

December 13, 2016

Mr. Terry Fox, L.G.  
North Carolina Department of Transportation  
Geotechnical Engineering Unit  
1589 Mail Service Center  
Raleigh, North Carolina 27699-1589

Reference: **Preliminary Site Assessment**  
**Jalaram Bapa Enterprises, LLC Property (Parcel #138)**  
**6022 Raeford Road**  
**Fayetteville, Cumberland County, North Carolina**  
**State Project: U-4405**  
**WBS Element 39049.1.1**  
**SIES Project No. 2016.0054.NDOT**

Dear Mr. Fox:

Solutions-IES, Inc., (SIES) has completed the Preliminary Site Assessment conducted at the above-referenced property. The work was performed in accordance with the Technical and Cost proposal dated September 26, 2016, and the North Carolina Department of Transportation's (NCDOT's) Notice to Proceed dated September 26, 2016. Activities associated with the assessment consisted of conducting a geophysical investigation, collecting soil samples for analysis, and reviewing applicable North Carolina Department of Environmental Quality (NCDEQ) records. 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 Jalaram Bapa Enterprises, LLC Property (Parcel #138) is located at 6022 Raeford Road in Fayetteville, Cumberland County, North Carolina. The property is situated on the north side of Raeford Road approximately 750 feet west of the intersection of Raeford Road and Skibo Road (**Figure 1**). The property consists of an active gas station and convenience store (Speedway Sunoco). The on-line UST registry information lists three underground storage tanks (USTs) at the site.

An asphalt parking area occupies the area on the south, east, and west sides of the building, and extends almost to the property boundaries. An attached metal canopy with four dispenser pumps is located in front of the building. The existing USTs are located under a concrete pad on the west side of the building (**Figure 2**). The proposed easement has not been marked at the site, but NCDOT plan sheets show that the easement will affect a small portion of the canopy, but not the USTs or building.

The NCDOT requested a Preliminary Site Assessment for the right-of-way and proposed easement because of the current site use as a 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 where contamination exists on the right-of-way/proposed easement. An estimate of the quantity of impacted soil is to be provided, should impacted soils be encountered.

SIES reviewed the on-line NCDEQ Incident Management database and Incident Number 13244 was assigned to the site. A further review of files regarding the incident from the NCDEQ Fayetteville Regional Office indicated that an Environmental Site Assessment (ESA), prepared by Groundwater and Environmental Services, Inc. and dated March 2009, was on file, but no other information was available. According to the ESA, a UST closure report was submitted in November 1994 that documented soil contamination in the UST area. Within the ESA, the following chronology was documented:

- January 1995 – NCDENR (now NCDEQ) issued a Notice of Regulatory Requirements (NORR) for corrective action.
- January 1995 – A Pollution Incident Form was filed with NCDENR and incident number 13244 was assigned to the site.
- March 1995 – An Initial Site Characterization was submitted.
- July 1996 – A Comprehensive Site Assessment (CSA) was submitted. The CSA detailed the assessment of soil and groundwater. A limited number of petroleum compounds were detected in soil, but numerous compounds at concentrations above the standards were detected in the groundwater. A Corrective Action Plan (CAP) was recommended.
- September 1998 – A Limited Soil and Groundwater Sampling Report and Site Closure Request was submitted. The report documented analytical results that showed no compounds present in the soil or groundwater above the industrial/commercial Maximum Soil Contaminant Concentrations (MSCC) for soil or the Gross Contaminant Levels (GCLs) for groundwater.
- February 1999 – A No Further Action (NFA) letter was issued for the site.
- March 2003 – Additional soil samples were collected from the site as part of a real estate transaction. No concentrations were detected above those previously recorded.
- June 2003 – The UST Section requested a Notice of Residual Petroleum (NORP) to be registered with the Register of Deeds in Cumberland County.

In March 2009, the ESA report was prepared because of another potential real estate transaction. Five monitoring wells were installed and soil samples were collected from the borings as well as groundwater samples following well installation. The analyses confirmed that soil and groundwater contamination was present at the site, but at concentrations consistent with those covered by the NFA letter. The ESA is presented in **Attachment A**.

SIES also examined the UST registration database to obtain and update UST ownership information. According to the database, the USTs on the property were operated under Facility Number 00-0-0000011727. The database indicated that three 10,000-gallon gasoline USTs are registered to the site. The owner and operator of record for the tanks are listed as follows:

Owner

Jalaram Bapa Enterprises, LLC  
6022 Raeford Road  
Fayetteville, NC 28304

Operator

Raeford Road Sunoco  
6022 Raeford Road  
Fayetteville, NC 28304

### **Geophysical Survey**

Prior to SIES' mobilization to the site, Pyramid Environmental & Engineering of Greensboro, NC (Pyramid) conducted a geophysical survey to confirm the presence of the known USTs and determine if additional USTs were present in the area of the right-of-way/proposed easement. The geophysical survey consisted of an electromagnetic survey using a Geonics EM61 time-domain electromagnetic induction meter to locate buried metallic objects, and specifically looking for USTs.

A survey grid was laid out along the right-of-way/proposed easement with the X-axis oriented approximately parallel to Raeford Road and the Y-axis oriented approximately perpendicular to Raeford Road. The grid was positioned to cover the entire right-of-way/proposed easement.

The survey lines were spaced 10 feet apart and magnetic data were collected continuously along each survey line with a data logger. After collection, the data were reviewed in the field with graphical computer software. The presence of USTs in the known UST basin was confirmed. Additional anomalies were attributed to visible cultural features and known utilities. For these reasons, a ground penetrating radar survey was not required to verify any unknown EM anomalies.

Access was available to all areas of the property and several anomalies were detected with the geophysical survey. No unknown metallic USTs were detected within the geophysical survey area. Pyramid's detailed report of findings and interpretations is presented in **Attachment B**.

### **Site Assessment Activities**

On October 27, 2016, SIES mobilized to the site to conduct a Geoprobe® direct-push investigation to evaluate subsurface soil conditions on the property. Six direct-push holes (138-SB-1 through 138-SB-6) were drilled in the right-of-way/proposed easement. The first two borings (138-SB-1 and -2) were advanced to a depth of 12 feet below ground surface (ft bgs). Groundwater was encountered between six and seven ft bgs in these borings, therefore the remaining borings were terminated at six ft bgs.

Boring locations are shown on the site map on **Figure 2**. The soil boring logs are included as **Attachment C**. Borings 138-SB-1 and 138-SB-2 were located to evaluate the subsurface conditions in the western side of the property. Borings 138-SB-3 and 138-SB-4 were placed to assess the conditions at the canopy and dispensers, and borings 138-SB-5 and 138-SB-6 were located to evaluate the subsurface on the eastern part of the property on the right-of-way/proposed easement (see photos in **Attachment D**).

Continuous sampling using a Geoprobe® resulted in good recovery of soil samples from the direct-push holes. Soil samples were collected and contained 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**). Following the completion of boring 138-SB-2, the PID malfunctioned and no field screening could be performed for the remaining borings. Therefore, the two bottom samples from each boring thereafter were submitted for analysis.

The selected soil samples were submitted to an on-site mobile laboratory for analysis of total petroleum hydrocarbons (TPH) diesel range organics (DRO) and gasoline range organics (GRO) using ultraviolet fluorescence (UVF) methodology. Each boring was backfilled with bentonite and drill cuttings to the surface after completion.

The lithology encountered by the direct-push samples was generally consistent throughout the site. The ground surface was covered with about 0.5 feet of asphalt or topsoil. Below this surface cover to a depth of about two feet was a mottled tan and red silty sand. Groundwater was observed at a depth of between six and seven ft bgs. No bedrock was noted in any of the borings.

According to the 1985 Geologic Map of North Carolina, the site is within of Coastal Plain Physiographic Province in North Carolina near the contact between the Cretaceous Black Creek and Middendorf Formations. The strata of the Black Creek Formation consist of gray to black clay, thin lenses of fine-grained sand and thick lenses of cross-bedded sand. The lithology may also include glauconite and fossils. In comparison, the Middendorf Formation consists of sand, sandstone, and mudstone that are laterally discontinuous. The soils observed at the site are consistent with the Middendorf Formation as the parent material.

## **Analytical Results**

The laboratory data are summarized in **Table 1** and the complete report is presented in **Attachment E**. Eleven soil samples were submitted for analysis (multiple samples were collected from all borings except 138-SB-1). Of these samples, four contained detectable GRO compounds and ten contained detectable DRO compounds. Detected GRO concentrations ranged from 0.84 to 2.1 milligrams per kilogram (mg/kg). Detected DRO concentrations ranged from 0.62 to 59.7 mg/kg. The action levels are 50 mg/kg for GRO and 100 mg/kg for DRO<sup>1</sup>. None of the soil samples analyzed for this site contained DRO or GRO concentrations above their respective action levels.

## **Conclusions and Recommendations**

A Preliminary Site Assessment was conducted to evaluate the Jalaram Bapa Enterprises LLC Property (Parcel #138) located at 6022 Raeford Road in Fayetteville, Cumberland County, North Carolina. Documents within the NCDEQ UST Section files indicated that a previous release occurred at the site. Soil and groundwater contamination were detected after removal of several USTs in 1995. The contaminant concentrations were below the industrial/commercial MSCC the GCLs for groundwater. Based on the analyses, a No Further Action letter was issued in 1999.

A geophysical survey conducted at the site indicated that no unknown metallic USTs were present within the geophysical survey area of the site. Six soil borings were advanced to evaluate the subsurface soil conditions along the right-of-way/proposed easement, from which 11 soil samples were collected. Four of the 11 soil samples analyzed had a GRO concentration above the detection limit, and 10 of the 11 soil samples had DRO concentrations were present above the detection limit. However, none of the DRO or GRO concentrations were above their respective action limits.

None of the soil samples had contaminant concentrations above applicable action levels (Table 1). Therefore, no estimate of the volume of soil requiring possible remediation was made.

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<sup>1</sup> NCDEQ, *Guidelines for North Carolina Action Limits for Total Petroleum Hydrocarbons (TPH)*, July 26, 2016,

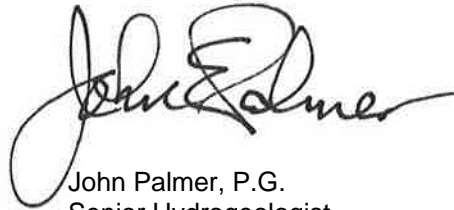
SIES appreciates the opportunity to work with the NCDOT on this project. Because compounds were detected above the method detection limit in the soil samples, SIES recommends that a copy of this report be submitted to the Division of Waste Management, UST Section, in the Fayetteville Regional Office.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

Sincerely,



Michael W. Branson, P.G.  
Project Manager

Attachments



John Palmer, P.G.  
Senior Hydrogeologist

**TABLE 1**  
**SOIL FIELD SCREENING AND ANALYTICAL RESULTS**  
**JALARAM BAPAS ENTERPRISES, LLC PROPERTY (PARCEL #138)**  
**FAYETTEVILLE, CUMBERLAND COUNTY, NORTH CAROLINA**  
**STATE PROJECT: U-4405**  
**WBS ELEMENT 39049.1.1**  
**SIES PROJECT NO. 2016.0054.NDOT**

SAMPLE ID	DEPTH (ft)	PID READING (ppm)	SAMPLE ID	ANALYTICAL RESULTS (mg/kg)	
				UVF GRO	UVF DRO
Action Level (mg/kg)				50	100
138-SB-1	0 - 2	0.2			
	2 - 4	0.6			
	4 - 6	0.6	138-SB-1-4-6	<b>1.7</b>	<b>40.8</b>
	6 - 8	NA			
	8 - 10	NA			
	10 - 12	NA			
138-SB-2	0 - 2	0.6			
	2 - 4	6.7	138-SB-2-2-4	<0.6	<b>2.9</b>
	4 - 6	38.7	138-SB-2-4-6	<b>0.84</b>	<b>59.7</b>
	6 - 8	0.5			
	8 - 10	9.5			
	10 - 12	11.6			
138-SB-3	0 - 2	NA			
	2 - 4	NA	138-SB-3-2-4	<0.58	<b>52</b>
	4 - 6	NA	138-SB-3-4-6	<0.6	<b>33.7</b>
138-SB-4	0 - 2	NA			
	2 - 4	NA	138-SB-4-2-4	<b>1.2</b>	<b>5.3</b>
	4 - 6	NA	138-SB-4-4-6	<0.56	<b>17.8</b>
138-SB-5	0 - 2	NA			
	2 - 4	NA	138-SB-5-2-4	<0.78	<0.78
	4 - 6	NA	138-SB-5-4-6	<0.73	<b>0.73</b>
138-SB-6	0 - 2	NA			
	2 - 4	NA	138-SB-6-2-4	<b>2.1</b>	<b>0.62</b>
	4 - 6	NA	138-SB-6-4-6	<0.59	<b>1.6</b>

