

Final Report
**PHASE II ENVIRONMENTAL
SITE ASSESSMENT
DIESEL GENERATOR SITE
BUTTERPOT PROVINCIAL PARK
TRANS-CANADA HIGHWAY,
NEWFOUNDLAND AND LABRADOR**

Prepared for:
**Government of Newfoundland and Labrador
Department of Environment and Conservation
Parks and Natural Areas**

(ADI File 26-3665-005.1)

April 2009

Final Report:

PHASE II ENVIRONMENTAL SITE ASSESSMENT

DIESEL GENERATOR SITE

BUTTERPOT PROVINCIAL PARK

TCH, NEWFOUNDLAND AND LABRADOR

Prepared for: Government of Newfoundland and Labrador

Department of Environment and Conservation

Parks and Natural Resources

ADI LIMITED

FILE: 26-3665-005-1

DATE: April 2009



ADI Limited

Engineering, Consulting, Procurement
and Project Management

April 16, 2009

File No. 26-3665-005.1

Government of Newfoundland and Labrador
Department of Environment and Conservation
Parks and Natural Areas
244 Park Avenue
Mount Pearl, Newfoundland and Labrador
A1N 1L1

Attention: Mr. Keith Brown
Park Manager

Dear Sirs:

RE: **Phase II Environmental Site Assessment**
Diesel Generator Site - Butterpot Provincial Park
Trans-Canada Highway, Newfoundland and Labrador



We are pleased to submit two copies of our Final Report on the findings of work completed at the above-noted site.

We trust this submission meets your present requirements. Should you have any questions, or require clarification on any aspect of this report, please do not hesitate to contact us.

Thank you for the opportunity of providing our services on this project.

Yours very truly,

ADI Limited

Cyril J. Humphrey, B.Sc., B.E.S., P.Geo.
Project Manager

William G. Melendy, M.A.Sc., P.Eng.
Group Manager,
Geotechnical/Environmental Engineering

OUR MISSION:

Success through

satisfied customers

CJP:dgn

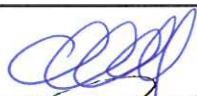

Enclosure: Report in duplicate

Web: www.adi.ca

This report was prepared by *ADI Limited* for the account of **GOVERNMENT OF NEWFOUNDLAND AND LABRADOR, DEPARTMENT OF ENVIRONMENT AND CONSERVATION - PARKS AND NATURAL AREAS**. Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. *ADI Limited* accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

TABLE OF CONTENTS

		Page No.
1.0	INTRODUCTION	1
2.0	SITE DESCRIPTION	1
3.0	INVESTIGATION PROCEDURE	1
3.1	Test Pit Excavation	1
3.2	Borehole/Monitor Well Programme	5
3.3	Sediment Sampling	7
4.0	INVESTIGATION RESULTS	6
4.1	Subsurface Conditions	6
4.2	Laboratory Analytical Results	7
4.2.1	Soils	7
5.0	ASSESSMENT OF RESULTS	10
6.0	RECOMMENDATIONS	10
7.0	REFERENCES	10
TABLES		
3-1	Summary of Laboratory Analytical Testing - Soils	5
4-1	Summary of Soil Laboratory Results	9
FIGURES		
1	Site Location Plan	2
2	Test Pit Location Plan	3
APPENDIX		
	Site Photos	
	Symbols and Terms Used on the Borehole, Test Pit and Monitor Well Records	
	Test Pit Records	
	Laboratory Certificates	

ADI Quality System Checks	
Project No.: 26-3665-005.1	Date: 2009 04 16 [yr/mo/da]
Issue Status: Final Report	Revision No.: 0
Prepared by: Cyril J. Pumphrey, B.Sc., B.E.S., P.Geo.	 [Signature]
Reviewed by: William G. Melendy, M.A.Sc., P.Eng.	 [Signature]

1.0 INTRODUCTION

Acting at the request of Newfoundland and Labrador Department of Environment and Conservation-Parks and Natural Areas (NDEC-PNA), and in general accordance with our proposal dated December 16, 2009, ADI Limited (ADI) has completed a Phase II Environmental Site Assessment (ESA) at the Diesel Generator Site - Butterpot Provincial Park - Trans-Canada Highway, Newfoundland and Labrador. The purpose of the work was to assess the extent of soil contamination in the vicinity of surface soil staining at your existing diesel generator shed/above ground storage tank.

2.0 SITE DESCRIPTION

The subject property is located within Butterpot Provincial Park, which itself is located approximately 40 km southwest of St. John's on the Trans-Canada Highway (TCH), Newfoundland and Labrador. The site is accessible by motor vehicle and consists of a diesel generator shed and an above-ground storage tank (AST), which are located on the south side of the Park maintenance yard. Refer to *Figure 1: Site Location Plan* and *Figure 2: Test Pit Location Plan*, for details. A selection of site photos is also appended.

