include: petroleum hydrocarbons (F1 and F2), benzene, toluene, ethylbenzene and total xylenes. The detected PHCs and BTEX parameters in soil are assumed to be the result of the former gasoline and diesel USTs located at the site.

The following observations are made based on a review of the above soil quality results in conjunction with a review of the borehole logs presented in Appendix A.

- Soils significantly contaminated with hydrocarbons were identified in UST Area 1 during INTERA's 2005 and 2006 investigations. Hydrocarbon contaminated soils extend north, east and south of the apparent limits of the former UST excavation (based on the visible cut/patch). The interpreted maximum areal extent of the hydrocarbon contamination is shown on Figure 3.1 and comprises an

area of approximately 780 m^2. Migration from the former UST to the maximum areal extent appears to have been through the shallow weathered clay. The maximum contamination extent is defined based on exceedences of the very conservative CCME guidelines for BTEX and interpolation of soil laboratory analytical data based on soil headspace CGI readings.

- A small amount of hydrocarbon contaminated soil extends below the Header House/greenhouse located to the south of the former UST area. The interpreted extent of soil contamination beneath the Header House/greenhouse comprises an area of approximately 35 m^2 and extends from about 1.0 to 2.4 mBGS.
- Soil contamination in the immediate vicinity of the former UST area appears to extend from about 0.5 to 4.2 mBGS and possibly to 6 mBGS within the former UST excavation area. The volume of PHC contaminated soil in the immediate vicinity of the former UST, based on an approximate area of 400 m^2 and a thickness of 4 m, is 1600 m^3.
- Soil contamination in the peripheral area around the former UST excavation area appears to extend from 1 to 2 mBGS to depths ranging from approximately 2.5 to 3.8 mBGS. The estimated volume of contamination in the peripheral area, based on an approximate area of 380 m^2 and average thickness of 2 m, is 760 m^3.

3.6 Groundwater Flow

3.6.1 Groundwater Flow Directions

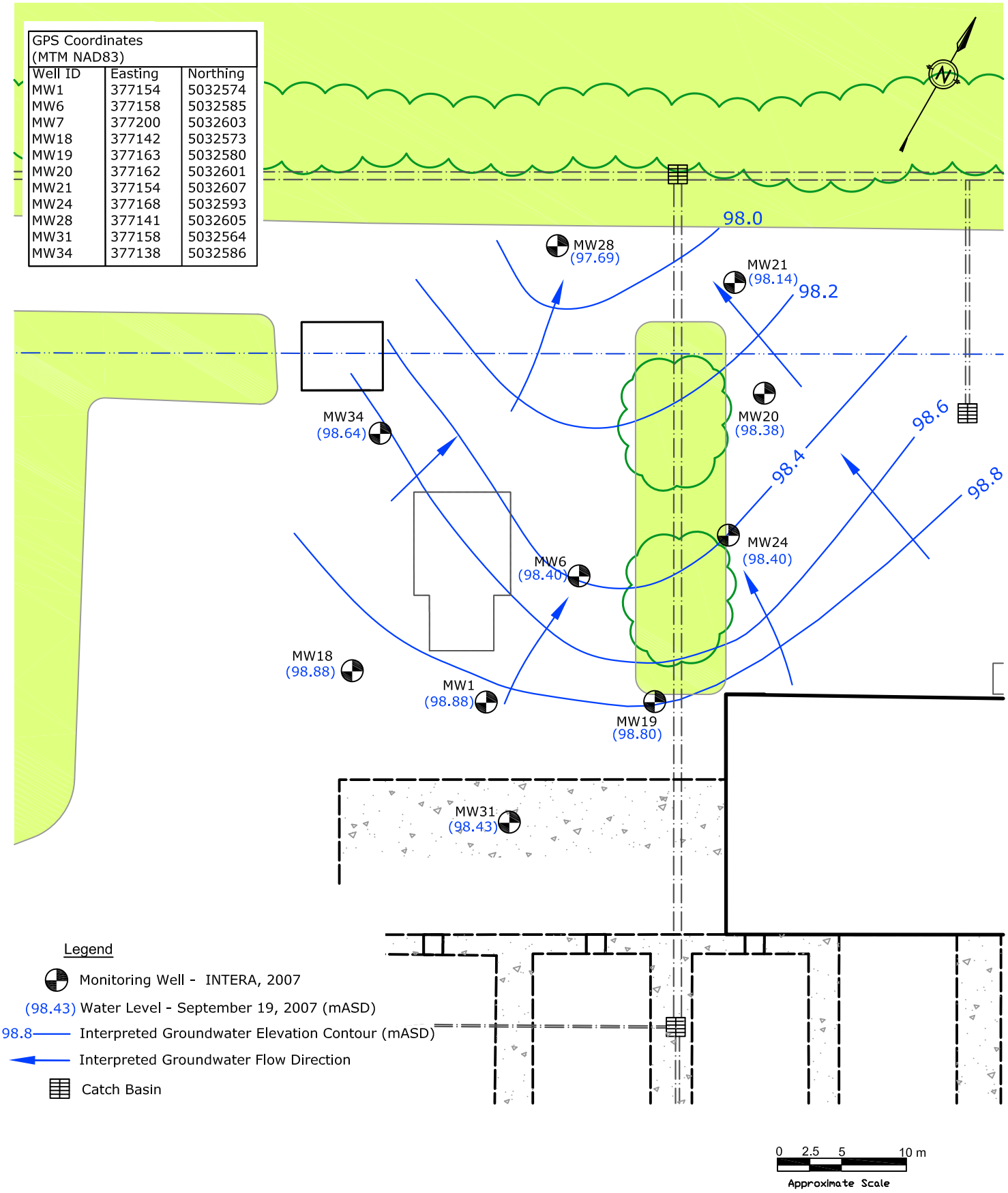
Stable water levels in each groundwater monitoring well were measured on September 19, 2007 relative to the top of PVC riser using an electronic water level tape. The groundwater table was encountered between 0.7 and 2.2 mBGS, generally within the upper part of the native clay unit.

Measured groundwater elevations relative to the local site benchmark are presented in Table 3.1, and are shown on Figure 3.4.

Table 3.1 Groundwater Elevations – September 19, 2007

Monitoring Well.	*Ground Surface Elevation (mASD)*	*Top of PVC Elevation (mASD)*	*Water Level Depth (mBPVC)*	*Water Level Elevation (mASD)*
MW1	100.0	99.85	0.97	98.88
MW6	100.0	99.82	1.42	98.40
MW7	99.9	99.79	0.73	99.06
MW18	100.0	99.87	0.99	98.88
MW19	100.0	99.87	1.07	98.80
MW20	99.9	99.78	1.40	98.38
MW21	100.0	99.91	1.77	98.14
MW24	99.9	99.78	1.38	98.40
MW28	100.0	99.93	2.24	97.69
MW31	99.9	99.88	1.45	98.43
MW34	99.9	99.82	1.18	98.64

mASD = metres above site datum; mBPVC = metres below top of PVC riser



Shallow Groundwater Elevations and Flow Directions
SLRA and Remedial Option Feasibility Study -
16 Tauvette St., Ottawa, Ontario

Prepared by: NKP
Reviewed by: KGR
Date: July 2008

FIGURE 3.4

Doc. No.: 05-215-34_Site Layout_R0.dwg

Figure 3.4 also shows the contouring of water level elevations and the interpreted directions of shallow groundwater flow at the site.

Based on the measured groundwater elevations and contouring of these monitoring well data shown in Figure 3.4, shallow groundwater is considered to be flowing in a northwest direction reflecting the gentle slope of the ground surface. As discussed in Section 3.2, test pit inspection of the granular bedding material surrounding the 0.6 m diameter CSP indicates it is not a preferential migration pathway for contaminated groundwater.

3.6.2 Hydraulic Conductivity Testing

Table 3.2 summarizes the results of the Hvorslev analyses and shows the calculated hydraulic conductivity for the six wells tested (MW6, MW18, MW19, MW20, MW21 and MW28). Bail tests were conducted for five of the wells (MW6, MW18, MW19, MW20 and MW28) in order to test the native grey clay. The calculated hydraulic conductivities for the grey clay ranged from 9.4×10^{-10} to 4.4×10^{-9} m/s with a geometric mean of 1.6×10^{-9} m/s.

Table 3.2 Results of Bail and Slug Hydraulic Testing of Monitoring Wells

Well	*Soil Tested*	*Date Test Started*	*Basic Time Lag, T_0 (s)*	*Hydraulic Conductivity, K (m/s)*
MW6	Grey Clay	October 11/07	122500	2.0×10^{-9}
MW18	Grey Clay	October 11/07	45000	4.4×10^{-9}
MW19	Grey Clay	October 11/07	195000	1.1×10^{-9}
MW20	Grey Clay	October 11/07	174000	1.3×10^{-9}
MW28	Grey Clay	October 11/07	270000	9.4×10^{-10}
MW21	Granular Fill/ Weathered Clay	October 19/07	9300	4.3×10^{-8}
MW28	Granular Fill/ Weathered Clay	October 19/07	23800	1.7×10^{-8}

Slug tests were conducted for two of the monitoring wells (MW21 and MW28) by adding a known volume of water to create an increase in water level of about 1.0 m that tested both the granular fill and the weathered upper clay. Calculated hydraulic conductivities for the sand fill overburden and shallow weathered clay are 1.7×10^{-8} and 4.3×10^{-8} m/s with a geometric mean of 2.7×10^{-8} m/s.

The hydraulic testing indicates that the granular fill and upper weathered clay is a possible migration pathway for contaminated groundwater at the site. Deeper native clay is too impermeable to be an important groundwater migration pathway.

3.7 Groundwater Quality

Groundwater samples were collected during the initial Phase II and supplemental Phase II ESAs (INTERA, 2005 and 2006) and the supplemental investigations of this study. Groundwater samples for PHCs and BTEX analyses were neither field filtered or acidified. While groundwater quality sample results were compared to the CCME groundwater criteria for a community water condition, this was for

reference/comparison purposes only and are not directly applicable to a non-potable groundwater condition.

3.7.1 Groundwater Quality Results

The groundwater quality data are presented in Table C.2 located in Appendix C.

Review of Table C.2 for PHCs and BTEX parameters indicates the following groundwater quality information.

- Of 19 groundwater samples analyzed for PHC parameters, six of the samples in two of the monitoring wells (MW1, MW6 close to the UST excavation) had detections in the F1 (C6-C10), F2 (>C10-C16), F3 (>C16-C34) and/or F4 (>C34) ranges. There are no numeric standards for PHC in a non-potable groundwater condition. However, for a site to meet the MOE Table 3 Standards there must be no evidence of free product, including but not limited to, visible hydrocarbon film or sheen present on groundwater, surface water, or in any groundwater or surface water samples. As hydrocarbon sheen was observed on groundwater purged from MW1 and MW6 and the PHC concentrations are elevated enough (several thousand µg/L) to suggest residual free product presence, they are judged to not meet the MOE standards.
- Of 19 groundwater samples analyzed for BTEX parameters, four of the samples in two of the monitoring wells (again MW1, MW6) exceeded CCME guidelines for benzene, toluene or total xylenes. None of the groundwater samples exceeded MOE standards.
- There were no detections of PHC or BTEX parameters in any of the groundwater samples collected from MW18, MW19, MW20, MW21, MW24, MW28, MW31 and MW34.
- Inspection of the duplicate analysis indicates that the relative percent differences in detected parameters in groundwater were within accepted norms and hence the laboratory analytical data are suitable for use in this SLRA.

3.7.2 Groundwater Quality Summary

Based on groundwater quality exceedences of MOE standards, potential contaminants of concern for groundwater at the site include PHCs and benzene. The detected PHCs and BTEX parameters in groundwater are assumed to be the result of the former gasoline and diesel USTs located at the site.

The extent of hydrocarbon impact in groundwater appears to be limited to the immediate vicinity of the former UST area.

Evidence from groundwater sampling performed over the last two years in wells MW1 and MW6 suggests reduction of PHC and BTEX parameters that may reflect ongoing natural attenuation.

3.8 Storm Sewer Sampling

Storm sewer samples were collected on October 19, 2007 from catchbasins CB7, CB12 and CB12B during the supplemental investigations of this study. Storm sewer samples for PHCs and BTEX analyses were neither field filtered or acidified. The storm sewer quality data are presented in Table C.3 located in Appendix C.

Table C.3 shows that PHCs and BTEX parameters were not detected in any of the three storm sewer samples collected from catch basins.

3.9 Identification of Contaminants of Concern

Contaminants of Concern (COCs) are those priority chemicals which are most likely to influence the results of risk assessments. In this simple screening identification of COCs for inclusion in the SLRA, non-potable groundwater conditions, fine and medium textured surface soil and commercial land use are assumed for the site. Table 3.3 summarizes this initial screening of quality data measured at the 16 Tauvette St. site to identify contaminants of concern for further evaluation in SLRA of the 16 Tauvette St. site.

Table 3.3 Identification of Soil and Groundwater COCs for SLRA

Soil (µg/g)	***Max Value***	***MOE Standard***	***CCME Standard/Guideline***	***Contaminant of Concern in SLRA***
PHC: F1	600	660	320	Yes
PHC: F2	5700	1500	260	Yes
PHC: F3	2000	2,500	2,500	No
PHC: F4	30	6,000	6,000	No
Benzene	1.9	25	0.28	Yes
Toluene	13	150	660	No
Ethylbenzene	14	1,000	430	No
Xylenes	88	210	460	No
Groundwater (µg/L)	***Max Value***	***MOE Standard***	***CCME Standard/Guideline***	***Contaminant of Concern in SLRA***
PHC: F1	600	No value	No Value	Yes
PHC: F2	5700	No Value	No Value	Yes
PHC: F3	2000	No Value	No Value	Yes
PHC: F4	30	No Value	No Value	Yes
Benzene	8,000	12,000	No Value	No
Toluene	6,100	37,000	No Value	No
Ethylbenzene	<50	50,000	No Value	No
Xylenes	4,200	35,000	No Value	No

COCs for inclusion in human health and ecological SLRA are identified based on a concentration detected in any soil or groundwater sample that exceeds the applicable CCME guidelines/standards or MOE standards or detections of chemicals for which no standards or guidelines are available (e.g., PHC in non-potable groundwater). For non-potable groundwater the applicable guidelines/standards are those of MOE (2004). For soil PHCs the applicable standards/guidelines are those of CCME

(2008a) and MOE (2004), recognizing that MOE (2004) standards for soil PHCs will most likely be updated to reflect the CCME (2008a) values. For soil BTEX, the applicable guidelines are those of MOE (2004) and CCME (1999). CCME soil BTEX guidelines are the most stringent of those developed for non-potable groundwater conditions. For benzene, the CCME (1999) guidelines for 10^{-6} risk are used.

Based on Table 3.3 screening, the following contaminants of concern (COCs) are identified for soil and groundwater for further evaluation in SLRA of the 16 Tauvette St. site:

- **Soil COCs:** PHC: F1 and F2 and benzene
- **Groundwater COCs:** PHC: F1, F2, F3 and F4.

4 SCREENING LEVEL HUMAN HEALTH RISK ASSESSMENT

4.1 Approach

SLRA for human health was completed using the following approach:

1. Screen maximum soil and groundwater concentrations of COCs identified in Section 3.9 against CCME Tier 1 and MOE standard/guideline components protective of human health to identify COCs retained in the human health SLRA.

2. For any soil PHCs retained for inclusion in the human health SLRA, use the CCME (2003) PHC_CWS Tier 2 spreadsheet model with site-specific information to quantify human exposures, risks and acceptable soil quality criteria.

3. For any soil BTEX parameters retained for inclusion in the human health SLRA, use the Health Canada (2008a) Preliminary Quantitative Risk Assessment spreadsheet model to quantify human exposure and health risks.

This approach generally follows available provincial (MOE, 2005) and federal (Health Canada, 2007a) guidance on completion of human health SLRA.

The PHC_CWS spreadsheet model is an Excel spreadsheet developed by CCME and recently released in March, 2008 as part of CCME updating of the Canada-Wide Standards for Petroleum Hydrocarbons in Soil. The 2008 PHC CWS update package includes the new PHC guidelines (CCME, 2008a), the scientific rationale supporting technical document (CCME, 2008b), user guidance document (2008c), and the PHC-CWS spreadsheet model.

The PHC_CWS spreadsheet model provides detailed descriptions of several analytical fate and transport models used to develop CCME PHC standards as well as CCME endorsed exposure scenarios, critical receptor characteristics and human and ecological toxicological data for PHC fractions. The fate and transport models include the Johnson and Ettinger (1991) model for assessing vapour intrusion to buildings and the Domenico and Robbins (1985) groundwater flow model for assessing groundwater impact to surface water and fresh water aquatic life.

The PQRA (Preliminary Quantitative Risk Assessment) Model is an Excel spreadsheet developed by Health Canada to assess hazards and risk posed by federal contaminated sites in Canada. The PQRA Model is described in Health Canada (2008a) and is part of a series of guidance documents prepared by Health Canada (2007a; 2007b; 2008a; 2008b) to ensure consistency in human health risk assessment at federal contaminated sites under Health Canada jurisdiction in Canada.

The PQRA Model includes sets of mathematic equations to estimate fate and transport of COCs in various environmental media, standardized human receptors and exposure characteristics and Health Canada approved toxicological reference values (TRVs) for use in preliminary quantitative risk assessment.

4.2 Screening of COCs for Inclusion in Human Health SLRA

4.2.1 Soil COCs

Table 4.1 summarizes the screening of maximum PHC and BTEX soil concentrations for COCs identified in Section 3.9 against CCME Tier 1 components for PHC and CCME and MOE soil quality components for BTEX. In all instances human health components are for fine-grained surface soil under a commercial land use and non-potable groundwater setting. For benzene, the CCME component is based on incremental risks of 10^{-5} and the MOE component is based on meeting an assumed background indoor air concentration for benzene. Table 4.1 identifies the governing exposure pathways for each component and whether the COC is retained for further consideration in the human health SLRA.

Table 4.1 Screening of Soil COC Concentrations (µg/g) for Human Health SLRA

Soil COC	*Max Value*	*MOE Component*	*CCME Component*	*Governing Exposure Pathway*	*Retained in SLRA*
PHC: F1	600	4,600	4,600	Vapour Intrusion – Slab-on-Grade Bldg	No
PHC: F2	5700	10,000	10,000	Direct Contact	No
Benzene	1.9	33.0	2.8	Vapour Intrusion – Slab-on-Grade Bldg	No

Incremental health risks of 10^{-5} are selected as appropriate target risk levels based on Health Canada (2007a – Appendix C) recommendation that 1×10^{-5} is an acceptable target level that represents essentially negligible cancer risk for use in human health risk assessment (HHRA) and management of federal contaminated sites. Health Canada has deemed cancer risks of 1×10^{-6} to 1×10^{-5} as acceptable in setting Canadian Drinking Water Guidelines and risk levels of 1×10^{-5} have been considered essentially negligible in risk assessments of high profile contaminated sites like the Sydney Tar Ponds. U.S. EPA also considers risk levels of 1×10^{-6} to 1×10^{-5} suitable for HHRA of contaminated sites. It should be noted that MOE (2005) considers 1×10^{-6} as the acceptable target level for cancer risks in human health risk assessment of contaminated sites in Ontario.

COCs are retained if the maximum COC soil concentration exceeds CCME or MOE human health component values. Based on the screening outlined in Table 4.1, no PHCs or BTEX parameters are retained for more detailed analysis of human health effects in the SLRA.

4.2.2 Groundwater COCs

Groundwater PHCs are identified in Section 3.9 as COCs for inclusion in the human health SLRA based on the fact that there are no MOE or CCME human health components for non-potable groundwater. Lacking such human health components the following rationale is provided to support screening of groundwater COCs for inclusion or exclusion in more detailed quantitative analysis of human health risks.

- There is no direct human contact with contaminated groundwater, either via ingestion or dermal exposure as the groundwater is not used as a source of drinking water and the main area of contaminated groundwater is below depths of 1.0 to 2.0 m beneath a paved parking lot.

- Indirect contact with contaminated groundwater via vapour intrusion to indoor air in the Header House building is not a significant pathway because the concentrations of volatile COCs in both soil and groundwater below the northern 10% of the Header House are not high enough to create indoor air quality impacts. For example, the soil quality data from BH-16 which is within 2 m of the Header House shows non detects (<20 µg/g) for PHC: F1, 300 µg/g for PHC: F2 and non-detect (<0.03 µg/g) for benzene. As these soil COC concentrations are orders of magnitude less than CCME components intended to protect against indoor air quality impacts (e.g., 4800 µg/g for PHC:F1, 23,000 µg/g for PHC: F2 and 2.8 µg/g for benzene), and CCME assumes that groundwater concentrations will be in equilibrium with soil concentrations, it is safe to assume that volatile COCs in groundwater (e.g., benzene, PHC:F1 and F2) are not a threat to indoor air quality. CCME (2008b) do not consider PHC: F3 and F4 compounds to be volatile enough to create indoor air quality issues.

- Furthermore, the maximum detected groundwater concentrations for volatile COCs closest to the building (i.e., at MW1) are also orders of magnitude less than the groundwater concentrations that would be calculated assuming simple equilibrium partitioning with the CCME components that are protective of indoor air quality. Also there are no detections of volatile COCs in well MW31 located below the northern third of the Header House. These data further support the conclusion that groundwater concentrations below the Header House will not adversely affect indoor air quality.

- Indirect contact with contaminated groundwater via partitioning of contaminated groundwater to soil vapour and direct soil vapour migration to outdoor air in the parking lot is not a significant pathway due to the presence of the paved parking lot surface and the lack of potential for accumulation of vapours in outdoor space.

- Indirect contact with contaminated groundwater via migration of contaminated groundwater to storm sewers, partitioning of volatile organic compounds in storm sewer water to catch basin air and vapour migration from catch basins to outdoor air is a possible exposure pathway as evidenced by historical observations during field work and pedestrian complaints to the NCC. However, the lack of detection of PHC and BTEX in catch basin water as reported in Section 3.8 of this report, and the lack of potential for accumulation of vapours in outdoor space, suggest that the intermittent human exposure to contaminated groundwater via this inhalation pathway is negligible and not a health concern.

Based on the above rationale, there are no groundwater COCs retained for more detailed quantitative analysis of human health risks in SLRA.

4.3 Summary of Results

Screening of soil and groundwater concentrations outlined above in Sections 4.2.1 and 4.2.2 shows that maximum detected COC concentrations do not exceed SLRA human health screening criteria and hence there are no COCs that need to be carried forward in the human health SLRA.

Inherent in the use of screening criteria based on CCME or MOE components intended to protect human health is the acceptance of the exposure scenarios on which the components are developed. The human health components developed based on vapour intrusion and direct soil contact exposure scenarios for non-potable commercial land use are based on CCME and MOE approved receptor and exposure scenarios that are described in CCME (2008b) and MOE (1996). For PHC COCs the critical receptor is a toddler that attends the site daily; for carcinogenic COCs (e.g., benzene) the critical receptor is an adult worker.

While these commercial land use exposure scenarios are appropriate for the 16 Tauvette St. site, they do not consider less common exposure scenarios that may create human exposure and health risk. These less common exposure scenarios include future excavation remediation of the remnant soil contamination and occasional servicing or repair of the shallow water main and storm sewer lines that cross the area of identified COC contamination outlined in Figure 3.1.

Health risks posed by these less common exposure scenarios are not expected to exceed target levels considered safe by Health Canada (e.g., Hazard Quotients and Incremental Lifetime Cancer Risks) due to limited exposure duration and frequency. These potential health risks are best managed by adoption of industry standard health and safety plans and procedures intended to limit work exposure (use of personal protective equipment, monitoring of air quality, etc) and attendant health risks.

5 SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT

5.1 Approach

SLRA for ecological health was completed using the following approach:

1. Screen maximum soil and groundwater concentrations of COCs identified in Section 3.9 against the most stringent CCME Tier 1 and MOE standard/guideline components protective of ecological health to identify COCs retained in the ecological SLRA.

2. For PHCs retained for inclusion in the ecological SLRA, use the CCME (2003) PHC_CWS Tier 2 spreadsheet model with site-specific information to quantify ecological exposures, risks and acceptable soil quality criteria.

