

## APPENDIX A – SOIL INVESTIGATION REPORT

Submitted To:



**PHASE II ESA**

**849 RAVELSTON AVENUE WEST, WINNIPEG, MANITOBA**



**JUNE 2016**

**FILE NO. 16-217-03**



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## **1.0 INTRODUCTION**

### **1.1 Terms of Reference**

ENG-TECH Consulting Limited (ENG-TECH) was retained by City of Winnipeg to conduct a Phase II Environmental Site Assessment (ESA) near the abandoned Gasoline and Diesel above ground storage tanks (ASTs) and former underground storage tanks (ASTs) at 849 Ravelston Avenue in Winnipeg, Manitoba. The Site is located on Ravelston Avenue northwest of Plessis Road in the City of Winnipeg, Manitoba as shown in Figures 1 and 2, and Photographs 1 to 4 (Appendix B). Assessment is related to the area near the current aboveground diesel and gasoline storage tanks and the former underground storage tanks located to the northwest of the existing building, any previous tanks, pumps, and spillages beyond the areas of the AST's and UST's are outside this scope of work. In this report, the property will subsequently be referred to as the Site with the investigation limited to the area near the tanks as mentioned above.

ENG-TECH received authorization from Jennefer Larson to proceed with the Phase II ESA on May 5, 2016.

### **1.2 Objectives**

The purpose of the Phase II ESA was to further delineate the presence or absence of petroleum hydrocarbons in the soil in the vicinity of current ASTs and pump islands and in the location of the former USTs and pump island. The land use of the Site is currently commercial, and being proposed for redeveloped having a mixture of commercial and residential buildings.

### **1.3 Scope of Work**

The Phase II ESA involved the following:

- Clearance of underground utility services.
- A test hole drilling and soil sampling program for petroleum hydrocarbons, including field testing the soil samples for volatile hydrocarbon vapours and the collection of duplicate soil samples for petroleum hydrocarbon laboratory testing.
- A laboratory soil testing program for petroleum hydrocarbons (benzene, toluene, ethylbenzene, xylene (BTEX), and fractions F1 to F4), glycols, and metals.
- An evaluation of the results.
- An ESA report outlining the work conducted and findings.

### **1.4 Methodology**

The environmental investigation was conducted using guidelines and criteria outlined in publications from American Society for Testing and Materials (ASTM), the Canadian Council of Ministers of the Environment (CCME), Canadian Standards Association and Manitoba Conservation (formerly Manitoba Environment). A bibliography/reference list of the publications is attached.

## **2.0 SITE CONDITIONS**

### **2.1 Site Location and Description**

The Site is located on Ravelston Avenue northwest of Plessis Road in the City of Winnipeg, Manitoba as shown in Figures 1 and 2. The Site is approximately 6,344 square meters in plan, with buildings on Site which are currently unoccupied as the property is scheduled for redevelopment, and registered in the City of Winnipeg under certificate of roll number 04005426500. The remainder of the Site is predominately covered with asphalt and limited grass area as shown in Figure 2.

### **2.2 Site Topography and Drainage**

The Site is relatively flat with surface drainage directed overland to catch basin located throughout the Site and on Ravelston Avenue.

### **2.3 Site Geology and Groundwater**

Local geological maps and water well logs show that the subsurface stratigraphy in this area of Winnipeg normally consists of fill soils (such as topsoil and granular), underlain by lacustrine silt and clay ranging in depth from 9.0 to 12.0 m. A deposit of silty till varying in thickness from 6 to 10 m is typically encountered between the lacustrine deposits and the underlain bedrock. Bedrock in this area of Winnipeg typically consists of dolomite with limestone beds of various thicknesses from the Selkirk Member of the Red River Formation. The bedrock formation was formed from the Paleozoic Era during the Ordovician Period.

Near surface groundwater elevations (perched groundwater) can exist at the Site and throughout the area, and will vary on a seasonal basis and from site to site. Perched groundwater elevations are predominantly controlled by site conditions, such as the type and thickness of fill soils. The near static groundwater elevation is encountered at approximately 6 m below existing grade in the underlain high plasticity lacustrine clay deposits. The near static groundwater elevation is controlled by the underlain bedrock aquifer. There are no aquifers above the bedrock. The potential for impact to the aquifer was considered unlikely due to the thickness of the underlain highly plastic clay deposits.

## **3.0 PHASE II ESA**

### **3.1 Test Hole Drilling**

On May 24, 2016 ENG-TECH supervised the drilling of a total of nine (9) test holes (TH1 to TH9) surrounding the gasoline and diesel AST's and the former UST's located northwest of the AST's. Test holes were drilled to a depth of 3.0 to 4.6 m below existing grade using a track mounted Geoprobe 7822DT drill rig equipped with 125 mm diameter solid stem continuous flight augers, owned and operated by Maple Leaf Drilling Ltd. The test holes were backfilled with the soil auger cuttings and bentonite, upon the completion of drilling. The test hole locations are shown on Figure 2, while stratigraphic logs outlining the soil and groundwater conditions are shown in Appendix A.

### **3.2 Soil Sampling Program**

Duplicate soil samples (set of two) were collected at regular depth intervals and at stratigraphic changes from the test holes, and visually classified using the Unified Soil Classification System

(USCS). One of each duplicate set of soil samples collected was subjected to an Ambient Temperature Headspace (ATH) vapour test using a RKI Eagle calibrated using hexane. Briefly, the procedures used for ATH vapour testing were as follows:

- Collect a soil sample and remove the perimeter edges. Cut the sample into small pieces and place them into a plastic sealable bag.
- Induce air into the bag such that the bag is taught and seal the bag.
- Allow the vapours emanating from the soil to accumulate in the headspace of the bag at an ambient temperature for about 15 minutes.
- Measure the hydrocarbon vapour concentration in the headspace of the bag by placing the probe of the RKI Eagle into the bag.

The remaining duplicate soil sample from each set collected had the perimeters edges removed and the sample examined for the presence of petroleum hydrocarbon odours and staining, and then:

- If the remaining duplicate soil sample had visual signs of petroleum hydrocarbon staining or petroleum hydrocarbon odours detected, then the soil sample was placed in a clean glass jar and sealed with a Teflon lined lid and placed in a cooler packed with ice.
- If no visual signs of staining or odours were detected then the duplicate soil sample was placed in a sealed bag with a minimal volume of air, and then placed in a cooler packed with ice for potential submission for laboratory analysis after review of the ATH vapour concentration.
- The recorded ATH Vapour concentrations for all samples are reviewed, and if the duplicate soil samples with the highest elevated concentrations had not been placed in jars, then the duplicate soil samples in the coolers were removed and the soil from the sealed bags placed in clean glass jars, sealed with Teflon lids and placed back in the cooler packed with ice.

Upon the completion of the field work, the soil samples in jars in the cooler packed with the ice were transported to ENG-TECH's office, then to ALS Laboratory Group in Winnipeg, Manitoba for analytical testing of petroleum hydrocarbons.

### 3.3 Analytical Analyses

ATH vapour concentrations (ppm) collected in the field are reported on the test hole logs, and the readings ranged from zero (0) to 240 ppm. Possible slight hydrocarbon odour and/or staining was observed at TH5, TH6, and TH9.

Eight (8) representative soil samples (based on headspace) were selected and submitted to ALS Laboratory Group (an accredited laboratory) and tested for BTEX and fractions F1 to F4. The results are shown in Tables 1 to 4, while a copy of the results from ALS Laboratory Group is shown in Appendix C.

### 3.4 Remediation Criteria

The results from the analytical analyses were compared to the values outlined in the most recent Canadian Council of the Ministers of the Environment (CCME) publications. The

petroleum hydrocarbons BTEX and fractions F1 to F4 results were compared to the CCME generic and vapour inhalation criteria for commercial land use. Generic criteria for commercial land use would not restrict Site commercial activities. Given the potential for future development of the Site as residential land-use an assessment of the analytical results for BTEX and fractions F1 to F4 following the CCME generic and vapour inhalation criteria for residential land use is warranted.

### **3.5 Discussion**

#### **Stratigraphy**

##### Aboveground Storage Tank and Pump Island

Overall, the stratigraphy at TH1 to TH4 in the vicinity of the AST's consisted of 200 mm thick layer of concrete underlain by a 50 mm thick layer of gravel fill, and was followed by a 965 mm thick layer of clay fill which was underlain by native clay to the depth explored. The gravel fill was medium brown, moist, medium dense, poorly graded, and fine grained, while the clay fill was black, moist, firm, medium plastic, and contained trace silt. The underlying native clay was medium, moist, firm, highly plastic, and contained trace silt.

##### Former Underground Storage Tank Nest

The stratigraphy at TH5 and TH6 consisted of 2.30 to 4.1 m thick layer of pea gravel which was followed by clay to the depth explored, except at TH6 where auger refusal occurred 4.10 m below grade on suspected concrete rubble. The pea gravel encountered was medium brown, moist to wet, loose, poorly graded, medium to fine grained, with a slight hydrocarbon odour detected at 0.8 m below grade. The native clay layer encountered at TH5 at 2.30 m below grade was dark brown, moist, firm, medium plastic, and contained trace silt.

The stratigraphy at TH7 and TH8 consisted of 50 mm thick layer of gravel fill that was underlain by a 1.17 m thick layer of clay fill then native clay to the depth explored. The gravel fill layer was medium brown, moist, medium dense, poorly graded, fine grained while the clay fill layer was dark brown, moist, firm, medium plastic, and contained trace silt. The native clay was dark brown, moist, firm, medium plastic, and contained trace silt.

