



SUPPLEMENTAL PRELIMINARY SITE ASSESSMENT

BALLARD LIVING TRUST PROPERTY (PARCEL #8)

6659 US Highway 401

Kipling, NC

State Project: R-5523

WBS Element: 45548.1.1

F&R Project #66R-3222

July 14, 2014

Prepared for:

North Carolina Department of Transportation

Geotechnical Engineering Unit

1020 Birch Ridge Drive

Raleigh, NC 27610



FROEHLING & ROBERTSON, INC.

Engineering Stability Since 1881

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July 14, 2014

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

Attn.: Mr. Craig Haden
GeoEnvironmental Project Manager

Re: State Project: R-5523
WBS Element: 45548.1.1
Realignment of Harnett Central Road at US 401 and Extension of
Smith Road (SR 1575)

Subject: Supplemental Preliminary Site Assessment
Ballard Living Trust Property (Parcel #8)
6659 US Hwy 401
Kipling, North Carolina
F&R Project #66R-3222

Dear Mr. Haden:

Froehling and Robertson, Inc. (F&R) has completed the authorized Supplemental Preliminary Site Assessment at the Ballard Living Trust Property in Kipling, North Carolina. The work was performed in general accordance with F&R's Supplemental Proposal No. 1466-00642, dated June 12, 2014. Notice to Proceed was issued to F&R on June 18, 2014. This report documents our field activities, presents the results of laboratory analysis and provides recommendations regarding the property.

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

Sincerely,

FROEHLING & ROBERTSON, INC.

Benjamin A. Whitley, P.E.
Project Engineer

Christopher J. Burkhardt
Senior Environmental Professional



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**Supplemental Preliminary Site Assessment Report
Ballard Living Trust Property (Parcel #8)
Kipling, Harnett County, North Carolina
F&R Project No. 66R-3222**

1.0 Introduction

Froehling and Robertson, Inc. (F&R) has prepared this Supplemental Preliminary Site Assessment Report (PSA) to document additional soil assessment activities performed at the Ballard Living Trust Property (currently an automotive repair facility) addressed as 6659 US Highway 401 in Kipling, Harnett County, North Carolina. The site is located in the northwest quadrant of the US Highway 401 and the Kipling Road Intersection. (Appendix I, Figure 1). As indicated in the Request for Proposal (RFP), a service station previously operated at this location. The site is currently being used for vehicle repair use. According to DENR's UST Registry, there are no known USTS, facility IDs or groundwater incidents associated with the property.

This work was performed in general accordance with F&R's Supplemental Proposal No. 1466-00642, dated June 12, 2014 with Notice to Proceed issued to F&R by the NCDOT on June 18, 2014. The purpose of this report is to document additional field activities, present the results of laboratory analysis, and provide recommendations regarding the property.

F&R conducted a previous PSA at the project site, which was submitted under separate cover and dated June 9, 2014. The previous PSA was performed within the NCDOT proposed right-of-way at the project site. As part of the previous PSA, a geophysical investigation was performed by Schnabel Engineering to investigate the existence of unknown/known USTs at the site. Based on the results of the geophysical survey, it was determined that USTs were not likely present at the site, within the surveyed area. Seven Geoprobe borings were advanced during the previous assessment inside the proposed right-of-way, where grading activities are proposed to realign the existing highway. Based on the results of laboratory testing and observed PID readings, it was determined that petroleum impacted soils existed in the vicinity of Borings B-1 through B-5 at concentrations above the NC DENR Action Level of 10 mg/kg (25.2 mg/kg DRO and 77 mg/kg GRO). In addition, petroleum impacted groundwater was identified in the vicinity of Boring B-3, with naphthalene detected above NCAC 2L Groundwater Standards (10.9 mg/L).

Based on conversations and information provided by the NCDOT, this Supplemental Preliminary Site Assessment was requested to perform additional assessment on the remaining portion of the project site. NCDOT requested six additional borings to assess the driveway area adjacent to Kipling Road as well as areas surrounding the site structure.



The property contains a one-story brick structure with a canopy on the front (eastern) elevation of the building. The area surrounding the structure and fronting US Highway 401 and Kipling Road consist of cleared grassy land. The remainder of the property consists of wooded land. Photos detailing existing site features are attached as Appendix IV of this report.

2.0 Geophysical Survey

Prior to F&R's supplemental soil assessment activities, Schnabel Engineering conducted a geophysical survey of the project site to locate suspect metal underground storage tanks (USTs) in the accessible areas of the remnant property. The geophysical work was conducted on May 20 and 21, 2014 under Schnabel's June 2, 2011 contract with NCDOT.

The geophysical investigation consisted of electromagnetic (EM) induction surveys using a Geonics EM61-MK2 instrument. Ground-penetrating radar (GPR) investigations of selected EM61 anomalies were investigated using a Geophysical Survey Systems SIR-3000 system equipped with a 400 MHz antenna. The EM61 data were collected along parallel survey lines spaced approximately 2.5 feet apart, while the GPR data were collected along survey lines spaced 1 to 2 feet apart in orthogonal directions. 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 the northern and western portions of the site, due to the presence of heavy vegetation. The EM data include responses from several obvious metallic objects at grade (e.g. signs and guy wires from utility poles), buried utilities, and reinforced concrete.

Based on the results of the EM and GPR geophysical data, Schnabel 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 June 24, 2014 to perform the Supplemental Preliminary Site Assessment. The additional assessment consisted of advancing six borings into the soils at the project site. Boring B-8 was advanced in the gravel driveway area adjacent to Kipling Road; Borings B-9 and B-10 were advanced adjacent to the southern elevation of the site building; Boring B-11 was advanced adjacent to the western elevation of the site structure; and Borings B-12 and B-13 were advanced adjacent to the northern elevation of the site structure (Appendix I, Figures 3 and 4).



The borings were advanced using direct-push technology (Geoprobe) to depths of 10 feet below ground surface (bgs). Boring locations were determined by F&R staff based on the results of the geophysical survey, site features and proposed construction activities.

Soil sample cores from the borings (B-8 through B-13) 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 and 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.

The soil sample which exhibited the highest PID concentration or the sample at boring termination 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.

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

F&R notes that sample B-9 was damaged during return shipment to QROS; therefore, the original sample was unable to be analyzed during initial laboratory analysis. However, upon discovery, F&R obtained an additional soil sample from the re-sealable plastic bag from Boring B-9 (7-8') and refrigerated the sample on June 25, 2014. QROS picked up the second B-9 sample on June 30 and analyzed the sample that evening. F&R notes that the plastic bag containing the B-9 (7-8') sample had volatilized an additional 24 hours prior to the collection of the second sample. Therefore, the laboratory results of the second Boring B-9 sample may be lower and not indicative of actual conditions.