3. For any BTEX parameters retained for inclusion in the ecological SLRA, use the CCME (1999) and Oak Ridge National Laboratory toxicological benchmarks for further screening of contaminants for effects on soil/litter invertebrates and heterotrophic processes (Efroymson et al., 1997a), terrestrial plants (Efroymson et al., 1997b) and wildlife (Sample et al., 1996)..

This approach generally follows available provincial (MOE, 2005) and federal (CCME, 1996) guidance on completion of ecological SLRA.

5.2 Screening of COCs for Inclusion in Ecological SLRA

5.2.1 Soil COCs

Table 5.1 summarizes the screening of maximum concentrations of soil COCs identified in Section 3.9 against the most stringent of CCME Tier 1 ecological components for PHC and CCME and MOE ecological components for BTEX. In all instances ecological components are for fine-grained surface soil under a commercial land use setting. Table 5.1 identifies the governing exposure pathways for each component and whether the COC is retained for further consideration in the ecological SLRA.

Table 5.1 Screening of Soil COC Concentrations (µg/g) for Ecological SLRA

Soil COC	*Max Value*	*MOE Component*	*CCME Component*	*Governing Exposure Pathway*	*Retained in SLRA*
PHC: F1	600	660	320	Eco Soil Contact	Yes
PHC: F2	5700	1500	260	Eco Soil Contact	Yes
Benzene	1.9	25	310	MOE- Ecotoxicity; CCME-Eco Soil Contact	No

COCs are retained if the maximum COC soil concentration exceed either of the listed CCME or MOE ecological health component values. Based on the screening outlined in Table 5.1 PHC: F1 and F2 in soil are retained for further consideration in the ecological SLRA. PHC: F1 and F2 are retained based on the ecological receptor direct contact with contaminated soil.

As noted in Section 3.4, CCME ecological health components for PHC: F1 and F2 listed in Table 5.1 are more current and applicable than those of MOE.

5.2.2 Groundwater COCs

Groundwater PHCs are identified in Section 3.9 as COCs for inclusion in the ecological SLRA based on the fact that there are no MOE or CCME ecological components for PHC in non-potable groundwater. Lacking such ecological components, the following rationale is provided to support screening of groundwater COCs for inclusion or exclusion in more detailed quantitative analysis of ecological health risks.

- There is no direct contact of ecological receptors (i.e., plants, litter invertebrates, wildlife) with contaminated groundwater, either via ingestion or immersion exposure as the area of contaminated groundwater is below depths of 1.0 to 2.0 m beneath a paved parking lot.

- Given the hydrogeologic and hydrologic properties of the site (low permeability clay-rich soils with low hydraulic gradient, surface water 200 m from site), the potential for groundwater migration through native soils and loading of COCs to surface water and adversely affecting freshwater aquatic life is negligible. This is evident by examination of the CCME (2008a) ecological soil components intended to protect against generic surface water assumed to be located 10 m from the identified COC plume. These CCME components are greater than 30,000 µg/g or PHC fraction solubility, implying PHC migration via groundwater flow in similar hydrogeologic settings is not likely to be greater than 10 to 20 m from the PHC source. This inference is confirmed by the delineation of the PHC contaminated area as shown in Figure 3.1.

- Although migration via the 0.6 m diameter CSP storm sewer and associated sewer granular bedding backfill is a possible migration pathway, test pit excavation and inspection of the bedding backfill and sampling and testing of storm water shows that this is not a PHC contaminant migration pathway at the site.

Based on the above rationale, there are no groundwater COCs retained for more detailed quantitative analysis of ecological health risks in SLRA.

5.3 Semi-Quantitative Ecological SLRA

Based on the screening of COCs completed in Section 5.2, PHC: F1 and F2 are carried forward in more detailed ecological risk assessment focussing on the exposure pathway of ecological direct soil contact. This semi-quantitative assessment is undertaken for the very conservative assumption that the paved parking lot is removed and for the existing site conditions with the paved parking lot present.

5.3.1 Valued Ecological Components

Valued ecosystem components (VECs) are parts of the ecosystem that are representative of site species or features judged to be important to protect, and for which assessment is possible. These VECs are mostly easily identified through inventory of the terrestrial environment of the site.

The site, although of commercial use, is located within a greenbelt of former vacant agricultural land,

comprised mainly of open grassed lands with various native trees and shrubs. The families of trees and shrubs identified in the area of the site included: spruce, maple, ash and pine. Wildlife present in the vicinity of the site likely includes small terrestrial mammals and avian species. As discussed in Section 5.2.2 aquatic organisms are not VECs for the site.

The following VECs are identified for screening level semi-quantitative ecological risk assessment of the 16 Tauvette St. site.

- Terrestrial Plants
- Soil Invertebrates, e.g., Earthworms
- Soil Microbes and Microbial Processes
- Terrestrial Mammals, e.g., Mice, Rabbits
- Birds

5.3.2 Exposure Assessment

Exposure point concentrations (EPCs) are the concentrations of COCs in environmental media that receptors may contact. They can be based on direct measurements, statistical treatment of measurements or estimated using various mathematical models. For this ecological SLRA, the EPCs are derived only for all soil data, which includes the clean surficial soil (0 to 1.0 m depth) and deeper soil to depths of about 3.0 m. Since most of the identified soil COC contamination exists below depths of 1.0 m, use of the EPCs for all soil will result in overestimation of ecological receptor exposure and risk.

EPCs for soil are calculated based on the 95th percent upper confidence limits on the mean (UCLM) soil concentrations of COCs. This EPC method for soil is recommended by US EPA (1989) and Health Canada (2004a). The 95th percent UCLM values were calculated assuming a normal distribution of data with all data included and non-detects represented at one half of the analytical method detection limit as listed in Tables C.1 and C.2. Table 5.2 summarizes soil EPCs for soil COCs identified in Section 5.2.1.

Table 5.2 Summary of Soil Exposure Point Concentrations for Ecological COCs

Soil COC	***95 % UCLM Concentration (µg/g)***
PHC; F1	102
PHC: F2	907

Exposure assessment using EPCs provides an average site-wide assessment of potential for impact for primarily foraging ecological receptors (i.e., birds, mammals). Use of these EPCs for non-foraging receptors (i.e., terrestrial plants, invertebrates and microbial processes) will both underestimate and overestimate the amount of local adverse impact that they are exposed to based on actual local soil conditions. However, this underestimation of adverse effect is offset by the recognition that ERA is intended to provide protection for populations not for individual plants, invertebrates or micro-organisms.

5.3.3 Toxicity Assessment

Ecotoxicity benchmarks for soil COCs were assembled from recent reviews completed by CCME (2008b). These benchmarks as soil concentrations in µg/g for terrestrial plants and soil invertebrates are given in Table 5.3. Benchmark data for plants and soil invertebrates in Table 5.3 are 50th percentile values for ranked 25% effects levels.

Although benchmarks are generated for combined plant (e.g., lettuce, radish, barley) and soil invertebrates (e.g., earthworms), PHC: F1 and F2 threshold effects levels for earthworms are typically lower than for plants by factors of 2 to 3. For example, CCME (2008b) present draft threshold effects concentrations based on 50th percentile of effects that are 170 µg/g and 300 µg/g for soil invertebrates for PHC:F1 and F2, respectively and 330 µg/g and 760 µg/g for plants for PHC: F1 and F2, respectively.

Table 5.3 Summary of Ecotoxicological Benchmarks for COCs

COC	*95th % UCLM*	*Microbial Processes*	*Terrestrial Plants*	*Soil Invertebrates*	*Mammals and Birds*
PHC:F1	102	NA	320	320	Not considered at risk
PHC:F2	907	NA	260	260	Not considered at risk
NA = None available					

CCME (2008b) has judged that terrestrial vertebrate animals such as mammals and birds are generally not at risk from exposure to PHCs in soil and groundwater, due to the fact that they readily metabolize PHCs and PHCs do not tend to accumulate in plant or lower animal tissues that may be food source for them.

Although CCME do not cite PHC ecotoxicological benchmarks for soil microbes and microbial processes, the fact that PHCs are readily biodegraded by soil microbes suggests that soil microbes and microbial processes are not adversely affected by presence of PHCs.

5.3.4 Risk Characterization

Hazards and risks to the identified VECs and ecological receptors of terrestrial plants, soil invertebrates, terrestrial mammals and birds are assessed for the current vacant commercial land use by integrating information from the toxicity assessment with the exposure assessment.

The results show that without the presence of the paved parking lot to limit ecological exposure, there may be some minor adverse impact to terrestrial plants and soil invertebrates in the immediate vicinity of the former UST. However, this potential for adverse effect would be relatively minor based on the fact that the majority of contamination is below depths of 1.0 m and that the sensitive types of plants subject to ecotoxicity testing (e.g., lettuce, radishes, barley) are not present at the site. Terrestrial mammals and birds would not be at risk of adverse effects.

With the presence of the paved parking lot the relatively minor potential adverse health effects for plants and soil invertebrates identified without the paved parking lot surface would be negligible as

these VECs are assumed to not be present below the parking lot.

5.4 Summary of Results

The ecological SLRA for the 16 Tauvette St. site indicates that ecological receptors of terrestrial plants, soil invertebrates, soil microbes and microbial processes, terrestrial mammals and birds, under current land use and site conditions are not be subject to unacceptable health hazards and risks from site contaminants.

Removal of the paved parking lot from the site has the potential to increase risk to plants and soil invertebrates, but only in the immediate area of the former UST, where minor soil contamination is found above depths of 1.0 m, and likely only for short period of time until biodegradation reduces the PHC concentrations in shallow soil to below ecotoxic levels.

7 CONCLUSIONS AND RISK MANAGEMENT RECOMMENDATIONS

The SLRA of the 16 Tauvette St. site supports the following conclusions and risk management recommendations.

- Contaminants that exceed applicable CCME and MOE guidelines and standards for commercial land use, fine-textured soils and non-potable groundwater conditions include PHC and BTEX parameters in soil and groundwater. The identified PHC and BTEX contamination is related to releases from the former UST. Soil and groundwater contamination covers a maximum area of approximately 780 m^2 at depths of about 1.0 to 4.0 m below a paved parking lot. The maximum volume of contaminated soil is about 2400 m^3 with a small volume of contaminated soil occurring below the north part of the Header House.

- Supplementary site investigations including test pit inspection and sampling of storm sewers show that the extent of PHC and BTEX contamination at the site has been adequately delineated and is contained on site. The bedding backfill of the storm sewer and the storm sewer that transects the area of contamination does not appear to be a pathway for off-site migration of PHC and BTEX.

- Contaminants of concern in the SLRA are PHC: F1, PHC: F2 and benzene in soil and PHC: F1 to F4 in groundwater. COCs in groundwater are identified based on the lack of MOE or CCME standards or guidelines for PHC in non-potable groundwater.

- Results of the SLRA show that the PHC and BTEX contamination related to the former UST at 16 Tauvette St. do not pose any adverse health effects to human or ecological receptors for current site conditions and land uses.

- [redacted]

- [redacted].

- Given the results of the SLRA and site and contaminant conditions, the recommended risk management approach for this site is to undertake monitored natural attenuation, with re-evaluation of monitoring results at completion of the proposed five year groundwater and storm sewer water monitoring program.

8 CLOSURE

This report has been prepared for the exclusive use of the National Capital Commission (NCC) using a methodology for conducting environmental site assessment and Screening Level Risk Assessment (SLRA) that is acceptable within the profession. Data obtained from sampling investigations represent the conditions about a limited area surrounding the sampling location at the time of sampling and as such can be expected to be variable with respect to location and time.

Intera Engineering Ltd. (INTERA) has exercised professional judgment in collecting and analyzing the information and in formulating recommendations based on the results of the study. The mandate at INTERA is to perform the given tasks within guidelines prescribed by the client and with the quality and due diligence expected within the profession. No other warranty or representation expressed or implied, as to the accuracy of the information or recommendations is included or intended in this report.

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Respectfully submitted,

Intera Engineering Ltd.

Kenneth G. Raven, M.Sc., P.Eng., P.Geo.

Principal

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APPENDIX A

Borehole Stratigraphic and Instrumentation Logs

(BH-1 to BH-6, BH-10, BH12 to BH-34)

Test Pit Tables

(TP1, TP3 to TP6, TP8, TP9)

BOREHOLE STRATIGRAPHIC AND INSTRUMENTATION LOG

Borehole Number: BH1/MW1

MOE Well ID: A029523

Project Number: 05-215-4

Date Completed: June 14, 2005

Client: NCC

Supervisor: NKP

Site Location: 16 Tauvette St., Ottawa, Ontario

Ground Surface Elevation: 99.97 mASD

Coordinates: MTM NAD83, 377154E, 5032574N

Drilling Method: Geo-Probe Vibratory Core

DEPTH BGS (ft / m)	SAMPLES	LAB SAMPLE	BLOW COUNT	CGI (ppm)	PID (ppm)	LOG	STRATIGRAPHIC DESCRIPTION	INSTALLATION
							GROUND SURFACE	MW1
0 – 2				53			**FILL** Grey gravel to grey silty clay. Hydrocarbon odour. Moist.	Asphalt; Bentonite seal
2 – 5		X		490			**CLAY** Grey clay, with slight sheen. Hydrocarbon odour. Moist.	83 mm diameter borehole; 38 mm diameter PVC Riser
5 – 7				117				
7 – 8							Slight hydrocarbon odour. Wet at 3.04 mBGS.	38 mm diameter PVC Screen; Silica well sand
8 – 10				116				
10 – 11				32				
11 – 13				105				
13 – 15				0			Borehole terminated at 4.87 m BGS.	Depth of MW1 = 4.57 mBGS.
15 – 16							BOREHOLE TERMINATED	

BOREHOLE STRATIGRAPHIC AND INSTRUMENTATION LOG

Borehole Number: BH2

MOE Well ID: N/A

Project Number: 05-215-4

Date Completed: June 14, 2005

Client: NCC

Supervisor: NKP

Site Location: 16 Tauvette St., Ottawa, Ontario

Ground Surface Elevation: N/A

Coordinates: N/A

Drilling Method: Geo-Probe Vibratory Core

DEPTH BGS (ft / m)	SAMPLES	LAB SAMPLE	BLOW COUNT	CGI (ppm)	PID (ppm)	LOG	STRATIGRAPHIC DESCRIPTION	INSTALLATION
-1 / 0							GROUND SURFACE	No Well Installation
0 / 1							FILL Asphalt at surface underlain by brown gravel and sand. Hydrocarbon odour. Moist.	
2 / 3				800			CLAY Grey clay with traces of brown sand. Hydrocarbon odour and a sheen from 1.2 to 1.8 mBGS.	
4 / 5	1	X		2500				
6 / 7	2			1080				
8							Wet at 2.4 mBGS.	
9				900				
10	3							
11				300				
12							Slight hydrocarbon odour at 3.7 mBGS.	
13	4			40				
14								
15				2				

BOREHOLE STRATIGRAPHIC AND INSTRUMENTATION LOG

Borehole Number: BH2

MOE Well ID: N/A

Project Number: 05-215-4

Date Completed: June 14, 2005

Client: NCC

Supervisor: NKP

Site Location: 16 Tauvette St., Ottawa, Ontario

Ground Surface Elevation: N/A

Coordinates: N/A

Drilling Method: Geo-Probe Vibratory Core

DEPTH BGS	SAMPLES	LAB SAMPLE	BLOW COUNT	CGI (ppm)	PID (ppm)	LOG	STRATIGRAPHIC DESCRIPTION	INSTALLATION
16				210				
17	5							
18								
19							Borehole terminated at 6.09 mBGS.	
20	6						BOREHOLE TERMINATED	
21								
22								
23	7							
24								
25								
26	8							
27								
28								
29	9							
30								
31								

BOREHOLE STRATIGRAPHIC AND INSTRUMENTATION LOG

Borehole Number: BH3

MOE Well ID: N/A

Project Number: 05-215-4

Date Completed: June 14, 2005

Client: NCC

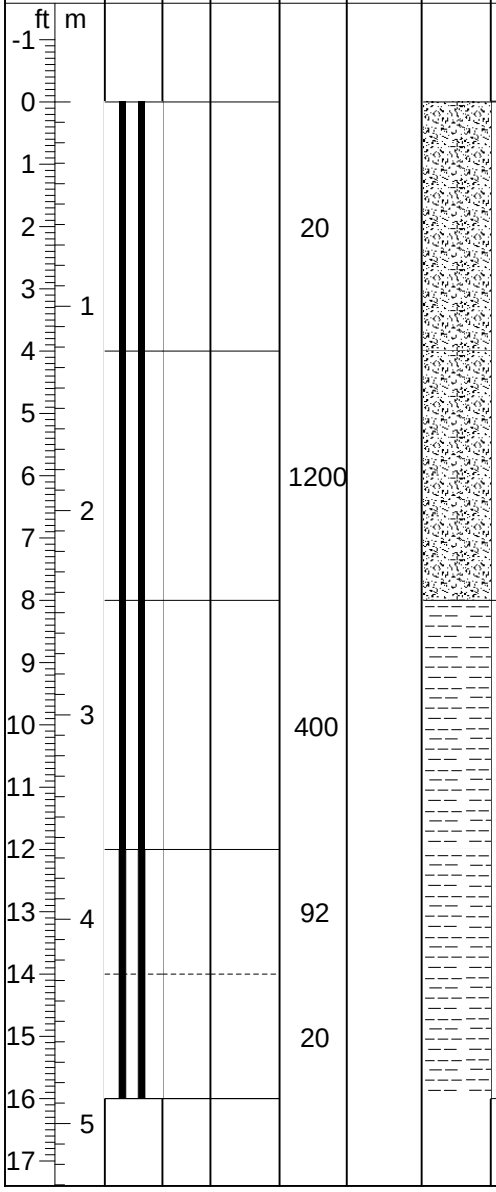
Supervisor: NKP

Site Location: 16 Tauvette St., Ottawa, Ontario

Ground Surface Elevation: N/A

Coordinates: N/A

Drilling Method: Geo-Probe Vibratory Core



STRATIGRAPHIC DESCRIPTION	INSTALLATION
GROUND SURFACE	No Well Installation
FILL Asphalt at surface, underlain by brown sand fill with rocks and pebbles. Hydrocarbon odour. Moist. Dark brown sand mixed with pebbles and grey clay.	
CLAY Grey clay. Hydrocarbon odour. Very Moist. Wet at 3.7 mBGS. Slight hydrocarbon odour. Borehole terminated at 4.87 mBGS.	
BOREHOLE TERMINATED	

BOREHOLE STRATIGRAPHIC AND INSTRUMENTATION LOG

Borehole Number: BH4

MOE Well ID: N/A

Project Number: 05-215-4

Date Completed: June 14, 2005

Client: NCC

Supervisor: NKP

Site Location: 16 Tauvette St., Ottawa, Ontario

Ground Surface Elevation: N/A

Coordinates: N/A

Drilling Method: Geo-Probe Vibratory Core

DEPTH BGS (ft / m)	SAMPLES	LAB SAMPLE	BLOW COUNT	CGI (ppm)	PID (ppm)	LOG	STRATIGRAPHIC DESCRIPTION	INSTALLATION
-1 /							GROUND SURFACE	No Well Installation
0 /							**FILL** Asphalt at surface underlain by brown sand and gravel fill.	
1 /								
2 /				2				
3 / 1								
4 /							Grey / brown clay with hydrocarbon odour at 1.2 mBGS.	
5 /				2				
6 /								
7 / 2				2				
8 /							**CLAY** Grey clay with minor pockets of dark brown sand at 3.0 mBGS. Very slight hydrocarbon odour.	
9 /				4				
10 / 3								
11 /				4				
12 /							No odours. Wet at 3.7 mBGS.	
13 / 4				2				
14 /								
15 /				0			Borehole terminated at 4.87 mBGS.	
16 /								
17 / 5							BOREHOLE TERMINATED	

BOREHOLE STRATIGRAPHIC AND INSTRUMENTATION LOG

Borehole Number: BH5

MOE Well ID: N/A

Project Number: 05-215-4

Date Completed: June 14, 2005

Client: NCC

Supervisor: NKP

Site Location: 16 Tauvette St., Ottawa, Ontario

Ground Surface Elevation: N/A

Coordinates: N/A

Drilling Method: Geo-Probe Vibratory Core

DEPTH BGS (ft / m)	SAMPLES	LAB SAMPLE	BLOW COUNT	CGI (ppm)	PID (ppm)	LOG	STRATIGRAPHIC DESCRIPTION	INSTALLATION
-1							GROUND SURFACE	No Well Installation
0							FILL Asphalt at surface underlain by gravel and brown sand. Slight hydrocarbon odour.	
2				4				
3 / 1								
4							CLAY Grey / brown clay with minor pockets of brown sand. No hydrocarbon odours.	
5				2				
6 / 2								
7				12				
8							Grey clay at 2.4 mBGS.	
9				10				
10 / 3								
11				8				
12							Wet at 3.4 mBGS.	
13 / 4				4				
14								
15				0			Borehole terminated at 4.87 mBGS.	
16 / 5							BOREHOLE TERMINATED	
17								

BOREHOLE STRATIGRAPHIC AND INSTRUMENTATION LOG

Borehole Number: BH6/MW6

MOE Well ID: A029523

Project Number: 05-215-4

Date Completed: June 14, 2005

Client: NCC

Supervisor: NKP

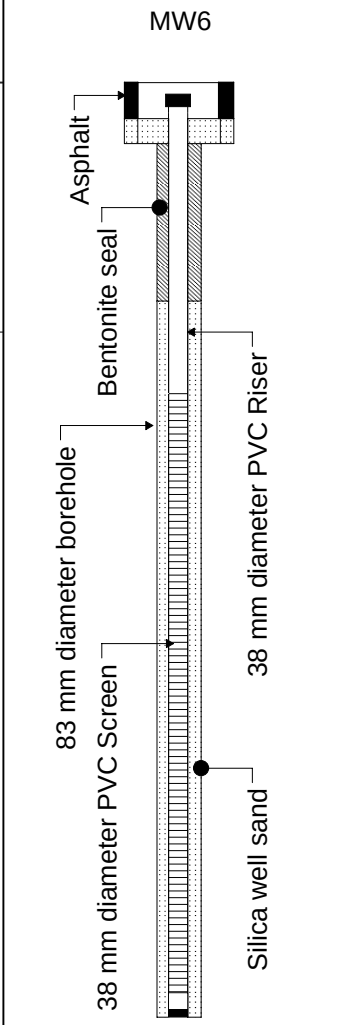
Site Location: 16 Tauvette St., Ottawa, Ontario

Ground Surface Elevation: 100.0 mASD

Coordinates: MTM NAD83, 377158E, 5032585N

Drilling Method: Geo-Probe Vibratory Core

DEPTH BGS (ft / m)	SAMPLES	LAB SAMPLE	BLOW COUNT	CGI (ppm)	PID (ppm)	LOG	STRATIGRAPHIC DESCRIPTION
							GROUND SURFACE
0 – 2 / 0 – 1				84			**FILL** Asphalt underlain by brown sand and gravel. Black staining at approximately 0.3 mBGS. Hydrocarbon odour.
3 / 1							Grey silty sand at 1.1 mBGS.
4 – 6 / 1 – 2		X		> 10000			**CLAY** Grey silty clay. Hydrocarbon odour.
7 – 9 / 2 – 3				3500			Grey clay. Very moist at 2.4 mBGS.
10 – 11 / 3				320			
12 / 4							Slight hydrocarbon odour. Wet at 3.7 mBGS.
13 – 14 / 4				20			
15 / 4 – 5				70			Borehole terminated at 4.87 mBGS.
16 / 5							BOREHOLE TERMINATED
17							



Depth of MW6 = 4.87 mBGS.