The stratigraphy at TH9 consisted of a 50 mm thick layer of gravel fill which was followed by a 1.17 m thick layer of clay fill then native clay to the depth explored. The gravel fill and clay fill were similar to what was encountered at TH7 and TH8. The native clay was dark brown, moist, firm, medium plastic, and contained trace silt.

#### **Groundwater**

TH1 to TH4 and TH7 to TH9 were dry and no sloughing was encountered at the time of drilling, while sloughing and seepage was encountered within the pea gravel at TH5 and TH6 at the time of the drilling.

#### **ATH Vapours**

The ATH vapour readings are shown on the test hole summary logs. The vapour concentrations ranged from zero (0) to 240 ppm. slight hydrocarbon odour and/or possible staining was observed at TH5, TH6, and TH9.

### Analytical Results

The petroleum hydrocarbons BTEX and fractions F1 to F4 results were compared to the CCME generic and vapour inhalation criteria for both commercial and residential land use due to the potential for future residential development of the Site. Generic criteria for commercial land use would not restrict Site commercial activities.

In the generic situations for both commercial and residential land use the soil sample from TH4 –S4 at 3 m was over the CCME criterion for benzene and TH5-S2 at 0.8 m was over the F2 criterion as shown on Table 1. When the results were compared to vapour inhalation for commercial and residential both sample results were below the applicable CCME criteria as shown on Tables 2 and 4. The remaining samples collected and analysed for petroleum hydrocarbon were all below the laboratory detection limits and therefore below the applicable commercial and residential CCME guidelines under the generic and vapour inhalation criteria.

### 3.6 Conclusions

Petroleum hydrocarbon concentrations from the soil samples tested from TH4 and TH5 were above select CCME criteria for commercial and residential land uses under the generic situation, but were below the applicable vapour inhalation criteria for both commercial and residential land uses. Therefore, no further action is warranted at this time in the vicinity of the ASTs and former USTs.

Additional sampling and testing can be performed beneath the tanks and pump island during their removal as per the Guideline for Dismantling and Removal of Petroleum Storage Tanks Systems (Manitoba Conservation February 2007), with extra attention in the area of TH4 due to the presence of benzene.

### 4.0 CLOSURE

The conclusion and recommendations presented in this report were based on the scope of work outlined for the purpose of the investigation, and were prepared in accordance with accepted professional engineering/geo-science principles and practices. However, as with any environmental site assessment the intent is to identify and address, not eliminate, potential environmental concerns.

The observations made at the Site do not apply to areas which could not be observed. In addition, other materials or compounds not investigated or addressed or beyond the scope of work could be present at the Site. If this occurs, ENG-TECH Consulting Limited must be notified to determine whether modification to any part of this report should be conducted. If you have any questions or concerns presented herein, please contact the undersigned.

Sincerely,  
ENG-TECH Consulting Limited

Prepared By,

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## **BIBLIOGRAPHY/REFERENCES**



## BIBLIOGRAPHY/REFERENCES

American Society for Testing and Materials, "Standard Practice for Environment Site Assessments: Phase I Environmental Site Assessment Process", Designation E 1527-05.

American Society for Testing and Materials, "Standard Practice for Environmental Site Assessments: Transaction Screen Process", E 1528-06.

American Society for Testing and Materials, "Standard Guide for Corrective Action for Petroleum Releases", E 1599.

Province of Manitoba, Department of Natural Resources, Water & Resources Branch, "Groundwater Availability Map Series (Selkirk)", R.N. Betcher, 1986

Canadian Standards Association, "Phase I Environmental Site Assessment Z768-01", (R2012).

Canada Mortgage and Housing Corporation, "Environmental Site Assessments, A Summary for Approved Lenders", 1993.

Manitoba Conservation, "Guideline for Designation of Contaminated Sites in Manitoba", Guideline 97-01, March 1997.

Manitoba Conservation, "Guideline for Environmental Site Investigations In Manitoba", Guideline 98-01, May 2002.

Ontario Ministry of Environmental and Energy, "Guideline for Use at Contaminated Sites in Ontario", Revised February 1997.

Canadian Council of Ministers of the Environment, "Canada Wide Standards for Petroleum Hydrocarbons (PHC) in Soil", April 30 – May 1, 2001, Revised January 2008.

Canadian Council of Ministers of the Environment, "Canadian Soil Quality Guidelines for the Protection of Environment and Human Health", 1999, Updated 2004

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- Table 2 - Petroleum Hydrocarbons in Soil (Commercial Site for Vapour Inhalation)
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- Table 4 - Petroleum Hydrocarbons in Soil (Residential Site for Vapour Inhalation)



**TABLE 1  
 PETROLEUM HYDROCARBONS IN SOIL (COMMERCIAL SITE CRITERIA FOR GENERIC SITUATION)  
 CONSIDERING INCREMENTAL CANCER RISK OF 10<sup>-6</sup> FOR BENZENE**

Page 1 of 1

Sample IDs	Parameters									
	BTEX					Total Hydrocarbons				
	Benzene	Toluene	Ethyl Benzene	Xylenes (total)	F1 (C6-C10)	F2 (C10-C16)	F3 (C16-C34)	F4 (C34-C50)	Total Hydrocarbons	
<b>Soil samples obtained from Site (May 24, 2016)</b>										
TH1 - S2@ 0.8 m	<0.0050	<0.050	<0.015	<0.071	<10	<25	<50	<50	<76	
TH2 - S4 @ 2.3 m	0.0053	<0.050	<0.015	<0.071	<10	<25	<50	<50	<76	
TH4 - S4 @ 2.3 m	[0.0072]	<0.050	<0.015	<0.071	<10	<25	<50	<50	<76	
TH4- S5@ 3.0 m	<0.0050	<0.050	<0.015	<0.071	<10	<25	<50	<50	<76	
TH5-S2@ 0.8 m	<0.0050	<0.050	<0.015	<0.071	54	[543]	843	160	2590	
TH5-S4@ 2.3 m	<0.0050	<0.050	<0.015	<0.071	<10	68	75	<50	143	
TH7-S3@ 1.5 m	<0.0050	<0.050	<0.015	<0.071	<10	<25	<50	<50	<76	
TH9-S1@ 0.3 m	<0.0050	<0.050	<0.015	<0.071	<10	<25	94	90	184	
<b>1999 CCME Environmental Quality Guidelines with 2004 update for Soil at Commercial Site for Generic Situation</b>										
Soil Quality Guideline for Human Health for Fine-grained Surface Soil	0.0068	0.08	0.018	2.4	—	—	—	—	—	
Soil Quality Guideline for Human Health for Fine-grained Subsoil	0.0068	0.08	0.018	2.4	—	—	—	—	—	
Soil Quality Guideline for Human Health for Coarse-grained Surface Soil	0.030	0.37	0.082	11	—	—	—	—	—	
Soil Quality Guideline for Human Health for Coarse-grained Subsoil	0.030	0.37	0.082	11	—	—	—	—	—	
<b>2008 CCME Canada-Wide Standards for Petroleum Hydrocarbons (PHCs) in Soil at Commercial Site for Generic Situation</b>										
Soil Criteria for Fine-grained Surface Soils	—	—	—	—	320	260	2500	6600	—	
Soil Criteria for Fine-grained Surface Soils (where protection of potable groundwater applicable)	—	—	—	—	170	230	2500	6600	—	
Soil Criteria for Coarse-grained Surface Soils	—	—	—	—	320	260	1700	3300	—	
Soil Criteria for Coarse-grained Surface Soils (where protection of potable groundwater applicable)	—	—	—	—	240	260	1700	3300	—	
<b>2008 CCME Canada-Wide Standards for Petroleum Hydrocarbons (PHCs) in Soil at Commercial Site for Management Limit</b>										
Soil Criteria for Fine-grained Subsoils	—	—	—	—	800	1000	5000	10000	—	
Soil Criteria for Coarse-grained Subsoils	—	—	—	—	700	1000	3500	10000	—	

Notes:

1. All concentrations are in mg/kg (ppm).
2. The soil at the site consisted of coarse-grained material
3. Coarse means coarse-textured soil having a median grain size of >75 µm.
4. Concentration exceeding CCME criteria for Site = [ 413 ]

**TABLE 2  
 PETROLEUM HYDROCARBONS IN SOIL (COMMERCIAL SITE FOR VAPOUR INHALATION)  
 CONSIDERING INCREMENTAL CANCER RISK OF 10<sup>-6</sup> FOR BENZENE**

