

**REPORT OF PRELIMINARY  
ENVIRONMENTAL SITE ASSESSMENT**

**PEARSON PROPERTY, PARCEL # 44  
STATE PROJECT U-2211B, WBS 34783.1.1  
1401 NORWOOD STREET  
LENOIR, NORTH CAROLINA**

Prepared for:

**North Carolina Department of Transportation  
Geotechnical Engineering Unit  
1589 Mail Service Center  
Raleigh, North Carolina 27699**

Prepared by:

**MACTEC Engineering and Consulting, Inc.  
3301 Atlantic Avenue  
Raleigh, North Carolina 27604**

**MACTEC Project No. 6470-08-2286**

**January 30, 2009**





engineering and constructing a better tomorrow

January 30, 2009

Mr. Ethan Caldwell, L.G.  
Geoenvironmental Project Manager  
NCDOT Geotechnical Engineering Unit  
1589 Mail Service Center  
Raleigh, North Carolina 27699

Subject: **Report of Preliminary Environmental Site Assessment  
Pearson Property, Parcel #44  
State Project U-2211B, WBS 34783.1.1  
1401 Norwood Street  
Lenoir, North Carolina  
MACTEC Project No. 6470-08-2286**

Dear Mr. Caldwell:

As authorized by your acceptance of MACTEC Proposal No. PROP 08-RAL-457 dated November 25, 2008, MACTEC Engineering and Consulting, Inc. (MACTEC) is pleased to submit the attached Report of Preliminary Environmental Site Assessment for the above-referenced site.

This report is intended for the use of NCDOT subject to contractual terms between NCDOT and MACTEC. Reliance on this document by any other party is not allowed without the expressed, written consent of MACTEC. Use of this report for purposes beyond those reasonably intended by NDOT and MACTEC will be at the sole risk of the user.

This report presents project information and assessment activities conducted, along with our findings, conclusions and recommendations. We appreciate your selection of MACTEC for this project and look forward to assisting you further on this and other projects. If you have any questions, please do not hesitate to contact us.

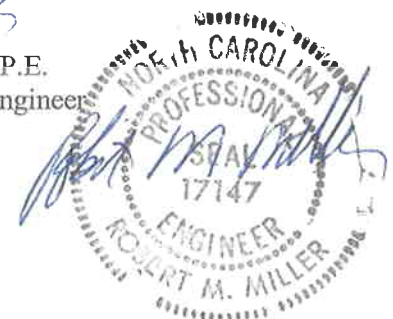
Sincerely,

**MACTEC ENGINEERING AND CONSULTING, INC.**

Matthew J. Gillis  
Staff Scientist

Richard A. Kolb, L.G.  
Principal Geologist

Robert M. Miller, P.E.  
Senior Principal Engineer



2-7-09

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Appendix B – Soil Boring Records

Appendix C – Laboratory Analytical Reports and Chain-of-Custody Records

## 1.0 INTRODUCTION

MACTEC Engineering and Consulting, Inc. (MACTEC) was contracted by North Carolina Department of Transportation (NCDOT) to perform a Preliminary Environmental Site Assessment of the property owned by Buel & Janet Pearson located at 1401 Norwood Street in Lenoir, Caldwell County, North Carolina (Figure 1). This property was one in a series of 11 sites that were investigated by MACTEC. MACTEC understands that NCDOT is planning road improvements to the area. The entire property is being acquired by NCDOT for this project. NCDOT requested that MACTEC assess the subject site to evaluate the extent (if any) of soil and/or groundwater contamination related to activity (past or present) at this location and the impact (if any) on the proposed road improvements. This report presents MACTEC's assessment activities, findings, conclusions and recommendations.

### 1.1 Site Location

The Pearson property is located at 1401 Norwood Street in Lenoir, Caldwell County, North Carolina. The site consists of approximately 0.18 acres of land and is developed with a vacant building. The Caldwell County Geographic Information Services (GIS) identifies the site as parcel identification number (PIN) 2758285210. The site is bound to the north by Berkley Street, across which is Bank of Granite; to the east by Bob's Lenoir Optical Service and a single-family residence; to the south by a vacant building; and to the west by Norwood Street, across which is the Central Baptist Church (Figure 2).

### 1.2 Background Information

The building on the subject site is 1,350 square feet in area and is constructed with a slab-on-grade concrete foundation and an aluminum/vinyl exterior. The asphalt parking lot provides access to Norwood Street and Berkley Street. MACTEC observed an empty aboveground storage tank along the eastern side of the building. MACTEC observed two ventilation pipes protruding from the ground along the eastern side of the building.

## 2.0 ASSESSMENT ACTIVITIES

Prior to field activities, MACTEC prepared a site health and safety plan in accordance with OSHA 1910.120 requirements. NCDOT contracted with GEL Geophysics (GEL) to perform a geophysical investigation to identify suspected USTs on the property and to identify buried utilities at the site. GEL provided paint mark outs of buried utilities and suspected USTs locations to MACTEC prior to our assessment activities. They did not identify anomalies that may be USTs.

### 2.1 Soil Assessment

On December 9, 2008, Regional Probing Services, Inc. (Regional Probing), under contract to MACTEC, advanced five soil borings (Nos. SB-18 through SB-22) at the subject site using a Geoprobe™ direct-push technology. Soil boring locations were selected based on the proposed NCDOT right of way, results of the geophysical investigation and field observations. Figure 2 shows

a site layout and the locations of the soil borings. Coordinates of the soil boring locations were recorded using a hand-held GPS.

MACTEC collected soil samples from each boring using the procedures outlined in Appendix A. Copies of soil boring records are included in Appendix B.

MACTEC instructed Regional Probing to advance each soil boring to 12 feet below ground surface (bgs). Soil boring SB-19 was advanced to eight feet bgs due to Geoprobe refusal. MACTEC screened soil samples from each boring at one-foot intervals for volatile organic vapors using a photoionization detector (PID) and selected one soil sample from each boring for laboratory testing. MACTEC selected the soil sample that exhibited the highest PID measurement or the deepest, unsaturated soil sample if the PID did not detect organic vapors. Soil borings SB-18 through SB-22 were backfilled with the excess soil cuttings and bentonite chips.

## **2.2 Soil Analysis**

MACTEC submitted the soil samples to Prism Laboratories (Prism) of Charlotte, North Carolina for analysis for total petroleum hydrocarbons (TPH) diesel range organics (DRO) according to EPA Preparation/Test Methods 3550/8015, and TPH gasoline range organics (GRO) according to EPA Preparation/Testing Methods 5035/8015.

## **3.0 LABORATORY RESULTS**

The laboratory test results are summarized on Table 1. The laboratory test reports and chain-of-custody records are included in Appendix C. The laboratory detected TPH DRO in the soil samples collected from soil borings SB-19 and SB-20 and TPH GRO in the soil samples collected from soil borings SB-18 through SB-20 at concentrations that exceed the laboratory reporting limit. TPH DRO in soil samples from SB-19 and SB-20 also exceeded the North Carolina Department of Environment and Natural Resources (NCDENR) Action Level of 10 mg/Kg.

