Draper Aden Associates
Engineering • Surveying • Environmental Services

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November 8, 2018

Dr. Dennis Li, Ph.D.
North Carolina Department of Transportation
Geotechnical Engineering Unit
1589 Mail Service Center
Raleigh, North Carolina 27699-1589

Reference: **Preliminary Site Assessment for the Quality Oil Company Property**
2005 New Hope Church Road
Raleigh, Wake County, North Carolina
State Project: P-5715
WBS Element 46927.1.1
DAA Project No. 18110166-010701 Rev 1

Dear Dr. Li:

Draper Aden Associates (DAA) has completed the Preliminary Site Assessment conducted at the above-referenced property. DAA performed the work in accordance with the Technical and Cost proposal dated March 30, 2018, and the North Carolina Department of Transportation's (NCDOT's) Notice to Proceed dated April 3, 2018. Activities associated with the assessment consisted of conducting a geophysical investigation and collecting soil samples for analysis. The purpose of this report is to document the field activities, present the laboratory analyses, and provide recommendations regarding the property.

Location and Description

The Quality Oil Company Property (Parcel #9) is located at 2005 New Hope Church Road in Raleigh, Wake County, North Carolina. The property is situated in the northwestern quadrant of the intersection of New Hope Church Road and Stillwell Court (**Figure 1**). The property is an active gas station and convenience store (Quality Mart). One building with detached gas dispensers and a canopy are located at the site with the existing underground storage tanks (USTs) located on the north side of the building (**Figure 2**). Concrete and asphalt paving dominates the site. According to the NCDOT, a new right-of-way acquisition will occur for eliminating the at-grade crossing for the rail line on the west side of the site. The proposed right-of-way will take the entire property; therefore, the taking will affect the building, canopy, and USTs.

The NCDOT requested a Preliminary Site Assessment for the right-of-way because the property contains an active gas station. The scope of work as defined in the Request for Technical and Cost Proposal was to evaluate the site with respect to the presence of known and unknown USTs, and

assess whether contamination exists on the study area. An estimate of the quantity of impacted soil is to be provided, should impacted soils be encountered.

DAA reviewed the on-line NCDEQ Incident Management database and UST Number RA-4260 was assigned to the site. According to the on-line NCDEQQ database, four 8,000-gallon gasoline USTs were removed from the site in 1993. Soil samples collected from the closure indicated no contamination and the no incident number was assigned. Although no incident number was assigned, it should be noted that a groundwater monitoring well was located north of the UST area. No information was available regarding the monitoring well.

DAA also examined the UST registration database to obtain UST ownership information. According to the database, the site operates under Facility Number 00-0-000006631 and includes one 12,000-gallon and two 8,000-gallon gasoline tanks installed in 1993. The database also indicates the three closed USTs. The owner and operator of the tanks are:

Owner	Operator
Quality Oil Company	Quality Mart #6
PO Box 2736/1540 Silas Creek Parkway	2005 New Hope Church Road
Winston-Salem, NC 27102-2736	Raleigh, NC 27284

Geophysical Survey

Prior to DAA's mobilization to the site, Pyramid Environmental & Engineering of Greensboro, NC (Pyramid) conducted a geophysical survey in the study area to determine if unknown USTs were present in the proposed easement. The geophysical survey consisted of an electromagnetic survey using a Geonics EM61 time-domain electromagnetic (EM) induction meter to locate buried metallic objects, and ground penetrating radar (GPR) using a Geophysical Survey Systems Inc. Utility Scan DF with a dual frequency 300/800 MHz antenna. Pyramid used the instruments specifically to locate USTs.

The geophysical team laid out a survey grid along the study area with the X-axis oriented approximately parallel to New Hope Church Road and the Y-axis oriented approximately perpendicular to New Hope Church Road. **Figure 2** of the geophysical survey report in **Attachment A** shows the EM survey area.

The geophysical survey lines were spaced five feet apart and the instruments collected magnetic data continuously along each survey line with a data logger. After collection, Pyramid reviewed the data in the field with graphical computer software. Following the electromagnetic survey, a GPR survey was conducted to further evaluate any significant metallic anomalies. GPR transects are shown on **Figure 3** of **Attachment A**.

Access was available to all areas of the study area and the geophysical survey detected several anomalies. With the exception of the known USTs, the survey attributed the anomalies to visible

cultural features, metallic debris, underground utilities, signage, or vehicles. The collective geophysical data did not record any evidence of unknown metallic USTs at the site. **Attachment A** presents Pyramid's detailed report of findings and interpretations.

Site Assessment Activities

On October 3 and 4, 2018, DAA mobilized to the site to conduct a Geoprobe® direct-push investigation to evaluate subsurface soil conditions on the property to a depth of 8 to 10 feet below ground surface (ft bgs) in non-UST areas and 15 ft bgs in the UST area. DAA advanced 15 direct-push holes (SB-1 through SB-15) throughout the proposed right-of-way (**Figure 2)**. The soil boring logs are included as **Attachment B**. The borings were located to evaluate the subsurface conditions in the study area (see boring location photos in **Attachment C**).

The lithology encountered by the direct-push samples was generally consistent throughout the site. The ground surface was covered with about six inches of topsoil or asphalt. Below this surface cover was to a depth of about 3 ft bgs was reworked soil consistent with site work prior to construction. Below the reworked soil was a reddish brown to orange brown silty clay with interlayered seams of medium-grained sand. No bedrock or groundwater was noted in any of the borings, but parent rock fabric was noted in several of the soil samples. Each boring was backfilled with bentonite and drill cuttings to the surface after completion.

According to the 1985 Geologic Map of North Carolina, the site is within the Piedmont Physiographic Province in North Carolina. The strata indicated for this area is a biotite gneiss and schist intruded by numerous sills and dikes of granite, pegmatite and aplite. The soils observed at the site are consistent with this description.

Continuous sampling using a Geoprobe® resulted in good recovery of soil samples from the direct-push holes. DAA collected and contained soil samples in four-foot long acetate sleeves inside the direct-push Macro-Core® sampler. Each of the sleeves was divided into two-foot long sections for soil sample screening. Soil from each two-foot interval was placed in a resealable plastic bag and the bag was set aside for volatilization of organic compounds from the soil to the bag headspace. A photoionization detector (PID) probe was inserted into the bag and the reading was recorded (**Table 1**).

DAA submitted one sample per boring for analysis, the depth interval with the highest PID reading (**Table 1**). The soil samples were submitted to REDLab in Wilmington, North Carolina, for analysis of total petroleum hydrocarbons (TPH) diesel range organics (DRO) and gasoline range organics (GRO) using ultraviolet fluorescence (UVF) methodology.

Analytical Results

Table 1 summarizes the laboratory data and **Attachment D** presents the complete report**.** DAA submitted 15 soil samples for TPH DRO/GRO analysis. Of these samples, two contained detectable

GRO compounds at concentrations of 8.5 milligrams per kilogram (mg/kg) and 792.9 mg/kg at SB-5 and SB-3, respectively. Fourteen of the 15 soil samples contained detectable DRO compounds ranging from 0.13 to 1725 mg/kg. The action levels are 50 mg/kg for GRO and 100 mg/kg for DRO[1]. One of the soil samples analyzed for this site contained DRO or GRO concentrations above their respective action levels. No other soil samples were above either the GRO or DRO action levels.

Contaminated Soil Volume Estimate

The UVF analytical results (**Table 1)** of the soil samples collected on October 3 and 4, 2018 indicate that one of the soil samples contained DRO and GRO concentrations above the action level. Therefore, DAA made an estimate of the volume of soil requiring possible remediation.

To estimate the volume of soil requiring possible remediation, DAA considered only the soil samples that contained a DRO and/or GRO concentration above the respective action levels. The thickness of the potentially contaminated soil was estimated from the UVF results and field screening, which indicated a thickness of four feet (**Table 1**). After estimating the potential contamination geometry using field observations and experience with similar sites and geology, DAA measured the affected section on **Figure 3** by using CAD software, which indicated a total area of about 340 ft^2. Estimating a four-foot contamination thickness, this calculates to a volume of about 50 bank cubic yards.

The use of DRO and GRO concentrations to determine UST closure and immediate soil removal is a valid analytical method. However, any cleanup beyond the closure is governed by risk-based methods that are based on individual constituents and do not correlate with DRO and GRO concentrations. Because of the uncertainty associated with the differences in these analytical methods, the actual volume of contaminated soil may be higher or lower.

Conclusions and Recommendations

DAA conducted a Preliminary Site Assessment to evaluate the Quality Oil Company Property (Parcel #9) located at 2005 New Hope Church Road in Raleigh, Wake County, North Carolina. A geophysical survey conducted at the site indicated that no unknown metallic USTs were detected within the proposed right-of-way on the site. Fifteen soil borings were advanced to evaluate the subsurface soil conditions within the site. One of the 15 soil samples analyzed for TPH contained a GRO and DRO concentration above the action level. Based on the action level, DAA estimates a contaminated soil volume of about 50 bank cubic yards.

[1] NCDEQ, *Guidelines for North Carolina Action Limits for Total Petroleum Hydrocarbons (TPH)*, July 26, 2016,

DAA appreciates the opportunity to work with the NCDOT on this project. Because compounds were detected above the action level in the soil samples, DAA recommends that a copy of this report be submitted to the Division of Waste Management, UST Section, in the Raleigh Regional Office. If you have any questions, please contact us at (919) 873-1060.

Sincerely,

Solutions-IES

Michael W. Branson, P.G.
Project Manager

John Palmer, P.G.
Senior Hydrogeologist

Attachments

TABLE 1
SOIL FIELD SCREENING AND ANALYTICAL RESULTS
QUALITY OIL COMPANYy PROPERTY
RALEIGH, WAKE COUNTY, NORTH CAROLINA
STATE PROJECT: P-5715
WBS ELEMENT 46927.1.1
DAA PROJECT NO. 18110166-010701

SAMPLE ID	DEPTH (ft)	PID READING (ppm)	SAMPLE ID	ANALYTICAL RESULTS (mg/kg)	
				UVF GRO	UVF DRO
	Action Level (mg/kg)			50	100
SB-01	0 - 2	3.6			
	2 - 4	5.7			
	4 - 6	12.7	SB-1-4-6	<0.52	**29.2**
	6 - 8	7.1			
	8 - 10	10.7			
	10 - 12	4.8			
SB-2	0 - 2	4.2			
	2 - 4	4.6			
	4 - 6	10.1			
	6 - 8	5.5			
	8 - 10	4.7			
	10 - 12	11.7	SB-2-10-12	<0.53	**43.2**
SB-3	0 - 2	2.0			
	2 - 4	1.7			
	4 - 6	1.7			
	6 - 8	1.2			
	8 - 10	5.9			
	10 - 12	15.0			
	12 - 14	56.7			
	14 - 16	1,303	SB-3-14-16	**792.9**	**1,725**
SB-4	0 - 2	3.7			
	2 - 4	3.5			
	4 - 6	3.6			
	6 - 8	3.7			
	8 - 12	2.7			
	12 - 15	461.0	SB-4-12-15	<0.51	**2.9**
SB-5	0 - 2	11.6			
	2 - 4	13.0			
	4 - 6	4.3			
	6 - 8	3.0			
	8 - 10	3.8			
	10 - 12	5.9			
	12 - 14	5.7			
	14 - 16	47.0	SB-5-14-16	**8.5**	**55.8**

TABLE 1
SOIL FIELD SCREENING AND ANALYTICAL RESULTS
QUALITY OIL COMPANYy PROPERTY
RALEIGH, WAKE COUNTY, NORTH CAROLINA
STATE PROJECT: P-5715
WBS ELEMENT 46927.1.1
DAA PROJECT NO. 18110166-010701

SB-6	0 - 2	2.3			
	2 - 4	4.4			
	4 - 6	4.4			
	6 - 8	7.8			
	8 - 10	43.4			
	10 - 12	95.1			
	12 - 14	78.0			
	14 - 16	153.0	SB-6-14-16	<0.65	**0.13**
SB-7	0 - 2	5.7			
	2 - 4	9.1			
	4 - 6	11.4			
	6 - 8	13.4			
	8 - 10	46.4			
	10 - 12	55.9	SB-7-10-12	<0.58	<0.23
	12 - 14	41.0			
	14 - 16	44.7			
SB-8	0 - 2	2.6			
	2 - 4	5.0			
	4 - 6	9.5			
	6 - 8	16.7	SB-8-6-8	<0.64	**83.8**
SB-9	0 - 2	2.2			
	2 - 4	2.2			
	4 - 6	5.7			
	6 - 8	17.7			
	8 - 10	14.4			
	10 - 12	11.5			
	12 - 14	22.8	SB-9-12-14	<0.66	**55.6**
	14 - 16	15.2			
SB-10	0 - 2	2.0			
	2 - 4	2.5			
	4 - 6	3.3			
	6 - 8	5.2	SB-10-6-8	<0.52	**5.6**
SB-11	0 - 2	3.0			
	2 - 4	4.0			
	4 - 6	4.8	SB-11-4-6	<0.77	**34.7**
	6 - 8	4.7			

TABLE 1
SOIL FIELD SCREENING AND ANALYTICAL RESULTS
QUALITY OIL COMPANYy PROPERTY
RALEIGH, WAKE COUNTY, NORTH CAROLINA
STATE PROJECT: P-5715
WBS ELEMENT 46927.1.1
DAA PROJECT NO. 18110166-010701

SB-12	0 - 2	2.8			
	2 - 4	2.9			
	4 - 6	3.1	SB-12-4-6	<0.63	**20**
	6 - 8	2.8			
SB-13	0 - 2	3.7			
	2 - 4	2.9			
	4 - 6	4.9	SB-13-4-6	<0.53	**11.5**
	6 - 8	4.4			
SB-14	0 - 2	3.5			
	2 - 4	3.7			
	4 - 6	4.5	SB-14-4-6	<0.8	**4.5**
	6 - 8	3.8			
SB-15	0 - 2	3.1			
	2 - 4	3.3	SB-15-2-4	<0.6	**8.9**
	4 - 6	3.1			
	6 - 8	2.0			

1) ft - feet

2) ppm - parts per million

3) PID - photoionization detector

4) mg/kg - milligrams per kilogram

5) UVF DRO - Diesel range organics by ultraviolet fluorescence (UVF)

6) UVF GRO - Gasoline range organics by UVF

7) Action level for TPH based upon NCDEQ memo *Guidelines for North Carolina Action Limits for Total Petroleum Hydrocarbons* - July 29, 2016. VOC action levels based on Maximum Soil Contaminant Concentrations

