FROEHLING & ROBERTSON, INC.

# PRELIMINARY SITE ASSESSMENT

**THE WINNERS PLACE (PARCEL #25)**
**909 Capital Boulevard**
**Raleigh, North Carolina**
**State Project: B-5121 & B-5317**
**WBS Element: 42263.1.1**
**F&R Project #66T-0097**

**August 21, 2015**

## Prepared for:

**North Carolina Department of Transportation**
**Geotechnical Engineering Unit**
**1020 Birch Ridge Drive**
**Raleigh, NC 27610**

310 Hubert Street Raleigh, North Carolina 27603 919.828.3441

SINCE 1881

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August 21, 2015

**North Carolina Department of Transportation**
**Geotechnical Engineering Unit**
1020 Birch Ridge Drive
Raleigh, North Carolina 27610

Attn.: Mr. Terry Fox, L.G.
GeoEnvironmental Project Manager

**Re:** State Project: B-5121 & B-5317
WBS Element: 42263.1.1
BR 277 on US 70/US 401/NC 50 (Capital Blvd.) over Peace Street and
BR 213 on US 70/NC 50 (Wade Ave.) over US 401 (Capital Blvd.)

**Subject:** **Preliminary Site Assessment**
**Parcel #25 – The Winners Place (Green Taxi – Complete Auto Care)**
909 Capital Blvd
Raleigh, North Carolina
F&R Project #66T-0097

Dear Mr. Fox:

Froehling and Robertson, Inc. (F&R) has completed the authorized Preliminary Site Assessment at The Winners Place property in Raleigh, North Carolina. The work was performed in general accordance with F&R's Proposal No. 1666-00058, dated May 19, 2015. Notice to Proceed was issued to F&R on June 25, 2015. This report documents our field activities, presents the results of laboratory analysis and provides estimated quantities of petroleum impacted soils.

Please do not hesitate to contact us if you should have any questions regarding this report.

Sincerely,

**FROEHLING & ROBERTSON, INC.**

DocuSigned by:
Benjamin A. Whitley
E425D6E8C23545B...

Benjamin A. Whitley, P.E.
Project Engineer

NORTH CAROLINA PROFESSIONAL SEAL 038743 ENGINEER BENJAMIN A. WHITLEY

DocuSigned by:
Michael Sabodish
B4FED45203C345C...

Michael S. Sabodish, Jr., Ph.D, P.E.
Engineering and Remediation Services Manager

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**Preliminary Site Assessment Report**
**The Winners Place Property (Parcel #25)**
**Raleigh, Wake County, North Carolina**
**F&R Project No. 66T-0097**

## 1.0 Introduction

Froehling and Robertson, Inc. (F&R) has prepared this Preliminary Site Assessment (PSA) Report to document soil assessment activities performed at The Winners Place Property addressed as 909 Capital Boulevard in Raleigh, Wake County, North Carolina. The site is located on the west side of Capital Boulevard approximately 250 feet north of the Dortch Street intersection, as shown in Appendix I, Figures 1 and 2. As indicated in the Request for Technical and Cost Proposal (RFTCP), the site originally operated as a Phillips 66 Service Station. According to the NCDENR UST Section registry, two USTs were removed from the site in 1990. Groundwater Incident #02821 was assigned to the site in 1990.

The PSA was performed in general accordance with F&R's Proposal No. 1666-00058, dated May 19, 2015 with Notice to Proceed issued to F&R by the NCDOT on June 25, 2015. The purpose of this report is to document field activities, present the results of laboratory analysis, and provide estimated quantities of petroleum impacted soils.

According to the NCDOT within their RFTCP, acquisition of right-of-way is necessary for the Peace Street Bridge, Wade Avenue Bridge and Capital Boulevard improvements in Raleigh (See Figure No. 3). As such, the NCDOT requested a PSA be performed to assess the possibility of encountering petroleum impacted soil from known or unknown USTs which may exist/existed at the project site.

The existing on-site structure is one-story in height and is constructed of concrete masonry unit (CMU) block with wood and steel framing. Four roll-up garage doors are located on the eastern side of the building. The remainder of the eastern portion of the site consists of an asphalt paved parking lot. Pigeon House Branch is located on the western portion of the property. The site is bordered to the north by Atlas Motor & Auto Sales; to the south by Habco Auto Sales; to the east by Capital Boulevard; and to the west by North West Street. Access to the site is gained from Capital Boulevard to the east. Photos detailing existing site features are attached as Appendix IV of this report.

## 2.0 Geophysical Survey

Prior to F&R's soil assessment activities, Pyramid Environmental & Engineering, P.C. (Pyramid) conducted a geophysical survey to locate suspect metal underground storage tanks (USTs). The geophysical work was conducted from June 26 to July 1, 2015, and was performed within the proposed construction easement.

The geophysical investigation consisted of electromagnetic (EM) induction surveys using a Geonics EM61 instrument. Ground-penetrating radar (GPR) investigations were investigated using a Geophysical Survey Systems UtilityScan DF unit equipped with a dual frequency 300/800 MHz antenna. The EM61 data was collected along parallel survey lines spaced approximately 5 feet apart. The data was reviewed in the field to evaluate the possible presence of USTs and later transferred to a desktop computer for further review. Data was collected over most of the planned survey site with the exception of areas immediately adjacent to metallic objects and other obstacles. An EM response was exhibited across the majority of the surveyed area, which was due to suspected reinforced concrete and the presence of parked vehicles. Pyramid subsequently performed a GPR survey, which verified the presence of reinforcement in the majority of the concrete. A portion of the concrete in the center of the survey did not contain reinforcement, which suggests that this section had been cut and removed.

Based on the EM and GPR data collected at the site, Pyramid did not observe anomalies that were interpreted to be the results of metallic USTs within about 6 feet of the ground surface. The complete geophysical report is attached as Appendix II.

## 3.0 Site Assessment Activities

F&R visited the site on July 29, 2015 to perform the Preliminary Site Assessment. The assessment consisted of advancing 3 borings into the soils at the project site using direct-push technology (Geoprobe). The boring locations were determined by F&R staff based on the results of the geophysical survey, site features and proposed construction activities, and were advanced on the eastern portion of the site adjacent to Capital Boulevard. Boring B-1 was advanced adjacent to the northern property boundary, and Boring B-3 was advanced adjacent to the southern property boundary. Boring B-2 was centrally located between Borings B-1 and B-3 (Appendix I, Figure 3). The borings were advanced to the proposed depth of 10 feet bgs.

Soil sample cores from the borings were collected in disposable, 4-foot long acetate sleeves. The soil samples were visually/manually classified and screened in the field using a photo-ionization detector (PID) for evidence of petroleum hydrocarbons. Evaluation of VOC

concentrations were performed using a MiniRae 2000 PID which produces results in parts per million (ppm). A representative soil sample was collected from one foot sections of each sleeve and placed in a re-sealable plastic bag. The vapors were then allowed to equilibrate in the headspace of the bag for approximately ten minutes prior to measurement with the PID. The measurements were collected by placing the probe tip into the headspace of the bag. PID measurements can be found in the Geoprobe Logs in Appendix III, as well as in Table 1 in Section 5.0 below.

Generally, the soil sample which exhibited the highest PID concentration was submitted for laboratory analysis for diesel range organics (DRO), gasoline range organics (GRO), Total BTEX (benzene, toluene, ethylbenzene and xylenes), 16 PAHs (polycyclic aromatic hydrocarbons) and BaP (Benzo(a)pyrene) by Ultraviolet Fluorescence (UVF) technology (QROS QED Hydrocarbon Analyzer).

The samples were collected in laboratory-supplied sample containers, placed in a cooler with ice, and shipped via UPS to QROS in Wilmington, North Carolina following standard chain-of custody procedures.

## 4.0 Subsurface Conditions

As indicated in the attached Geoprobe Logs (Appendix III), subsurface conditions from existing ground surface to boring termination primarily included various layers of moist, red-tan, silty fine sand (USCS – SM), red-brown to tan sandy silty clay (USCS – CL), and/or tan-brown sandy clay (USCS – CL). The borings were terminated at the proposed depth of 10 feet bgs.

PID readings did not exceed 1.5 ppm, and petroleum odors and/or groundwater were not observed during field screening or sample collection activities.

F&R notes the soil conditions in Boring B-2 consisted of a dry, tan fine to medium sand from existing ground surface to 2 feet bgs, and a red-tan to tan silty fine sand from 2 to 10 feet bgs. In addition, the soil conditions in B-2 were not consistent with the soils observed in Borings B-1 and B-3. Furthermore, recovery of the soil in the Geoprobe acetate sleeves was less than the recovery observed in B-1 and B-3, suggesting the soils at B-2 consisted of poorly compacted fill.

## 5.0 Analytical Results

As shown in the following table, petroleum hydrocarbons identified as DRO were encountered in the soil samples at the three boring locations advanced at the site (B-1 through B-3), at depths ranging from seven feet bgs (B-1) to 10 feet bgs (B-2). At boring locations B-1 through B-3, the laboratory results indicate the DRO concentrations ranged from 3 mg/kg (B-1) to 92.1 mg/kg (B-2). The DRO concentration at Boring B-2 (92.1 mg/kg) exceeded the NCDENR Action Level of 10 mg/kg.

The laboratory analytical results indicate concentrations of the sum of 16 EPA PAHs above the method detection limit, but below the NCDENR Action Level of 7,041.14 mg/kg at Borings B-1 through B-3. In addition, Benzo(a)pyrene (BaP) was detected in samples B-2 and B-3 at concentrations above the NCDENR Soil-to-Water MSCC of 0.096 mg/kg.

The soil analytical results are summarized in Table 1 below. The laboratory analytical results can also be found in the attached Appendix V of this report.

**Table 1**
**Soil Sampling Analytical Results**

| Sample ID | Sample Date | Sample Depth (ft bgs) | PID Reading (ppm) | GRO (mg/kg) | DRO (mg/kg) | TPH (mg/kg) | Total BTEX (mg/kg) | Total Aromatics (mg/kg) | 16 EPA PAHs (mg/kg) | BaP (mg/kg) |
|---|---|---|---|---|---|---|---|---|---|---|
| B-1 | 7/29/15 | 7-8 | 0.5 | < 0.51 | 3 | 3 | < 1 | 1.1 | 0.04 | < 0.01 |
| B-2 | | 8-10 | 0.9 | < 0.66 | **92.1** | **92.1** | < 1.3 | 48.1 | 1.9 | 0.029 |
| B-3 | | 8-9 | 1.5 | < 0.51 | 9 | 9 | < 1 | 7.5 | 0.37 | 0.004 |
| **NCDENR Action Level** | | | | **10** | **10** | **10** | **13.8** | **NSE** | **7,041.41** | **0.096** |

Samples shown in bold exceed the NCDENR Action Level as outlined in the NCDENR, DWM, UST Section Guidelines
ppm = parts per million
GRO = Gasoline Range Organics
DRO = Diesel Range Organics
TPH = Total Petroleum Hydrocarbons
BTEX = Benzene, Toluene, Ethylbenzene and Xylenes
NSE = No Standard Exists

## 6.0 Conclusions and Recommendations

F&R conducted a PSA at The Winners Place Property located at 909 Capital Boulevard in Raleigh, Wake County, North Carolina. A geophysical investigation was performed by Pyramid Environmental & Engineering to investigate the existence of unknown/known USTs in the proposed right-of-way. Based on the results of the geophysical survey, it was determined that USTs were not present within the surveyed area.