## **4.0 CONCLUSIONS AND RECOMMENDATIONS**

Based on the Preliminary Environmental Site Assessment, MACTEC offers the following conclusions and recommendations:

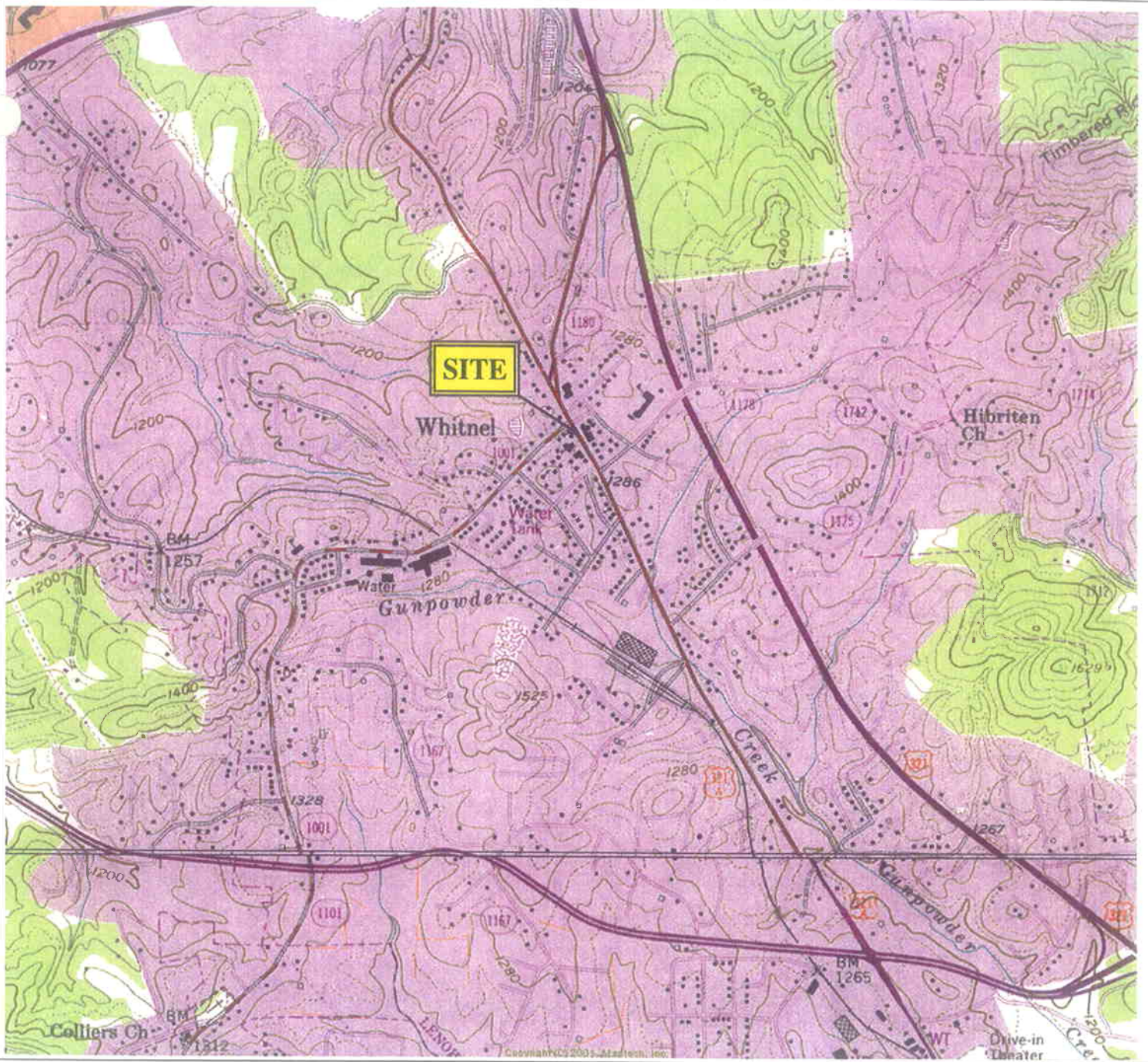
- The laboratory detected TPH GRO at concentrations that exceed the laboratory reporting limit in three soil samples. The concentrations do not exceed North Carolina Department of Environment and Natural Resources Action Level of 10 mg/Kg.
- The laboratory detected TPH DRO in two soil samples (SB-19 and SB-20) that exceed NCDENR's Action Level of 10 mg/Kg.
- If we assume that impacted soil at the locations of SB-19 and SB-20 extends up to approximately 37 feet from these borings, five feet horizontally in all directions from the borings and 12 feet vertically from the boring locations, an estimated total of 85 cubic yards of impacted soil would be present at this location.

- The ventilation pipes along the eastern side of the building are consistent with UST systems. If USTs are discovered during future construction, MACTEC recommends closing any USTs in accordance with state regulations.
- The presence of TPH is evidence of a release of petroleum. MACTEC recommends notifying the property owner of this finding, who should then report this evidence to the Asheville Regional Office of NCDENR.

## **5.0 QUALIFICATIONS**

This assessment was performed under a limited scope for those purposes described above. The conclusions and recommendations presented in this report are based upon the data that were reviewed and documented in this report along with our experience on similar projects. The discovery of any additional information concerning environmental conditions at the site should be reported to MACTEC for additional review so that potential environmental impacts can be reassessed and the conclusions and recommendations modified, if appropriate.

**FIGURES**



NORTH

**LENOIR, NC**  
35081-H5-TF-024

1993

DMA 4655 I NE-SERIES V842

**DREXEL, NC**  
35081-G5-TF-024

1993

DMA 4655 I SE-SERIES V842

CONTOUR INTERVAL 40 FEET  
DOTTED LINES REPRESENT 20 FOOT CONTOURS  
NATIONAL GEODETIC VERTICAL DATUM OF 1929



QUADRANGLE LOCATION

NOTE: SITE LOCATION IS APPROXIMATE

**MACTEC**

MACTEC ENGINEERING AND CONSULTING, INC.  
3301 ATLANTIC AVENUE  
RALEIGH, NORTH CAROLINA

**TOPOGRAPHIC SITE MAP  
PEARSON PROPERTY  
PARCEL #44  
LENOIR, NORTH CAROLINA**

DRAWN: MJG	DATE: JANUARY 2009	FIGURE
ENG CHECK: <i>Wsk</i>	SCALE: 1 : 24000	<b>1</b>
APPROVAL: <i>PAK</i>	JOB: 6470-08-2286	