BOREHOLE STRATIGRAPHIC AND INSTRUMENTATION LOG

Borehole Number: BH10

MOE Well ID: N/A

Project Number: 05-215-4

Date Completed: June 14, 2005

Client: NCC

Supervisor: NKP

Site Location: 16 Tauvette St., Ottawa, Ontario

Ground Surface Elevation: N/A

Coordinates: N/A

Drilling Method: Geo-Probe Vibratory Core

DEPTH BGS (ft / m)	SAMPLES	LAB SAMPLE	BLOW COUNT	CGI (ppm)	PID (ppm)	LOG	STRATIGRAPHIC DESCRIPTION	INSTALLATION
-1							GROUND SURFACE	No Well Installation
0 – 3 / 1				10			FILL Asphalt at surface underlain by dark brown sand and gravel fill. No odour. Moist.	
4 – 5 / 1		X		12			CLAY Grey / brown clay. Hydrocarbon odour.	
6 – 7 / 2				92			Wet at 2.13 mBGS.	
8 – 9 / 2				22			Grey clay at 2.4 mBGS.	
10 – 11 / 3				17				
12 – 13 / 4				8				
14 – 15 / 4				0			Borehole terminated at 4.87 mBGS.	
16 – 17 / 5							BOREHOLE TERMINATED	

BOREHOLE STRATIGRAPHIC AND INSTRUMENTATION LOG

Borehole Number: BH12

MOE Well ID: N/A

Project Number: 05-215-24

Date Completed: June 6, 2006

Client: NCC

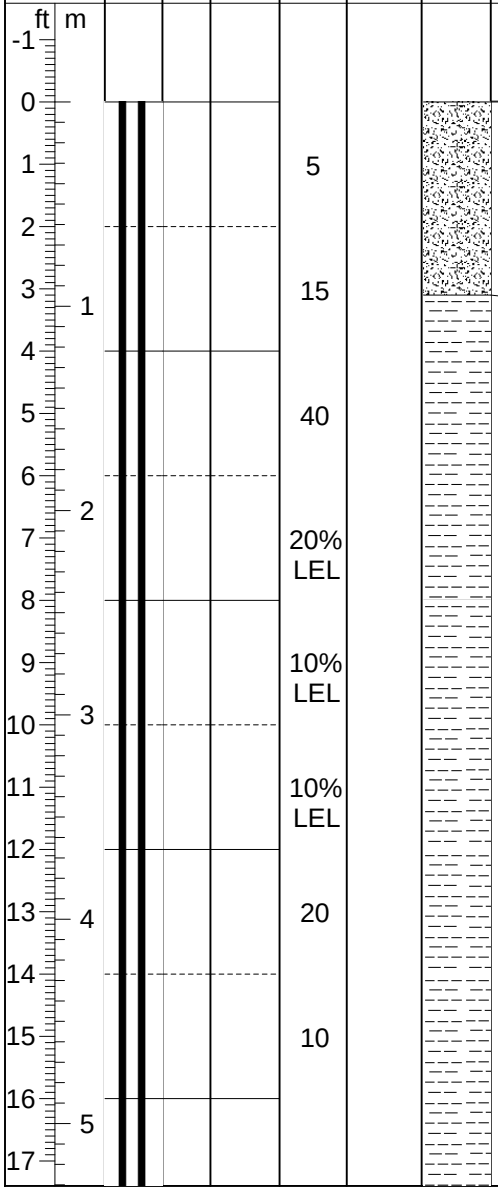
Supervisor: NKP

Site Location: 16 Tauvette St., Ottawa, Ontario

Ground Surface Elevation: N/A

Coordinates: N/A

Drilling Method: Geo-Probe Vibratory Core



STRATIGRAPHIC DESCRIPTION	CGI (ppm)	INSTALLATION
GROUND SURFACE		No Well Installation
FILL Brown sand with slight hydrocarbon odour. Wet at 0.8 mBGS.	5 15	
CLAY Grey / brown clay. Moist. Hydrocarbon odour.	40	
Grey clay at 2.4 mBGS.	20% LEL 10% LEL	
Wet at 3.6 mBGS. Slight hydrocarbon odour.	10% LEL	
No hydrocarbon odour at approximately 4.3 mBGS.	20 10	

BOREHOLE STRATIGRAPHIC AND INSTRUMENTATION LOG

Borehole Number: BH12

MOE Well ID: N/A

Project Number: 05-215-24

Date Completed: June 6, 2006

Client: NCC

Supervisor: NKP

Site Location: 16 Tauvette St., Ottawa, Ontario

Ground Surface Elevation: N/A

Coordinates: N/A

Drilling Method: Geo-Probe Vibratory Core

DEPTH BGS	SAMPLES	LAB SAMPLE	BLOW COUNT	CGI (ppm)	PID (ppm)	LOG	STRATIGRAPHIC DESCRIPTION	INSTALLATION
18								
19								
6 20								
21							Borehole terminated at 6.7 mBGS.	
22							BOREHOLE TERMINATED	
7 23								
24								
25								
26								
8 27								
28								
29								
9 30								
31								
32								
10 33								
34								
35								

BOREHOLE STRATIGRAPHIC AND INSTRUMENTATION LOG

Borehole Number: BH13

MOE Well ID: N/A

Project Number: 05-215-24

Date Completed: June 6, 2006

Client: NCC

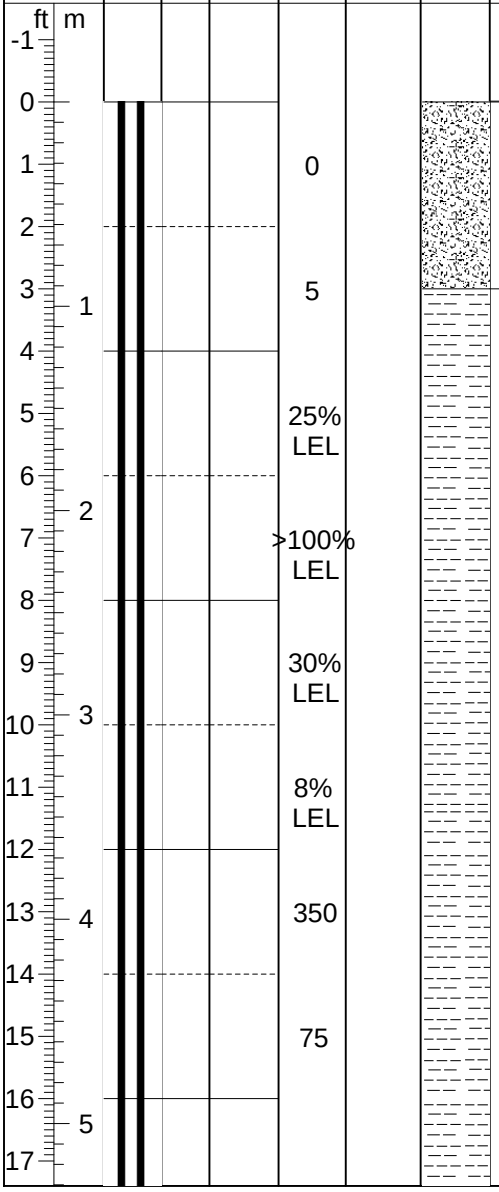
Supervisor: NKP

Site Location: 16 Tauvette St., Ottawa, Ontario

Ground Surface Elevation: N/A

Coordinates: N/A

Drilling Method: Geo-Probe Vibratory Core



DEPTH BGS (ft / m)	SAMPLES	LAB SAMPLE	BLOW COUNT	CGI (ppm)	PID (ppm)	LOG	STRATIGRAPHIC DESCRIPTION	INSTALLATION
							GROUND SURFACE	No Well Installation
0				0			**FILL** Asphalt at surface underlain by dark brown sand and gravel fill. No odour. Moist. Brown sand with no hydrocarbon odour. Very moist to wet.	
3 / 1				5			**CLAY** Grey clay. Moist. Hydrocarbon odour increasing with depth.	
5				25% LEL				
7 / 2				>100% LEL				
9				30% LEL				
10 / 3								
11				8% LEL			Layer of grey clay with minor dark purple staining from 3.4 to 3.7 mBGS. Hydrocarbon odour. Wet at 3.6 mBGS. Slight hydrocarbon odour.	
13 / 4				350				
15				75				
16 / 5							No hydrocarbon odour at approximately 4.8 mBGS.	
17								

BOREHOLE STRATIGRAPHIC AND INSTRUMENTATION LOG

Borehole Number: BH13

MOE Well ID: N/A

Project Number: 05-215-24

Date Completed: June 6, 2006

Client: NCC

Supervisor: NKP

Site Location: 16 Tauvette St., Ottawa, Ontario

Ground Surface Elevation: N/A

Coordinates: N/A

Drilling Method: Geo-Probe Vibratory Core

DEPTH BGS	SAMPLES	LAB SAMPLE	BLOW COUNT	CGI (ppm)	PID (ppm)	LOG	STRATIGRAPHIC DESCRIPTION	INSTALLATION
18								
19							Borehole terminated at 6.1 mBGS.	
6 20							BOREHOLE TERMINATED	
21								
22								
7 23								
24								
25								
8 26								
27								
28								
29								
9 30								
31								
32								
10 33								
34								
35								

BOREHOLE STRATIGRAPHIC AND INSTRUMENTATION LOG

Borehole Number: BH14

MOE Well ID: N/A

Project Number: 05-215-24

Date Completed: June 6, 2006

Client: NCC

Supervisor: NKP

Site Location: 16 Tauvette St., Ottawa, Ontario

Ground Surface Elevation: N/A

Coordinates: N/A

Drilling Method: Geo-Probe Vibratory Core

DEPTH BGS (ft / m)	SAMPLES	LAB SAMPLE	BLOW COUNT	CGI (ppm)	PID (ppm)	LOG	STRATIGRAPHIC DESCRIPTION	INSTALLATION
-1 /							GROUND SURFACE	No Well Installation
0 /							FILL Asphalt at surface underlain by dark brown sand and gravel fill. Moist.	
1 /				25			Brown sand with no hydrocarbon odour. Wet.	
2 /								
3 / 1				50			CLAY Grey clay. Moist. Hydrocarbon odour increasing with depth.	
4 /								
5 /				70% LEL				
6 /								
7 / 2				>100% LEL				
8 /							Grey clay. Very moist. Strong hydrocarbon odour.	
9 /				80% LEL				
10 / 3								
11 /				20% LEL				
12 /							Wet at 3.6 mBGS. No hydrocarbon odour.	
13 / 4				225				
14 /								
15 /				75				
16 /								
17 / 5								

BOREHOLE STRATIGRAPHIC AND INSTRUMENTATION LOG

Borehole Number: BH14

MOE Well ID: N/A

Project Number: 05-215-24

Date Completed: June 6, 2006

Client: NCC

Supervisor: NKP

Site Location: 16 Tauvette St., Ottawa, Ontario

Ground Surface Elevation: N/A

Coordinates: N/A

Drilling Method: Geo-Probe Vibratory Core

DEPTH BGS	SAMPLES	LAB SAMPLE	BLOW COUNT	CGI (ppm)	PID (ppm)	LOG	STRATIGRAPHIC DESCRIPTION	INSTALLATION
18								
19							Borehole terminated at 6.1 mBGS.	
20	6						BOREHOLE TERMINATED	
21								
22								
23	7							
24								
25								
26	8							
27								
28								
29								
30	9							
31								
32								
33	10							
34								
35								

BOREHOLE STRATIGRAPHIC AND INSTRUMENTATION LOG

Borehole Number: BH15

MOE Well ID: N/A

Project Number: 05-215-24

Date Completed: June 6, 2006

Client: NCC

Supervisor: NKP

Site Location: 16 Tauvette St., Ottawa, Ontario

Ground Surface Elevation: N/A

Coordinates: N/A

Drilling Method: Geo-Probe Vibratory Core

DEPTH BGS (ft)	DEPTH BGS (m)	SAMPLES	LAB SAMPLE	BLOW COUNT	CGI (ppm)	PID (ppm)	LOG	STRATIGRAPHIC DESCRIPTION	INSTALLATION
-1								GROUND SURFACE	No Well Installation
0								**FILL** Asphalt at surface underlain by grey sand and gravel fill. Moist.	
1					10			Orangish brown sand with with minor iron staining. Wet. No hydrocarbon odour.	
2									
3	1				10			**CLAY** Brown clay, moist. No hydrocarbon odour.	
4									
5			X		25			Grey clay, moist at 1.2 mBGS.	
6									
7	2				10				
8								Grey clay. Wet at 3.0 mBGS.	
9					10				
10	3								
11					10				
12									
13	4				0				
14									
15					0				
16									
17	5								

BOREHOLE STRATIGRAPHIC AND INSTRUMENTATION LOG

Borehole Number: BH15

MOE Well ID: N/A

Project Number: 05-215-24

Date Completed: June 6, 2006

Client: NCC

Supervisor: NKP

Site Location: 16 Tauvette St., Ottawa, Ontario

Ground Surface Elevation: N/A

Coordinates: N/A

Drilling Method: Geo-Probe Vibratory Core

DEPTH BGS	SAMPLES	LAB SAMPLE	BLOW COUNT	CGI (ppm)	PID (ppm)	LOG	STRATIGRAPHIC DESCRIPTION	INSTALLATION
18								
19							Borehole terminated at 6.1 mBGS.	
20	6						BOREHOLE TERMINATED	
21								
22								
23	7							
24								
25								
26	8							
27								
28								
29								
30	9							
31								
32								
33	10							
34								
35								

BOREHOLE STRATIGRAPHIC AND INSTRUMENTATION LOG

Borehole Number: BH16

MOE Well ID: N/A

Project Number: 05-215-24

Date Completed: June 6, 2006

Client: NCC

Supervisor: NKP

Site Location: 16 Tauvette St., Ottawa, Ontario

Ground Surface Elevation: N/A

Coordinates: N/A

Drilling Method: Geo-Probe Vibratory Core

DEPTH BGS (ft / m)	SAMPLES	LAB SAMPLE	BLOW COUNT	CGI (ppm)	PID (ppm)	LOG	STRATIGRAPHIC DESCRIPTION	INSTALLATION
							GROUND SURFACE	No Well Installation
0							FILL Asphalt at surface underlain by dark brown sand and gravel fill with organics. No odour. Moist.	
1				30			Brown sand. Wet. No hydrocarbon odour.	
2								
3 / 1				150				
4							CLAY Grey clay, moist. Slight hydrocarbon odour.	
5		X		5% LEL			Grey clay with strong hydrocarbon odour at 1.2 mBGS.	
6 / 2								
7				5% LEL				
8								
9		X		25			Grey clay with no hydrocarbon odour at 2.7 mBGS. Very moist.	
10 / 3								
11				5				
12							Wet at 3.7 mBGS.	
13 / 4				5				
14								
15				0				
16 / 5								
17								

BOREHOLE STRATIGRAPHIC AND INSTRUMENTATION LOG

Borehole Number: BH16

MOE Well ID: N/A

Project Number: 05-215-24

Date Completed: June 6, 2006

Client: NCC

Supervisor: NKP

Site Location: 16 Tauvette St., Ottawa, Ontario

Ground Surface Elevation: N/A

Coordinates: N/A

Drilling Method: Geo-Probe Vibratory Core

DEPTH BGS	SAMPLES	LAB SAMPLE	BLOW COUNT	CGI (ppm)	PID (ppm)	LOG	STRATIGRAPHIC DESCRIPTION	INSTALLATION
18								
19							Borehole terminated at 6.1 mBGS.	
20	6						BOREHOLE TERMINATED	
21								
22								
23	7							
24								
25								
26	8							
27								
28								
29								
30	9							
31								
32								
33	10							
34								
35								

BOREHOLE STRATIGRAPHIC AND INSTRUMENTATION LOG

Borehole Number: BH17

MOE Well ID: N/A

Project Number: 05-215-24

Date Completed: June 6, 2006

Client: NCC

Supervisor: NKP

Site Location: 16 Tauvette St., Ottawa, Ontario

Ground Surface Elevation: N/A

Coordinates: N/A

Drilling Method: Geo-Probe Vibratory Core

DEPTH BGS (ft / m)	SAMPLES	LAB SAMPLE	BLOW COUNT	CGI (ppm)	PID (ppm)	LOG	STRATIGRAPHIC DESCRIPTION	INSTALLATION
-1 /							GROUND SURFACE	No Well Installation
0 /							FILL Asphalt at surface underlain by dark brown sand and gravel fill with organics. No odour. Wet.	
1 /				75			Grey sand with clay.	
2 /							CLAY Grey clay, moist. Slight hydrocarbon odour.	
3 / 1				5% LEL				
4 /							Grey clay with very strong hydrocarbon odour at 1.2 mBGS.	
5 /				8% LEL				
6 / 2								
7 /				>100% LEL				
8 /							Grey clay with slight hydrocarbon odour at 2.4 mBGS. Very moist.	
9 /				300				
10 / 3								
11 /		X		75				
12 /							Grey clay with no hydrocarbon odour at 3.7 mBGS. Wet.	
13 / 4				5				
14 /								
15 /				0				
16 / 5								
17 /								

BOREHOLE STRATIGRAPHIC AND INSTRUMENTATION LOG

Borehole Number: BH17

MOE Well ID: N/A

Project Number: 05-215-24

Date Completed: June 6, 2006

Client: NCC

Supervisor: NKP

Site Location: 16 Tauvette St., Ottawa, Ontario

Ground Surface Elevation: N/A

Coordinates: N/A

Drilling Method: Geo-Probe Vibratory Core

DEPTH BGS	SAMPLES	LAB SAMPLE	BLOW COUNT	CGI (ppm)	PID (ppm)	LOG	STRATIGRAPHIC DESCRIPTION	INSTALLATION
18								
19							Borehole terminated at 6.1 mBGS.	
20	6						BOREHOLE TERMINATED	
21								
22								
23	7							
24								
25								
26	8							
27								
28								
29								
30	9							
31								
32								
33	10							
34								
35								

BOREHOLE STRATIGRAPHIC AND INSTRUMENTATION LOG

Borehole Number: BH18/MW18

MOE Well ID:

Project Number: 05-215-24

Date Completed: June 6, 2006

Client: NCC

Supervisor: NKP

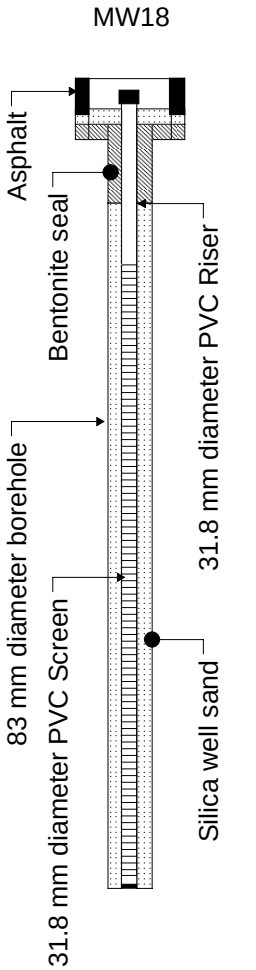
Site Location: 16 Tauvette St., Ottawa, Ontario

Ground Surface Elevation: 99.96 mASD

Coordinates: MTM NAD83, 377142E, 5032573N

Drilling Method: Geo-Probe Vibratory Core

DEPTH BGS (ft / m)	SAMPLES	LAB SAMPLE	BLOW COUNT	CGI (ppm)	PID (ppm)	LOG	STRATIGRAPHIC DESCRIPTION
-1 / 0							GROUND SURFACE
0 / 1				30			**FILL** Asphalt at surface underlain by dark brown sand and gravel fill. Slight hydrocarbon odour. Wet.
2 / 3	1			25			Brown sand mixed with clay at 0.9 mBGS.
4 / 5		X		25			**CLAY** Grey clay. Moist, no odour.
6 / 7	2			10			
8 / 9				0			Grey clay. Very moist at 2.4 mBGS.
10 / 11	3			0			
12 / 13	4			0			Wet at 3.7 mBGS.
14 / 15				0			Borehole terminated at 4.87 mBGS.
16 / 17	5						BOREHOLE TERMINATED



Depth of MW18 = 4.0 mBGS.

BOREHOLE STRATIGRAPHIC AND INSTRUMENTATION LOG

Borehole Number: BH19/MW19

MOE Well ID:

Project Number: 05-215-24

Date Completed: June 6, 2006

Client: NCC

Supervisor: NKP

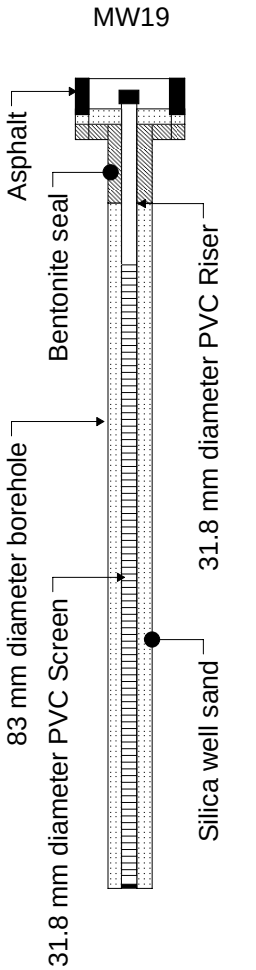
Site Location: 16 Tauvette St., Ottawa, Ontario

Ground Surface Elevation: 99.97 mASD

Coordinates: MTM NAD83, 377163E, 5032580N

Drilling Method: Geo-Probe Vibratory Core

DEPTH BGS (ft / m)	SAMPLES	LAB SAMPLE	BLOW COUNT	CGI (ppm)	PID (ppm)	LOG	STRATIGRAPHIC DESCRIPTION
-1							GROUND SURFACE
0							**FILL** Asphalt at surface underlain by brown sand and gravel fill. No hydrocarbon odour. Wet.
1				25			
2							Brown sand mixed with clay at 0.55 mBGS.
3 / 1				10			**CLAY** Grey clay. Moist, no odour.
4							Grey clay with strong hydrocarbon odour at 1.2 mBGS. Moist.
5				10% LEL			
6 / 2							
7		X		60			
8							Grey clay with minor hydrocarbon odour at 2.4 mBGS. Very moist.
9				25			
10 / 3							
11				0			
12							Grey clay with no hydrocarbon odour at 3.7 mBGS. Wet.
13 / 4				0			
14							
15				0			
16							Borehole terminated at 4.87 mBGS.
17 / 5							BOREHOLE TERMINATED



Depth of MW19 = 4.0 mBGS.

BOREHOLE STRATIGRAPHIC AND INSTRUMENTATION LOG

Borehole Number: BH20/MW20

MOE Well ID:

Project Number: 05-215-24

Date Completed: June 6, 2006

Client: NCC

Supervisor: NKP

Site Location: 16 Tauvette, Ottawa, Ontario

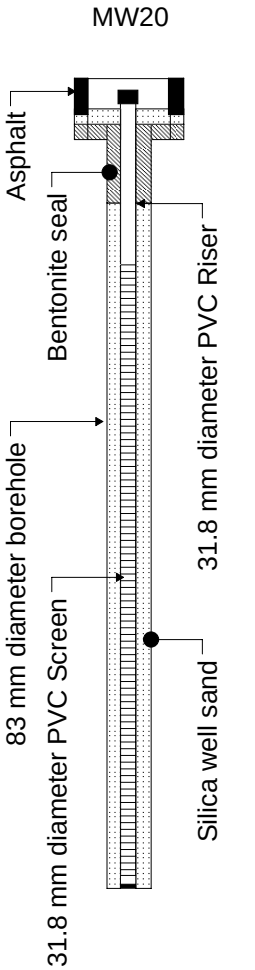
Ground Surface Elevation: 99.87 mASD

Coordinates: MTM NAD83, 377162E, 5032601N

Drilling Method: Geo-Probe Vibratory Core

DEPTH BGS (ft / m)	SAMPLES	LAB SAMPLE	BLOW COUNT	CGI (ppm)	PID (ppm)	LOG	STRATIGRAPHIC DESCRIPTION
-1							GROUND SURFACE
0				0			**FILL** Asphalt at surface underlain by brown sand and gravel fill. Wet.
1							Brown sand and clay with fractured rock at 0.15 mBGS.
2				0			**CLAY** Brown / grey clay. Moist, no odour.
3 / 1							
4							Grey clay at 1.2 mBGS. Moist.
5		X		5			
6							
7 / 2				0			
8							Grey clay at 2.4 mBGS. Very moist to wet.
9				0			
10 / 3							
11				0			
12							Grey clay with slight sulphur odour at 3.7 mBGS. Very wet.
13 / 4				0			
14							
15				0			
16							Borehole terminated at 4.87 mBGS.
17 / 5							BOREHOLE TERMINATED

INSTALLATION



Depth of MW20 = 4.0 mBGS.