Page 1 of 1

Sample IDs	BTEX						Total Hydrocarbons			
	Benzene	Toluene	Ethyl Benzene	Xylenes (total)	F1 (C6-C10)	F2 (C10-C16)	F3 (C16-C34)	F4 (C34-C50)	Total Hydrocarbons	
<b>Soil samples obtained from Site (May 24, 2016)</b>										
TH1 - S2@ 0.8 m	<0.0050	<0.050	<0.015	<0.071	<10	<25	<50	<50	<76	<76
TH2 - S4 @ 2.3 m	0.0053	<0.050	<0.015	<0.071	<10	<25	<50	<50	<76	<76
TH4 - S4 @ 2.3 m	0.0072	<0.050	<0.015	<0.071	<10	<25	<50	<50	<76	<76
TH4 - S5@ 3.0 m	<0.0050	<0.050	<0.015	<0.071	<10	<25	<50	<50	<76	<76
TH5-S2@ 0.8 m	<0.0050	<0.050	<0.015	<0.071	54	543	843	150	2590	2590
TH5-S4@ 2.3 m	<0.0050	<0.050	<0.015	<0.071	<10	68	75	<50	143	143
TH7-S3@ 1.5 m	<0.0050	<0.050	<0.015	<0.071	<10	<25	<50	<50	<76	<76
TH9-S1@ 0.3 m	<0.0050	<0.050	<0.015	<0.071	<10	<25	94	90	184	184
<b>1999 CCME Environmental Quality Guidelines with 2004 update for Soil at Commercial Site for Inhalation of Indoor Air Check (Slab-on-grade)</b>										
Soil Quality Guideline for Human Health for Fine-grained Surface Soil	0.28	13000	6500	1600	—	—	—	—	—	—
Soil Quality Guideline for Human Health for Fine-grained Subsoil	0.29	13000	6700	1600	—	—	—	—	—	—
Soil Quality Guideline for Human Health for Coarse-grained Surface Soil	0.030	1400	630	160	—	—	—	—	—	—
Soil Quality Guideline for Human Health for Coarse-grained Subsoil	0.032	1500	670	170	—	—	—	—	—	—
<b>2008 CCME Canada-Wide Standards for Petroleum Hydrocarbons (PHCs) in Soil at Commercial Site for Vapour Inhalation (Indoor)</b>										
Soil Criteria for Fine-grained Surface Soils	—	—	—	—	4600	23000	NA	NA	—	—
Soil Criteria for Fine-grained Subsoils	—	—	—	—	4600	23000	NA	NA	—	—
Soil Criteria for Coarse-grained Surface Soils	—	—	—	—	320	1700	NA	NA	—	—
Soil Criteria for Coarse-grained Subsoils	—	—	—	—	320	1700	NA	NA	—	—

Notes:

1. All concentrations are in mg/kg (ppm).
2. The soil at the site consisted of fine-grained material.
3. Coarse means coarse-textured soil having a median grain size of >75 µm.
4. Concentration exceeding CCME criteria for Site = [ 413 ]
5. NA = Not Applicable



**TABLE 3  
 PETROLEUM HYDROCARBONS IN SOIL (RESIDENTIAL SITE CRITERIA FOR GENERIC SITUATION)  
 CONSIDERING INCREMENTAL CANCER RISK OF 10<sup>-6</sup> FOR BENZENE**

Page 1 of 1

Sample IDs	Parameters									
	BTEX			Total Hydrocarbons						
	Benzene	Toluene	Ethyl Benzene	Xylenes (total)	F1 (C6-C10)	F2 (C10-C16)	F3 (C16-C34)	F4 (C34-C50)	Total Hydrocarbons	
<b>Soil samples obtained from Site (May 24, 2016)</b>										
TH1 - S2@ 0.8 m	<0.0050	<0.050	<0.015	<0.071	<10	<25	<50	<50	<76	
TH2 - S4 @ 2.3 m	0.0053	<0.050	<0.015	<0.071	<10	<25	<50	<50	<76	
TH4 - S4 @ 2.3 m	[0.0072]	<0.050	<0.015	<0.071	<10	<25	<50	<50	<76	
TH4- S5@ 3.0 m	<0.0050	<0.050	<0.015	<0.071	<10	<25	<50	<50	<76	
TH5-S2@ 0.8 m	<0.0050	<0.050	<0.015	<0.071	54	[543]	843	150	2590	
TH5-S4@ 2.3 m	<0.0050	<0.050	<0.015	<0.071	<10	68	75	<50	143	
TH7-S3@ 1.5 m	<0.0050	<0.050	<0.015	<0.071	<10	<25	<50	<50	<76	
TH9-S1@ 0.3 m	<0.0050	<0.050	<0.015	<0.071	<10	<25	94	90	184	
<b>1999 CCME Environmental Quality Guidelines with 2004 update for Soil at Residential Site for Generic Situation</b>										
Soil Quality Guideline for Human Health for Fine-grained Surface Soil	0.0068	0.08	0.018	2.4	—	—	—	—	—	
Soil Quality Guideline for Human Health for Fine-grained Subsoil	0.0068	0.08	0.018	2.4	—	—	—	—	—	
Soil Quality Guideline for Human Health for Coarse-grained Surface Soil	0.0095	0.37	0.082	11	—	—	—	—	—	
Soil Quality Guideline for Human Health for Coarse-grained Subsoil	0.0095	0.37	0.082	11	—	—	—	—	—	
<b>2008 CCME Canada-Wide Standards for Petroleum Hydrocarbons (PHCs) in Soil at Residential Site for Generic Situation</b>										
Soil Criteria for Fine-grained Surface Soils	—	—	—	—	210	150	1300	5600	—	
Soil Criteria for Fine-grained Surface Soils (where protection of potable groundwater applicable)	—	—	—	—	170	230	—	—	—	
Soil Criteria for Coarse-grained Surface Soils	—	—	—	—	210	150	—	—	—	
Soil Criteria for Coarse-grained Surface Soils (where protection of potable groundwater applicable)	—	—	—	—	240	320	1700	3300	—	
<b>2008 CCME Canada-Wide Standards for Petroleum Hydrocarbons (PHCs) in Soil at Residential Site for Management Limit</b>										
Soil Criteria for Fine-grained Subsoils	—	—	—	—	800	1000	5000	10000	—	
Soil Criteria for Coarse-grained Subsoils	—	—	—	—	700	1000	3500	10000	—	

**Notes:**

1. All concentrations are in mg/kg (ppm).
2. The soil at the site consisted of coarse-grained material
3. Coarse means coarse-textured soil having a median grain size of >75 µm.
4. Concentration exceeding CCME criteria for Site = [ 413 ]



**TABLE 4  
 PETROLEUM HYDROCARBONS IN SOIL (RESIDENTIAL SITE FOR VAPOUR INHALATION)  
 CONSIDERING INCREMENTAL CANCER RISK OF 10-6 FOR BENZENE**

Page 1 of 1

Sample IDs	Parameters										Total Hydrocarbons
	BTEX				Xylenes (total)	F1 (C6-C10)	F2 (C10-C16)	F3 (C16-C34)	F4 (C34-C50)	Total Hydrocarbons	
Benzene	Toluene	Ethyl Benzene									
<b>Soil samples obtained from Site (May 24, 2016)</b>											
TH1 - S2@ 0.8 m	<0.0050	<0.050	<0.015	<0.071	<10	<25	<50	<50	<50	<76	
TH2 - S4 @ 2.3 m	0.0053	<0.050	<0.015	<0.071	<10	<25	<50	<50	<50	<76	
TH4 - S4 @ 2.3 m	0.0072	<0.050	<0.015	<0.071	<10	<25	<50	<50	<50	<76	
TH4 - S5@ 3.0 m	<0.0050	<0.050	<0.015	<0.071	<10	<25	<50	<50	<50	<76	
TH5-S2@ 0.8 m	<0.0050	<0.050	<0.015	<0.071	54	543	843	150	150	2590	
TH5-S4@ 2.3 m	<0.0050	<0.050	<0.015	<0.071	<10	68	75	<50	<50	143	
TH7-S3@ 1.5 m	<0.0050	<0.050	<0.015	<0.071	<10	<25	<50	<50	<50	<76	
TH9-S1@ 0.3 m	<0.0050	<0.050	<0.015	<0.071	<10	<25	94	90	90	184	
<b>1999 CCME Environmental Quality Guidelines with 2004 update for Soil at Residential Site for Inhalation of Indoor Air Check (Slab-on-grade)</b>											
Soil Quality Guideline for Human Health for Fine-grained Surface Soil	0.21	2600	1300	320	—	—	—	—	—	—	
Soil Quality Guideline for Human Health for Fine-grained Subsoil	0.21	2600	1300	320	—	—	—	—	—	—	
Soil Quality Guideline for Human Health for Coarse-grained Surface Soil	0.015	200	88	22	—	—	—	—	—	—	
Soil Quality Guideline for Human Health for Coarse-grained Subsoil	0.015	200	88	22	—	—	—	—	—	—	
<b>2008 CCME Canada-Wide Standards for Petroleum Hydrocarbons (PHCs) in Soil at Residential Site for Vapour Inhalation (Indoor)</b>											
Soil Criteria for Fine-grained Surface Soils	—	—	—	—	710	3600	NA	NA	NA	—	
Soil Criteria for Fine-grained Subsoils	—	—	—	—	710	3600	NA	NA	NA	—	
Soil Criteria for Coarse-grained Surface Soils	—	—	—	—	40	190	NA	NA	NA	—	
Soil Criteria for Coarse-grained Subsoils	—	—	—	—	40	190	NA	NA	NA	—	