4.0 Subsurface Conditions

As indicated in the attached Geoprobe Logs (Appendix III), subsurface conditions from existing ground surface to boring termination at a depth of 10 feet included various layers of dry to wet, tan and gray, silty fine to medium sand (USCS – SM); wet, tan or tan-orange, silty sandy clay and sandy silty clay (USCS – CL); and moist to wet, tan, sandy clayey silt (USCS – ML).



Most of the borings were terminated in wet, tan to tan-orange, silty medium sand (USCS – SM) or wet, tan to tan-orange, clayey medium sand (USCS – SC). The groundwater table was encountered at 8 to 9 feet below ground surface at boring locations B-8, B-9, B-12 and B-13. The groundwater table was also apparent at 3 feet below ground surface at boring location B-11. The groundwater table was not encountered at boring location B-10.

5.0 Analytical Results

Petroleum hydrocarbons identified as DRO were encountered in the soil at the six boring locations advanced during the supplemental assessment, at depths ranging from one foot (Boring B-8) to at least eight feet (Boring B-9) feet below ground surface. The laboratory results indicate the soil samples collected from Borings B-8, B-11 and B-12 exceeded the NC DENR Action level of 10 mg/kg for DRO (35.93 mg/kg, 14.34 mg/kg and 187.7 mg/kg DRO, respectively). The laboratory results for the soil samples collected at Borings B-9, B-10, and B-13 indicated DRO levels below the NC DENR Action Level (3.2 mg/kg, 1.31 mg/kg, and 8.7 mg/kg DRO, respectively).

Petroleum hydrocarbons identified as GRO were encountered at two of the boring locations (B-10 and B-13) at seven feet below ground surface. The laboratory results indicate the soil sample collected from Boring B-13 exceeded the NC DENR Action level of 10 mg/kg for GRO (17.43 mg/kg GRO). The laboratory results for the soil sample collected at Boring B-5 indicated GRO levels below the NC DENR Action Level for GRO (1.31 mg/kg GRO).

Benzo(a)pyrene (BaP) was identified in the sample collected from Boring B-12 at seven feet below ground surface. The laboratory results indicate the soil sample collected from Boring B-13 exceeded the NC DENR Action level of 0.096 mg/kg for BaP (4.99 mg/kg BaP).

Compounds identified as 16 PAHs were encountered at the six boring locations at depths ranging from one foot (Boring B-8) to at least eight feet (Boring B-9) feet below ground surface. The laboratory results for the six soil samples collected indicated 16 PAH levels below the NC DENR Action Level for PAHs of 7,041.41 mg/kg.

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



Table 1
Soil Sampling Analytical Results
Ballard Living Trust Property (Parcel #8)
Kipling, Harnett County, North Carolina

Sample ID	Sample Date	Sample Depth (ft bgs)	PID Reading (ppm)	DRO (mg/kg)	GRO (mg/kg)	Total BTEX (mg/kg)	16 EPA PAHs (mg/kg)	BaP (mg/kg)
B-8	6/24/14	0-1	2.0	35.93	<1.1	<1.1	5.14	0.037
B-9	6/24/14	7-8	152	3.2	<0.7	<0.7	0.16	<0.014
B-10	6/24/14	6-7	273	1.31	1.31	<1	0.13	<0.021
B-11	6/24/14	1-2	3.7	14.34	<0.9	<0.9	2.23	<0.019
B-12	6/24/14	6-7	241	187.7	<7.7	<7.7	67.8	4.99
B-13	6/24/14	6-7	48.6	8.7	17.43	<1	0.54	<0.019
NC DENR Action Level				10	10	13.8	7,041.41	0.096

Notes:

ft bgs = feet below ground surface

ppm = parts per million

mg/kg = milligrams/kilogram

NCDENR standard for Total BTEX and 16 PAHs presented as the sum of the individual compounds

Bold indicates soil analytical results above NCDENR Action Levels

6.0 Conclusions and Recommendations

F&R conducted a Supplemental PSA at the Ballard Living Trust Property located at 6659 US Highway 401 in Kipling, Harnett County, North Carolina. A geophysical investigation was performed by Schnabel Engineering to investigate the existence of unknown/known USTs at the site. Based on the results of the geophysical survey, it was determined that USTs were not present at the site, within the surveyed area.

Six geoprobe borings were advanced during the supplemental assessment, outside of the right-of-way. Based on the results of laboratory testing and observed PID readings, it has been determined that petroleum impacted soils exist in the vicinity of Borings B-9 and B-10 at concentrations above laboratory method detection limit, and at Borings B-8, B-11, B-12 and B13 at concentrations above the NC DENR Action Levels for DRO, GRO and Benzo(a)pyrene.

Based on conversations with NCDOT, construction and/or disturbance of the soils outside of the right-of-way is not anticipated. According to the proposed roadway re-alignment plans, no below grade utilities are apparent on the project site. Based on laboratory analysis and PID readings, it is estimated that petroleum impacted soils are present from existing ground surface to the groundwater table (on



average, at a depth of at least eight feet below existing ground surface) in the vicinity of Borings B-8 through B-13.

Based on the depths at which soil contamination was observed, PID readings and our experience, it appears one area of contaminated soil exists at the site as shown in Figure 4. For the purpose of this assessment, we have estimated that the petroleum impacted soils are present in the cleared area of the project site, to an average depth of 8 feet bgs. Using the dimensions in the below table, it can be approximated that the quantity of petroleum impacted soil which may be encountered is approximately 4,764 tons. Petroleum impacted soils that are removed should be properly managed and disposed of in accordance with all NCDENR rules and regulations.

Table 3
Approximate Volume of Petroleum Impacted Soil
Ballard Living Trust Property (Parcel #8)
Kipling, Harnett County, North Carolina

Excavation Location (As Shown on Figure 4)	L x W x D (feet)	Soil Volume (cubic feet)	Soil Volume (tons)
East side of project site	90 x 40 x 8	28,800	1,728
West side of project site	125 x 45 x 8	45,000	2,700
Southeastern corner of project site	20 x 35 x 8	5,600	336
Soil Volume (assuming a soil density of 120 pcf)		Total	4,764

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 similar petroleum UST releases. The amount of impacted soil can only be determined after excavation or by advancing additional borings at the site to possibly 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