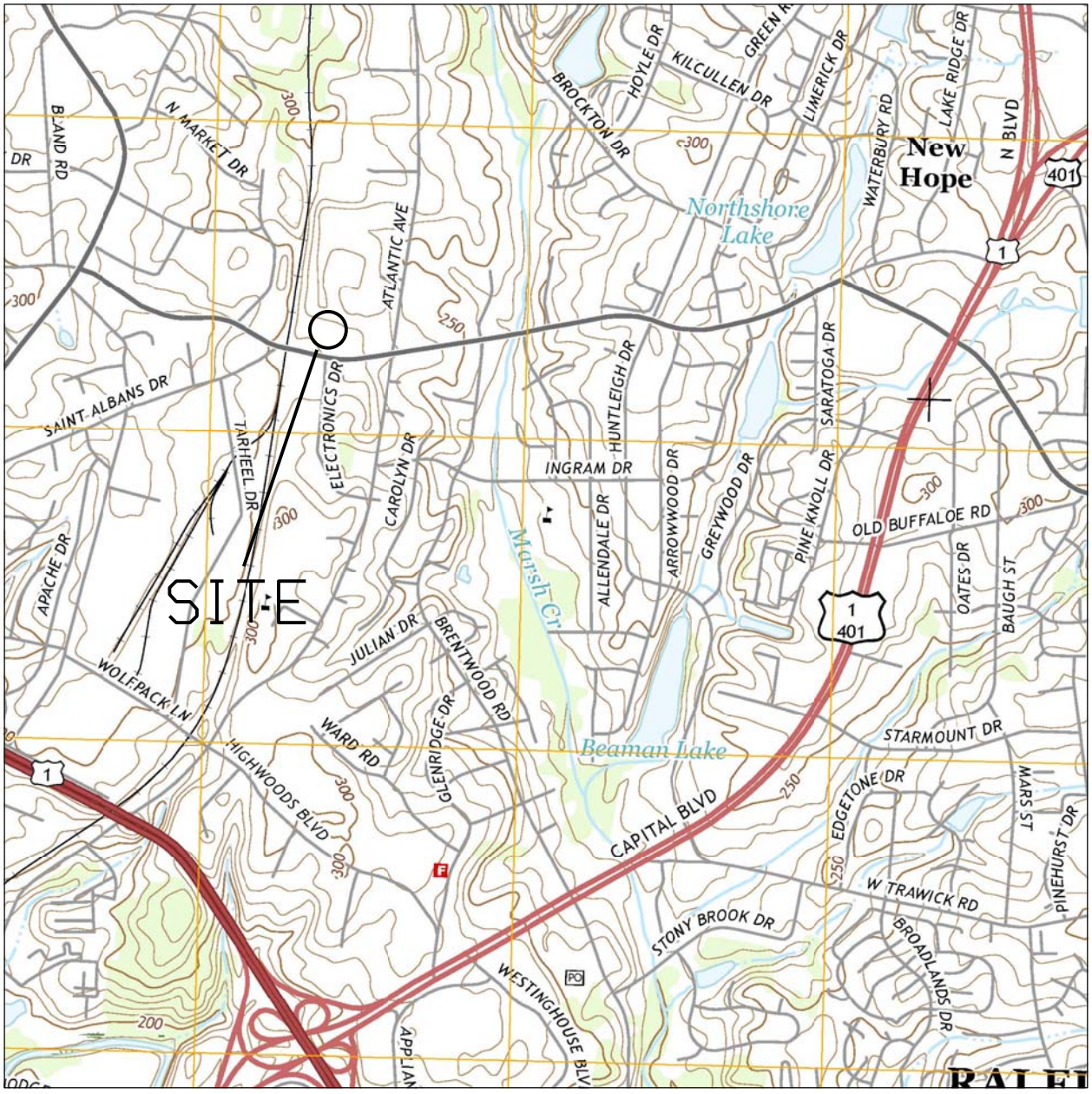
8) Soil samples were collected on October 3 and 4, 2018.

9) **Bold** values are above the detection level.

10) Shaded values are above the action level.

FIGURES

FILE	DATE	PROJECT MANAGER	CHECKED BY	PROJECT NUMBER
NCDOT QUALITY OIL COMPANY PSA	SEPTWEMBER 2018	MWB	JEP	181016G-010701



SCALE 1:24,000

1 ½ 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 .5 0 1 KILOMETER

SOURCE: U.S. GEOLOGICAL SURVEY 7.5 MIN QUADRANGLE: RALEIGH EAST, NC (2016)

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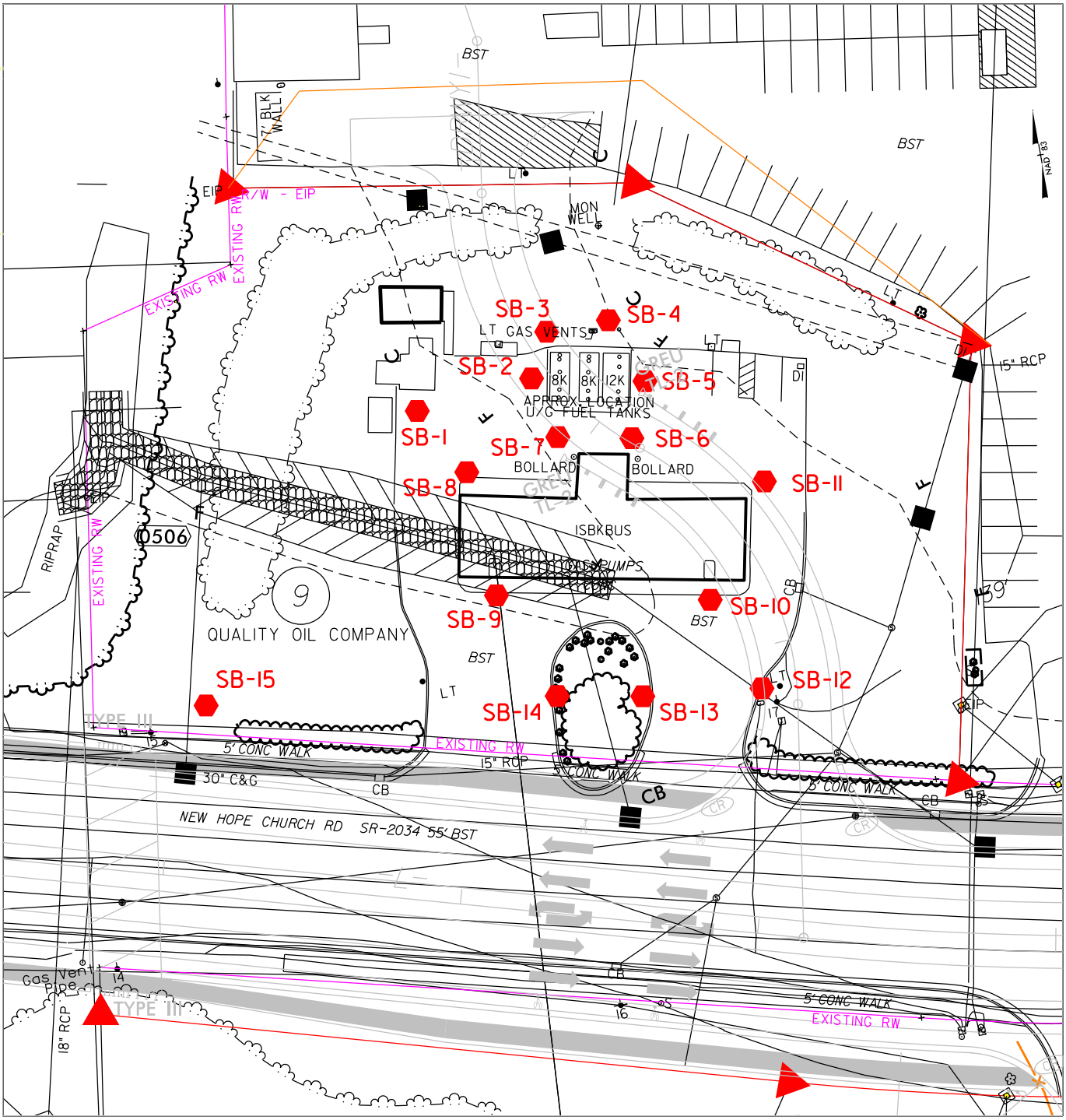
VICINITY MAP

QUALITY OIL COMPANY PROPERTY
RALEIGH, NORTH CAROLINA

FIGURE
1

FILE	DATE	PROJECT MANAGER	CHECKED BY	DRAFTER	PROJECT NUMBER
QUALITY OIL COMPANY PSA	OCTOBER 2018	MWB	JEP	MWB	181I0166-0I0701



LEGEND

SB-1 SOIL BORING LOCATION AND ID

PROPOSED RIGHT-OF-WAY

0 25 50

GRAPHIC SCALE (FEET)

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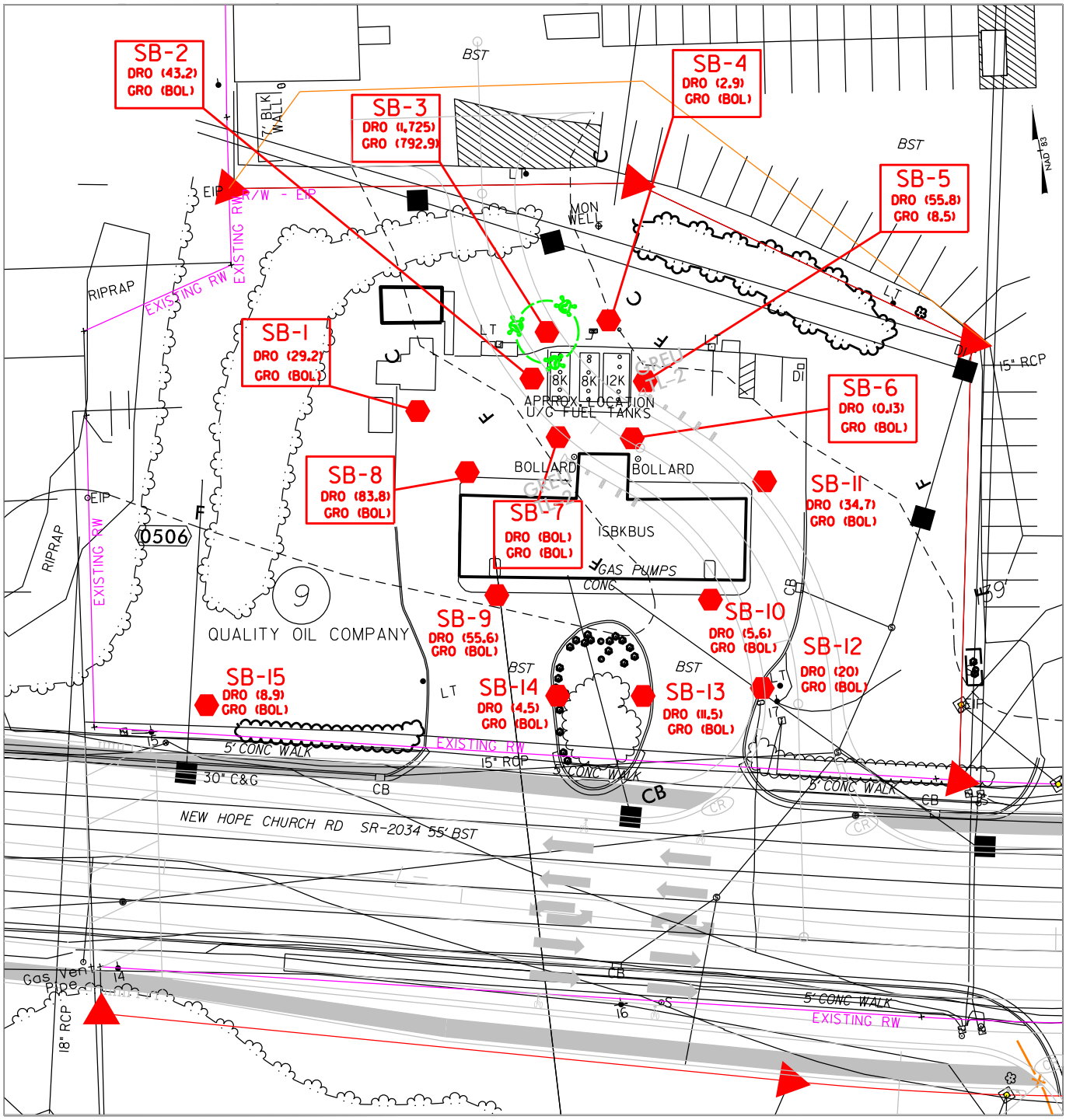
SITE MAP

QUALITY OIL COMPANY PROPERTY

RALEIGH, NORTH CAROLINA

FIGURE

2



LEGEND

SB-01 — SOIL BORING LOCATION AND ID

DRO (123) — DIESEL RANGE ORGANICS (MG/KG)

GRO (123) — GASOLINE RANGE ORGANICS (MG/KG)

BOL — BELOW QUANTITTION LIMIT

ESTIMATED EXTENT OF POTENTIAL CONTAMINATION

0 25 50

GRAPHIC SCALE (FEET)

FILE: QUALITY OIL COMPANY PSA
DATE: NOVEMBER 2017
PROJECT MANAGER: MWB
CHECKED BY: JEP
DRAFTER: MWB
PROJECT NUMBER: 181105004-000700

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SOIL TPH CONCENTRATIONS MAP

QUALITY OIL COMPANY PROPERTY

RALEIGH, NORTH CAROLINA

FIGURE

3

ATTACHMENT A

PYRAMID GEOPHYSICAL SERVICES
(PROJECT 2018-246)

GEOPHYSICAL SURVEY

METALLIC UST INVESTIGATION:
PARCEL 9
NCDOT PROJECT P-5715

2005 NEW HOPE CHURCH ROAD, RALEIGH, NC

SEPTEMBER 21, 2018

Report prepared for: **Mike Branson**
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LIST OF ACRONYMS

CADD .....Computer Assisted Drafting and Design
DF .....Dual Frequency
EM.....Electromagnetic
GPR.....Ground Penetrating Radar
GPS .....Global Positioning System
NCDOT.....North Carolina Department of Transportation
ROW .....Right-of-Way
UST .....Underground Storage Tank

GEOPHYSICAL INVESTIGATION REPORT
Parcel 9 – 2005 New Hope Church Road
Raleigh, Wake County, North Carolina

Table of Contents

Figures

Appendices

EXECUTIVE SUMMARY

Project Description: Pyramid Environmental conducted a geophysical investigation for Draper Aden Associates at Parcel 9, located at 2005 New Hope Church Road, in Raleigh, NC. The survey was part of an NCDOT Right-of-Way (ROW) investigation (NCDOT Project P-5715). The survey was designed to extend from the existing edge of pavement into the proposed ROW and/or easements, whichever distance was greater. Conducted on September 19, 2018, the geophysical investigation was performed to determine if unknown, metallic underground storage tanks (USTs) were present beneath the survey area.

Geophysical Results: The geophysical investigation consisted of electromagnetic (EM) induction-metal detection and ground penetrating radar (GPR) surveys. A total of eighteen EM anomalies were identified. The majority of the EM anomalies were directly attributed to visible cultural features at the ground surface. Several EM anomalies were associated with known USTs, a suspected storm sewer, and the pump islands/building/vehicles and were further investigated with GPR. GPR recorded evidence of hyperbolic reflectors consistent with various utilities (storm sewer, electrical lines) and the gas station product lines.

GPR also verified the sizes and orientations of the three known USTs on the north side of the service station building. The western UST (UST #1) was approximately 23 feet long by 9 feet wide. The central UST (UST #2) was approximately 24.5 feet long by 10 feet wide. The eastern UST (UST #3) was approximately 32 feet long by 9 feet wide. Collectively, the geophysical data recorded evidence of three known USTs at Parcel 9.

INTRODUCTION

Pyramid Environmental conducted a geophysical investigation for Draper Aden Associates at Parcel 9, located at 2005 New Hope Church Road, in Raleigh, NC. The survey was part of an NCDOT Right-of-Way (ROW) investigation (NCDOT Project P-5715). The survey was designed to extend from the existing edge of pavement into the proposed ROW and/or easements, whichever distance was greater. For this parcel, the proposed ROW encompassed the entire parcel. Conducted from September 19, 2018, the geophysical investigation was performed to determine if unknown, metallic underground storage tanks (USTs) were present beneath the survey area.

The site included an active gas station surrounded by concrete, asphalt, and grass surfaces. Three known USTs were located within the survey area on the north side of the service station building. An aerial photograph showing the survey area boundaries and ground-level photographs are shown in **Figure 1**.

FIELD METHODOLOGY

The geophysical investigation consisted of electromagnetic (EM) induction-metal detection and ground penetrating radar (GPR) surveys. Pyramid collected the EM data using a Geonics EM61-MK2 (EM61) metal detector integrated with a Geode External GPS/GLONASS receiver. The integrated GPS system allows the location of the instrument to be recorded in real-time during data collection, resulting in an EM data set that is geo-referenced and can be overlain on aerial photographs and CADD drawings. A boundary grid was established around the perimeter of the site with marks every 10 feet to maintain orientation of the instrument throughout the survey and assure complete coverage of the area.