Three Geoprobe borings were advanced during the assessment within the proposed right-of-way, where grading activities are proposed in association with the Peace Street Bridge, Wade Avenue Bridge and Capital Boulevard improvements. Based on the results of laboratory testing and observed PID readings, petroleum impacted soils were found at concentrations above the NCDENR Action Level of 10 mg/kg at boring location B-2. Therefore, it is estimated that petroleum impacted soils, at concentrations above the NCDENR Action Level, are present from existing ground surface to a depth of at least ten feet below existing ground surface in the vicinity of Boring B-2.

F&R notes the soil conditions in Boring B-2 consisted of a dry, tan fine to medium sand from existing ground surface to 2 feet bgs, and a red-tan to tan silty fine sand from 2 to 10 feet bgs. In addition, the soil conditions in B-2 were not consistent with the soils observed in Borings B-1 and B-3. Furthermore, recovery of the soil in the Geoprobe acetate sleeves was less than the recovery observed in B-1 and B-3, suggesting the soils at B-2 consisted of poorly compacted fill. While the GPR survey detected reinforced concrete in the majority of the survey area, no reinforcement was detected near Boring B-2. Based upon these observations, it is possible the former USTs noted in the RFP were located in the vicinity of Boring B-2.

No below grade utilities appear on the proposed improvement plans. However, driveway reconstruction and curbline realignment is depicted, which will likely require re-grading of the existing ground surface during the construction. For the purpose of this assessment, we have estimated an average petroleum-impacted area of 2,957.2 square feet, extending to a depth of ten feet bgs. This area accounts for impacted soils that may be generated during re-grading activities and for unknown below grade utilities that may be installed during construction. The area was determined by averaging distances between the proposed construction easement and the existing edge of pavement on the construction drawings (Appendix I, Figure 4).

**Table 2**
**Approximate Volume of Petroleum Impacted Soil**

| Excavation Location (As Shown on Figure 4) | L x W x D (feet) | Soil Volume (cubic feet) | Soil Volume (tons) |
|---|---|---|---|
| Vicinity of B-2 | L x W varies (2,957.2 SF) X 10’ depth | 29,572.0 | 1,774.3 |
| **Soil Volume (assuming a soil density of 120 pcf)** | | **Total** | **1,774.3** |

It should be noted that a delineation of the soil contamination was not performed, as this was not included in the proposed scope of work. The above estimates are based on interpretations of soil analytical results, PID readings and our experience with petroleum UST releases. In order to generate estimated quantities of petroleum impacted soils, we have inferred that the contamination has occurred between the existing ground surface and the sample collection depth. The amount of impacted soil can only be determined after excavation or by advancing additional borings and performing additional laboratory analysis to delineate the extents (horizontal and vertical) of contamination.

## 7.0 Limitations

These services have been performed, under authorization of the North Carolina Department of Transportation for specific application on this project. These services have been performed in accordance with generally accepted environmental and hydrogeological practices. No other warranty, expressed or implied is made. As with any subsurface investigation, actual conditions exist only at the precise locations from which samples were taken. Certain inferences are based on the results of sampling and related testing to form a professional opinion of conditions in areas beyond those from which samples were taken. Our conclusions and recommendations are based upon information provided to us by others, our sampling and testing results and our site observations. We have not verified the completeness or accuracy of the information provided by others, unless otherwise noted. Our observations are based upon conditions readily visible at the site at the time of our site visits.

Froehling & Robertson, Inc. by virtue of providing the services described in this report, does not assume the responsibility of the person(s) in charge of the site, or otherwise undertake responsibility for reporting to any local, state or federal public agencies any conditions at the site that may present a potential danger to public health, safety or the environment. In areas that require notification of local, state, or federal public agencies as required by law, it is the Client's responsibility to so notify.

**APPENDIX I**

**Figure No. 1 – SITE VICINITY MAP**

**Figure No. 2 – TOPOGRAPHIC MAP**

**Figure No. 3 – LABORATORY RESULTS & BORING LOCATION PLAN**

**Figure No. 4 – ESTIMATED EXTENTS OF SOIL CONTAMINATION**

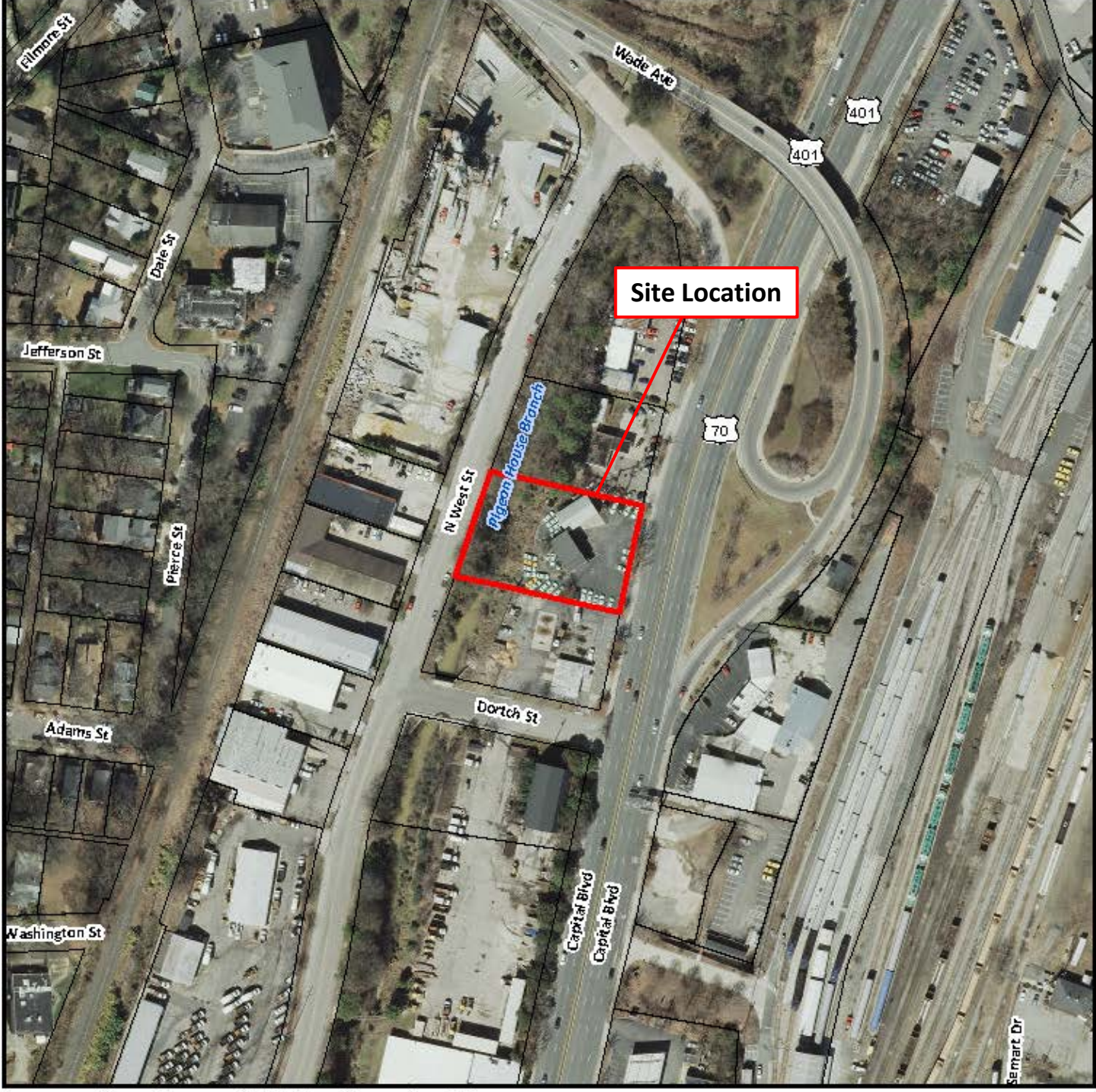


**Image Courtesy of Wake County iMaps**

N

0 100 200 400 Feet

1 inch = 200 feet

## SITE VICINITY MAP

North

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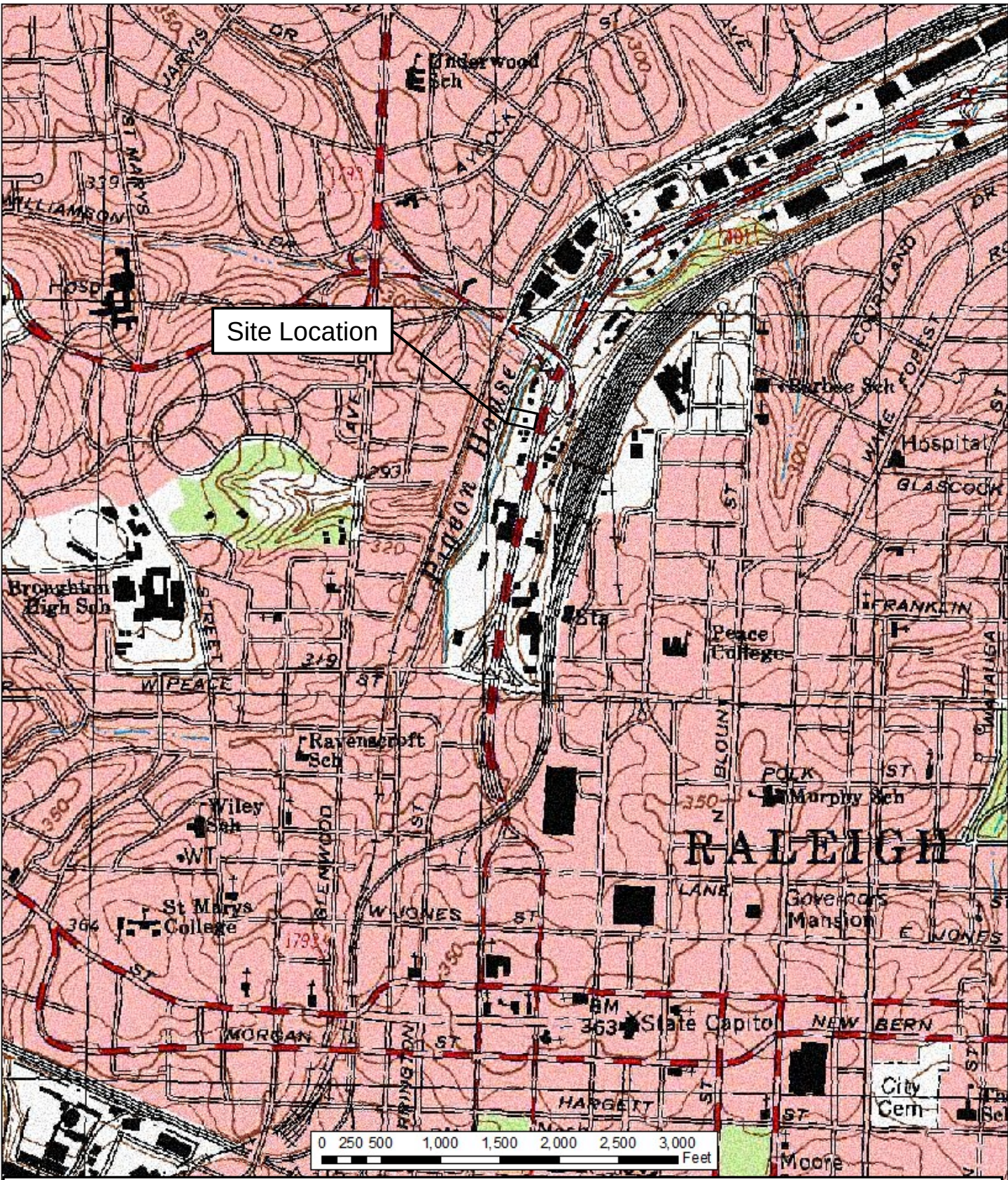
| | | |
|---|---|---|
| **CLIENT**: NCDOT | | |
| **PROJECT**: B-5121 & B-5317, The Winners Place Property, NCDOT Parcel #25 | | |
| **LOCATION**: Raleigh, Wake County, North Carolina | | |
| **F&R PROJECT No.**: 66T-0097 | | FIGURE No.: 1 |
| **DRAWN BY**: B. Whitle | | |
| **DATE**: August 2015 | **SCALE**: 1" = 200 ' | |