**Notes:**

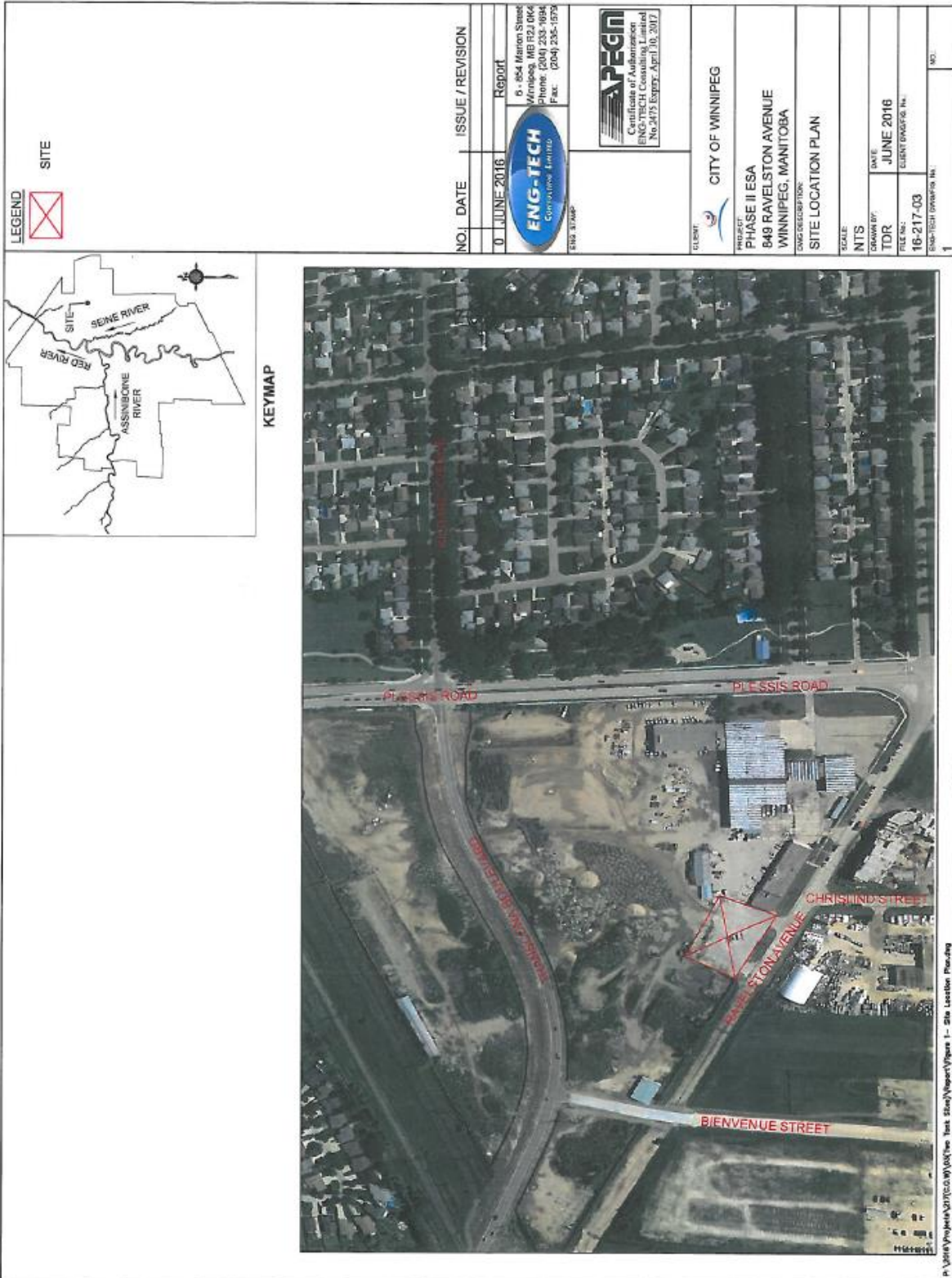
1. All concentrations are in mg/kg (ppm).
2. The soil at the site consisted of fine-grained material.
3. Coarse means coarse-textured soil having a median grain size of >75 µm.
4. Concentration exceeding CCME criteria for Site = [ 413 ]
5. NA = Not Applicable



### **LIST OF FIGURES**

Figure 1 –Site Location Plan

Figure 2 –Test Hole Location Plan & Photograph Index







### **LIST OF APPENDICES**

Appendix A - Stratigraphic Test Hole Logs (9)

Appendix B - Site Photographs (4)

Appendix C - Analytical Test Results (1)

## **APPENDIX A**

Stratigraphic Test Hole Logs (9)

Template Version: C320150806 - C LR

MODIFIED UNIFIED CLASSIFICATION SYSTEM FOR SOILS							
MAJOR DIVISION	GROUP SYMBOL	GRAPH SYMBOL	TYPICAL DESCRIPTION	LABORATORY CLASSIFICATION CRITERIA			
COARSE GRAINED SOILS (MORE THAN HALF BY WEIGHT LARGER THAN 75 µm)	GRAVELS MORE THAN HALF THE COARSE FRACTION LARGER THAN 4.75 mm	GW	WELL GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES	$C_u = \frac{D_{60}}{D_{10}} > 4$ ; $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}} = 1 \text{ TO } 3$			
		GP	POORLY GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES	NOT MEETING ABOVE REQUIREMENTS			
		GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES	ATTERBERG LIMITS BELOW 'A' LINE OR P.I. LESS THAN 4			
		GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES	ATTERBERG LIMITS ABOVE 'A' LINE AND P.I. MORE THAN 7			
	SANDS MORE THAN HALF THE COARSE FRACTION SMALLER THAN 4.75 mm	SW	WELL GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES	$C_u = \frac{D_{60}}{D_{10}} > 6$ ; $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}} = 1 \text{ TO } 3$			
		SP	POORLY GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES	NOT MEETING ABOVE REQUIREMENTS			
		SM	SILTY SANDS, SAND-SILT MIXTURES	ATTERBERG LIMITS BELOW 'A' LINE OR P.I. LESS THAN 4			
		SC	CLAYEY SANDS, SAND-CLAY MIXTURES	ATTERBERG LIMITS ABOVE 'A' LINE AND P.I. MORE THAN 7			
FINE GRAINED SOILS (MORE THAN HALF BY WEIGHT SMALLER THAN 75 µm)	SILTS BELOW 'A' LINE NEGLECTABLE ORGANIC CONTENT	ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY SANDS OF SLIGHTY PLASTICITY	CLASSIFICATION IS BASED UPON PLASTICITY CHART (SEE BELOW)			
		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS, FINE SANDY OR SILTY SOILS				
	CLAYS ABOVE 'A' LINE NEGLECTABLE ORGANIC CONTENT	CL	INORGANIC CLAYS OF LOW PLASTICITY, GRAVELLY, SANDY OR SILTY CLAYS, LEAN CLAYS				
		CI	INORGANIC CLAYS OF MEDIUM PLASTICITY, SILTY CLAYS				
		CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS				
	ORGANIC SILTS & CLAYS BELOW 'A' LINE	OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY				
		OH	ORGANIC CLAYS OF HIGH PLASTICITY				
		PI	PEAT AND OTHER HIGHLY ORGANIC SOILS		STRONG COLOUR OR ODOUR, AND OFTEN FIBROUS TEXTURE		
ADDITIONAL SYMBOLS		PLASTIC SOILS					
TILL	SANDSTONE	MOISTURE	PLASTICITY	INTRUSIONS	CONSISTENCY	POCKET PENET (mm)	(N)
FILL	GRANITE	DRY	LOW	ROOTLETS	VERY SOFT	0 - 2	< 2
TOPSOIL		DAMP	MEDIUM	OXIDES	SOFT	0 - 0.5	2 - 4
CONCRETE		MOIST	HIGH	MICA	FIRM	0.5 - 1.0	4 - 8
SHALE		WET		GYPSPUM	STIFF	1.0 - 2.0	8 - 15
LIMESTONE				ETC.	VERY STIFF	2.0 - 4.0	15 - 30
					HARD	> 4.0	> 30
		$TSF \approx 95.8 + 4P_u (q_u)$ $S_u = \frac{1}{2} \times q_u$			SOIL DESCRIPTIONS		
		TRACE: 0 - 10%	BOULDERS: > 200 mm	COARSE SAND: 2 - 4.75 mm			
		SOME: 10 - 20%	COBBLES: 75 - 200 mm	MEDIUM SAND: 0.425 - 2 mm			
		WITH: 20 - 35%	COURSE GRAVEL: 19 - 75 mm	FINE SAND: 0.075 - 0.425 mm			
		AND: 35 - 50%	FINE GRAVEL: 4.75 - 19 mm	FINES: < 0.075 mm			
		GRANULAR SOILS					
		MOISTURE	DENSITY	GRADATION	INTRUSIONS	SPT (N)	
		DRY	VERY LOOSE	POORLY	ROOTLETS	0 - 4	
		DAMP	LOOSE	WELL	OXIDES	4 - 10	
		MOIST	MED. DENSE		MICA	10 - 30	
		WET	DENSE		FINES	30 - 50	
			VERY DENSE		ETC.	> 50	
		DEFINITIONS					
		LL = LIQUID LIMIT	C <sub>u</sub> = COMPRESSION INDEX				
		P.I. = PLASTICITY INDEX	P.L. = PLASTIC LIMIT				
		C <sub>u</sub> = COEFFICIENT OF UNIFORMITY					
		q <sub>u</sub> = UNCONFINED COMPRESSIVE STRENGTH					
		S <sub>u</sub> = UNDRAINED SHEAR STRENGTH					

P:\Drefting\SOIL CLASSIFICATIONS\SOIL CLASSIFICATIONS.dwg



6 - #54 Marion Street  
 Winnipeg, MB R2J 0K4  
 Phone: (204) 235-1994  
 Fax: (204) 235-1579