According to the instrument specifications, the EM61 can detect a metal drum down to a maximum depth of approximately 8 feet. Smaller objects (1-foot or less in size) can be detected to a maximum depth of 4 to 5 feet. The EM61 data were digitally collected at approximately 0.8-foot intervals along north-south trending or east-west trending,

generally parallel survey lines, spaced five feet apart. The data were downloaded to a computer and reviewed in the field and office using the Geonics NAV61 and Surfer for Windows Version 15.0 software programs.

GPR data were acquired across select EM anomalies on September 19, 2018, using a Geophysical Survey Systems, Inc. (GSSI) UtilityScan DF unit equipped with a dual frequency 300/800 MHz antenna. Data were collected both in reconnaissance fashion as well as along formal transect lines across EM features. The GPR data were viewed in real-time using a vertical scan of 512 samples, at a rate of 48 scans per second. GPR data were viewed down to a maximum depth of approximately 6 feet, based on dielectric constants calculated by the DF unit in the field during the reconnaissance scans. GPR transects across specific anomalies were saved to the hard drive of the DF unit for post-processing and figure generation.

Pyramid's classifications of USTs for the purposes of this report are based directly on the geophysical UST ratings provided by the NCDOT. These ratings are as follows:

Geophysical Surveys for Underground Storage Tanks
on NCDOT Projects

High Confidence	Intermediate Confidence	Low Confidence	No Confidence
Known UST Active tank - spatial location, orientation, and approximate depth determined by geophysics.	**Probable UST** Sufficient geophysical data from both magnetic and radar surveys that is characteristic of a tank. Interpretation may be supported by physical evidence such as fill/vent pipe, metal cover plate, asphalt/concrete patch, etc.	**Possible UST** Sufficient geophysical data from either magnetic or radar surveys that is characteristic of a tank. Additional data is not sufficient enough to confirm or deny the presence of a UST.	Anomaly noted but not characteristic of a UST. Should be noted in the text and may be called out in the figures at the geophysicist's discretion.

DISCUSSION OF RESULTS

Discussion of EM Results

A contour plot of the EM61 results obtained across the survey area at the property is presented in **Figure 2**. Each EM anomaly is numbered for reference in the figure. The

following table presents the list of EM anomalies and the cause of the metallic response, if known:

LIST OF METALLIC ANOMALIES IDENTIFIED BY EM SURVEY

Metallic Anomaly #	Cause of Anomaly	Investigated with GPR
1	Air Pump/Lamp Post	
2	**Three Known USTs**	☑
3	Fallen Lamp Post	
4	Vehicle	
5	Manhole	
6	Drop Inlet	
7	Storm Sewer	☑
8	Sign/Utility	
9	Sign	
10	Drop Inlet/Sign	
11	Manholes	
12	Utilities	
13	Sign	
14	Drop Inlet	
15	Utilities	
16	Lamp Post	
17	Pump Islands/Building/Vehicles	☑
18	AST/Dumpsters/Shed	

The majority of the EM anomalies were directly attributed to visible cultural features at the ground surface, including the known USTs, an air pump, lamp posts, vehicles, manholes, drop inlets, signs, utilities, an aboveground storage tank (AST), dumpsters, and a shed. Three large high-amplitude EM anomalies (Anomaly 2), were associated with the three known USTs within the survey area. GPR was performed across the known USTs to verify their sizes and orientations.

Anomaly 7 was suspected to be the result of a corrugated steel storm sewer pipe and investigated further with GPR.

The canopy above the pump islands/building resulted in a lack of GPS signal, so this area was investigated using GPR.

Discussion of GPR Results

Figure 3 presents the locations of the formal GPR transects performed at the property, as well as select transect images. A total of sixteen formal GPR transects were performed at the site. All of the transect images are included in **Appendix A**. GPR Transect 1 was performed across EM Anomaly 7. This transect recorded a hyperbolic reflector consistent with a buried utility.

GPR Transect 2 was performed across the widths of the three known USTs associated with EM Anomaly 2. This transect, as well as additional reconnaissance GPR scans, verified the sizes and orientations of the three known tanks. The western UST (UST #1) was approximately 23 feet long by 9 feet wide. The central UST (UST #2) was approximately 24.5 feet long by 10 feet wide. The eastern UST (UST #3) was approximately 32 feet long by 9 feet wide. **Figure 4** provides the locations and sizes of the three known USTs overlain on an aerial, along with ground-level photographs.

GPR Transects 3-16 were performed in a grid-like fashion beneath the canopy to investigate for buried structures due to the loss of GPS signal during the EM survey. These transects recorded hyperbolic reflectors laid out in a linear fashion surrounding the pumps that were consistent with suspected product lines.

Collectively, the geophysical data recorded evidence of three known USTs at Parcel 9. **Figure 5** provides an overlay of the geophysical survey area and the locations of the known USTs onto the NCDOT MicroStation engineering plans for reference.

SUMMARY & CONCLUSIONS

Pyramid's evaluation of the EM61 and GPR data collected at Parcel 9 in Raleigh, North Carolina, provides the following summary and conclusions:

- The EM61 and GPR surveys provided reliable results for the detection of metallic USTs within the accessible portions of the geophysical survey area.
- The majority of the EM anomalies were directly attributed to visible cultural features at the ground surface.
- Several EM anomalies were associated with known USTs, a suspected storm sewer, and the pump islands/building/vehicles and were further investigated with GPR.
- GPR recorded evidence of hyperbolic reflectors consistent with various utilities (storm sewer, electrical lines) and the gas station product lines.
- GPR verified the sizes and orientations of the three known USTs on the north side of the service station building. The western UST (UST #1) was approximately 23 feet long by 9 feet wide. The central UST (UST #2) was approximately 24.5 feet long by 10 feet wide. The eastern UST (UST #3) was approximately 32 feet long by 9 feet wide.
- Collectively, the geophysical data recorded evidence of three known USTs at Parcel 9.

LIMITATIONS

Geophysical surveys have been performed and this report was prepared for Draper Aden Associates in accordance with generally accepted guidelines for EM61 and GPR surveys. It is generally recognized that the results of the EM61 and GPR surveys are non-unique and may not represent actual subsurface conditions. The EM61 and GPR results obtained for this project have not conclusively determined the definitive presence or absence of metallic USTs, but the evidence collected is sufficient to result in the conclusions made in this report. Additionally, it should be understood that areas containing extensive vegetation, reinforced concrete, or other restrictions to the accessibility of the geophysical instruments could not be fully investigated.

APPROXIMATE BOUNDARIES OF GEOPHYSICAL SURVEY AREA

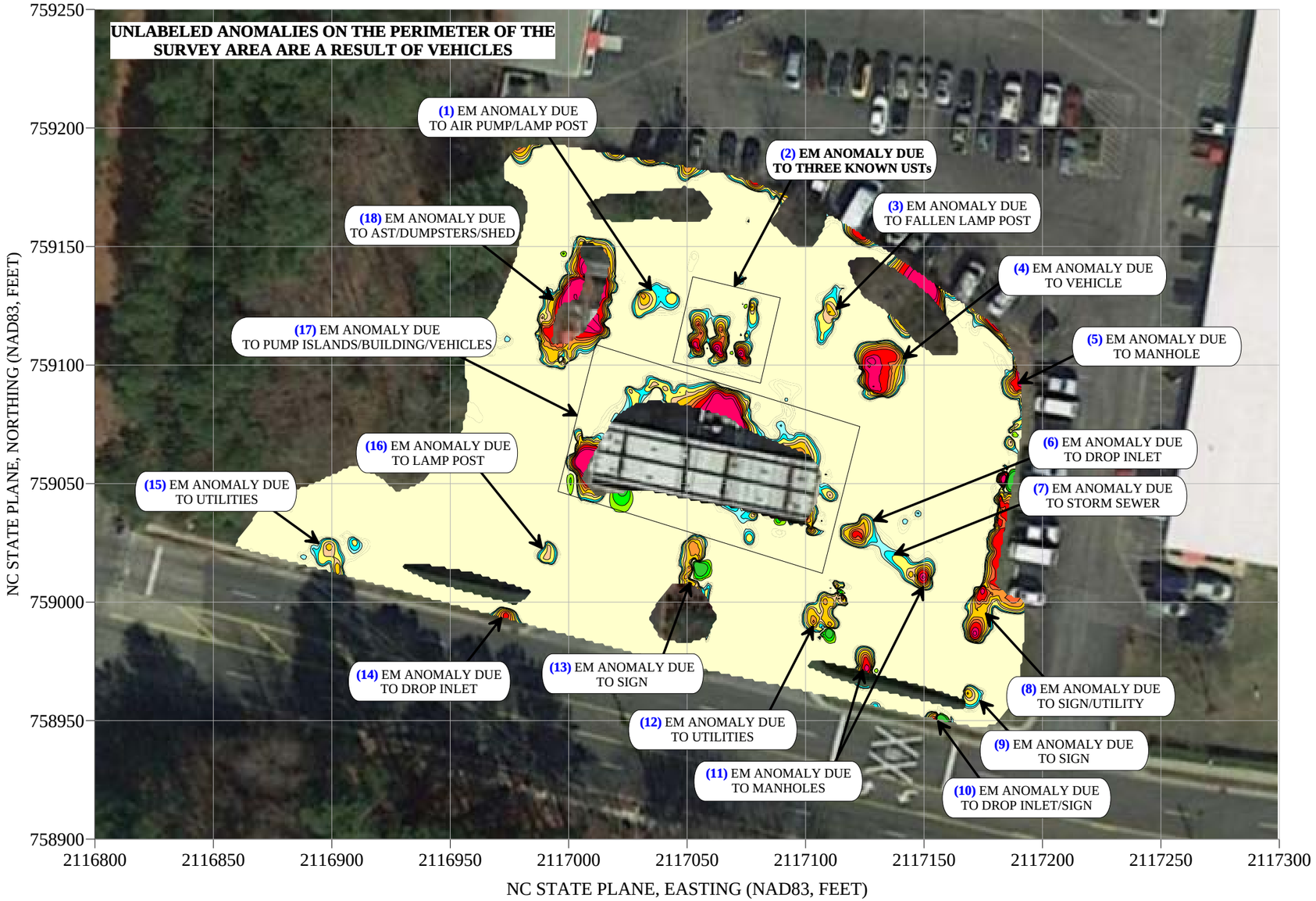
View of Survey Area
(Facing Approximately North)

View of Survey Area
(Facing Approximately West)

N

PYRAMID GEOPHYSICS 503 INDUSTRIAL AVENUE GREENSBORO, NC 27460 (336) 335-3174 (p) (336) 691-0648 (f) License # C1251 Eng. / License # C257 Geology	PROJECT PARCEL 9 RALEIGH, NORTH CAROLINA NCDOT PROJECT P-5715	TITLE PARCEL 9 - GEOPHYSICAL SURVEY BOUNDARIES AND SITE PHOTOGRAPHS	DATE 9/19/2018 PYRAMID PROJECT #: 2018-246	CLIENT DRAPER ADEN ASSOCIATES **FIGURE 1**

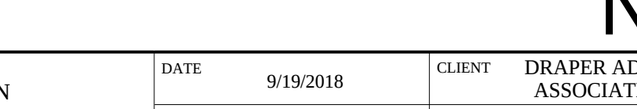
EM61 METAL DETECTION RESULTS



EVIDENCE OF THREE KNOWN USTs OBSERVED.

The contour plot shows the differential results of the EM61 instrument in millivolts (mV). The differential results focus on larger metallic objects such as USTs and drums. The EM61 data were collected on September 19, 2018, using a Geonics EM61 instrument. Verification GPR data were collected using a GSSI UtilityScan DF instrument with a dual frequency 300/800 MHz antenna on September 19, 2018.

EM61 Metal Detection Response (millivolts)



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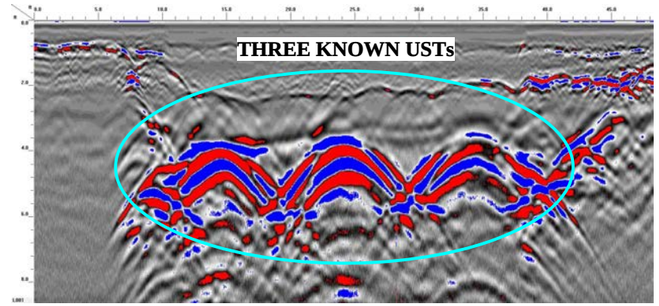
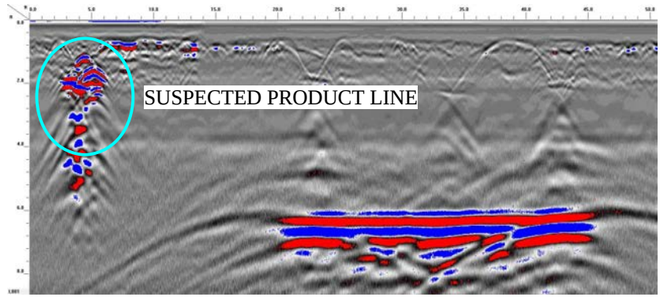
PROJECT	PARCEL 9 RALEIGH, NORTH CAROLINA NCDOT PROJECT P-5715
TITLE	PARCEL 9 - EM61 METAL DETECTION CONTOUR MAP
DATE	9/19/2018
PYRAMID PROJECT #:	2018-246
CLIENT	DRAPER ADEN ASSOCIATES
	FIGURE 2

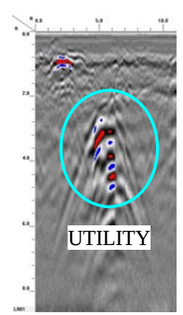
LOCATIONS OF GPR TRANSECTS



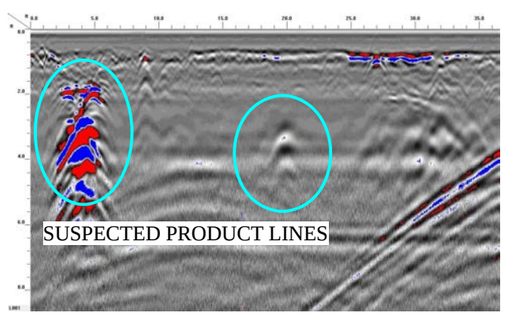
GPR TRANSECT 2 (T2)



GPR TRANSECT 3 (T3)



GPR TRANSECT 1 (T1)



GPR TRANSECT 14 (T14)

*EXTENSIVE GPR SCANS WERE CONDUCTED OVER THE ENTIRE SITE. TRANSECT LINES ON THE MAP ABOVE INDICATE LOCATIONS WHERE DATA WERE SAVED. THESE LOCATIONS WERE CHOSEN TO HIGHLIGHT STRUCTURES IDENTIFIED IN THE SUBSURFACE OR TRANSECTS THAT ARE REPRESENTATIVE OF GENERAL SUBSURFACE CONDITIONS.