3.0 INVESTIGATION PROCEDURE

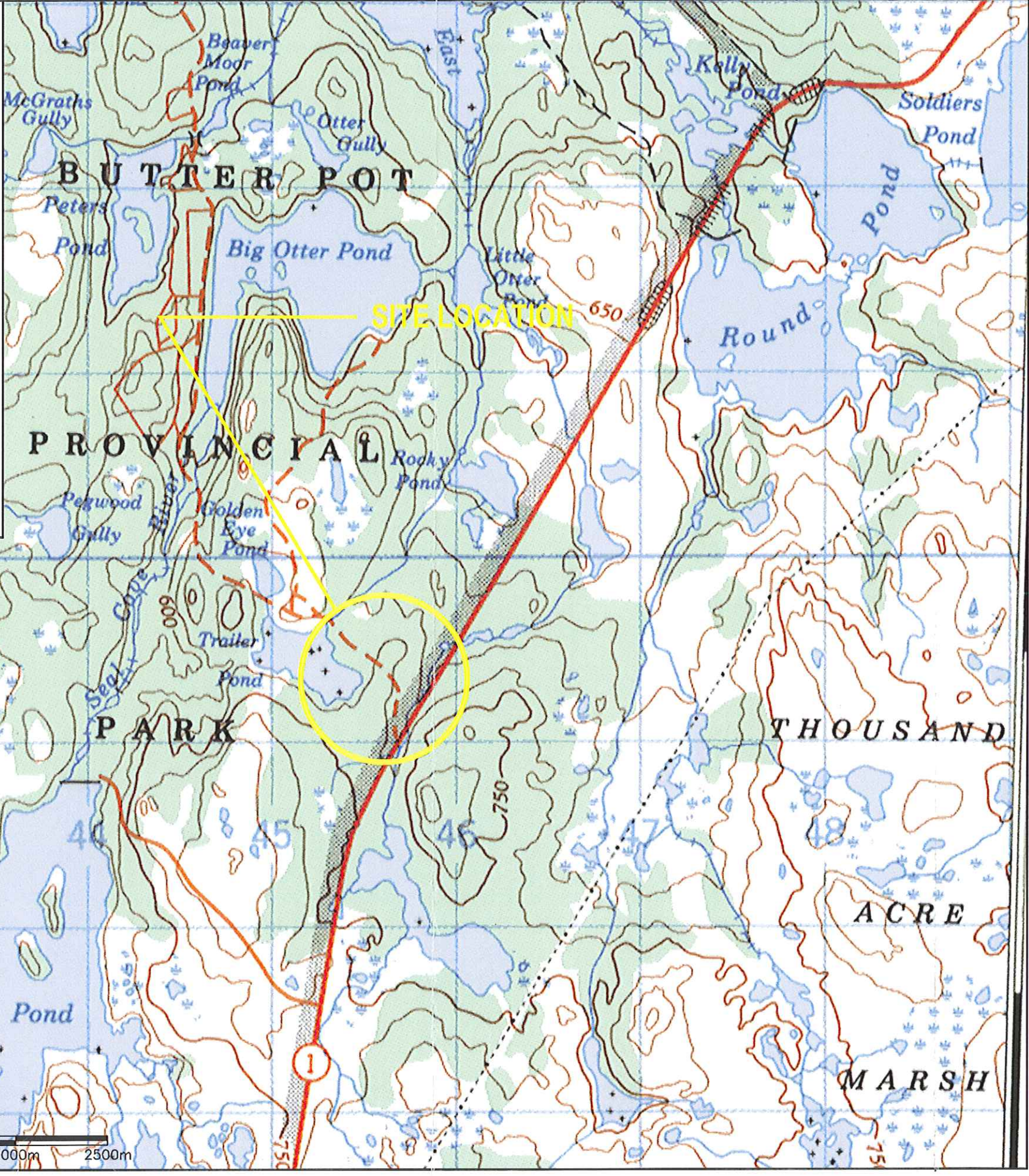
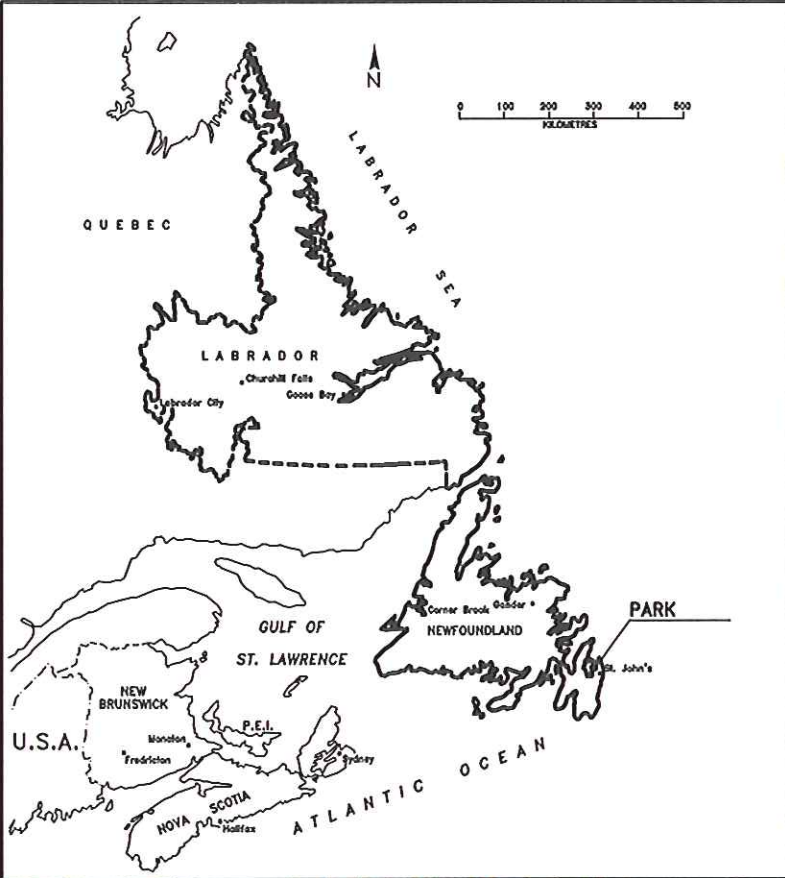
The current Phase II ESA consisted of the following field program:

- completion of four test pits, with associated soil sampling/laboratory analysis.

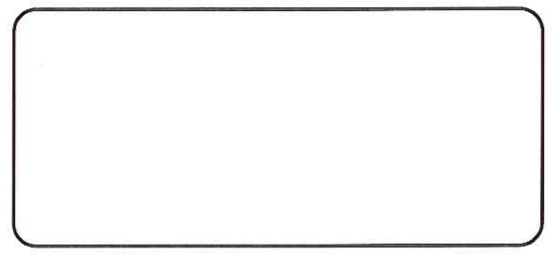
3.1 Test Pit Excavation

A test pit sampling programme involving four test pits was completed on March 19, 2009. Test pits were completed using a *Case 580 Super M*, rubber-tired backhoe supplied and operated by *Cadillac Services Ltd.* of St. John's, Newfoundland and Labrador.

FILE: MODEL: MODELNAME: PLOTTED BY: USER DATE: DATE TIME:



No.	Issue	Date	
No.	Revision	Ckd. By	Date



	Const. North
	Drawn By: S.R.N.
	Dwg. Standards Ckd. By:
	Designed By: C.J.P.
Date Printed	Dwg. Design Ckd. By:

ADI Limited
 St. John's, NL, Canada
 Engineering, Consulting, Procurement and Project Management