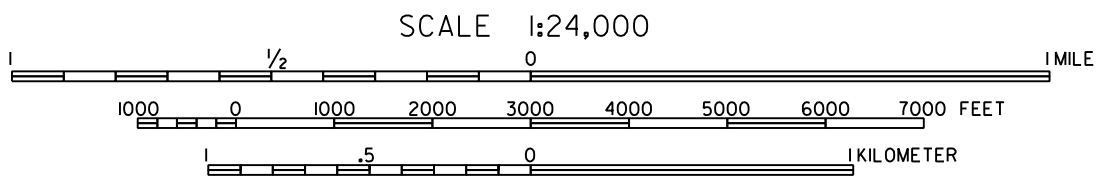
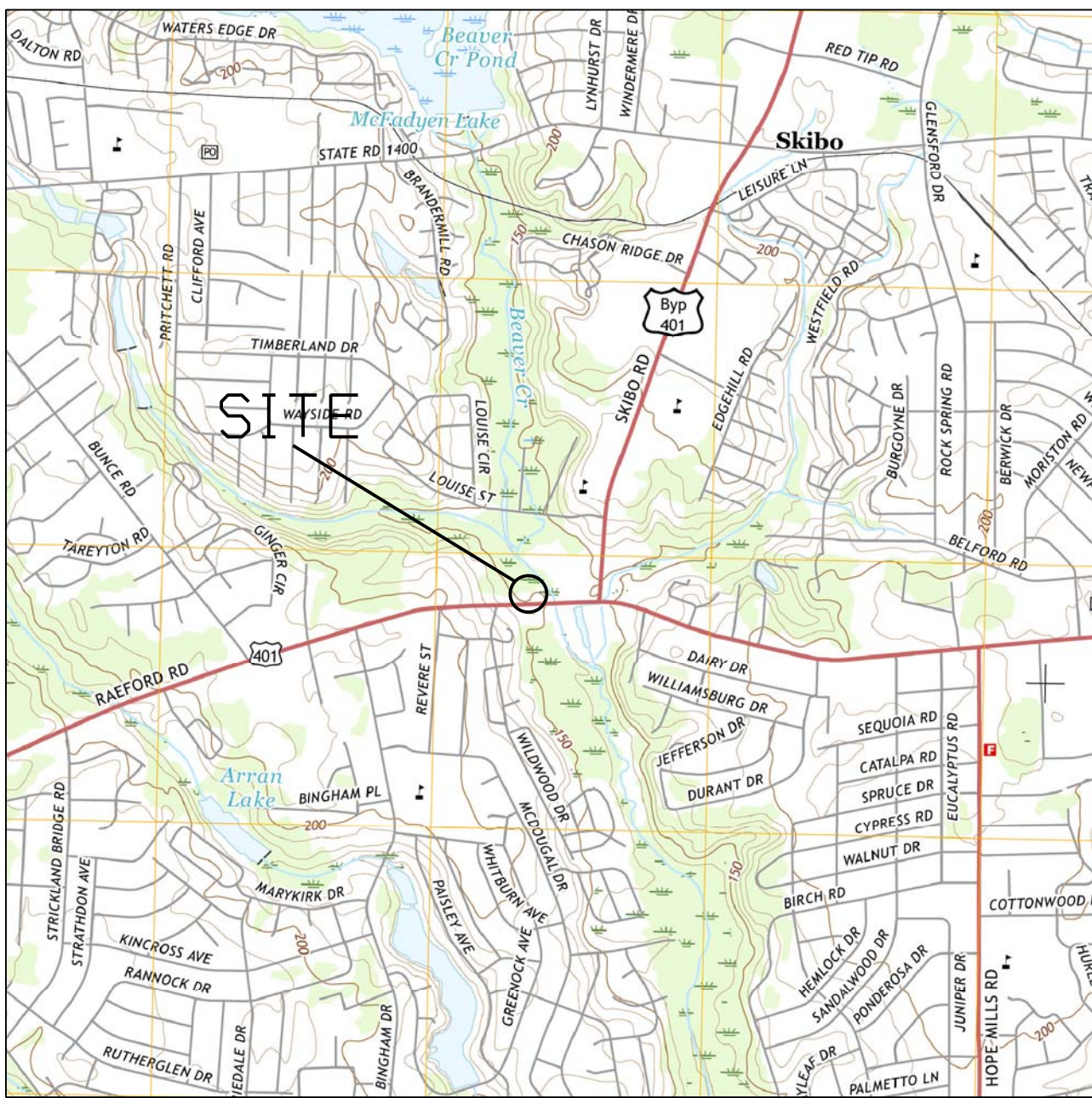
- 1) ft - feet
- 2) ppm - parts per million.
- 3) PID - photoionization ionization detector
- 4) mg/kg - milligrams per kilogram.
- 5) UVF DRO - Diesel range organics by UVF.
- 6) UVF GRO - Gasoline range organics by UVF.
- 7) Action level based upon NCDEQ memo *Guidelines for North Carolina Action Limits for Total Petroleum Hydrocarbons* - July 29, 2016.
- 8) Soil samples were collected on October 27, 2016.
- 9) NS - Not sampled due to groundwater
- 10) **Bold** values are above the detection level.
- 11) NA - Not applicable due to malfunctioning screening equipment

## FIGURES





PROJECT NUMBER 2016-0054.NDOT  
 CHECKED BY JEP  
 PROJECT MANAGER MWB  
 DATE NOVEMBER 2016  
 FILE FAYETTEVILLE PSAS

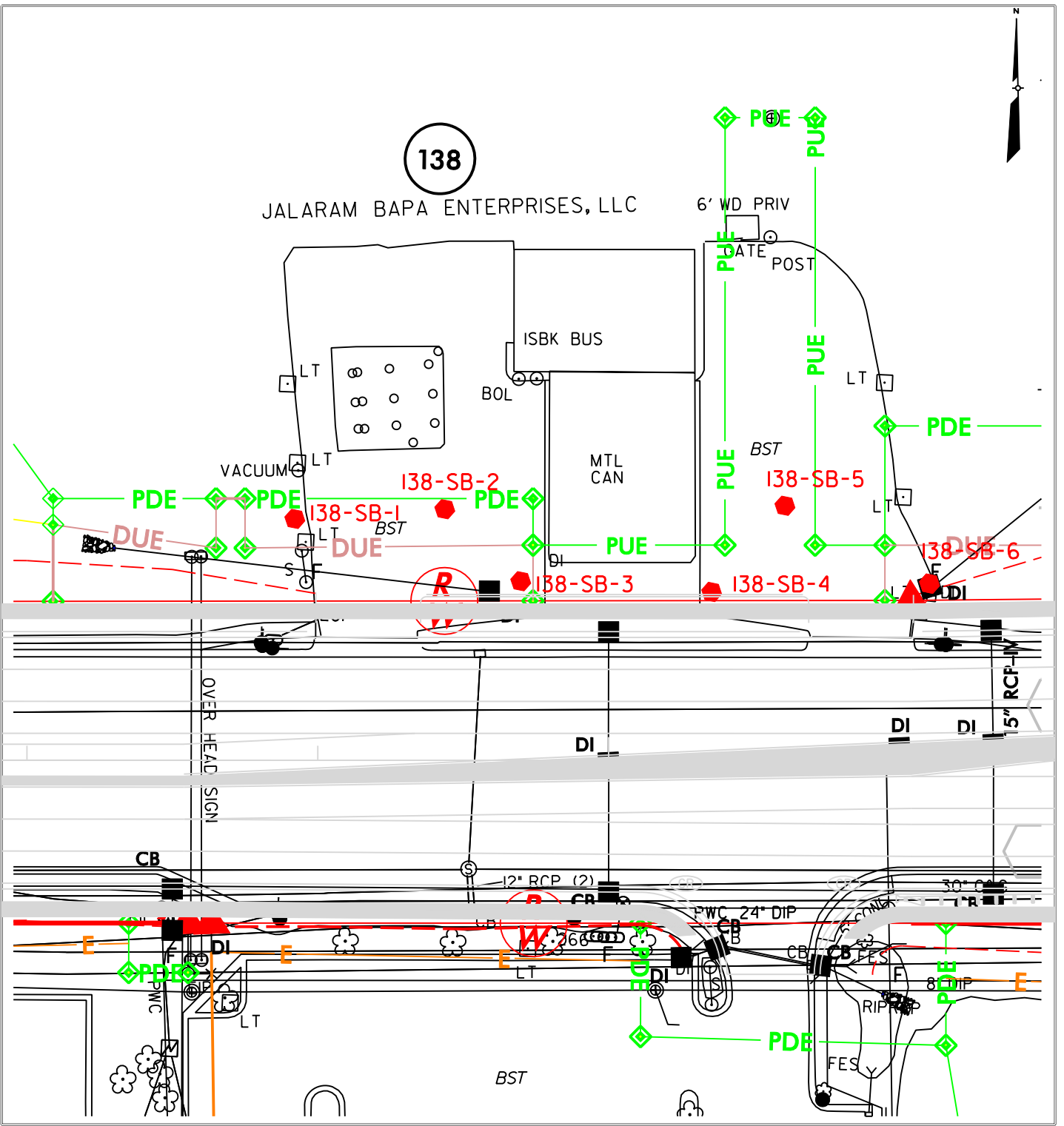


SOURCE: U.S. GEOLOGICAL SURVEY 7.5 MIN QUADRANGLE: FAYETTEVILLE, NC (2016)

**Solutions-IES**  
 Industrial & Environmental Services  
 1101 NOWELL ROAD  
 RALEIGH, NORTH CAROLINA 27607  
 TEL: (919) 873-1060 FAX: (919) 873-1074

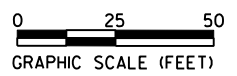
VICINITY MAP  
 JALARAM BAPA ENTERPRISES LLC PROPERTY (PARCEL #138)  
 FAYETTEVILLE, CUMBERLAND COUNTY NORTH CAROLINA

FIGURE  
 1



LEGEND

**138-SB-1**  SOIL SAMPLE LOCATION AND IDENTIFICATION




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SITE MAP  
JALARAM BAPA ENTERPRISES LLC PROPERTY (PARCEL #138)  
FAYETTEVILLE, CUMBERLAND COUNTY, NORTH CAROLINA

FIGURE  
2

ATTACHMENT A

**RECEIVED**  
OCT 08 2009

DIVISION OF WASTE MANAGEMENT  
FAYETTEVILLE REGIONAL OFFICE

# **Environmental Site Assessment Report**

**Sunoco DUNS #0614-8506  
6022 Raeford Road  
Fayetteville, North Carolina**

*Prepared for:*

**Mr. Scott Cullinan  
Sunoco, Inc.  
350 Eagleview Boulevard  
Exton, Pennsylvania 19342**

*Prepared by:*

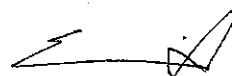
**Groundwater and Environmental Services, Inc.  
3344 Hillsborough Street  
Suite 150  
Raleigh, North Carolina 27607**

**March 2009**



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**Hillary Shoreland  
Associate Environmental Scientist**



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**Eli Holland  
Project Manager**

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## 1.0 INTRODUCTION

Sunoco retained Groundwater and Environmental Services, Inc. (GES) to complete an Environmental Site Assessment of Sunoco DUNS #0614-8506 located at 6022 Racford Road, Fayetteville, North Carolina (the Property). The Property is referenced as Sunoco DUNS #0614-8506, and consists of an active retail petroleum fuel station.

The purpose of this ESA was to evaluate current subsurface conditions at the Property. Monitoring wells were installed at strategic locations through out the Property. Soil samples were collected during well installation and analyzed by Pace Laboratories (Pace) of Huntersville, North Carolina. Following well installation, the wells were developed and a representative groundwater sample was collected from each location. The ESA scope of work is as follows:

- Installation of five (5) groundwater monitoring wells;
- Screening and classification of soil cuttings;
- Collection and laboratory analysis of soil samples for volatile organic carbons (VOCs) by EPA Method 8260 and semi-volatile organic compounds (SVOCs) by EPA Method 8270;
- Gauging, development and surveying of groundwater monitoring wells;
- Collection and laboratory analysis of groundwater samples for VOCs by EPA Method 8260 and SVOCs by EPA Method 8270; and
- Completion of a local area survey.

## 2.0 BACKGROUND

### 2.1 Site Description and Features

The Property is located at 6022 Raeford Road, in Fayetteville, North Carolina. **Figure 1** shows the approximate location of the Property on the USGS topographic quadrangle map for Fayetteville, North Carolina. The approximate geographical coordinates for the Property are 35 degrees, 2 minutes, 41.03 seconds North (Latitude) by 78 degrees, 58 minutes, 43.14 seconds West (Longitude). The approximate ground surface elevation is 147 feet above mean sea level (AMSL).

The 0.86-acre property is currently used as an active Sunoco petroleum filling station. There are four (4) dispenser islands with eight (8) multi-product dispensers on the Property. The UST field contains three (3) 10,000-gallon gasoline USTs and is located near the northwest corner of the Property. **Figure 2** shows a Site Map with the approximate locations of the existing site features at the time of the ESA.

The Property is zoned for commercial use. The surrounding properties are mixed commercial and wooded land. No private potable or irrigation wells were observed during the local area survey. Municipal water is supplied to the Property and surrounding area by the City of Fayetteville.

### 2.2 Physical Setting

The Property is located in the western portion of Cumberland County, North Carolina. This portion of Cumberland County lies within the Atlantic Coastal Plain province and consists of long ridges and hills, with a generally moderate relief. The upper deposits across most of the county consist of surficial sediments except in the sandhill region where leached beds of the Middendorf formation occur. Remnants of the Castle Hayne Limestone formations probably cap some high hills in the Fort Bragg Reservation (Schopf, Robert G., 1961).