Template Version: C320150806 - C LR



**Test Hole #: TH1**

**Client:** City of Winnipeg

**Site:** See Figure 2

**Location:** 849 Ravelsten Ave, Winnipeg, MB

**Project:** Phase II ESA

**File No.:** 16-217-03

**Date Drilled:** May 24, 2016

**Grade Elevation:** 100.0 m

**Water Elevation:** - -

**Engineering And Testing  
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SUBSURFACE PROFILE			SAMPLE DATA			VOC Concentrations (% LEL)	VOC Concentrations (ppm)	VOC Concentrations (%LEL)	Comments
Depth (m)	Soil Symbol	Description	Elevation (m)	Sample No.	Sample Type				
0.0		Ground Surface	100.0						
		<i>Concrete (200 mm)</i>							
		<i>Gravel Fill (GP)</i> - medium brown, moist, medium dense, poorly graded, coarse grained.		S1	S	5			
		<i>Clay Fill (Cl)</i> - dark brown, moist, firm, medium plastic.		S2	S	40			
1.0		<i>Clay (CH)</i> - dark brown, moist, firm, highly plastic, trace silt.	99.0	S3	S	5			
2.0			98.0	S4	S	30			
3.0			97.0	S5	S	10			
4.0			96.0	S6	S	5			
5.0			95.0	S7	S	10			
6.0		<b>End of Test Hole</b> - end of test hole at 4.6 m below grade. - no sloughing or seepage was encountered upon completion of drilling. - test hole was backfilled with bentonite and soil cuttings upon completion of drilling.	94.0						

ENG-TECH Consulting Limited

Logged by: TR

Reviewed by: *TR*

Drilled By: Maple Leaf Drilling

Drill Rig: Geoprobe

Auger Size: 125 mm SS

Completion Depth: 4.6 m

Completion Elevation: 95.4 m

Sheet: 1 of 1

SAMPLE TYPE



SPLIT BARREL



SHELBY TUBE



AUGER CUTTINGS



SPLIT SPOON

Template Version: C320150806 - C LR



**Test Hole #: TH2**

**Client:** City of Winnipeg

**Site:** See Figure 2

**Location:** 849 Ravelsten Ave, Winnipeg, MB

**Project:** Phase II ESA

**File No.:** 16-217-03

**Date Drilled:** May 24, 2016

**Grade Elevation:** 100.0 m

**Water Elevation:** - -

**Engineering And Testing  
 Solutions That Work For You**

SUBSURFACE PROFILE			SAMPLE DATA			VOC Concentrations (% LEL)	VOC Concentrations (PPM)	Comments
Depth (m)	Soil Symbol	Description	Elevation (m)	Sample No.	Sample Type			
0.0		Ground Surface	100.0					
		Concrete (200 mm)						
		Gravel Fill (GP) - medium brown, moist, medium dense, poorly graded, coarse grained.		S1	10			
		Clay Fill (Cl) - black, moist, firm, medium plastic, trace silt.		S2	10			
1.0		Clay (CH) - medium brown, moist, firm, highly plastic, trace silt.	99.0	S3	5			
2.0			98.0	S4	75			
3.0			97.0	S5	15			
4.0			96.0	S6	0			
5.0			95.0	S7	0			
6.0		End of Test Hole - end of test hole at 4.6 m below grade. - no sloughing or seepage was encountered upon completion of drilling. - test hole was backfilled with bentonite and soil cuttings upon completion of drilling.	94.0					

ENG-TECH Consulting Limited

Logged by: TR

Reviewed by: *TR*

Drilled By: Maple Leaf Drilling

Drill Rig: Geoprobe

Auger Size: 125 mm SS

Completion Depth: 4.6 m

Completion Elevation: 95.4 m

Sheet: 1 of 1

SAMPLE TYPE



SPLIT BARREL



SHELBY TUBE



AUGER CUTTINGS



SPLIT SPOON



**Test Hole #: TH3**

**Client:** City of Winnipeg

**Site:** See Figure 2

**Location:** 849 Ravelsten Ave, Winnipeg, MB

**Project:** Phase II ESA

**File No.:** 16-217-03

**Date Drilled:** May 24, 2016

**Grade Elevation:** 100.0 m

**Water Elevation:** - -

**Engineering And Testing  
 Solutions That Work For You**

SUBSURFACE PROFILE			SAMPLE DATA			VOC Concentrations (%LEL)	VOC Concentrations (PPM)	Comments
Depth (m)	Soil Symbol	Description	Elevation (m)	Sample No.	Sample Type			
0.0		Ground Surface	100.0					
		Concrete (200 mm)						
		Gravel Fill (GP) - medium brown, moist, medium dense, poorly graded, coarse grained.		S1	Split Barrel	15		
		Clay Fill (CI) - black, moist, firm, medium plastic, trace silt.	99.0	S2	Split Barrel	5		
		Clay (CI) - medium brown, moist, firm, medium plastic, trace silt.		S3	Split Barrel	5		
			98.0	S4	Split Barrel	5		
			97.0	S5	Split Barrel	5		
			96.0	S6	Split Barrel	0		
			95.0	S7	Split Barrel	5		
5.0		<b>End of Test Hole</b> - end of test hole at 4.6 m below grade. - no sloughing or seepage was encountered upon completion of drilling. - test hole was backfilled with bentonite and soil cuttings upon completion of drilling.	94.0					

ENG-TECH Consulting Limited

Logged by: TR

Reviewed by: *TR*

Drilled By: Maple Leaf Drilling

Drill Rig: Geoprobe

Auger Size: 125 mm SS

Completion Depth: 4.6 m

Completion Elevation: 95.4 m

Sheet: 1 of 1

SAMPLE TYPE



SPLIT BARREL



SHELBY TUBE



AUGER CUTTINGS



SPLIT SPOON



**Test Hole #: TH4**

**Client:** City of Winnipeg

**Site:** See Figure 2

**Location:** 849 Ravelsten Ave, Winnipeg, MB

**Project:** Phase II ESA

**File No.:** 16-217-03

**Date Drilled:** May 24, 2016

**Grade Elevation:** 100.0 m

**Water Elevation:** - -

**Engineering And Testing  
 Solutions That Work For You**

SUBSURFACE PROFILE			SAMPLE DATA		VOC Concentrations (% LEL)	VOC Concentrations (PPM)	Comments
Depth (m)	Soil Symbol	Description	Elevation (m)	Sample No.			
0.0		Ground Surface	100.0				
		Concrete (200 mm)					
		Gravel Fill (GP) - medium brown, moist, medium dense, poorly graded, coarse grained.		S1	Split Barrel	130	
		Clay Fill (C1) - medium brown, moist, firm, medium plastic, trace silt, slight hydrocarbon odour at 0.8 m.	99.0	S2	Split Barrel	15	
		Clay (C1) - dark brown, moist, firm, medium plastic, trace silt.	98.0	S3	Shelby Tube	0	
			97.0	S4	Split Barrel	190	
			96.0	S5	Split Barrel	75	
			95.0	S6	Split Barrel	10	
			94.0	S7	Split Barrel	40	
5.0		<b>End of Test Hole</b> - end of test hole at 4.6 m below grade. - no sloughing or seepage was encountered upon completion of drilling. - test hole was backfilled with bentonite and soil cuttings upon completion of drilling.	95.4				

ENG-TECH Consulting Limited

Logged by: TR

Reviewed by: *TR*

Drilled By: Maple Leaf Drilling

Drill Rig: Geoprobe

Auger Size: 125 mm SS

Completion Depth: 4.6 m

Completion Elevation: 95.4 m

Sheet: 1 of 1

SAMPLE TYPE



SPLIT BARREL



SHELBY TUBE



AUGER CUTTINGS



SPLIT SPOON





**Engineering And Testing**  
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**Test Hole #: TH5**

**Client:** City of Winnipeg

**Site:** See Figure 2

**Location:** 849 Ravelsten Ave, Winnipeg, MB

**Project:** Phase II ESA

**File No.:** 16-217-03

**Date Drilled:** May 24, 2016

**Grade Elevation:** 100.0 m

**Water Elevation:** - -

SUBSURFACE PROFILE			SAMPLE DATA			VOC Concentrations (% LEL)	VOC Concentrations (ppm)	Comments
Depth (m)	Soil Symbol	Description	Elevation (m)	Sample No.	Sample Type			
0.0		<b>Ground Surface</b> <b>Pea Gravel</b> - medium brown, moist, loose, poorly graded, coarse grained.	100.0					
1.0		- slight hydrocarbon detected between 0.8 m and 1.5 m.	99.0	S1	S	85		
				S2	S	240		
2.0			98.0	S3	S	0		
		<b>Clay (Cl)</b> - dark brown, moist, firm, medium plastic.		S4	S	60		
3.0			97.0	S5	S	10		
4.0			96.0	S6	S	5		
5.0		<b>End of Test Hole</b> - end of test hole at 4.6 m below grade. - sloughing and seepage encountered within pea gravel upon completion of drilling. - test hole was backfilled with bentonite and soil cuttings upon completion of drilling.	95.0	S7	S	0		
6.0			94.0					

ENG-TECH Consulting Limited

Logged by: TR

Reviewed by:

Drilled By: Maple Leaf Drilling

Drill Rig: Geoprobe

Auger Size: 125 mm SS

Completion Depth: 4.6 m

Completion Elevation: 95.4 m

Sheet: 1 of 1

SAMPLE TYPE



SPLIT BARREL



SHELBY TUBE



AUGER CUTTINGS



SPLIT SPOON



**Test Hole #: TH7**

**Client:** City of Winnipeg

**Site:** See Figure 2

**Location:** 849 Ravelsten Ave, Winnipeg, MB

**Project:** Phase II ESA

**File No.:** 16-217-03

**Date Drilled:** May 24, 2016

**Grade Elevation:** 100.0 m

**Water Elevation:** - -

**Engineering And Testing  
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SUBSURFACE PROFILE			SAMPLE DATA			VOC Concentrations (% LEL)	VOC Concentrations (PPM)	Comments
Depth (m)	Soil Symbol	Description	Elevation (m)	Sample No.	Sample Type			
0.0		Ground Surface	100.0					
		<b>Gravel Fill (GP)</b> - medium brown, moist, medium dense, poorly graded, coarse grained.		S1	Split Barrel	0		
		<b>Clay Fill (CI)</b> - dark brown, moist, firm, medium plastic, trace silt.		S2	Split Barrel	0		
1.0		<b>Clay (CI)</b> - dark brown, moist, firm, medium plastic, trace silt.	99.0	S3	Shelby Tube	0		
2.0			98.0	S4	Shelby Tube	0		
3.0		<b>End of Test Hole</b> - end of test hole at 3.0 m below grade. - no sloughing or seepage was encountered upon completion of drilling. - test hole was backfilled with bentonite and soil cuttings upon completion of drilling.	97.0	S5	Shelby Tube	0		
4.0			96.0					

ENG-TECH Consulting Limited

Logged by: TR

Reviewed by: *TR*

Drilled By: Maple Leaf Drilling

Drill Rig: Geoprobe

Auger Size: 125 mm SS

Completion Depth: 3.0 m

Completion Elevation: 97.0 m

Sheet: 1 of 1

SAMPLE TYPE



SPLIT BARREL



SHELBY TUBE



AUGER CUTTINGS



SPLIT SPOON



**Test Hole #: TH8**

**Client:** City of Winnipeg

**Site:** See Figure 2

**Location:** 849 Ravelsten Ave, Winnipeg, MB

**Project:** Phase II ESA

**File No.:** 16-217-03

**Date Drilled:** May 24, 2016

**Grade Elevation:** 100.0 m

**Water Elevation:** - -

**Engineering And Testing  
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SUBSURFACE PROFILE			SAMPLE DATA				VOC Concentrations (% LEL)	VOC Concentrations (PPM)	Comments
Depth (m)	Soil Symbol	Description	Elevation (m)	Sample No.	Sample Type	VOC Concentrations (ppm)			
0.0		Ground Surface	100.0						
		<b>Gravel Fill (GP)</b> - medium brown, moist, medium dense, poorly graded, coarse grained.		S1	Split Barrel	25			
		<b>Clay Fill (Cl)</b> - dark brown, moist, firm, medium plastic, trace silt.		S2	Split Barrel	0			
1.0		<b>Clay (Cl)</b> - dark brown, moist, firm, medium plastic, trace silt.	99.0	S3	Split Barrel	0			
2.0			98.0	S4	Split Barrel	0			
3.0		<b>End of Test Hole</b> - end of test hole at 3.0 m below grade. - no sloughing or seepage was encountered upon completion of drilling. - test hole was backfilled with bentonite and soil cuttings upon completion of drilling.	97.0	S5	Split Barrel	0			
4.0			96.0						

ENG-TECH Consulting Limited

Logged by: TR

Reviewed by: *CA*

Drilled By: Maple Leaf Drilling

Drill Rig: Geoprobe

Auger Size: 125 mm SS

Completion Depth: 3.0 m

Completion Elevation: 97.0 m

Sheet: 1 of 1

SAMPLE TYPE



SPLIT BARREL



SHELBY TUBE



AUGER CUTTINGS



SPLIT SPOON



**Test Hole #: TH9**

**Client:** City of Winnipeg

**Site:** See Figure 2

**Location:** 849 Ravelsten Ave, Winnipeg, MB

**Project:** Phase II ESA

**File No.:** 16-217-03

**Date Drilled:** May 24, 2016

**Grade Elevation:** 100.0 m

**Water Elevation:** - -

**Engineering And Testing  
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SUBSURFACE PROFILE			SAMPLE DATA			VOC Concentrations (% LEL)	VOC Concentrations (PPM)	Comments
Depth (m)	Description	Elevation (m)	Sample No.	Sample Type	VOC Concentrations (ppm)			
0.0	Ground Surface	100.0						
	<b>Clay Fill (Cl)</b> - dark brown, moist, firm, medium plastic, trace silt.		S1	Split Barrel	35			
			S2	Split Barrel	6			
1.0		99.0						
	<b>Clay (Cl)</b> - dark brown, moist, firm, medium plastic, trace silt.		S3	Shelby Tube	0			
2.0		98.0						
			S4	Shelby Tube	0			
3.0		97.0						
	<b>End of Test Hole</b> - end of test hole at 3.0 m below grade. - no sloughing or seepage was encountered upon completion of drilling. - test hole was backfilled with bentonite and soil cuttings upon completion of drilling.		S5	Shelby Tube	0			
4.0		96.0						

ENG-TECH Consulting Limited

Logged by: TR

Reviewed by: *TR*

Drilled By: Maple Leaf Drilling

Drill Rig: Geoprobe

Auger Size: 125 mm SS

Completion Depth: 3.0 m

Completion Elevation: 97.0 m

Sheet: 1 of 1

SAMPLE TYPE



SPLIT BARREL



SHELBY TUBE



AUGER CUTTINGS



SPLIT SPOON

**APPENDIX B**

Site Photographs (4)



**PHOTOGRAPH #1:** Site, facing southeast showing the drilling of TH1 near the abandoned AST's on 849 Ravelston Avenue. In the background Commercial Building C of 1500 Plessis Road to the southeast.



**PHOTOGRAPH #2:** Site, facing southwest showing the drilling of TH2 near the northwest of the existing AST's tank pad and Pump Island. In the background, the commercial and residential properties and Ravelston Avenue to the southwest.





**PHOTOGRAPH #3:** Site, facing northeast showing the existing AST's location on 849 Ravelston Avenue. In the background, the former UST and Pump Island and the Northern portion of 1500 Plessis Road can be seen.



**PHOTOGRAPH #4:** Site, facing east showing the location of the former UST location near the northeast corner of the 849 Ravelston Avenue. In the background the northern portion of 1500 Plessis Road can be seen.



## **APPENDIX C**

### Analytical Test Results (1)





ENG-TECH Consulting  
ATTN: TREVOR ROBERTSON  
#6 - 854 Marion Street  
Winnipeg MB R2J 0K4

Date Received: 25-MAY-16  
Report Date: 31-MAY-16 14:20 (MT)  
Version: FINAL

Client Phone: 204-233-1694

## Certificate of Analysis

Lab Work Order #: L1773433  
Project P.O. #: NOT SUBMITTED  
Job Reference: 16-217-03  
C of C Numbers:  
Legal Site Desc:

A handwritten signature in black ink, appearing to read 'Hua Wo', written over a horizontal line.

Hua Wo  
Chemistry Laboratory Manager

[This report shall not be reproduced except in full without the written authority of the Laboratory.]

ADDRESS: 1329 Niakwa Road East, Unit 12, Winnipeg, MB R2J 3T4 Canada | Phone: +1 204 255 9720 | Fax: +1 204 255 9721  
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Environmental A small icon of a tree or plant next to the word 'Environmental'.