# TOPOGRAPHIC MAP – RALEIGH, NC

North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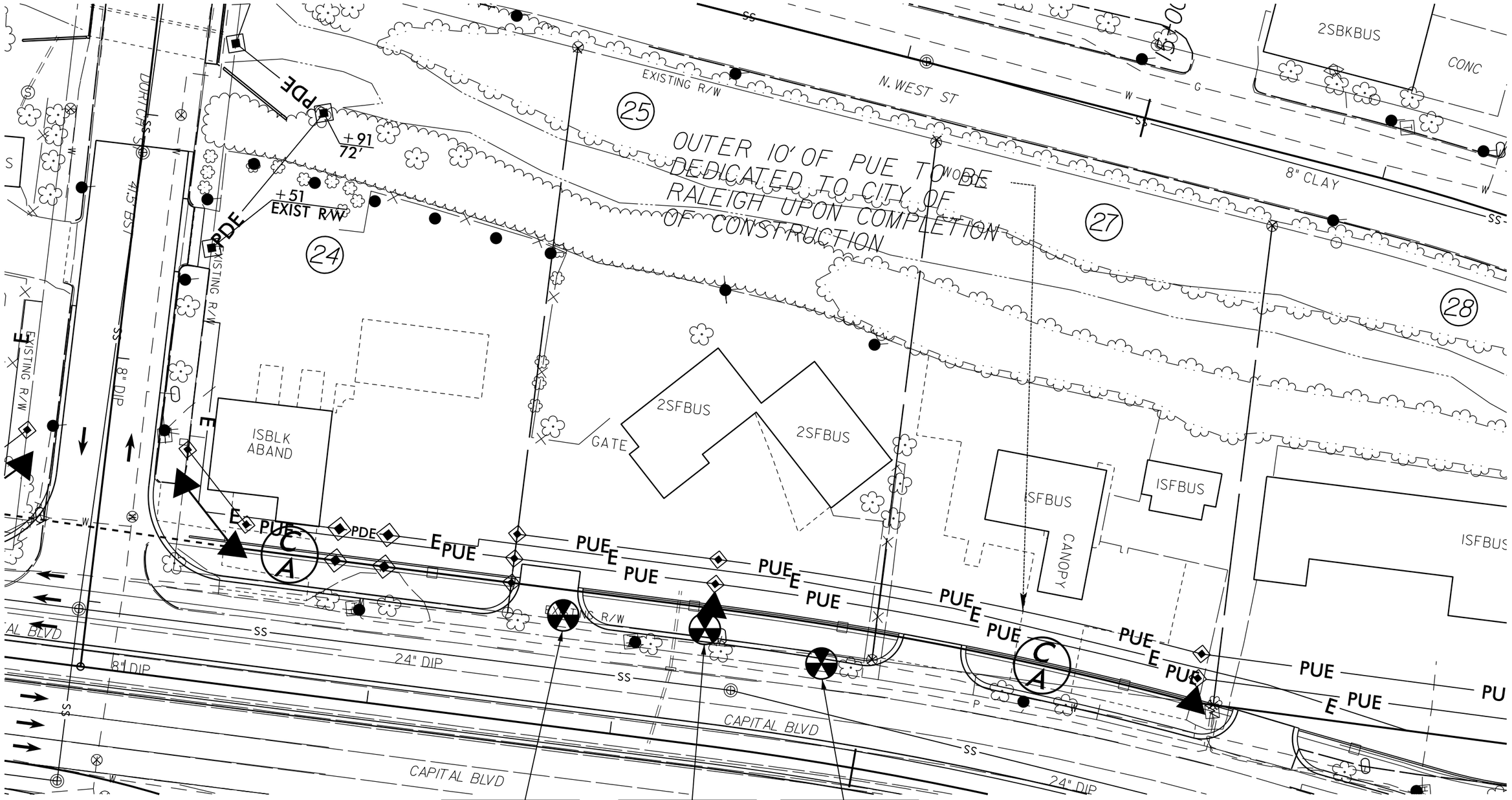
| | |
|---|---|
| **CLIENT**: NCDOT | |
| **PROJECT**: B-5121 & B-5317, The Winners Place Property, NCDOT Parcel #25 | |
| **LOCATION**: Raleigh, Wake County, North Carolina | |
| **F&R PROJECT No.**: 66T-0097 | FIGURE No.: 2 |
| **DRAWN BY**: B. Whitley | |
| **DATE**: August 2015 | **SCALE**: As Shown |




NAD 83/NSRS 2007

SCALE (FEET)
0 20' 40'
1"=40'

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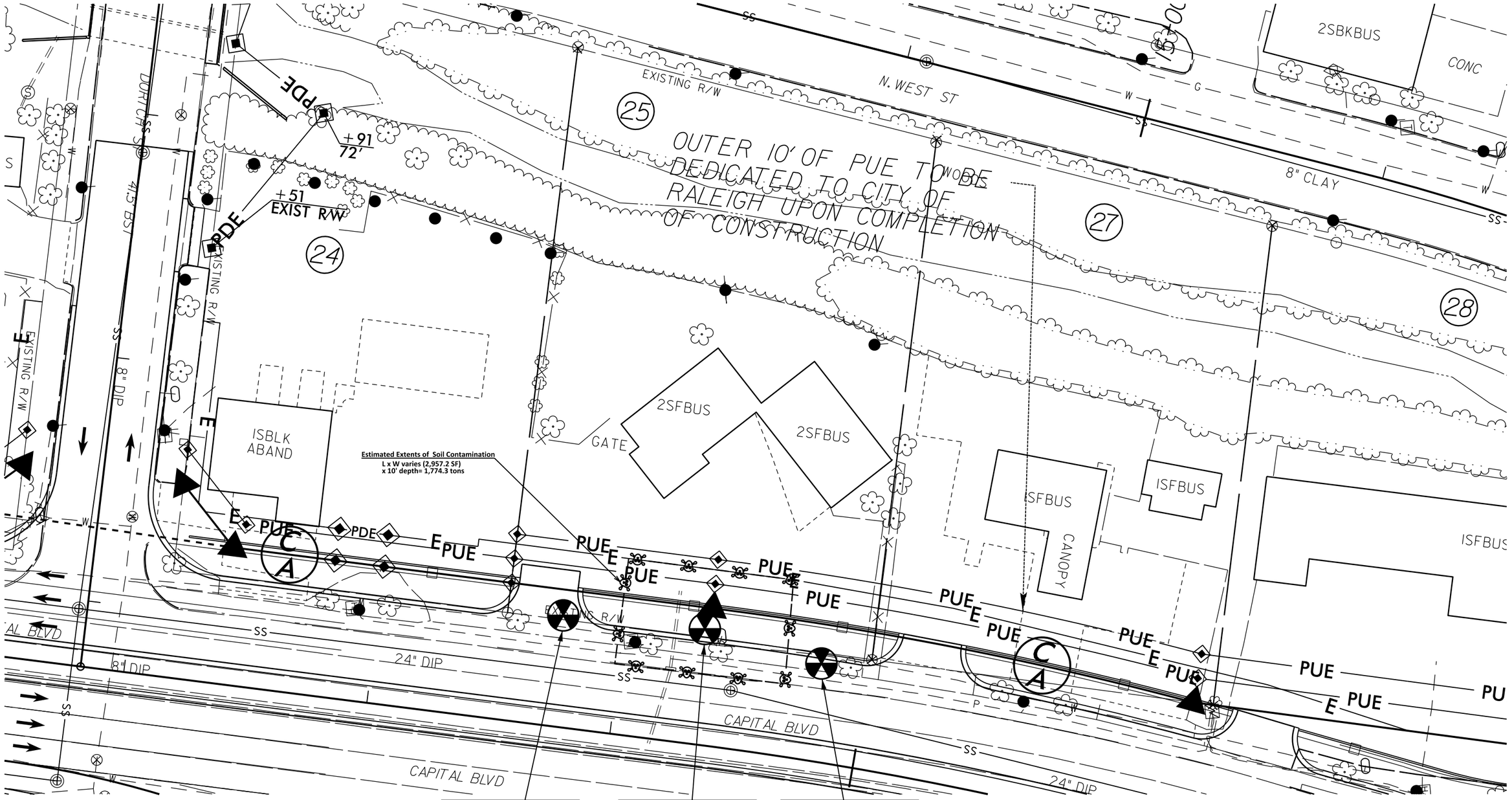
## LEGEND

Approximate Geoprobe Boring Location

**Samples Shown in Bold Exceed the NCDENR Action Level as Outlined in the NCDENR, DWM, UST Section Guideline**

## LABORATORY RESULTS & BORING LOCATION PLAN

| | | |
|---|---|---|
| CLIENT: NCDOT | | |
| PROJECT: B-5121/B-5317 The Winners Place (Parcel #25) | | |
| LOCATION: Raleigh, Wake, County, North Carolina | | |
| F&R PROJECT No.: 66T-0097 | | FIGURE No.: 3 |
| DRAWN BY: T. T. Walker | CHECKED BY: M. Sabodish, P.E. | |
| DATE: August 2015 | SCALE: 1"=40' | |




B-1: 7.0'-8.0'
DRO= 3 mg/kg
GRO=<0.51 mg/kg
TOTAL BTEX=<1 mg/kg
16 EPA PAHs= 0.04 mg/kg
BaP=<0.01 mg/kg

B-2: 8.0'-10.0'
**DRO= 92.1 mg/kg**
GRO=<0.66 mg/kg
TOTAL BTEX=<1.3 mg/kg
16 EPA PAHs= 1.9 mg/kg
BaP= 0.029 mg/kg

B-3: 8.0'-9.0'
DRO= 9 mg/kg
GRO=<0.51 mg/kg
TOTAL BTEX=<1 mg/kg
16 EPA PAHs= 0.37 mg/kg
BaP= 0.004 mg/kg

NAD 83/NSRS 2007

SCALE (FEET)
0 20' 40'
1"=40'

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## LEGEND

Approximate Geoprobe Boring Location

**Samples Shown in Bold Exceed the NCDENR Action Level as Outlined in the NCDENR, DWM, UST Section Guideline**

## ESTIMATED EXTENTS OF SOIL CONTAMINATION

| | | |
|---|---|---|
| CLIENT: NCDOT | | |
| PROJECT: B-5121/B-5317 The Winners Place (Parcel #25) | | |
| LOCATION: Raleigh, Wake County, North Carolina | | |
| F&R PROJECT No.: 66T-0097 | | FIGURE No.: 4 |
| DRAWN BY: T. T. Walker | CHECKED BY: M. Sabodish, P.E. | |
| DATE: August 2015 | SCALE: 1"=40' | |

**APPENDIX II**

**GEOPHYSICAL REPORT PREPARED BY PYRAMID**

PYRAMID ENVIRONMENTAL & ENGINEERING, P.C.