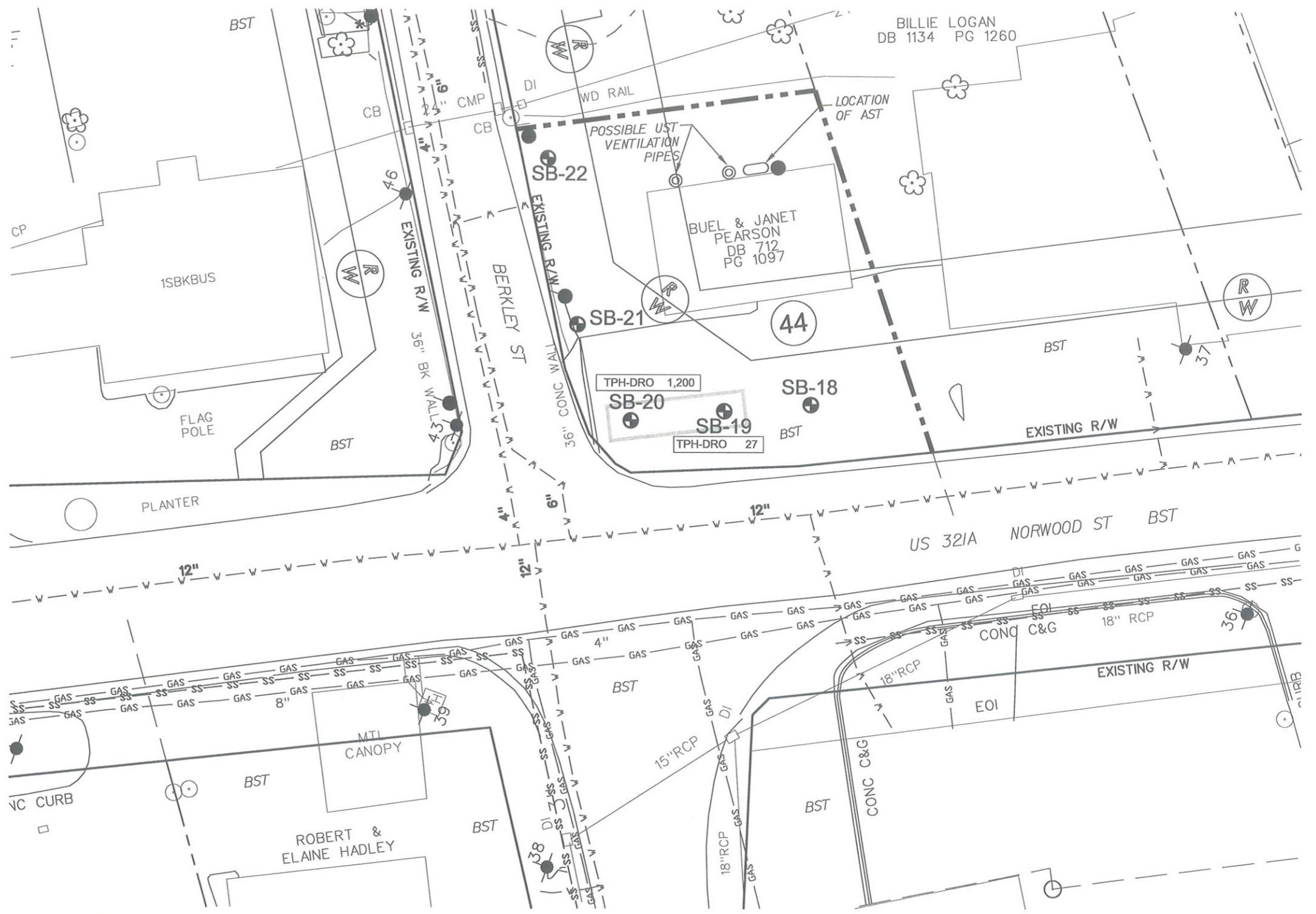
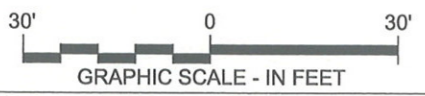
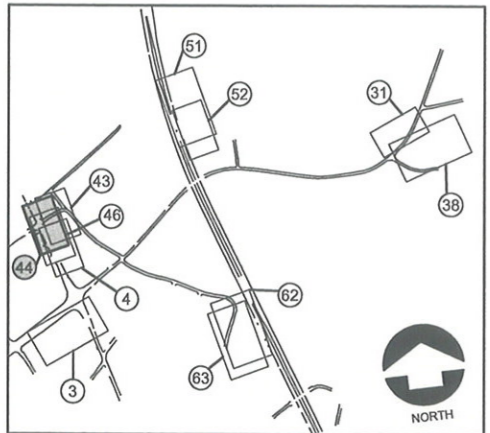


F:\6470\08\INDOT 2008-2009 Geotech Contract\6470-08-2286 U-2211B PSAs at 11 sites in Caldwell County\CAD Files\Drawings\Site Location Map Parcel 44.dwg Fri, 06 Mar 2009 - 9:41am rrbhie



**LEGEND:**

- EXISTING PROPERTY LINE
- EXISTING RIGHT OF WAY LINE
- - - EXISTING ROAD SOILS
- GAS — EXISTING UTILITY UG GAS LINE
- SS - SS - EXISTING UTILITY UG SANITARY SEWER LINE
- W - W - EXISTING UTILITY UG WATER LINE
- EXISTING STRUCTURE
- (R/W) PROPOSED RIGHT OF WAY LINE
- (#) DOT PARCEL NUMBER
- (Tree symbol) EXISTING VEGETATION TREE
- (Dashed line) EXISTING VEGETATION WOOD LINE
- (Dot) EXISTING UTILITY POLE
- (SB-#) SOIL BORING LOCATION
- (Dot with circle) SOIL BORING SHOWING ESTIMATED EXTENT OF CONTAMINATION ABOVE NCDENR ACTION LEVELS (Concentrations are in mg/kg)



**SITE LAYOUT SHOWING SOIL BORING LOCATIONS  
 PEARSON PROPERTY, PARCEL #44  
 NCDOT PROJECT NO. U-2211B  
 LENOIR, NORTH CAROLINA**

DRAWN:	R.R.	DATE:	JANUARY 2009
ENG CHECK:	MJB	SCALE:	1" = 30'
APPROVAL:	[Signature]	JOB No.:	6470-08-2286

FIGURE  
2

REFERENCE: BASE DRAWING PROVIDED BY NCDOT; MACTEC FIELD NOTES.

**TABLE**

**Table 1**  
**Summary of Laboratory Test Results**  
**State Project U-2211B, WBS 34783.1.1**  
**Pearson Property, Parcel #44**  
**Lenoir, North Carolina**  
**MACTEC Job No. 6470-08-2286**

Analytical Method -->		EPA 8015	EPA 8015
Contaminant of Concern -->		TPH-DRO	TPH-GRO
Sample ID	Date Collected	Sample Depth	mg/Kg
SB-18	12/9/2008	5'-6'	<7.9
SB-19	12/9/2008	7'-8'	27
SB-20	12/9/2008	10'-11'	1,200
SB-21	12/9/2008	11'-12'	<8.9
SB-22	12/9/2008	11'-12'	<8.8
NCDENR Action Level		10	10

**Notes:**

NCDENR North Carolina Department of Environment and Natural Resources

**Bold** Concentration exceeds Reporting Limit (RL)

**<#** Concentration exceeds the NCDENR Action Level

**J** Analyte not detected above the RL shown

Estimated value between the RL and Method Detection Limit

Prepared by: MJB Date: 1-21-09

Checked by: WJR Date: 1-21-09

**APPENDIX A**

**PROCEDURES FOR COLLECTING SOIL SAMPLES**

### **Procedures for Collecting Soil Samples for Laboratory Testing Using the Geoprobe**

- MACTEC will collect the soil samples using the Geoprobe hammer impact system. Downforce or percussion will be utilized to advance the sampler to the desired depth to obtain the soil sample.
- Soil cores will be retrieved from the sampler and classified by an on-site geologist or engineer. The one-inch diameter cores are approximately four feet in length and are contained within a pre-cleaned, disposable plastic sleeve.
- Soil samples from the boring soil cores will be placed in pre-labeled, airtight, plastic "twin" bags.
- After several minutes, the gas contained in the "headspace" or void area within one of the twin bags will be tested with a photoionization detector (PID).
- The duplicate of the sample that exhibits the highest headspace reading will be submitted to the laboratory for testing. The remaining portion of the soil core will be utilized for classification purposes.
- The soils will be classified in accordance with the Unified Soils Classification System.
- The soil sample will be placed into laboratory-supplied bottles.
- Sample bottles will be labeled prior to sample collection.
- Caps will be secured on bottles.
- All sample containers will be placed in plastic bags and the bags sealed.
- Documentation, including chain-of-custody record and laboratory analytical request form, will be completed for all samples.
- Samples will be packed in coolers with "bubble wrap" and ice packs for shipment to the laboratory.
- The chain-of-custody record and analytical request form will be placed inside the cooler, which will be sealed with security tape.
- Samples will be shipped under Chain-of-Custody via overnight express to the analytical laboratory within 24 hours following collection.