BOREHOLE STRATIGRAPHIC AND INSTRUMENTATION LOG

Borehole Number: BH21/MW21

MOE Well ID:

Project Number: 05-215-24

Date Completed: June 6, 2006

Client: NCC

Supervisor: NKP

Site Location: 16 Tauvette St., Ottawa, Ontario

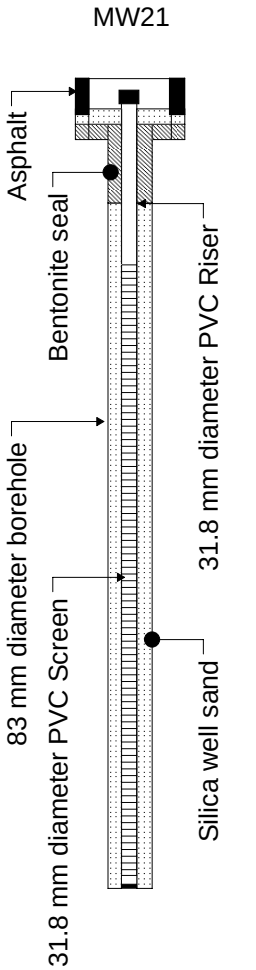
Ground Surface Elevation: 99.99 mASD

Coordinates: MTM NAD83, 377154E, 5032607N

Drilling Method: Geo-Probe Vibratory Core

DEPTH BGS (ft / m)	SAMPLES	LAB SAMPLE	BLOW COUNT	CGI (ppm)	PID (ppm)	LOG	STRATIGRAPHIC DESCRIPTION
							GROUND SURFACE
0 – 4 ft (1 m)				25			**FILL** Asphalt at surface underlain by brown sand and gravel fill with organics. Organic odour. Moist. Thin layer of light brown sand with iron staining at 0.6 mBGS. Brown sand mixed with clay at 0.7 mBGS. Very moist.
4 – 8 ft (1 – 2 m)		X		30			**CLAY** Grey clay. Moist, no odour.
8 – 12 ft (2 – 3 m)				10 / 0			Wet at 2.4 mBGS.
12 – 16 ft (3 – 4 m)				0			
16 – 17 ft (4 – 5 m)							Borehole terminated at 4.87 mBGS. BOREHOLE TERMINATED

INSTALLATION



Depth of MW21 = 4.0 mBGS.

BOREHOLE STRATIGRAPHIC AND INSTRUMENTATION LOG

Borehole Number: BH22

MOE Well ID: N/A

Project Number: 05-215-34

Date Completed: September 10, 2007

Client: NCC

Supervisor: NKP

Site Location: 16 Tauvette St., Ottawa, Ontario

Ground Surface Elevation: N/A

Coordinates: N/A

Drilling Method: Geo-Probe Vibratory Core

DEPTH BGS (ft)	DEPTH BGS (m)	SAMPLES	LAB SAMPLE	BLOW COUNT	CGI (ppm)	PID (ppm)	LOG	STRATIGRAPHIC DESCRIPTION	INSTALLATION
-1									
0						N/A		GROUND SURFACE	No Well Installation
1					56			FILL Asphalt at surface underlain by dark brown sand and gravel. Moist, no odours.	
2					51			Layer of dark brown sand, stones and pebbles at 0.2 mBGS.	
3	1							Thin layer of brown sand at 0.7 mBGS	
4								CLAY Brown silty clay at 0.8 mBGS.	
5					49			Grey clay at 1.2 mBGS. Moist, no odours.	
6	2								
7			X		70				
8								Grey clay at 2.4 mBGS. Very moist, no odours.	
9					29				
10	3								
11					46			Wet at 3.2 mBGS.	
12					26				
13	4								
14					46				
15					49				
16	5							Borehole terminated at 5.2 mBGS.	
17					71				

BOREHOLE STRATIGRAPHIC AND INSTRUMENTATION LOG

Borehole Number: BH23

MOE Well ID: N/A

Project Number: 05-215-34

Date Completed: September 10, 2007

Client: NCC

Supervisor: NKP

Site Location: 16 Tauvette St., Ottawa, Ontario

Ground Surface Elevation: N/A

Coordinates: N/A

Drilling Method: Geo-Probe Vibratory Core

DEPTH BGS (ft / m)	SAMPLES	LAB SAMPLE	BLOW COUNT	CGI (ppm)	PID (ppm)	LOG	STRATIGRAPHIC DESCRIPTION	INSTALLATION
-1 /							GROUND SURFACE	No Well Installation
0 /					N/A		**FILL** Asphalt at surface underlain by dark brown sand and gravel fill with organics. Moist, no odours.	
1 /				0				
2 /				65			Layer of light brown sand at 0.75 mBGS.	
3 / 1							**CLAY** Brown silty clay at 0.9 mBGS.	
4 /							Brown/grey clay at 1.2 mBGS. Moist, no odours.	
5 /				51				
6 /								
7 / 2				61				
8 /							Grey clay at 2.4 mBGS. Very moist, no odours.	
9 /				50				
10 / 3							Wet at 2.9 mBGS.	
11 /				54				
12 /		X		325				
13 / 4				51				
14 /								
15 /				25				
16 / 5				30			Borehole terminated at 5.2 mBGS.	
17 /								

BOREHOLE STRATIGRAPHIC AND INSTRUMENTATION LOG

Borehole Number: BH24/MW24

MOE Well ID: A029523

Project Number: 05-215-34

Date Completed: September 10, 2007

Client: NCC

Supervisor: NKP

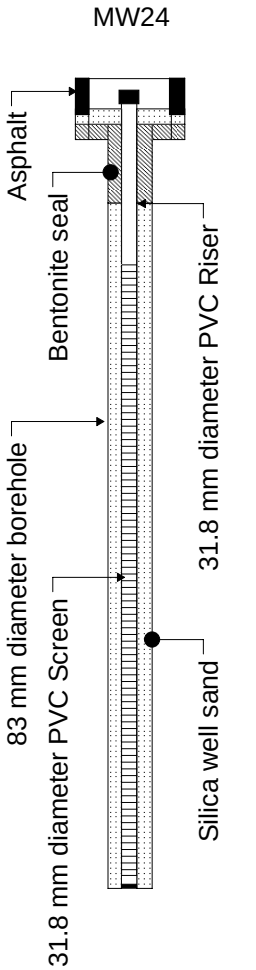
Site Location: 16 Tauvette St., Ottawa, Ontario

Ground Surface Elevation: 99.9 mASD

Coordinates: MTM NAD83, 377168E, 5032593N

Drilling Method: Geo-Probe Vibratory Core

DEPTH BGS (ft / m)	SAMPLES	LAB SAMPLE	BLOW COUNT	CGI (ppm)	PID (ppm)	LOG	STRATIGRAPHIC DESCRIPTION
							GROUND SURFACE
0 – 2 ft				68			**FILL** Asphalt at surface underlain by dark brown sand and gravel fill with minor brick. Moist. No odour. Layer of brown sand at 0.6 mBGS.
2 – 5 ft		X		98			**CLAY** Brown clay with minor sand at 0.9 mBGS. Brown/grey clay. Moist, no odours.
5 – 8 ft				27			
8 – 10 ft				25			Grey clay at 2.4 mBGS. Very moist.
10 – 11 ft				27			
11 – 12 ft				10			Wet at 3.4 mBGS. Minor organic odour.
13 – 14 ft				13			Borehole terminated at 4.3 mBGS.
							BOREHOLE TERMINATED



Depth of MW24 = 4.0 mBGS.

BOREHOLE STRATIGRAPHIC AND INSTRUMENTATION LOG

Borehole Number: BH25

MOE Well ID: N/A

Project Number: 05-215-34

Date Completed: September 10, 2007

Client: NCC

Supervisor: NKP

Site Location: 16 Tauvette St., Ottawa, Ontario

Ground Surface Elevation: N/A

Coordinates: N/A

Drilling Method: Geo-Probe Vibratory Core

DEPTH BGS (ft)	DEPTH BGS (m)	SAMPLES	LAB SAMPLE	BLOW COUNT	CGI (ppm)	PID (ppm)	LOG	STRATIGRAPHIC DESCRIPTION	INSTALLATION
-1									
0						N/A		GROUND SURFACE	No Well Installation
1								FILL Asphalt at surface underlain by dark brown sand and gravel fill. Moist, no odours.	
2					51			Layer of brown sand and crushed stone at 0.6 mBGS.	
3	1							CLAY Brown/grey clay at 0.9 mBGS.	
4									
5			X		48				
6								Grey clay at 1.8 mBGS. Moist, no odours.	
7	2				28				
8									
9					25				
10	3				21				
11								Minor purple staining between 3.3 and 3.4 mBGS.	
12					10			Wet at 3.4 mBGS.	
13	4				5			Borehole terminated at 4.3 mBGS.	
14								BOREHOLE TERMINATED	
15									
16									
17	5								

BOREHOLE STRATIGRAPHIC AND INSTRUMENTATION LOG

Borehole Number: BH26

MOE Well ID: N/A

Project Number: 05-215-34

Date Completed: September 10, 2007

Client: NCC

Supervisor: NKP

Site Location: 16 Tauvette St., Ottawa, Ontario

Ground Surface Elevation: N/A

Coordinates: N/A

Drilling Method: Geo-Probe Vibratory Core

DEPTH BGS (ft / m)	SAMPLES	LAB SAMPLE	BLOW COUNT	CGI (ppm)	PID (ppm)	LOG	STRATIGRAPHIC DESCRIPTION	INSTALLATION
-1								
0					N/A		GROUND SURFACE	No Well Installation
1				18			FILL Asphalt at surface underlain by dark brown sand and gravel fill. Moist, no odours.	
2							Thin layer of dark grey/black silty clay at 0.5 mBGS.	
3 (1 m)				30			Layer of brown sand at 0.6 mBGS.	
4							CLAY Brown silty clay at 0.9 mBGS.	
5				195			Grey/brown clay at 1.2 mBGS. Moist. Strong hydrocarbon odour, increasing with depth.	
6 (2 m)								
7				65% LEL				
8							Grey clay, very moist at 2.4 mBGS. Strong hydrocarbon odour.	
9				4% LEL				
10 (3 m)				210				
11							Grey clay, wet. Minor hydrocarbon odour.	
12				220				
13 (4 m)				78			No hydrocarbon odour at 3.8 mBGS.	
14								
15				0				
16 (5 m)				0			Borehole terminated at 5.2 mBGS.	
17								

BOREHOLE STRATIGRAPHIC AND INSTRUMENTATION LOG

Borehole Number: BH27

MOE Well ID: N/A

Project Number: 05-215-34

Date Completed: September 10, 2007

Client: NCC

Supervisor: NKP

Site Location: 16 Tauvette St., Ottawa, Ontario

Ground Surface Elevation: N/A

Coordinates: N/A

Drilling Method: Geo-Probe Vibratory Core

DEPTH BGS (ft / m)	SAMPLES	LAB SAMPLE	BLOW COUNT	CGI (ppm)	PID (ppm)	LOG	STRATIGRAPHIC DESCRIPTION	INSTALLATION
-1 /							GROUND SURFACE	No Well Installation
0 /					N/A		**FILL** Asphalt at surface underlain by dark brown sand and gravel fill with organics. Moist, no odours.	
1 /							Thin layer of dark brown silty sand with organics and pebbles at 0.45 mBGS.	
2 /				26			Layer of light brown sand at 0.6 mBGS.	
3 / 1							**CLAY** Brown sandy clay at 0.9 mBGS.	
4 /							Grey/brown clay at 1.2 mBGS. Moist, no odours.	
5 /				32				
6 /							Grey clay at 1.8 mBGS. Very moist, hydrocarbon odour.	
7 / 2		X		53				
8 /								
9 /				24				
10 / 3				30				
11 /							Grey clay. Wet, no hydrocarbon odour.	
12 /				0				
13 / 4				0			Borehole terminated at 4.3 mBGS.	
14 /							BOREHOLE TERMINATED	
15 /								
16 / 5								
17 /								

BOREHOLE STRATIGRAPHIC AND INSTRUMENTATION LOG

Borehole Number: BH28/MW28

MOE Well ID: A029523

Project Number: 05-215-34

Date Completed: September 10, 2007

Client: NCC

Supervisor: NKP

Site Location: 16 Tauvette St., Ottawa, Ontario

Ground Surface Elevation: 100.0 mASD

Coordinates: MTM NAD83, 377141E, 5032605N

Drilling Method: Geo-Probe Vibratory Core

DEPTH BGS (ft / m)	SAMPLES	LAB SAMPLE	BLOW COUNT	CGI (ppm)	PID (ppm)	LOG	STRATIGRAPHIC DESCRIPTION	INSTALLATION
							GROUND SURFACE	MW28
0							**FILL** Asphalt at surface underlain by dark brown sand and gravel fill. Moist, no odours.	Asphalt
1							Thin layer of light brown sand at 0.5 mBGS.	Bentonite seal
2				27			Brown sand at 0.6 mBGS. Moist, no odours.	31.8 mm diameter PVC Riser
3 / 1								
4							**CLAY** Brown/grey clay. Moist, no odours.	
5		X		98				
6							Slight hydrocarbon odour at 1.8 mBGS.	83 mm diameter borehole
7 / 2				58				
8							Grey clay at 2.4 mBGS. Very moist, very slight hydrocarbon odour.	31.8 mm diameter PVC Screen
9				54				Silica well sand
10 / 3				34			No hydrocarbon odour.	
11							Wet at 3.4 mBGS.	
12				30				
13 / 4				24			Borehole terminated at 4.3 mBGS.	
14							BOREHOLE TERMINATED	
15								
16 / 5								Depth of MW28 = 4.0 mBGS.
17								

BOREHOLE STRATIGRAPHIC AND INSTRUMENTATION LOG

Borehole Number: BH29

MOE Well ID: N/A

Project Number: 05-215-34

Date Completed: September 10, 2007

Client: NCC

Supervisor: NKP

Site Location: 16 Tauvette St., Ottawa, Ontario

Ground Surface Elevation: N/A

Coordinates: N/A

Drilling Method: Geo-Probe Vibratory Core

DEPTH BGS (ft / m)	SAMPLES	LAB SAMPLE	BLOW COUNT	CGI (ppm)	PID (ppm)	LOG	STRATIGRAPHIC DESCRIPTION	INSTALLATION
-1 /							GROUND SURFACE	No Well Installation
0 /					N/A		**FILL** Asphalt at surface underlain by dark brown sand and gravel fill. Moist, no odours.	
1 /				39			Thin layer of dark brown silty sand with organics at 0.3 mBGS.	
2 /				50			Layer of brown sand at 0.6 mBGS.	
3 / 1							**CLAY** Brown sandy clay at 0.9 mBGS.	
4 /							Grey/brown clay at 1.2 mBGS. Moist, no odours.	
5 /				59				
6 / 2								
7 /		X		44				
8 /							Grey clay at 2.4 mBGS. Very moist, no odours.	
9 /				4				
10 / 3				0				
11 /							Wet at 3.4 mBGS.	
12 /				15				
13 / 4				7			Borehole terminated at 4.3 mBGS.	
14 /							BOREHOLE TERMINATED	
15 /								
16 / 5								
17 /								

BOREHOLE STRATIGRAPHIC AND INSTRUMENTATION LOG

Borehole Number: BH30

MOE Well ID: N/A

Project Number: 05-215-34

Date Completed: September 10, 2007

Client: NCC

Supervisor: NKP

Site Location: 16 Tauvette St., Ottawa, Ontario

Ground Surface Elevation: N/A

Coordinates: N/A

Drilling Method: Geo-Probe Vibratory Core

DEPTH BGS (ft / m)	SAMPLES	LAB SAMPLE	BLOW COUNT	CGI (ppm)	PID (ppm)	LOG	STRATIGRAPHIC DESCRIPTION	INSTALLATION
-1 /							GROUND SURFACE	No Well Installation
0 /					N/A		**FILL** Gravel at surface underlain by light brown sand and gravel fill. Moist, no odours. Layer of dark brown silty sand with organics and iron staining at 0.2 mBGS.	
2 /				47			Layer of brown sand at 0.5 mBGS. Very moist.	
3 / 1							**CLAY** Brown sandy clay at 0.9 mBGS. Moist, no odours.	
4 /							Grey/brown clay at 1.2 mBGS.	
5 /		X		62				
6 / 2								
7 /				29				
8 /							Grey clay at 2.4 mBGS. Very moist, no odours.	
9 /				18				
10 / 3				12				
11 /							Wet at 3.4 mBGS. Minor organic odour.	
12 /				5				
13 / 4				0			Borehole terminated at 4.3 mBGS.	
14 /							BOREHOLE TERMINATED	
15 /								
16 / 5								
17 /								

BOREHOLE STRATIGRAPHIC AND INSTRUMENTATION LOG

Borehole Number: BH31/MW31

MOE Well ID: A029523

Project Number: 05-215-34

Date Completed: September 10, 2007

Client: NCC

Supervisor: NKP

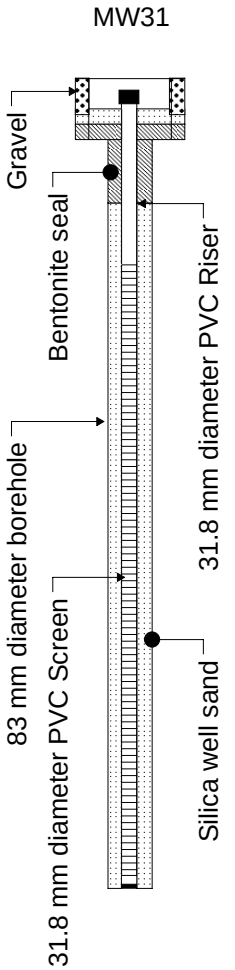
Site Location: 16 Tauvette St., Ottawa, Ontario

Ground Surface Elevation: 99.9 mASD

Coordinates: MTM NAD83, 377158E, 5032564N

Drilling Method: Geo-Probe Vibratory Core

DEPTH BGS (ft / m)	SAMPLES	LAB SAMPLE	BLOW COUNT	CGI (ppm)	PID (ppm)	LOG	STRATIGRAPHIC DESCRIPTION
-1 /							GROUND SURFACE
0 /							**FILL** Gravel at surface underlain by light brown sand and gravel fill. Moist, no odours.
1 /							Layer of stained dark brown sand and gravel fill at 0.3 mBGS.
2 /				0			Layer of lighter brown sand with pebbles at 0.6 mBGS.
3 / 1							**CLAY** Brown sandy clay at 0.9 mBGS. Moist, no odours.
4 /							Brown/grey clay at 1.2 mBGS.
5 /		X		24			
6 /							
7 / 2				12			
8 /							Grey clay at 2.4 mBGS. Very moist, no odours.
9 /				5			
10 / 3				0			
11 /							Wet at 3.4 mBGS. Slight organic odour.
12 /				10			
13 / 4				0			Borehole terminated at 4.3 mBGS.
14 /							BOREHOLE TERMINATED
15 /							
16 / 5							
17 /							



Depth of MW31 = 3.95 mBGS.

BOREHOLE STRATIGRAPHIC AND INSTRUMENTATION LOG

Borehole Number: BH32

MOE Well ID: N/A

Project Number: 05-215-34

Date Completed: September 10, 2007

Client: NCC

Supervisor: NKP

Site Location: 16 Tauvette St., Ottawa, Ontario

Ground Surface Elevation: N/A

Coordinates: N/A

Drilling Method: Geo-Probe Vibratory Core

DEPTH BGS (ft / m)	SAMPLES	LAB SAMPLE	BLOW COUNT	CGI (ppm)	PID (ppm)	LOG	STRATIGRAPHIC DESCRIPTION	INSTALLATION
-1 / 0					N/A		GROUND SURFACE	No Well Installation
0 / 0							**FILL** Gravel at surface underlain by light brown sand and gravel fill. Moist, no odours.	
2 / 1				0			Layer of slightly stained, brown sand and gravel fill at 0.3 mBGS. Layer of brown sand at 0.6 mBGS.	
3 / 1							**CLAY** Brown sandy clay at 0.9 mBGS. Moist, no odours.	
4 / 1							Grey/brown clay at 1.2 mBGS. Moist, minor hdyrocarbon odour.	
5 / 2				128				
6 / 2								
7 / 2				198				
8 / 2							Grey clay at 2.4 mBGS. Very moist. Slight hydrocarbon odour.	
9 / 3				4				
10 / 3							No hydrocarbon odour at 2.9 mBGS.	
11 / 3				4				
11 / 3							Wet at 3.4 mBGS. Minor organic odour.	
12 / 3				0				
13 / 4								
13 / 4				0			Borehole terminated at 4.3 mBGS.	
14 / 4							BOREHOLE TERMINATED	
15 / 4								
16 / 5								
17 / 5								

BOREHOLE STRATIGRAPHIC AND INSTRUMENTATION LOG

Borehole Number: BH33

MOE Well ID: N/A

Project Number: 05-215-34

Date Completed: September 10, 2007

Client: NCC

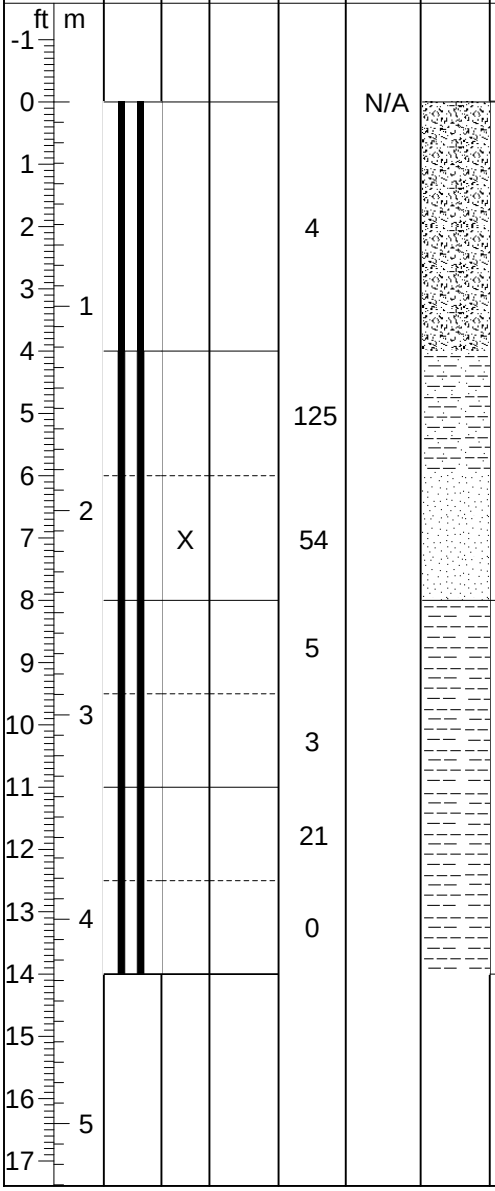
Supervisor: NKP

Site Location: 16 Tauvette St., Ottawa, Ontario

Ground Surface Elevation: N/A

Coordinates: N/A

Drilling Method: Geo-Probe Vibratory Core



DEPTH BGS (ft / m)	SAMPLES	LAB SAMPLE	BLOW COUNT	CGI (ppm)	PID (ppm)	LOG	STRATIGRAPHIC DESCRIPTION	INSTALLATION
							GROUND SURFACE	No Well Installation
0					N/A		**FILL** Asphalt at surface underlain by stained, brown sand and gravel fill. Moist, no odours.	
2				4			Brown sandy clay with pebbles at 0.6 mBGS.	
1								
4							Grey/brown sandy clay at 1.2 mBGS. Slight hydrocarbon odour.	
5				125				
6							Brown sand (possible sewer bedding) with hydrocarbon odour at 1.8 mBGS. Very wet.	
2								
7		X		54				
8							**CLAY** Grey clay at 2.4 mBGS. Very moist. Slight hydrocarbon odour.	
9				5				
10				3			No hydrocarbon odour at 2.7 mBGS. Wet	
3								
11							Minor organic odour at 3.4 mBGS.	
12				21				
13				0			Borehole terminated at 4.3 mBGS.	
4								
14							BOREHOLE TERMINATED	
15								
16								
5								
17								

BOREHOLE STRATIGRAPHIC AND INSTRUMENTATION LOG

Borehole Number: BH34/MW34

MOE Well ID: A029523

Project Number: 05-215-34

Date Completed: September 10, 2007

Client: NCC

Supervisor: NKP

Site Location: 16 Tauvette St., Ottawa, Ontario

Ground Surface Elevation: 99.9 mASD

Coordinates: MTM NAD83, 377138E, 5032586N

Drilling Method: Geo-Probe Vibratory Core

DEPTH BGS (ft / m)	SAMPLES	LAB SAMPLE	BLOW COUNT	CGI (ppm)	PID (ppm)	LOG	STRATIGRAPHIC DESCRIPTION	INSTALLATION
-1 / 0							GROUND SURFACE	MW34
0 / 0							**FILL** Asphalt at surface underlain by sand and gravel fill.	Asphalt; Bentonite seal; 31.8 mm diameter PVC Riser
4 / 1							**CLAY** Grey clay at 1.2 mBGS.	83 mm diameter borehole; 31.8 mm diameter PVC Screen; Silica well sand
13 / 4							Borehole terminated at 4.3 mBGS.	
14 / 4							BOREHOLE TERMINATED	Depth of MW34 = 3.9 mBGS.
17 / 5								