SITE VICINITY MAP

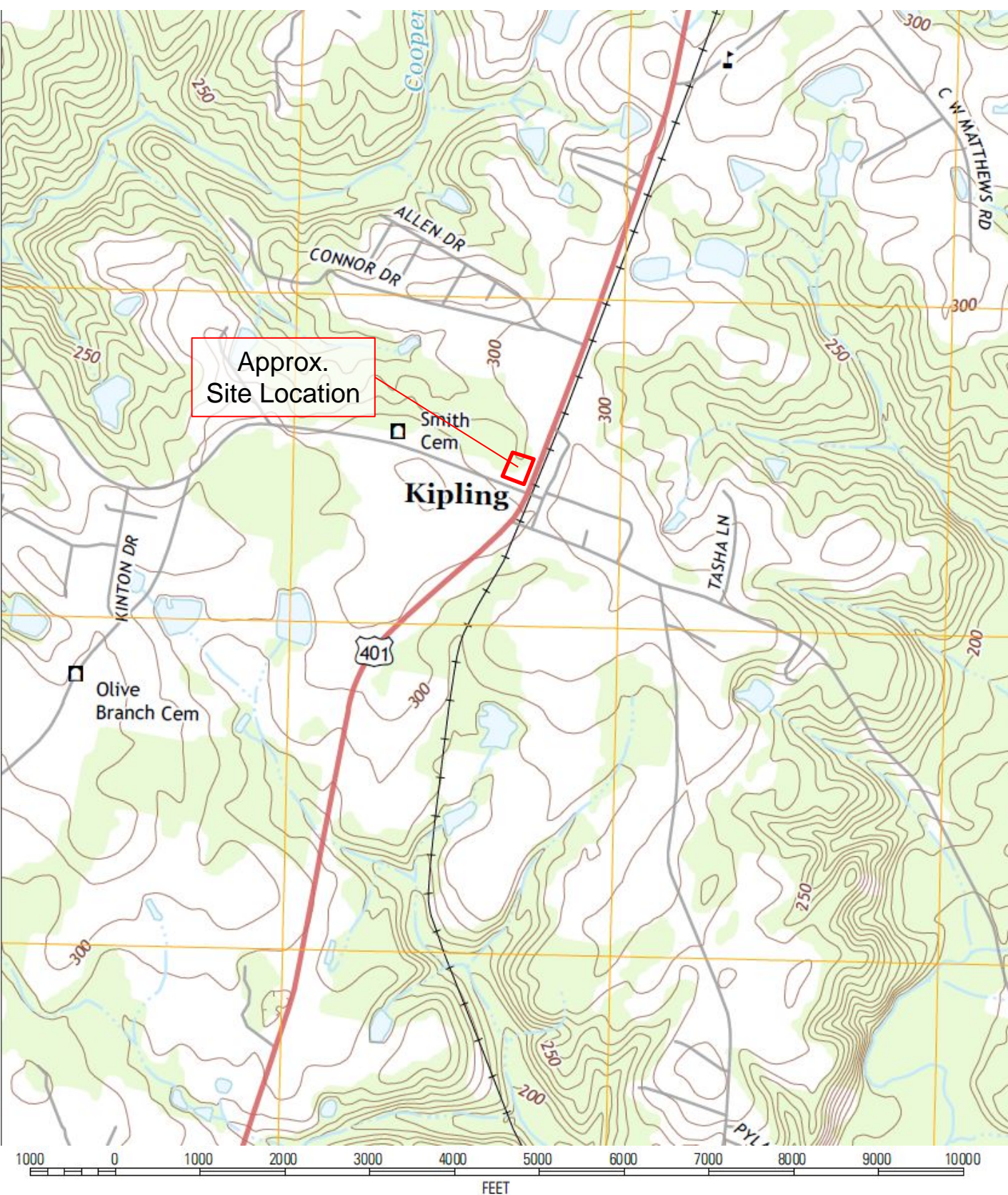
North

SINCE

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CLIENT: NCDOT		FIGURE No.: 1
PROJECT: Ballard Living Trust Property (Parcel #8)		
LOCATION: Kipling, Harnett County, North Carolina		
F&R PROJECT No.: 66R-3222		
DRAWN BY: M. Sabodish		
DATE: July 2014	SCALE: As shown	