**APPENDIX B**  
**SOIL BORING RECORDS**



MACTEC Engineering and Consulting, Inc.  
3301 Atlantic Avenue  
Raleigh, North Carolina

Soil Boring Sample Record

MACTEC Project ID: Pearson Property, Parcel #44

MACTEC Field Representative

MACTEC Project #: 6470-08-2286

Gillis

Date: 12-9-08

Boring ID: SB-18

Depth Interval	Soil Description	Time	HeadSpace Screening Results (in ppm)		Comments
			PID		
0-1	Top 3" asphalt; Reddish brown silty, clayey, micaceous, fine to medium sand		0.0		
1-2	Reddish brown silty, clayey, micaceous, fine to medium sand		0.0		
2-3	Reddish brown silty, clayey, micaceous, fine to medium sand		0.0		
3-4	Reddish brown silty, clayey, micaceous, fine to medium sand		0.0		
4-5	Reddish brown silty, clayey, micaceous, fine to medium sand		0.1		
5-6	Brown clayey, fine to medium sand	1030	1.7		Sample
6-7	Brown clayey, fine to medium sand		0.5		
7-8	Brown clayey, fine to medium sand		0.0		
8-9	Reddish brown clayey, micaceous, fine to medium sand		0.0		
9-10	Reddish brown clayey, micaceous, fine to medium sand		0.0		
10-11	Reddish brown clayey, micaceous, fine to medium sand		0.0		
11-12	Reddish brown clayey, micaceous, fine to medium sand		0.0		

Prepared By: WTJ6 Date: 1-30-09

Checked By: [Signature] Date: 1/30/09



MACTEC Engineering and Consulting, Inc.  
3301 Atlantic Avenue  
Raleigh, North Carolina

Soil Boring Sample Record

MACTEC Project ID: Pearson Property, Parcel #44

MACTEC Field Representative

MACTEC Project #: 6470-08-2286

Gillis

Date: 12-9-08

Boring ID: SB-19

Depth Interval	Soil Description	Time	Headspace Screening Results (in ppm)		Comments
			PID		
0-1	Top 3" asphalt; Reddish brown clayey, silty, micaceous, fine to medium sand		0.0		
1-2	Reddish brown clayey, silty, micaceous, fine to medium sand		0.0		
2-3	Reddish brown clayey, silty, micaceous, fine to medium sand		0.0		
3-4	Reddish brown clayey, silty, micaceous, fine to medium sand		0.0		
4-5	Light brown silty, micaceous, fine to medium sand with quartz		0.0		
5-6	Light brown silty, micaceous, fine to medium sand with quartz		0.0		
6-7	Brown clayey, fine to medium sand		0.1		
7-8	Brown clayey, fine to medium sand	1055	1.2		Sample
8-9					
9-10					Geoprobe refusal at 8 feet bgs.
10-11					
11-12					

Prepared By: MJB Date: 1-30-09  
Checked By: [Signature] Date: 1/30/09





MACTEC Engineering and Consulting, Inc.  
3301 Atlantic Avenue  
Raleigh, North Carolina

Soil Boring Sample Record

MACTEC Project ID: Pearson Property, Parcel #44

MACTEC Field Representative

MACTEC Project #: 6470-08-2286

Gillis

Date: 12-9-08

Boring ID: SB-20

Depth Interval	Soil Description	Time	Headspace Screening Results (in ppm)		Comments
			PID		
0-1	Top 3" asphalt; Reddish brown silty, fine to medium sand with some clay and mica		0.0		
1-2	Reddish brown silty, fine to medium sand with some clay and mica		0.0		
2-3	Reddish brown silty, fine to medium sand with some clay and mica		0.0		
3-4	Reddish brown silty, fine to medium sand with some clay and mica		0.0		
4-5	Reddish brown clayey, micaceous, fine to medium sand		0.0		
5-6	Reddish brown clayey, micaceous, fine to medium sand		0.0		
6-7	Reddish brown clayey, micaceous, fine to medium sand		0.0		
7-8	Reddish brown clayey, micaceous, fine to medium sand		0.0		
8-9	Reddish brown clayey, micaceous, fine to medium sand		0.0		
9-10	Reddish brown clayey, micaceous, fine to medium sand		0.2		
10-11	Brown silty, micaceous, fine to medium sand	1105	32.9		Sample
11-12	Reddish brown clayey, micaceous, fine to medium sand		0.0		

Prepared By: MJB Date: 1-30-09

Checked By: [Signature] Date: 1/30/09



MACTEC Engineering and Consulting, Inc.  
3301 Atlantic Avenue  
Raleigh, North Carolina

Soil Boring Sample Record

MACTEC Project ID: Pearson Property, Parcel #44

MACTEC Field Representative

MACTEC Project #: 6470-08-2286

Gillis

Date: 12-9-08

Boring ID: SB-21

Depth Interval	Soil Description	Time	Headspace Screening Results (in ppm)		Comments
			PID		
0-1	Top 3" topsoil; Reddish brown silty, fine to medium sand with some clay and mica		0.0		
1-2	Reddish brown silty, fine to medium sand with some clay and mica		0.0		
2-3	Reddish brown silty, fine to medium sand with some clay and mica		0.0		
3-4	Reddish brown silty, fine to medium sand with some clay and mica		0.0		
4-5	Reddish brown silty, fine to medium sand with some clay and mica		0.0		
5-6	Reddish brown clayey, micaceous, fine to medium sand		0.0		
6-7	Reddish brown clayey, micaceous, fine to medium sand		0.0		
7-8	Reddish brown clayey, micaceous, fine to medium sand		0.0		
8-9	Reddish brown clayey, micaceous, fine to medium sand		0.0		
9-10	Reddish brown clayey, micaceous, fine to medium sand		0.0		
10-11	Reddish brown clayey, micaceous, fine to medium sand		0.0		
11-12	Reddish brown clayey, micaceous, fine to medium sand	1115	0.0		Sample

Prepared By: MJB Date: 1-30-09

Checked By: [Signature] Date: 1/30/09



MACTEC Engineering and Consulting, Inc.  
3301 Atlantic Avenue  
Raleigh, North Carolina

Soil Boring Sample Record

MACTEC Project ID: Pearson Property, Parcel #44

MACTEC Project #: 6470-08-2286

MACTEC Field Representative

Gillis

Date: 12-9-08

Boring ID: SB-22

Depth Interval	Soil Description	Time	Headspace Screening Results (in ppm)		Comments
			PID		
0-1	Top 3" topsoil; Reddish brown silty, micaceous, fine to medium sand		0.0		
1-2	Reddish brown silty, micaceous, fine to medium sand		0.0		
2-3	Reddish brown silty, micaceous, fine to medium sand		0.0		
3-4	Reddish brown silty, micaceous, fine to medium sand		0.0		
4-5	Reddish brown clayey, micaceous, fine to medium sand		0.0		
5-6	Reddish brown clayey, micaceous, fine to medium sand		0.0		
6-7	Reddish brown clayey, micaceous, fine to medium sand		0.0		
7-8	Reddish brown clayey, micaceous, fine to medium sand		0.0		
8-9	Brown clayey, fine to medium sand		0.0		
9-10	Reddish brown clayey, fine to medium sand		0.0		
10-11	Reddish brown clayey, fine to medium sand		0.0		
11-12	Reddish brown clayey, fine to medium sand	1130	0.0		Sample

Prepared By: MS6 Date: 1-30-09

Checked By: [Signature] Date: 1/30/09

**APPENDIX C**

**LABORATORY ANALYTICAL REPORTS  
AND CHAIN-OF-CUSTODY RECORDS**



# Case Narrative (Revised)

**Date:** 01/23/09  
**Company:** N.C. Department of Transportation  
**Contact:** Matt Gillis  
**Address:** c/o MACTEC Eng. & Consulting, Inc  
 3301 Atlantic Ave.  
 Raleigh, NC 27604

**Client Project ID:** NCDOT Lenoir  
**Prism COC Group No:** G1208362  
**Collection Date(s):** 12/08/08 thru 12/10/08  
**Lab Submittal Date(s):** 12/10/08  
**Client Project Name Or No:** WBS# 34783.1.1

This is a revised report and supersedes our original laboratory report dated 12/24/08. Report modified to include Pearson Property data only.