05-215-34 Test Pit Tables

TEST PIT NUMBER: TP1
DATE : September 10, 2007
TOTAL DEPTH: 1.4 mBGS

Interval Depth (mBGS)	Sample ID	Sample Depth (mBGS)	Stratigraphy	Odour	Stain	CGI (ppm)	Analysis
0 - 0.1	--	--	**ASPHALT**	--	--	--	--
0.1 - 0.2	--	--	**FILL -** Crushed stone	No	No	--	--
0.2 - 0.9	--	--	Brown sand.	No	No	--	--
0.9 - 1.4	TP1-1	1.2	**CLAY** - Grey silty clay. Water pooling in bottom of excavation.	Hydrocarbon odour	Yes	25	--

TEST PIT NUMBER: TP3
DATE : September 10, 2007
TOTAL DEPTH: 1.4 mBGS

Interval Depth (mBGS)	Sample ID	Sample Depth (mBGS)	Stratigraphy	Odour	Stain	CGI (ppm)	Analysis
0 - 0.1	--	--	**TOPSOIL**	No	No	--	--
0.1 - 0.6	--	--	**SAND -** Brown silty sand. Moist.	No	No	--	--
0.6 - 1.4	TP3-1	1.35	**CLAY-** Brown/grey silty clay. Wet at 1.3 mBGS.	No	No	0	--

TEST PIT NUMBER: TP4
DATE : September 10, 2007
TOTAL DEPTH: 2.2 mBGS

Interval Depth (mBGS)	Sample ID	Sample Depth (mBGS)	Stratigraphy	Odour	Stain	CGI (ppm)	Analysis
0 - 0.1	--	--	**TOPSOIL**	No	No	--	--
0.1 - 0.6	--	--	**FILL** - Brown sand fill.	No	No	--	--
0.6 - 2.2	TP4-1	2.0	**CLAY -** Brown/grey silty clay. Sand bedding around 100mm dia. ductile iron watermain. Wet.	No	No	20	PHC, BTEX

TEST PIT NUMBER: TP5
DATE : September 10, 2007
TOTAL DEPTH: 2.9 mBGS

Interval Depth (mBGS)	Sample ID	Sample Depth (mBGS)	Stratigraphy	Odour	Stain	CGI (ppm)	Analysis
0 - 0.1	--	--	**TOPSOIL**	No	No	--	--
0.1 - 0.6	--	--	**FILL** - Brown sand fill. Moist.	No	No	--	--
0.6 - 2.9	TP5-1	2.6 (east half of excavation)	**CLAY -** Grey clay. Water pooling in bottom of excavation.	Strong hydrocarbon odour in west half of excavation.	No	25	--

05-215-34 Test Pit Tables

TEST PIT NUMBER: TP6
DATE : September 10, 2007
TOTAL DEPTH: 2.3. mBGS

Interval Depth (mBGS)	Sample ID	Sample Depth (mBGS)	Stratigraphy	Odour	Stain	CGI (ppm)	Analysis
0 - 0.1	--	--	**TOPSOIL**	No	No	--	--
0.1 - 0.75	--	--	**FILL** - Brown sand fill. Moist.	No	No	--	--
0.75 - 2.3	TP6-1	2.25 (east half of excavation)	**CLAY** - Grey silty clay. Water pooling in bottom of west half of excavation has a sheen on it.	Hydrocarbon odour in west half of excavation	No	15	--

TEST PIT NUMBER: TP8
DATE : September 10, 2007
TOTAL DEPTH: 1.7 mBGS

Interval Depth (mBGS)	Sample ID	Sample Depth (mBGS)	Stratigraphy	Odour	Stain	CGI (ppm)	Analysis
0 - 0.1	--	--	**TOPSOIL**	No	No	--	--
0.1 - 0.8	--	--	**SAND -** Brown silty sand. Moist.	No	No	--	--
0.6 - 1.7	TP8-1	1.2 (sand bedding above sewer)	**CLAY -** Brown/grey silty clay. Sand bedding around sewer pipe. Wet.	Hydrocarbon odour	No	70	--
	TP8-2	1.6 (clay below sewer - south side)		Hydrocarbon odour	No	105	PHC, BTEX
	TP8-3	1.5 (sand and clay - north side of sewer)		Hydrocarbon odour	No	15	--

TEST PIT NUMBER: TP9
DATE : September 10, 2007
TOTAL DEPTH: 1.9 mBGS

Interval Depth (mBGS)	Sample ID	Sample Depth (mBGS)	Stratigraphy	Odour	Stain	CGI (ppm)	Analysis
0 - 0.1	--	--	**TOPSOIL**	No	No	--	--
0.1 - 0.8	--	--	**SAND -** Brown silty sand. Moist.	No	No	--	--
0.8 - 1.9	TP9-1	1.8 (north side of sewer)	**CLAY -** Brown/grey silty clay. Sand bedding around sewer pipe. Wet.	No	No	0	--
	TP9-2	1.8 (south side of sewer)		No	No	0	--

APPENDIX B

Hydraulic Test Results

Bail Test: MW6, MW18, MW19, MW20 and MW28

Slug Test: MW21 and MW28

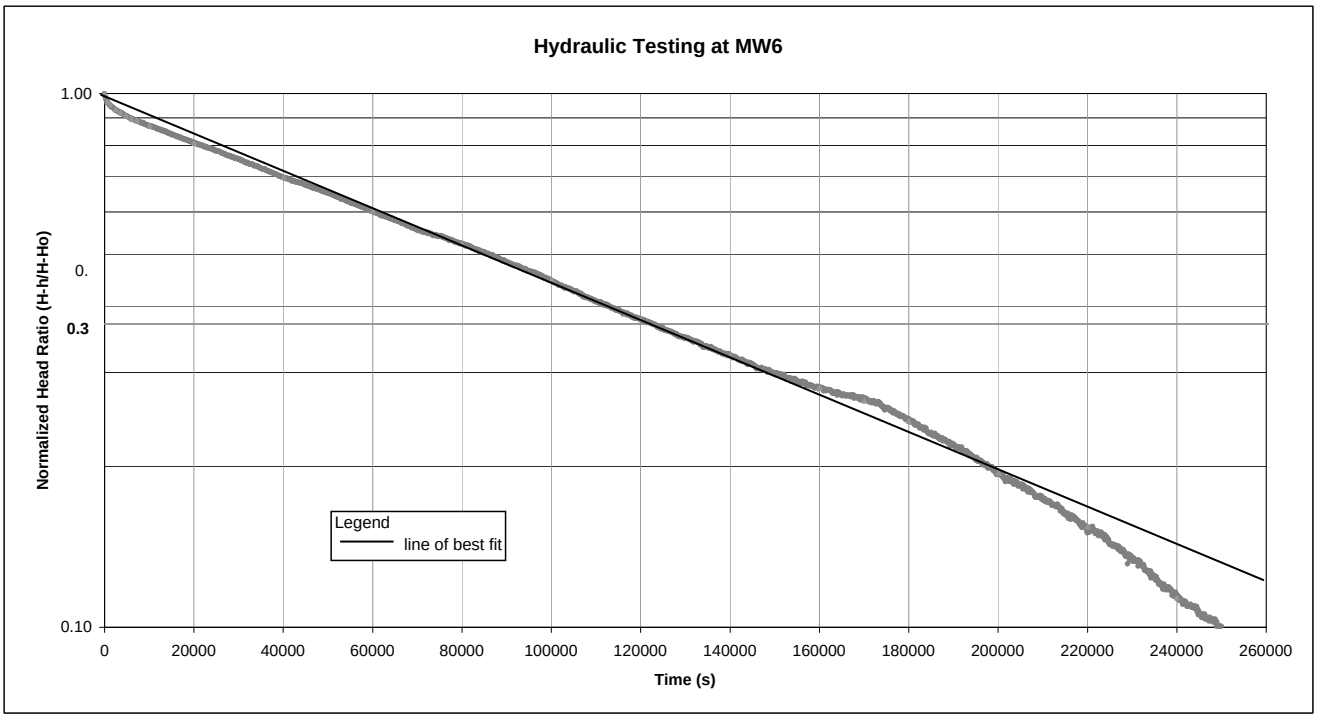
BHMW6

Hvorslev Bail-Test Method

Date (m/d/yyyy)	Time (hr:min:sec)	Time (s)	h (cm)	H-h (cm)	(H-h/H-H_o)	Comments
10/11/2007	14:55:38	0	118.5	258.8	1.000	H (cm) = 377.300
10/11/2007	15:05:38	600	127.5	249.8	0.965	H_O (cm) = 118.500
10/11/2007	15:15:38	1200	130.8	246.5	0.952	
10/11/2007	15:35:38	2400	135.9	241.4	0.933	
10/11/2007	15:55:38	3600	139.2	238.1	0.920	H = static pressure
10/11/2007	16:15:38	4800	142.5	234.8	0.907	H_O = pressure at T = 0
10/11/2007	16:35:38	6000	145.1	232.2	0.897	h = pressure (cm)
10/11/2007	16:55:38	7200	147	230.3	0.890	
10/11/2007	17:43:38	10080	152.2	225.1	0.870	
10/11/2007	20:29:38	20040	168.3	209	0.808	
10/12/2007	2:03:38	40080	197.1	180.2	0.696	
10/12/2007	7:35:38	60000	221.4	155.9	0.602	
10/12/2007	13:09:38	80040	241.8	135.5	0.524	
10/12/2007	18:43:38	100080	261.7	115.6	0.447	
10/13/2007	0:15:38	120000	279.7	97.6	0.377	
10/13/2007	5:49:38	140040	293.7	83.6	0.323	
10/13/2007	11:23:38	160080	304.5	72.8	0.281	
10/13/2007	14:09:38	170040	308.5	68.8	0.266	
10/13/2007	16:55:38	180000	314.3	63	0.243	
10/13/2007	22:29:38	200040	326.9	50.4	0.195	
10/14/2007	4:03:38	220080	337.4	39.9	0.154	
10/14/2007	9:35:38	240000	347.9	29.4	0.114	
10/14/2007	15:09:38	260040	355.1	22.2	0.086	
10/14/2007	20:43:38	280080	362.9	14.4	0.056	

$$K = \frac{r_c^{\,2} \ln\left(\frac{L}{R}\right)}{2\,L\,T_o}$$

K =	2.01E-09	m/s
R (borehole radius)	0.0415	m
L (interval length)	3.392	m
r_c (radius of well casing)	0.0195	m
T_O (T = 63% recovery)	122500	s



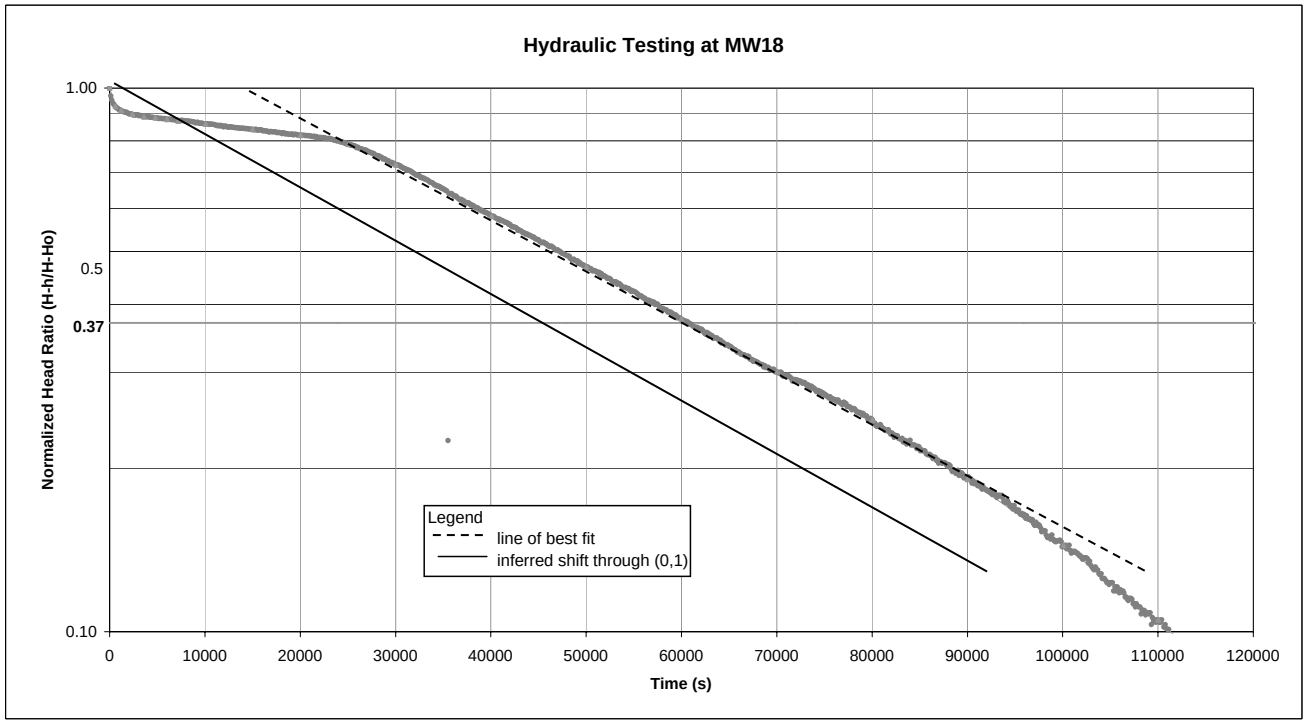
BHMW18

Hvorslev Bail-Test Method

Date (m/d/yyyy)	Time (hr:min:sec)	Time (s)	h (cm)	H-h (cm)	(H-h/H-H_o)	Comments
10/11/2007	15:45:18	0	138.7	189.3	1.000	H (cm) = 328.000
10/11/2007	15:55:18	600	152.8	175.2	0.926	H_O (cm) = 138.700
10/11/2007	16:05:18	1200	155.9	172.1	0.909	
10/11/2007	16:25:18	2400	158.7	169.3	0.894	
10/11/2007	16:45:18	3600	160.4	167.6	0.885	H = static pressure
10/11/2007	17:05:18	4800	161.1	166.9	0.882	H_O = pressure at T = 0
10/11/2007	17:25:18	6000	162.2	165.8	0.876	h = pressure (cm)
10/11/2007	17:45:18	7200	163.4	164.6	0.870	
10/11/2007	18:33:18	10080	165.4	162.6	0.859	
10/11/2007	19:55:18	15000	169.1	158.9	0.839	
10/11/2007	21:19:18	20040	173.1	154.9	0.818	
10/11/2007	22:43:18	25080	178.9	149.1	0.788	
10/12/2007	0:05:18	30000	191.3	136.7	0.722	
10/12/2007	2:53:18	40080	218.1	109.9	0.581	
10/12/2007	5:39:18	50040	239.3	88.7	0.469	
10/12/2007	8:25:18	60000	256.8	71.2	0.376	
10/12/2007	11:13:18	70080	271.1	56.9	0.301	
10/12/2007	13:59:18	80040	281.6	46.4	0.245	
10/12/2007	16:45:18	90000	291.9	36.1	0.191	
10/12/2007	19:33:18	100080	300.7	27.3	0.144	
10/12/2007	22:19:18	110040	308.1	19.9	0.105	
10/13/2007	1:05:18	120000	314.5	13.5	0.071	
10/13/2007	3:53:18	130080	319.3	8.7	0.046	

$$K = \frac{r_c^{\,2} \ln\left(\frac{L}{R}\right)}{2 L T_o}$$

K =	4.38E-09	m/s
R (borehole radius)	0.0415	m
L (interval length)	2.669	m
r_c (radius of well casing)	0.0159	m
T_O (T = 63% recovery)	45000	s



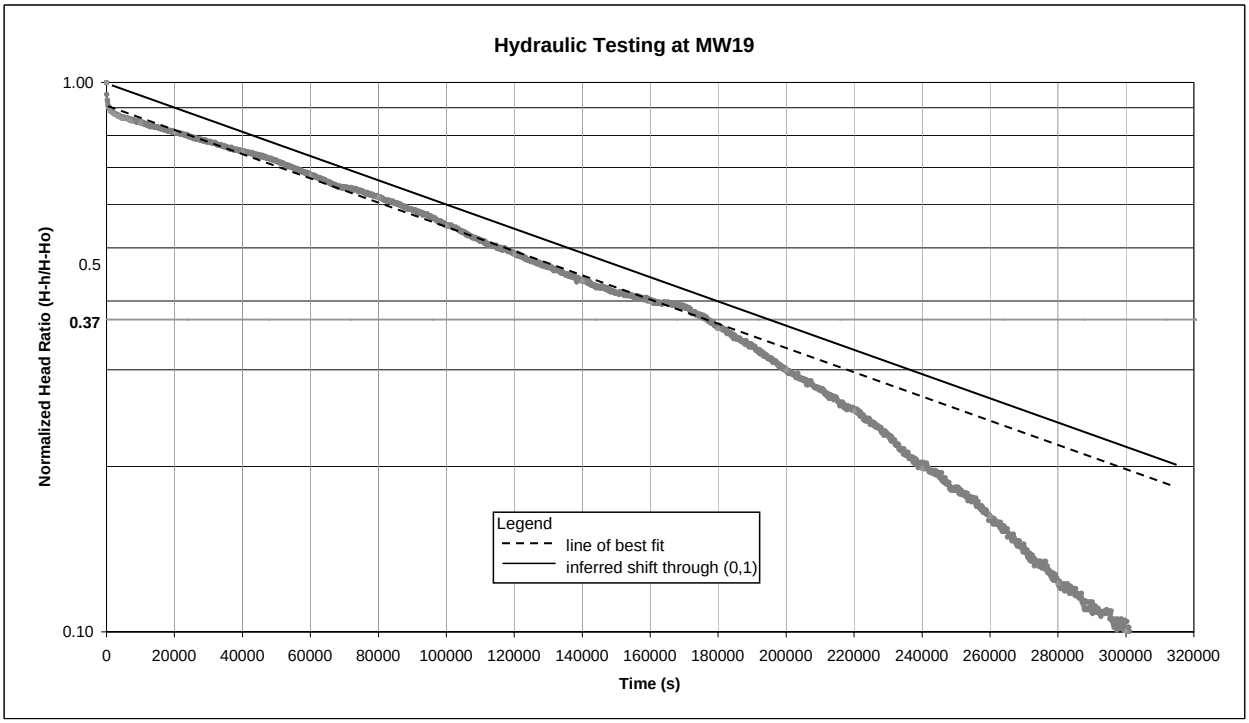
BHMW19

Hvorslev Bail-Test Method

Date (m/d/yyyy)	Time (hr:min:sec)	Time (s)	h (cm)	H-h (cm)	(H-h/H-H_o)	Comments
10/11/2007	15:35:38	0	147.3	166.8	1.000	H (cm) = 314.100
10/11/2007	15:45:38	600	163.5	150.6	0.903	H_O (cm) = 147.300
10/11/2007	15:55:38	1200	165.8	148.3	0.889	
10/11/2007	16:15:38	2400	167.7	146.4	0.878	
10/11/2007	16:35:38	3600	169.1	145	0.869	H = static pressure
10/11/2007	16:55:38	4800	170.3	143.8	0.862	H_O = pressure at T = 0
10/11/2007	17:15:38	6000	170.5	143.6	0.861	h = pressure (cm)
10/11/2007	17:35:38	7200	171.7	142.4	0.854	
10/11/2007	18:23:38	10080	172.8	141.3	0.847	
10/11/2007	21:09:38	20040	178.5	135.6	0.813	
10/12/2007	2:43:38	40080	189	125.1	0.750	
10/12/2007	8:15:38	60000	201	113.1	0.678	
10/12/2007	13:49:38	80040	210.7	103.4	0.620	
10/12/2007	19:23:38	100080	222.5	91.6	0.549	
10/13/2007	0:55:38	120000	232.7	81.4	0.488	
10/13/2007	6:29:38	140040	241.3	72.8	0.436	
10/13/2007	12:03:38	160080	247.4	66.7	0.400	
10/13/2007	17:35:38	180000	254.5	59.6	0.357	
10/13/2007	23:09:38	200040	264	50.1	0.300	
10/14/2007	4:43:38	220080	271.9	42.2	0.253	
10/14/2007	10:15:38	240000	280.9	33.2	0.199	
10/14/2007	15:49:38	260040	287	27.1	0.162	
10/14/2007	21:23:38	280080	293.6	20.5	0.123	
10/15/2007	2:55:38	300000	297.3	16.8	0.101	

$$K = \frac{r_c^{\,2} \ln\left(\frac{L}{R}\right)}{2 L T_o}$$

K =	1.06E-09	m/s
R (borehole radius)	0.0415	m
L (interval length)	2.498	m
r_c (radius of well casing)	0.0159	m
T_O (T = 63% recovery)	195000	s



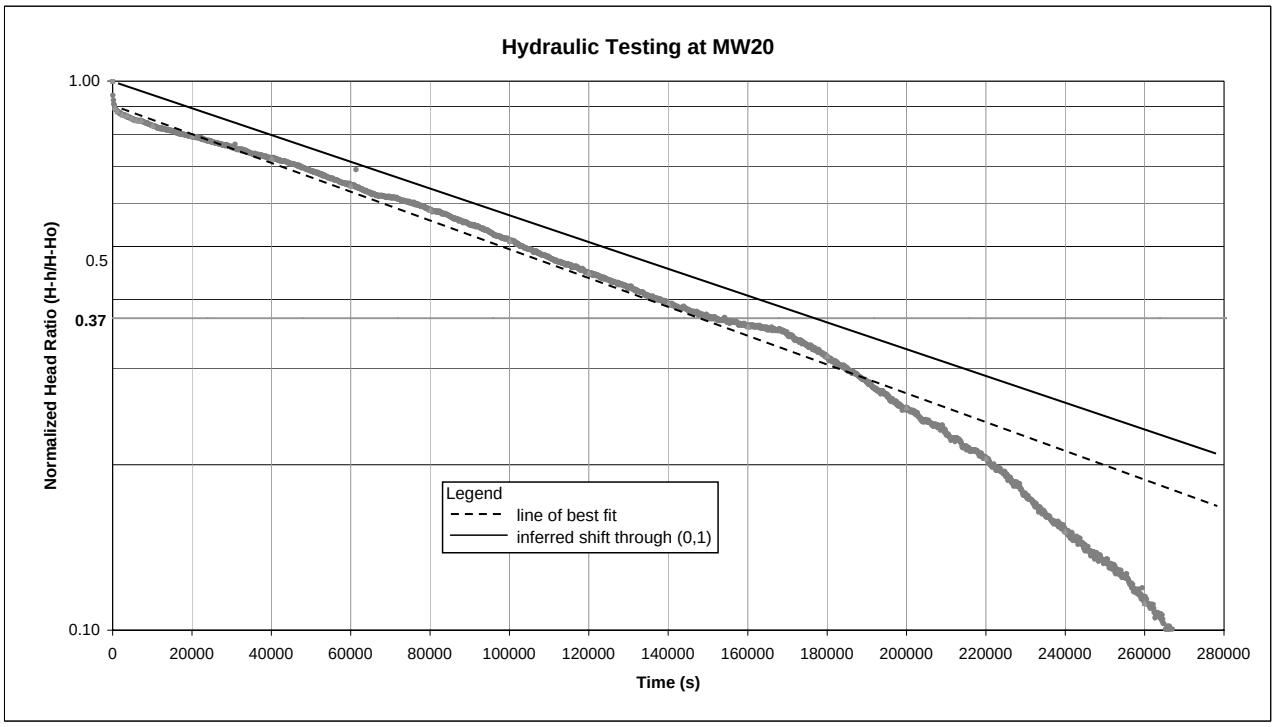
BHMW20

Hvorslev Bail-Test Method

Date (m/d/yyyy)	Time (hr:min:sec)	Time (s)	h (cm)	H-h (cm)	(H-h/H-H_o)	Comments
10/11/2007	16:06:39	0	128.1	163.4	1.000	H (cm) = 291.500
10/11/2007	16:16:39	600	145.5	146	0.894	H_O (cm) = 128.100
10/11/2007	16:26:39	1200	147.7	143.8	0.880	
10/11/2007	16:46:39	2400	149.5	142	0.869	
10/11/2007	17:06:39	3600	150.1	141.4	0.865	H = static pressure
10/11/2007	17:26:39	4800	151.9	139.6	0.854	H_O = pressure at T = 0
10/11/2007	17:46:39	6000	152.9	138.6	0.848	h = pressure (cm)
10/11/2007	18:06:39	7200	152.9	138.6	0.848	
10/11/2007	18:54:39	10080	155.9	135.6	0.830	
10/11/2007	21:40:39	20040	161.9	129.6	0.793	
10/12/2007	3:14:39	40080	173.5	118	0.722	
10/12/2007	8:46:39	60000	186.1	105.4	0.645	
10/12/2007	14:20:39	80040	196.4	95.1	0.582	
10/12/2007	19:54:39	100080	208	83.5	0.511	
10/13/2007	1:26:39	120000	218.5	73	0.447	
10/13/2007	7:00:39	140040	227.3	64.2	0.393	
10/13/2007	12:34:39	160080	233.1	58.4	0.357	
10/13/2007	18:06:39	180000	239.9	51.6	0.316	
10/13/2007	23:40:39	200040	249.9	41.6	0.255	
10/14/2007	5:14:39	220080	257.9	33.6	0.206	
10/14/2007	10:46:39	240000	266.8	24.7	0.151	
10/14/2007	16:20:39	260040	273.2	18.3	0.112	
10/14/2007	21:54:39	280080	279.6	11.9	0.073	

$$K = \frac{r_c^{\,2} \ln\left(\frac{L}{R}\right)}{2 L T_o}$$

K =	1.27E-09	m/s
R (borehole radius)	0.0415	m
L (interval length)	2.292	m
r_c (radius of well casing)	0.0159	m
T_O (T = 63% recovery)	174000	s