© 2014 Google

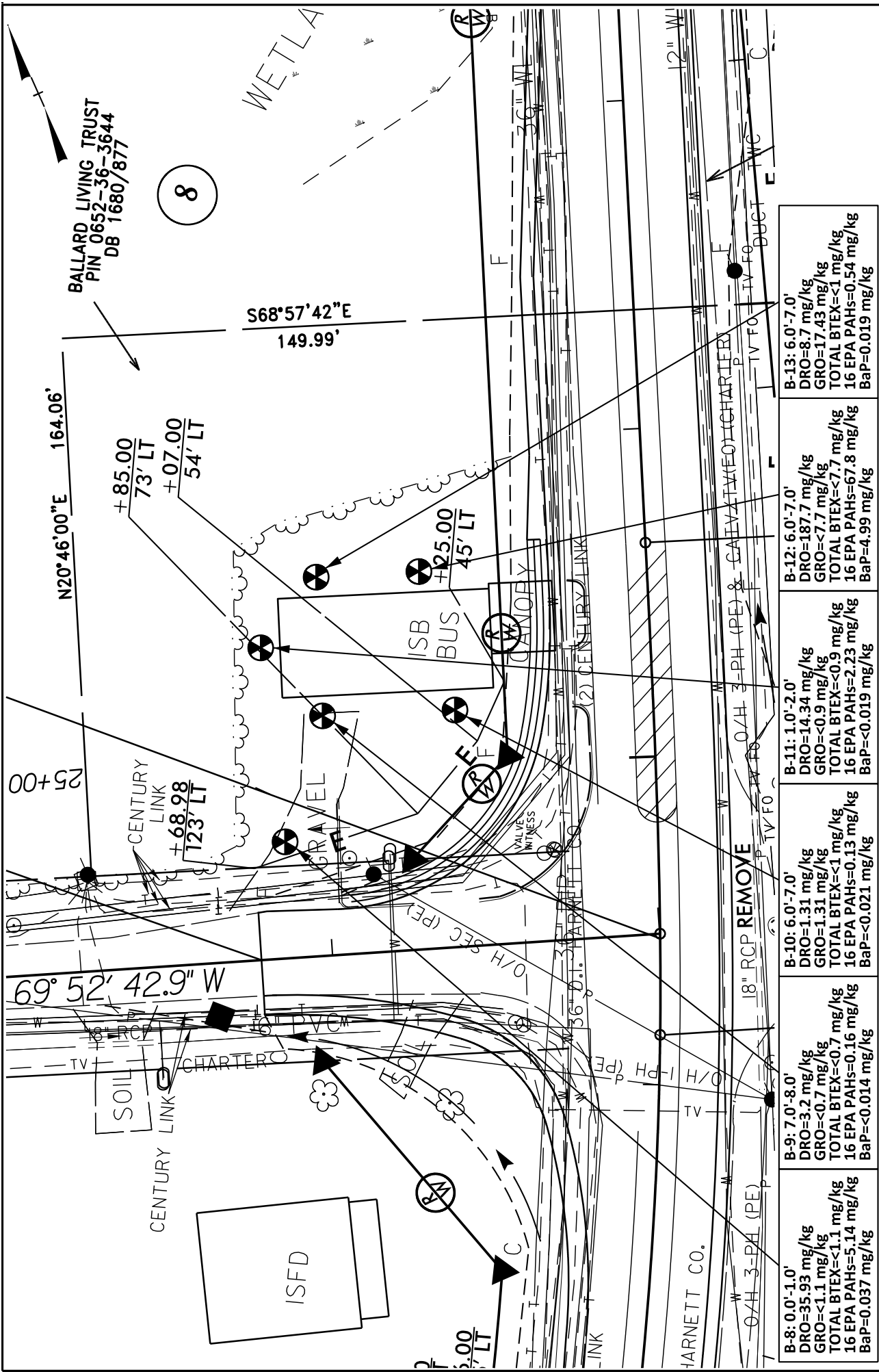


TOPOGRAPHIC MAP – 2013 “Lillington, NC” Quadrangle

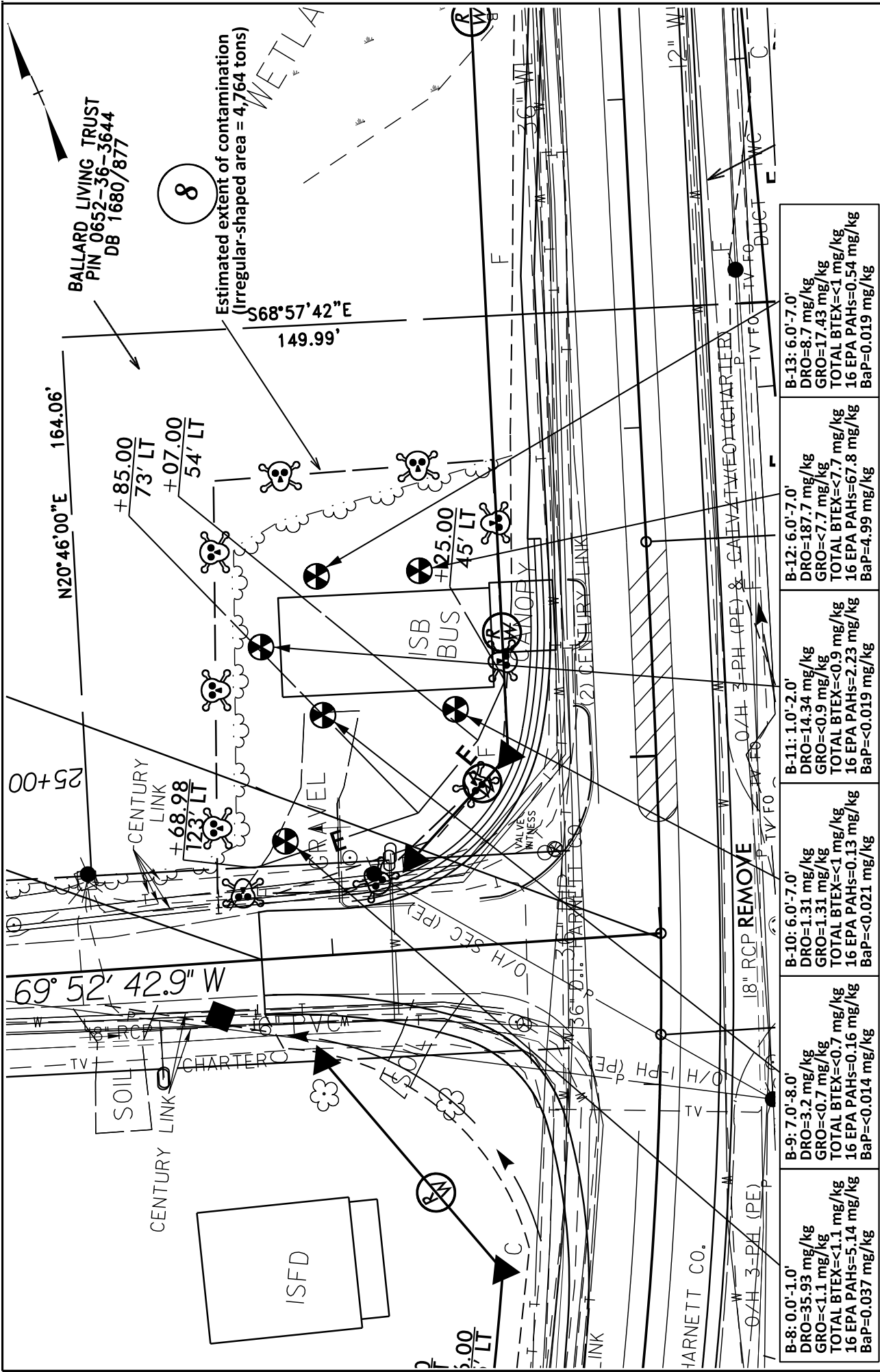
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CLIENT: NCDOT		FIGURE No.: 2
PROJECT: Ballard Living Trust Property (Parcel #8)		
LOCATION: Kipling, Harnett County, North Carolina		
F&R PROJECT No.: 66R-3222		
DRAWN BY: B. Whitley		
DATE: July 2014	SCALE as shown	



LABORATORY RESULTS & BORING LOCATION PLAN					
LEGEND Approximate Geoprobe Boring Location SCALE (FEET) 0 20' 40' 1"=40'	CLIENT: NCDOT PROJECT: Ballard Living Trust Property (Parcel #8) LOCATION: Kipling, Harnett County, North Carolina F&R PROJECT No.: 66R-3222 DRAWN BY: D. Racey DATE: July 2014				
	FROEHLING & ROBERTSON, INC. <i>Engineering Stability Since 1881</i> 310 Hubert Street Raleigh, North Carolina 27603-2302 USA T 919.828.3441 F 919.828.5751 www.fandr.com				
B-8: 0.0'-1.0' DRO=35.93 mg/kg GRO=<1.1 mg/kg TOTAL BTEX=<1.1 mg/kg 16 EPA PAHs=5.14 mg/kg BaP=0.037 mg/kg	B-9: 7.0'-8.0' DRO=3.2 mg/kg GRO=<0.7 mg/kg TOTAL BTEX=<0.7 mg/kg 16 EPA PAHs=0.16 mg/kg BaP=<0.014 mg/kg	B-10: 6.0'-7.0' DRO=1.31 mg/kg GRO=1.31 mg/kg TOTAL BTEX=<1 mg/kg 16 EPA PAHs=0.13 mg/kg BaP=<0.021 mg/kg	B-11: 1.0'-2.0' DRO=14.34 mg/kg GRO=<0.9 mg/kg TOTAL BTEX=<0.9 mg/kg 16 EPA PAHs=2.23 mg/kg BaP=<0.019 mg/kg	B-12: 6.0'-7.0' DRO=187.7 mg/kg GRO=<7.7 mg/kg TOTAL BTEX=<7.7 mg/kg 16 EPA PAHs=67.8 mg/kg BaP=4.99 mg/kg	B-13: 6.0'-7.0' DRO=8.7 mg/kg GRO=17.43 mg/kg TOTAL BTEX=<1 mg/kg 16 EPA PAHs=0.54 mg/kg BaP=0.019 mg/kg