This data package contains the analytical results for the project identified above and includes a Case Narrative, Laboratory Report and Quality Control Data totaling 7 pages. A chain-of-custody is also attached for the samples submitted to Prism for this project.

Data qualifiers are flagged individually on each sample. A key reference for the data qualifiers appears at the end of this case narrative. Quality control statements and/or sample specific remarks are included in the sample comments section of the laboratory report for each sample affected.

### Semi Volatile Analysis

No Anomalies Reported

### Volatile Analysis

No Anomalies Reported

### Metals Analysis

N/A

### Wet Lab and Micro Analysis

N/A

Please call if you have any questions relating to this analytical report.

**Date Reviewed by:** Steven H. Guptill  
**Signature:** *Steven H. Guptill*  
**Review Date:** 01/23/09

**Project Manager:** Steven H. Guptill  
**Signature:** *Steven H. Guptill*  
**Approval Date:** 01/23/09

### **Data Qualifiers Key Reference:**

- B: Compound also detected in the method blank.
- #: Result outside of the QC limits.
- DO: Compound diluted out.
- E: Estimated concentration, calibration range exceeded.
- J: The analyte was positively identified but the value is estimated below the reporting limit.
- H: Estimated concentration with a high bias.
- L: Estimated concentration with a low bias.
- M: A matrix effect is present.

Notes: This report should not be reproduced, except in its entirety, without the written consent of Prism Laboratories, Inc. The results in this report relate only to the samples submitted for analysis.



NC Certification No. 402  
 SC Certification No. 99012  
 NC Drinking Water Cert. No. 37735

# Laboratory Report

01/23/09

N.C. Department of Transportation  
 Attn: Matt Gillis  
 c/o MACTEC Eng. & Consulting, Inc  
 3301 Atlantic Ave.  
 Raleigh, NC 27604

Project ID: NCDOT Lenoir  
 Project No.: WBS# 34783.1.1  
 Sample Matrix: Soil

Client Sample ID: SB-18  
 Prism Sample ID: 232991  
 COC Group: G1208362  
 Time Collected: 12/09/08 10:30  
 Time Submitted: 12/10/08 16:45

Parameter	Result	Units	Report Limit	MDL	Dilution Factor	Method	Analysis Date/Time	Analyst	Batch ID
<b>Percent Solids Determination</b>									
Percent Solids	88.5	%			1	SM2540 G	12/15/08 14:00	dsullivan	
<b>Diesel Range Organics (DRO) by GC-FID</b>									
Diesel Range Organics (DRO)	BRL	mg/kg	7.9	1.3	1	8015B	12/18/08 16:12	jvogel	Q37828
Sample Preparation:			25.02 g	/	1 mL	3545	12/17/08 14:00	pbarr	P23339
						<b>Surrogate</b>	<b>% Recovery</b>	<b>Control Limits</b>	
						o-Terphenyl	89	49 - 124	
<b>Sample Weight Determination</b>									
Weight 1	7.38	g			1	GRO	12/12/08 0:00	lbrown	
Weight 2	7.70	g			1	GRO	12/12/08 0:00	lbrown	
<b>Gasoline Range Organics (GRO) by GC-FID</b>									
Gasoline Range Organics (GRO)	5.0 J	mg/kg	5.6	0.69	50	8015B	12/15/08 22:08	dliamm	Q37664
						<b>Surrogate</b>	<b>% Recovery</b>	<b>Control Limits</b>	
						aaa-TFT	63	55 - 129	

**Sample Comment(s):**

BRL = Below Reporting Limit

J- Estimated value between the Reporting Limit and the MDL

The results in this report relate only to the samples submitted for analysis and meet state certification requirements other than NELAC certification except for those instances indicated in the case narrative and/or test comments.

All results are reported on a dry-weight basis

Angela D. Overcash, V.P. Laboratory Services

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449 Springbrook Road - P.O. Box 240543 - Charlotte, NC 28224-0543

Phone: 704/529-6364 - Toll Free Number: 1-800/529-6364 - Fax: 704/525-0409



NC Certification No. 402  
 SC Certification No. 99012  
 NC Drinking Water Cert. No. 37735

# Laboratory Report

01/23/09

N.C. Department of Transportation  
 Attn: Matt Gillis  
 c/o MACTEC Eng. & Consulting, Inc  
 3301 Atlantic Ave.  
 Raleigh, NC 27604

Project ID: NCDOT Lenoir  
 Project No.: WBS# 34783.1.1  
 Sample Matrix: Soil

Client Sample ID: SB-19  
 Prism Sample ID: 232992  
 COC Group: G1208362  
 Time Collected: 12/09/08 10:55  
 Time Submitted: 12/10/08 16:45

Parameter	Result	Units	Report Limit	MDL	Dilution Factor	Method	Analysis Date/Time	Analyst	Batch ID
-----------	--------	-------	--------------	-----	-----------------	--------	--------------------	---------	----------

**Percent Solids Determination**

Percent Solids	80.8	%			1	SM2540 G	12/15/08 14:00	dsullivan	
----------------	------	---	--	--	---	----------	----------------	-----------	--

**Diesel Range Organics (DRO) by GC-FID**

Diesel Range Organics (DRO)	27	mg/kg	8.7	1.4	1	8015B	12/18/08 16:47	jvogel	Q37828
-----------------------------	----	-------	-----	-----	---	-------	----------------	--------	--------

Sample Preparation:			25.03 g	/	1 mL	3545	12/17/08 14:00	pbarr	P23339
---------------------	--	--	---------	---	------	------	----------------	-------	--------

Surrogate	% Recovery	Control Limits
o-Terphenyl	88	49 - 124

**Sample Weight Determination**

Weight 1	6.39	g			1	GRO	12/12/08 0:00	lbrown	
Weight 2	6.50	g			1	GRO	12/12/08 0:00	lbrown	

**Gasoline Range Organics (GRO) by GC-FID**

Gasoline Range Organics (GRO)	8.3	mg/kg	6.2	0.75	50	8015B	12/15/08 22:39	dliamm	Q37664
-------------------------------	-----	-------	-----	------	----	-------	----------------	--------	--------

Surrogate	% Recovery	Control Limits
aaa-TFT	64	55 - 129

**Sample Comment(s):**

BRL = Below Reporting Limit

J- Estimated value between the Reporting Limit and the MDL

The results in this report relate only to the samples submitted for analysis and meet state certification requirements other than NELAC certification except for those instances indicated in the case narrative and/or test comments.

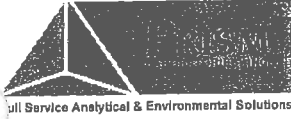
All results are reported on a dry-weight basis

Angela D. Overcash, V.P. Laboratory Services

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449 Springbrook Road - P.O. Box 240543 - Charlotte, NC 28224-0543

Phone: 704/529-6364 - Toll Free Number: 1-800/529-6364 - Fax: 704/525-0409



NC Certification No. 402  
 SC Certification No. 99012  
 NC Drinking Water Cert. No. 37735

# Laboratory Report

01/23/09

N.C. Department of Transportation  
 Attn: Matt Gillis  
 c/o MACTEC Eng. & Consulting, Inc  
 3301 Atlantic Ave.  
 Raleigh, NC 27604

Project ID: NCDOT Lenoir  
 Project No.: WBS# 34783.1.1  
 Sample Matrix: Soil

Client Sample ID: SB-20  
 Prism Sample ID: 232993  
 COC Group: G1208362  
 Time Collected: 12/09/08 11:05  
 Time Submitted: 12/10/08 16:45

Parameter	Result	Units	Report Limit	MDL	Dilution Factor	Method	Analysis Date/Time	Analyst	Batch ID
-----------	--------	-------	--------------	-----	-----------------	--------	--------------------	---------	----------