The Black Creek formation overlies the Middendorf formation in the southern, eastern and central part of the county. The Black Creek formation typically consists of thin layers of brownish to black clay alternating with thin layers of gray to white fine-grained quartz sand which can be bedded. The Middendorf formation, which crops out through most of Cumberland County consists of beds of tan to reddish-brown loose to fairly well consolidated sandy clay with loose surficial sands. The formation is approximately 120 feet thick at the northwest corner of the county and at least 300 feet thick in the southern part (Schopf, Robert G., 1961).

Topographic and geologic features observed during the ESA field activities indicated apparent groundwater flow to be to the north. **Figure 3** provides a groundwater contour map, which depicts actual groundwater flow to be in the northern direction.

### 2.3 Adjacent Property Land Use

The immediately adjoining properties are summarized as follows:

- The Property is bordered to the north, northeast, and northwest by undeveloped wooded land. The rear parking lot for Ed's Auto Service and Salvage is located approximately 250 feet northeast and downgradient of the Site. Properties to the north are located crossgradient of the Sunoco station. Properties to the northeast of the subject Site are located downgradient of the Sunoco station.



- The Property is bordered to the south by Raeford Road. A commercial building featuring a Family Dollar store is located farther south across Raeford Road. Vacant wooded land is located farther south behind the commercial building and to the southeast and southwest of the subject Site. Properties to the south and southeast are located crossgradient of the Sunoco Station. Properties to the southwest of the subject Site are located upgradient of the Sunoco station.
- The Property is bordered to the east by undeveloped wooded land. Ed's Auto Service and Salvage is located approximately 500 feet east of the station. A NCDENR incident number has not been assigned to the Ed's Auto Service and Salvage however hydraulic lifts are used at the property. Properties to the east are located crossgradient of the Sunoco Station.
- The Property is bordered to the west by undeveloped wooded land. Properties to the west are located crossgradient of the Sunoco Station.

#### 2.4 Existing/Former Environmental Cases

Prior to use as a Sunoco fuel station, the Site was operated as EMRO Store #203 (Speedway / Starvin Marvin). In November 1994, an Underground Storage Tank and Piping Closure Report was submitted by ERMO Marketing Company to NCDENR summarizing piping excavation activities at EMRO Store #203 (Speedway / Starvin Marvin). Soil impacts were detected in samples collected from the pipeline excavation above state standards.

NCDENR issued a Notice of Regulatory Requirement (NORR) on January 3, 1995 requesting corrective action and documentation following the discovery of the release. A Pollution Incident / UST Leak Reporting Form was completed and filed with the NCDENR on January 10, 1995. The Pollution Incident Form lists Mr. Chris Shimmel of ERMO Marketing Company as the potential source owner-operator. ERMO Store #203 was assigned NCDENR incident number 13244 and a site priority ranking of 030D.

On March 13, 1995, ERMO Marketing Company submitted an Initial Abatement Report developed by S&MI, Inc to the NCDENR. An Initial Site Characterization Report was submitted by S&ME, Inc. on behalf of ERMO Marketing Company on March 21, 1995. On July 18, 1996, a Comprehensive Site Assessment (CSA) report was completed by S&ME, Inc and submitted to the NCDENR on behalf of ERMO Marketing Company. The CSA report summarized investigative activities conducted by S&ME, Inc between February and July 1995 as listed below:

- In February and March 1995, an initial soil and groundwater investigation was conducted by S&ME, Inc. in the vicinity of UST field, dispensers and product piping. Seventeen hand auger borings were completed and four groundwater monitoring wells were installed. Concentrations of Total Petroleum Hydrocarbons (TPH) for gasoline and diesel exceeded state regulations in one soil sample. Analysis of groundwater samples collected from the four monitoring wells indicated several compounds above the NC 2L standard including lead.
- In May 1995, additional soil and groundwater assessment was completed. Two hand auger borings were completed and four additional monitoring wells were installed. Analysis of soil samples did not detect any concentrations of TPH for gasoline above state action levels. Analysis of groundwater samples collected from the four existing and four additional monitoring wells detected concentrations in excess of NC 2L standards.
- In July 1995, one temporary well was installed and abandoned onsite. Analysis of the groundwater sample collected from the temporary well did not reveal any detections above NC 2L standards.



Based on the data presented in the CSA, a Corrective Action Plan (CAP) was recommended to be developed to remediate soil and groundwater at the Site.

On September 23, 1998, a Limited Soil and Groundwater Sampling Report and Site Closure Request was developed by S&ME, Inc. and submitted to the NCDENR. Soil and groundwater sampling was conducted at the Site in an effort to determine the Site's eligibility for site closure. Two soil samples were collected from the area previously identified as containing the highest onsite soil contamination. One groundwater sample was collected from MW-5 which was previously identified as containing the highest dissolved hydrocarbon concentrations. Analytical results of the soil and groundwater samples did not detect any constituents above North Carolina Industrial/Commercial Maximum Soil Contamination Concentrations (MSCCs) or North Carolina Gross Contaminant Levels (GCLs). A closure request was included in the report citing detections of hydrocarbon concentrations below station action levels as reason for closure.

A Notice of No Further Action (NFA) was issued by the NCDENR for the Property on February 3, 1999. All necessary public notifications were documented in a letter from S&ME, Inc. dated March 30, 1999. Eight monitoring wells were abandoned on March 29, 1999. Well abandonment activities were summarized in a letter from S&ME, Inc. dated March 31, 1999.

In March 2003, soil and groundwater samples were collected at the Site at the request of Speedway SuperAmerica, LLC (former property and UST owners) and Sunoco, Inc (new property and UST owners) as part of the property transaction. Split samples were collected by S&ME, Inc. and ATC Associates, Inc from three locations previously identified as containing the highest levels of hydrocarbon concentrations. Analytical detections were not higher than those previously recorded at the site in September 1998 or not higher than the cleanup levels established by the state at the time of the NFA.

On June 26, 2003, the NCDENR issued a NORR requesting a Notice of Residual Petroleum (NORP) be completed and filed with the Cumberland County Register of Deeds. The NORP was signed by Scott Hiser of Speedway SuperAmerica, LLC and Gene Jackson of the Fayetteville NCDENR Regional Office and filed with the Cumberland County Register of Deeds on August 7, 2003.

### 3.0 ENVIRONMENTAL SITE ASSESSMENT ACTIVITIES

#### 3.1 Monitoring Well Installation and Soil Classification

Five soil borings and monitoring wells were installed at the Property on February 9, 2009. Monitoring well locations were designated in the field based on current and past site features and existing subsurface utilities. Monitoring well locations are presented in **Figure 2**.

Prior to the initiation of subsurface investigation activities, a public utility mark out was requested using North Carolina's One-Call utility locating service. Underground electric lines were marked out between a light located on the southeast corner of the Property to the northeast corner of the convenience store building. An underground gas line and storm sewer pipe was located along the southern boundary of the Property along Raeford Road. Tank vent lines were observed adjacent to the UST field. Each well location was designated to avoid disturbing subsurface utilities and to stay outside "critical areas" including product and vent lines associated with the UST system. Once final field locations were established, each of the proposed boring / well locations was then hand augured to a minimum of five feet below ground surface (bgs).

Soil borings were installed using a direct push hollow stem auger drill rig. Soil samples were continuously collected every five feet and screened for total organic vapors (TOVs) utilizing a photoionization detector (PID), calibrated to an isobutylene standard. One soil sample from each soil boring was submitted for laboratory analysis based on the highest PID reading and/or the observed depth to water. Soil samples were placed in laboratory-provided glassware, packed on ice in shipping containers and submitted under proper chain-of-custody to the Pace Laboratory of Huntersville, North Carolina.

At each of the soil boring locations, permanent groundwater monitoring wells were installed using 2-inch diameter slotted Schedule 40 polyvinyl chloride (PVC) screen and solid PVC riser to grade. The annular space between the well screen and the borehole wall was backfilled with clean, #2 filter pack silica sand to approximately 2.5 feet above the screened interval, and topped with a hydrated bentonite seal to 0.5 feet bgs. The remaining annular space was grouted with concrete grout, and the monitoring well was completed with a metal flush-mount protective cover within a concrete pad. Between each boring / monitoring well location, non-disposable drilling equipment and hand tools were decontaminated with a high-pressure water rinse. Well construction information was recorded by the supervising field geologist and was used to generate the soil boring logs / well construction diagrams included in **Appendix A**.

Each monitoring well was subsequently developed by surging / bailing technique and allowed to recharge to promote effective hydraulic equilibrium with the surrounding formation. Development efforts continued until the discharge was relatively clear and turbid free. Decontamination and development fluids were handled in accordance with state and local regulations.

Specific details related to the drilling and monitoring well installation activities at the Property are listed below.

<b>Date Performed</b>	<b>February 9, 2009</b>
<b>Well ID</b>	GMW-1, GMW-2, GMW-3, GMW-4, and GMW-5
<b>Driller</b>	Quantex, Inc of Clayton, NC
<b>Drilling Method Utilized</b>	Direct push air rotary auger
<b>Completion Depths</b>	GMW-1: 13 feet GMW-2: 17.5 feet GMW-3: 13 feet GMW-4: 13 feet GMW-5: 13 feet
<b>Screened Interval</b>	GMW-1: 13-3 feet GMW-2: 13-3 feet GMW-3: 13-3 feet GMW-4: 13-3 feet GMW-5: 13-3 feet
<b>Material Utilized</b>	2-inch diameter 0.020 machine-slotted schedule-40 polyvinyl chloride (PVC) well screen with a flush threaded 2-inch diameter solid PVC casing
<b>Annular Space</b>	#2 Sand to two feet above the well screen Bentonite grout slurry to 0.5 foot below grade Concrete to grade
<b>Soil Sample Intervals</b>	GMW-1: 5.0 – 7.5 feet GMW-2: 7.5 – 10.0 feet GMW-3: 7.5 – 10.0 feet GMW-4: 2.5 – 5.0 feet GMW-5: 2.5 – 5.0 feet
<b>Soil Analyses Conducted</b>	Volatile Organic Compounds (VOCs) via EPA Method 8260 and Semi Volatile Organic Compounds (SVOCs) via Method 8270

### 3.2 Well Elevation and Survey Procedures

Upon completion of the monitoring wells, each location was field-surveyed to determine relative top of casing (TOC) elevations. Lateral locations of the monitoring wells were field-measured and the resulting estimated locations are shown on **Figure 2**.

### 3.3 Groundwater Sampling and Analysis Procedures

Prior to the collection of groundwater samples, each of the recently-installed groundwater monitoring wells at the Property were gauged with an oil-water interface probe to determine the water level and check for the presence of Liquid Phase Hydrocarbons (LPH). Depth to groundwater and depth to product was measured from the TOC. The resulting data was then used to calculate the groundwater elevation and groundwater flow direction for the property, as documented on the Groundwater

Monitoring Map included as **Figure 3**. The measured depths and calculated elevations are shown in **Table 1**.

On February 10, 2009, field sampling personnel collected representative groundwater samples from the recently-installed monitoring wells. A minimum of three (3) well volumes were purged from each monitoring well prior to the collection of groundwater samples. Purging and sample collection was accomplished using dedicated bailers for each monitoring well. Aqueous samples were placed in laboratory-provided glassware, packed on ice in shipping containers, and submitted under proper chain-of-custody to the Pace Laboratory.

Equipment used for groundwater sampling consisted of new, disposable materials, or was properly decontaminated between sample locations. Sampling personnel exchanged nitrile sampling gloves between each sample location to minimize the potential for sample cross-contamination. Investigative-derived waste (IDW) such as used nitrile gloves were properly handled as non-hazardous solid waste for disposal.

<b>Date Performed</b>	<b>February 10, 2009</b>
<b>Wells Gauged/ Sampled</b>	GMW-1, GMW-2, GMW-3, GMW-4, and GMW-5
<b>Wells Gauged Only</b>	None
<b>Liquid Phase Hydrocarbon</b>	None Detected
<b>Minimum / Maximum Depth to Water</b>	7.12 feet/8.73 feet
<b>Groundwater Flow Direction</b>	Northeast
<b>Aqueous Analyses Conducted</b>	VOCs via EPA Method 8260 and SVOCs via EPA Method 8270

## 4.0 EVALUATION AND PRESENTATION OF RESULTS

### 4.1 Soil Sampling Results

Soil samples analyzed by Pace Laboratories detected the presence of petroleum constituents above North Carolina Soil-to-Water Maximum Contaminant Concentrations (MSCCs) however concentrations did not exceed the Industrial / Commercial MSCC standards. The maximum contaminant concentrations and the monitoring well in which they were detected are listed in the table below.

Compound	Maximum Concentration Detected (ug/Kg)	Soil-to-Water MSCC (ug/Kg)	Industrial / Commercial MSCC (ug/Kg)	Monitoring Well
Benzene	16	5.6	164,000	GMW-5

Soil analytical results for the collected samples are summarized in **Table 2**, along with the soil sample location, depth, and PID detection. The Laboratory Analytical Report and the corresponding chain-of-custody are included in **Appendix B**.

### 4.2 Groundwater Sampling Results

Groundwater samples analyzed by Pace Laboratories detected the presence of petroleum constituents at levels above their respective North Carolina Groundwater Quality Standards (2L) however no petroleum constituents were detected in levels exceeding North Carolina Gross Contamination Levels for Groundwater (GCLs). The maximum contaminant concentrations which exceeded their respective 2L concentrations and the monitoring well in which they were detected are listed in the table below.