BALLARD LIVING TRUST
PIN 0652-36-3644
DB 1680/877

8

Estimated extent of contamination
(Irregular-shaped area = 4,764 tons)

B-8: 0.0'-1.0' DRO=35.93 mg/kg GRO=<1.1 mg/kg TOTAL BTEX=<1.1 mg/kg 16 EPA PAHs=5.14 mg/kg BaP=0.037 mg/kg	B-9: 7.0'-8.0' DRO=3.2 mg/kg GRO=<0.7 mg/kg TOTAL BTEX=<0.7 mg/kg 16 EPA PAHs=0.16 mg/kg BaP=<0.014 mg/kg	B-10: 6.0'-7.0' DRO=1.31 mg/kg GRO=1.31 mg/kg TOTAL BTEX=<1 mg/kg 16 EPA PAHs=0.13 mg/kg BaP=<0.021 mg/kg	B-11: 1.0'-2.0' DRO=14.34 mg/kg GRO=<0.9 mg/kg TOTAL BTEX=<0.9 mg/kg 16 EPA PAHs=2.23 mg/kg BaP=<0.019 mg/kg	B-12: 6.0'-7.0' DRO=187.7 mg/kg GRO=<7.7 mg/kg TOTAL BTEX=<7.7 mg/kg 16 EPA PAHs=67.8 mg/kg BaP=4.99 mg/kg	B-13: 6.0'-7.0' DRO=8.7 mg/kg GRO=17.43 mg/kg TOTAL BTEX=<1 mg/kg 16 EPA PAHs=0.54 mg/kg BaP=0.019 mg/kg
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ESTIMATED EXTENTS OF SOIL CONTAMINATION	
CLIENT: NCDOT	PROJECT: Ballard Living Trust Property (Parcel #8)
LOCATION: Kipling, Harnett County, North Carolina	F&R PROJECT No.: 66R-3222
DRAWN BY: D. Racey	CHECKED BY: B. Whitley, P.E.
DATE: July 2014	SCALE: 1"=40'

LEGEND	
	Approximate Geoprobe Boring Location
SCALE (FEET) 0 20' 40' 1"=40'	

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APPENDIX II

GEOPHYSICAL REPORT PREPARED BY SCHNABEL ENGINEERING



May 27, 2014

Mr. Michael Sabodish, Ph.D, PE
Froehling & Robertson, Inc.
310 Hubert Street
Raleigh, NC 27603-2302

RE: State Project: R-5523
 WBS Element: 45548.1.1
 County: Harnett
 Description: Realignment of Harnett Central Road at US 401 and Extension of Smith Road (SR 1575)

**Subject: Project 11821014.35, Report on Additional Geophysical Surveys
 Parcel 8, Ballard Living Trust Property, Kipling, North Carolina**

Dear Dr. Sabodish:

SCHNABEL ENGINEERING SOUTH, PC (Schnabel) is pleased to present this report on the geophysical surveys we performed on the subject property. The report includes two 11x17 inch color figures and two 8.5x11 inch color figures. This study was performed in accordance with our proposal to Craig Haden (NCDOT) for Geophysical Surveys to Locate Possible USTs, dated May 15, 2014, as approved by Craig Haden via electronic mail on May 19, 2014, and our existing NCDOT limited services agreement dated June 2, 2011.

INTRODUCTION

The field work described in this report was performed on May 20, 2014 and May 21, 2014, by Schnabel. A previous phase of geophysical surveys was completed within the accessible areas of the NCDOT right-of-way and/or easement at Parcel 8 on April 3, 2014 and April 8, 2014, by Schnabel. Our report on the previous geophysical surveys was sent to you on April 23, 2014. The purpose of the additional geophysical surveys was to evaluate the potential presence of metal underground storage tanks (USTs) in the accessible areas of the portion of Parcel 8 that were not surveyed in our previous phase of work. Photographs of the property are included on Figure 1. The property is located in the northwest quadrant of the US 401 and Kipling Road intersection in Kipling, NC.

The geophysical surveys consisted of an electromagnetic (EM) induction survey and a ground penetrating radar (GPR) survey. The EM survey was performed using a Geonics EM61-MK2 (EM61) instrument. The

EM61 is a time domain metal detector that stores data digitally for later processing and review. Sensitivity to metallic objects is dependent on the size, depth, and orientation of the buried object and the amount of noise (i.e. response from spurious metallic objects) in the area. The EM61 can generally observe a single buried 55 gallon drum at a depth of 10 feet or less. The EM61 makes measurements by creating an electromagnetic pulse and then measuring the response from metallic objects over time after the pulse is generated. We measured and recorded the response at several time increments after the pulse to help evaluate relative size and depth of metallic objects in the subsurface.

The GPR survey was performed over selected EM61 anomalies using a Geophysical Survey Systems SIR-3000 system equipped with a 400 MHz antenna to further investigate and evaluate EM responses that could indicate a potential UST. The depth penetration of the GPR signal, when using a 400 MHz antenna, is normally limited to 6 feet or less.

Photographs of the equipment used are shown on Figure 2.

FIELD METHODOLOGY

We obtained locations of geophysical data points using a sub-meter Trimble Pro-XRS differential global positioning system (DGPS). References to direction and location in this report are based on the US State Plane 1983 System, North Carolina 3200 Zone, using the NAD 83 datum, with units in US survey feet. We also recorded the locations of existing site features (utilities, metal object, etc.) with the DGPS for later correlation with the geophysical data and a site plan provided by the NCDOT.

The EM61 data were collected along parallel survey lines spaced approximately 2.5 feet apart. The EM61 and DGPS data were recorded digitally using a field computer and later transferred to a desktop computer for data processing. The GPR data were primarily collected along survey lines spaced approximately one to two feet apart in orthogonal directions over anomalous EM readings not attributed to cultural features. The GPR data were reviewed in the field to evaluate the possible presence of USTs. The GPR data also were recorded digitally and later transferred to a desktop computer for further review.

DISCUSSION OF RESULTS

The contoured EM61 data collected over Parcel 8 and the GPR survey locations are shown on Figure 3, EM61 Early Time Gate Response, and Figure 4, EM61 Differential Response. Areas outside the colored, contoured EM61 data were not surveyed during this phase of work. Early time data refer to the response measured at a short time after the initial EM pulse is generated. Early time data typically contain responses from all metal objects, small or large and shallow or deep, within the sensitivity range of the instrument. Differential data represent the difference in response between the top and bottom coils of the EM61 instrument at a later time after the initial pulse than early time data. Differential data naturally tend to filter out the effect of surface and very shallowly buried metallic objects. Typically, the differential response emphasizes anomalies from deeper and larger objects such as USTs.

We were not able to access small areas in the northern and western portions of the planned survey due to the presence of thick vegetation. The EM data contain multiple anomalies that we investigated with GPR (as shown on Figures 3 and 4), all of which appear to be the result of buried utilities, reinforced

concrete, or other metal objects at the ground surface or at shallow depths. The geophysical data collected at the site do not indicate the presence of metallic USTs within the areas surveyed.