**Percent Solids Determination**

Percent Solids	78.8	%			1	SM2540 G	12/15/08 14:00	dsullivan	
----------------	------	---	--	--	---	----------	----------------	-----------	--

**Diesel Range Organics (DRO) by GC-FID**

Diesel Range Organics (DRO)	1200	mg/kg	180	29	20	8015B	12/19/08 2:13	jvogel	Q37828
-----------------------------	------	-------	-----	----	----	-------	---------------	--------	--------

Sample Preparation: 25.08 g / 1 mL 3545 12/17/08 14:00 pbarr P23339

Surrogate	% Recovery	Control Limits
o-Terphenyl	DO #	49 - 124

**Sample Weight Determination**

Weight 1	6.12	g			1	GRO	12/12/08 0:00	lbrown	
Weight 2	6.24	g			1	GRO	12/12/08 0:00	lbrown	

**Gasoline Range Organics (GRO) by GC-FID**

Gasoline Range Organics (GRO)	6.5	mg/kg	6.3	0.77	50	8015B	12/15/08 23:10	dliamm	Q37664
-------------------------------	-----	-------	-----	------	----	-------	----------------	--------	--------

Surrogate	% Recovery	Control Limits
aaa-TFT	65	55 - 129

Sample Comment(s):

BRL = Below Reporting Limit

J- Estimated value between the Reporting Limit and the MDL

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All results are reported on a dry-weight basis

Angela D. Overcash, V.P. Laboratory Services

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NC Certification No. 402  
 SC Certification No. 99012  
 NC Drinking Water Cert. No. 37735

# Laboratory Report

01/23/09

N.C. Department of Transportation  
 Attn: Matt Gillis  
 c/o MACTEC Eng. & Consulting, Inc  
 3301 Atlantic Ave.  
 Raleigh, NC 27604

Project ID: NCDOT Lenoir  
 Project No.: WBS# 34783.1.1  
 Sample Matrix: Soil

Client Sample ID: SB-21  
 Prism Sample ID: 232994  
 COC Group: G1208362  
 Time Collected: 12/09/08 11:15  
 Time Submitted: 12/10/08 16:45

Parameter	Result	Units	Report Limit	MDL	Dilution Factor	Method	Analysis Date/Time	Analyst	Batch ID
<b><u>Percent Solids Determination</u></b>									
Percent Solids	78.9	%			1	SM2540 G	12/15/08 14:00	dsullivan	
<b><u>Diesel Range Organics (DRO) by GC-FID</u></b>									
Diesel Range Organics (DRO)	BRL	mg/kg	8.9	1.4	1	8015B	12/18/08 17:22	jvogel	Q37828
Sample Preparation:			25.01 g	/	1 mL	3545	12/17/08 14:00	pbarr	P23339
						<b>Surrogate</b>	<b>% Recovery</b>	<b>Control Limits</b>	
						o-Terphenyl	79	49 - 124	
<b><u>Sample Weight Determination</u></b>									
Weight 1	6.42	g			1	GRO	12/12/08 0:00	lbrown	
Weight 2	6.43	g			1	GRO	12/12/08 0:00	lbrown	
<b><u>Gasoline Range Organics (GRO) by GC-FID</u></b>									
Gasoline Range Organics (GRO)	BRL	mg/kg	6.3	0.77	50	8015B	12/15/08 23:43	dliamm	Q37664
						<b>Surrogate</b>	<b>% Recovery</b>	<b>Control Limits</b>	
						aaa-TFT	68	55 - 129	

**Sample Comment(s):**

BRL = Below Reporting Limit

J- Estimated value between the Reporting Limit and the MDL

The results in this report relate only to the samples submitted for analysis and meet state certification requirements other than NELAC certification except for those instances indicated in the case narrative and/or test comments.

All results are reported on a dry-weight basis

Angela D. Overcash, V.P. Laboratory Services

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NC Certification No. 402  
 SC Certification No. 99012  
 NC Drinking Water Cert. No. 37735

# Laboratory Report

01/23/09

N.C. Department of Transportation  
 Attn: Matt Gillis  
 c/o MACTEC Eng. & Consulting, Inc  
 3301 Atlantic Ave.  
 Raleigh, NC 27604

Project ID: NCDOT Lenoir  
 Project No.: WBS# 34783.1.1  
 Sample Matrix: Soil

Client Sample ID: SB-22  
 Prism Sample ID: 232995  
 COC Group: G1208362  
 Time Collected: 12/09/08 11:30  
 Time Submitted: 12/10/08 16:45

Parameter	Result	Units	Report Limit	MDL	Dilution Factor	Method	Analysis Date/Time	Analyst	Batch ID
<b>Percent Solids Determination</b>									
Percent Solids	79.1	%			1	SM2540 G	12/15/08 14:00	dsullivan	
<b>Diesel Range Organics (DRO) by GC-FID</b>									
Diesel Range Organics (DRO)	BRL	mg/kg	8.8	1.4	1	8015B	12/18/08 17:58	jvogel	Q37828
Sample Preparation:			25.01 g	/	1 mL	3545	12/17/08 14:00	pbarr	P23339
					<b>Surrogate</b>		<b>% Recovery</b>	<b>Control Limits</b>	
					o-Terphenyl		86	49 - 124	
<b>Sample Weight Determination</b>									
Weight 1	6.51	g			1	GRO	12/12/08 0:00	lbrown	
Weight 2	6.62	g			1	GRO	12/12/08 0:00	lbrown	
<b>Gasoline Range Organics (GRO) by GC-FID</b>									
Gasoline Range Organics (GRO)	BRL	mg/kg	6.3	0.77	50	8015B	12/16/08 12:55	dliamm	Q37664
					<b>Surrogate</b>		<b>% Recovery</b>	<b>Control Limits</b>	
					aaa-TFT		56	55 - 129	

**Sample Comment(s):**

BRL = Below Reporting Limit

J- Estimated value between the Reporting Limit and the MDL

The results in this report relate only to the samples submitted for analysis and meet state certification requirements other than NELAC certification except for those instances indicated in the case narrative and/or test comments.

All results are reported on a dry-weight basis

Angela D. Overcash, V.P. Laboratory Services

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NC Certification No. 402  
 SC Certification No. 99012  
 NC Drinking Water Cert. No. 37735

# Level II QC Report

01/23/09

N.C. Department of Transportation  
 Attn: Matt Gillis  
 c/o MACTEC Eng. & Consulting, Inc  
 3301 Atlantic Ave.  
 Raleigh, NC 27604

Project ID: NCDOT Lenoir  
 Project No.: WBS# 34783.1.1

COC Group Number: G1208362  
 Date/Time Submitted: 12/10/08 16:45

**Gasoline Range Organics (GRO) by GC-FID, method 8015B**

Method Blank					QC Batch ID
	Result	RL	Control Limit	Units	
Gasoline Range Organics (GRO)	ND	5	<2.5	mg/kg	Q37664

Laboratory Control Sample						QC Batch ID
	Result	Spike Amount	Units	Recovery %	Recovery Ranges %	
Gasoline Range Organics (GRO)	38.1	50	mg/kg	76	67-116	Q37664

Matrix Spike						QC Batch ID
Sample ID:	Result	Spike Amount	Units	Recovery %	Recovery Ranges %	
232978 Gasoline Range Organics (GRO)	29.3	50	mg/kg	59	57-113	Q37664

Matrix Spike Duplicate								QC Batch ID
Sample ID:	Result	Spike Amount	Units	Recovery %	Recovery Ranges %	RPD %	RPD Range %	
232978 Gasoline Range Organics (GRO)	32.9	50	mg/kg	66	57-113	12	0 - 23	Q37664