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16-217-03

L1773433 CONTD....  
 PAGE 2 of 6  
 Version: FINAL

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
<b>L1773433-1 TH1-S2 @ 2.5'</b> Sampled By: TREVOR ROBERTSON on 24-MAY-16 Matrix: SOIL <b>BTEX and F1-F4 by Tumbler Method</b> <b>BTX plus F1 by GCMS</b>							
Benzene	<0.0050		0.0050	mg/kg	27-MAY-16	28-MAY-16	R3468373
Toluene	<0.050		0.050	mg/kg	27-MAY-16	28-MAY-16	R3468373
Ethyl benzene	<0.015		0.015	mg/kg	27-MAY-16	28-MAY-16	R3468373
o-Xylene	<0.050		0.050	mg/kg	27-MAY-16	28-MAY-16	R3468373
m+p-Xylenes	<0.050		0.050	mg/kg	27-MAY-16	28-MAY-16	R3468373
F1 (C6-C10)	<10		10	mg/kg	27-MAY-16	28-MAY-16	R3468373
Surrogate: 4-Bromofluorobenzene (SS)	101.6		70-130	%	27-MAY-16	28-MAY-16	R3468373
<b>CCME Total Extractable Hydrocarbons</b>							
F2 (C10-C16)	<25		25	mg/kg	27-MAY-16	28-MAY-16	R3467079
F3 (C16-C34)	<50		50	mg/kg	27-MAY-16	28-MAY-16	R3467079
F4 (C34-C50)	<50		50	mg/kg	27-MAY-16	28-MAY-16	R3467079
Surrogate: 2-Bromobenzotrifluoride	92.6		60-140	%	27-MAY-16	28-MAY-16	R3467079
Chrom. to baseline at nC50	YES				27-MAY-16	28-MAY-16	R3467079
<b>CCME Total Hydrocarbons</b>							
F1-BTEX	<10		10	mg/kg		31-MAY-16	
Total Hydrocarbons (C6-C50)	<76		76	mg/kg		31-MAY-16	
<b>Sum of Xylene Isomer Concentrations</b>							
Xylenes (Total)	<0.071		0.071	mg/kg		31-MAY-16	
<b>Miscellaneous Parameters</b>							
Moisture	26.2		0.10	%		27-MAY-16	R3466541
<b>L1773433-2 TH2 - S4 @7.5'</b> Sampled By: TREVOR ROBERTSON on 24-MAY-16 Matrix: SOIL <b>BTEX and F1-F4 by Tumbler Method</b> <b>BTX plus F1 by GCMS</b>							
Benzene	0.0053		0.0050	mg/kg	27-MAY-16	28-MAY-16	R3468373
Toluene	<0.050		0.050	mg/kg	27-MAY-16	28-MAY-16	R3468373
Ethyl benzene	<0.015		0.015	mg/kg	27-MAY-16	28-MAY-16	R3468373
o-Xylene	<0.050		0.050	mg/kg	27-MAY-16	28-MAY-16	R3468373
m+p-Xylenes	<0.050		0.050	mg/kg	27-MAY-16	28-MAY-16	R3468373
F1 (C6-C10)	<10		10	mg/kg	27-MAY-16	28-MAY-16	R3468373
Surrogate: 4-Bromofluorobenzene (SS)	113.6		70-130	%	27-MAY-16	28-MAY-16	R3468373
<b>CCME Total Extractable Hydrocarbons</b>							
F2 (C10-C16)	<25		25	mg/kg	27-MAY-16	28-MAY-16	R3467079
F3 (C16-C34)	<50		50	mg/kg	27-MAY-16	28-MAY-16	R3467079
F4 (C34-C50)	<50		50	mg/kg	27-MAY-16	28-MAY-16	R3467079
Surrogate: 2-Bromobenzotrifluoride	93.0		60-140	%	27-MAY-16	28-MAY-16	R3467079
Chrom. to baseline at nC50	YES				27-MAY-16	28-MAY-16	R3467079
<b>CCME Total Hydrocarbons</b>							
F1-BTEX	<10		10	mg/kg		31-MAY-16	
Total Hydrocarbons (C6-C50)	<76		76	mg/kg		31-MAY-16	
<b>Sum of Xylene Isomer Concentrations</b>							
Xylenes (Total)	<0.071		0.071	mg/kg		31-MAY-16	
<b>Miscellaneous Parameters</b>							
Moisture	32.4		0.10	%		27-MAY-16	R3466541
<b>L1773433-3 TH4 - S4 @7.5'</b> Sampled By: TREVOR ROBERTSON on 24-MAY-16 Matrix: SOIL <b>BTEX and F1-F4 by Tumbler Method</b> <b>BTX plus F1 by GCMS</b>							

\* Refer to Referenced Information for Qualifiers (if any) and Methodology.

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Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1773433-3 TH4 - S4 @7.5'							
Sampled By: TREVOR ROBERTSON on 24-MAY-16							
Matrix: SOIL							
<b>BTX plus F1 by GCMS</b>							
Benzene	0.0072		0.0050	mg/kg	27-MAY-16	28-MAY-16	R3468373
Toluene	<0.050		0.050	mg/kg	27-MAY-16	28-MAY-16	R3468373
Ethyl benzene	<0.015		0.015	mg/kg	27-MAY-16	28-MAY-16	R3468373
o-Xylene	<0.050		0.050	mg/kg	27-MAY-16	28-MAY-16	R3468373
m+p-Xylenes	<0.050		0.050	mg/kg	27-MAY-16	28-MAY-16	R3468373
F1 (C6-C10)	<10		10	mg/kg	27-MAY-16	28-MAY-16	R3468373
Surrogate: 4-Bromofluorobenzene (SS)	113.2		70-130	%	27-MAY-16	28-MAY-16	R3468373
<b>CCME Total Extractable Hydrocarbons</b>							
F2 (C10-C16)	<25		25	mg/kg	27-MAY-16	28-MAY-16	R3467079
F3 (C16-C34)	<50		50	mg/kg	27-MAY-16	28-MAY-16	R3467079
F4 (C34-C50)	<50		50	mg/kg	27-MAY-16	28-MAY-16	R3467079
Surrogate: 2-Bromobenzotrifluoride	93.9		60-140	%	27-MAY-16	28-MAY-16	R3467079
Chrom. to baseline at nC50	YES				27-MAY-16	28-MAY-16	R3467079
<b>CCME Total Hydrocarbons</b>							
F1-BTEX	<10		10	mg/kg		31-MAY-16	
Total Hydrocarbons (C6-C50)	<76		76	mg/kg		31-MAY-16	
<b>Sum of Xylene Isomer Concentrations</b>							
Xylenes (Total)	<0.071		0.071	mg/kg		31-MAY-16	
<b>Miscellaneous Parameters</b>							
Moisture	31.7		0.10	%		27-MAY-16	R3466541
L1773433-4 TH4 - S5 @ 10'							
Sampled By: TREVOR ROBERTSON on 24-MAY-16							
Matrix: SOIL							
<b>BTEX and F1-F4 by Tumbler Method</b>							
<b>BTX plus F1 by GCMS</b>							
Benzene	<0.0050		0.0050	mg/kg	27-MAY-16	28-MAY-16	R3468373
Toluene	<0.050		0.050	mg/kg	27-MAY-16	28-MAY-16	R3468373
Ethyl benzene	<0.015		0.015	mg/kg	27-MAY-16	28-MAY-16	R3468373
o-Xylene	<0.050		0.050	mg/kg	27-MAY-16	28-MAY-16	R3468373
m+p-Xylenes	<0.050		0.050	mg/kg	27-MAY-16	28-MAY-16	R3468373
F1 (C6-C10)	<10		10	mg/kg	27-MAY-16	28-MAY-16	R3468373
Surrogate: 4-Bromofluorobenzene (SS)	108.8		70-130	%	27-MAY-16	28-MAY-16	R3468373
<b>CCME Total Extractable Hydrocarbons</b>							
F2 (C10-C16)	<25		25	mg/kg	27-MAY-16	28-MAY-16	R3467079
F3 (C16-C34)	<50		50	mg/kg	27-MAY-16	28-MAY-16	R3467079
F4 (C34-C50)	<50		50	mg/kg	27-MAY-16	28-MAY-16	R3467079
Surrogate: 2-Bromobenzotrifluoride	93.7		60-140	%	27-MAY-16	28-MAY-16	R3467079
Chrom. to baseline at nC50	YES				27-MAY-16	28-MAY-16	R3467079
<b>CCME Total Hydrocarbons</b>							
F1-BTEX	<10		10	mg/kg		31-MAY-16	
Total Hydrocarbons (C6-C50)	<76		76	mg/kg		31-MAY-16	
<b>Sum of Xylene Isomer Concentrations</b>							
Xylenes (Total)	<0.071		0.071	mg/kg		31-MAY-16	
<b>Miscellaneous Parameters</b>							
Moisture	33.4		0.10	%		27-MAY-16	R3466541
L1773433-5 TH5 - S2 @ 2.5'							
Sampled By: TREVOR ROBERTSON on 24-MAY-16							
Matrix: SOIL							
<b>BTEX and F1-F4 by Tumbler Method</b>							
<b>BTX plus F1 by GCMS</b>							
Benzene	<0.0050		0.0050	mg/kg	27-MAY-16	28-MAY-16	R3468373

\* Refer to Referenced Information for Qualifiers (if any) and Methodology.

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Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
<b>L1773433-5 TH5 - S2 @ 2.5'</b> Sampled By: TREVOR ROBERTSON on 24-MAY-16 Matrix: SOIL <b>BTX plus F1 by GCMS</b> Toluene <0.050 0.050 mg/kg 27-MAY-16 28-MAY-16 R3468373 Ethyl benzene <0.015 0.015 mg/kg 27-MAY-16 28-MAY-16 R3468373 o-Xylene 0.172 0.050 mg/kg 27-MAY-16 28-MAY-16 R3468373 m+p-Xylenes 0.076 0.050 mg/kg 27-MAY-16 28-MAY-16 R3468373 F1 (C6-C10) 54 10 mg/kg 27-MAY-16 28-MAY-16 R3468373 Surrogate: 4-Bromofluorobenzene (SS) 96.8 70-130 % 27-MAY-16 28-MAY-16 R3468373 <b>CCME Total Extractable Hydrocarbons</b> F2 (C10-C16) 1540 25 mg/kg 28-MAY-16 28-MAY-16 R3467079 F3 (C16-C34) 843 50 mg/kg 28-MAY-16 28-MAY-16 R3467079 F4 (C34-C50) 150 50 mg/kg 28-MAY-16 28-MAY-16 R3467079 Surrogate: 2-Bromobenzotrifluoride 99.2 60-140 % 28-MAY-16 28-MAY-16 R3467079 Chrom. to baseline at nC50 YES 28-MAY-16 28-MAY-16 R3467079 <b>CCME Total Hydrocarbons</b> F1-BTEX 53 10 mg/kg 31-MAY-16 Total Hydrocarbons (C6-C50) 2590 76 mg/kg 31-MAY-16 <b>Sum of Xylene Isomer Concentrations</b> Xylenes (Total) 0.247 0.071 mg/kg 31-MAY-16 <b>Miscellaneous Parameters</b> Moisture 7.11 0.10 % 30-MAY-16 R3469068							
<b>L1773433-6 TH5 - S4 @ 7.5'</b> Sampled By: TREVOR ROBERTSON on 24-MAY-16 Matrix: SOIL <b>BTEX and F1-F4 by Tumbler Method</b> <b>BTX plus F1 by GCMS</b> Benzene <0.0050 0.0050 mg/kg 27-MAY-16 28-MAY-16 R3468373 Toluene <0.050 0.050 mg/kg 27-MAY-16 28-MAY-16 R3468373 Ethyl benzene <0.015 0.015 mg/kg 27-MAY-16 28-MAY-16 R3468373 o-Xylene <0.050 0.050 mg/kg 27-MAY-16 28-MAY-16 R3468373 m+p-Xylenes <0.050 0.050 mg/kg 27-MAY-16 28-MAY-16 R3468373 F1 (C6-C10) <10 10 mg/kg 27-MAY-16 28-MAY-16 R3468373 Surrogate: 4-Bromofluorobenzene (SS) 121.9 70-130 % 27-MAY-16 28-MAY-16 R3468373 <b>CCME Total Extractable Hydrocarbons</b> F2 (C10-C16) 66 25 mg/kg 28-MAY-16 28-MAY-16 R3467079 F3 (C16-C34) 75 50 mg/kg 28-MAY-16 28-MAY-16 R3467079 F4 (C34-C50) <50 50 mg/kg 28-MAY-16 28-MAY-16 R3467079 Surrogate: 2-Bromobenzotrifluoride 95.5 60-140 % 28-MAY-16 28-MAY-16 R3467079 Chrom. to baseline at nC50 YES 28-MAY-16 28-MAY-16 R3467079 <b>CCME Total Hydrocarbons</b> F1-BTEX <10 10 mg/kg 31-MAY-16 Total Hydrocarbons (C6-C50) 143 76 mg/kg 31-MAY-16 <b>Sum of Xylene Isomer Concentrations</b> Xylenes (Total) <0.071 0.071 mg/kg 31-MAY-16 <b>Miscellaneous Parameters</b> Moisture 34.6 0.10 % 30-MAY-16 R3469068							
<b>L1773433-7 TH7 - S3 @ 5'</b> Sampled By: TREVOR ROBERTSON on 24-MAY-16 Matrix: SOIL <b>BTEX and F1-F4 by Tumbler Method</b> <b>BTX plus F1 by GCMS</b> Benzene <0.0050 0.0050 mg/kg 27-MAY-16 28-MAY-16 R3468373 Toluene <0.050 0.050 mg/kg 27-MAY-16 28-MAY-16 R3468373							