Compound	Maximum Concentration Detected (ug/L)	2L Standard (ug/L)	GCL Standard (ug/L)	Monitoring Well
Benzene	873	1	5,000	GMW-1
Total Xylenes	1,770	530	87,500	GMW-1
Naphthalene	121	21	15,500	GMW-2
Methyl tert-butyl ether (MTBE)	256	200	200,000	GMW-1
2-Methylnaphthalene	32.6	14	15,500	GMW-2

Groundwater analytical results from the collected samples are summarized in **Table 3**. The Laboratory Analytical Report and the corresponding chain-of-custody are included in **Appendix B**.

## 5.0 LOCAL AREA SURVEY

A survey of the local area surrounding the Property was conducted on February 9, 2009. GES attempted to locate and identify potential sensitive receptors such as potable wells, basements, and schools.

- A surface water body (Beaver Creek) was observed approximately 120 feet northeast and downgradient of the Property. Beaver Creek was observed flowing to the southeast towards Raeford Road.
- Ed's Auto Repair and Salvage, a garage and vehicle repair facility, is located approximately 500 feet east and crossgradient of the Property. The rear parking lot for Ed's Auto Repair and Salvage is located approximately 250 feet northeast and downgradient of the subject Site. No NCDENR incident numbers were identified for the repair facility however hydraulic lifts are in use.
- Undeveloped wooded land is located west and crossgradient of the Property.
- The Property is bordered to the north, northeast, and northwest by undeveloped wooded land. Properties to the north are located crossgradient of the Sunoco station. As previously stated, the rear parking lot for Ed's Auto Service and Salvage is located approximately 250 feet northeast and downgradient of the Site.
- The Property is bordered to the south by Raeford Road. A commercial building featuring a Family Dollar store is located farther south across Raeford Road. Vacant wooded land is located farther south behind the commercial building and to the southeast and southwest of the subject Site. Properties to the south and southeast are located crossgradient of the Sunoco Station. Properties to the southwest of the subject Site are located upgradient of the Sunoco station.

## 6.0 DISCUSSION OF FINDINGS AND CONCLUSIONS

On February 9, 2009, five (5) groundwater monitoring wells were installed to assess current soil and groundwater conditions at the Property.

Laboratory analysis of soil samples detected the presence of benzene above the North Carolina Soil-to-Water MSCCs of 5.6 ug/Kg however benzene was not detected above the Industrial / Commercial MSCC standard previously established for the Site.

Laboratory analysis of groundwater samples detected the presence of benzene, total xylenes, naphthalene, MTBE, and 2-methylnaphthalene above NC 2L standards however analytical detections did not exceed the NC GCL standards previously established for the Site.

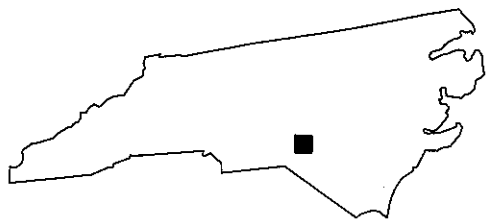
The highest analytical detections were reported in samples collected from GMW-1 and GMW-2. GMW-1 and GMW-2 were installed northeast and downgradient of the dispenser islands. In the CSA conducted by S&ME, Inc. and submitted to NCDENR in March 1995, groundwater analytical results detected the highest concentrations of petroleum contaminants in MW-4. GMW-2 was installed in the vicinity of MW-4, and GMW-1 was installed downgradient of GMW-2.

Detections of petroleum contaminants in the vicinity of MW-4 have decreased since samples were last collected on March 20, 1995. Concentrations of benzene, ethylbenzene, toluene, xylenes, and naphthalene have decreased 43.7%, 38.8%, 99.2%, 33.4%, and 60.5% respectively. No detections were reported in higher concentrations during this ESA conducted by GES.

Concentrations of contaminants of concern appear to have generally decreased over time. Upon the receipt of the Soil Cleanup Report with Site Closure Request in 1999, NCDENR issued a NFA. Current soil and groundwater analytical detections remain below the Industrial / Commercial MSCC and GCL groundwater standard previously established for the Site. Therefore, GES does not recommend any further assessment or remediation activities at this Property.



SOURCE: USGS 7.5 MINUTE SERIES  
 TOPOGRAPHIC QUADRANGLE 1987  
 FAYETTEVILLE, NORTH CAROLINA  
 CONTOUR INTERVAL = 10'



QUADRANGLE LOCATION

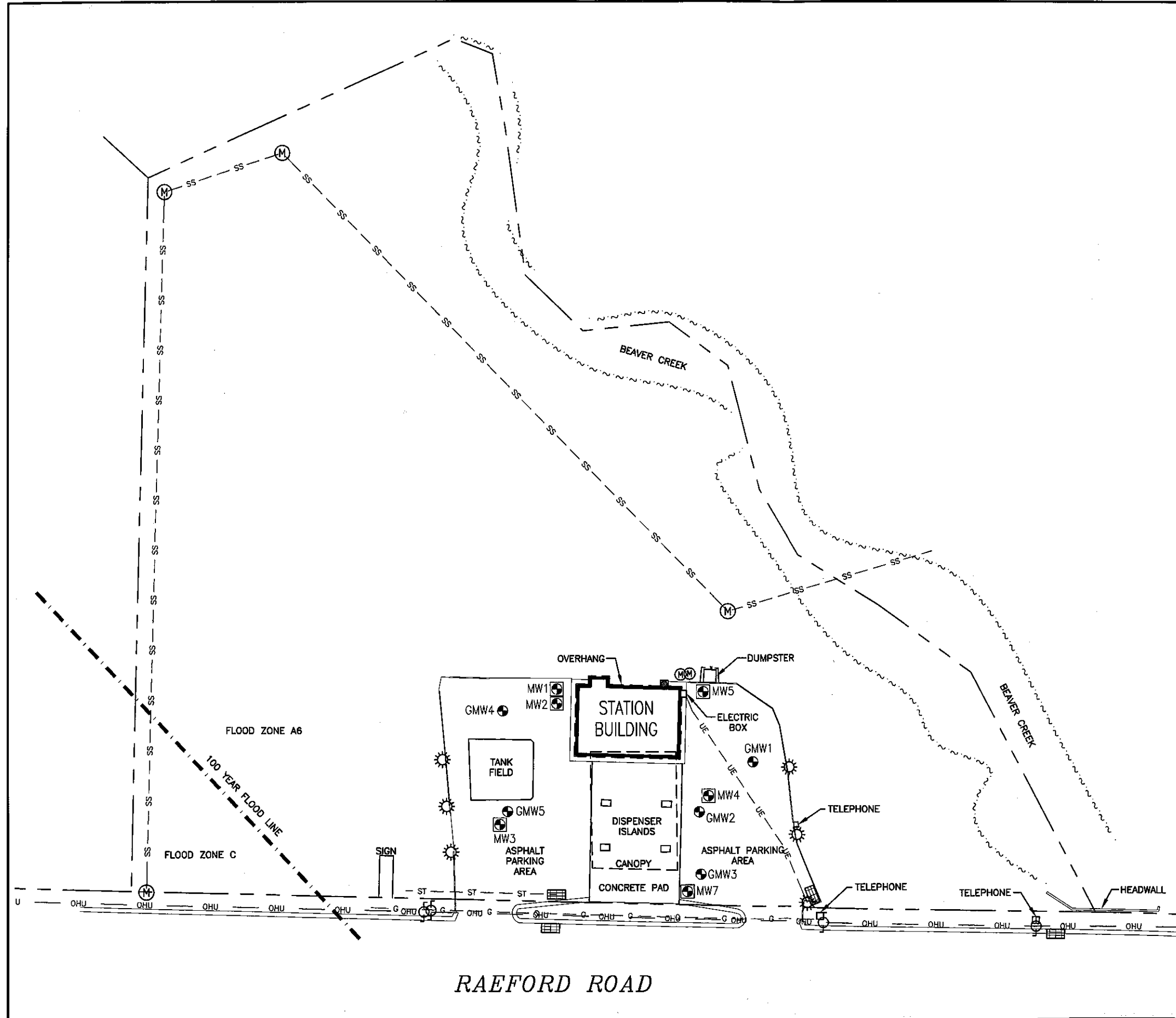
LAT. 035° 02' 41.03" N  
 LONG. 078° 58' 43.14" W  
 (APPROXIMATE SITE COORDINATES)

DRAFTED BY: W.A.W. (N.J.)	<b>SITE LOCATION MAP</b>	
CHECKED BY: H.S.		
REVIEWED BY: E.H.	<b>SUNOCO SERVICE STATION #0614-8506 6022 RAEFORD ROAD FAYETTEVILLE, NORTH CAROLINA</b>	
NORTH 	<b>Groundwater &amp; Environmental Services, Inc.</b> 3344 HILLSBOROUGH STREET, SUITE 150, RALEIGH, NORTH CAROLINA, 27607	
	SCALE IN FEET 	DATE 2-25-09



**LEGEND**

- PROPERTY BOUNDARY
- x - FENCE
- [ ] CATCH BASIN
- (M) UTILITY MANHOLE
- (☀) LIGHT POLE
- (⊙) UTILITY POLE
- [ ] DRAIN
- (●) MONITORING WELL
- (⊙) ABANDONED MONITORING WELL
- SS - UNDERGROUND SANITARY SEWER LINE
- ST - UNDERGROUND STORM SEWER LINE
- UE - UNDERGROUND ELECTRIC LINE
- G - UNDERGROUND GAS LINE
- OHU - OVERHEAD UTILITIES

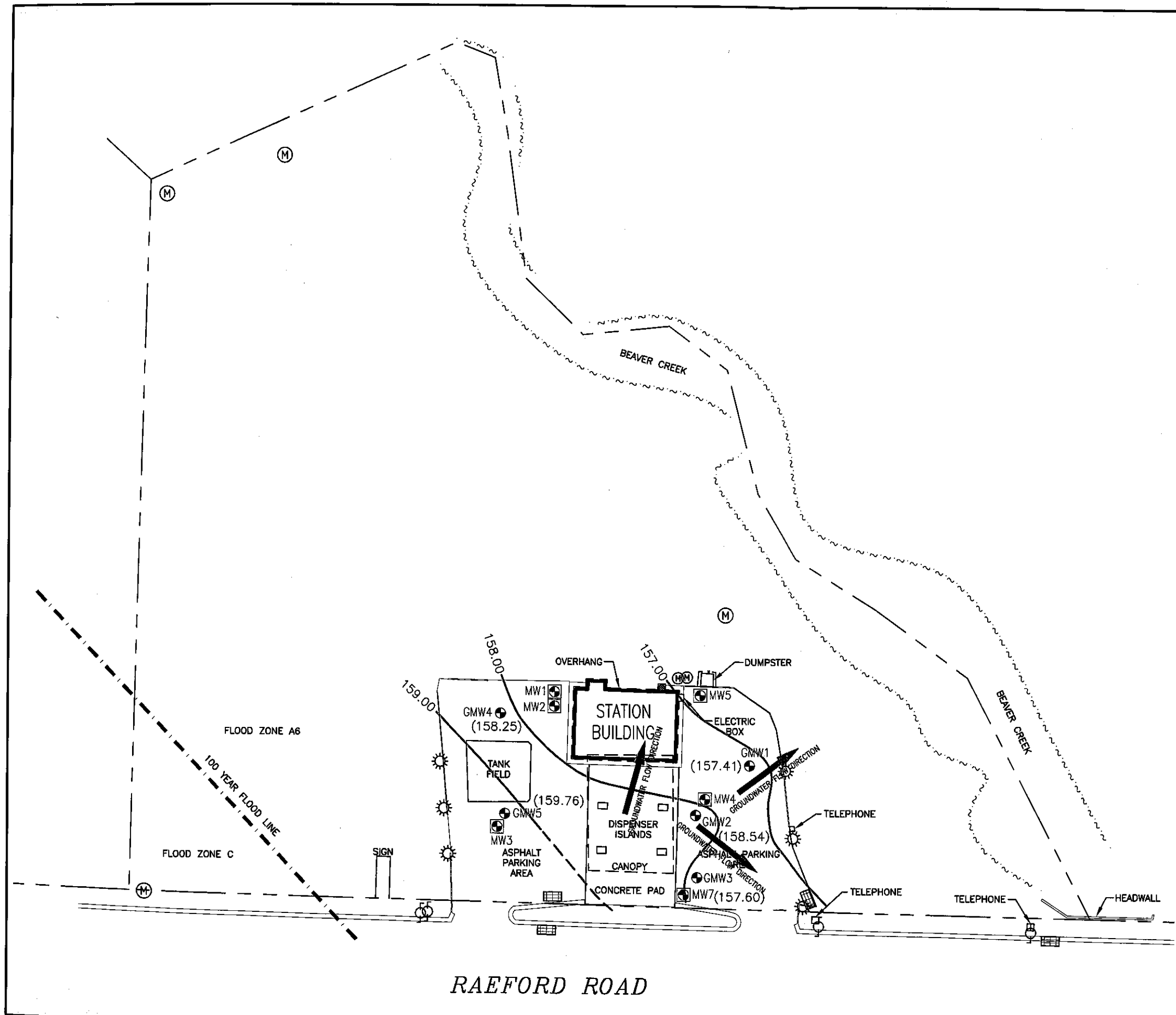


DRAFTED BY: W.A.W. (N.J.)	<b>SITE MAP</b>	
CHECKED BY: H.S.	<b>SUNOCO SERVICE STATION #0614-8506 6022 RAEFORD ROAD FAYETTEVILLE, NORTH CAROLINA</b>	
REVIEWED BY: E.H.	<b>Groundwater &amp; Environmental Services, Inc. 3344 HILLSBOROUGH STREET, SUITE 150, RALEIGH, NORTH CAROLINA, 27607</b>	
NORTH 	SCALE IN FEET (APPROXIMATE) 	DATE 3-23-09
		FIGURE 2