**Diesel Range Organics (DRO) by GC-FID, method 8015B**

Method Blank					QC Batch ID
	Result	RL	Control Limit	Units	
Diesel Range Organics (DRO)	ND	7	<3.5	mg/kg	Q37828

Laboratory Control Sample						QC Batch ID
	Result	Spike Amount	Units	Recovery %	Recovery Ranges %	
Diesel Range Organics (DRO)	79.1	80	mg/kg	99	55-109	Q37828

Matrix Spike						QC Batch ID
Sample ID:	Result	Spike Amount	Units	Recovery %	Recovery Ranges %	
232999 Diesel Range Organics (DRO)	63.7	80	mg/kg	80	50-117	Q37828

Matrix Spike Duplicate								QC Batch ID
Sample ID:	Result	Spike Amount	Units	Recovery %	Recovery Ranges %	RPD %	RPD Range %	
232999 Diesel Range Organics (DRO)	63.5	80	mg/kg	79	50-117	0	0 - 24	Q37828

#-See Case Narrative

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Full Service Analytical & Environmental Solutions

449 Springbrook Road • P.O. Box 240543 • Charlotte, NC 28224-0543  
Phone: 704/529-6364 • Fax: 704/625-0409

Client Company Name: MACTEC  
Report To/Contact Name: Matt Gillis  
Reporting Address: 3301 Atlantic Ave Raleigh NC 27604

Phone: 919 831 8056 Fax (Yes) (No):  
Email (Yes) (No) Email Address: mgillis@mactec  
EDD Type: PDF  Excel  Other  
Site Location Name: NC DOT Lenoir  
Site Location Physical Address: 6470-08-2286

# CHAIN OF CUSTODY RECORD

PAGE 2 OF 6 QUOTE # TO ENSURE PROPER BILLING:

Project Name: \_\_\_\_\_ UST Project: (Yes) (No) \_\_\_\_\_  
Short Hold Analysis: (Yes) (No) \_\_\_\_\_  
\*Please ATTACH any project specific reporting (QC LEVEL I II III IV) provisions and/or QC Requirements  
Invoice To: MACTEC NC DOT  
Address: \_\_\_\_\_

Purchase Order No./Billing Reference \_\_\_\_\_  
Requested Due Date  1 Day  2 Days  3 Days  4 Days  5 Days  
"Working Days"  6-9 Days  Standard 10 days  Rush Work Must Be Pre-Approved  
Samples received after 15:00 will be processed next business day.  
Turnaround time is based on business days, excluding weekends and holidays.  
(SEE REVERSE FOR TERMS & CONDITIONS REGARDING SERVICES RENDERED BY PRISM LABORATORIES, INC. TO CLIENT)

CLIENT SAMPLE DESCRIPTION	DATE COLLECTED	TIME COLLECTED MILITARY HOURS	MATRIX (SOIL, WATER OR SLUDGE)	SAMPLE CONTAINER		PRESERVATIVES	ANALYSES REQUESTED	REMARKS	PRISM LAB ID NO.
				*TYPE SEE BELOW	NO. SIZE				
SB-11	12-8-08	1500	Soil	C	4	W/STAB	X		232984
SB-12	12-8-08	1530			4		X		232985
SB-13	12-9-08	0905			4		X		232986
SB-14	12-9-08	0920			4		X		232987
SB-15	12-9-08	0935			4		X		232988
SB-16	12-9-08	0950			4		X	232985	232985
SB-17	12-9-08	1015			4		X		232990
SB-18	12-9-08	1030			4		X		232991
SB-19	12-9-08	1055			4		X		232992
SB-20	12-9-08	1105			4		X		232993

Sampler's Signature: Matthew G. 1/3 Sampled By (Print Name): Matthew G. 1/3 Affiliation: MACTEC

Upon relinquishing, this Chain of Custody is your authorization for Prism to proceed with the analyses as requested above. Any changes must be submitted in writing to the Prism Project Manager. There will be charges for any changes after analyses have been initialized.

Relinquished By (Signature): Matthew New Received For (Signature): [Signature] Date: 12/16/08 Military/Hours: 16.50  
Relinquished By (Signature): [Signature] Received By (Signature): [Signature] Date: 12/16/08

Relinquished By (Signature): [Signature] Received For Prism Laboratories By: [Signature] Date: 12/16/08 COG Group No. G1308362

NOTE: ALL SAMPLE CONTAINERS SHOULD BE TAPED SHUT WITH CUSTODY SEALS FOR TRANSPORTATION TO THE LABORATORY. SAMPLES ARE NOT ACCEPTED AND VERIFIED AGAINST COC UNTIL RECEIVED AT THE LABORATORY.  
Fed Ex  UPS  Hand-delivered  Other   
NPDES:  SC  NC  DRINKING WATER:  NC  SC  SOLID WASTE:  NC  SC  RCRA:  NC  SC  CERCLA:  NC  SC  LANDFILL:  NC  SC  OTHER:  NC  SC   
\*CONTAINER TYPE CODES: A = Amber G = Glass P = Plastic; TL = Teflon-Lined Cap VOA = Volatile Organics Analysis (Zero Head Space)

**LAB USE ONLY**

Samples INTACT upon arrival? YES  NO  N/A

Received ON TIME? YES  NO  N/A

PROPER PRESERVATIVES indicated? YES  NO  N/A

Received WITHIN HOLDING TIMES? YES  NO  N/A

CUSTODY SEALS INTACT? YES  NO  N/A

VOLATILES (BAR/W/OUT HEADSPACE)? YES  NO  N/A

PROPER CONTAINERS used? YES  NO  N/A

TO BE FILLED IN BY CLIENT/SAMPLING PERSONNEL  
Certification: NELAC \_\_\_\_\_ USACE \_\_\_\_\_ FL \_\_\_\_\_ NC \_\_\_\_\_  
SC \_\_\_\_\_ OTHER \_\_\_\_\_ N/A \_\_\_\_\_  
Water Chlorinated: YES \_\_\_\_\_ NO \_\_\_\_\_  
Sample Iced Upon Collection: YES \_\_\_\_\_ NO \_\_\_\_\_

PRISM USE ONLY  
Site Arrival Time: \_\_\_\_\_  
Site Departure Time: \_\_\_\_\_  
Field Tech Fee: \_\_\_\_\_  
Mileage: \_\_\_\_\_

Additional Comments: \_\_\_\_\_  
**PRESS DOWN FIRMLY - 3 COPIES**

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Phone: 704/529-6364 • Fax: 704/525-0409

Client Company Name: MACTEC  
Report To/Contact Name: Math Gillis  
Reporting Address: 3301 Atlantic Ave  
Wesley, NC 27604

Phone: 919 831 8056 Fax (Yes) (No):  
Email (Yes) (No) Email Address: M.J.gillis@maectec.com  
EDD Type: PDF  Excel  Other \_\_\_\_\_  
Site Location Name: NCDOT Lenox  
Site Location Physical Address: 6470-08 2286

# CHAIN OF CUSTODY RECORD

PAGE 3 OF 6 QUOTE # TO ENSURE PROPER BILLING:

Project Name: \_\_\_\_\_ UST Project: (Yes) (No) \_\_\_\_\_  
Short Hold Analysis: (Yes) (No) \_\_\_\_\_  
\*Please ATTACH any project specific reporting (QC LEVEL I III IV)  
provisions and/or QC Requirements  
Invoice To: NCDOT  
Address: \_\_\_\_\_

Purchase Order No./Billing Reference \_\_\_\_\_  
Requested Due Date  1 Day  2 Days  3 Days  4 Days  5 Days  
"Working Days"  6-9 Days  Standard 10 days  Rush Work Must Be  
Pre-Approved  
Samples received after 15:00 will be processed next business day.  
Turnaround time is based on business days, excluding weekends and holidays.  
(SEE REVERSE FOR TERMS & CONDITIONS REGARDING SERVICES  
RENDERED BY PRISM LABORATORIES, INC. TO CLIENT)

# LAB USE ONLY

Samples INTACT upon arrival? YES  NO  N/A  
Received ON WET ICE? Temp 4/3  
PROPER PRESERVATIVES indicated?   
Received WITHIN HOLDING TIMES?   
CUSTODY SEALS INTACT?   
VOATILES: acid/W/OUT HEADSPACE?   
PROPER CONTAINERS used?