CONCLUSIONS

As shown in Figures 3 and 4, the EM data we collected over Parcel 8 did not cover a portion of the planned survey area due to the presence of thick vegetation within the planned survey area. The EM data include responses from visible metallic objects at grade (e.g. utilities, scrap metal, etc.). We did not observe anomalies in the EM or the GPR geophysical data at the subject property that we interpret to be the results of metallic USTs within about 6 feet of the ground surface.

LIMITATIONS

These services have been performed and this report prepared for Froehling & Robertson, Inc. and the North Carolina Department of Transportation in accordance with generally accepted guidelines for conducting geophysical surveys. It is generally recognized that the results of geophysical surveys are non-unique and may not represent actual subsurface conditions.

We appreciate the opportunity to have provided these services. Please call if you need additional information or have any questions.

Sincerely,

SCHNABEL ENGINEERING SOUTH, PC



James W. Whitt, LG
Senior Staff Geophysicist



Joel C. Daniel, LG
Senior Geophysicist

JWW:JCD

Attachments: Figures (4)

CC: Craig Haden - NCDOT

FILE: G:\2011-SDE-JOBS\11821014_00_NCDOT_2011_GEOTECHNICAL_UNIT_SERVICES\11821014_35_R-5523_HARNETT_COUNTY\REPORT\PARCEL 8 (TOTAL TAKE)\SCHNABEL ADDITIONAL GEOPHYSICAL REPORT ON PARCEL 8 (R-5523) FINAL.DOCX

Attachments:

- Figure 1 - Parcel 8 Site Photos
- Figure 2 - Photos of Geophysical Equipment Used
- Figure 3 - EM61 Early Time Gate Response
- Figure 4 - EM61 Differential Response



Parcel 8 (Ballard Living Trust Property), looking northwest



Parcel 8 (Ballard Living Trust Property), looking southwest



STATE PROJECT R-5523
NC DEPT. OF TRANSPORTATION
HARNETT CO., NORTH CAROLINA
PROJECT NO. 11821014.35

PARCEL 8
SITE PHOTOS

FIGURE 1



Geonics EM61-MK2 Metal Detector with Trimble DGPS Unit



GSSI SIR-3000 Ground-Penetrating Radar with 400 MHz Antenna

Note: Stock photographs – not taken on site.

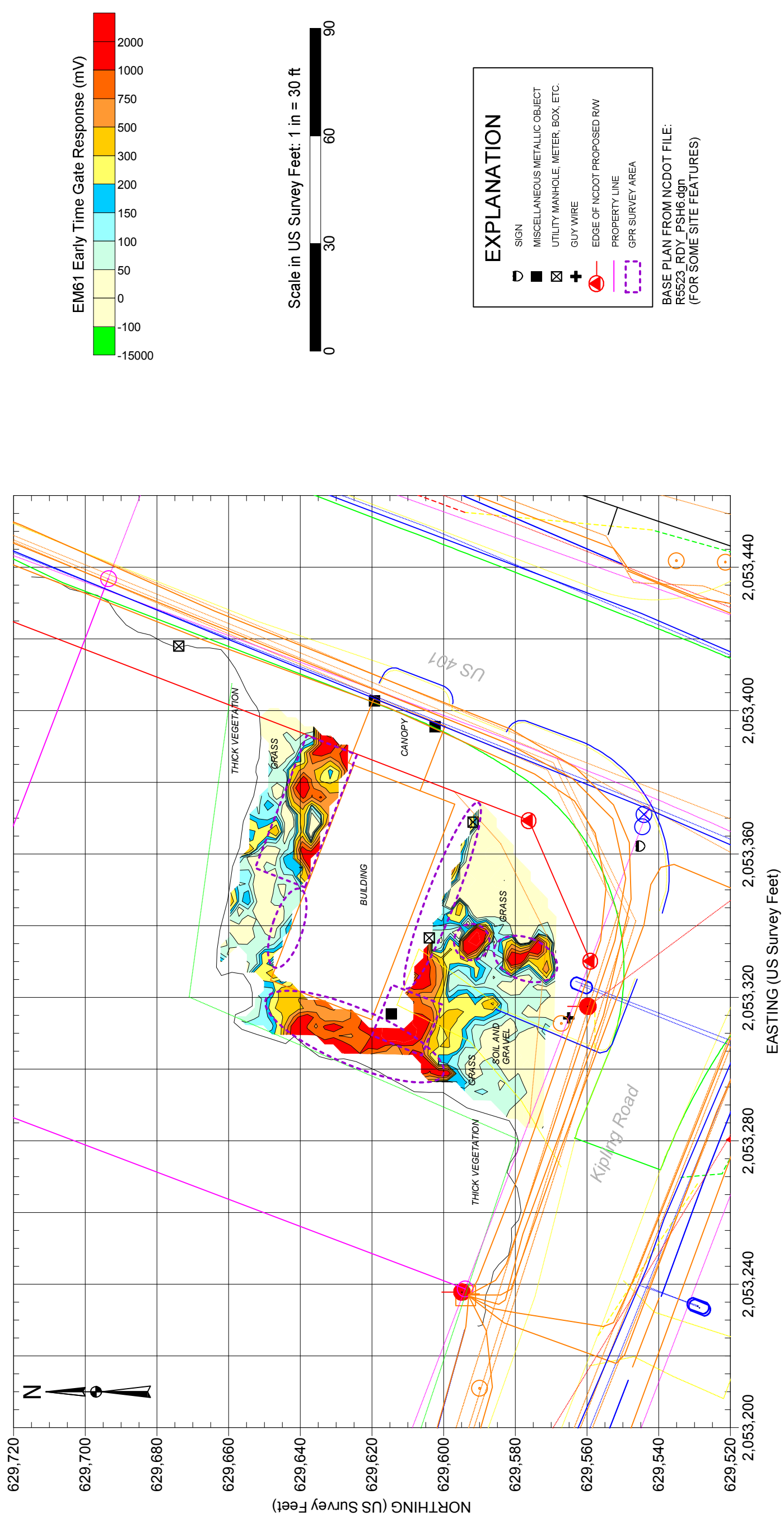


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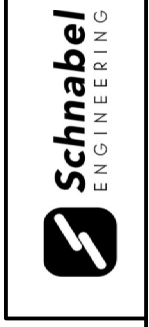
PHOTOS OF
GEOPHYSICAL
EQUIPMENT USED