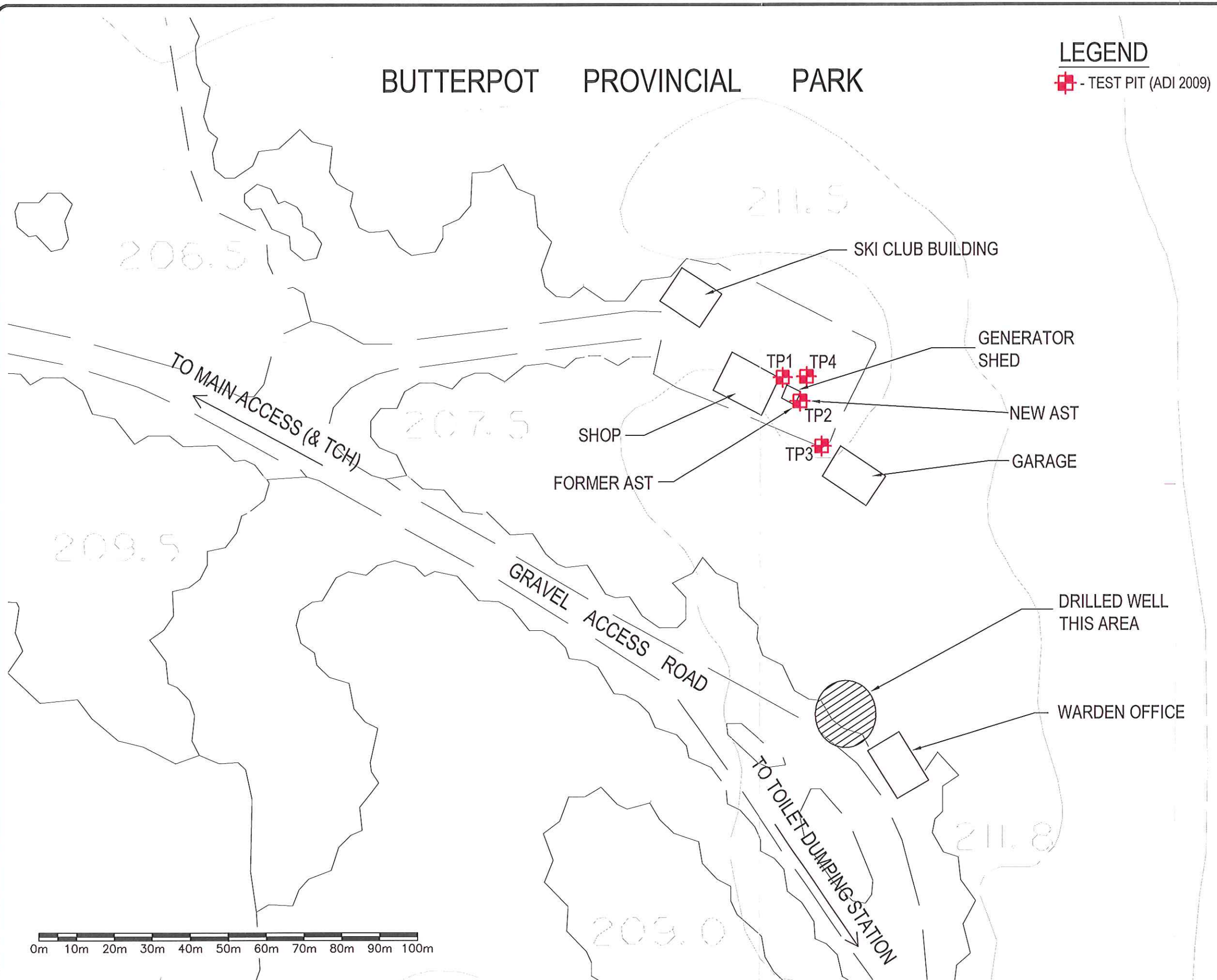
Project Title	
PHASE II ESA BUTTER POT PARK TCH, NL	
Dwg. Title	
SITE LOCATION PLAN	
Project No.	26-3665-005.1
Dwg. No.	FIGURE 1
Scale	1 : 25000
This drawing is not to be scaled	

Offices located in:
 Charlottetown, Moncton, Saint John, Truro, Halifax, Sydney
 Port Hawkesbury, St. John's, Fredericton and Salem, NH

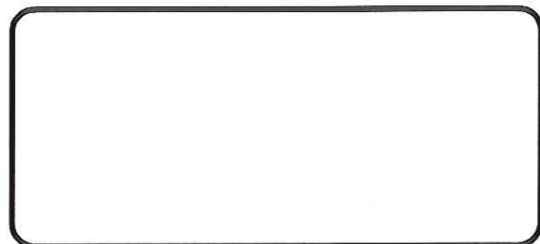
BUTTERPOT PROVINCIAL PARK

LEGEND

■ - TEST PIT (ADI 2009)



No.	Issue	Date	
No.	Revision	Ckd. By	Date



Const. North

Drawn By: S.R.N.

Dwg. Standards Ckd. By:

Designed By: C.J.P.

Date Printed

Dwg. Design Ckd. By:

ADI Limited
 St. John's, NL, Canada
 Engineering, Consulting, Procurement and Project Management

Project Title		PHASE II ESA BUTTERPOT PARK TCH, NL	
Dwg. Title			
TEST PIT LOCATION PLAN			
Project No.	26-3665-005.1		
Dwg. No.	FIGURE 2	Rev. No.	
Scale	1 : 1000 <small>This drawing is not to be scaled</small>		

Offices located in:
 Charlottetown, Moncton, Saint John, Truro, Halifax, Sydney
 Port Hawkesbury, St. John's, Fredericton and Salem, NH

Test pit locations TP1, TP2, TP3, and TP4, were selected in the field by *ADI* at locations of potential environmental concern, as determined by surface soil staining in areas adjacent to the existing diesel generator and above-ground storage tank (AST). Test pit locations are shown on *Figure 2: Test Pit Location Plan*. Test pits TP1, TP3, and TP4 were excavated to refusal on large boulders before the water table was encountered. Test pit TP2 was located between the generator shed and the AST; unsafe/unstable ground conditions prevented further excavation in this area and the water table was not encountered. Conditions encountered in each test pit were recorded and representative soil samples collected.

The test pit programme was completed under the direct full-time monitoring of Mr. Blair D. Cameron, P.Tech., with *ADI*. Information collected relative to each test pit is presented on the individual Test Pit Records included in the Appendix. Representative soil samples were collected from the test pit walls using hand-held sampling equipment where possible, and from the backhoe bucket where unsafe/unstable ground conditions existed. The sampling tools were cleaned between sampling events using a distilled water/methyl hydrate rinse. All soil samples recovered were stored in new laboratory-supplied glass sample jars (for laboratory analyses), and zip-loc bags (for field screening). All soil samples were returned to *ADI*'s laboratory where headspace soil vapour analyses were performed using a *GasTector Model 1238ME* gas vapour detector. Headspace measurements for all soil samples are presented on the Test Pit Records in the Appendix.

Selected soil samples from test pits were submitted to *Maxxam Analytics Inc.* in St. John's, Newfoundland and Labrador for benzene, toluene, ethylbenzene and xylene (BTEX), total petroleum hydrocarbons (TPH) analyses. A summary of analytical testing completed on soil samples from the test pit programme is presented in *Table 3-1: Summary of Laboratory Analytical Testing - Soils*.

Table 3-1: Summary of Laboratory Analytical Testing - Soils		
Sample	Depth (m below surface)	BTEX/TPH
TP1-SA2	0.5 - 1.0	✓
TP1-SA5	2.5 - 2.6	✓
TP2-SA1	0.0 - 0.5	✓
TP2-SA3	1.0 - 1.5	✓
TP3-SA4	2.0 - 2.5	✓
TP4-SA4	2.0 - 2.4	✓
QA/QC-S1(TP3-SA4)	2.0 - 2.4	✓

3.2 Selection of Application Environmental Quality Guidelines/Standards

The Newfoundland and Labrador Department of Environment and Conservation (NLDEC) policy on impacted sites is outlined by NLDEC PPD05-01 (issued February 22, 2005) and a related *Guidance Document for the Management of Impacted Sites* (Version 1.0). The purpose of the policy and guidance document is to outline the site management process that is to be followed during the assessment and remediation of impacted sites in the Province. Although the process allows for two parallel paths, one for designated and one for non-designated contaminated sites, the assessment process is generally consistent with the phased approach outlined previously by the *Canadian Council of Ministers of the Environment (CCME)*. The process follows a tiered approach for comparison of analytical results to achieve site closure. The first level, or Tier I, consists of generally conservative values established by CCME and the Atlantic PIRI Committee and are meant to be applicable to a wide variety of sites, with less need for technical input. Tier II and Tier III methods involve an increasing level of technical complexity and usually require a higher level of site professional expertise. In this case, analytical results are compared against Atlantic PIRI Tier 1 *Risk Based Screening Levels (RBSL)*.