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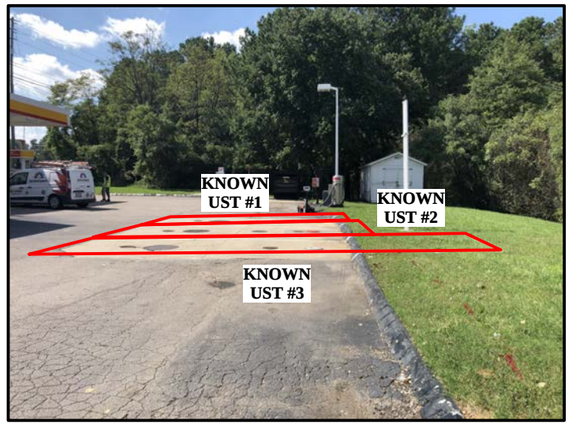
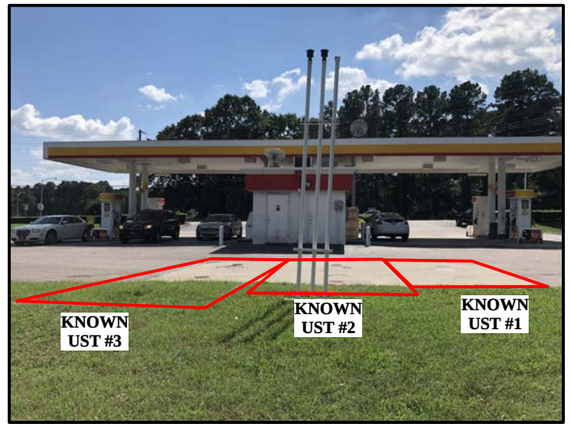
503 INDUSTRIAL AVENUE
GREENSBORO, NC 27460
(336) 335-3174 (p) (336) 691-0648 (f)
License # C1251 Eng. / License # C257 Geology

PROJECT	PARCEL 9 RALEIGH, NORTH CAROLINA NCDOT PROJECT P-5715	TITLE	PARCEL 9 - GPR TRANSECT LOCATIONS AND SELECT IMAGES	DATE 9/19/2018 PYRAMID PROJECT #: 2018-246
CLIENT	DRAPER ADEN ASSOCIATES			**FIGURE 3**

LOCATIONS OF THREE KNOWN USTs



View of Three Known USTs Facing Approximately West



View of Three Known USTs Facing Approximately South

N

PYRAMID GEOPHYSICS 503 INDUSTRIAL AVENUE GREENSBORO, NC 27460 (336) 335-3174 (p) (336) 691-0648 (f) License # C1251 Eng. / License # C257 Geology	PROJECT PARCEL 9 RALEIGH, NORTH CAROLINA NCDOT PROJECT P-5715	TITLE PARCEL 9 - LOCATIONS AND SIZES OF THREE KNOWN USTs	DATE 9/19/2018 PYRAMID PROJECT #: 2018-246	CLIENT DRAPER ADEN ASSOCIATES **FIGURE 4**

LEGEND

- EXISTING ROW
- EXISTING PROPERTY BOUNDARY
- PROPOSED ROW LINE
- E — TEMPORARY CONSTRUCTION EASEMENT
- PDE — PROPOSED PERMANENT DRAINAGE
- PUE — PROPOSED PERMANENT UTILITY
- PROPOSED SS CUT LINE
- PROPOSED SS FILL LINE
- GEOPHYSICAL SURVEY AREA
- KNOWN UST

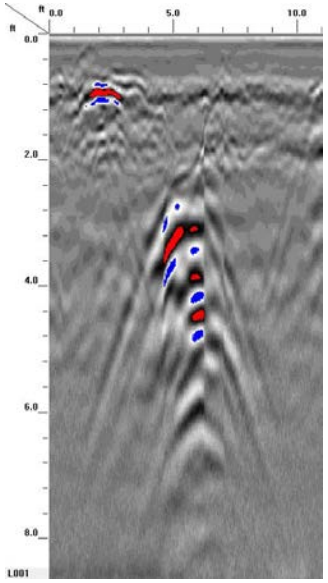
TITLE: OVERLAY OF GEOPHYSICAL SURVEY BOUNDARIES AND THREE KNOWN USTs ON NCDOT ENGINEERING PLANS

PROJECT: PARCEL 9
RALEIGH, NORTH CAROLINA
NCDOT PROJECT P-5715

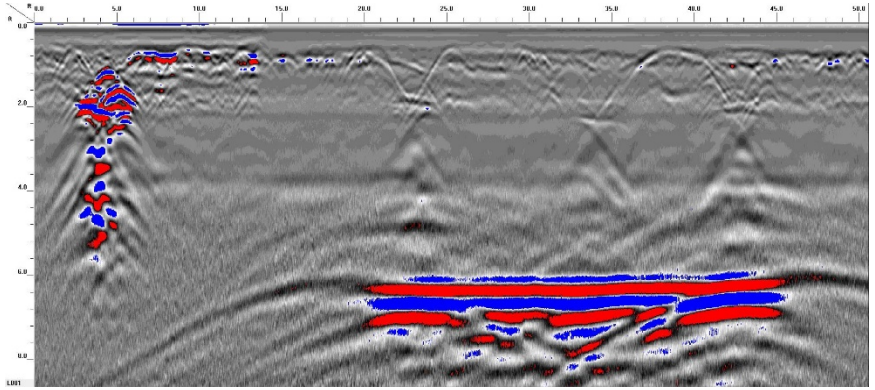
PYRAMID GEOPHYSICS
503 INDUSTRIAL AVENUE
GREENSBORO, NC 27406
336.335.3174 (p) 336.691.0648 (f)
License # C1251 Eng. / #C257 Geology