FIGURE 2

PARCEL 8



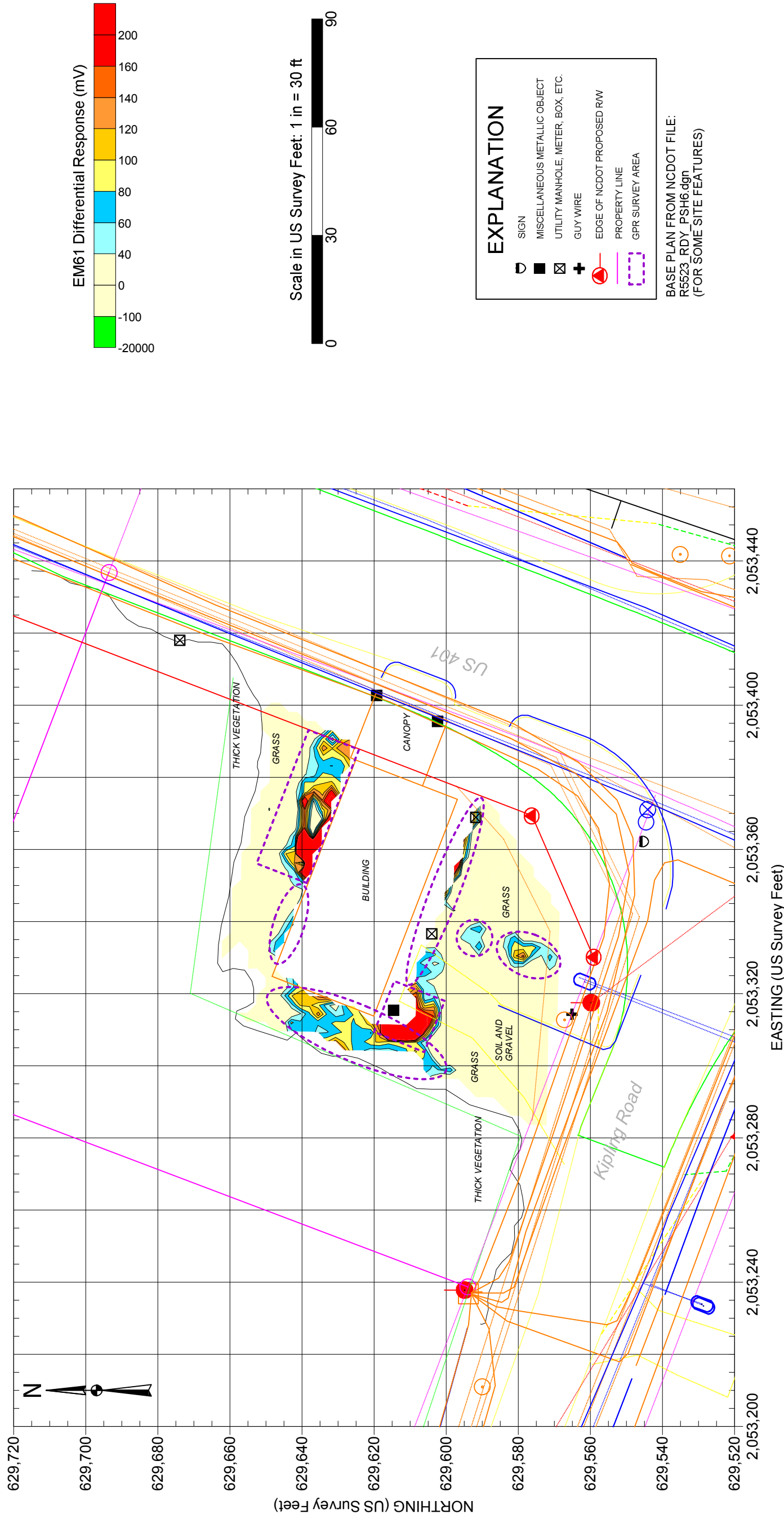
Note: The contour plot shows the earliest and more sensitive time gate of the EM61 bottom coil/channel in millivolts (mV). The EM data were collected on May 20 and May 21, 2014, using a Geonics EM61-MK2 instrument. Positioning for the EM61 survey was provided using a submeter Trimble ProXRS DGPS system. Coordinates are in the US State Plane 1983 System, North Carolina Zone 3200, using the NAD 1983 datum. GPR data were acquired on May 20 and May 21, 2014, using a Geophysical Survey Systems SIR 3000 equipped with a 400 MHz antenna.



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EM61
 EARLY TIME GATE
 RESPONSE
 FIGURE 3

PARCEL 8



Note: The contour plot shows the difference, in millivolts (mV), between the readings from the top and bottom coils of the EM61. The difference is taken to reduce the effect of shallow metal objects and emphasize anomalies caused by deeper metallic objects, such as drums and tanks. The EM data were collected on May 20 and May 21, 2014, using a Geonics EM61-MK2 instrument. Positioning for the EM61 survey was provided using a submeter Trimble ProXRSS DGPS system. Coordinates are in the US State Plane 1983 System, North Carolina 3200 Zone, using the NAD 1983 datum. GPR data were acquired on May 20 and May 21, 2014, using a Geophysical Survey Systems SIR 3000 equipped with a 400 MHz antenna.



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EM61
 DIFFERENTIAL
 RESPONSE



APPENDIX III
GEOPROBE LOGS



Project No: 66R-3222
Client: NCDOT
Project: R-5523 (Parcel 8)
City/State: Harnett County, NC

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

Drilling Method: Geoprobe
Hammer Type: N/A
Date Drilled: 6/24/14
Driller: Regional Probing

Elevation	Depth	Description of Materials (Classification)	*Sample Depth (feet)	PID (ppm)	Remarks
	0.0	Dry, tan, fine to medium SAND (SP), with gravel.	0.0	2.0*	*Sample submitted for laboratory analysis for TPH DRO/GRO, Total BTEX, 16 PAHs, and BaP
	1.0	Moist to wet, tan, silty sandy CLAY (CL), with gravel.	1.0	0.7	
	2.0		2.0	0.6	
	3.0	Moist, orange-tan, sandy silty CLAY (CL).	3.0	0.5	
	4.0		4.0	0.5	
	5.0	Moist, orange-tan, silty sandy CLAY (CL).	5.0	0.4	
	6.0	Moist to wet, orange-tan, clayey medium SAND (SC).	6.0	0.4	
	7.0		7.0	0.7	
	8.0		8.0	0.7	
	9.0		9.0	0.6	Groundwater encountered at 9.0'
	10.0	Geoprobe Boring Terminated at 10.0 feet.	10.0		

GEOPROBE_LOG_R5523_GEOENV_GEOPROBELOGS_PARCEL08.GPJ F&R.GDT 7/7/14

*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.