The subject property is located within Butterpot Provincial Park, a provincially-owned/operated campground. The site itself is located within the Park maintenance yard, an area that is frequented primarily by Park staff, though is at least partially accessible to Park users and the general public. There is also a drilled well located within approximately 100 m of the site. The well provides potable water to Park staff and campground users. The latter utilize the water by way of a toilet-dumping and water station located south of the site. At this time groundwater flow direction in the

vicinity of the diesel site is not known, however, based on area topography, may be towards the drilled well.

Based on this, analytical results in soils are compared to the Atlantic PIRI Tier 1 *RBSL* guidelines for both commercial and residential land uses, with potable groundwater, coarse-grained soils, and a diesel product type.

4.0 INVESTIGATION RESULTS

4.1 Subsurface Conditions

Conditions encountered in the test pits are described below and on the Test Pit Records included in the Appendix.

Organics

An Organic layer was encountered at the surface in TP3, and beneath the Fill in TP1, TP2, and TP4 at depths of 0.5 m, 0.2 m, and 0.4 m, respectively, below the existing ground surface. The Organic layer extended to depths ranging from 0.3 m to 0.6 m below the existing ground surface. The composition of the Organics may generally be described as dark brown, wet, with petroleum hydrocarbon odour present in TP1 and TP2.

Fill

Fill was encountered at the surface in TP1, TP2, and TP4,. The composition of the Fill is variable but may generally be described as a frozen (at the time of the programme) grey to brown Gravel and Sand, with traces to some silt. Petroleum hydrocarbon odours were present in TP1 and TP2. The Fill extended to depths ranging from 0.2 m to 0.5 m below the existing ground surface.

Based on observations of backhoe performance, the Fill is classified as very dense in terms of relative density.

Till

Till was encountered beneath the organic layer in TP1, TP2, TP3, and TP4 at depths ranging from 0.3 m to 0.7 m below the existing ground surface. The composition of the Till is variable, but may generally be described as a greyish-orangy brown to brownish-grey Sand and Gravel, with some silt, and occasional cobbles and boulders. The frequency of cobbles and boulders in the Till increased

with depth. Test Pits TP1, TP2, TP3, and TP4 were terminated in the Till at depths ranging from 1.9 m to 2.6 m below the existing ground surface.

Based on observations of backhoe performance, the Till is classified as compact to very dense in terms of relative density.

Groundwater

Groundwater was not encountered in any of the test pits.

4.2 Laboratory Analytical Results

4.2.1 Soils

Selected soil samples were analysed for BTEX/TPH. A summary of these laboratory analytical results is presented in *Table 4-1: Summary of Soil Laboratory Results*, for comparison to applicable criteria maximums. Where Atlantic RBCA Tier 1 *RBSLs* are exceeded, values are presented in **bold** type (*Residential* exceedances) or **bold/underline** type (*Commercial* and *Residential* exceedances) in the text. Laboratory certificates are included in the Appendix.

Volatile Organic Compound (VOC) Measurements

Headspace measurements of Volatile Organic Compound concentrations in soil samples (where sample recovery permitted) were obtained using a *GasTechtor 1238ME* gas detector, calibrated to hexane. Readings ranged from 5 ppm (parts per million) to 200 ppm. Headspace measurements are provided on individual Test Pits Records in the Appendix.

BTEX/TPH

One or more BTEX components were detected in four of the seven soil samples analysed as follows:

- TPI-SA2: benzene, not-detected; toluene, not-detected; ethyl benzene, **0.60 mg/kg**; xylene, 3.2 mg/kg.
- TP1-SA5: benzene, not-detected; toluene, not-detected; ethyl benzene, **0.12 mg/kg**; xylenes, 0.71 mg/kg.
- TP2-SA1: benzene, not-detected; toluene, **7.3 mg/kg**; ethyl benzene, **1.5 mg/kg**; xylene, 11 mg/kg.
- TP2-SA3: benzene, not-detected; toluene, 0.04 mg/kg; ethyl benzene, **0.12 mg/kg**; xylenes, 1.1 mg/kg.

BTEX components were not detected in soil samples TP3-SA4; TP4-SA4, and QA/QC-S1.

Total petroleum hydrocarbons (TPH) were detected in 4 soil samples analysed, as follows:

TP1-SA2:	TPH, <u>7900 mg/kg</u>
TP1-SA5:	TPH, 4200 mg/kg
TP2-SA1:	TPH, <u>51 000 mg/kg</u>
TP2-SA3:	TPH, 1800 mg/kg

TPH was not-detected in soil samples TP3-SA4; TP4-SA4; and QA/QC-S1.

Table 4-1: Summary of Soil Laboratory Results

Analyte	Units	Guidelines		Sample ID/Location		
		RBSL Commercial ⁽¹⁾	RBSL Residential ⁽²⁾	TP1-SA2 (0.5-1.0 m)	TP1-SA5 (2.0-2.8 m)	TP2-SA1 (0.0-0.5 m)
Benzene	mg/kg	0.03	0.03	nd	nd	nd
Toluene	mg/kg	0.38	0.38	nd	nd	7.3
Ethylbenzene	mg/kg	0.08	0.08	0.60	0.12	1.5
Xylenes	mg/kg	11	11	3.2	0.71	11
C ₆ - C ₁₀ (Gas)	mg/kg	450	39	260	190	140
C ₁₀ - C ₂₁ (# 2 Oil)	mg/kg	7400	140	6900	3600	28 000
C ₂₁ - C ₃₂ (# 6 Oil)	mg/kg	10 000	690	800	430	23 000
Modified TPH	mg/kg			7900	4200	51 000
Product Resemblance				FFr	FFr	WFFr, LFr
Analyte	Units	Guidelines		Sample ID/Location		
		RBSL Commercial ⁽¹⁾	RBSL Residential ⁽²⁾	TP2-SA3 (1.0 - 1.5 m)	TP3-SA4 (2.0 - 2.5 m)	QA/QC-S1 (TP3-SA4)
Benzene	mg/kg	0.03	0.03	nd	nd	nd
Toluene	mg/kg	0.38	0.38	0.04	nd	nd
Ethylbenzene	mg/kg	0.08	0.08	0.12	nd	nd
Xylenes	mg/kg	11	11	1.1	nd	nd
C ₆ - C ₁₀	mg/kg	39	39	130	nd	nd
C ₁₀ - C ₂₁	mg/kg	140	140	1300	nd	nd
C ₂₁ - C ₃₂	mg/kg	690	690	350	nd	nd
Modified TPH	mg/kg			1800	nd	nd
Product Resemblance				FFr, LR	-	-
Analyte	Units	Guidelines		Sample ID/Location		
		RBSL Commercial ⁽¹⁾	RBSL Residential ⁽²⁾	TP4-SA4 (2.0 - 2.4)	-	-
Benzene	mg/kg	0.03	0.03	nd	-	-
Toluene	mg/kg	0.38	0.38	nd	-	-
Ethylbenzene	mg/kg	0.08	0.08	nd	-	-
Xylenes	mg/kg	11	11	nd	-	-
C ₆ - C ₁₀	mg/kg	39	39	nd	-	-
C ₁₀ - C ₂₁	mg/kg	140	140	nd	-	-
C ₂₁ - C ₃₂	mg/kg	690	690	nd	-	-
Modified TPH	mg/kg			nd	-	-
Product Resemblance				-	-	-

Notes: Guidelines presented are Atlantic PIRI Tier 1 RBSL Tables (Potable Groundwater/Coarse Grained Soil/# 2 Fuel Oil) for ⁽¹⁾ Commercial RBSL guidelines, and ⁽²⁾ Residential RBSL guidelines.
 Exceedances of Residential RBSLs are presented in bold type. Exceedances of Commercial RBSLs are presented in bold/underline type.
 nd=not-detected; W=weathered; G=Gas; F=Fuel Oil; L=Lube Oil; Fr=fraction; P=possible; R=range.