DATE: 09-21-2018	REVISION NO. 0
PYRAMID PROJECT NO. 2018-246	FIGURE NO. 5

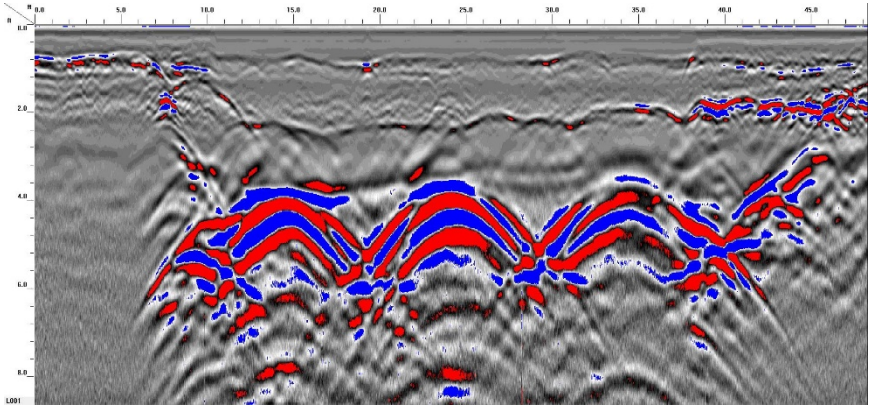
Appendix A – GPR Transect Images



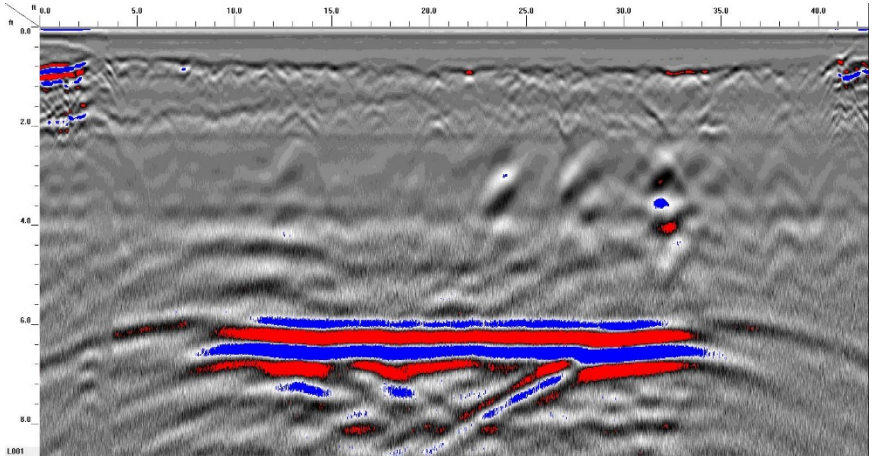
Transect 1



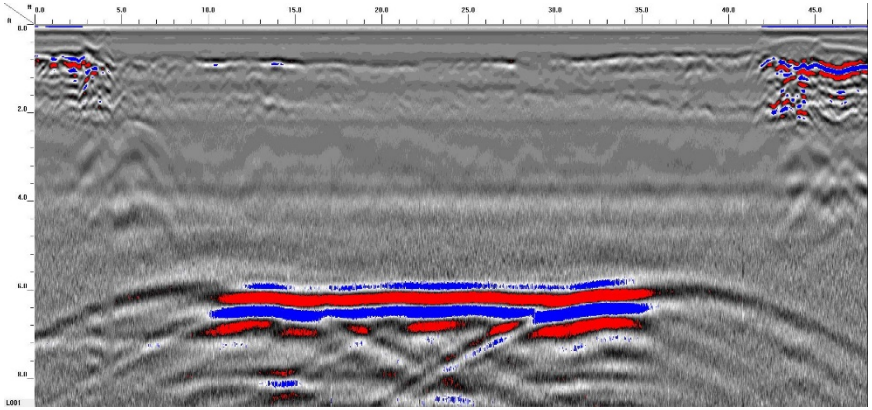
Transect 3



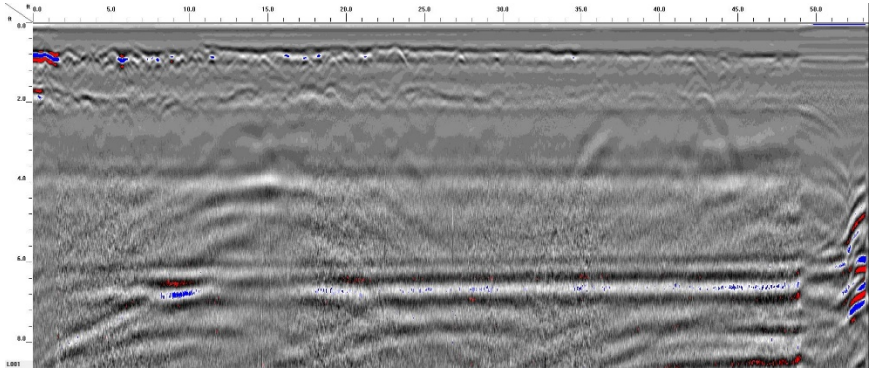
Transect 2



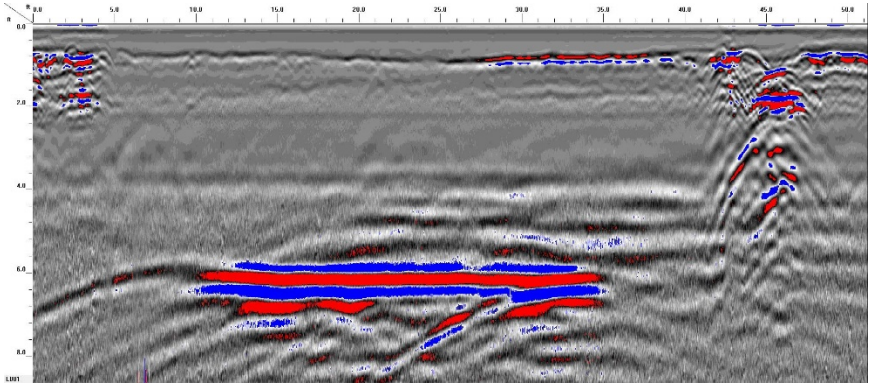
Transect 4



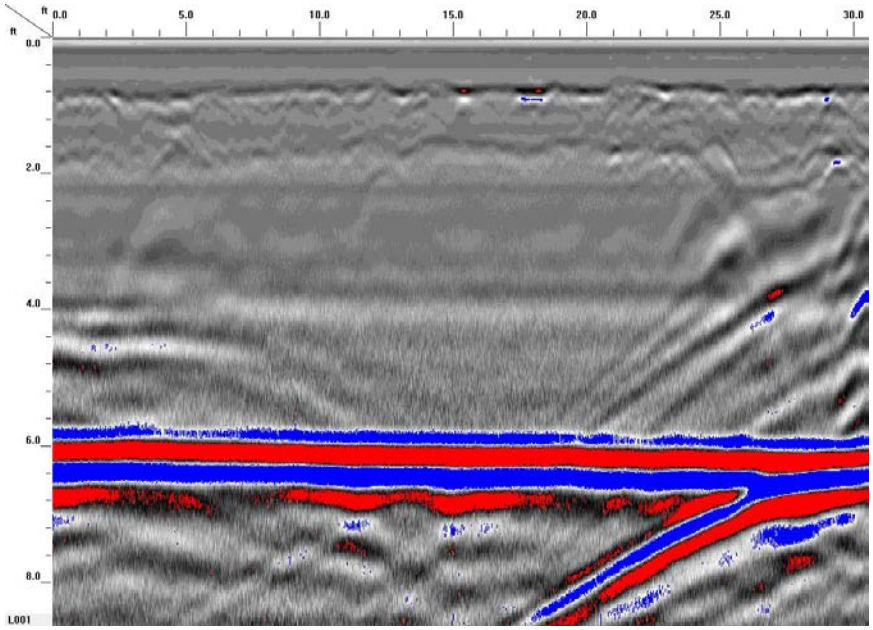
Transect 5



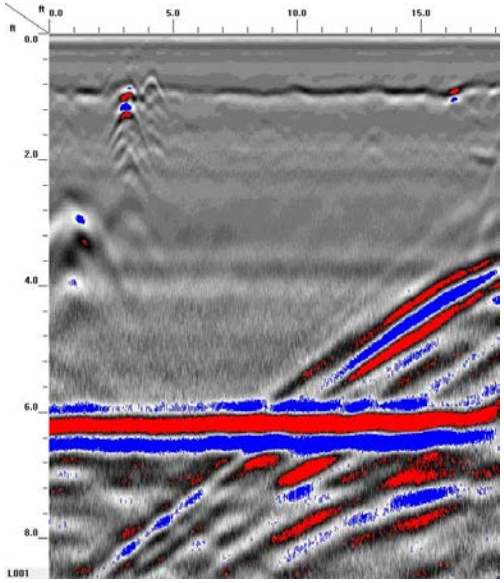
Transect 7



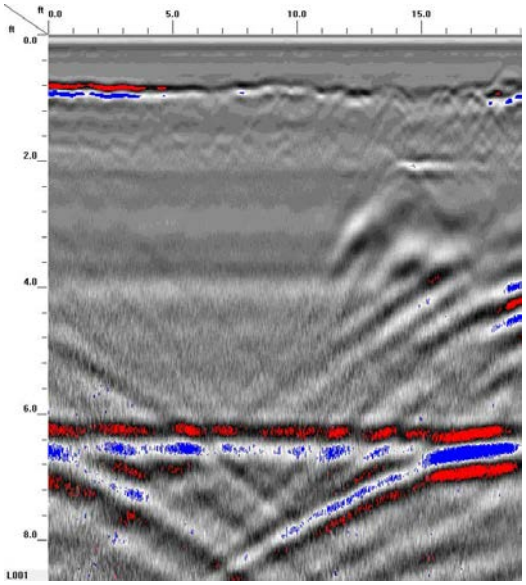
Transect 6



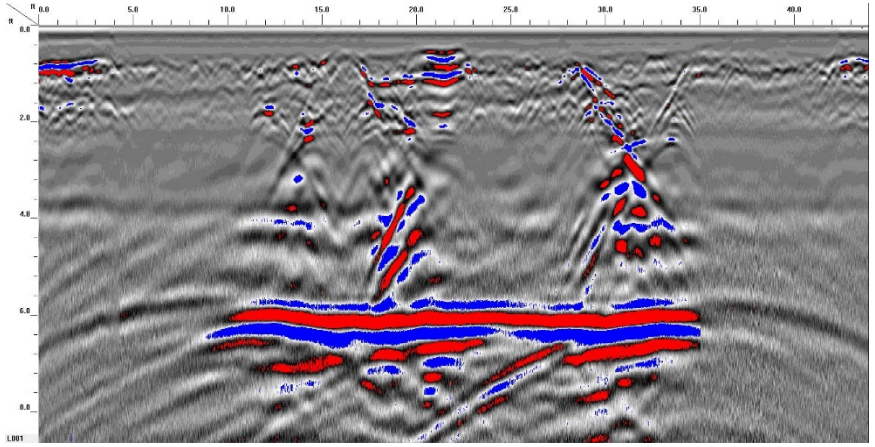
Transect 8



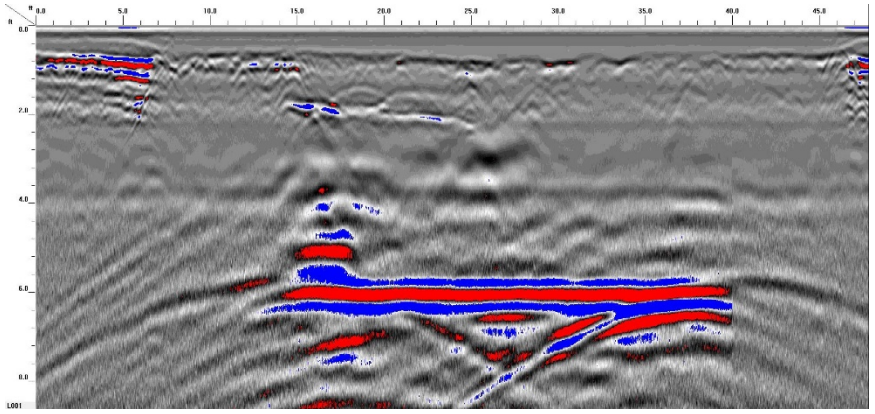
Transect 9



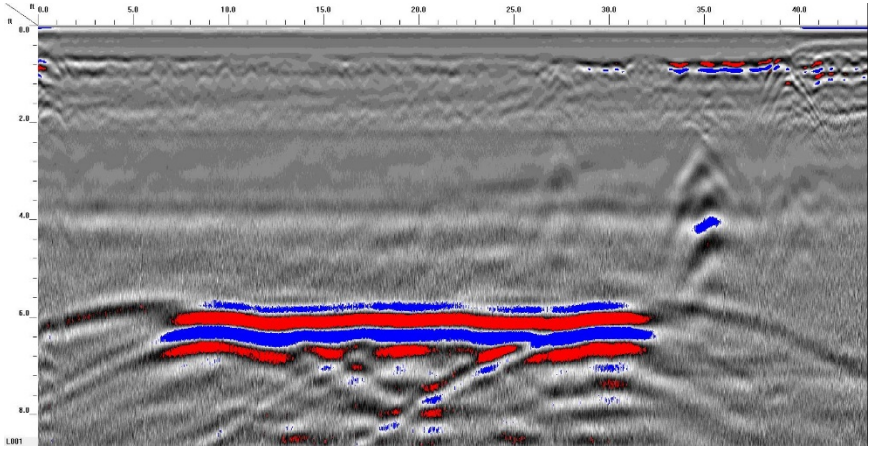
Transect 10



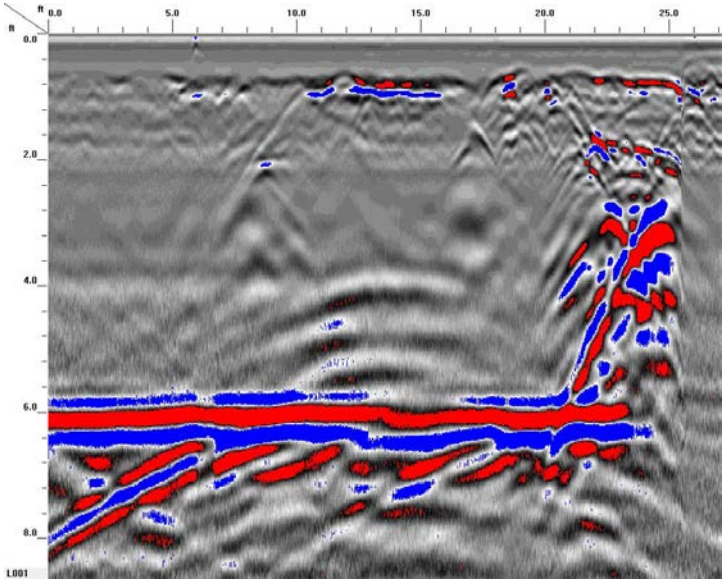
Transect 11



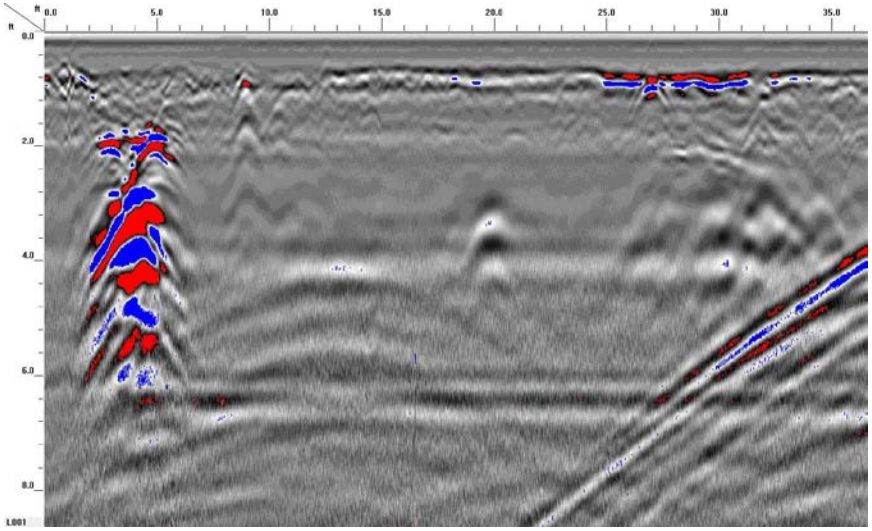
Transect 12



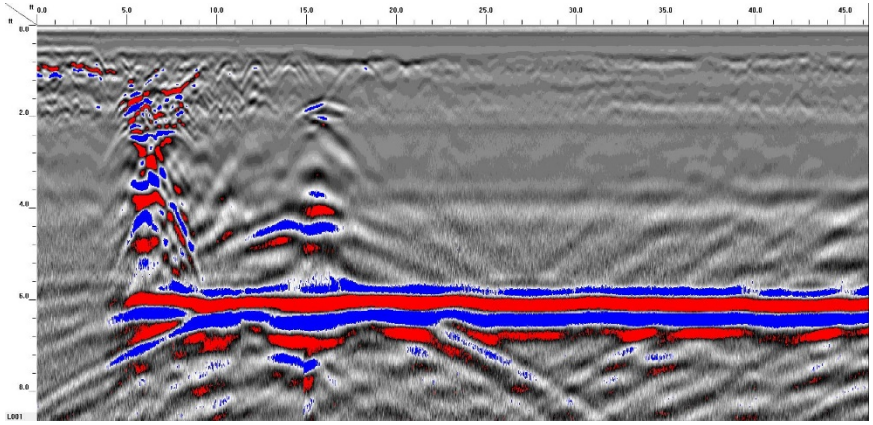
Transect 13



Transect 15



Transect 14



Transect 16

ATTACHMENT B

Draper Aden Associates
Engineering • Surveying • Environmental Services

BORING ID: SB-1

PROJECT NAME: Quality Oil	PROJECT NUMBER: 18110166-010701
CLIENT: NCDOT- Cyrus Parker, PE, PG	DATE: 10/3/2018
SITE LOCATION: 2005 New Hope Church Rd., Raleigh, NC	TOTAL DEPTH (ft bgs): 12
DRILLING CONTRACTOR: Regional Probing Services	BORING COORDINATES:
DRILLING METHOD: Direct Push	BOREHOLE DIAMETER: 2 inches
DRILLING EQUIPMENT: Geoprobe	DEPTH TO WATER (ft bgs): NE
LOGGED BY: Brandy Barnes	PROJECT MANAGER: Mike Branson, PG

DEPTH (ft bgs)	SAMPLES: Sample ID	SAMPLES: Recovery %	PID Reading (ppm)	USCS	LITHOLOGIC DESCRIPTION:	Notes:
0					ASPHALT	
				SP	POORLY GRADED SAND, Brown to light brown, medium grained, with lenses of reddish brown clay, fill	
1			3.6		CLAY, Reddish brown	
2		100		CH/CL	-- Grayish brown with reddish brown, abundant mica and silt	
3			5.7		-- Reddish brown with red and brown seams	
4						
5	SB-1		12.7	SC	CLAYEY SAND, Grayish brown, fine to medium grained, with mica, slight petroleum odor	
6		100				
7			7.1	SP-SC	POORLY GRADED SAND WITH CLAY, Gray with red, orange, and brown, fine to medium grained, with mica	
8						
9			10.7	SC	CLAYEY SAND, Greenish yellow, fine grained, with mica	
10		100		CH/CL	CLAY, Orange and red brown, with coarse sand and mica, consolidated	
11			4.8			
12					End of Borehole at 12 feet	
13						
14						
15						
16						
17						
18						
19						
20						

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BORING ID: SB-2

PROJECT NAME: Quality Oil	PROJECT NUMBER: 18110166-010701
CLIENT: NCDOT- Cyrus Parker, PE, PG	DATE: 10/3/2018
SITE LOCATION: 2005 New Hope Church Rd., Raleigh, NC	TOTAL DEPTH (ft bgs): 12
DRILLING CONTRACTOR: Regional Probing Services	BORING COORDINATES:
DRILLING METHOD: Direct Push	BOREHOLE DIAMETER: 2 inches
DRILLING EQUIPMENT: Geoprobe	DEPTH TO WATER (ft bgs): NE
LOGGED BY: Brandy Barnes	PROJECT MANAGER: Mike Branson, PG

DEPTH (ft bgs)	SAMPLES: Sample ID	SAMPLES: Recovery %	PID Reading (ppm)	USCS	LITHOLOGIC DESCRIPTION:	Notes:
0					ASPHALT	
				SP	POORLY GRADED SAND, Light brown, fine medium grained, fill	
1			4.2	CH/CL	CLAY, Reddish brown, with mica and course grained fragments	
2		100				
			4.6		With abundant course fragments, rock, and mica, with lenses of sand, and greenish gray staining	
3						
4					Damp	
			10.1			
5				SP-SC	POORLY GRADED SAND WITH CLAY, Brownish, greenish, red, course grained, with peebles, with greenish gray staining	
6		100				
			5.5	SC	CLAYEY SAND, Brown to light brown, fine grained, with fragements of rock and mica, partially consolidated	
7						
8						
			4.7	CH/CL	CLAY, Reddish brown, moist to damp, with mica	
9						
10		100				
				SC	CLAY, Brown and gray, fine grained, with silt and mica, silt petroleum odor	
11	SB-2		11.7			
12					End of Borehole at 12 feet	
13						
14						
15						
16						
17						
18						
19						
20						

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BORING ID: SB-3

PROJECT NAME: Quality Oil	PROJECT NUMBER: 18110166-010701
CLIENT: NCDOT- Cyrus Parker, PE, PG	DATE: 10/3/2018
SITE LOCATION: 2005 New Hope Church Rd., Raleigh, NC	TOTAL DEPTH (ft bgs): 16
DRILLING CONTRACTOR: Regional Probing Services	BORING COORDINATES:
DRILLING METHOD: Direct Push	BOREHOLE DIAMETER: 2 inches
DRILLING EQUIPMENT: Geoprobe	DEPTH TO WATER (ft bgs): NE
LOGGED BY: Brandy Barnes	PROJECT MANAGER: Mike Branson, PG

DEPTH (ft bgs)	SAMPLES: Sample ID	SAMPLES: Recovery %	PID Reading (ppm)	USCS	LITHOLOGIC DESCRIPTION:	Notes:
0–2		100	2.0	SP	SAND, Orangeish brown, fine to medium grained, little to no top soil above sand	
2–3			1.7	CH/CL	CLAY, Orangeish red brown, with silt, abundant mica	
3–4				SC	CLAYEY SAND, Brown with red and orange, fine to coarse grained	
4–5		100	1.7	CH/CL	CLAY, Reddish orange, abundant silt and mica, with rock fragments and peeble size grains, staining	
5–7			1.2	SC	CLAYEY SAND, Reddish brown and yellowish brown, fine to medium grained, with mica	
7–8				SP-SC	POORLY GRADED SAND WITH CLAY, Grayish brown with grayish green, fine to coarse grained	
8–9		100	5.9	CH/CL	CLAY, Reddish brown clay, with mica	
9–12			15.0	SC	CLAYEY SAND, Orange, red, brown, and gray, fine to coarse grained, with peebles and rock fragments, slight petroleum odor and staining, black at 12 feet.	
12–14		100	56.7			
14–15	SB-3		1303.0	CH/CL	CLAY, Black, light brown, and orange brown, with rock fragments and mica	
15–16					End of Borehole at 16 feet	
16–20						

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BORING ID: SB-4

PROJECT NAME: Quality Oil	PROJECT NUMBER: 18110166-010701
CLIENT: NCDOT- Cyrus Parker, PE, PG	DATE: 10/3/2018
SITE LOCATION: 2005 New Hope Church Rd., Raleigh, NC	TOTAL DEPTH (ft bgs): 15
DRILLING CONTRACTOR: Regional Probing Services	BORING COORDINATES:
DRILLING METHOD: Direct Push	BOREHOLE DIAMETER: 2 inches
DRILLING EQUIPMENT: Geoprobe	DEPTH TO WATER (ft bgs): NE
LOGGED BY: Brandy Barnes	PROJECT MANAGER: Mike Branson, PG

DEPTH (ft bgs)	SAMPLES: Sample ID	SAMPLES: Recovery %	PID Reading (ppm)	USCS	LITHOLOGIC DESCRIPTION:	Notes:
0–2		50	3.7	SC	CLAYEY SAND, Orangeish red brown, fine to coarse grained	
2–4			3.5	SW	GRAVEL, Gray and brown, with sand, fine to coarse grained, slight petroleum odor, probable tank fill	
4–6		50	3.6			
6–8			3.7			
8–10		50	2.7			
10–12			2.7			
12–14	SB-4	50	461.0	CH/CL	CLAY, Greenish and yellowish brown, damp, with mica, with petroleum odor	
15					End of Borehole at 15 feet	
16–20						

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BORING ID: SB-5

PROJECT NAME: Quality Oil	PROJECT NUMBER: 18110166-010701
CLIENT: NCDOT- Cyrus Parker, PE, PG	DATE: 10/3/2018
SITE LOCATION: 2005 New Hope Church Rd., Raleigh, NC	TOTAL DEPTH (ft bgs): 16
DRILLING CONTRACTOR: Regional Probing Services	BORING COORDINATES: See Appendix
DRILLING METHOD: Direct Push	BOREHOLE DIAMETER: 2 inches
DRILLING EQUIPMENT: Geoprobe	DEPTH TO WATER (ft bgs): NE
LOGGED BY: Brandy Barnes	PROJECT MANAGER: Mike Branson, PG

DEPTH (ft bgs)	SAMPLES: Sample ID	SAMPLES: Recovery %	PID Reading (ppm)	USCS	LITHOLOGIC DESCRIPTION:	Notes:
0					ASPHALT	
1		75	11.6	SP	POORLY GRADED SAND, Greenish brown, tan, and gray, fine to coarse grained, interbedded with seams of gravel and one clay seam at 3.5 ft	
2						
3			13.0			
4		75	4.3	SC	CLAYEY SAND, Orangeish brown with red, fine to coarse grained, with peebles and mica	
5						
6			3.0	SP	POORLY GRADED SAND, Light brown, fine to medium grained, with black organic debris (wood), trace silt	
7						
8		100	3.8			
9						
10			5.9	SC	CLAYEY SAND, Brown and orange, fine to coarse grained, moist	
11						
12		100	5.7	SP	POORLY GRADED SAND, Light brown with black, medium grained, wet, slight petroleum odor, with staining	
13						
14			47.0	CH/CL	CLAY, Reddish brown, with greenish gray staining, with mica, damp, petroleum odor	
15	SB-5					
16					End of Borehole at 16 feet	
17						
18						
19						
20						