M:\Graphics\2200-Raleigh\Sunoco\0614-8506 Fayetteville SM.dwg, 3/23/2009 9:57:53 AM, WWesterlund

**LEGEND**

- PROPERTY BOUNDARY
- x - FENCE
- [Grid] CATCH BASIN
- (M) UTILITY MANHOLE
- [Sun] LIGHT POLE
- [Circle with dot] UTILITY POLE
- [Square with cross] DRAIN
- [Circle with dot] MONITORING WELL
- [Square with cross] ABANDONED MONITORING WELL
- (158.54) GROUNDWATER ELEVATION (feet)
- 157.00 --- GROUNDWATER CONTOUR (feet)  
DASHED WHERE INFERRED



DRAFTED BY: W.A.W. (N.J.)	<b>GROUNDWATER CONTOUR MAP</b> FEBRUARY 10, 2009	
CHECKED BY: H.S.	<b>SUNOCO SERVICE STATION #0614-8506</b> 6022 RAEFORD ROAD FAYETTEVILLE, NORTH CAROLINA	
REVIEWED BY: E.H.	Groundwater & Environmental Services, Inc. 3344 HILLSBOROUGH STREET, SUITE 150, RALEIGH, NORTH CAROLINA, 27607	
NORTH 	SCALE IN FEET (APPROXIMATE) 	DATE 3-23-09
		FIGURE 3

M:\Graphics\2200-Raleigh\Sunoco\0614-8506 Fayetteville\0614-8506 Fayetteville SM.dwg, 3/23/2009 9:36:08 AM, WWesterlund

**Table 1**  
**Groundwater Elevation Summary**  
**Sunoco DUNS #0614-8506**  
**Fayetteville, North Carolina**

Monitor Well I.D.	Gauging Date	Top of Casing Elevation (ft)	Depth to Water (ft BTOC)	Depth to Product (ft BTOC)	Product Thickness (ft)	Ground Water Elevation (ft)	Depth to Bottom (DTB)	Well Diameter (in)
GMW-1	2/10/2009	166.14	8.73	NA	NA	157.41	13.20	2
GMW-2	2/10/2009	166.12	7.58	NA	NA	158.54	12.77	2
GMW-3	2/10/2009	165.92	8.32	NA	NA	157.60	13.01	2
GMW-4	2/10/2009	166.28	8.03	NA	NA	158.25	12.97	2
GMW-5	2/10/2009	166.88	7.12	NA	NA	159.76	12.99	2

Notes: BTOC = Below Top of Casing

**Table 2**  
**Soil Monitoring and Analysis**  
**Sunoco Retail Station DUNS #0416-8506**  
**Fayetteville, North Carolina**

Sample ID	Analytical Method			EPA 8260B					EPA 8270C		
	Contaminant of Concern			Benzene	Toluene	Ethylbenzene	Total Xylene	Naphthalene	MTBE	Phenanthrene	Pyrene
	Date Collected	Sample Depth (BGS)	PID (PPM)								
Soil-to-Water MSCC (ug/Kg)				5.6	7,300	4,600	5,000	580	920	60,000	290,000
Industrial / Commercial MSCC (ug/Kg)				164,000	82,000,000	40,000,000	81,760,000	8,176,000	1,908,000	1,635,000	12,264,000
GMW-1	2/9/2009	5-7.5	483	7.3	ND	9.7	37.7	9.1	4.9	89.5J	146I
GMW-2	2/9/2009	7.5-10	83.1	2.2J	ND	ND	6.1J	5.8	ND	ND	ND
GMW-3	2/9/2009	7.5-10	16.5	ND	1.6J	ND	13.3	19.6	1.8J	305J	347J
GMW-4	2/9/2009	2.5-5	197	1.4J	ND	2J	10.3	1.2J	12.6	ND	ND
GMW-5	2/9/2009	2.5-5	36.7	16	5.4	8.4	87.7	ND	21.3	ND	ND

Notes:  
 All results reported in ug/Kg  
 BGS = Below ground surface  
 PPM = Parts per million  
 ND = Non-detect above laboratory reporting limits  
 J= Estimated concentration above the adjusted method detection limit and below adjusted reporting limit  
 Bold = Detection exceeds Soil-to-Water MSCC

**Table 3**  
**Groundwater Analysis**  
**Sunoco Retail Station DUNS #0614-8506**  
**Fayetteville, North Carolina**

Analytical Method		EPA 8260B										8270C	
Well ID	Date	Benzene	Toluene	Ethylbenzene	Total Xylenes	BTEX	Naphthalene	MTBE	1-Methylnaphthalene	2-Methylnaphthalene			
NC 2L Standard		1	1,000	550	530	NE	21	200	NE	14			
GCL		5,000	257,500	84,500	87,500	NE	15,500	200,000	NE	12,500			
GMW-1	2/10/2009	873	32	388	1770	3,063.4	104	256	ND	ND			
GMW-2	2/10/2009	166	3.2	152	675	996	121	22	21.2J	32.6J			
GMW-3	2/10/2009	.47J	0.39J	ND	2.4	2.4	2.4	1.9	ND	ND			
GMW-4	2/10/2009	59.7	7.3	16.4	283	366	6.5	39.1	ND	ND			
GMW-5	2/10/2009	4.4	1.7	0.43J	3.6	9.7	ND	2.2	ND	ND			

Notes:  
 All results reported in ug/L  
 ND = Non-detect above laboratory reporting limits  
 NA = Not applicable  
 NE = Not established  
 SVOCs = Semi-Volatile Organic Compounds  
 Blue = Exceeds NC 2L Standard  
 Red = Exceeds NC GCL Standard



# Soil Boring Log

Well ID: GMW-1

## PROJECT INFORMATION

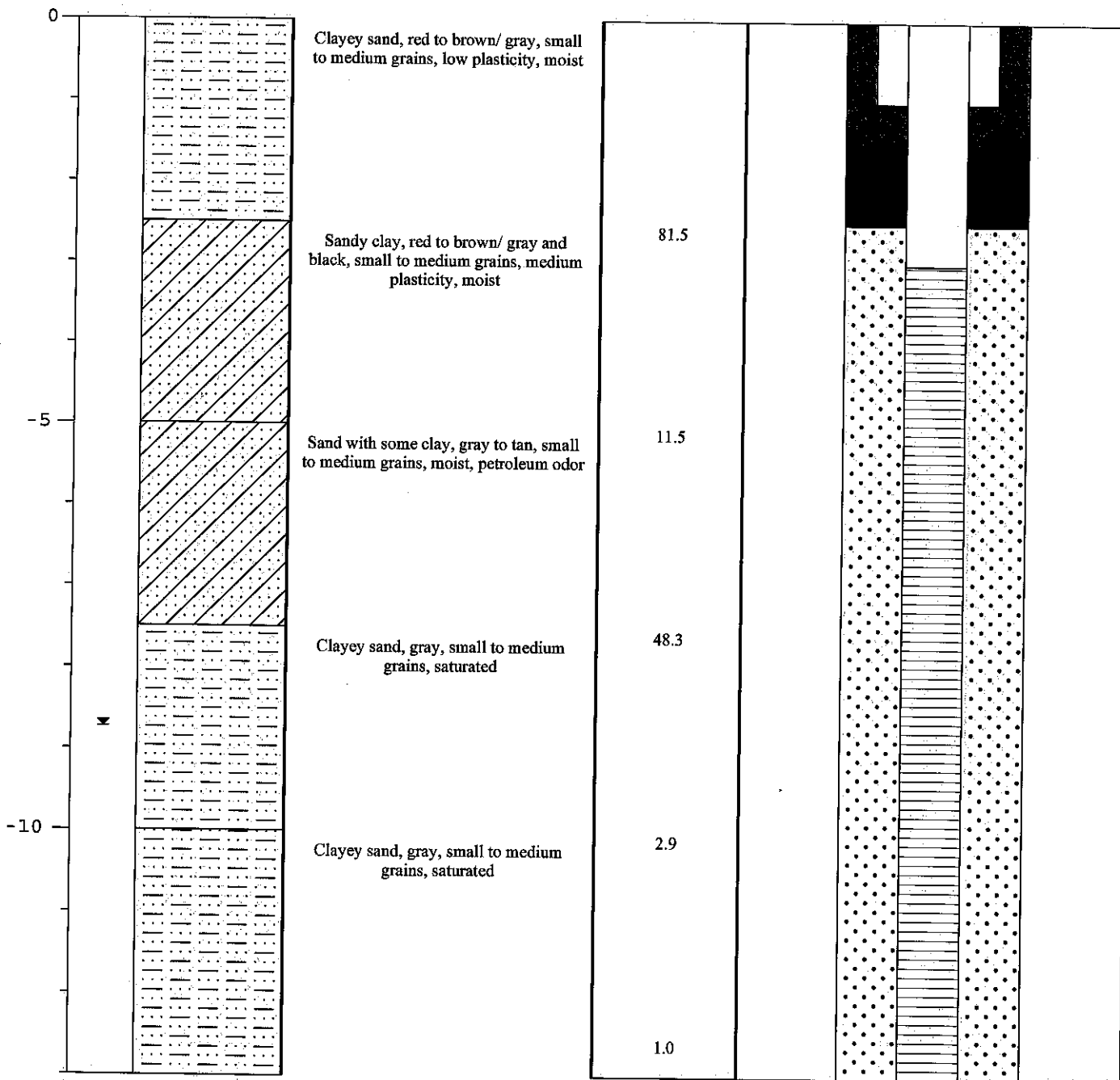
## DRILLING INFORMATION

PROJECT:	Sunoco Inc., Fayetteville, NC	DRILLER:	JD Barker
SITE LOCATION:	6022 Raeford St.	BORING DEPTH:	13 feet
JOB NAME:	DUNS #0614-8506	DRILLING CO.:	Quantex, Inc.
LOGGED BY:	Paul Goodell	RIG TYPE:	GeoProbe 7220
PROJECT MANAGER:	Eli Holland	METHOD OF DRILLING:	Hollow-Stem Auger
DATES DRILLED:	02/09/09	SAMPLING METHODS:	2.5-foot grab
WELL ID	GMW-1	HAMMER:	NA

NOTES:

- ▼ Observed Water Level
- NM = Not Measured

VERTICAL DEPTH	SOIL/ROCK SYMBOLS	SOIL DESCRIPTION	PID (ppm)	WELL CONSTRUCTION
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# Soil Boring Log