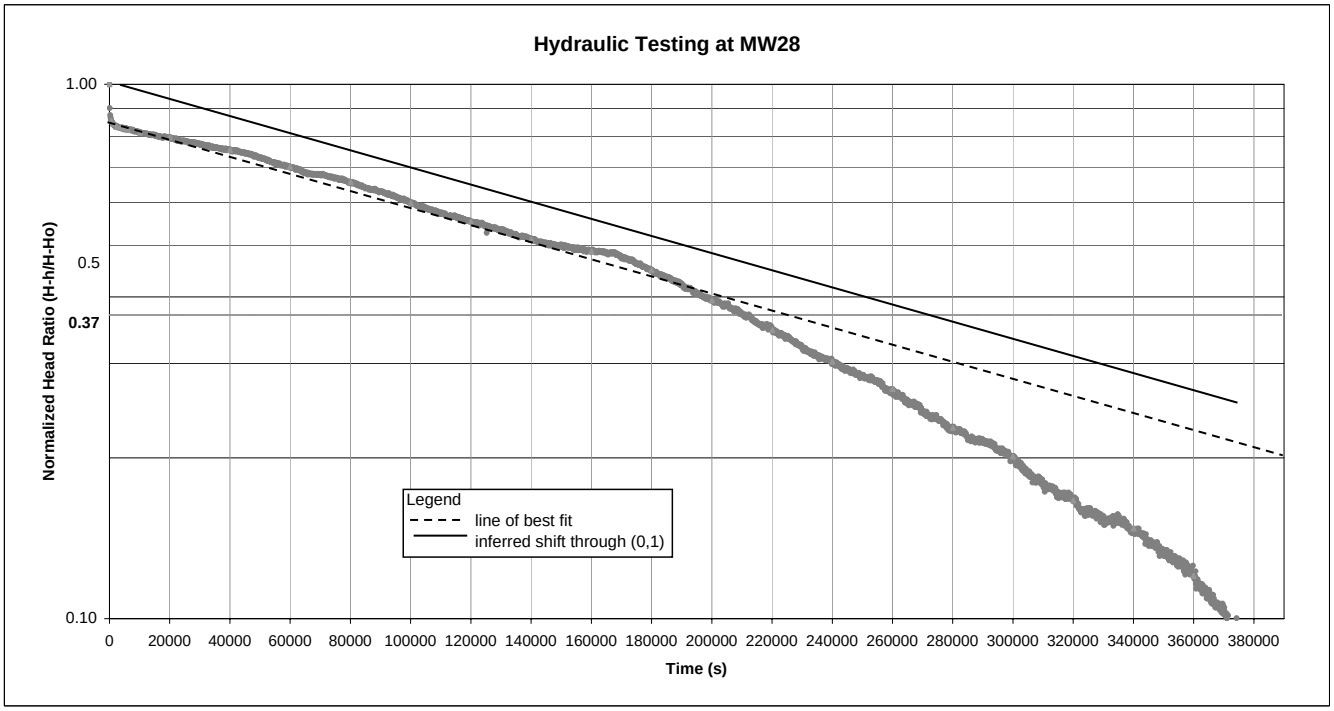
BHMW28

Hvorslev Bail-Test Method

Date (m/d/yyyy)	Time (hr:min:sec)	Time (s)	h (cm)	H-h (cm)	(H-h/H-H_o)	Comments
10/11/2007	16:13:03	0	106.9	169.6	1.000	H (cm) = 276.500
10/11/2007	16:23:03	600	131.6	144.9	0.854	H_O (cm) = 106.900
10/11/2007	16:33:03	1200	133.6	142.9	0.843	
10/11/2007	16:53:03	2400	135.3	141.2	0.833	
10/11/2007	17:13:03	3600	135.9	140.6	0.829	H = static pressure
10/11/2007	17:33:03	4800	136.3	140.2	0.827	H_O = pressure at T = 0
10/11/2007	17:53:03	6000	137.2	139.3	0.821	h = pressure (cm)
10/11/2007	19:01:03	10080	138.9	137.6	0.811	
10/11/2007	21:47:03	20040	141.5	135	0.796	
10/12/2007	3:21:03	40080	148.7	127.8	0.754	
10/12/2007	8:53:03	60000	157.7	118.8	0.700	
10/12/2007	14:27:03	80040	165.2	111.3	0.656	
10/12/2007	20:01:03	100080	174.9	101.6	0.599	
10/13/2007	1:33:03	120000	182.7	93.8	0.553	
10/13/2007	7:07:03	140040	189.7	86.8	0.512	
10/13/2007	12:41:03	160080	193.9	82.6	0.487	
10/13/2007	18:13:03	180000	200.4	76.1	0.449	
10/13/2007	23:47:03	200040	209.7	66.8	0.394	
10/14/2007	5:21:03	220080	217.7	58.8	0.347	
10/14/2007	10:53:03	240000	225.2	51.3	0.302	
10/14/2007	16:27:03	260040	230.9	45.6	0.269	
10/14/2007	22:01:03	280080	237.9	38.6	0.228	
10/15/2007	3:33:03	300000	242.4	34.1	0.201	
10/15/2007	9:07:03	320040	248.3	28.2	0.166	
10/15/2007	14:41:03	340080	251.5	25	0.147	
10/15/2007	20:13:03	360000	256.1	20.4	0.120	

$$K = \frac{r_c^{\,2} \ln\left(\frac{L}{R}\right)}{2\,L\,T_o}$$

K =	9.39E-10	m/s
R (borehole radius)	0.0415	m
L (interval length)	1.908	m
r_c (radius of well casing)	0.0159	m
T_O (T = 63% recovery)	270000	s



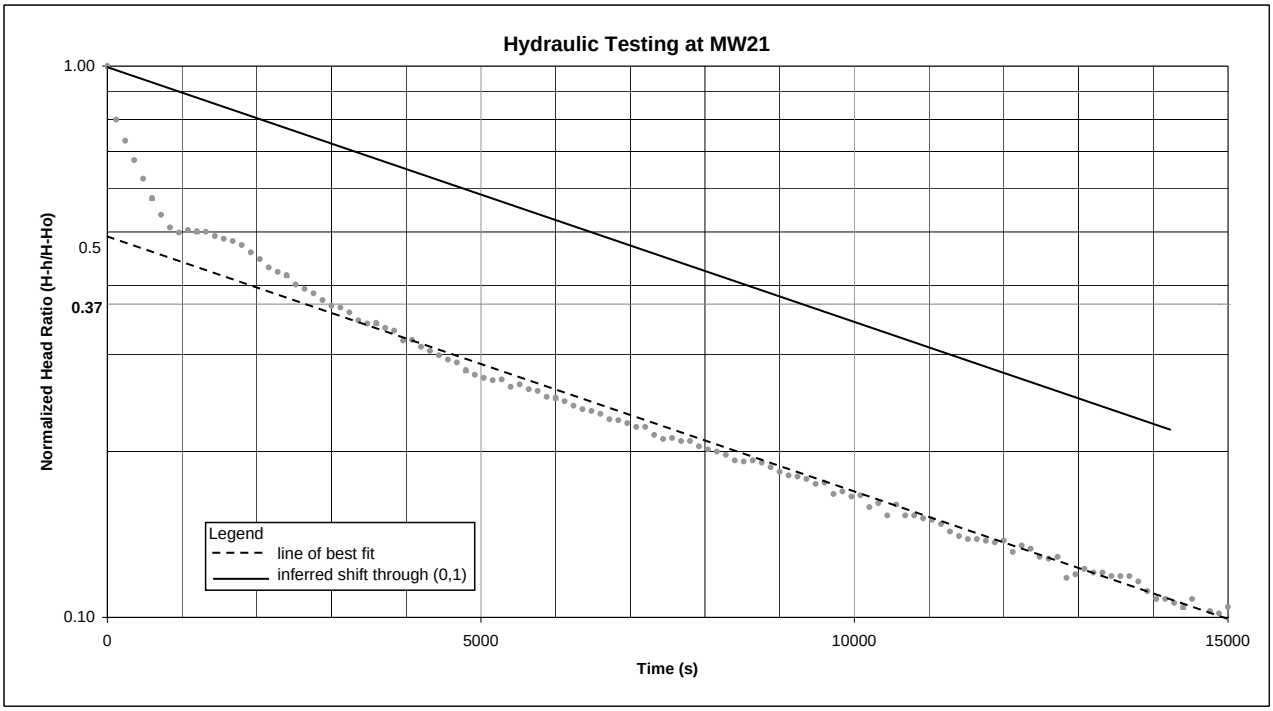
BHMW21

Hvorslev Slug-Test Method

Date (m/d/yyyy)	Time (hr:min:sec)	Time (s)	h (cm)	h-H (cm)	(h-H/H_o-H)	Comments
10/19/2007	14:25:38	0	432.2	111.100	1.000	H (cm) = 321.100
10/19/2007	14:35:38	600	385.1	64.000	0.576	H_O (cm) = 432.200
10/19/2007	14:45:38	1200	376.8	55.700	0.501	
10/19/2007	15:05:38	2400	367.5	46.400	0.418	
10/19/2007	15:25:38	3600	359.1	38.000	0.342	H = static pressure
10/19/2007	15:45:38	4800	352.3	31.200	0.281	H_O = pressure at T = 0
10/19/2007	16:05:38	6000	348.9	27.800	0.250	h = pressure (cm)
10/19/2007	18:25:38	14400	332.7	11.600	0.104	
10/19/2007	21:23:38	25080	325.7	4.600	0.041	
10/20/2007	4:19:38	50040	321.1	0.000	0.000	

$$K = \frac{r_c^{\,2} \ln\left(\frac{L}{R}\right)}{2\,L\,T_o}$$

K =	4.33E-08	m/s
R (borehole radius)	0.0415	m
L (interval length)	1.00	m
r_c (radius of well casin	0.0159	m
T_O (T = 63% recovery)	9300	s



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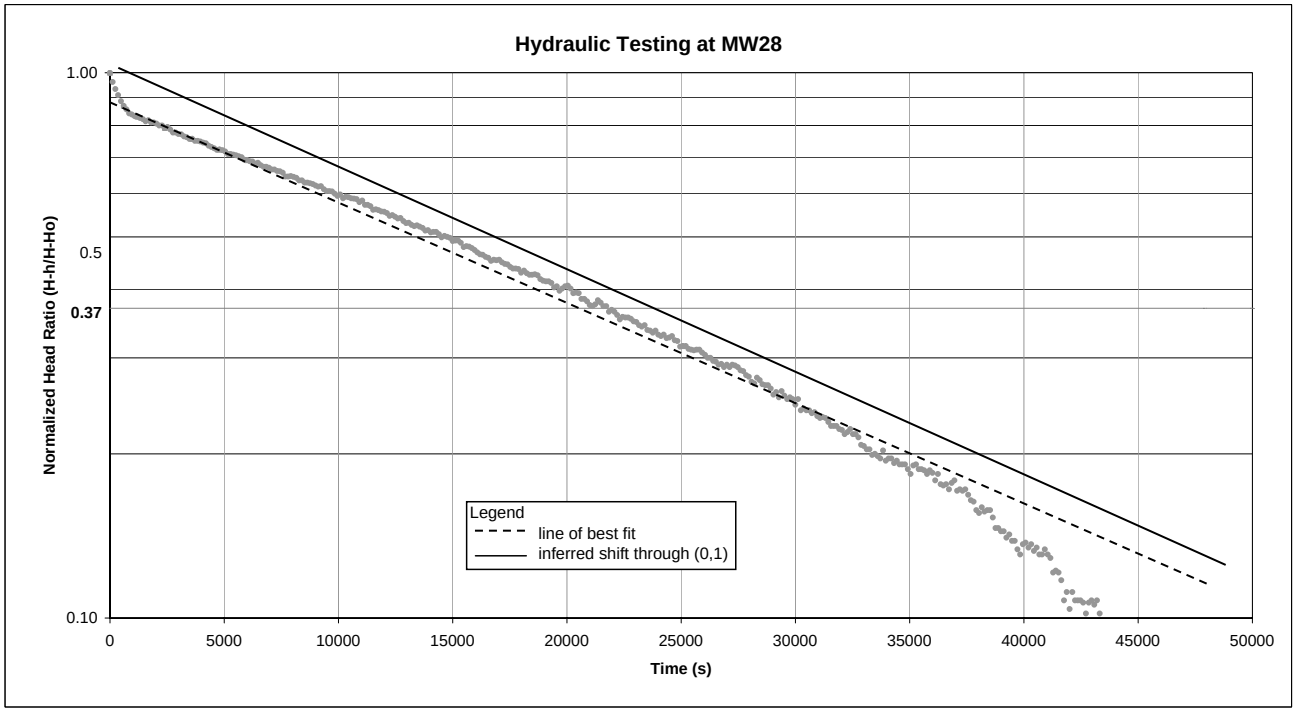
BHMW28

Hvorslev Slug-Test Method

Date (m/d/yyyy)	Time (hr:min:sec)	Time (s)	h (cm)	h-H (cm)	(h-H/H_o-H)	Comments
10/19/2007	13:01:03	0	445.3	104.000	1.000	H (cm) = 341.300
10/19/2007	13:11:03	600	431.7	90.400	0.869	H_O (cm) = 445.300
10/19/2007	13:21:03	1200	427.7	86.400	0.831	
10/19/2007	13:41:03	2400	423.7	82.400	0.792	
10/19/2007	14:01:03	3600	420	78.700	0.757	H = static pressure
10/19/2007	14:21:03	4800	416.5	75.200	0.723	H_O = pressure at T = 0
10/19/2007	14:41:03	6000	413.2	71.900	0.691	h = pressure (cm)
10/19/2007	19:59:03	25080	374.1	32.800	0.315	
10/20/2007	2:55:03	50040	346.3	5.000	0.048	
10/20/2007	9:51:03	75000	344.8	3.500	0.034	
10/20/2007	16:49:03	100080	342.7	1.400	0.013	

$$K = \frac{r_c^{\,2} \ln\left(\frac{L}{R}\right)}{2 L T_o}$$

K =	1.69E-08	m/s
R (borehole radius)	0.0415	m
L (interval length)	1.00	m
r_c (radius of well casing)	0.0159	m
T_O (T = 63% recovery)	23800	s



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Reviewed by: SNG
05-215-34_Hydraulic Testing_R0B.xls

APPENDIX C

Soil and Groundwater Quality Tables

Table C.1 - Soil Analytical Results - Petroleum Hydrocarbons (PHC) and BTEX Parameters

				Former UST Area 1 - Initial Investigation				
Parameter	**MDL**	**CCME**	**MOE Table 3**	**BH1-2**	**BH2-2**	**BH3-2**	**BH6-2**	**BH10-2B**
Sample Depth (mBGS) >	**(µg/g)**	**Comm[1]**	**Ind/Comm/Com[2]**	1.2 - 1.8	1.2 - 1.8	1.2 - 2.4	1.2 - 2.4	1.8 - 2.4
Date Sampled >				14-Jun-05	14-Jun-05	14-Jun-05	14-Jun-05	14-Jun-05
CGI Reading				490 ppm	2500 ppm	1200 ppm	>10000 ppm	92 ppm
Petroleum Hydrocarbons								
F1 (C6-C10)	20	320	660	100	300	40	**600**	120
F2 (>C10-C16)	10	260	1,500	**2,200**	**5,700**	10	**2,500**	**270**
F3 (>C16-C34)	10	2,500	2,500	880	2,000	10	800	60
F4 (>C34)	10	6,600	6,600	ND	ND	30	ND	ND
BTEX								
Benzene	0.05	0.0068	25	ND(0.3) [(3)]	**1.9**	**0.2**	**1.3**	**0.05**
Toluene	0.05	0.08	150	ND(0.3) [(3)]	**0.2**	**0.6**	**13**	ND
Ethylbenzene	0.05	0.018	1000	**1.3**	**9.6**	**0.7**	**14**	**1.6**
m/p-Xylene	0.1	NV	NV	3	34	3.2	61	2.5
o-Xylenes	0.05	NV	NV	ND(0.3)	0.45	1	27	0.05
Total Xylenes	NV	2.4	210	**3.0**	**34.5**	**4.2**	**88**	**2.6**

Notes:

All units are µg/g unless otherwise noted.

MDL = Method Detection Limit.
NV = No Value.
ND = Not Detected above MDL.
mBGS = meters below ground surface.
-- = Not Analysed.
CCME = Canadian Council of Ministers of the Environment. Canadian Environment Quality Guidelines, 2007 and Canada-Wide Standards for Petroleum Hydrocarbons in Soil, 2008.
1) Comm - Soil remediation standards for Commercial land use, fine grained soil.
MOE = Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act, March 2004. Table 3 = Full depth generic site condition standards in a non-potable ground water condition.
2) Soil remediation standards for Industrial/Commercial/Community land use, medium and fine textured soil.
bold/highlight = indicates concentrations which exceed CCME Standards and Guidelines.
underline = indicates concentrations which exceed MOE Table 3 Standards.
(3) = Method Detection Limit greater than CCME criteria.

Table C.1 - Soil Analytical Results - Petroleum Hydrocarbons (PHC) and BTEX Parameters (continued)

				Former UST Area 1 - Supplemental Investigation				
Parameter	**MDL**	**CCME**	**MOE Table 3**	**BH15-3**	**BH16-3**	**BH16-5**	**BH17-6**	**BH18-3**
Sample Depth (mBGS) >	**(µg/g)**	**Comm[1]**	**Ind/Comm/Com[2]**	1.2 - 1.8	1.2 - 1.8	2.4 - 3.0	3.0 - 3.6	1.2 - 1.8
Date Sampled >				6-Jun-06	6-Jun-06	6-Jun-06	6-Jun-06	6-Jun-06
CGI Reading				25 ppm	5% LEL	25 ppm	75 ppm	25 ppm
Petroleum Hydrocarbons								
F1 (C6-C10)	20	320	660	ND	ND	ND	ND	ND
F2 (>C10-C16)	10	260	1,500	ND	**300**	ND	ND	ND
F3 (>C16-C34)	10	2,500	2,500	ND	180	ND	ND	ND
F4 (>C34)	10	6,600	6,600	ND	ND	ND	ND	ND
BTEX								
Benzene	0.002	0.0068	25	**0.024**	ND(0.03) [(3)]	ND	**0.32**	ND
Toluene	0.002	0.08	150	0.02	**0.1**	0.002	0.006	0.002
Ethylbenzene	0.002	0.018	1000	0.008	ND(0.03) [(3)]	ND	**0.15**	ND
m/p-Xylene	0.002	NV	NV	0.028	ND(0.05)	0.004	0.28	0.002
o-Xylenes	0.002	NV	NV	0.01	ND(0.05)	ND	0.008	ND
Total Xylenes	NV	2.4	210	0.038	ND(0.05)	0.004	0.288	0.002

Notes:

All units are µg/g unless otherwise noted.

MDL = Method Detection Limit.

NV = No Value.

ND = Not Detected above MDL.

mBGS = meters below ground surface.

-- = Not Analysed.

CCME = Canadian Council of Ministers of the Environment. Canadian Environment Quality Guidelines, 2007 and Canada-Wide Standards for Petroleum Hydrocarbons in Soil, 2008.

1) Comm - Soil remediation standards for Commercial land use, fine grained soil.

MOE = Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act, March 2004. Table 3 = Full depth generic site condition standards in a non-potable ground water condition.

2) Soil remediation standards for Industrial/Commercial/Community land use, medium and fine textured soil.

bold/highlight = indicates concentrations which exceed CCME Standards and Guidelines.

underline = indicates concentrations which exceed MOE Table 3 Standards.

(3) = Method Detection Limit greater than CCME criteria.

Table C.1 - Soil Analytical Results - Petroleum Hydrocarbons (PHC) and BTEX Parameters (continued)

				Former UST Area 1 - Supplemental Investigation		
Parameter	**MDL**	**CCME**	**MOE Table 3**	**BH19-4**	**BH20-3**	**BH21-3**
Sample Depth (mBGS) >	**(µg/g)**	**Comm[1]**	**Ind/Comm/Com[2]**	1.8 - 2.4	1.2 - 1.8	1.2 - 1.8
Date Sampled >				6-Jun-06	6-Jun-06	6-Jun-06
CGI Reading				60 ppm	5 ppm	30 ppm
Petroleum Hydrocarbons						
F1 (C6-C10)	20	320	660	ND	ND	ND
F2 (>C10-C16)	10	260	1,500	ND	ND	ND
F3 (>C16-C34)	10	2,500	2,500	ND	ND	ND
F4 (>C34)	10	6,600	6,600	ND	ND	ND
BTEX						
Benzene	0.002	0.0068	25	ND	ND	ND
Toluene	0.002	0.08	150	ND	ND	ND
Ethylbenzene	0.002	0.018	1000	**0.022**	ND	0.004
m/p-Xylene	0.002	NV	NV	0.02	0.004	0.016
o-Xylenes	0.002	NV	NV	ND	ND	ND
Total Xylenes	NV	2.4	210	0.02	0.004	0.016

Notes:

All units are µg/g unless otherwise noted.

MDL = Method Detection Limit.

NV = No Value.

ND = Not Detected above MDL.

mBGS = meters below ground surface.

-- = Not Analysed.

CCME = Canadian Council of Ministers of the Environment. Canadian Environment Quality Guidelines, 2007 and Canada-Wide Standards for Petroleum Hydrocarbons in Soil, 2008.

1) Comm - Soil remediation standards for Commercial land use, fine grained soil.

MOE = Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act, March 2004. Table 3 = Full depth generic site condition standards in a non-potable ground water condition.

2) Soil remediation standards for Industrial/Commercial/Community land use, medium and fine textured soil.

bold/highlight = indicates concentrations which exceed CCME Standards and Guidelines.

underline = indicates concentrations which exceed MOE Table 3 Standards.

(3) = Method Detection Limit greater than CCME criteria.