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BORING ID: SB-6

PROJECT NAME: Quality Oil	PROJECT NUMBER: 18110166-010701
CLIENT: NCDOT- Cyrus Parker, PE, PG	DATE: 10/3/2018
SITE LOCATION: 2005 New Hope Church Rd., Raleigh, NC	TOTAL DEPTH (ft bgs): 16
DRILLING CONTRACTOR: Regional Probing Services	BORING COORDINATES: See Appendix
DRILLING METHOD: Direct Push	BOREHOLE DIAMETER: 2 inches
DRILLING EQUIPMENT: Geoprobe	DEPTH TO WATER (ft bgs): NE
LOGGED BY: Brandy Barnes	PROJECT MANAGER: Mike Branson, PG

DEPTH (ft bgs)	SAMPLES: Sample ID	SAMPLES: Recovery %	PID Reading (ppm)	USCS	LITHOLOGIC DESCRIPTION:	Notes:
0					ASPHALT	
1			2.3	CH/CL	CLAY, Reddish brown, with coarse to peeble grains	
2		100				
3			4.4	SC	CLAYEY SAND, Reddish brown with greenish gray, fine to coarse grained, aboundant silt and mica, with rock fragments	
4					Dark gray with red, with lenses of consolidated clay	
5			4.4	SP-SC	POORLY GRADED SAND WITH CLAY, Light brown gray and yellow, fine to coarse grained, consolidated/cemented sand lenses	
6		100				
7			7.8	CH/CL	CLAY, Orange, brown, and cream, trace fine to coarse grained sands, with mica	
8						
9			43.4	SC	CLAYEY SAND, Grayish brown, black, and greenish gray, fine to coarse grains	
10		100				
11			95.1	CH/CL	CLAY, Yellowish to greenish brown and orange brown, with coarse and peeble grains, partially consolidated, with petroleum odor	
12						
13			78.0	ML	SILT, Dark orange, red and yellow, abundant mica, petroleum odor	
14		100				
15	SB-6		153.0	SM	SILTY SAND, Dark reddish brown and orange, fine to coarse grained, with clay	
16					End of Borehole at 16 feet	
17						
18						
19						
20						

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BORING ID: SB-7

PROJECT NAME: Quality Oil	PROJECT NUMBER: 18110166-010701
CLIENT: NCDOT- Cyrus Parker, PE, PG	DATE: 10/3/2018
SITE LOCATION: 2005 New Hope Church Rd., Raleigh, NC	TOTAL DEPTH (ft bgs): 16
DRILLING CONTRACTOR: Regional Probing Services	BORING COORDINATES:
DRILLING METHOD: Direct Push	BOREHOLE DIAMETER: 2 inches
DRILLING EQUIPMENT: Geoprobe	DEPTH TO WATER (ft bgs): NE
LOGGED BY: Brandy Barnes	PROJECT MANAGER: Mike Branson, PG

DEPTH (ft bgs)	SAMPLES: Sample ID	SAMPLES: Recovery %	PID Reading (ppm)	USCS	LITHOLOGIC DESCRIPTION:	Notes:
0					ASPHALT	
1			5.7	CH/CL	CLAY, Reddish brown, with fine to coarse grained sand	
2		100				
3			9.1	SC	CLAYEY SAND, Reddish brown, fine to coarse grained, with silt, pebbles, and mica, slight odor from 4-6 ft, seam of light brown and grayish brown	
4						
5			11.4			
6		100				
7			13.4			
8						
9			46.4			
10		100			CLAY, Dark brown with red and gray, with mica and fine to coarse graines, petroleum odor	
11	SB-7		55.9	CH/CL	Orange with yellow and white, with silt and mica, petroleum odor, staining at 12-14ft	
12						
13			41.0			
14		100				
15			44.7			
16				SC	CLAYEY SAND, White, tan, and yellow, fine to coarse grained, with silt and mica, trace roots	
17					End of Borehole at 16 feet	
18						
19						
20						

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BORING ID: SB-8

PROJECT NAME: Quality Oil	PROJECT NUMBER: 18110166-010701
CLIENT: NCDOT- Cyrus Parker, PE, PG	DATE: 10/3/2018
SITE LOCATION: 2005 New Hope Church Rd., Raleigh, NC	TOTAL DEPTH (ft bgs): 8
DRILLING CONTRACTOR: Regional Probing Services	BORING COORDINATES:
DRILLING METHOD: Direct Push	BOREHOLE DIAMETER: 2 inches
DRILLING EQUIPMENT: Geoprobe	DEPTH TO WATER (ft bgs): NE
LOGGED BY: Brandy Barnes	PROJECT MANAGER: Mike Branson, PG

DEPTH (ft bgs)	SAMPLES: Sample ID	SAMPLES: Recovery %	PID Reading (ppm)	USCS	LITHOLOGIC DESCRIPTION:	Notes:
0					ASPHALT	
				SP	POORLY GRADED SAND, Brown to light brown, medium grained, with lenses of reddish brown clay, fill	
1			2.6			
2		100		CH/CL	CLAY, Reddish brown, with fine to coarse grained sand, consolidated, with mica	
3			5.0			
4						
5			9.5	SC	CLAYEY SAND, Gray and brown, fine to coarse grained, with mica, with seams of cemented sands, lenese of medium grained sands	
6		100				
7	SB-8		16.7		Brown with yellow, white, and gray, with silt and mica, partially cemented	
8					End of Borehole at 8 feet	
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						

Draper Aden Associates
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BORING ID: SB-9

PROJECT NAME: Quality Oil	PROJECT NUMBER: 18110166-010701
CLIENT: NCDOT- Cyrus Parker, PE, PG	DATE: 10/3/2018
SITE LOCATION: 2005 New Hope Church Rd., Raleigh, NC	TOTAL DEPTH (ft bgs): 16
DRILLING CONTRACTOR: Regional Probing Services	BORING COORDINATES: See Appendix
DRILLING METHOD: Direct Push	BOREHOLE DIAMETER: 2 inches
DRILLING EQUIPMENT: Geoprobe	DEPTH TO WATER (ft bgs): NE
LOGGED BY: Brandy Barnes	PROJECT MANAGER: Mike Branson, PG

DEPTH (ft bgs)	SAMPLES: Sample ID	SAMPLES: Recovery %	PID Reading (ppm)	USCS	LITHOLOGIC DESCRIPTION:	Notes:
0					ASPHALT	
1			2.2	CH/CL	Reddish brown with brown and gray, with mica and fine to peebles grains	
2		75		SW	GRAVEL, Fine to cobble size grains, with seams of greenish brown and red clays and sands	
3			2.2			
4						
5			5.7	CH/CL	CLAY, Greenish gray, brown, orange, and red, fine to pebble grains, with mica, silt, and lenses of sand, trace organic debris at 5-7.5ft	
6		100				
7			17.7			
8				SC	CLAYEY SAND, Orange and yellowish brown, fine grained, with trace wood and organic debris, petroleum odor	
9			14.4			
10		100		CH/CL	CLAY, Orangeish brown with red, yellow, and white, abundant silt and mica, trace organic debris, seams of silt, petroleum odor	
11			11.5			
12						
13	SB-9		22.8	ML	SILT, Orange gray, red, and yellow, with fine to coarse grains, petroleum odor	
14		100				
15			15.2	SP-SC	POORLY GRADED SAND WITH CLAY, Yellow, orange, and white, fine to coarse grained, trace silt, petroleum odor	
16					End of Borehole at 16 feet	
17						
18						
19						
20						

Draper Aden Associates
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BORING ID: SB-10

PROJECT NAME: Quality Oil	PROJECT NUMBER: 18110166-010701
CLIENT: NCDOT- Cyrus Parker, PE, PG	DATE: 10/4/2018
SITE LOCATION: 2005 New Hope Church Rd., Raleigh, NC	TOTAL DEPTH (ft bgs): 8
DRILLING CONTRACTOR: Regional Probing Services	BORING COORDINATES:
DRILLING METHOD: Direct Push	BOREHOLE DIAMETER: 2 inches
DRILLING EQUIPMENT: Geoprobe	DEPTH TO WATER (ft bgs): NE
LOGGED BY: Brandy Barnes	PROJECT MANAGER: Mike Branson, PG

DEPTH (ft bgs)	SAMPLES: Sample ID	SAMPLES: Recovery %	PID Reading (ppm)	USCS	LITHOLOGIC DESCRIPTION:	Notes:
0					ASPHALT	
				SP	POORLY GRADED SAND, Brown to light brown, medium grained, fill	
1			2.0	CH/CL	CLAY, Dark reddish brown with greenish gray, with fine to coarse grained	
2		50				
3			2.5	SC	CLAYEY SAND, Greenish gray brown, fine to coarse grained, with gravel, silt, and mica	
4						
5			3.3			
6		100		SM	SILTLY SAND, Greenish gray, fine to coarse grained, with seams of dark gray and light brown clay	
7	SB-10		5.2			
8					End of Borehole at 8 feet	
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						

Draper Aden Associates
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BORING ID: SB-11

PROJECT NAME: Quality Oil	PROJECT NUMBER: 18110166-010701
CLIENT: NCDOT- Cyrus Parker, PE, PG	DATE: 10/4/2018
SITE LOCATION: 2005 New Hope Church Rd., Raleigh, NC	TOTAL DEPTH (ft bgs): 8
DRILLING CONTRACTOR: Regional Probing Services	BORING COORDINATES:
DRILLING METHOD: Direct Push	BOREHOLE DIAMETER: 2 inches
DRILLING EQUIPMENT: Geoprobe	DEPTH TO WATER (ft bgs): NE
LOGGED BY: Brandy Barnes	PROJECT MANAGER: Mike Branson, PG

DEPTH (ft bgs)	SAMPLES: Sample ID	SAMPLES: Recovery %	PID Reading (ppm)	USCS	LITHOLOGIC DESCRIPTION:	Notes:
0					ASPHALT	
				SP	POORLY GRADED SAND, Brown to light brown, medium grained, fill, with gravel	
1			3.0			
2		100		CH/CL	CLAY, Reddish orange brown, with fine to pebble grains, with mica, seams of sand	
3			4.0			
4						
5	SB-11		4.8			
6		100		SC	CLAYEY SAND, Greenish gray and brown, fine to coarse grained, abundant silt and mica, with seams of reddish brown clay, black staining	
7			4.7			
8					End of Borehole at 8 feet	
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						

Draper Aden Associates
Engineering • Surveying • Environmental Services

BORING ID: SB-12

PROJECT NAME: Quality Oil	PROJECT NUMBER: 18110166-010701
CLIENT: NCDOT- Cyrus Parker, PE, PG	DATE: 10/4/2018
SITE LOCATION: 2005 New Hope Church Rd., Raleigh, NC	TOTAL DEPTH (ft bgs): 8
DRILLING CONTRACTOR: Regional Probing Services	BORING COORDINATES: See Appendix
DRILLING METHOD: Direct Push	BOREHOLE DIAMETER: 2 inches
DRILLING EQUIPMENT: Geoprobe	DEPTH TO WATER (ft bgs): NE
LOGGED BY: Brandy Barnes	PROJECT MANAGER: Mike Branson, PG

DEPTH (ft bgs)	SAMPLES: Sample ID	SAMPLES: Recovery %	PID Reading (ppm)	USCS	LITHOLOGIC DESCRIPTION:	Notes:
0–2		50	2.8	SP-SM	POORLY GRADED SAND WITH SILT, Reddish brown, fine with coarse grained, asphalt and trash debris at 1-2 ft	
2–4			2.9	CH/CL	CLAY, Reddish brown, with fine to coarse grained sand, with silt and mica	
4–6	SB-12	100	3.1	SC	CLAYEY SAND, Reddish brown, gray, and light brown, fine to coarse grained, with mica, with tan and light brown seams of clay	
6–8			2.8			
8					End of Borehole at 8 feet	

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BORING ID: SB-13

PROJECT NAME: Quality Oil	PROJECT NUMBER: 18110166-010701
CLIENT: NCDOT- Cyrus Parker, PE, PG	DATE: 10/4/2018
SITE LOCATION: 2005 New Hope Church Rd., Raleigh, NC	TOTAL DEPTH (ft bgs): 8
DRILLING CONTRACTOR: Regional Probing Services	BORING COORDINATES:
DRILLING METHOD: Direct Push	BOREHOLE DIAMETER: 2 inches
DRILLING EQUIPMENT: Geoprobe	DEPTH TO WATER (ft bgs): NE
LOGGED BY: Brandy Barnes	PROJECT MANAGER: Mike Branson, PG

DEPTH (ft bgs)	SAMPLES: Sample ID	SAMPLES: Recovery %	PID Reading (ppm)	USCS	LITHOLOGIC DESCRIPTION:	Notes:
0–1		50	3.7		MULCH/TOP SOIL, with sandy fill	
1–2				SP	POORLY GRADED SAND, Light brown, coarse grained with peebles	
2–3			2.9	CH/CL	CLAY, Orange brown, with fine to coarse grained sand	
3–4				ML	SILT, Black, wooded debris, organic material	
4–5	SB-13		4.9			
5–6		50		SC	CLAYEY SAND, Orange to red brown with light brown and yellow brown, fine to coarse grained, with mica, partially cemented	
6–7			4.4			
7–8					End of Borehole at 8 feet	
8–20						

Draper Aden Associates
Engineering • Surveying • Environmental Services

BORING ID: SB-14

PROJECT NAME: Quality Oil	PROJECT NUMBER: 18110166-010701
CLIENT: NCDOT- Cyrus Parker, PE, PG	DATE: 10/4/2018
SITE LOCATION: 2005 New Hope Church Rd., Raleigh, NC	TOTAL DEPTH (ft bgs): 8
DRILLING CONTRACTOR: Regional Probing Services	BORING COORDINATES:
DRILLING METHOD: Direct Push	BOREHOLE DIAMETER: 2 inches
DRILLING EQUIPMENT: Geoprobe	DEPTH TO WATER (ft bgs): NE
LOGGED BY: Brandy Barnes	PROJECT MANAGER: Mike Branson, PG

DEPTH (ft bgs)	SAMPLES: Sample ID	SAMPLES: Recovery %	PID Reading (ppm)	USCS	LITHOLOGIC DESCRIPTION:	Notes:
0–1			3.5		MULCH/TOP SOIL, with sandy fill	
1–2		50		SW	GRAVEL, Coarse grained with sand, seams of oragnic debris/wood	
2–3			3.7			
3–4						
4–5	SB-14		4.5			
5–6		75				
6–7			3.8	CH/CL	CLAY, Reddish brown, with fine to coarse sand, with mica	
7–8				SC	CLAYEY SAND, Light brown, gray,a nd orange, fine to coarse grains, with mica,	
8–20					End of Borehole at 8 feet	

Draper Aden Associates
Engineering • Surveying • Environmental Services

BORING ID: SB-15

PROJECT NAME: Quality Oil	PROJECT NUMBER: 18110166-010701
CLIENT: NCDOT- Cyrus Parker, PE, PG	DATE: 10/4/2018
SITE LOCATION: 2005 New Hope Church Rd., Raleigh, NC	TOTAL DEPTH (ft bgs): 8
DRILLING CONTRACTOR: Regional Probing Services	BORING COORDINATES:
DRILLING METHOD: Direct Push	BOREHOLE DIAMETER: 2 inches
DRILLING EQUIPMENT: Geoprobe	DEPTH TO WATER (ft bgs): NE
LOGGED BY: Brandy Barnes	PROJECT MANAGER: Mike Branson, PG