Well ID: GMW-2

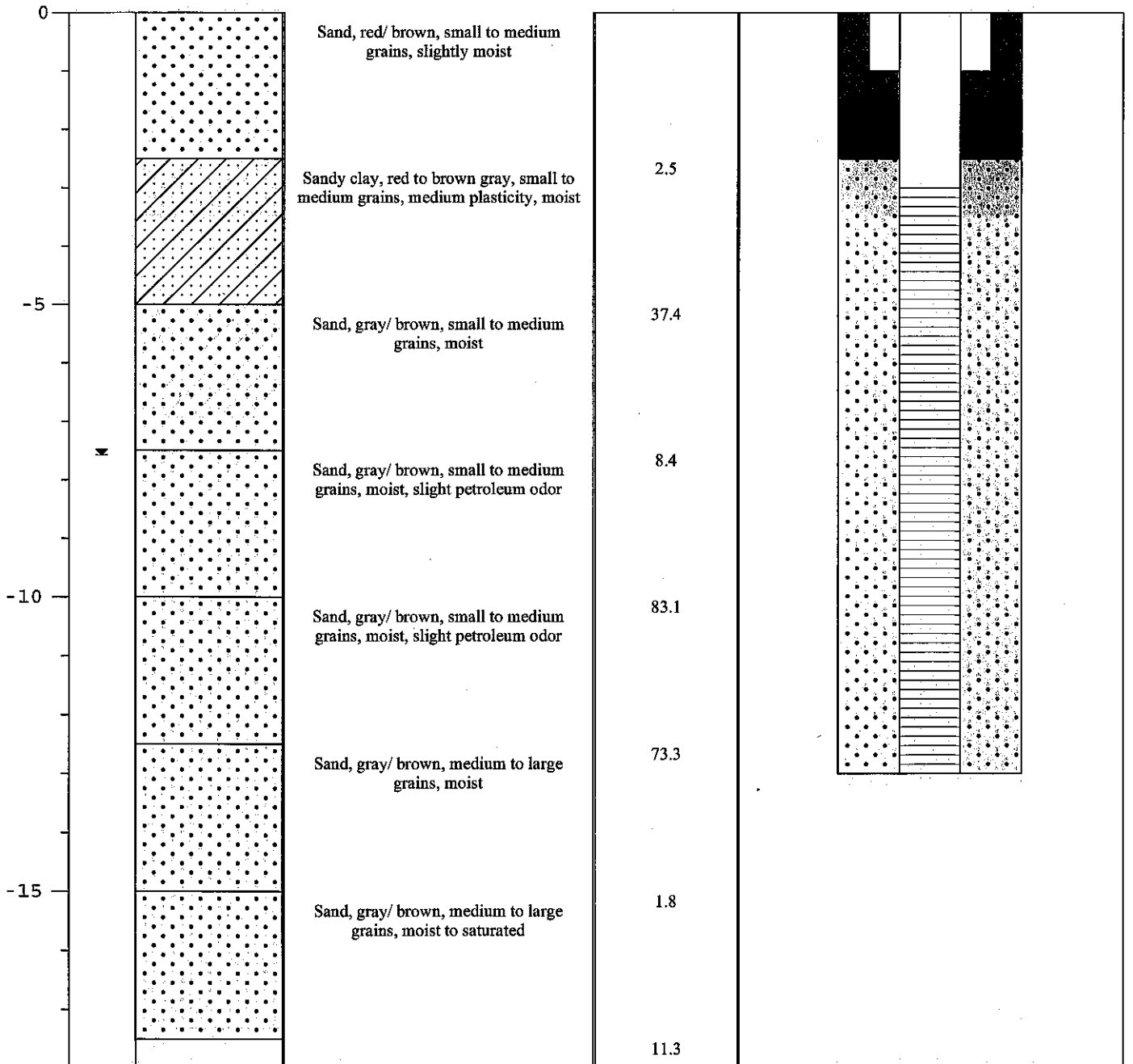
## PROJECT INFORMATION

## DRILLING INFORMATION

PROJECT:	Sunoco Inc., Fayetteville, NC	DRILLER:	JD Barker
SITE LOCATION:	6022 Raeford St.	BORING DEPTH:	17.5 feet
JOB NAME:	DUNS #0614-8506	DRILLING CO.:	Quantex, Inc.
LOGGED BY:	Paul Goodell	RIG TYPE:	GeoProbe 7220
PROJECT MANAGER:	Eli Holland	METHOD OF DRILLING:	Hollow-Stem Auger
DATES DRILLED:	02/09/09	SAMPLING METHODS:	2.5-foot grab
WELL ID:	GMW-2	HAMMER:	NA

NOTES:  
 ▼ Observed Water Level  
 NM = Not Measured

VERTICAL DEPTH	SOIL/ROCK SYMBOLS	SOIL DESCRIPTION	PID (ppm)	WELL CONSTRUCTION
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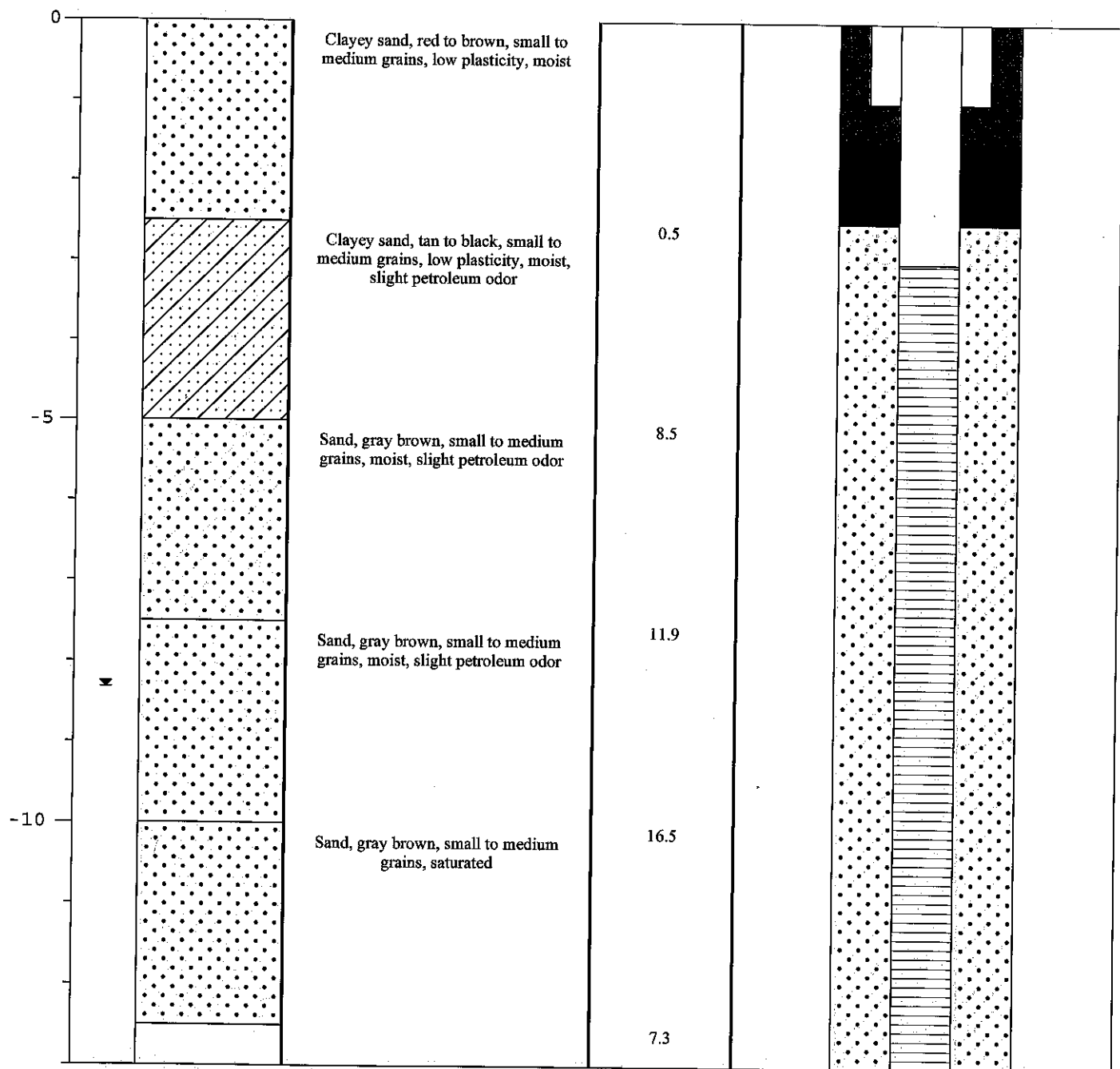
PROJECT INFORMATION

DRILLING INFORMATION

PROJECT:	Sunoco Inc., Fayetteville, NC	DRILLER:	JD Barker
SITE LOCATION:	6022 Raeford St.	BORING DEPTH:	13 feet
JOB NAME:	DUNS #0614-8506	DRILLING CO.:	Quantex, Inc.
LOGGED BY:	Paul Goodell	RIG TYPE:	GeoProbe 7220
PROJECT MANAGER:	Eli Holland	METHOD OF DRILLING:	Hollow-Stem Auger
DATES DRILLED:	02/09/09	SAMPLING METHODS:	2.5-foot grab
WELL ID	GMW-3	HAMMER:	NA

NOTES:  
 ▼ Observed Water Level  
 NM = Not Measured

VERTICAL DEPTH	SOIL/ROCK SYMBOLS	SOIL DESCRIPTION	PID (ppm)	WELL CONSTRUCTION
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PROJECT INFORMATION

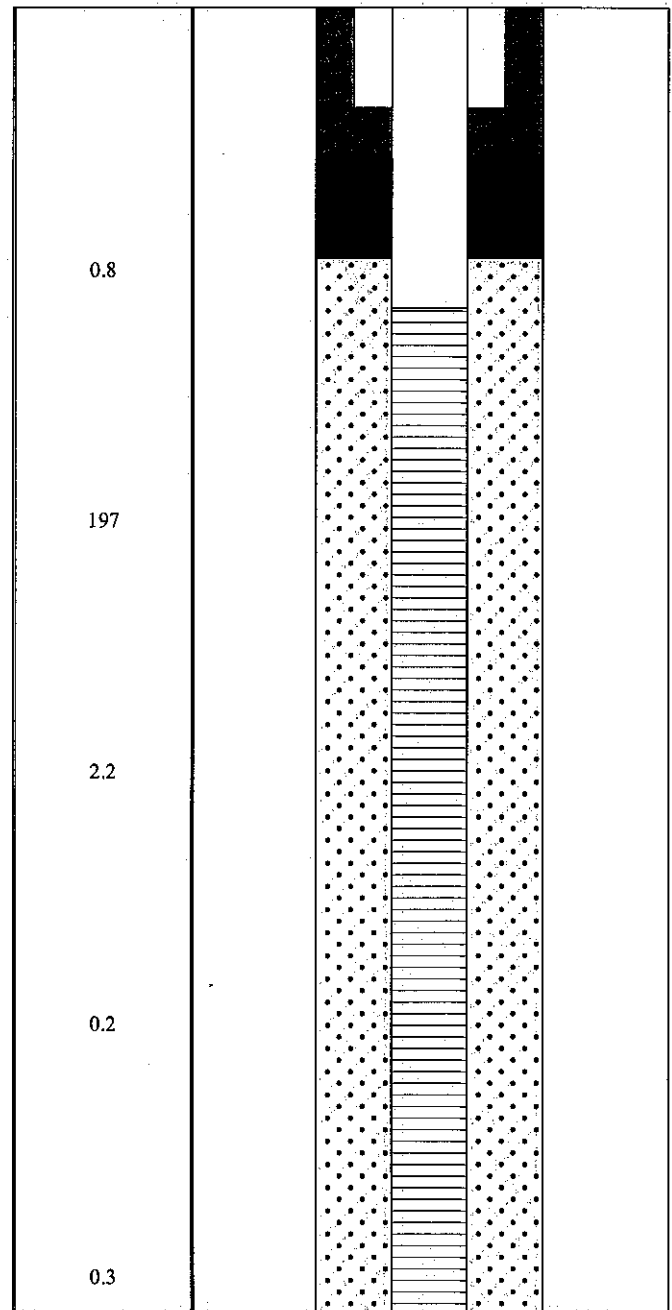
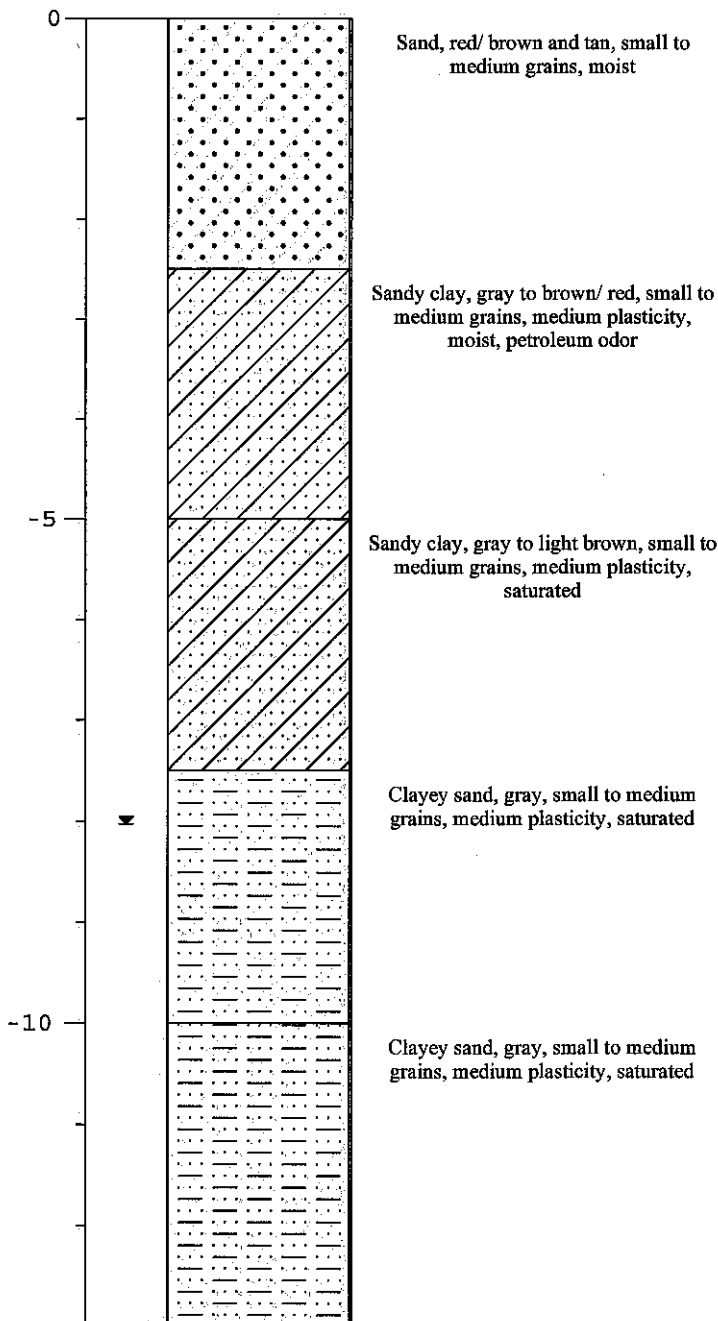
DRILLING INFORMATION