Table C.1 - Soil Analytical Results - Petroleum Hydrocarbons (PHC) and BTEX Parameters (continued)

				Former UST Area - SLRA				
Parameter	**MDL**	**CCME**	**MOE Table 3**	**BH22-4**		**BH23-7**	**BH24-2**	**BH25-2**
Sample Depth (mBGS) >	**(ug/g)**	**Comm[1]**	**Ind/Comm/Com[2]**	1.8 - 2.4	Duplicate	3.4 - 3.8	1.2 - 1.8	1.2 - 1.8
Date Sampled >				10-Sep-07	10-Sep-07	10-Sep-07	10-Sep-07	10-Sep-07
CGI Reading				70 ppm	70 ppm	325 ppm	98 ppm	48 ppm
Petroleum Hydrocarbons								
F1 (C6-C10)	20	320	660	ND	ND	ND	ND	ND
F2 (>C10-C16)	10	260	1,500	ND	ND	ND	ND	ND
F3 (>C16-C34)	10	2,500	2,500	ND	ND	ND	ND	ND
F4 (>C34)	10	6,600	6,600	ND	ND	ND	ND	ND
BTEX								
Benzene	0.03	0.0068	25	ND (3)	ND (3)	ND (3)	ND (3)	ND (3)
Toluene	0.05	0.08	150	ND	ND	ND	ND	ND
Ethylbenzene	0.05	0.018	1000	ND (3)	ND (3)	ND (3)	ND (3)	ND (3)
m/p-Xylene	0.05	NV	NV	ND	ND	ND	ND	ND
o-Xylenes	0.05	NV	NV	ND	ND	ND	ND	ND
Total Xylenes	NV	2.4	210	ND	ND	ND	ND	ND

Notes:

All units are µg/g unless otherwise noted.

MDL = Method Detection Limit.

NV = No Value.

ND = Not Detected above MDL.

mBGS = meters below ground surface.

-- = Not Analysed.

CCME = Canadian Council of Ministers of the Environment. Canadian Environment Quality Guidelines, 2007 and Canada-Wide Standards for Petroleum Hydrocarbons in Soil, 2008.

1) Comm - Soil remediation standards for Commercial land use, fine grained soil.

MOE = Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act, March 2004. Table 3 = Full depth generic site condition standards in a non-potable ground water condition.

2) Soil remediation standards for Industrial/Commercial/Community land use, medium and fine textured soil.

bold/highlight = indicates concentrations which exceed CCME Standards and Guidelines.

underline = indicates concentrations which exceed MOE Table 3 Standards.

(3) = Method Detection Limit greater than CCME criteria.

Table C.1 - Soil Analytical Results - Petroleum Hydrocarbons (PHC) and BTEX Parameters (continued)

				Former UST Area - SLRA				
Parameter	**MDL**	**CCME**	**MOE Table 3**	**BH27-3**	**BH28-2**	**BH29-3**	**BH30-2**	**BH31-2**
Sample Depth (mBGS) >	**(ug/g)**	**Comm[1]**	**Ind/Comm/Com[2]**	1.8 - 2.4	1.2 - 1.8	1.2 - 1.8	1.2 - 1.8	1.2 - 1.8
Date Sampled >				10-Sep-07	10-Sep-07	10-Sep-07	10-Sep-07	10-Sep-07
CGI Reading				53 ppm	98 ppm	59	62 ppm	24 ppm
Petroleum Hydrocarbons								
F1 (C6-C10)	20	320	660	ND	ND	ND	ND	ND
F2 (>C10-C16)	10	260	1,500	ND	10	ND	23	10
F3 (>C16-C34)	10	2,500	2,500	ND	ND	ND	67	ND
F4 (>C34)	10	6,600	6,600	ND	ND	ND	ND	ND
BTEX								
Benzene	0.03	0.0068	25	ND (3)	ND (3)	ND (3)	ND (3)	ND (3)
Toluene	0.05	0.08	150	ND	ND	ND	ND	ND
Ethylbenzene	0.05	0.018	1000	ND (3)	ND (3)	ND (3)	ND (3)	ND (3)
m/p-Xylene	0.05	NV	NV	ND	ND	ND	ND	ND
o-Xylenes	0.05	NV	NV	ND	ND	ND	ND	ND
Total Xylenes	NV	2.4	210	ND	ND	ND	ND	ND

Notes:

All units are µg/g unless otherwise noted.

MDL = Method Detection Limit.

NV = No Value.

ND = Not Detected above MDL.

mBGS = meters below ground surface.

-- = Not Analysed.

CCME = Canadian Council of Ministers of the Environment. Canadian Environment Quality Guidelines, 2007 and Canada-Wide Standards for Petroleum Hydrocarbons in Soil, 2008.

1) Comm - Soil remediation standards for Commercial land use, fine grained soil.

MOE = Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act, March 2004. Table 3 = Full depth generic site condition standards in a non-potable ground water condition.

2) Soil remediation standards for Industrial/Commercial/Community land use, medium and fine textured soil.

bold/highlight = indicates concentrations which exceed CCME Standards and Guidelines.

underline = indicates concentrations which exceed MOE Table 3 Standards.

(3) = Method Detection Limit greater than CCME criteria.

Table C.1 - Soil Analytical Results - Petroleum Hydrocarbons (PHC) and BTEX Parameters (continued)

				Former UST Area - SLRA		
Parameter	**MDL**	**CCME**	**MOE Table 3**	**BH33-3**	**TP4-1**	**TP8-2**
Sample Depth (mBGS) >	**(ug/g)**	**Comm[1]**	**Ind/Comm/Com[2]**	1.8 - 2.4	1.7	1.7
Date Sampled >				10-Sep-07	10-Sep-07	10-Sep-07
CGI Reading				54 ppm	20 ppm	105 ppm
Petroleum Hydrocarbons						
F1 (C6-C10)	20	320	660	ND	ND	ND
F2 (>C10-C16)	10	260	1,500	ND	ND	ND
F3 (>C16-C34)	10	2,500	2,500	ND	ND	ND
F4 (>C34)	10	6,600	6,600	ND	ND	ND
BTEX						
Benzene	0.03	0.0068	25	ND (3)	ND (3)	ND (3)
Toluene	0.05	0.08	150	ND	ND	ND
Ethylbenzene	0.05	0.018	1000	ND (3)	ND (3)	ND (3)
m/p-Xylene	0.05	NV	NV	ND	ND	ND
o-Xylenes	0.05	NV	NV	ND	ND	ND
Total Xylenes	NV	2.4	210	ND	ND	ND

Notes:

All units are µg/g unless otherwise noted.

MDL = Method Detection Limit.

NV = No Value.

ND = Not Detected above MDL.

mBGS = meters below ground surface.

-- = Not Analysed.

CCME = Canadian Council of Ministers of the Environment. Canadian Environment Quality Guidelines, 2007 and Canada-Wide Standards for Petroleum Hydrocarbons in Soil, 2008.

1) Comm - Soil remediation standards for Commercial land use, fine grained soil.

MOE = Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act, March 2004. Table 3 = Full depth generic site condition standards in a non-potable ground water condition.

2) Soil remediation standards for Industrial/Commercial/Community land use, medium and fine textured soil.

bold/highlight = indicates concentrations which exceed CCME Standards and Guidelines.

underline = indicates concentrations which exceed MOE Table 3 Standards.

(3) = Method Detection Limit greater than CCME criteria.

Table C.2 - Groundwater Analytical Results - Petroleum Hydrocarbons (PHC) and BTEX Parameters

Parameter	MDL (µg/L)	CCME	MOE Table 3	MW1			MW6		
Date Sampled >				23-Jun-05	21-Jun-06	20-Sep-07	23-Jun-05	21-Jun-06	20-Sep-07
Petroleum Hydrocarbons									
F1 (C6-C10)	200	NV	NV[a]	ND	ND	ND	ND	9,000	4,610
F2 (>C10-C16)	100	NV	NV[a]	2500	6,100	623	700	1,000	1,140
F3 (>C16-C34)	100	NV	NV[a]	1300	3,800	645	ND	200	ND
F4 (>C34)	100	NV	NV[a]	600	ND	ND	ND	ND	ND
BTEX									
Benzene	0.5	5.0	12,000	**34**	ND	ND	**2000**	**8,000**	**5,300**
Toluene	0.5	24*	37,000	ND	ND	ND	ND	**350**	**139**
Ethylbenzene	0.5	2.4*	50,000	ND	ND	ND	ND	ND	ND (50)
m/p-Xylene	0.5	NV	NV	ND	ND	ND	ND	1,500	3,220
o-Xylenes	0.5	NV	NV	0.5	ND	ND	80	980	980
Total Xylenes	NV	300*	35,000	0.5	ND	ND	80	**2,480**	**4,200**

Notes:

All units are µg/L unless otherwise noted.

MDL = Method Detection Limit.
NV = No Value.
ND = Not Detected above MDL.
-- = Not Analysed.
CCME = Canadian Council of Ministers of the Environment. Canadian Environment Quality Guidelines, Chapter 2 - Community Water Use, 1999 (updates to 2007)
* = CCME Aesthetic Objective
MOE = Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act, March 2004.
Table 3 = Full depth generic site condition standards in a non-potable ground water condition for all types of property use, medium and fine textured soils.
a = For a site to meet this standard, there must be no evidence of free product, including but not limited to, visible petroleum hydrocarbon film or sheen present on groundwater, surface water or in any groundwater or surface water samples.
bold/highlight = indicates concentrations which exceed CCME Standards and Guidelines.
underline = indicates concentrations which exceed MOE Table 3 Standards.

Table C.2 - Groundwater Analytical Results - Petroleum Hydrocarbons (PHC) and BTEX Parameters (continued)

Parameter	MDL (µg/L)	CCME	MOE Table 3	MW18		MW19		MW20		MW21	
Date Sampled >				21-Jun-06	20-Sep-07	21-Jun-06	20-Sep-07	21-Jun-06	20-Sep-07	21-Jun-06	20-Sep-07
Petroleum Hydrocarbons											
F1 (C6-C10)	200	NV	NV[a]	ND	ND	ND	ND	ND	ND	ND	ND
F2 (>C10-C16)	100	NV	NV[a]	ND	ND	ND	ND	ND	ND	ND	ND
F3 (>C16-C34)	100	NV	NV[a]	ND	ND	ND	ND	ND	ND	ND	ND
F4 (>C34)	100	NV	NV[a]	ND	ND	ND	ND	ND	ND	ND	ND
BTEX											
Benzene	0.5	5.0	12,000	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	0.5	24*	37,000	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	0.5	2.4*	50,000	ND	ND	ND	ND	ND	ND	ND	ND
m/p-Xylene	0.5	NV	NV	ND	ND	ND	ND	ND	ND	ND	ND
o-Xylenes	0.5	NV	NV	ND	ND	ND	ND	ND	ND	ND	ND
Total Xylenes	NV	300*	35,000	ND	ND	ND	ND	ND	ND	ND	ND

Notes:

All units are µg/L unless otherwise noted.

MDL = Method Detection Limit.
NV = No Value.
ND = Not Detected above MDL.
-- = Not Analysed.
CCME = Canadian Council of Ministers of the Environment. Canadian Environment Quality Guidelines, Chapter 2 - Community Water Use, 1999 (updates to 2007)
* = CCME Aesthetic Objective
MOE = Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act, March 2004.
Table 3 = Full depth generic site condition standards in a non-potable ground water condition for all types of property use, medium and fine textured soils.
a = For a site to meet this standard, there must be no evidence of free product, including but not limited to, visible petroleum hydrocarbon film or sheen present on groundwater, surface water or in any groundwater or surface water samples.
bold/highlight = indicates concentrations which exceed CCME Standards and Guidelines.
underline = indicates concentrations which exceed MOE Table 3 Standards.

Table C.2 - Groundwater Analytical Results - Petroleum Hydrocarbons (PHC) and BTEX Parameters (continued)

Parameter	MDL (µg/L)	CCME	MOE Table 3	MW24		MW28	MW31	MW34
Date Sampled >				20-Sep-07	Duplicate 20-Sep-07	20-Sep-07	20-Sep-07	20-Sep-07
Petroleum Hydrocarbons								
F1 (C6-C10)	200	NV	NV[a]	ND	ND	ND	ND	ND
F2 (>C10-C16)	100	NV	NV[a]	ND	ND	ND	ND	ND
F3 (>C16-C34)	100	NV	NV[a]	ND	ND	ND	ND	ND
F4 (>C34)	100	NV	NV[a]	ND	ND	ND	ND	ND
BTEX								
Benzene	0.5	5.0	12,000	ND	ND	ND	ND	ND
Toluene	0.5	24*	37,000	ND	ND	ND	ND	ND
Ethylbenzene	0.5	2.4*	50,000	ND	ND	ND	ND	ND
m/p-Xylene	0.5	NV	NV	ND	ND	ND	ND	ND
o-Xylenes	0.5	NV	NV	ND	ND	ND	ND	ND
Total Xylenes	NV	300*	35,000	ND	ND	ND	ND	ND

Notes:

All units are µg/L unless otherwise noted.

MDL = Method Detection Limit.
NV = No Value.
ND = Not Detected above MDL.
-- = Not Analysed.
CCME = Canadian Council of Ministers of the Environment. Canadian Environment Quality Guidelines, Chapter 2 - Community Water Use, 1999 (updates to 2007)
* = CCME Aesthetic Objective
MOE = Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act, March 2004.
Table 3 = Full depth generic site condition standards in a non-potable ground water condition for all types of property use, medium and fine textured soils.
a = For a site to meet this standard, there must be no evidence of free product, including but not limited to, visible petroleum hydrocarbon film or sheen present on groundwater, surface water or in any groundwater or surface water samples.
bold/highlight = indicates concentrations which exceed CCME Standards and Guidelines.
underline = indicates concentrations which exceed MOE Table 3 Standards.

Table C.3 - Storm Sewer Analytical Results - Petroleum Hydrocarbons (PHC) and BTEX Parameters

Parameter Date Sampled >	MDL (µg/L)	CCME	PWQO	CB7 19-Oct-07	CB12 19-Oct-07	CB12B 19-Oct-07
Petroleum Hydrocarbons						
F1 (C6-C10)	200	NV	NV	ND	ND	ND
F2 (>C10-C16)	100	NV	NV	ND	ND	ND
F3 (>C16-C34)	100	NV	NV	ND	ND	ND
F4 (>C34)	100	NV	NV	ND	ND	ND
BTEX						
Benzene	0.5	370	100	ND	ND	ND
Toluene	0.5	2	0.8	ND	ND	ND
Ethylbenzene	0.5	90	8	ND	ND	ND
m-Xylene	0.5	NV	2	ND	ND	ND
p-Xylene	0.5	NV	30	ND	ND	ND
o-Xylenes	0.5	NV	40	ND	ND	ND
Total Xylenes	NV	NV	NV	ND	ND	ND

Notes:

All units are µg/L unless otherwise noted.

MDL = Method Detection Limit.

NV = No Value.

ND = Not Detected above MDL.

-- = Not Analysed.

CCME = Canadian Council of Ministers of the Environment. Canadian Environment Quality Guidelines, Chapter 4 - Protection of Freshwater Aquatic Life, 199 (Updates to 2007)

PWQO = Provincial Water Quality Objectives for Ontario, MOE, 1994.

bold/highlight = indicates concentrations which exceed CCME Standards.

underline = indicates concentrations which exceed PWQO Table 3 Standards.

APPENDIX D

Site Photographs

Header House Former UST Area, looking southwest

Former UST Area and Former AST Pad, looking northwest

Header House and Former UST Area, looking south

Former UST Area, looking west

SLRA and Remedial Option Feasibility Study – 16 Tauvette St.

Photos Taken on June 14, 2005 and June 6, 2006

APPENDIX E

Laboratory Analytical Reports

PARACEL LABORATORIES LTD.

300-2319 St. Laurent Blvd.
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f: (613) 731-9064
e: paracel@paracellabs.com
www.paracellabs.com

Certificate of Analysis

INTERA Engineering Ltd.

Suite 200, 1 Raymond St.
Ottawa, ON K1R 1A2
Attn: Steve Wegner

Phone: (613) 232-2525
Fax: (613) 232-7149

Client PO:
Project: 05-215-34
Custody: 31257

Report Date: 17-Sep-2007
Order Date: 11-Sep-2007
Order #: 7370044

This Certificate of Analysis contains analytical data applicable to the following samples submitted:

Paracel ID	Client ID
7370044-01	BH22-4
7370044-02	BH23-7
7370044-03	BH24-2
7370044-04	BH25-2
7370044-05	BH27-3
7370044-06	BH28-2
7370044-07	BH29-3
7370044-08	BH30-2
7370044-09	BH31-2
7370044-10	BH33-3
7370044-11	TP4-1
7370044-12	TP8-2
7370044-13	BHD

Approved By: Mark Foto

Mark Foto, M.Sc. For Dale Robertson, BSc
Laboratory Director

PARACEL LABORATORIES LTD.

Order #: 7370044

Certificate of Analysis

Report Date: 17-Sep-2007

Order Date:11-Sep-2007

Client: **INTERA Engineering Ltd.**

Client PO: Project Description: 05-215-34

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
BTEX	EPA 8260 - P&T GC-MS	12-Sep-07	13-Sep-07
CCME PHC F1	CWS Tier 1 - P&T GC-FID	12-Sep-07	13-Sep-07
CCME PHC F2 - F4	CWS Tier 1 - GC-FID, extraction	15-Sep-07	15-Sep-07
Solids, Dry Weight	Gravimetric, calculation	11-Sep-07	11-Sep-07

PARACEL LABORATORIES LTD.

Order #: 7370044

Certificate of Analysis

Report Date: 17-Sep-2007

Order Date:11-Sep-2007

Client: **INTERA Engineering Ltd.**

Client PO:

Project Description: 05-215-34

	Client ID:	BH22-4	BH23-7	BH24-2	BH25-2
	Sample Date:	11-Sep-07	11-Sep-07	11-Sep-07	11-Sep-07
	Sample ID:	7370044-01	7370044-02	7370044-03	7370044-04
	MDL/Units	Soil	Soil	Soil	Soil
Physical Characteristics					
% Solids	0.1 % by Wt.	68.0	60.2	69.6	67.9
Volatiles					
Benzene	0.03 ug/g dry	<0.03	<0.03	<0.03	<0.03
Ethylbenzene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Toluene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
m,p-Xylenes	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
o-Xylene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Toluene-d8	Surrogate	102%	100%	104%	104%
Hydrocarbons					
F1 PHCs (C6-C10)	20 ug/g dry	<20	<20	<20	<20
F2 PHCs (C10-C16)	10 ug/g dry	<10	<10	<10	<10
F3 PHCs (C16-C34)	10 ug/g dry	<10	<10	<10	<10
F4 PHCs (C34-C50)	10 ug/g dry	<10	<10	<10	<10

	Client ID:	BH27-3	BH28-2	BH29-3	BH30-2
	Sample Date:	11-Sep-07	11-Sep-07	11-Sep-07	11-Sep-07
	Sample ID:	7370044-05	7370044-06	7370044-07	7370044-08
	MDL/Units	Soil	Soil	Soil	Soil
Physical Characteristics					
% Solids	0.1 % by Wt.	67.4	70.6	71.8	71.8
Volatiles					
Benzene	0.03 ug/g dry	<0.03	<0.03	<0.03	<0.03
Ethylbenzene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Toluene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
m,p-Xylenes	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
o-Xylene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Toluene-d8	Surrogate	103%	107%	102%	102%
Hydrocarbons					
F1 PHCs (C6-C10)	20 ug/g dry	<20	<20	<20	<20
F2 PHCs (C10-C16)	10 ug/g dry	<10	10	<10	23
F3 PHCs (C16-C34)	10 ug/g dry	<10	<10	<10	67
F4 PHCs (C34-C50)	10 ug/g dry	<10	<10	<10	<10

PARACEL LABORATORIES LTD.

Order #: 7370044

Certificate of Analysis

Report Date: 17-Sep-2007

Order Date:11-Sep-2007

Client: **INTERA Engineering Ltd.**

Client PO:

Project Description: 05-215-34

	Client ID:	BH31-2	BH33-3	TP4-1	TP8-2
	Sample Date:	11-Sep-07	11-Sep-07	11-Sep-07	11-Sep-07
	Sample ID:	7370044-09	7370044-10	7370044-11	7370044-12
	MDL/Units	Soil	Soil	Soil	Soil
Physical Characteristics					
% Solids	0.1 % by Wt.	69.0	87.2	71.1	67.9
Volatiles					
Benzene	0.03 ug/g dry	<0.03	<0.03	<0.03	<0.03
Ethylbenzene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Toluene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
m,p-Xylenes	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
o-Xylene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Toluene-d8	Surrogate	102%	103%	105%	102%
Hydrocarbons					
F1 PHCs (C6-C10)	20 ug/g dry	<20	<20	<20	<20
F2 PHCs (C10-C16)	10 ug/g dry	10	<10	<10	<10
F3 PHCs (C16-C34)	10 ug/g dry	<10	<10	<10	<10
F4 PHCs (C34-C50)	10 ug/g dry	<10	<10	<10	<10

	Client ID:	BHD	-	-	-
	Sample Date:	11-Sep-07	-	-	-
	Sample ID:	7370044-13	-	-	-
	MDL/Units	Soil	-	-	-
Physical Characteristics					
% Solids	0.1 % by Wt.	67.6	-	-	-
Volatiles					
Benzene	0.03 ug/g dry	<0.03	-	-	-
Ethylbenzene	0.05 ug/g dry	<0.05	-	-	-
Toluene	0.05 ug/g dry	<0.05	-	-	-
m,p-Xylenes	0.05 ug/g dry	<0.05	-	-	-
o-Xylene	0.05 ug/g dry	<0.05	-	-	-
Toluene-d8	Surrogate	103%	-	-	-
Hydrocarbons					
F1 PHCs (C6-C10)	20 ug/g dry	<20	-	-	-
F2 PHCs (C10-C16)	10 ug/g dry	<10	-	-	-
F3 PHCs (C16-C34)	10 ug/g dry	<10	-	-	-
F4 PHCs (C34-C50)	10 ug/g dry	<10	-	-	-

Certificate of Analysis

Report Date: 17-Sep-2007

Order Date:11-Sep-2007

Client: **INTERA Engineering Ltd.**

Client PO: Project Description: 05-215-34

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	20	ug/g						
F2 PHCs (C10-C16)	ND	10	ug/g						
F3 PHCs (C16-C34)	ND	10	ug/g						
F4 PHCs (C34-C50)	ND	10	ug/g						
Volatiles									
Benzene	ND	0.03	ug/g						
Ethylbenzene	ND	0.05	ug/g						
Toluene	ND	0.05	ug/g						
m,p-Xylenes	ND	0.05	ug/g						
o-Xylene	ND	0.05	ug/g						
Surrogate: Toluene-d8	*8.22*		*ug/g*		*103*	*76-118*			

Certificate of Analysis

Report Date: 17-Sep-2007

Order Date:11-Sep-2007

Client: **INTERA Engineering Ltd.**

Client PO: Project Description: 05-215-34

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	20	ug/g dry	ND				32	
F2 PHCs (C10-C16)	34	10	ug/g dry	26			29.1	50	
F3 PHCs (C16-C34)	101	10	ug/g dry	80			23.6	50	
F4 PHCs (C34-C50)	34	10	ug/g dry	24			35.4	50	
Volatiles									
Benzene	ND	0.03	ug/g dry	ND				50	
Ethylbenzene	ND	0.05	ug/g dry	ND				34	
Toluene	ND	0.05	ug/g dry	ND				32	
m,p-Xylenes	ND	0.05	ug/g dry	ND				35	
o-Xylene	ND	0.05	ug/g dry	ND				50	
Surrogate: Toluene-d8	*9.18*		*ug/g dry*	*ND*	*103*	*76-118*			

Certificate of Analysis

Report Date: 17-Sep-2007

Order Date:11-Sep-2007

Client: **INTERA Engineering Ltd.**

Client PO: Project Description: 05-215-34

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	94	20	ug/g	ND	93.8	80-120			
F2 PHCs (C10-C16)	101	10	ug/g	ND	126	61-129			
F3 PHCs (C16-C34)	204	10	ug/g	ND	102	61-129			
F4 PHCs (C34-C50)	105	10	ug/g	ND	87.5	61-129			
Volatiles									
Benzene	0.504	0.03	ug/g	ND	136	55-141			
Ethylbenzene	4.01	0.05	ug/g	ND	107	61-139			
Toluene	17.0	0.05	ug/g	ND	108	54-136			
m,p-Xylenes	12.8	0.05	ug/g	ND	100	61-139			
o-Xylene	5.32	0.05	ug/g	ND	106	60-142			
Surrogate: Toluene-d8	*8.22*		*ug/g*		*103*	*76-118*			

Certificate of Analysis

Report Date: 17-Sep-2007
Order Date:11-Sep-2007

Client: **INTERA Engineering Ltd.**

Client PO: Project Description: 05-215-34

Sample Data Revisions

None

Work Order Revisions/Comments:

None

Other Report Notes:

n/a: not applicable

MDL: Method Detection Limit

Source Result: Data used as source for matrix and duplicate samples

%REC: Percent recovery.