DEPTH (ft bgs)	SAMPLES: Sample ID	SAMPLES: Recovery %	PID Reading (ppm)	USCS	LITHOLOGIC DESCRIPTION:	Notes:
0–2		70	**3.1**	SP	POORLY GRADED SAND, Light orange brown and red, fine to coarse grained, trace construction debris	
2–4	SB-15		**3.3**	CH/CL	CLAY, Reddish brown with light brown, with fine to peeble grains	
4–6		100	**3.1**	SP-SC	POORLY GRADED SAND WITH CLAY, Light brown and yellowish green brown, fine to coarse grained	
6–8			**2.0**	CH/CL	CLAY, Reddish brown, with coarse grains, abundnat silt and mica	
8					End of Borehole at 8 feet	

ATTACHMENT C

PHOTO 1- VIEW OF SOIL BORING LOOKING WEST

PHOTO 2 - VIEW OF SOIL BORING LOOKING EAST

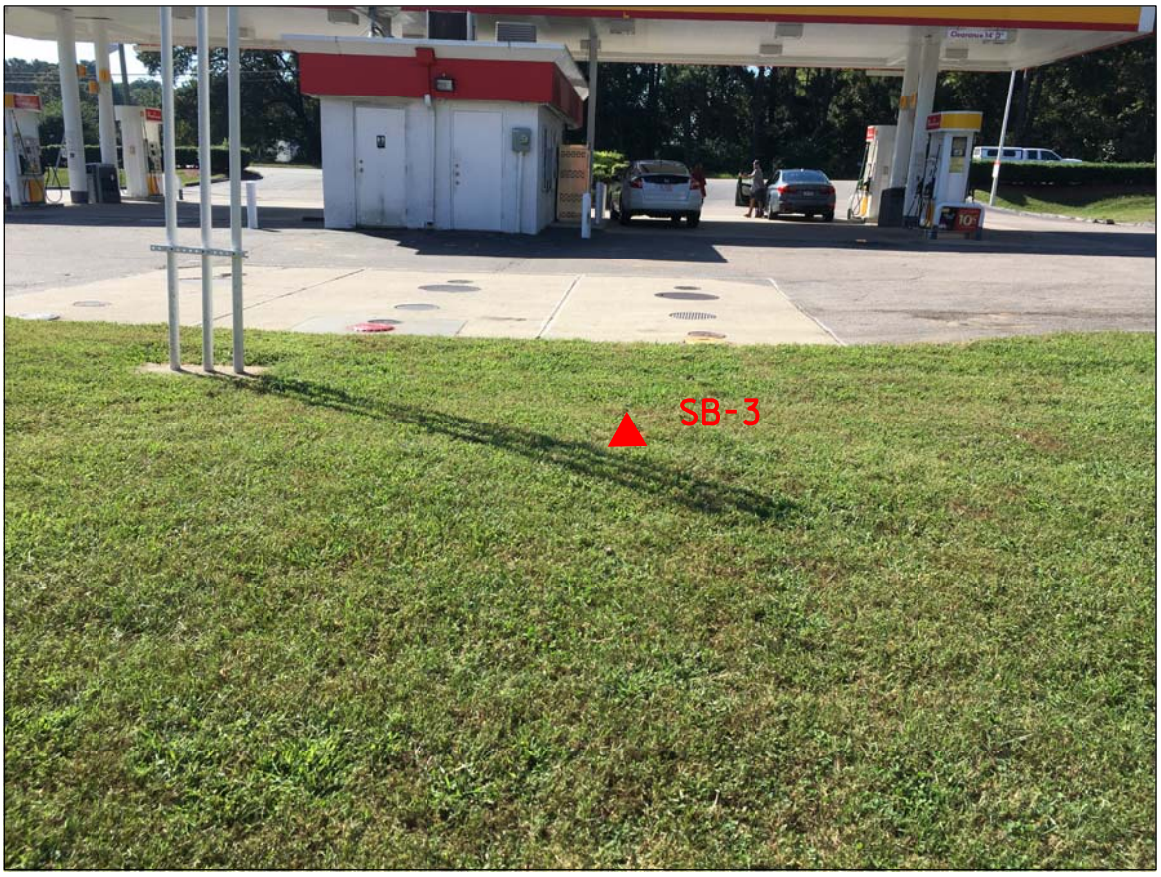


PHOTO 3 - VIEW OF SOIL BORING LOOKING SOUTH

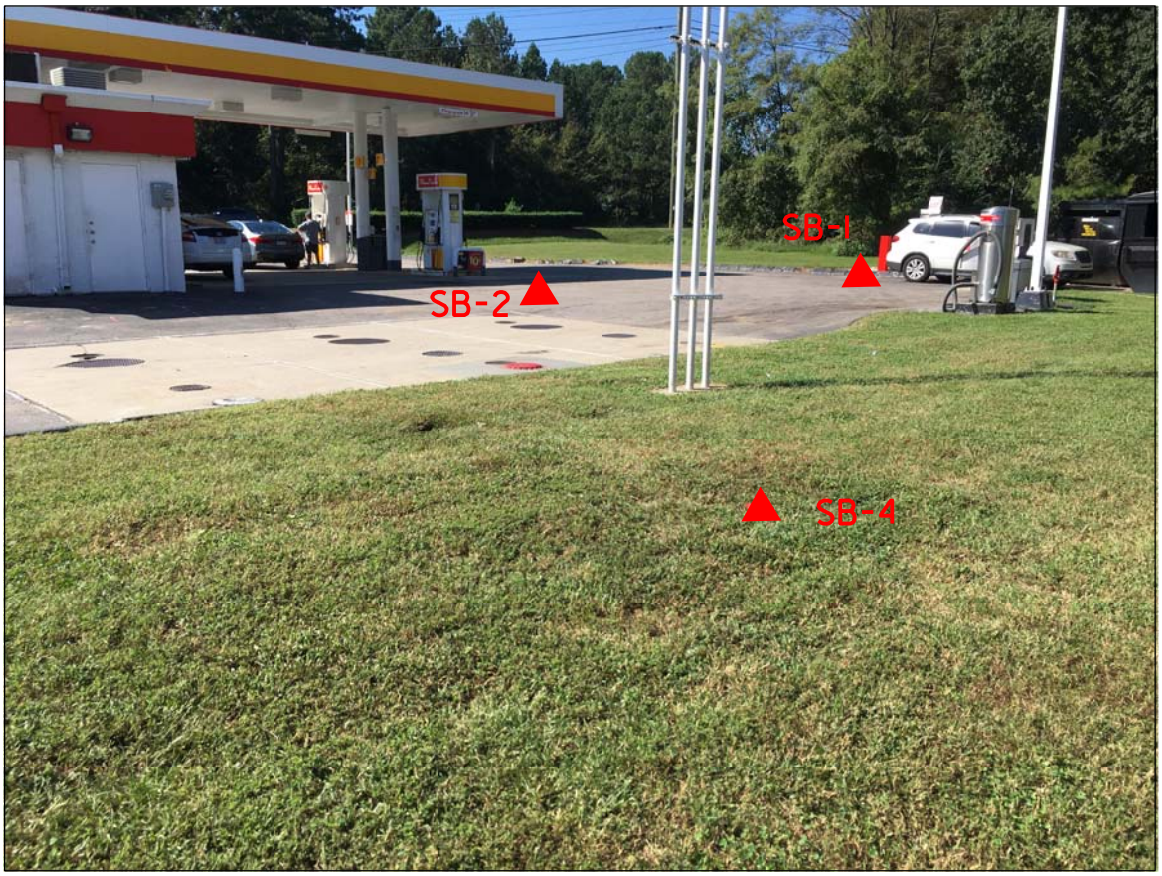


PHOTO 4 - VIEW OF SOIL BORING LOOKING WEST

PHOTO 5 - VIEW OF SOIL BORING LOOKING WEST

PHOTO 6 - VIEW OF SOIL BORING LOOKING NORTHWEST

PHOTO 7- VIEW OF SOIL BORING LOOKING NORTHEAST

PHOTO 8 - VIEW OF SOIL BORING LOOKING EAST

PHOTO 9 - VIEW OF SOIL BORING LOOKING NORTH

PHOTO 10 - VIEW OF SOIL BORING LOOKING NORTH

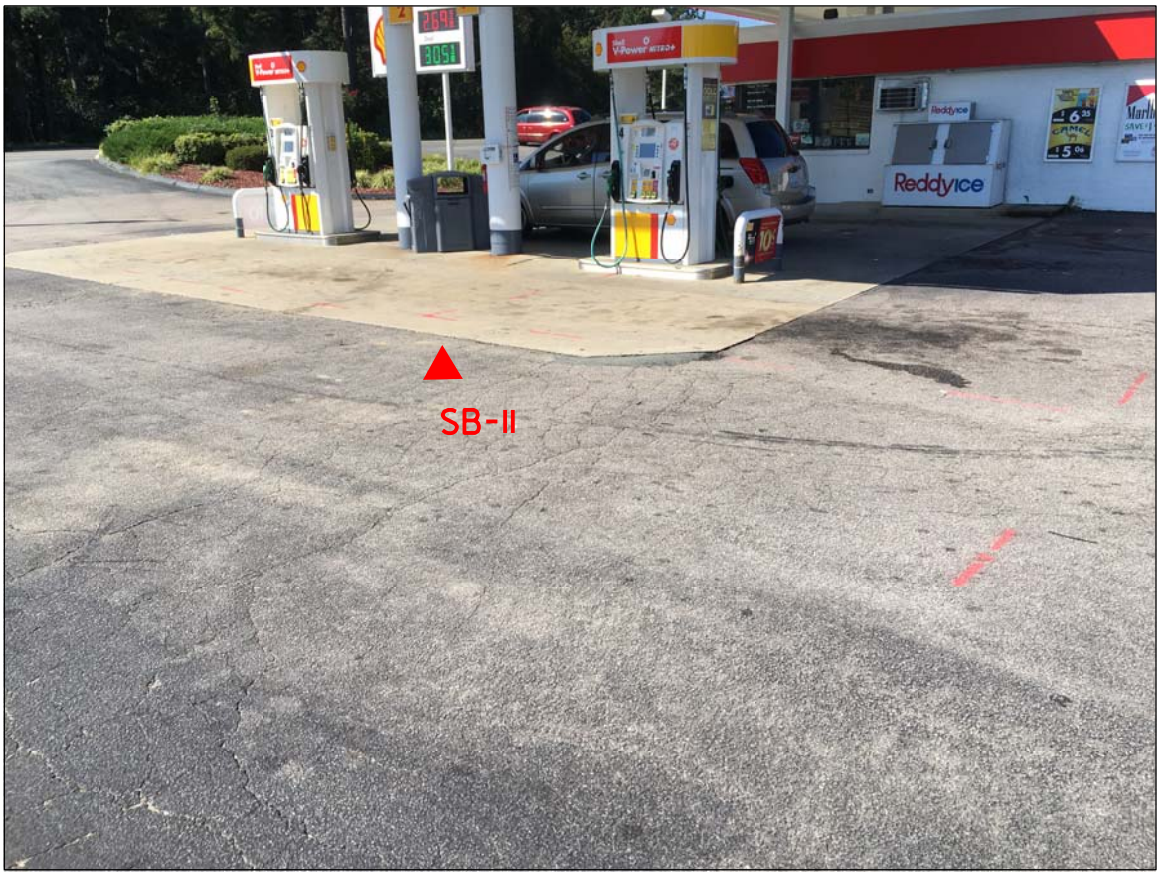


PHOTO 11 - VIEW OF SOIL BORING LOOKING SOUTHWEST

PHOTO 12 - VIEW OF SOIL BORING LOOKING NORTHEAST

PHOTO 13 - VIEW OF SOIL BORING LOOKING WEST

PHOTO 14 - VIEW OF SOIL BORING LOOKING EAST

PHOTO 15 - VIEW OF SOIL BORING LOOKING NORTHEAST

ATTACHMENT D

QED

REDLAB
RAPID ENVIRONMENTAL DIAGNOSTICS

QROS

Hydrocarbon Analysis Results

Client: DRAPER ADEN ASSOCIATES
Address: 1101 NOWELL ROAD
SUITE 100
RALEIGH, NC 27607

Contact: MIKE BRANSON
COLLECTED BY DANIEL BEALL
Project: 18110166-010701

Samples taken Thursday, October 4, 2018
Samples extracted Thursday, October 4, 2018
Samples analysed Tuesday, October 9, 2018

Operator MAX MOYER

U04049

Matrix	Sample ID	Dilution used	BTEX (C6 - C9)	GRO (C5 - C10)	DRO (C10 - C35)	TPH (C5 - C35)	Total Aromatics (C10-C35)	16 EPA PAHs	BaP	% Ratios			HC Fingerprint Match
										C5 - C10	C10 - C18	C18	
Soil	SB-1 4'-6'	20.8	<0.52	<0.52	29.2	29.2	13.2	0.72	0.01	0	93.3	6.7	Deg Fuel 90.1%,(FCM)
Soil	SB-2 10'-12'	21.1	<0.53	<0.53	43.2	43.2	23.9	1.3	0.022	0	93.9	6.1	Deg Fuel 75.6%,(FCM)
Soil	SB-3 14'-16'	256.0	<6.4	792.9	1725	2518	157.5	5.7	<0.077	85.8	14.1	0.1	Deg.Gas 70.6%,(FCM)
Soil	SB-4 12'-15'	20.3	<0.51	<0.51	2.9	2.9	0.82	0.06	<0.006	0	96.3	3.7	V.Deg.Diesel 65.4%,(FCM)
Soil	SB-5 14'-16'	22.6	<0.57	8.5	55.8	64.3	4.5	0.17	<0.007	69.3	30.4	0.3	Deg.Bituminous 67.2%,(FCM),(PFM)
Soil	SB-6 14'-16'	26.0	<0.65	<0.65	0.13	0.13	0.12	0.01	<0.008	0	66.8	33.2	Residual HC
Soil	SB-7 10'-12'	23.0	<0.58	<0.58	<0.23	<0.58	<0.01	<0.01	<0.007	0	0	0	PHC ND,(FCM)
Soil	SB-8 6'-8'	25.7	<0.64	<0.64	83.8	83.8	10	0.43	0.002	0	97.3	2.7	Deg.Fuel 78.8%,(FCM)
Soil	SB-9 12'-14'	26.5	<0.66	<0.66	55.6	55.6	31	1.7	0.029	0	94.1	5.9	Deg Fuel 76.4%,(FCM)
Soil	SB-11 4'-6'	31.0	<0.77	<0.77	34.7	34.7	16.9	0.93	0.016	0	94	6	Deg Fuel 76.1%,(FCM)

Initial Calibrator QC check OK Final FCM QC Check OK 100.6%

Concentration values in mg/kg for soil samples and mg/L for water samples. Soil values uncorrected for moisture or stone content. Fingerprints provide a tentative hydrocarbon identification.