\* Refer to Referenced Information for Qualifiers (if any) and Methodology.

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Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
<b>L1773433-7 TH7 - S3 @ 5'</b> Sampled By: TREVOR ROBERTSON on 24-MAY-16 Matrix: SOIL <b>BTX plus F1 by GCMS</b> Ethyl benzene <0.015 0.015 mg/kg 27-MAY-16 28-MAY-16 R3468373 o-Xylene <0.050 0.050 mg/kg 27-MAY-16 28-MAY-16 R3468373 m+p-Xylenes <0.050 0.050 mg/kg 27-MAY-16 28-MAY-16 R3468373 F1 (C6-C10) <10 10 mg/kg 27-MAY-16 28-MAY-16 R3468373 Surrogate: 4-Bromofluorobenzene (SS) 107.2 70-130 % 27-MAY-16 28-MAY-16 R3468373 <b>CCME Total Extractable Hydrocarbons</b> F2 (C10-C16) <25 25 mg/kg 28-MAY-16 28-MAY-16 R3467079 F3 (C16-C34) <50 50 mg/kg 28-MAY-16 28-MAY-16 R3467079 F4 (C34-C50) <50 50 mg/kg 28-MAY-16 28-MAY-16 R3467079 Surrogate: 2-Bromobenzotrifluoride 92.0 60-140 % 28-MAY-16 28-MAY-16 R3467079 Chrom. to baseline at nC50 YES 28-MAY-16 28-MAY-16 R3467079 <b>CCME Total Hydrocarbons</b> F1-BTEX <10 10 mg/kg 31-MAY-16 Total Hydrocarbons (C6-C50) <76 76 mg/kg 31-MAY-16 Sum of Xylene Isomer Concentrations Xylenes (Total) <0.071 0.071 mg/kg 31-MAY-16 <b>Miscellaneous Parameters</b> Moisture 29.2 0.10 % 30-MAY-16 R3469068							
<b>L1773433-8 TH8 - S1 @ 1'</b> Sampled By: TREVOR ROBERTSON on 24-MAY-16 Matrix: SOIL <b>BTEX and F1-F4 by Tumbler Method</b> <b>BTX plus F1 by GCMS</b> Benzene <0.0050 0.0050 mg/kg 27-MAY-16 28-MAY-16 R3468373 Toluene <0.050 0.050 mg/kg 27-MAY-16 28-MAY-16 R3468373 Ethyl benzene <0.015 0.015 mg/kg 27-MAY-16 28-MAY-16 R3468373 o-Xylene <0.050 0.050 mg/kg 27-MAY-16 28-MAY-16 R3468373 m+p-Xylenes <0.050 0.050 mg/kg 27-MAY-16 28-MAY-16 R3468373 F1 (C6-C10) <10 10 mg/kg 27-MAY-16 28-MAY-16 R3468373 Surrogate: 4-Bromofluorobenzene (SS) 93.4 70-130 % 27-MAY-16 28-MAY-16 R3468373 <b>CCME Total Extractable Hydrocarbons</b> F2 (C10-C16) <25 25 mg/kg 28-MAY-16 28-MAY-16 R3467079 F3 (C16-C34) 94 50 mg/kg 28-MAY-16 28-MAY-16 R3467079 F4 (C34-C50) 90 50 mg/kg 28-MAY-16 28-MAY-16 R3467079 Surrogate: 2-Bromobenzotrifluoride 95.0 60-140 % 28-MAY-16 28-MAY-16 R3467079 Chrom. to baseline at nC50 YES 28-MAY-16 28-MAY-16 R3467079 <b>CCME Total Hydrocarbons</b> F1-BTEX <10 10 mg/kg 31-MAY-16 Total Hydrocarbons (C6-C50) 184 76 mg/kg 31-MAY-16 Sum of Xylene Isomer Concentrations Xylenes (Total) <0.071 0.071 mg/kg 31-MAY-16 <b>Miscellaneous Parameters</b> Moisture 11.1 0.10 % 30-MAY-16 R3469068							

\* Refer to Referenced Information for Qualifiers (if any) and Methodology.

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## Reference Information

### Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
BTEXS+F1-HSMS-WP	Soil	BTX plus F1 by GCMS	EPA 8260C
The soil methanol extract is added to water and reagents, then heated in a sealed vial to equilibrium. The headspace from the vial is transferred into a gas chromatograph. Target compound concentrations are measured using mass spectrometry detection.			
F1-F4-CALC-WP	Soil	CCME Total Hydrocarbons	CCME CWS-PHC, Pub #1310, Dec 2001-S
Analytical methods used for analysis of CCME Petroleum Hydrocarbons have been validated and comply with the Reference Method for the CWS PHC.			
In cases where results for both F4 and F4G are reported, the greater of the two results must be used in any application of the CWS PHC guidelines and the gravimetric heavy hydrocarbons cannot be added to the C6 to C50 hydrocarbons.			
In samples where BTEX and F1 were analyzed, F1-BTEX represents a value where the sum of Benzene, Toluene, Ethylbenzene and total Xylenes has been subtracted from F1.			
In samples where PAHs, F2 and F3 were analyzed, F2-Naphth represents the result where Naphthalene has been subtracted from F2. F3-PAH represents a result where the sum of Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Dibenzo(a,h)anthracene, Fluoranthene, Indeno(1,2,3-cd)pyrene, Phenanthrene, and Pyrene has been subtracted from F3.			
Unless otherwise qualified, the following quality control criteria have been met for the F1 hydrocarbon range:			
1. All extraction and analysis holding times were met.			
2. Instrument performance showing response factors for C8 and C10 within 30% of the response factor for toluene.			
3. Linearity of gasoline response within 15% throughout the calibration range.			
Unless otherwise qualified, the following quality control criteria have been met for the F2-F4 hydrocarbon ranges:			
1. All extraction and analysis holding times were met.			
2. Instrument performance showing C10, C16 and C34 response factors within 10% of their average.			
3. Instrument performance showing the C50 response factor within 30% of the average of the C10, C16 and C34 response factors.			
4. Linearity of diesel or motor oil response within 15% throughout the calibration range.			
F2-F4-TMB-FID-WP	Soil	CCME Total Extractable Hydrocarbons	CCME CWS-PHC, Pub #1310, Dec 2001
A soil or sediment sample is extracted with 1:1 hexane/acetone in a tumbler, followed by a silica gel clean up to facilitate separation of the hydrocarbons from other polar extractions. An aliquot of the solvent is analyzed using a gas chromatograph equipped with a flame-ionization detector.			
MOISTURE-WP	Soil	% Moisture	CCME CWS-PHC, Pub #1310, Dec 2001
Moisture content in solid matrices is determined gravimetrically after drying to constant weight at 105°C.			
XYLENES-SUM-CALC-WP	Soil	Sum of Xylene Isomer Concentrations	CALCULATED RESULT
Total xylenes represents the sum of o-xylene and m&p-xylene.			

\*\* ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
WP	ALS ENVIRONMENTAL - WINNIPEG, MANITOBA, CANADA

### Chain of Custody Numbers:

### GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.

mg/kg - milligrams per kilogram based on dry weight of sample

mg/kg wwt - milligrams per kilogram based on wet weight of sample

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight

mg/L - unit of concentration based on volume, parts per million.

< - Less than.

D.L. - The reporting limit.

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.