RPD: Relative percent difference.

Soil results are reported on a dry weight basis when the units are denoted with 'dry'.

CCME PHC additional information:

- The method for the analysis of PHCs complies with the Reference Method for the CWS PHC and is validated for use in the laboratory. All prescribed quality criteria identified in the method has been met.
- F1 range corrected for BTEX.
- F2 to F3 ranges corrected for appropriate PAHs where available.
- The gravimetric heavy hydrocarbons (F4G) are not to be added to C6 to C50 hydrocarbons.
- In the case where F4 and F4G are both reported, the greater of the two results is to be used for comparison to CWS PHC criteria.

PARACEL Laboratories Ltd.
Environmental & Indoor Air Quality

300-2319 St. Laurent Blvd., Ottawa, ON K1G 4J8
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Toll Free: (800) 749-1947 email: paracel@paracellabs.com

Chain of Custody Record
№ 31257
Pg. 1 of 2

Contact: Steve Wegner
Company: INTERA Engineering Ltd.
Address: 1 Raymond St., Suite 20
Ottawa, ON K1R 1A2
Tel: 613-232-2525 Fax: 613-232-7149

Project Ref: 05-215-34
PO #:
Quote #: ☐Not Quoted
Email: swegner@intera.com
Preservative to be added by Paracel? ☐Yes ☐No

REPORTING REQUIREMENTS
[ ] Hard Copy [✓] Email – PDF
[ ] FAX [ ] Email - spreadsheet

TURN AROUND TIME
[ ] 1-day [ ] 2-day [✓] Regular

REGULATORY/GUIDELINE REQUIREMENTS
CCME + MOE TABLE 3

Matrix Types: S–Soil/Sed GW–Ground Water SW–Surface Water SS–Storm/Sanitary Sewer A-Air O-Other

Paracel Order #	Sample Identification	Matrix	# Bottles	Date Sampled d/m/y	Analysis Required: PAH (A-PA)	Analysis Required: BTEX
7370044						
1	BH22-4	Soil	1	10-Sept-07	✓	✓
2	BH 23-7				✓	✓
3	BH 24-2				✓	✓
4	BH25-2				✓	✓
5	BH 27-3				✓	✓
6	BH28-2				✓	✓
7	BH 29-3				✓	✓
8	BH 30-2				✓	✓
9	BH31-2				✓	✓
10	BH33-3				✓	✓

Comments:

Relinquished by: N. Pyykkonen
Date: 11-Sept-07 Time: pm

Received by: D. BLOOM
Date: Sept 11, 07 Time: 3:00

Verified by: D BLOOM
Date: Sept 11, 07 Time: 3:53

PARACEL Laboratories Ltd.
Environmental & Indoor Air Quality

300-2319 St. Laurent Blvd., Ottawa, ON K1G 4J8
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Toll Free: (800) 749-1947 email: paracel@paracellabs.com

Chain of Custody Record
№ 31258
Pg 2 of 2

Contact: Steve Wegner
Company: INTERA ENGINEERING
Address: 1 Raymond St, Suite 200
Ottawa, ON K1R 1A2
Tel: 613-232-2525 Fax: 613-232-7149

Project Ref: 05-215-34
PO #:
Quote #: ☐Not Quoted
Email: swegner@intera.com
Preservative to be added by Paracel? ☐Yes ☐No

REPORTING REQUIREMENTS
[ ] Hard Copy [X] ~~Email~~ - PDF
[ ] FAX [ ] Email - spreadsheet

TURN AROUND TIME
[ ] 1-day [ ] 2-day [X] ~~Regular~~

REGULATORY/GUIDELINE REQUIREMENTS
CCME + MOE TABLE 3

Matrix Types: S–Soil/Sed GW–Ground Water SW–Surface Water SS–Storm/Sanitary Sewer A-Air O-Other

	Paracel Order # 7370044 / Sample Identification	Matrix	# Bottles	Date Sampled d/m/y	PHC (F1-F4)	BTEX
1	TP 4-1	Soil	1	7-Sept-07	✓	✓
2	TP8-2	↓	↓	7-Sept-07	✓	✓
3	BHD	↓	↓	10-Sept-07	✓	✓
4						
5						
6						
7						
8						
9						
10						

Comments:

Relinquished by: N. Pythoud
Date: 14 Sept-07 Time: pm

Received by: D. Bloom
Date: Sept 14, 07 Time: 3:00

Verified by: [illegible]
Date: Sept 14 07 Time: 3:07

PARACEL LABORATORIES LTD.

300-2319 St. Laurent Blvd.
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Certificate of Analysis

INTERA Engineering Ltd.

Suite 200, 1 Raymond St.
Ottawa, ON K1R 1A2
Attn: Steve Wegner

Phone: (613) 232-2525
Fax: (613) 232-7149

Client PO:
Project: 05-215-34
Custody: 36675,76

Report Date: 27-Sep-2007
Order Date: 20-Sep-2007
Order #: 7380089

This Certificate of Analysis contains analytical data applicable to the following samples submitted:

Paracel ID	Client ID
7380089-01	MW1
7380089-02	MW6
7380089-03	MW18
7380089-04	MW19
7380089-05	MW20
7380089-06	MW21
7380089-07	MW24
7380089-08	MW28
7380089-09	MW31
7380089-10	MW34
7380089-11	MWD

Approved By: Mark Foto

Mark Foto, M.Sc. For Dale Robertson, BSc
Laboratory Director

Certificate of Analysis

Report Date: 27-Sep-2007

Order Date:20-Sep-2007

Client: **INTERA Engineering Ltd.**

Client PO:

Project Description: 05-215-34

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
BTEX	EPA 624 - P&T GC-MS	21-Sep-07	22-Sep-07
CCME PHC F1	CWS Tier 1 - P&T GC-FID	21-Sep-07	26-Sep-07
CCME PHC F2 - F4	CWS Tier 1 - GC-FID, extraction	22-Sep-07	23-Sep-07

PARACEL LABORATORIES LTD.

Order #: 7380089

Certificate of Analysis

Report Date: 27-Sep-2007
Order Date:20-Sep-2007

Client: **INTERA Engineering Ltd.**

Client PO: Project Description: 05-215-34

	Client ID:	MW1	MW6	MW18	MW19
	Sample Date:	20-Sep-07	20-Sep-07	20-Sep-07	20-Sep-07
	Sample ID:	7380089-01	7380089-02	7380089-03	7380089-04
	MDL/Units	Water	Water	Water	Water
Volatiles					
Benzene	0.5 ug/L	<0.5	5300	<0.5	<0.5
Ethylbenzene	0.5 ug/L	<0.5	<50.0 [1]	<0.5	<0.5
Toluene	0.5 ug/L	<0.5	139	<0.5	<0.5
m,p-Xylenes	0.5 ug/L	<0.5	3220	<0.5	<0.5
o-Xylene	0.5 ug/L	<0.5	980	<0.5	<0.5
Toluene-d8	Surrogate	99.5%	89.8%	93.7%	91.5%
Hydrocarbons					
F1 PHCs (C6-C10)	200 ug/L	<200	4610	<200	<200
F2 PHCs (C10-C16)	100 ug/L	623	1140	<100	<100
F3 PHCs (C16-C34)	100 ug/L	645	<100	<100	<100
F4 PHCs (C34-C50)	100 ug/L	<100	<100	<100	<100

	Client ID:	MW20	MW21	MW24	MW28
	Sample Date:	20-Sep-07	20-Sep-07	20-Sep-07	20-Sep-07
	Sample ID:	7380089-05	7380089-06	7380089-07	7380089-08
	MDL/Units	Water	Water	Water	Water
Volatiles					
Benzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Toluene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
m,p-Xylenes	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
o-Xylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Toluene-d8	Surrogate	88.6%	91.3%	89.2%	89.2%
Hydrocarbons					
F1 PHCs (C6-C10)	200 ug/L	<200	<200	<200	<200
F2 PHCs (C10-C16)	100 ug/L	<100	<100	<100	<100
F3 PHCs (C16-C34)	100 ug/L	<100	<100	<100	<100
F4 PHCs (C34-C50)	100 ug/L	<100	<100	<100	<100

PARACEL LABORATORIES LTD.

Order #: 7380089

Certificate of Analysis

Report Date: 27-Sep-2007
Order Date:20-Sep-2007

Client: **INTERA Engineering Ltd.**

Client PO: Project Description: 05-215-34

	Client ID:	MW31	MW34	MWD	-
	Sample Date:	20-Sep-07	20-Sep-07	20-Sep-07	-
	Sample ID:	7380089-09	7380089-10	7380089-11	-
	MDL/Units	Water	Water	Water	-
Volatiles					
Benzene	0.5 ug/L	<0.5	<0.5	<0.5	-
Ethylbenzene	0.5 ug/L	<0.5	<0.5	<0.5	-
Toluene	0.5 ug/L	<0.5	<0.5	<0.5	-
m,p-Xylenes	0.5 ug/L	<0.5	<0.5	<0.5	-
o-Xylene	0.5 ug/L	<0.5	<0.5	<0.5	-
Toluene-d8	Surrogate	89.9%	101%	89.0%	-
Hydrocarbons					
F1 PHCs (C6-C10)	200 ug/L	<200	<200	<200	-
F2 PHCs (C10-C16)	100 ug/L	<100	<100	<100	-
F3 PHCs (C16-C34)	100 ug/L	<100	<100	<100	-
F4 PHCs (C34-C50)	100 ug/L	<100	<100	<100	-

Certificate of Analysis

Report Date: 27-Sep-2007
Order Date:20-Sep-2007

Client: **INTERA Engineering Ltd.**

Client PO: Project Description: 05-215-34

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	200	ug/L						
F2 PHCs (C10-C16)	ND	100	ug/L						
F3 PHCs (C16-C34)	ND	100	ug/L						
F4 PHCs (C34-C50)	ND	100	ug/L						
Volatiles									
Benzene	ND	0.5	ug/L						
Ethylbenzene	ND	0.5	ug/L						
Toluene	ND	0.5	ug/L						
m,p-Xylenes	ND	0.5	ug/L						
o-Xylene	ND	0.5	ug/L						
Surrogate: Toluene-d8	*81.6*		*ug/L*		*102*	*76-118*			

Certificate of Analysis

Report Date: 27-Sep-2007
Order Date:20-Sep-2007

Client: **INTERA Engineering Ltd.**

Client PO: Project Description: 05-215-34

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	200	ug/L	ND				32	
Volatiles									
Benzene	2.78	0.5	ug/L	2.72			2.2	20	
Ethylbenzene	0.69	0.5	ug/L	0.85			20.8	35	
Toluene	4.25	0.5	ug/L	4.74			10.9	30	
m,p-Xylenes	3.12	0.5	ug/L	3.61			14.6	34	
o-Xylene	1.11	0.5	ug/L	1.32			17.3	32	
Surrogate: Toluene-d8	*72.7*		*ug/L*	*ND*	*90.8*	*76-118*			

Certificate of Analysis

Report Date: 27-Sep-2007
Order Date:20-Sep-2007

Client: **INTERA Engineering Ltd.**

Client PO: Project Description: 05-215-34

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	1930	200	ug/L	ND	96.6	68-117			
F2 PHCs (C10-C16)	1850	100	ug/L	ND	116	61-129			
F3 PHCs (C16-C34)	4240	100	ug/L	ND	106	61-129			
F4 PHCs (C34-C50)	2320	100	ug/L	ND	96.5	61-129			
Volatiles									
Benzene	42.6	0.5	ug/L	ND	107	55-141			
Ethylbenzene	42.8	0.5	ug/L	ND	107	61-139			
Toluene	47.0	0.5	ug/L	ND	118	54-136			
m,p-Xylenes	87.8	0.5	ug/L	ND	110	61-139			
o-Xylene	42.2	0.5	ug/L	ND	105	60-142			
Surrogate: Toluene-d8	*75.0*		*ug/L*		*93.7*	*76-118*			

Certificate of Analysis

Report Date: 27-Sep-2007

Order Date:20-Sep-2007

Client: **INTERA Engineering Ltd.**

Client PO: Project Description: 05-215-34

Sample and QC Qualifiers Notes

1- GEN07 : Elevated detection limit because of dilution required due to high target analyte concentration.

Sample Data Revisions

None

Work Order Revisions/Comments:

None

Other Report Notes:

n/a: not applicable

MDL: Method Detection Limit

Source Result: Data used as source for matrix and duplicate samples

%REC: Percent recovery.

RPD: Relative percent difference.

CCME PHC additional information:

- The method for the analysis of PHCs complies with the Reference Method for the CWS PHC and is validated for use in the laboratory. All prescribed quality criteria identified in the method has been met.
- F1 range corrected for BTEX.
- F2 to F3 ranges corrected for appropriate PAHs where available.
- The gravimetric heavy hydrocarbons (F4G) are not to be added to C6 to C50 hydrocarbons.
- In the case where F4 and F4G are both reported, the greater of the two results is to be used for comparison to CWS PHC criteria.

PARACEL Laboratories Ltd.
Environmental & Indoor Air Quality

300-2319 St. Laurent Blvd., Ottawa, ON K1G 4J8
Tel: (613) 731-9577 Fax: (613) 731-9064
Toll Free: (800) 749-1947 email: paracel@paracellabs.com

Chain of Custody Record

№ 36676 Pg 2 of 2

Contact: Steve Wegner
Company: INTERA Engineering Ltd
Address: 1 Raymond St., Suite 200
Ottawa, ON K1R 1A2
Tel: 613-232-2525 Fax: 613-232-7149

Project Ref: 05-215-34
PO #:
Quote #: ☐Not Quoted
Email: swegner@intera.com
Preservative to be added by Paracel? ☐Yes ☐No

REPORTING REQUIREMENTS
[ ] Hard Copy [✓] Email – PDF
[ ] FAX [ ] Email - spreadsheet

TURN AROUND TIME
[ ] 1-day [ ] 2-day [✓] Regular

REGULATORY/GUIDELINE REQUIREMENTS
CCME + MOE TABLE 3

Matrix Types: S–Soil/Sed GW–Ground Water SW–Surface Water SS–Storm/Sanitary Sewer A-Air O-Other

Paracel Order #	Sample Identification	Matrix	# Bottles	Date Sampled d/m/y	Analysis Required: PHC (F1-F4)	BTEX
7380087						
1	MW3	GW	3	20/Sept/07	✓	✓
2						
3						
4						
5						
6						
7						
8						
9						
10						

Comments:

Relinquished by: N. Rykhoven
Date: 20-Sept-07 Time: 11:00

Received by: [illegible]
Date: Sept 20/07 Time: 11:00

Verified by: D. Bloom
Date: Sept 20/07 Time: 12:26

PARACEL Laboratories Ltd.
Environmental & Indoor Air Quality

300-2319 St. Laurent Blvd., Ottawa, ON K1G 4J8
Tel: (613) 731-9577 Fax: (613) 731-9064
Toll Free: (800) 749-1947 email: paracel@paracellabs.com

Chain of Custody Record

№ 36675 Pg 1 of 2

Contact: Steve Wegner
Company: INTERA Engineering Ltd
Address: 1 Raymond St., Suite 200
Ottawa, ON K1R 1A2
Tel: 613-232-2525 Fax: 613-232-7149

Project Ref: 05-215-54
PO #:
Quote #: ☐Not Quoted
Email: swegner@intera.com
Preservative to be added by Paracel? ☐Yes ☐No

REPORTING REQUIREMENTS
[ ] Hard Copy [ ] ~~Email~~ PDF
[ ] FAX [ ] Email - spreadsheet

TURN AROUND TIME
[ ] 1-day [ ] 2-day [ ] Regular

REGULATORY/GUIDELINE REQUIREMENTS
CCME + MOE TABLE 3

Matrix Types: S–Soil/Sed GW–Ground Water SW–Surface Water SS–Storm/Sanitary Sewer A-Air O-Other

Paracel Order #: 7380089

	Sample Identification	Matrix	# Bottles	Date Sampled d/m/y	PHC (F1-F4)	BTEX
1	MW1	GW	3	20/Sept/07	✓	✓
2	MW6				✓	✓
3	MW18				✓	✓
4	MW19				✓	✓
5	MW20				✓	✓
6	MW21				✓	✓
7	MW24				✓	✓
8	MW28				✓	✓
9	MW31				✓	✓
10	MW34				✓	✓

Comments:

Relinquished by: N. Pyykonen
Date: 20-Sept-07 Time: 11:00

Received by: D. Bloom
Date: 20 Sept 07 Time: 11:00

Verified by: D Bloom
Date: 20/09/07 Time: 12:26

PARACEL LABORATORIES LTD.

300-2319 St. Laurent Blvd.
Ottawa, ON K1G 4J8
p: (613) 731-9577
f: (613) 731-9064
e: paracel@paracellabs.com
www.paracellabs.com

Certificate of Analysis

INTERA Engineering Ltd.

Suite 200, 1 Raymond St.
Ottawa, ON K1R 1A2
Attn: Steve Wegner

Phone: (613) 232-2525
Fax: (613) 232-7149

Client PO:
Project: 05-215-34
Custody: 36677

Report Date: 24-Oct-2007
Order Date: 19-Oct-2007
Order #: 7420156

This Certificate of Analysis contains analytical data applicable to the following samples submitted:

Paracel ID	Client ID
7420156-01	CB7
7420156-02	CB12
7420156-03	CB12B

Approved By: Mark Foto

Mark Foto, M.Sc. For Dale Robertson, BSc
Laboratory Director

Certificate of Analysis

Report Date: 24-Oct-2007

Order Date:19-Oct-2007

Client: **INTERA Engineering Ltd.**

Client PO:

Project Description: 05-215-34

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
BTEX	EPA 624 - P&T GC-MS	19-Oct-07	22-Oct-07
CCME PHC F1	CWS Tier 1 - P&T GC-FID	19-Oct-07	22-Oct-07
CCME PHC F2 - F4	CWS Tier 1 - GC-FID, extraction	23-Oct-07	24-Oct-07

PARACEL LABORATORIES LTD.

Order #: 7420156

Certificate of Analysis

Report Date: 24-Oct-2007

Order Date:19-Oct-2007

Client: **INTERA Engineering Ltd.**

Client PO:

Project Description: 05-215-34

	Client ID:	CB7	CB12	CB12B	-
	Sample Date:	19-Oct-07	19-Oct-07	19-Oct-07	-
	Sample ID:	7420156-01	7420156-02	7420156-03	-
	MDL/Units	Water	Water	Water	-
Volatiles					
Benzene	0.5 ug/L	<0.5	<0.5	<0.5	-
Ethylbenzene	0.5 ug/L	<0.5	<0.5	<0.5	-
Toluene	0.5 ug/L	<0.5	<0.5	<0.5	-
m,p-Xylenes	0.5 ug/L	<0.5	<0.5	<0.5	-
o-Xylene	0.5 ug/L	<0.5	<0.5	<0.5	-
Toluene-d8	Surrogate	86.8%	84.3%	87.4%	-
Hydrocarbons					
F1 PHCs (C6-C10)	200 ug/L	<200	<200	<200	-
F2 PHCs (C10-C16)	100 ug/L	<100	<100	<100	-
F3 PHCs (C16-C34)	100 ug/L	<100	<100	<100	-
F4 PHCs (C34-C50)	100 ug/L	<100	<100	<100	-

Certificate of Analysis

Report Date: 24-Oct-2007

Order Date:19-Oct-2007

Client: **INTERA Engineering Ltd.**

Client PO: Project Description: 05-215-34

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	200	ug/L						
F2 PHCs (C10-C16)	ND	100	ug/L						
F3 PHCs (C16-C34)	ND	100	ug/L						
F4 PHCs (C34-C50)	ND	100	ug/L						
Volatiles									
Benzene	ND	0.5	ug/L						
Ethylbenzene	ND	0.5	ug/L						
Toluene	ND	0.5	ug/L						
m,p-Xylenes	ND	0.5	ug/L						
o-Xylene	ND	0.5	ug/L						
Surrogate: Toluene-d8	*81.3*		*ug/L*		*102*	*76-118*			

Certificate of Analysis

Report Date: 24-Oct-2007

Order Date:19-Oct-2007

Client: **INTERA Engineering Ltd.**

Client PO: Project Description: 05-215-34

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	200	ug/L	ND				32	
Volatiles									
Benzene	ND	0.5	ug/L	ND				20	
Ethylbenzene	ND	0.5	ug/L	ND				35	
Toluene	1.19	0.5	ug/L	1.32			10.4	30	
m,p-Xylenes	1.10	0.5	ug/L	1.26			13.6	34	
o-Xylene	0.85	0.5	ug/L	0.74			13.8	32	
Surrogate: Toluene-d8	*70.4*		*ug/L*	*ND*	*88.0*	*76-118*			

Certificate of Analysis

Report Date: 24-Oct-2007

Order Date:19-Oct-2007

Client: **INTERA Engineering Ltd.**

Client PO: Project Description: 05-215-34

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	2040	200	ug/L	ND	102	68-117			
F2 PHCs (C10-C16)	1680	100	ug/L	ND	105	61-129			
F3 PHCs (C16-C34)	4130	100	ug/L	ND	103	61-129			
F4 PHCs (C34-C50)	2580	100	ug/L	ND	108	61-129			
Volatiles									
Benzene	41.8	0.5	ug/L	ND	105	55-141			
Ethylbenzene	33.9	0.5	ug/L	ND	84.8	61-139			
Toluene	39.8	0.5	ug/L	ND	99.5	54-136			
m,p-Xylenes	69.2	0.5	ug/L	ND	86.4	61-139			
o-Xylene	33.1	0.5	ug/L	ND	82.7	60-142			
Surrogate: Toluene-d8	*76.6*		*ug/L*		*95.8*	*76-118*			

Certificate of Analysis

Report Date: 24-Oct-2007

Order Date:19-Oct-2007

Client: **INTERA Engineering Ltd.**

Client PO: Project Description: 05-215-34

Sample Data Revisions

None

Work Order Revisions/Comments:

None

Other Report Notes:

n/a: not applicable

MDL: Method Detection Limit

Source Result: Data used as source for matrix and duplicate samples

%REC: Percent recovery.

RPD: Relative percent difference.

CCME PHC additional information:

- The method for the analysis of PHCs complies with the Reference Method for the CWS PHC and is validated for use in the laboratory. All prescribed quality criteria identified in the method has been met.
- F1 range corrected for BTEX.
- F2 to F3 ranges corrected for appropriate PAHs where available.
- The gravimetric heavy hydrocarbons (F4G) are not to be added to C6 to C50 hydrocarbons.
- In the case where F4 and F4G are both reported, the greater of the two results is to be used for comparison to CWS PHC criteria.

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Toll Free: (800) 749-1947 email: paracel@paracellabs.com

Chain of Custody Record

№ 36677

Pg. 1 of 1

Contact: Steve Wegner
Company: Intera Engineering Ltd
Address: 1 Raymond St., Suite 200
Ottawa, ON K1R 1A2
Tel: 613-232-2525 Fax: 613-232-7149

Project Ref: 05-215-34
PO #:
Quote #: ☐Not Quoted
Email: swegner@intera.com
Preservative to be added by Paracel? ☐Yes ☐No

REPORTING REQUIREMENTS
[ ] Hard Copy [X] Email - PDF
[ ] FAX [ ] Email - spreadsheet

TURN AROUND TIME
[ ] 1-day [ ] 2-day [X] Regular

REGULATORY/GUIDELINE REQUIREMENTS
PWQO & CCME

Matrix Types: S–Soil/Sed GW–Ground Water SW–Surface Water SS–Storm/Sanitary Sewer A-Air O-Other

	Paracel Order # 7420156 / Sample Identification	Matrix	# Bottles	Date Sampled d/m/y	PHC (F1-F4)	BTEX
1	CB7	SW	3	19-Oct-07	✓	✓
2	CB12	SW	3	19-Oct-07	✓	✓
3	CB12B	SW	3	19-Oct-07	✓	✓
4						
5						
6						
7						
8						
9						
10						

Comments:

Relinquished by: N. Pyykonen
Date: 19-Oct-07 Time: PM

Received by: N Corry
Date: Oct 19 Time: 6:02

Verified by: N Corry
Date: Oct 19 Time: 7:04