PYRAMID ENVIRONMENTAL & ENGINEERING
(PROJECT 2015-176)

# GEOPHYSICAL SURVEY

## METALLIC UST INVESTIGATION:
## PARCEL 25 – THE WINNERS PLACE
## NCDOT PROJECT B-5121/B5317
## (WBS 42263.1.1)

**909 CAPITAL BLVD., RALEIGH, WAKE COUNTY, NC**

**JULY 17, 2015**

**Report prepared for:** **Michael Sabodish Jr., Ph.D., P.E.**
**Froehling and Robertson**
**310 Hubert Street**
**Raleigh, North Carolina 27603**

**Prepared by:** _____
**Eric C. Cross, P.G.**
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**Douglas A. Canavello, P.G.**
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**GEOPHYSICAL INVESTIGATION REPORT**
**Parcel 25 – The Winners Place**
**Raleigh, Wake County, North Carolina**

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# Figures



# Appendices

## 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

**Project Description:** Pyramid Environmental conducted a geophysical investigation for Froehling & Robertson (F&R) at Parcel 25, located at 909 Capital Blvd., Raleigh, NC. The survey was part of a North Carolina Department of Transportation (NCDOT) Right-of-Way (ROW) investigation (NCDOT Project B-5121/B-5317). F&R directed Pyramid as to the geophysical survey boundaries at the project site, which were designed to extend from the existing edge of pavement into the proposed ROW line and/or proposed easements, whichever distance was greater. Conducted from June 26 to July 1, 2015, the geophysical investigation was performed to determine if unknown, metallic underground storage tanks (USTs) were present beneath the survey area.

**Geophysical Results:** The entire survey area exhibited a high amplitude EM response due to suspected metal reinforcement within the concrete and a group of parked vehicles in the center of the survey area. The GPR survey verified that metal reinforcement was present across most of the survey area. A section of concrete in the center of the survey area lacked reinforcement, suggesting it had been cut and removed. Collectively, the geophysical data did not record any evidence of unknown metallic USTs at the property.

## INTRODUCTION

Pyramid Environmental conducted a geophysical investigation for Froehling & Robertson (F&R) at Parcel 25, located at 909 Capital Blvd., Raleigh, NC. The survey was part of a North Carolina Department of Transportation (NCDOT) Right-of-Way (ROW) investigation (NCDOT Project B-5121/B-5317). F&R directed Pyramid as to the geophysical survey boundaries at the project site, which were designed to extend from the existing edge of pavement into the proposed ROW line and/or proposed easements, whichever distance was greater. Conducted from June 26 to July 1, 2015, the geophysical investigation was performed to determine if unknown, metallic underground storage tanks (USTs) were present beneath the survey area.

The site included an automotive repair building surrounded by concrete and an asphalt parking areas. It should be noted that a significant portion of the center of the survey area was inaccessible due to parked vehicles. Aerial photographs 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 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 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 acquired across select EM anomalies on June 30, 2015, 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 10 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 to us 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**. A high amplitude EM response was exhibited across the entire survey area due to suspected reinforced concrete spanning the majority of the parcel, as well as the group of parked vehicles in the center of the survey area. For this reason, the entire site was investigated further 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 20 formal GPR transects were performed at the property. The transects were performed in a grid-like fashion across all accessible areas within the survey boundaries. The GPR survey verified the presence of metal reinforcement within the majority of the concrete across the site. A section of concrete in the center of the survey area lacked any reinforcement, suggesting it had been removed at some point in the past. This area still exhibited a high amplitude EM response due to adjacent vehicles. No evidence of significant subsurface structures was observed.

Collectively, the geophysical data did not record any evidence of unknown metallic USTs at the property.

## SUMMARY & CONCLUSIONS

Our evaluation of the EM61 and GPR data collected at Parcel 25 in Raleigh, Wake County, North Carolina, provides the following summary and conclusions:

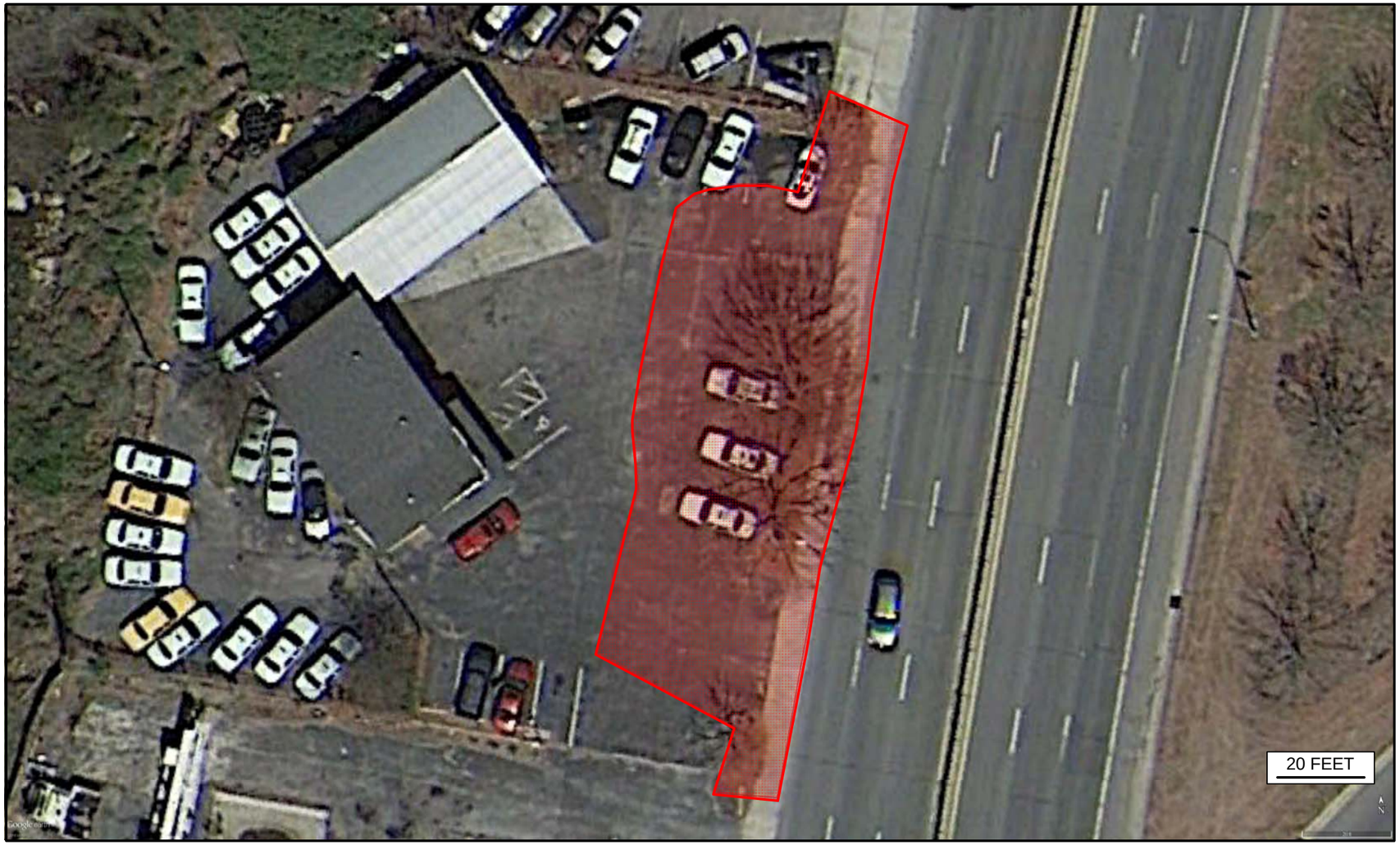
- The EM61 and GPR surveys provided reliable results for the detection of metallic USTs within the accessible portions of the geophysical survey area.

- The entire survey area exhibited a high amplitude EM response due to suspected metal reinforcement within the concrete and a group of parked vehicles in the center of the survey area.
- The GPR survey verified that metal reinforcement was present across most of the survey area. A section of concrete in the center of the survey area lacked reinforcement, suggesting it had been cut and removed.
- Collectively, the geophysical data did not record any evidence of unknown metallic USTs at the property.

## LIMITATIONS

Geophysical surveys have been performed and this report prepared for F&R 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 that 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