5.0 ASSESSMENT OF RESULTS

We offer the following comments regarding the comparison of soil analytical results with guidelines identified in Section 3.2.

Based on the current investigation at the subject site, one or more BTEX components have been detected above the applicable Atlantic PIRI *RBSL* guidelines for *Residential/Potable Water/Coarse-Grained Soil* site classification in four of the soil samples analysed. BTEX components did not exceed the applicable Atlantic PIRI *RBSL* guidelines for *Commercial/Potable Water/Coarse-Grain Soil* site classification in any of the soil samples analysed.

TPH concentrations have been detected above the applicable Atlantic PIRI *RBSL* guidelines for *Residential/Potable Water/Coarse-Grained Soil* site classification in four of the soil samples analysed. TPH concentrations have been detected above the applicable Atlantic PIRI *RBSL* for *Commercial/Potable Water/Coarse-Grain Soil* site classification in two of the soil samples analysed.

6.0 RECOMMENDATIONS

Based on the findings of the current investigation, *ADI Limited* recommend completion of a Phase III Environmental Site Assessment (ESA)/site-specific Human Health Risk Assessment (HHRA) at the site to further delineate the extent of petroleum hydrocarbon contamination in soils/ groundwater and to develop a Remedial Action Plan for the site.

7.0 REFERENCES

- *Atlantic RBCA (Risk Based Corrective Action) for Petroleum Impacted Sites in Atlantic Canada*. Version 2.0, March 2007.
- Canadian Council of Ministers of the Environment - *Canadian Environmental Quality Guidelines*, 1999/2008.
- Newfoundland & Labrador Department of Environment & Conservation, Policy Directive PPD05-01: *Management of Impacted Sites*, February 22, 2005.

- Newfoundland and Labrador Department of Environment and Conservation *Guidance Document for the Management of Impacted Sites* (Version 1.01), September 2005.

APPENDIX

Site Photos



Photo#1: Looking southeast at back of generator shed. Note former AST & soil staining.



Photo#2: Looking southwest at generator shed, with shop at right. Note concrete pad at left-location of new diesel AST.



Photo#3: Looking southeast at shop, generator shed & garage from right to left.



Photo#4: Looking northeast from generator shed across maintenance yard.

**Symbols and Terms Used on the Borehole,
Test Pit, and Monitor Well Records**



**SYMBOLS AND TERMS USED ON THE BOREHOLE,
TEST PIT, AND MONITOR WELL RECORDS**

SOIL DESCRIPTION

Behavioural properties (i.e. plasticity, permeability) take precedence over particle gradation in describing soils.

Terminology describing soil structure:

- Desiccated - having visible signs of weathering by oxidation clay minerals, shrinkage, cracks, etc.
- Fissured - having cracks, and hence a blocky structure
- Varved - composed of regular alternating layers of silt and clay
- Stratified - composed of alternating layers of different soil types, e.g. silt and sand or silt and clay
- Well-graded - having wide range in grain sizes and substantial amounts of all intermediate particle sizes
- Uniformly-graded - predominantly of one grain size.

Terminology used for describing soil strata based upon proportion of individual particle sizes present:

- Trace, or occasional - less than 10%
- Some - 10% to 20%
- Adjective (e.g. silty or sandy) - 20% to 35%
- And (e.g. silt and sand) - 35% to 50%

The standard terminology to describe cohesionless soils include the relative density, as determined by laboratory test or by the Standard Penetration Test N-value: the number of blows of 140 pound (64 kg) hammer falling 30 inches (760 mm), required to drive a 2-inch (50.8 mm) O.D. split-spoon sampler 1 foot (305 mm) into the soil. On the records, where complete sampler penetration is not achieved and an N-value cannot be reported, the total number of blows are shown over actual penetration in millimetres (eg. 75/180).

Relative Density	N-value	Relative Density %
Very Loose	<4	<15
Loose	4 - 10	15 - 35
Compact	10 - 30	35 - 65
Dense	30 - 50	65 - 85
Very Dense	>50	>85

The standard terminology to describe cohesive soils include the consistency, which is based on undrained shear strength as measured by in situ vane tests, penetrometer tests, unconfined compression tests, or occasionally by Standard Penetration Tests.

Consistency	Undrained Shear Strength		N-value
	Kips/sq.ft.	kPa	
Very Soft	< 0.25	< 12.5	< 2
Soft	0.25 to 0.5	12.5 to 25	2 to 4
Firm	0.5 to 1.0	25 to 50	4 to 8
Stiff	1.0 to 2.0	50 to 100	8 to 15
Very Stiff	2.0 to 4.0	100 to 200	15 to 30
Hard	> 4.0	> 200	> 30

SAMPLES

- | | | | |
|----|---|----|---|
| SS | Split-spoon sample
(obtained by performing the
Standard Penetration Test) | BK | Bulk sample |
| AS | Auger sample | WS | Wash sample |
| ST | Shelby tube or thin-wall tube | RC | Rock core
AXT, BXL, etc. |
| PS | Piston sample | | Rock core samples obtained with the use of
standard diamond drilling bits. |

OTHER TESTS

- | | | | |
|----|-------------------------------|-----|--|
| G | Specific Gravity | CU | Consolidated undrained triaxial with pore pressure measure-
ments |
| H | Hydrometer Analysis | UU | Unconsolidated undrained triaxial |
| S | Sieve Analysis | RCC | Rock Core Compression |
| MC | Moisture Content | DS | Direct Shear |
| y | Unit Weight | P | Field Permeability |
| C | Consolidation | TPH | Total Petroleum Hydrocarbons (ppm) |
| CD | Consolidated drained triaxial | ND | Below Detection Limit |

ROCK DESCRIPTION

The description of rock is based on the rock quality designation (RQD).