PROJECT: Sunoco Inc., Fayetteville, NC  
 SITE LOCATION: 6022 Raeford St.  
 JOB NAME: DUNS #0614-8506  
 LOGGED BY: Paul Goodell  
 PROJECT MANAGER: Eli Holland  
 DATES DRILLED: 02/09/09  
 WELL ID: GMW-4

DRILLER: JD Barker  
 BORING DEPTH: 13 feet  
 DRILLING CO.: Quantex, Inc.  
 RIG TYPE: GeoProbe 7220  
 METHOD OF DRILLING: Hollow-Stem Auger  
 SAMPLING METHODS: 2.5-foot grab  
 HAMMER: NA

NOTES:  
 ▼ Observed Water Level  
 NM = Not Measured

VERTICAL DEPTH	SOIL/ROCK SYMBOLS	SOIL DESCRIPTION	PID (ppm)	WELL CONSTRUCTION
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# Soil Boring Log

Well ID: GMW-5

## PROJECT INFORMATION

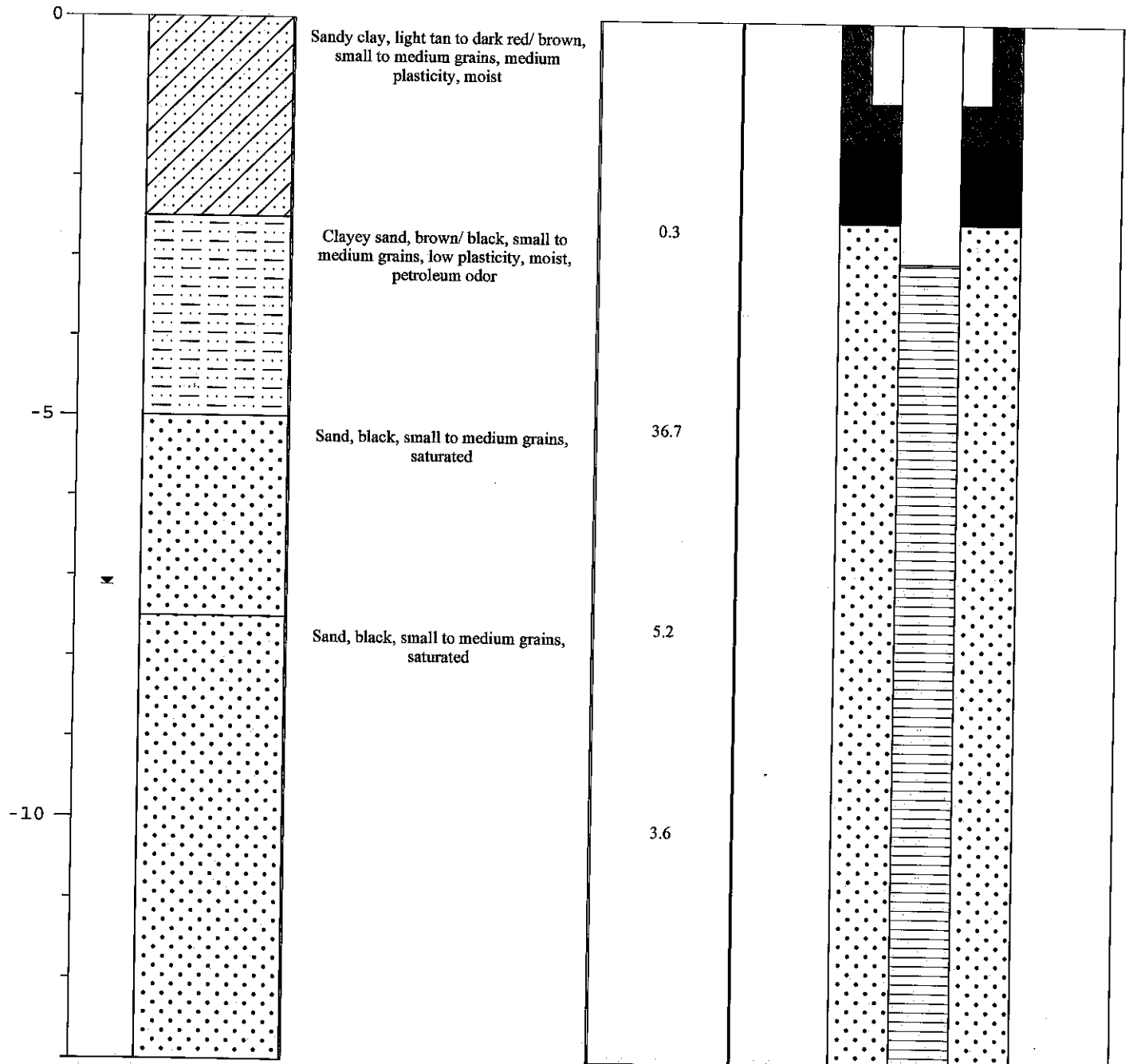
## DRILLING INFORMATION

PROJECT:	Sunoco Inc., Fayetteville, NC	DRILLER:	JD Barker
SITE LOCATION:	6022 Raeford St.	BORING DEPTH:	13 feet
JOB NAME:	DUNS #0614-8506	DRILLING CO.:	Quantex, Inc.
LOGGED BY:	Paul Goodell	RIG TYPE:	GeoProbe 7220
PROJECT MANAGER:	Eli Holland	METHOD OF DRILLING:	Hollow-Stem Auger
DATES DRILLED:	02/09/09	SAMPLING METHODS:	2.5-foot grab
WELL ID	GMW-5	HAMMER:	NA

NOTES:

- ▼ Observed Water Level
- NM = Not Measured

VERTICAL DEPTH	SOIL/ROCK SYMBOLS	SOIL DESCRIPTION	PID (ppm)	WELL CONSTRUCTION
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ATTACHMENT B



PYRAMID GEOPHYSICAL SERVICES  
(PROJECT 2016-265)

# GEOPHYSICAL SURVEY


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## METALLIC UST INVESTIGATION: PARCEL 138 – JALARAM BAPA ENTERPRISES, LLC NCDOT PROJECT U-4405

6022 RAEFORD RD., FAYETTEVILLE, CUMBERLAND COUNTY, NC

NOVEMBER 4, 2016

Report prepared for:                   Mike Branson  
  Solutions, IES  
  1101 Nowell Road  
  Raleigh, North Carolina 27607

Prepared by:   
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NC License #2181

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Douglas A. Canavella, P.G.  
NC License #1066

503 INDUSTRIAL AVENUE, GREENSBORO, NC 27406  
P: 336.335.3174      F: 336.691.0648  
C257: GEOLOGY      C1251: ENGINEERING

**GEOPHYSICAL INVESTIGATION REPORT**  
**Parcel 138 – 6022 Raeford Road**  
**Fayetteville, Cumberland County, North Carolina**

**Table of Contents**

Executive Summary .....1  
Introduction.....2  
Field Methodology.....2  
Discussion of Results.....3  
Summary and Conclusions .....4  
Limitations .....5

**Figures**

- Figure 1 – Parcel 138 Geophysical Survey Boundaries and Site Photographs  
Figure 2 – Parcel 138 EM61 Results Contour Map

## 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
SVE.....	Soil Vapor Extraction
UST .....	Underground Storage Tank

## EXECUTIVE SUMMARY

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**Project Description:** Pyramid Environmental conducted a geophysical investigation for Solutions, IES (Solutions) at Parcel 138, located at 6022 Raeford Road, Fayetteville, NC. The survey was part of a North Carolina Department of Transportation (NCDOT) Right-of-Way (ROW) investigation (NCDOT Project U-4405). Solutions directed Pyramid as to the geophysical survey boundaries at the project site, which were designed to extend from the existing edge of pavement to the proposed ROW lines and/or easement lines within the property, whichever distance was greater. Conducted from October 12-17, 2016, the geophysical investigation was performed to determine if unknown, metallic underground storage tanks (USTs) were present beneath the survey area.

**Geophysical Results:** A known UST bed was located on the west side of the property, north of the geophysical survey area. All EM anomalies were directly attributed to visible cultural features and known utilities. A GPR survey was not required. Collectively, the geophysical data did not show any evidence of unknown metallic USTs at Parcel 138.

## INTRODUCTION

---

Pyramid Environmental conducted a geophysical investigation for Solutions, IES (Solutions) at Parcel 138, located at 6022 Raeford Road, Fayetteville, NC. The survey was part of a North Carolina Department of Transportation (NCDOT) Right-of-Way (ROW) investigation (NCDOT Project U-4405). Solutions directed Pyramid as to the geophysical survey boundaries at the project site, which were designed to extend from the existing edge of pavement to the proposed ROW lines and/or easement lines within the property, whichever distance was greater. Conducted from October 12-17, 2016, 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 service station building with a pump island and canopy surrounded by asphalt parking areas and grass medians. A known UST bed was located on the west side of the property, north of the geophysical survey area. Aerial photographs showing the survey area boundaries and ground-level photographs are shown in **Figure 1**.

## FIELD METHODOLOGY

---

The geophysical investigation consisted of an electromagnetic (EM) induction-metal detection survey. Pyramid collected the EM data using a Geonics EM61 metal detector integrated with a Trimble AG-114 GPS antenna. 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 11.0 software programs.

GPR data were not required at this property due to all EM anomalies being directly attributed to visible cultural features at the ground surface or known utilities (see Discussion of Results below).

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
<b>Known UST</b> Active tank - spatial location, orientation, and approximate depth determined by geophysics.	<b>Probable UST</b> 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.	<b>Possible UST</b> 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

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### *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**

<b>Metallic Anomaly #</b>	<b>Cause of Anomaly</b>	<b>Investigated with GPR</b>
1	Sign/Light Pole	
2	Drop Inlet and Storm Pipe	
3	Phone/Light Poles	
4	Phone Booth/Light Pole	
5	Vehicles	
6	Dumpster	
7	Manholes	

All of the EM anomalies recorded by the survey are directly attributed to visible cultural features such as signs, posts, a phone booth, vehicles, a drop inlet, storm pipes, manholes and a dumpster. For this reason, a GPR survey was not required to verify any unknown EM anomalies.

Collectively, the geophysical data did not show any evidence of unknown metallic USTs at Parcel 138. A known UST bed was located on the west side of the property, north of the geophysical survey area.

**SUMMARY & CONCLUSIONS**

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Our evaluation of the EM61 collected at Parcel 138 in Fayetteville, Cumberland County, North Carolina, provides the following summary and conclusions:

- The EM61 survey provided reliable results for the detection of metallic USTs within the accessible portions of the geophysical survey area.
- A known UST bed was located on the west side of the property, north of the geophysical survey area.
- All EM anomalies were directly attributed to visible cultural features and known utilities. A GPR survey was not required.

- Collectively, the geophysical data did not show any evidence of unknown metallic USTs at Parcel 138.

## LIMITATIONS

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Geophysical surveys have been performed and this report was prepared for Solutions, IES in accordance with generally accepted guidelines for EM61 surveys. It is generally recognized that the results of the EM61 surveys are non-unique and may not represent actual subsurface conditions. The EM61 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.



N ↑


APPROXIMATE BOUNDARIES OF GEOPHYSICAL SURVEY AREA



View of Survey Area  
(Facing Approximately West)



View of Survey Area  
(Facing Approximately North)

TITLE		PARCEL 138 - GEOPHYSICAL SURVEY BOUNDARIES AND SITE PHOTOGRAPHS	
PROJECT		6022 RAEFORD ROAD FAYETTEVILLE, NORTH CAROLINA NCDOT PROJECT U-4405	
		503 INDUSTRIAL AVENUE GREENSBORO, NC 27460 (336) 335-3174 (p) (336) 691-0648 (f) License # C1251 Eng. / License # C257 Geology	
DATE	10/31/16	CLIENT	SOLUTIONS, IES
PYRAMID PROJECT #:	2016-265	<b>FIGURE 1</b>	





### EM61 METAL DETECTION RESULTS

### NO EVIDENCE OF UNKNOWN METALLIC 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 October 13, 2016, using a Geonics EM61 instrument. GPR verification data were not required due to all EM anomalies being directly attributed to visible cultural features.