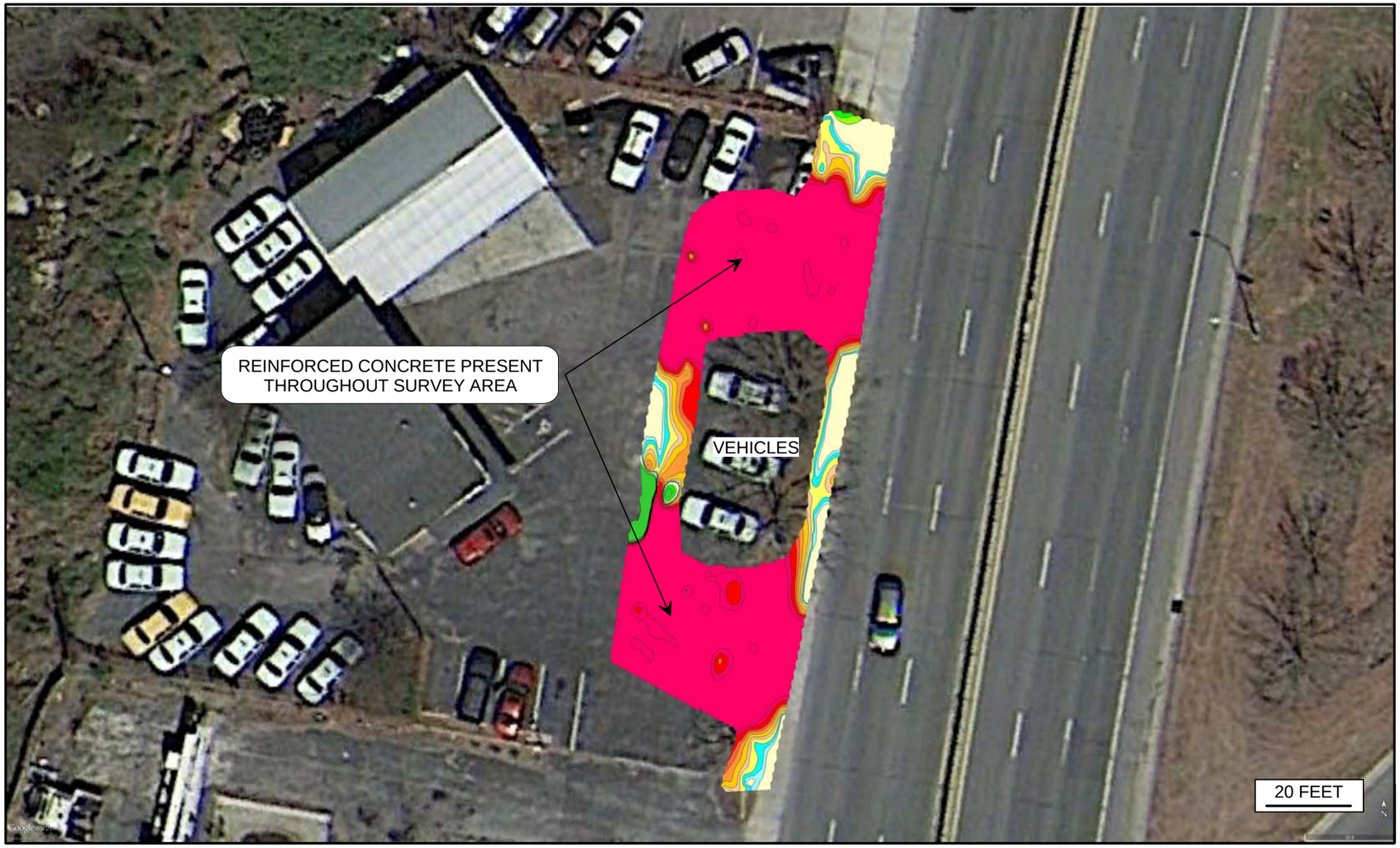
View of Survey Area
(Facing Approximately West)

View of Survey Area
(Facing Approximately North)

| | |
|---|---|
| TITLE | PARCEL 25 - 909 CAPITAL BLVD.<br>GEOPHYSICAL SURVEY BOUNDARIES<br>AND SITE PHOTOGRAPHS |
| PROJECT | METALLIC UST INVESTIGATION<br>NCDOT B-5121/B-5317, RALEIGH, NC |
| PYRAMID ENVIRONMENTAL & ENGINEERING, P.C. | 503 INDUSTRIAL AVENUE<br>GREENSBORO, NC 27460<br>(336) 335-3174 (p) (336) 691-0648 (f)<br>License # C1251 Eng. / License # C257 Geology |
| DATE 7/6/2015 | CLIENT FROEHLING & ROBERTSON |
| PYRAMID PROJECT #: 2015-176 | **FIGURE 1** |

N

# Parcel 25 - EM61 Differential Results




Locations of metallic anomalies detected by the EM61 survey. Numbers correspond to descriptive Table in report.

## NO EVIDENCE OF METALLIC USTs OBSERVED

The contour plot shows the differential results of the EM61 instrument in millivolts (mV). The EM61 data were collected on June 29, 2015, using a Geonics EM61 instrument. Ground penetrating radar (GPR) data were aquired on July 1, 2015, using a GSSI UtilityScan DF unit with a dual frequency 300/800 MHz antenna.

EM61 Metal Detection Response (millivolts)

1000 750 500 400 300 200 150 100 75 60 50 40 30 -90 -100 -200 -400 -5000

TITLE
PARCEL 25 - 909 CAPITAL BLVD.
EM 61 RESULTS CONTOUR MAP

PROJECT
METALLIC UST INVESTIGATION
NCDOT PROJECT B-5121/B-5317 (42263.1.1)

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

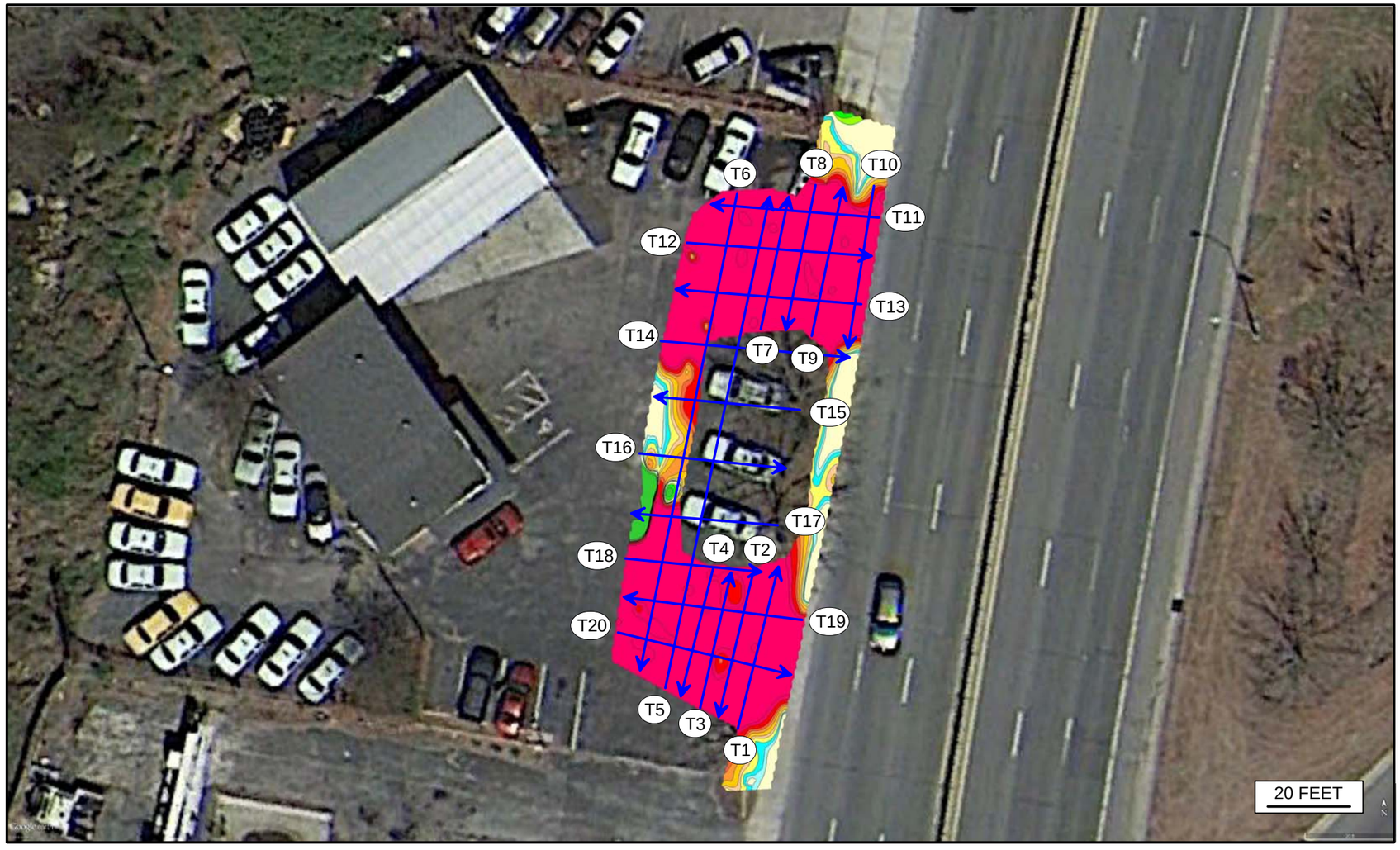
DATE 7/6/2015

CLIENT FROEHLING & ROBERTSON

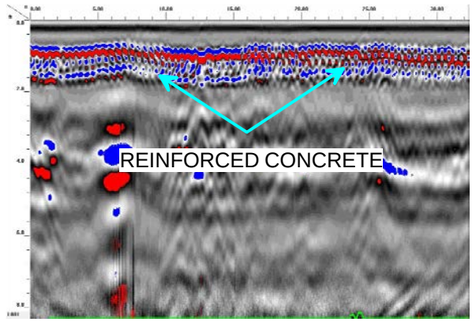
PYRAMID PROJECT #: 2015-176

**FIGURE 2**

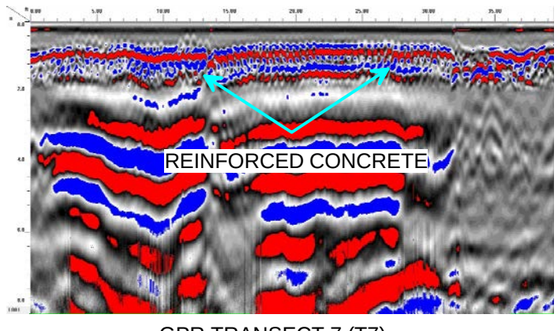
# Parcel 25 - Approximate Locations of GPR Transects




N




GPR TRANSECT 1 (T1)



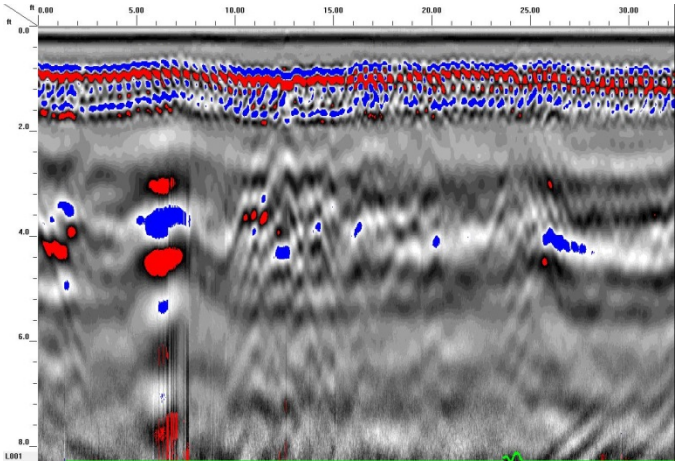

GPR TRANSECT 7 (T7)

| | |
|---|---|
| TITLE | PARCEL 25 - 909 CAPITAL BLVD.<br>GPR TRANSECT LOCATIONS<br>AND SELECT IMAGES |
| PROJECT | METALLIC UST INVESTIGATION<br>NCDOT PROJECT B-5121/B-5317 (42263.1.1) |