TO BE FILLED IN BY CLIENT/SAMPLING PERSONNEL

Certification: NELAC \_\_\_\_\_ USACE \_\_\_\_\_ FL \_\_\_\_\_ NC \_\_\_\_\_  
SC \_\_\_\_\_ OTHER \_\_\_\_\_ N/A  
Water Chlorinated: YES \_\_\_\_\_ NO \_\_\_\_\_  
Sample Iced Upon Collection: YES \_\_\_\_\_ NO \_\_\_\_\_

CLIENT SAMPLE DESCRIPTION	DATE COLLECTED	TIME COLLECTED MILITARY HOURS	MATRIX (SOIL, WATER OR SLUDGE)	SAMPLE CONTAINER			PRESERVA- TIVES	ANALYSES REQUESTED	REMARKS	PRISM LAB ID NO.
				*TYPE SEE BELOW	NO.	SIZE				
SB-21	12-9-08	1115	Soil	C	4	Method	X	X	232994	
SB-22		1130			4		X	X	232995	
SB-23		1330			4		X	X	232996	
SB-24		1345			4		X	X	232997	
SB-25		1355			4		X	X	232998	
SB-26		1415			4		X	X	232999	232999
SB-27		1435			4		X	X	233000	
SB-28		1450			4		X	V	233001	
SB-29		1600			4		X	X	233002	
SB-30		1610			4		X	X	233003	

PRISM USE ONLY

Site Arrival Time  
Site Departure Time  
Elect Tech Fee  
Mileage

Additional Comments:

Sampler's Signature: Matthew Gillis Sampled By (Print Name): Matthew Gillis Affiliation: MACTEC

Upon relinquishing, this Chain of Custody for Prism to proceed with the analyses as requested above. Any changes must be submitted in writing to the Prism Project Manager. There will be charges for any changes after analyses have been initialized.

Relinquished By: (Signature) [Signature] Date: 12/9/08 Military Hours: 1615  
Relinquished By: (Signature) [Signature] Date: 12/9/08 Military Hours: 1615

Relinquished By: (Signature) [Signature] Date: 12/9/08 Military Hours: 1615

Relinquished By: (Signature) [Signature] Date: 12/9/08 Military Hours: 1615

Method of Shipment:  Hand-delivered  Prisms Field Service  Other  
NPDES:  NC  SC  NC  SC  NC  SC  NC  SC  NC  SC  NC  SC  NC  SC  NC  SC  NC  SC  NC  SC  NC  SC  NC  SC

\*CONTAINER TYPE CODES: A = Amber C = Clear G = Glass P = Plastic; TL = Teflon-Lined Cap VOA = Volatile Organics Analysis (Zero Head Space)

## **ATTACHMENT F**

### **RESULTS OF GEOPHYSICAL INVESTIGATION**

**Buel & Janet Pearson Property, Parcel #44**

**U-2211B, WBS No. 34783.1.1**

**Caldwell County, North Carolina**

A geophysical investigation was conducted on the Buel and Janet Pearson Property (Parcel No. 44) to identify the presence or absence of underground storage tanks (USTs) and associated appurtenances at the subject site. The geophysical investigation utilized ground penetrating radar and time domain electromagnetics. These instruments were used in concert with one another in order to identify subsurface metallic anomalies and, in particular, to identify the presence of USTs on site. A brief description of each instrument is presented in the following paragraphs followed by a discussion of the results of the geophysical evaluation.

#### **1.0 Ground Penetrating Radar Methodology**

A RAMAC digital radar control system configured with a 250 Megahertz (MHz) antenna array was used in this investigation. Ground Penetrating Radar (GPR) is an electromagnetic geophysical method that detects interfaces between subsurface materials with differing dielectric constants. The GPR system consists of an antenna that houses the transmitter and receiver, a digital control unit that both generates and digitally records the GPR data, and a color video monitor to view data as they are collected in the field.

The transmitter radiates repetitive short-duration electromagnetic waves (at radar frequencies) into the earth from an antenna moving across the ground surface. These radar waves are reflected back to the receiver from the interface of materials with different dielectric constants. The intensity of the reflected signal is a function of the contrast in the dielectric constant between the materials, the conductivity of the material through which the wave is traveling, and the frequency of the signal. Subsurface features that commonly cause such reflections are: 1) natural geologic conditions, such as changes in sediment composition, bedding, and cementation horizons and voids; or 2) unnatural changes to the subsurface, such as disturbed soils, soil backfill, buried debris, tanks, pipelines, and utilities. The digital control unit processes the signal from the receiver and produces a continuous cross-section of the subsurface interface reflection events.

**GEL Engineering of NC, Inc.**  
*an Affiliate of The GEL Group, Inc.*

**fc: ncdt01008**

GPR data profiles are collected along transects, which are measured paths along which the GPR antenna is moved. During a survey, marks are placed in the data by the operator at designated points along the GPR transects or with a survey wheel odometer. These marks allow for a correlation between the GPR data and the position of the GPR antenna on the ground.

Depth of investigation of the GPR signal is highly site-specific and is limited by signal attenuation (absorption) in the subsurface materials. Signal attenuation is dependent on the electrical conductivity of the subsurface materials. Signal attenuation is greatest in materials with relatively high electrical conductivities, such as clays, brackish groundwater, or groundwater with a high dissolved solid content from natural or man-made sources. Signal attenuation is lowest in relatively low-conductivity materials, such as dry sand or rock. Depth of investigation is also dependent on the antenna's transmitting frequency. Depth of investigation generally increases as transmitting frequency decreases; however, the ability to resolve smaller subsurface features is diminished as frequency is decreased.

The GPR antenna used at this site is internally shielded from aboveground interference sources. Accordingly, the GPR response is not affected by overhead power lines, metallic buildings, or nearby objects.

## **2.0 Time Domain Electromagnetic Methodology**

The Time Domain Electromagnetic (TDEM) methods measure the electrical conductivity of subsurface materials. The conductivity is determined by inducing (from a transmitter) a time or frequency-varying magnetic field and measuring (with a receiver) the amplitude and phase shift of an induced secondary magnetic field. The secondary magnetic field is created by subsurface conductive materials behaving as an inductor as the primary magnetic field is passed through them.

The Geonics EM-61 system used in this investigation operates within these principles. However, the EM-61 TDEM system can discriminate between moderately conductive earth materials and very conductive metallic targets. The EM-61 consists of a portable coincident loop time domain transmitter and receiver with a 0.5-meter by 1.0-meter coil system. The EM-61 generates 150 pulses per second and measures the response from the ground after transmission or between pulses. The secondary EM responses from metallic targets are of longer duration than those created by conductive

earth materials. By recording the later time EM arrivals, only the response from metallic targets is measured, rather than the field generated by the earth material.

### **3.0 Field Procedures**

The geophysical field investigation was performed on December 1-2 & 8, 2008. Interpretation of the GPR data was conducted in the field and any potential anomalies were marked in the field. GPR data processing typically included band pass filtering, background removal, horizontal smoothing, and gain adjustments. TDEM was also used to scan the project site. Any electromagnetic anomalies indicative of buried metallic objects were marked in the field. No subsurface anomalies were identified on the subject site during the survey.