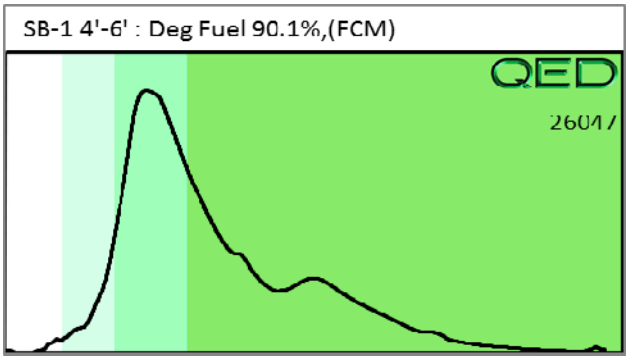
Abbreviations :- FCM = Results calculated using Fundamental Calibration Mode : % = confidence of hydrocarbon identification : (PFM) = Poor Fingerprint Match : (T) = Turbid : (P) = Particulate detected

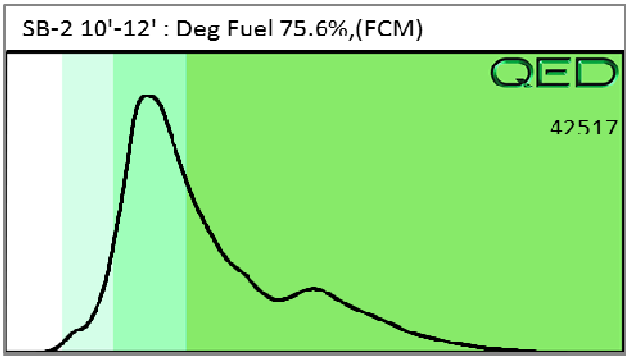
B = Blank Drift : (SBS)/(LBS) = Site Specific or Library Background Subtraction applied to result : (BO) = Background Organics detected : (OCR) = Outside cal range : (M) = Modifed Result.

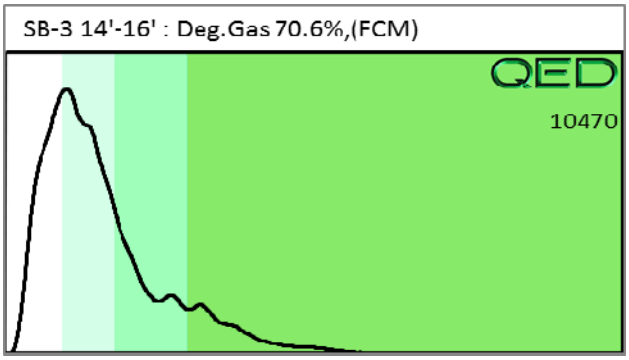
% Ratios estimated aromatic carbon number proportions : HC = Hydrocarbon : PHC = Petroleum HC : FP = Fingerprint only. **Data generated by HC-1 Analyser**

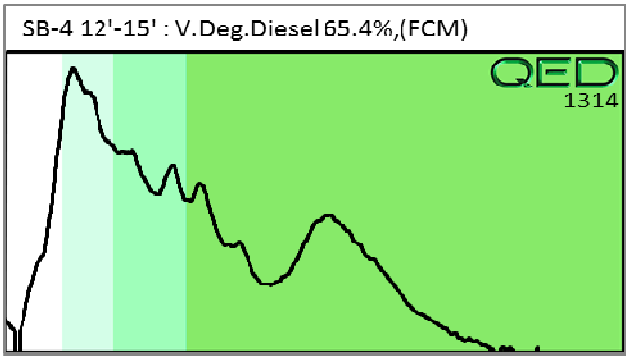
QED Hydrocarbon Fingerprints

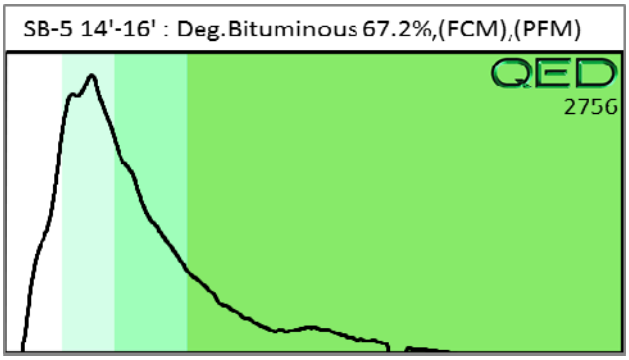
Project: 18110166-010701 Tuesday, October 9, 2018

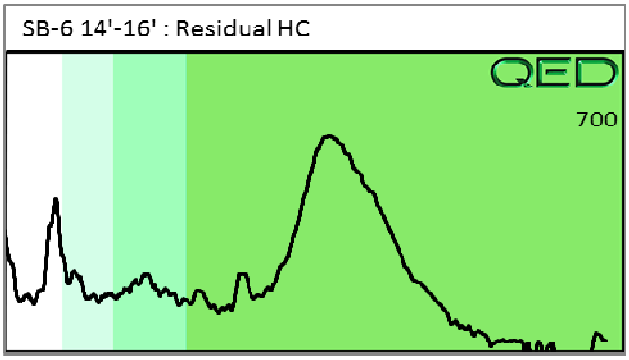


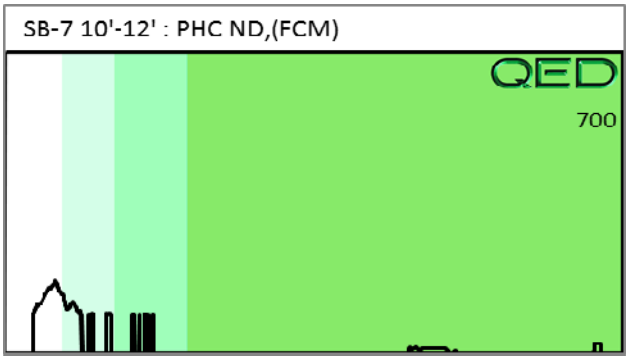


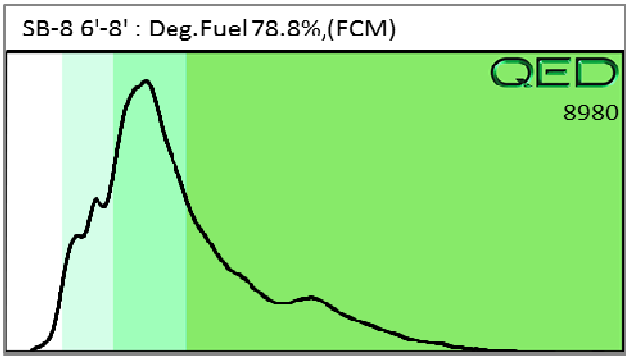


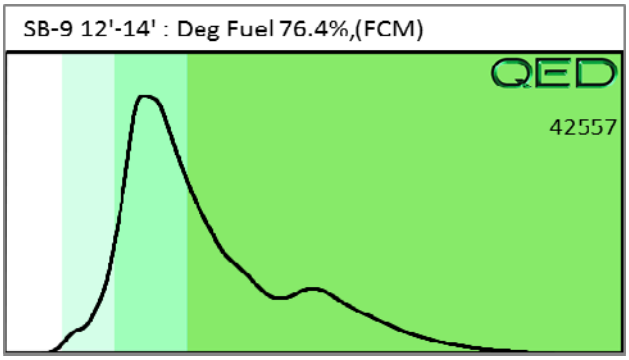


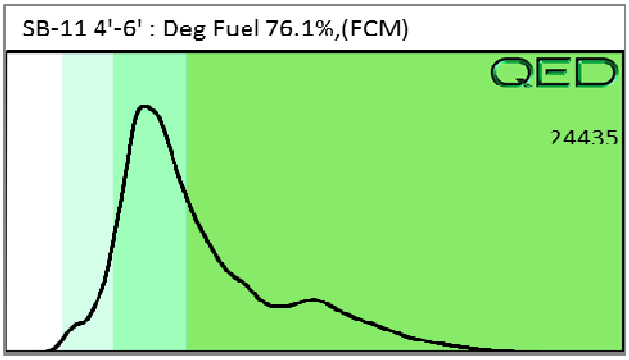












QED

REDLAB RAPID ENVIRONMENTAL DIAGNOSTICS

QROS

Hydrocarbon Analysis Results

Client: DRAPER ADEN ASSOCIATES
Address: 1101 NOWELL ROAD
SUITE 100
RALEIGH, NC 27607

Contact: MIKE BRANSON
COLLECTED BY DANIEL BEALL
Project: 18110166-010701

Samples taken Thursday, October 4, 2018
Samples extracted Thursday, October 4, 2018
Samples analysed Tuesday, October 9, 2018

Operator MAX MOYER

U04049

Matrix	Sample ID	Dilution used	BTEX (C6 - C9)	GRO (C5 - C10)	DRO (C10 - C35)	TPH (C5 - C35)	Total Aromatics (C10-C35)	16 EPA PAHs	BaP	% Ratios			HC Fingerprint Match
										C5 - C10	C10 - C18	C18	
Soil	SB-10 6'-8'	21.0	<0.52	<0.52	5.6	5.6	2.7	0.13	0.001	0	94	6	Deg Fuel 75.7%,(FCM)
Soil	SB-12 4'-6'	25.2	<0.63	<0.63	20	20	8.2	0.45	0.01	0	92.9	7.1	Deg Fuel 90.3%,(FCM)
Soil	SB-13 4'-6'	21.3	<0.53	<0.53	11.5	11.5	6.1	0.27	0.005	0	95.1	4.9	Deg Fuel 75.1%,(FCM)
Soil	SB-14 4'-6'	32.1	<0.8	<0.8	4.5	4.5	2	0.11	0.003	0	84.1	15.9	V.Deg.PHC 95%,(FCM),(P)
Soil	SB-15 2'-4'	23.9	<0.6	<0.6	8.9	8.9	4	0.21	0.005	0	83.8	16.2	V.Deg.PHC 93.3%,(FCM)

Initial Calibrator QC check OK Final FCM QC Check OK 98.6%

Concentration values in mg/kg for soil samples and mg/L for water samples. Soil values uncorrected for moisture or stone content. Fingerprints provide a tentative hydrocarbon identification.

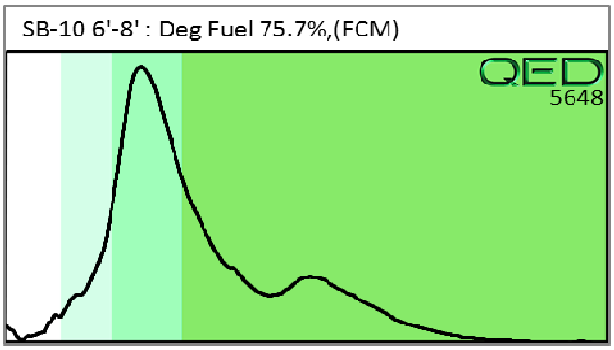
Abbreviations :- FCM = Results calculated using Fundamental Calibration Mode : % = confidence of hydrocarbon identification : (PFM) = Poor Fingerprint Match : (T) = Turbid : (P) = Particulate detected

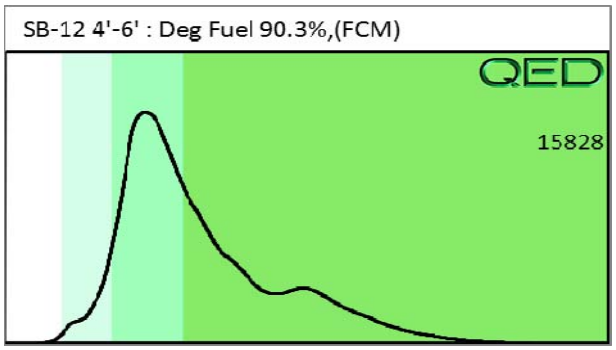
B = Blank Drift : (SBS)/(LBS) = Site Specific or Library Background Subtraction applied to result : (BO) = Background Organics detected : (OCR) = Outside cal range : (M) = Modifed Result.

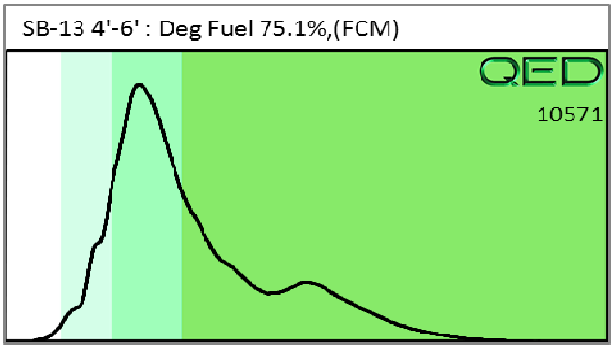
% Ratios estimated aromatic carbon number proportions : HC = Hydrocarbon : PHC = Petroleum HC : FP = Fingerprint only. **Data generated by HC-1 Analyser**

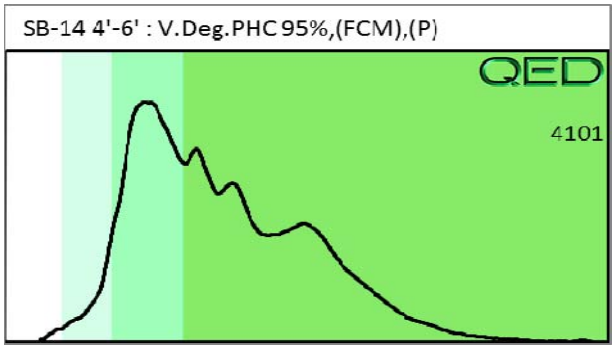
QED Hydrocarbon Fingerprints

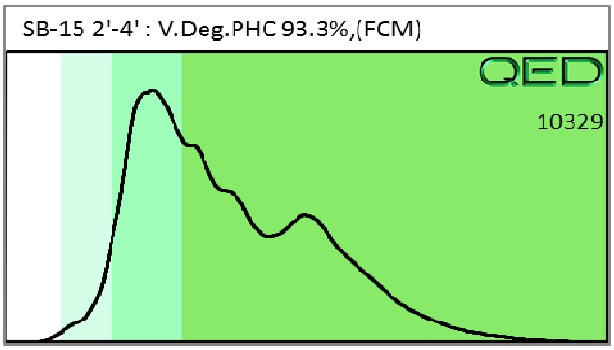
Project: 18110166-010701 Tuesday, October 9, 2018











B94

Client Name:	Draper Aden Associate
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Contact:	Mike Branson
Project Ref.:	18110606-010701
Email:	mbranson@daa.com
Phone #:	919-873-1060
Collected by:	Daniel Beall

REDLAB™
RAPID ENVIRONMENTAL DIAGNOSTICS

CHAIN OF CUSTODY AND ANALYTICAL REQUEST FORM

RED Lab, LLC
5598 Marvin K Moss Lane
MARBIONC Bldg, Suite 2003
Wilmington, NC 28409

Each sample will be analyzed for BTEX, GRO, DRO, TPH, PAH total aromatics and BaP

Sample Collection Date/Time	TAT Requested 24 Hour	TAT Requested 48 Hour	Initials	Sample ID	Total Wt.	Tare Wt.	Sample Wt.
10/3/18 0947			DS	SB-1 4-6'	55.8	43.3	12.5
1023			DS	SB-2 10-12'	56.2	43.9	12.3
1100			DS	SB-3 14-16'	57.2	44.0	13.2
1135			DS	SB-4 12-15'	56.9	44.1	12.8
1210			DS	SB-5 14-16'	54.6	43.1	11.5
1355			DS	SB-6 14-16'	53.7	43.7	10.0
1445			DS	SB-7 10-12'	55.1	43.8	11.3
1520			DS	SB-8 6-8'	54.6	44.5	10.1
1605			DS	SB-9 12-14'	53.6	43.8	9.8
1630			AB	SB-11 4-6'	52.1	43.7	8.4
10/4/18 910			DS	SB-10 6-8'	56.2	43.8	12.4
930			DS	SB-12 4-6'	53.7	43.4	10.3
950			DS	SB-13 4-6'	55.9	43.7	12.2
1015			DS	SB-14 4-6'	52.1	44.0	8.1
1050			DS	SB-15 2-4'	54.6	43.7	10.9
			[illegible]				
			DS				
			D				

Comments:
DRO/GRO x UVF

Relinquished by	Date/Time	Accepted by	Date/Time
Daniel Beall	10/4/18 1300	MM	10/9/18
Relinquished by	Date/Time	Accepted by	Date/Time

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15