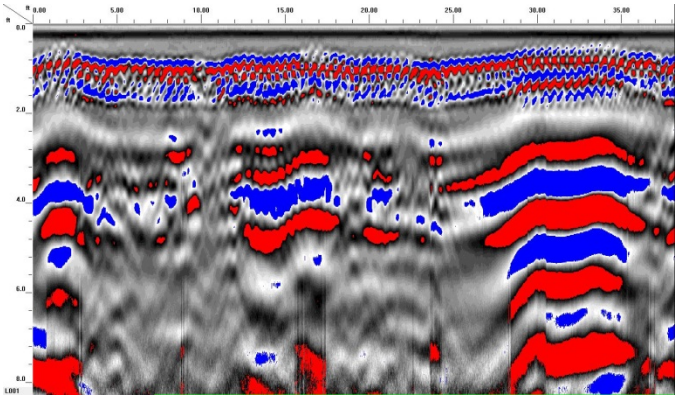
PYRAMID ENVIRONMENTAL & ENGINEERING, P.C.
503 INDUSTRIAL AVENUE
GREENSBORO, NC 27460
(336) 335-3174 (p) (336) 691-0648 (f)
License # C1251 Eng. / License # C257 Geology

| | |
|---|---|
| DATE 7/6/2015 | CLIENT FROEHLING & ROBERTSON |
| PYRAMID PROJECT #: 2015-176 | **FIGURE 3** |

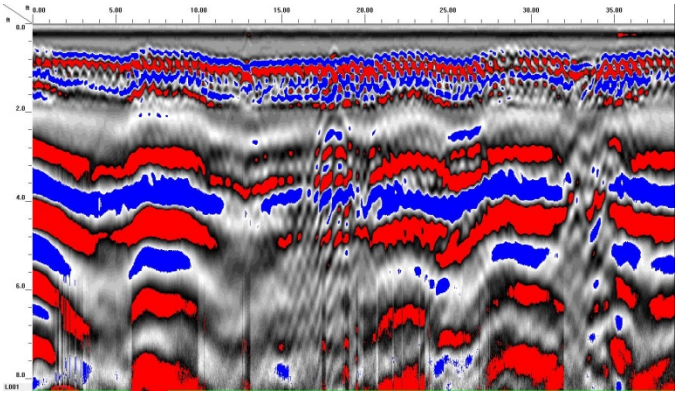
# Appendix A – GPR Transects



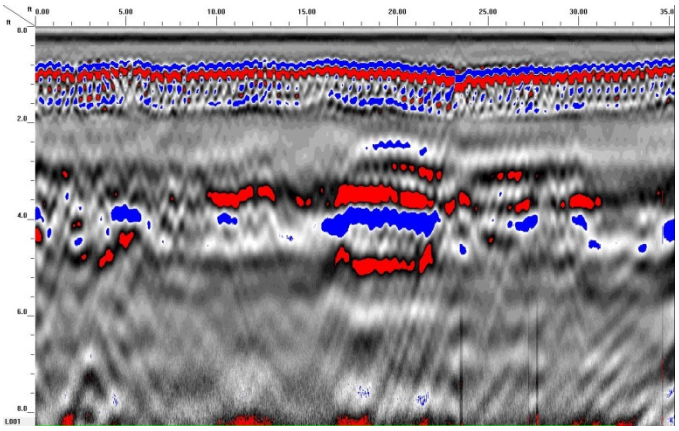
GPR TRANSECT 1



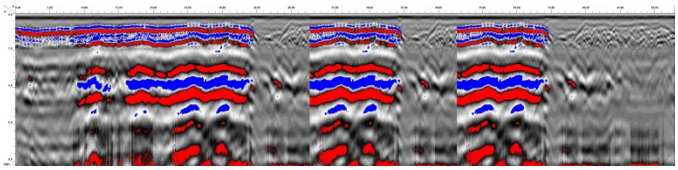
GPR TRANSECT 2



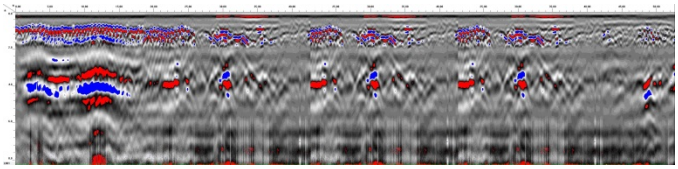
GPR TRANSECT 3



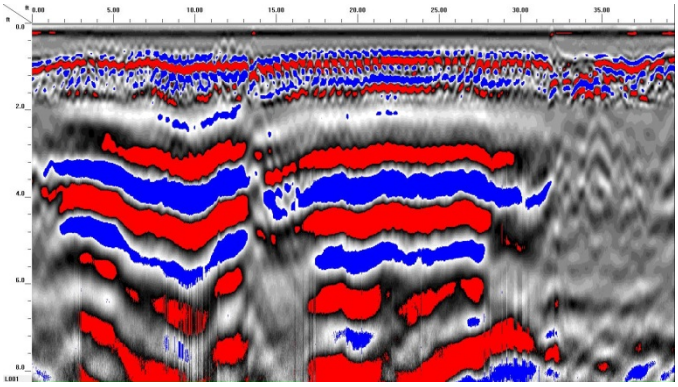
GPR TRANSECT 4



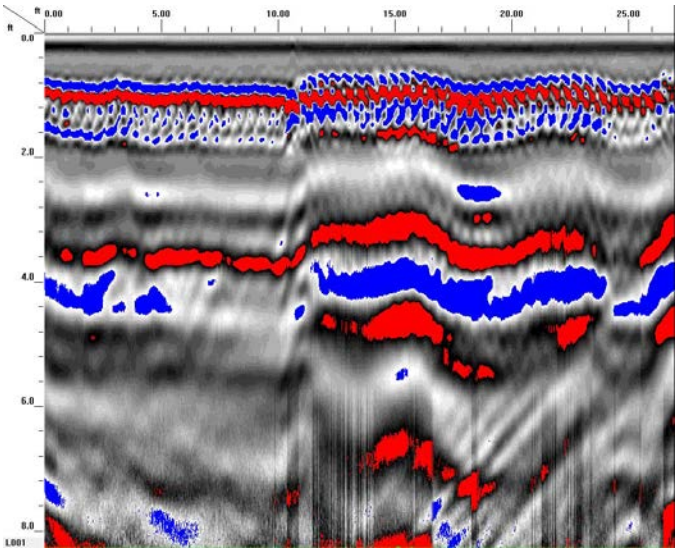
GPR TRANSECT 5



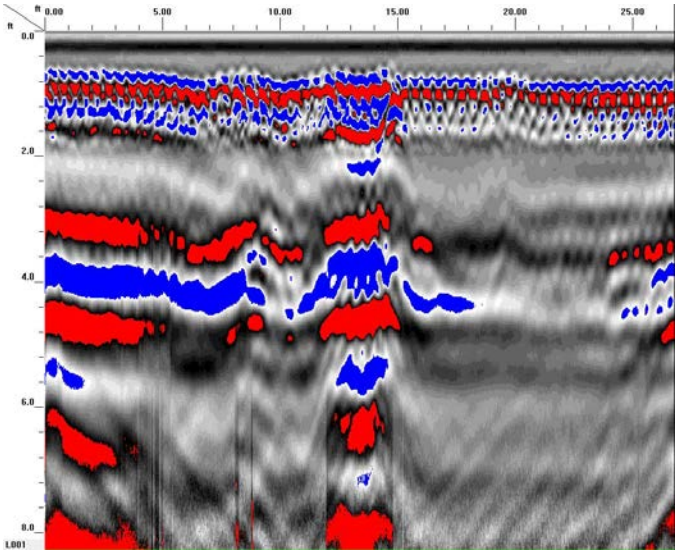
GPR TRANSECT 6



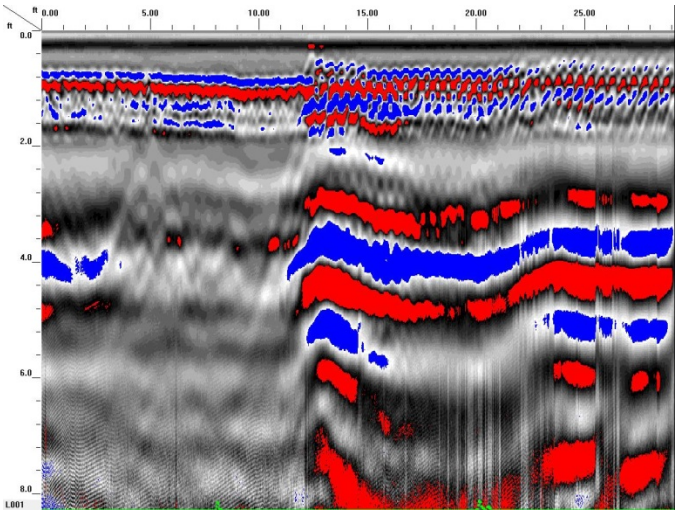
GPR TRANSECT 7



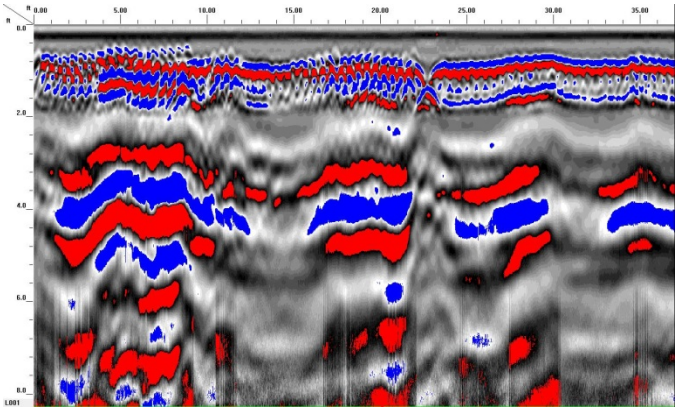
GPR TRANSECT 8



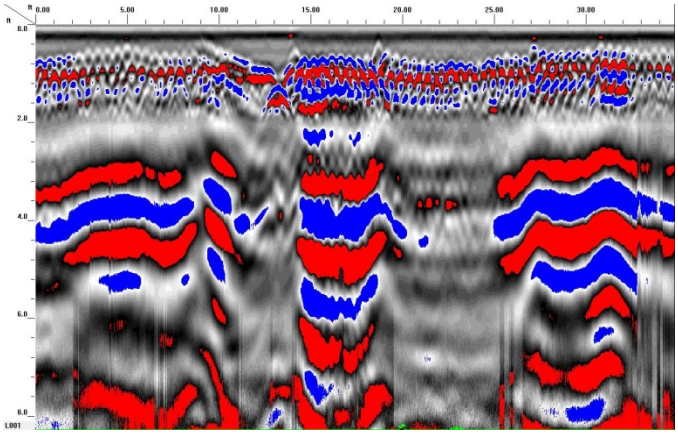
GPR TRANSECT 9



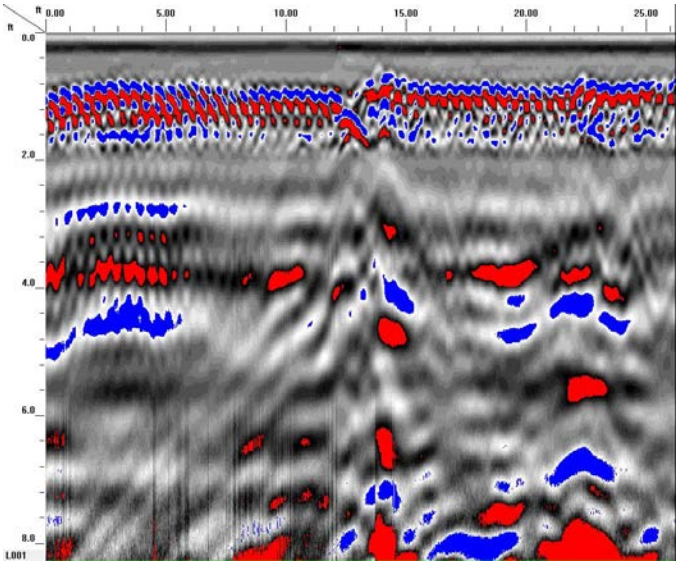
GPR TRANSECT 10



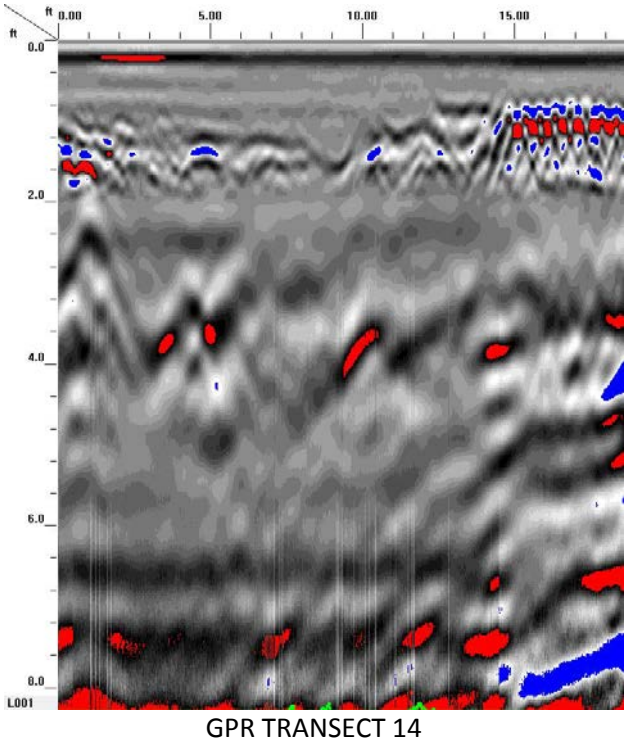
GPR TRANSECT 11



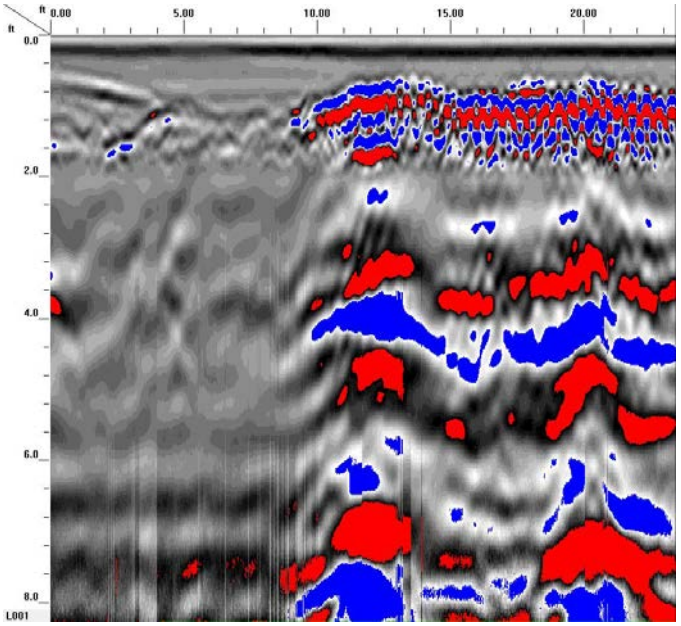
GPR TRANSECT 12



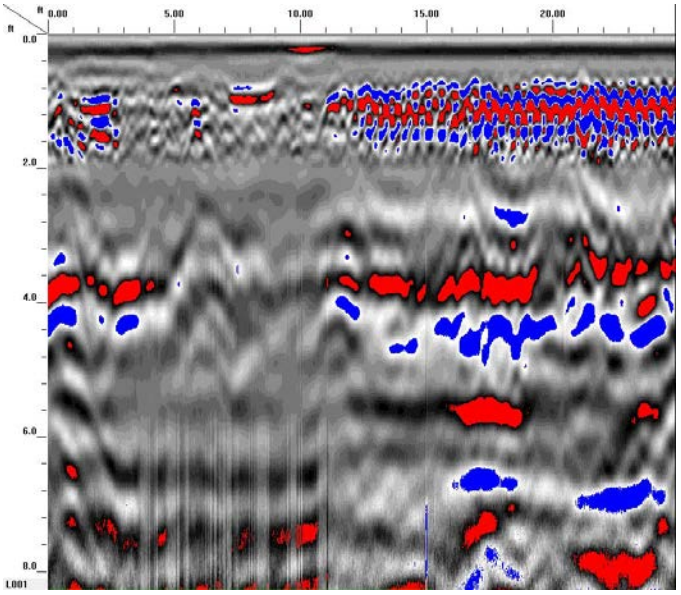
GPR TRANSECT 13



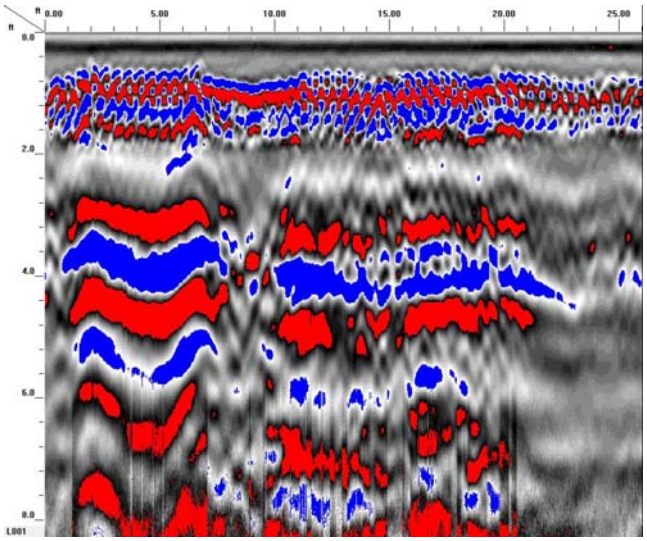
GPR TRANSECT 14



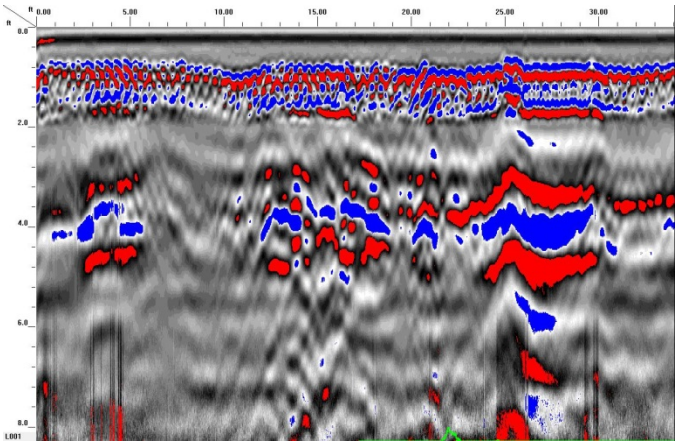

GPR TRANSECT 15



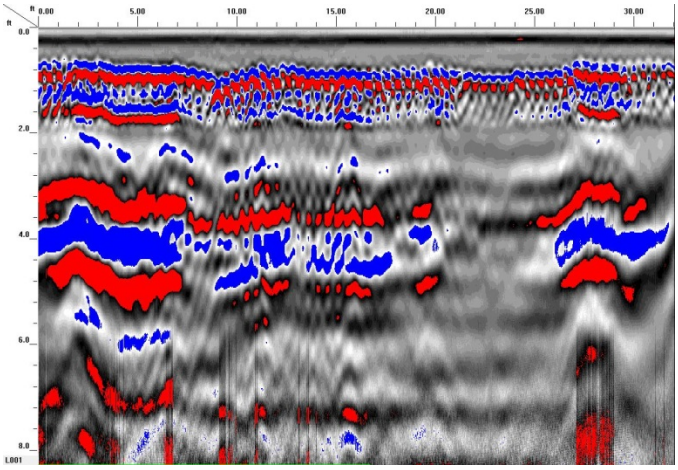

GPR TRANSECT 16



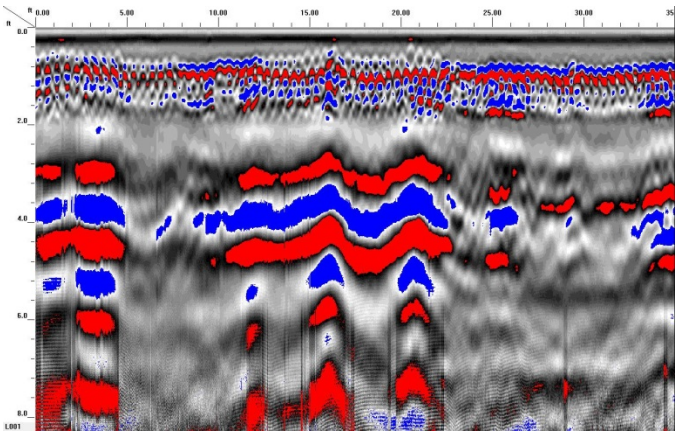

GPR TRANSECT 17




GPR TRANSECT 18




GPR TRANSECT 19




GPR TRANSECT 20