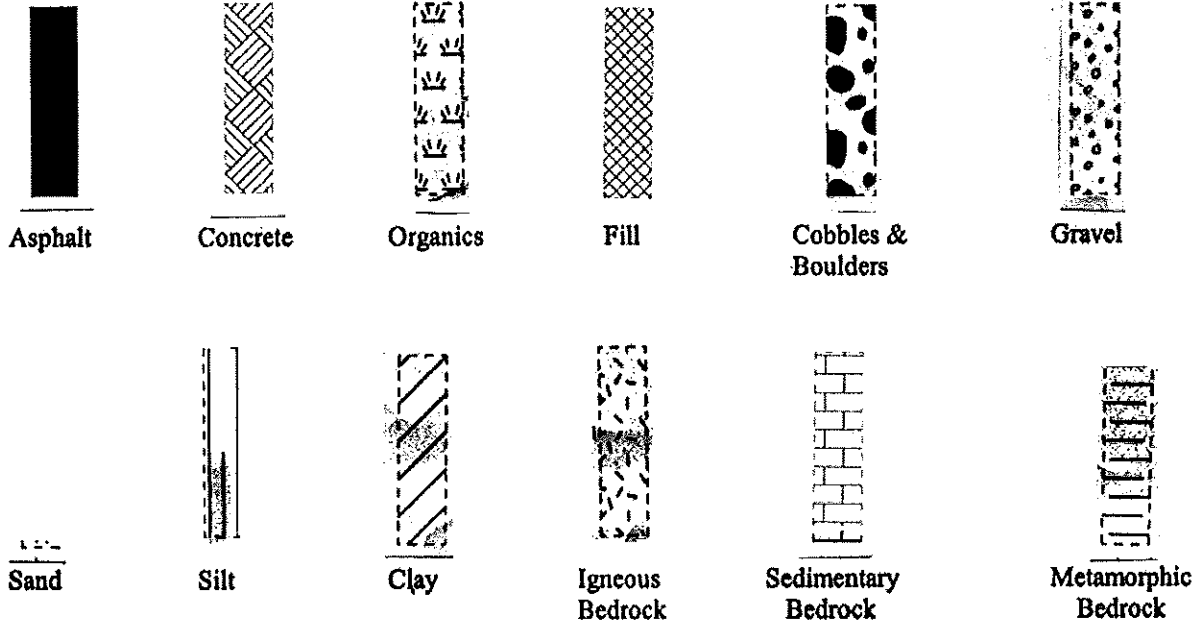
The classification is based on a modified core recovery percentage in which all pieces of sound core over 100 mm long are counted as recovery. The smaller pieces are considered to be due to close shearing, jointing, faulting, or weathering in the rock mass and are not counted. In most cases, RQD is run on NXL core; however, it can be used on different core sizes if the bulk of the fractures caused by drilling stresses are easily distinguishable from normal in situ fractures.

RQD	Rock Quality
90 to 100	excellent quality
75 to 90	good quality
50 to 75	fair quality
25 to 50	poor quality
< 25	very poor quality

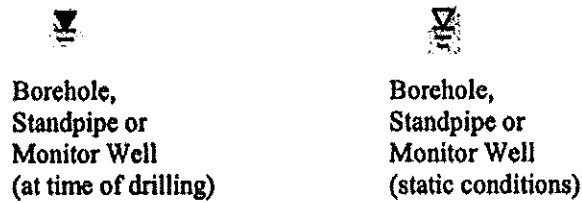
CLASSIFICATION OF ROCK WITH REGARD TO STRENGTH

STRENGTH		FIELD IDENTIFICATION METHOD	RANGE OF UNCONFINED COMPRESSIVE STRENGTH (MPa)
Grade	Classification		
RO	Extremely weak	Indented by thumbnail	< 1
R1	Very weak	Crumbles under firm blows of geological hammer; can be peeled with a pocket-knife	1 - 5
R2	Weak rock	Can be peeled by a pocket-knife with difficulty; shallow indentations made by a firm blow with point of geological hammer	5 - 25
R3	Medium strong	Cannot be scraped or peeled with a pocket-knife; specimen can be fractured with a single firm blow of geological hammer	25 - 50
R4	Strong	Specimen requires more than one blow of geological hammer to fracture	50 - 100
R5	Very strong	Specimen requires many blows of geological hammer to fracture	100 - 250
R6	Extremely strong	Specimen can be chipped by geological hammer	> 250

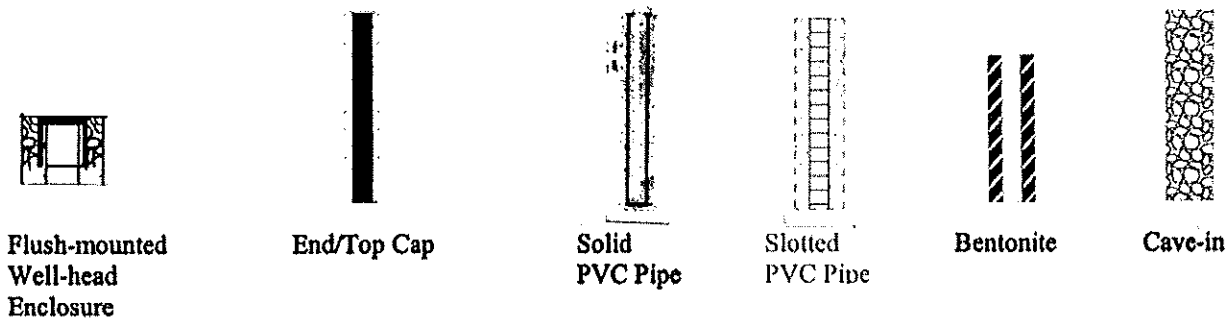
STRATA PLOT



WATER LEVEL MEASUREMENT



WELL CONSTRUCTION



Test Pit Records



TEST PIT RECORD

CLIENT Department of Environment & Conservation Parks & Natural Areas
 LOCATION Phase II ESA - Diesel Generator Site, Butterpot Provincial Park
 DATES (dd-mm-yy): DUG 3-19-09 WATER LEVEL 19-03-09

PROJECT No. 26-3665-005.1
 TEST PIT No. TP 1
 DATUM Site

DEPTH (m)	ELEV. (m)	DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES			CHEMICAL ANALYSES (mg/kg)						
					TYPE	NUMBER	OTHER TESTS	Laboratory						
								Benzene	Toluene	Ethyl Benzene	Xyloc	TPH	Gas Techtor Levels (ppm)	
0	99.85	FILL: Frozen grey to brown GRAVEL and SAND; trace to some silt; slight to moderate hydrocarbon odour; moist.			BK	1								40
	99.4	ORGANICS: Dark brown turf/rootmat; moderate hydrocarbon odour; moist to wet.												
	99.2	TILL: Compact to very dense greyish orangy brown to brownish grey SAND and GRAVEL; some silt; occasional cobbles and boulders - frequency increasing with depth; moderate to strong hydrocarbon odour; moist.			BK	2		nd	nd	0.60	3.2	7900	275	
1					BK	3							150	
2					BK	4							175	
	97.3	End of Test Pit			BK	5		nd	nd	0.12	0.71	4200	150	
3		NOTES: 1) Test pit terminated at 2.6 m depth. Bedrock not encountered. 2) Test pit dry at time of excavation. 3) Ground surface frozen at time of investigation.												
4														

ENVIRO 36650051.GPJ ADI.GDT 4/16/09



ADI Limited
 60 Pippy Place, Suite 200
 A1B 4H7
 Tel 709.579.2027
 Fax 709.579.7115

Technologist: B. Cameron
 Reviewed By: C. Pumphrey
 Contractor: Cadillac Services Ltd.
 Equipment: Case 580 Super M Backhoe