NC STATE PLANE, NORTHING (NAD83, FEET)



NUMBERS IN BLUE (x) CORRESPOND TO ANOMALY TABLE INCLUDED IN THE REPORT

### EM61 Metal Detection Response (millivolts)



TITLE  
PARCEL 138 - EM61 RESULTS  
CONTOUR MAP

PROJECT  
6022 RAEFORD ROAD  
FAYETTEVILLE, NORTH CAROLINA  
NCDOT PROJECT U-4405



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

DATE  
10/26/2016

CLIENT  
SOLUTIONS, IES

PYRAMID PROJECT #:  
2016-265

FIGURE 2

ATTACHMENT C

BORING LOCATION: Parcel #138, Fayetteville, NC	PROJECT NUMBER: 2016.0054.NDOT
DRILLING CONTRACTOR: Regional Probing Services	DATE STARTED: 10/27/2016 DATE FINISHED: 10/27/2016
DRILLING METHOD: Direct Push      BOREHOLE DIAMETER: 2.25"	TOTAL DEPTH (ft bgs): 12 ft bgs SCREEN INTERVAL (ft bgs): NA
DRILLING EQUIPMENT: Geoprobe 5410	NORTHING: NA EASTING: NA
SAMPLING METHOD: Macro Core	INITIAL DTW: NA FINAL DTW: NA
LOGGED BY: Samuel McIntyre	CHECKED BY:

DEPTH (ft bgs)	SAMPLES			PID (ppm)	DESCRIPTION OF MATERIALS	DEPTH (ft bgs)
	Sample ID and Interval	Recovery				
0						0
1			0.2		Tan and red mottled silty sand. Dry.	1
2		100%				2
3			0.6			3
4					Tan and red mottled silty sand. Saturated.	4
5	138-SB-1-4-6		0.6			5
6		100%				6
7			NA			7
8						8
9			NA			9
10		100%				10
11			NA			11
12					End of Boring	12

BORING LOCATION: Parcel #138, Fayetteville, NC	PROJECT NUMBER: 2016.0054.NDOT
DRILLING CONTRACTOR: Regional Probing Services	DATE STARTED: 10/27/2016 DATE FINISHED: 10/27/2016
DRILLING METHOD: Direct Push      BOREHOLE DIAMETER: 2.25"	TOTAL DEPTH (ft bgs): 12 ft bgs SCREEN INTERVAL (ft bgs): NA
DRILLING EQUIPMENT: Geoprobe 5410	NORTHING: NA EASTING: NA
SAMPLING METHOD: Macro Core	INITIAL DTW: NA FINAL DTW: NA
LOGGED BY: Samuel McIntyre	CHECKED BY:

DEPTH (ft bgs)	SAMPLES			PID (ppm)	DESCRIPTION OF MATERIALS	DEPTH (ft bgs)
	Sample ID and Interval	Recovery				
0					Asphalt.	0
1				0.6		1
2	138-SB-2-2-4	100%				2
3				6.7	Tan and red mottled silty sand. Dry.	3
4	138-SB-2-4-6	100%				4
5				38.7		5
6						6
7				0.5		7
8						8
9				9.5	Tan and red mottled silty sand. Saturated.	9
10		100%				10
11				11.6		11
12					End of Boring	12



BORING LOCATION: Parcel #138, Fayetteville, NC	PROJECT NUMBER: 2016.0054.NDOT
DRILLING CONTRACTOR: Regional Probing Services	DATE STARTED: 10/27/2016 DATE FINISHED: 10/27/2016
DRILLING METHOD: Direct Push      BOREHOLE DIAMETER: 2.25"	TOTAL DEPTH (ft bgs): 6 ft bgs SCREEN INTERVAL (ft bgs): NA
DRILLING EQUIPMENT: Geoprobe 5410	NORTHING: NA EASTING: NA
SAMPLING METHOD: Macro Core	INITIAL DTW: NA FINAL DTW: NA
LOGGED BY: Samuel McIntyre	CHECKED BY:

DEPTH (ft bgs)	SAMPLES			PID (ppm)	DESCRIPTION OF MATERIALS	DEPTH (ft bgs)
	Sample ID and Interval	Recovery				
0					Asphalt.	0
1				NA	Tan and red mottled silty sand. Dry.	1
2	138-SB-3-2-4	100%		NA		2
3				NA		3
4					End of Boring	4
5	138-SB-3-4-6	100%		NA		5
6						6

End of Boring

BORING LOCATION: Parcel #138, Fayetteville, NC	PROJECT NUMBER: 2016.0054.NDOT
DRILLING CONTRACTOR: Regional Probing Services	DATE STARTED: 10/27/2016 DATE FINISHED: 10/27/2016
DRILLING METHOD: Direct Push      BOREHOLE DIAMETER: 2.25"	TOTAL DEPTH (ft bgs): 6 ft bgs SCREEN INTERVAL (ft bgs): NA
DRILLING EQUIPMENT: Geoprobe 5410	NORTHING: NA EASTING: NA
SAMPLING METHOD: Macro Core	INITIAL DTW: NA FINAL DTW: NA
LOGGED BY: Samuel McIntyre	CHECKED BY:

DEPTH (ft bgs)	SAMPLES			PID (ppm)	DESCRIPTION OF MATERIALS	DEPTH (ft bgs)
	Sample ID and Interval	Recovery				
0					Asphalt.	0
1			NA		Tan and red mottled silty sand. Dry.	1
2	138-SB-4-2-4	100%				2
3			NA			3
4					End of Boring	4
5	138-SB-4-4-6	100%	NA			5
6						6

End of Boring

BORING LOCATION: Parcel #138, Fayetteville, NC	PROJECT NUMBER: 2016.0054.NDOT
DRILLING CONTRACTOR: Regional Probing Services	DATE STARTED: 10/27/2016 DATE FINISHED: 10/27/2016
DRILLING METHOD: Direct Push      BOREHOLE DIAMETER: 2.25"	TOTAL DEPTH (ft bgs): 6 ft bgs SCREEN INTERVAL (ft bgs): NA
DRILLING EQUIPMENT: Geoprobe 5410	NORTHING: NA EASTING: NA
SAMPLING METHOD: Macro Core	INITIAL DTW: NA FINAL DTW: NA
LOGGED BY: Samuel McIntyre	CHECKED BY:

DEPTH (ft bgs)	SAMPLES			PID (ppm)	DESCRIPTION OF MATERIALS	DEPTH (ft bgs)
	Sample ID and Interval	Recovery				
0					Asphalt.	0
1				NA	Tan and red mottled silty sand. Dry.	1
2	138-SB-5-2-4	100%		NA		2
3				NA		3
4						4
5	138-SB-5-4-6	100%		NA		5
6						6

End of Boring

BORING LOCATION: Parcel #138, Fayetteville, NC	PROJECT NUMBER: 2016.0054.NDOT
DRILLING CONTRACTOR: Regional Probing Services	DATE STARTED: 10/27/2016 DATE FINISHED: 10/27/2016
DRILLING METHOD: Direct Push      BOREHOLE DIAMETER: 2.25"	TOTAL DEPTH (ft bgs): 6 ft bgs SCREEN INTERVAL (ft bgs): NA
DRILLING EQUIPMENT: Geoprobe 5410	NORTHING: NA EASTING: NA
SAMPLING METHOD: Macro Core	INITIAL DTW: NA FINAL DTW: NA
LOGGED BY: Samuel McIntyre	CHECKED BY:

DEPTH (ft bgs)	SAMPLES			PID (ppm)	DESCRIPTION OF MATERIALS	DEPTH (ft bgs)
	Sample ID and Interval	Recovery				
0						0
1				NA		1
2	138-SB-6-2-4	100%			Tan and red mottled silty sand. Dry.	2
3			NA			3
4						4
5	138-SB-6-4-6	100%				5
6			NA			6

End of Boring

ATTACHMENT D





PHOTO 1 - VIEW OF BORING LOOKING SOUTH



PHOTO 2 - VIEW OF BORING LOOKING NORTHEAST



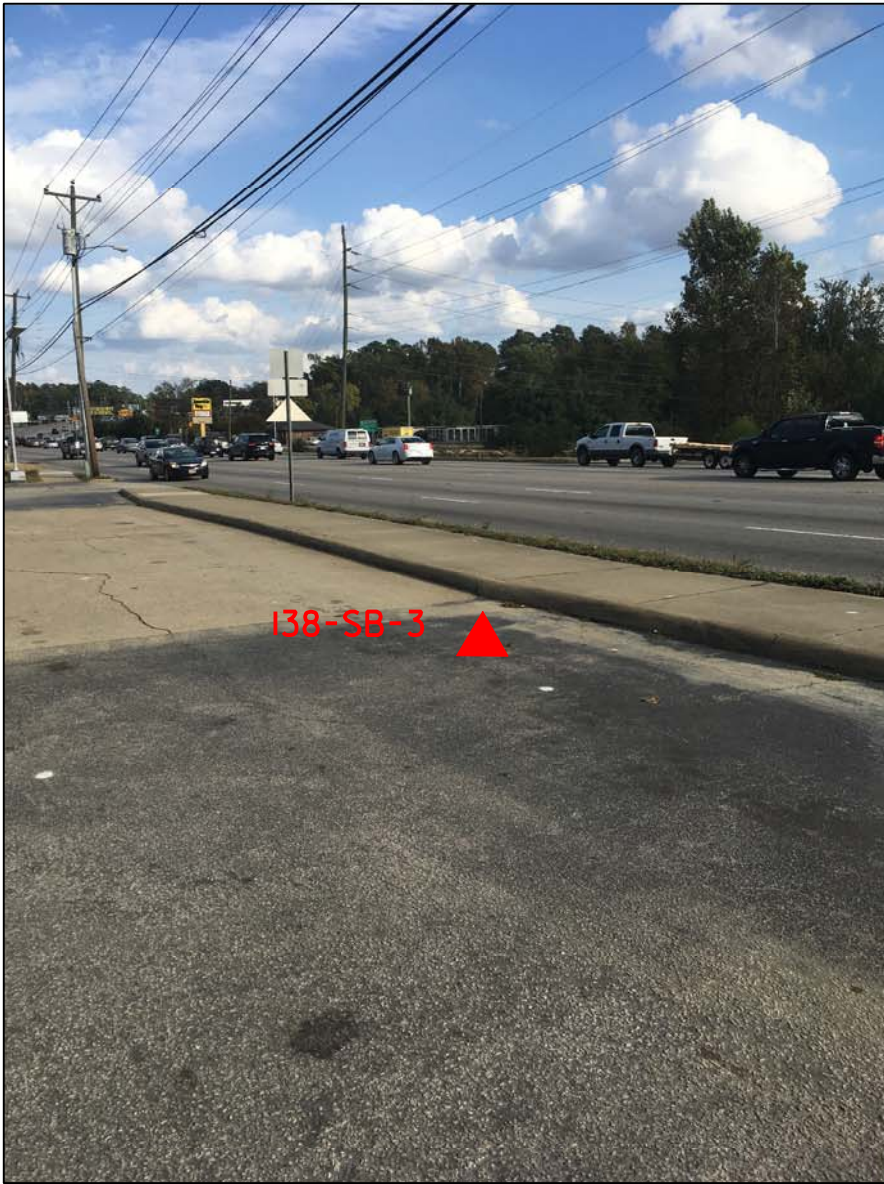


PHOTO 3 - VIEW OF BORING LOOKING SOUTHEAST



PHOTO 4 - VIEW OF BORING LOOKING SOUTHEAST





PHOTO 5 - VIEW OF BORING LOOKING NORTHEAST



PHOTO 6 - VIEW OF BORING LOOKING NORTHWEST



ATTACHMENT E



### Hydrocarbon Analysis Results

**Client:** NCDOT  
**Address:** Parcel 138: 6022 Raeford Road  
 Fayetteville, NC

**Samples taken** 10/27/2016  
**Samples extracted** 10/27/2016  
**Samples analysed** 10/27/2016

**Contact:**

**Operator** Candy Elliott

**Project:** 2016.0054.NDOT

													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
										% light	% mid	% heavy	
s	138-SB-1-4-6	23.2	<0.58	1.7	40.8	42.5	34	3.5	0.11	5.1	79.4	15.6	Road Tar (FCM) 80.8%
s	138-SB-2-2-4	24.1	<0.6	<0.6	2.9	2.9	1.7	0.07	<0.002	0	94.7	5.3	Deg.Fuel (FCM) 75.8%
s	138-SB-2-4-6	26.7	<0.67	0.84	59.7	60.5	27.1	1.1	0.009	3	93.7	3.2	Deg.Fuel (FCM) 92.8%
s	138-SB-3-2-4	23.2	<0.58	<0.58	52	52	38.8	1.6	0.017	0	86.5	13.5	V.Deg.PHC (FCM) 68.1%
s	138-SB-3-4-6	24.1	<0.6	<0.6	33.7	33.7	18.2	0.82	0.009	0	84.5	15.5	V.Deg.PHC (FCM) 68.9%
s	138-SB-4-2-4	25.2	<0.63	1.2	5.3	6.5	4.4	0.45	0.013	23.2	59.8	17	Deg.PHC (FCM) 69.4%
s	138-SB-4-4-6	22.5	<0.56	<0.56	17.8	17.8	7.9	0.38	0.004	0	85.1	14.9	V.Deg.PHC (FCM) 82.5%
s	138-SB-5-2-4	31.1	<1.6	<0.78	<0.78	<0.78	<0.16	<0.02	<0.003	0	0	100	
s	138-SB-5-4-6	29.4	<0.73	<0.73	0.73	0.73	0.6	0.07	<0.003	0	53.2	46.8	Residual.PHC (FCM) 63.1%
s	138-SB-6-2-4	24.8	<0.62	2.1	0.62	2.72	0.32	<0.02	<0.002	88.3	3.1	8.6	V.Deg.Gas (FCM) 49.4%
s	138-SB-6-4-6	23.5	<0.59	<0.59	1.6	1.6	1.3	0.15	<0.002	0	74.1	25.9	Deg.PHC (FCM) 68.3%
Initial Calibrator QC check										OK			99.7 %
Final FCM QC Check										OK			99.7 %

Results generated by a QED HC-1 analyser. Concentration values in mg/kg for soil samples and mg/L for water samples. Soil values are not corrected for moisture or stone content

Fingerprints provide a tentative hydrocarbon identification. The abbreviations are:- FCM = Results calculated using Fundamental Calibration Mode : % = confidence for sample fingerprint match to library

(SBS) or (LBS) = Site Specific or Library Background Subtraction applied to result : (PFM) = Poor Fingerprint Match : (T) = Turbid : (P) = Particulate present