**APPENDIX III**

**GEOPROBE LOGS**

FROEHLING & ROBERTSON, INC.

# GEOPROBE LOG

**Boring:** B-1 (1 of 1)

**Project No:** 66T-0097
**Client:** NCDOT
**Project:** B-5121/B-5137 The Winners Place(Par. 25)
**City/State:** Raleigh, NC

**Elevation:** Existing Ground Surface
**Total Depth:** 10.0'
**Boring Location:** See Plan

**Drilling Method:** Geoprobe
**Hammer Type:** N/A
**Date Drilled:** 7/29/15
**Driller:** Regional Probing Services

| Elevation | Depth | Description of Materials (Classification) | *Sample Depth (feet) | PID (ppm) | Remarks |
|---|---|---|---|---|---|
| | 0.2 | Asphalt | 0.0 | 0.5 | Petroleum Odors not Observed in Boring |
| | | Moist, Tan, Sandy Silty CLAY (CL) | | | |
| | 1.0 | Moist, Red-Orange, Sandy Silty CLAY with Mica (CL) | 1.0 | 0.5 | |
| | | | 2.0 | 0.5 | |
| | 3.0 | Moist, Red-Tan, Sandy Silty CLAY with Gravel (CL) | 3.0 | 0.4 | |
| | | | 4.0 | 0.5 | |
| | 5.0 | Moist, Red-Brown, Sandy Silty CLAY (CL) | 5.0 | 0.3 | |
| | | | 6.0 | 0.5 | |
| | | | 7.0 | 0.5* | *Sample Submitted for Laboratory Analysis for TPH, DRO/GRO, Total BTEX, 16 PAHs, and BaP |
| | 8.0 | Moist, Tan, Medium Sandy CLAY (CL) | 8.0 | 0.4 | |
| | | | 9.0 | 0.4 | |
| | 10.0 | Geoprobe Boring Terminated at 10 feet. | 10.0 | | |

*Geoprobe soil samples were collected by continuous push of a 2 inch ID stainless steel barrel containing a 4 foot long acetate collection sleeve. The 4 foot long soil sample sleeves were cut open and the soil was separated into 1 foot long sample intervals.