Water Level at Time of Drilling/Excavation
 Static Water Level



TEST PIT RECORD

CLIENT Department of Environment & Conservation Parks & Natural Areas
 LOCATION Phase II ESA - Diesel Generator Site, Butterport Provincial Park
 DATES (dd-mm-yy): DUG 3-19-09 WATER LEVEL 19-03-09

PROJECT No. 26-3665-005.1
 TEST PIT No. TP 2
 DATUM Site

DEPTH (m)	ELEV. (m)	DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES			CHEMICAL ANALYSES (mg/kg)						
					TYPE	NUMBER	OTHER TESTS	Laboratory						
								Benzene	Toluene	Ethyl Benzene	Xylene	TPH	Gas Tector Levels (ppm)	
0	99.85	FILL: Frozen grey to brown GRAVEL and SAND; trace to some silt; moderate hydrocarbon odour; moist.												
	99.6	ORGANICS: Dark brown turf/rootmat; strong hydrocarbon odour; wet.		BK	1			nd	7.3	1.5	11	51000	100	
	99.2	TILL: Compact to very dense greyish orangy brown to brownish grey SAND and GRAVEL; some silt; occasional cobbles and boulders; moderate to strong hydrocarbon odour; moist.		BK	2									90
1				BK	3			nd	0.04	0.12	1.1	1800	200	
	97.9		BK	4									50	
2		End of Test Pit												
		NOTES: 1) Test pit terminated at 1.9 m depth. Bedrock not encountered. 2) Test pit dry at time of excavation. 3) Ground surface frozen at time of investigation.												
3														
4														

ENVIRO_36650051.CPJ ADI.GDT 4/16/09



ADI Limited
 60 Pippy Place, Suite 200
 A1B 4H7
 Tel 709.579.2027
 Fax 709.579.7115

Technologist: B. Cameron
 Reviewed By: C. Pumphrey
 Contractor: Cadillac Services Ltd.
 Equipment: Case 580 Super M Backhoe

Water Level at Time of Drilling/Excavation
 Static Water Level



TEST PIT RECORD

CLIENT Department of Environment & Conservation Parks & Natural Areas
 LOCATION Phase II ESA - Diesel Generator Site, Butterpot Provincial Park
 DATES (dd-mm-yy): DUG 3-19-09 WATER LEVEL 19-03-09

PROJECT No. 26-3665-005.1
 TEST PIT No. TP 3
 DATUM Site

DEPTH (m)	ELEV. (m)	DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES			CHEMICAL ANALYSES (mg/kg)					
					TYPE	NUMBER	OTHER TESTS	Laboratory					Gas Tector Levels (ppm)
								Benzene	Toluene	Ethyl Benzene	Xylocene	TPH	
0	100.01	ORGANICS: Dark brown turf/rootmat, moist.											
	99.7	TILL: Compact to very dense greyish orange brown to brownish grey SAND and GRAVEL; some silt; occasional cobbles and boulders - frequency increasing with depth; moist.			BK	1							0
1					BK	2							0
2					BK	3							0
	97.5				BK	4		nd	nd	nd	nd	nd	0
		End of Test Pit											
3		NOTES: 1) Test pit terminated at 2.5 m depth. Bedrock not encountered. 2) Test pit dry at time of excavation. 3) Soil sample QA/QC-S1 obtained from soil sample BK4.											
4													

ENVIRO 36650051.GPJ ADI.GDT 4/16/09



ADI Limited
 60 Pippy Place, Suite 200
 A1B 4H7
 Tel 709.579.2027
 Fax 709.579.7115

Technologist: B. Cameron
 Reviewed By: C. Pumphrey
 Contractor: Cadillac Services Ltd.
 Equipment: Case 580 Super M Backhoe

Water Level at Time of Drilling/Excavation
 Static Water Level



TEST PIT RECORD

CLIENT Department of Environment & Conservation Parks & Natural Areas
 LOCATION Phase II ESA - Diesel Generator Site, Butterpot Provincial Park
 DATES (dd-mm-yy): DUG 3-19-09 WATER LEVEL 19-03-09

PROJECT No. 26-3665-005.1
 TEST PIT No. TP 4
 DATUM Site

DEPTH (m)	ELEV. (m)	DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES			CHEMICAL ANALYSES (mg/kg)						
					TYPE	NUMBER	OTHER TESTS	Laboratory						
								Benzene	Toluene	Ethyl Benzene	Xylene	TPH	Gas Tecator Levels (ppm)	
0	99.94	FILL: Frozen grey to brown GRAVEL and SAND; trace to some silt; moist.			BK	1								25
	99.5													
	99.4	ORGANICS: Dark brown turf/rootmat, moist.												
1		TILL: Compact to very dense greyish orange brown to brownish grey SAND and GRAVEL; some silt; occasional cobbles and boulders - frequency increasing with depth; moist.			BK	2								0
					BK	3								0
2					BK	4		nd	nd	nd	nd	nd	0	
	97.5													
3		End of Test Pit												
		NOTES: 1) Test pit terminated at 2.4 m depth. Bedrock not encountered. 2) Test pit dry at time of excavation. 3) Ground surface frozen at time of investigation.												
4														

ENVIRO 36650051.GPJ ADI.GDT 4/16/09



ADI Limited
 60 Pippy Place, Suite 200
 A1B 4H7
 Tel 709.579.2027
 Fax 709.579.7115

Technologist: B. Cameron
 Reviewed By: C. Pumphrey
 Contractor: Cadillac Services Ltd.
 Equipment: Case 580 Super M Backhoe

Water Level at Time of Drilling/Excavation
 Static Water Level

Laboratory Certificates

Your Project #: 26-3665-005.1
 Site: PHASE II ESA, BUTTER POT PARK
 Your G.O.C. #: 30894

Attention: Cyril Pumphrey
 ADI Limited
 60 Pippy Pl
 Suite 200
 St. John's, NL
 A1B 4H7

incoming Data/Product
Supplied by: Maxxam
Project No.: 26-3665-005.1
Reviewed by: CJP
Date Reviewed: April 14 / 09

Report Date: 2009/03/27

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: A931321
Received: 2009/03/20, 09:50

Sample Matrix: Soil
 # Samples Received: 7

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Method Reference
TEH in Soil (PIRI)	7	2009/03/24	2009/03/25	ATL SOP-00197 R2	Based on Atl. PIRI
Moisture	7	N/A	2009/03/24	ATL SOP-00196 R3	MOE Handbook 1983
VPH in Soil (PIRI)	7	2009/03/24	2009/03/24	ATL SOP 00199 R3	Based on Atl. PIRI
ModTPH (T1) Calc. for Soil	7	2009/03/20	2009/03/25		Based on Atl. PIRI

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

Encryption Key

Paula Chaplin

Paula Chaplin
 27 Mar 2009 09:04:02 -02:30

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

ROB WHELAN, Project Manager
 Email: Rob.Whelan@maxxamanalytics.com
 Phone# (709) 754-0203

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. SCC and CALA have approved this reporting process and electronic report format.