GEOPROBE_LOG B5121_GEOENV_GEOPROBEBORELOG_PARCEL25.GPJ F&R.GDT 8/14/15

FROEHLING & ROBERTSON, INC.

# GEOPROBE LOG

**Boring:** B-2 (1 of 1)

**Project No:** 66T-0097
**Client:** NCDOT
**Project:** B-5121/B-5137 The Winners Place(Par. 25)
**City/State:** Raleigh, NC

**Elevation:** Existing Ground Surface
**Total Depth:** 10.0'
**Boring Location:** See Plan

**Drilling Method:** Geoprobe
**Hammer Type:** N/A
**Date Drilled:** 7/29/15
**Driller:** Regional Probing Services

| Elevation | Depth | Description of Materials (Classification) | *Sample Depth (feet) | PID (ppm) | Remarks |
|---|---|---|---|---|---|
| | 0.1 | Asphalt | 0.0 | 0.9 | Petroleum Odors not Observed in Boring |
| | 0.4 | Concrete | | | |
| | | Dry, Tan, Fine to Medium SAND (SP) | | | |
| | 2.0 | Dry, Red-Tan, Silty Fine SAND (SM) | 2.0 | 0.3 | |
| | | | 4.0 | 0.4 | |
| | | | 6.0 | 0.8 | |
| | 8.0 | Dry, Tan, Silty Fine SAND (SM) | 8.0 | 0.9* | *Sample Submitted for Laboratory Analysis for TPH, DRO/GRO, Total BTEX, 16 PAHs, and BaP |
| | 10.0 | Geoprobe Boring Terminated at 10 feet. | 10.0 | | |

*Geoprobe soil samples were collected by continuous push of a 2 inch ID stainless steel barrel containing a 4 foot long acetate collection sleeve. The 4 foot long soil sample sleeves were cut open and the soil was separated into 1 foot long sample intervals.

GEOPROBE_LOG B5121_GEOENV_GEOPROBEBORELOG_PARCEL25.GPJ F&R.GDT 8/14/15

FROEHLING & ROBERTSON, INC.

# GEOPROBE LOG

**Boring:** B-3 (1 of 1)

**Project No:** 66T-0097
**Client:** NCDOT
**Project:** B-5121/B-5137 The Winners Place(Par. 25)
**City/State:** Raleigh, NC

**Elevation:** Existing Ground Surface
**Total Depth:** 10.0'
**Boring Location:** See Plan

**Drilling Method:** Geoprobe
**Hammer Type:** N/A
**Date Drilled:** 7/29/15
**Driller:** Regional Probing Services

| Elevation | Depth | Description of Materials (Classification) | *Sample Depth (feet) | PID (ppm) | Remarks |
|---|---|---|---|---|---|
| | 0.2 | Asphalt | 0.0 | 0.7 | Petroleum Odors not Observed in Boring |
| | | Moist, Tan, Sandy Silty CLAY with Gravel (CL) | | | |
| | 2.0 | Moist, Tan, Medium Sandy CLAY (CL) | 2.0 | 0.9 | |
| | 4.0 | Moist, Tan, Sandy Silty CLAY (CL) | 4.0 | 1.1 | |
| | 6.0 | Moist, Orange-Tan, Silty Sandy CLAY (CL) | 6.0 | 1.1 | |
| | 7.0 | Moist, Gray-Brown, Silty Sandy CLAY (CL) | 7.0 | 1.4 | |
| | | | 8.0 | 1.5* | *Sample Submitted for Laboratory Analysis for TPH, DRO/GRO, Total BTEX, 16 PAHs, and BaP |
| | 9.0 | Moist, Tan-Brown, Medium Sandy CLAY with Mica (CL) | 9.0 | 0.9 | |
| | 10.0 | Geoprobe Boring Terminated at 10 feet. | 10.0 | | |

*Geoprobe soil samples were collected by continuous push of a 2 inch ID stainless steel barrel containing a 4 foot long acetate collection sleeve. The 4 foot long soil sample sleeves were cut open and the soil was separated into 1 foot long sample intervals.

GEOPROBE_LOG B5121_GEOENV_GEOPROBEBORELOG_PARCEL25.GPJ F&R.GDT 8/14/15

**APPENDIX IV**

**SITE PHOTOS**


**Photo #1:** A view of Boring B-1, facing west.


**Photo #2:** A view of Boring B-2, facing west.


**Photo #3:** A view of Boring B-3, facing north.

# APPENDIX V

# LABORATORY ANALYTICAL RESULTS

QED

QROS

# Hydrocarbon Analysis Results

**Client:** F&R
**Address:**

**Samples taken** Wednesday, July 29, 2015
**Samples extracted** Wednesday, July 29, 2015
**Samples analysed** Monday, August 03, 2015

**Contact:** Ben Whitley

**Operator** King

**Project:** NCDOT B-5121/B-5317

| Fingerprints Only | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 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 | B-1 7-8 | 20.5 | <1 | <0.51 | 3 | 3 | 1.1 | 0.04 | <0.01 | 0 | 77.9 | 22.1 | Deg Fuel (FCM) 73.4% |
| s | B-2 8-10 | 26.5 | <1.3 | <0.66 | 92.1 | 92.1 | 48.1 | 1.9 | 0.029 | 0 | 92.8 | 7.2 | Deg Fuel (FCM) 93.2% |
| s | B-3 8-9 | 20.3 | <1 | <0.51 | 9 | 9 | 7.5 | 0.37 | 0.004 | 0 | 91.6 | 8.4 | Road Tar (FCM) 97.2% |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |

Initial Calibrator QC check OK Final FCM QC Check OK 102.6%

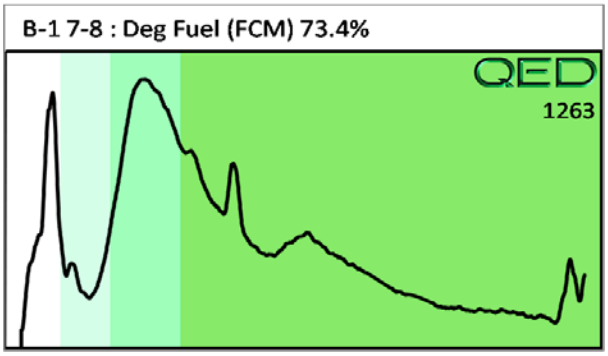
Results generated by a QED HC-1 analyser. Concentration values in mg/kg for soil samples and mg/L for water samples. Soil values are not corrected for moisture or stone content

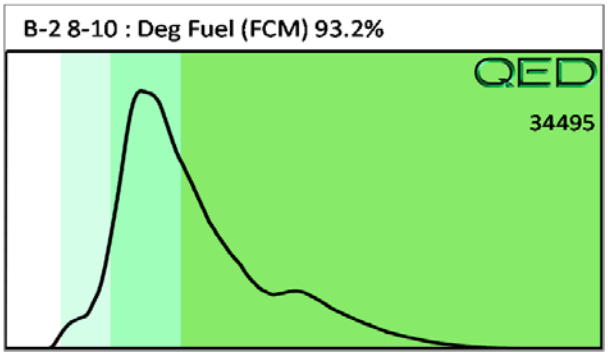
Fingerprints provide a tentative hydrocarbon identification. The abbreviations are:- FCM = Results calculated using Fundamental Calibration Mode : % = confidence for sample fingerprint match to library

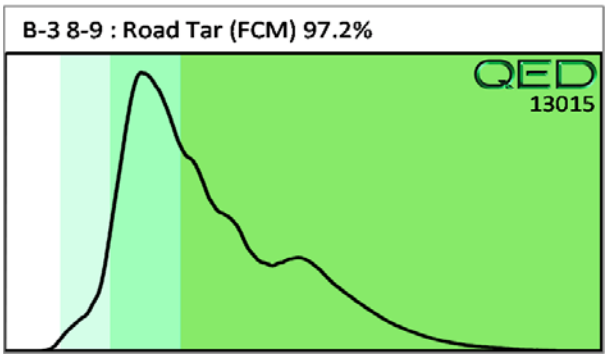
(SBS) or (LBS) = Site Specific or Library Background Subtraction applied to result : (PFM) = Poor Fingerprint Match : (T) = Turbid : (P) = Particulate present

QED Hydrocarbon Fingerprints

Project: NCDOT B-5121/B-5317 ##################



# Chain of Custody Record and Analytical Request Form

| | Sample ID | Sample Collection | | | TAT Requested | |
|---|---|---|---|---|---|---|
| | QED UVF | Date | Time | Initials | 24 Hour | 48 Hour |
| Parcel 23 | B-4 6-7 | 7-29-15 | 1620 | BMW | 13.2 | X |
| Parcel 27 | B-1 9-10 | | 955 | | 11.5 | |
| | B-2 7-8 | | 1015 | | 13.5 | |
| | B-3 2-3 | | 1035 | | 14.2 | |
| Parcel 25 | B-1 7-8 | | 1110 | | 12.7 | |
| | B-2 8-10 | | 1120 | | 9.8 | |
| | B-3 8-9 | | 1150 | | 12.8 | |
| Parcel 24 | B-1 7-8 | | 1255 | | 12.7 | |
| | B-2 7-8 | | 1315 | | 11.0 | |
| | B-3 5-6 | | 1350 | | 13.0 | |
| | B-4 5-6 | | 1415 | | 12.6 | |
| | B-5 8-9 | | 1445 | | 12.2 | |
| | B-6 5-6 | | 1500 | | 11.6 | |
| | B-7 8-9 | | 1530 | | 13.3 | |
| | B-8 6-7 | ↓ | 1540 | ↓ | 11.9 | ↓ |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

**Client:** FGR

**Contact:** Ben Whitley

**Phone:** 919-630-5661

**Email:** bwhitley@fandr.com

**Project Reference:**
NCDOT B-5121 / B-5317

Each sample will be analyzed for total

BTEX, GRO, DRO, TPH and PAH

Each sample will generate a fingerprint representative of the petroleum product within the samples. Electronic data will be submitted to the email above.

| | | | |
|---|---|---|---|
| FGR | 7-31-15 | UPS overnight | 7-31-15 |
| Relinquished by | Date/Time | Accepted by | Date/Time |
| | | [illegible] | 8/1/15 |
| Relinquished by | Date/Time | Accepted by | Date/Time |
| | | | |
| Relinquished by | Date/Time | Accepted by | Date/Time |

**SHIP TO:**
QROS, LLC
420 Raleigh Street, Suite E
Wilmington, NC 28412

Hannah King
hannahk@grosllc.com
(704)-654-7391

**ATTENTION**

When shipping, please DO NOT submerge sample vials in ice or water. This is to avoid dilution errors and contamination. To keep the samples cool we suggest using a freezer pack or a bag of ice sealed that will not leak.

* test results on seperate spreadsheets for each parcel please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