Total cover pages: 1

Maxxam Job #: A931321
 Report Date: 2009/03/27

ADI Limited
 Client Project #: 26-3665-005.1
 Project name: PHASE II ESA, BUTTER POT PARK

ATLANTIC MUST IN SOIL (SOIL)

Maxxam ID		BZ6467	BZ6468	BZ6469	BZ6470		
Sampling Date		2009/03/19	2009/03/19	2009/03/19	2009/03/19		
COC Number		30694	30694	30694	30694		
Registration #							
	Units	TP1; SA2	TP1; SA5	TP2; SA1	TP2; SA3	RDL	QC Batch

Inorganics							
Moisture	%	19	8	61	14	1	1771025
Petroleum Hydrocarbons							
Benzene	mg/kg	ND	ND	ND	ND	0.03	1771023
Toluene	mg/kg	ND	ND	7.3	0.04	0.03	1771023
Ethylbenzene	mg/kg	0.60	0.12	1.5	0.12	0.03	1771023
Xylene (Total)	mg/kg	3.2	0.71	11	1.1	0.05	1771023
C6 - C10 (less BTEX)	mg/kg	260	190	140	130	3	1771023
>C10-C21 Hydrocarbons	mg/kg	6900	3600	28000	1300	15	1771024
>C21-<C32 Hydrocarbons	mg/kg	800	430	23000	350	15	1771024
Modified TPH (Tier1)	mg/kg	7900	4200	51000	1800	20	1768675
Surrogate Recovery (%)							
Isobutylbenzene - Extractable	%	121	109	134 (1)	90		1771024
n-Dotriacontane - Extractable	%	121 (2)	123 (2)	57 (3)	117 (4)		1771024
Isobutylbenzene - Volatile	%	100	104	33 (5)	113		1771023

ND = Not detected
 RDL = Reportable Detection Limit
 QC Batch = Quality Control Batch
 (1) Please refer to General Comments page for specific clarification.
 (2) Fuel oil fraction.
 (3) Weathered fuel oil fraction. Lube oil fraction. Isobutylbenzene/n-Dotriacontane recovery(ies) not within acceptance limits due to matrix/co-extractive interference.
 (4) Fuel oil fraction. Lube oil range.
 (5) Isobutylbenzene recovery not within acceptance limits due to matrix/co-extractive interference.

Maxxam Job #: A931321
 Report Date: 2009/03/27

ADI Limited
 Client Project #: 26-3665-005.1
 Project name: PHASE II ESA, BUTTER POT PARK

ATLANTIC MUST IN SOIL (SOIL)

Maxxam ID		BZ6471	BZ6473	BZ6474		
Sampling Date		2009/03/19	2009/03/19	2009/03/19		
COC Number		30694	30694	30694		
Registration #						
	Units	TP3; SA4	TP4; SA4	QA/QC-S1	RDL	QC Batch

Inorganics						
Moisture	%	10	6	10	1	1771025
Petroleum Hydrocarbons						
Benzene	mg/kg	ND	ND	ND	0.03	1771023
Toluene	mg/kg	ND	ND	ND	0.03	1771023
Ethylbenzene	mg/kg	ND	ND	ND	0.03	1771023
Xylene (Total)	mg/kg	ND	ND	ND	0.05	1771023
C6 - C10 (less BTEX)	mg/kg	ND	ND	ND	3	1771023
>C10-C21 Hydrocarbons	mg/kg	ND	ND	ND	15	1771024
>C21-<C32 Hydrocarbons	mg/kg	ND	ND	ND	15	1771024
Modified TPH (Tier1)	mg/kg	ND	ND	ND	20	1768675
Surrogate Recovery (%)						
Isobutylbenzene - Extractable	%	99	100	102		1771024
n-Dotriacontane - Extractable	%	106	98	104		1771024
Isobutylbenzene - Volatile	%	92	95	99		1771023

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

Maxxam Job #: A931321
Report Date: 2009/03/27

ADI Limited
Client Project #: 26-3665-005.1
Project name: PHASE II ESA, BUTTER POT PARK

GENERAL COMMENTS

Results relate only to the items tested.

ADI Limited
 Attention: Cyril Pumphrey
 Client Project #: 26-3665-005.1
 P.O. #:
 Project name: PHASE II ESA, BUTTER POT PARK

Quality Assurance Report
 Maxxam Job Number: ZA931321

QA/QC Batch	QC Type	Parameter	Date Analyzed	Value	Recovery	Units	QC Limits	
Num Init			yyyy/mm/dd					
1771023 SPN	Spiked Blank	Isobutylbenzene - Volatile	2009/03/24		100	%	60 - 140	
		Benzene	2009/03/24		90	%	60 - 140	
		Toluene	2009/03/24		90	%	60 - 140	
		Ethylbenzene	2009/03/24		89	%	60 - 140	
		Xylene (Total)	2009/03/24		90	%	60 - 140	
	Method Blank	Isobutylbenzene - Volatile	2009/03/24			106	%	60 - 140
		Benzene	2009/03/24	ND, RDL=0.03		mg/kg		
		Toluene	2009/03/24	ND, RDL=0.03		mg/kg		
		Ethylbenzene	2009/03/24	ND, RDL=0.03		mg/kg		
		Xylene (Total)	2009/03/24	ND, RDL=0.05		mg/kg		
	RPD [BZ6473-01]	C6 - C10 (less BTEX)	2009/03/24	ND, RDL=3		mg/kg		
		Benzene	2009/03/24	NC		%	50	
		Toluene	2009/03/24	NC		%	50	
		Ethylbenzene	2009/03/24	NC		%	50	
Xylene (Total)		2009/03/24	NC		%	50		
1771024 SPI	MATRIX SPIKE [BZ6473-01]	C6 - C10 (less BTEX)	2009/03/24	NC		%	50	
		Isobutylbenzene - Extractable	2009/03/25		100	%	30 - 130	
		n-Dotriacontane - Extractable	2009/03/25		117	%	30 - 130	
		>C10-C21 Hydrocarbons	2009/03/25		98	%	30 - 130	
		>C21-<C32 Hydrocarbons	2009/03/25		94	%	30 - 130	
	Spiked Blank	Isobutylbenzene - Extractable	2009/03/25		101	%	30 - 130	
		n-Dotriacontane - Extractable	2009/03/25		121	%	30 - 130	
		>C10-C21 Hydrocarbons	2009/03/25		102	%	30 - 130	
		>C21-<C32 Hydrocarbons	2009/03/25		97	%	30 - 130	
		Method Blank	Isobutylbenzene - Extractable	2009/03/25		118	%	30 - 130
	RPD [BZ6473-01]	n-Dotriacontane - Extractable	2009/03/25		120	%	30 - 130	
		>C10-C21 Hydrocarbons	2009/03/25	ND, RDL=15		mg/kg		
		>C21-<C32 Hydrocarbons	2009/03/25	ND, RDL=15		mg/kg		
		>C10-C21 Hydrocarbons	2009/03/25	NC		%	50	
>C21-<C32 Hydrocarbons		2009/03/25	NC		%	50		
1771025 CDR	RPD [BZ6473-01]	Moisture	2009/03/24	4.6		%	25	

ND = Not detected
 NC = Non-calculable
 RPD = Relative Percent Difference
 SPIKE = Fortified sample