Project No: 66R-3222
Client: NCDOT
Project: R-5523 (Parcel 8)
City/State: Harnett County, NC

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

Drilling Method: Geoprobe
Hammer Type: N/A
Date Drilled: 6/24/14
Driller: Regional Probing

Elevation	Depth	Description of Materials (Classification)	*Sample Depth (feet)	PID (ppm)	Remarks
		Dry to wet, gray to gray-tan, fine to medium SAND (SP).	0.0	0.6	
			1.0	1.2	
	2.0	Saturated, tan, sandy silty CLAY (CL).	2.0	0.7	
	3.0	Moist to wet, orange-tan, sandy silty CLAY (CL).	3.0	0.7	
	4.0	Moist to wet, orange-tan, silty sandy CLAY (CL).	4.0	0.7	
			5.0	1.0	
			6.0	8.6	
	7.0	Moist to wet, orange-gray to gray, clayey medium SAND (SC).	7.0	152*	*Sample submitted for laboratory analysis for TPH DRO/GRO, Total BTEX, 16 PAHs, and BaP
			8.0	7.7	Petroleum odor from 7'-8' and 9'-10'
			9.0	102	Groundwater encountered at 9.0'
	10.0	Geoprobe Boring Terminated at 10.0 feet.	10.0		

GEOPROBE_LOG_R5523_GEOENV_GEOPROBELOGS_PARCEL08.GPJ F&R.GDT 7/7/14

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Project No: 66R-3222
Client: NCDOT
Project: R-5523 (Parcel 8)
City/State: Harnett County, NC

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

Drilling Method: Geoprobe
Hammer Type: N/A
Date Drilled: 6/24/14
Driller: Regional Probing

Elevation	Depth	Description of Materials (Classification)	*Sample Depth (feet)	PID (ppm)	Remarks
		Moist to wet, tan to tan-gray, silty fine SAND (SM).	0.0	0.8	
			1.0	0.8	
	2.0	Moist, tan, clayey sandy SILT (ML).	2.0	1.1	
	3.0	Moist, tan, sandy clayey SILT (ML).	3.0	0.7	
			4.0	1.1	
	5.0	Moist, tan-gray, clayey medium SAND (SC).	5.0	8.0	
	6.0	Moist, tan-gray, sandy CLAY (CL).	6.0	273*	*Sample submitted for laboratory analysis for TPH DRO/GRO, Total BTEX, 16 PAHs, and BaP Petroleum odor from 6'-10'
	7.0	Moist to wet, gray to orange-tan, silty medium SAND (SM).	7.0	208	
			8.0	209	
			9.0	7.6	
	10.0	Geoprobe Boring Terminated at 10.0 feet.	10.0		

GEOPROBE_LOG_R5523_GEOENV_GEOPROBELOGS_PARCEL08.GPJ F&R.GDT 7/7/14

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Project No: 66R-3222
Client: NCDOT
Project: R-5523 (Parcel 8)
City/State: Harnett County, NC

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

Drilling Method: Geoprobe
Hammer Type: N/A
Date Drilled: 6/24/14
Driller: Regional Probing

Elevation	Depth	Description of Materials (Classification)	*Sample Depth (feet)	PID (ppm)	Remarks
		Moist, gray-brown, clayey silty fine to medium SAND (SC).	0.0	2.2	
	1.0	Moist to saturated, gray, silty fine to medium SAND (SM).	1.0	3.7*	*Sample submitted for laboratory analysis for TPH DRO/GRO, Total BTEX, 16 PAHs, and BaP
			2.0	2.1	
			3.0	1.6	Groundwater encountered at 3.0'
	4.0	Saturated, tan to tan-gray, sandy CLAY (CL).	4.0	39.8	Petroleum odor from 4'-9'
			5.0	183	
	6.0	Wet, tan-gray, clayey medium SAND (SC).	6.0	431	
	7.0	Wet, gray, silty medium SAND (SM).	7.0	381	
	8.0	Wet to saturated, tan, clayey fine to medium SAND (SC).	8.0	122	
			9.0	4.4	
	10.0	Geoprobe Boring Terminated at 10.0 feet.	10.0		

GEOPROBE_LOG_R5523_GEOENVY_GEOPROBELOGS_PARCEL08.GPJ F&R.GDT 7/7/14

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Project No: 66R-3222
Client: NCDOT
Project: R-5523 (Parcel 8)
City/State: Harnett County, NC

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

Drilling Method: Geoprobe
Hammer Type: N/A
Date Drilled: 6/24/14
Driller: Regional Probing

Elevation	Depth	Description of Materials (Classification)	*Sample Depth (feet)	PID (ppm)	Remarks
		Moist, gray, silty fine to medium SAND (SM).	0.0	2.8	
	1.0	Moist to wet, tan-gray, sandy SILT (ML).	1.0	2.5	
	2.0	Wet, tan, sandy silty CLAY (CL).	2.0	2.1	
	3.0	Wet, tan, sandy CLAY (CL).	3.0	2.1	
	4.0	Wet, tan to red-tan, silty medium SAND (SM).	4.0	5.8	
	5.0		5.0		
	6.0		6.0	241*	*Sample submitted for laboratory analysis for TPH DRO/GRO, Total BTEX, 16 PAHs, and BaP Petroleum odor from 6'-10'
	7.0	Wet, gray, clayey medium SAND (SC).	7.0	156	
	8.0	Wet, tan, sandy CLAY (CL).	8.0	19.7	Groundwater encountered at 8.0'
	9.0	Wet, tan, silty medium SAND (SM).	9.0	6.3	
	10.0	Geoprobe Boring Terminated at 10.0 feet.	10.0		

GEOPROBE_LOG_R5523_GEOENV_GEOPROBELOGS_PARCEL08.GPJ F&R.GDT 7/7/14

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Project No: 66R-3222
Client: NCDOT
Project: R-5523 (Parcel 8)
City/State: Harnett County, NC

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

Drilling Method: Geoprobe
Hammer Type: N/A
Date Drilled: 6/24/14
Driller: Regional Probing

Elevation	Depth	Description of Materials (Classification)	*Sample Depth (feet)	PID (ppm)	Remarks
		Moist, orange-gray, silty medium SAND (SM).	0.0	1.0	
	1.0	Wet, tan, fine SAND (SP).	1.0	1.0	
	2.0	Moist to wet, tan, sandy SILT (ML).	2.0	0.8	
	3.0	Moist to wet, tan to tan-gray, silty medium SAND (SM).	3.0	2.0	
			4.0	5.8	
			5.0	48.6*	*Sample submitted for laboratory analysis for TPH DRO/GRO, Total BTEX, 16 PAHs, and BaP Petroleum odor from 5'-6'
	6.0	Moist, gray, medium SAND (SP).	6.0	1003	
	7.0	Moist to saturated, tan-gray to tan, silty fine to medium SAND (SM).	7.0	955	
			8.0	649	
			9.0	10.0	Groundwater encountered at 9.0'
	10.0	Geoprobe Boring Terminated at 10.0 feet.	10.0		

GEOPROBE_LOG_R5523_GEOENV_GEOPROBELOGS_PARCEL08.GPJ F&R.GDT 7/7/14

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APPENDIX IV

SITE PHOTOS



Photo #1: Boring locations B-8 and B-9, facing southeast.



Photo #2: Boring location B-10, facing northeast.



Photo #3: Boring location B-11, facing southeast.



Photo #4: Boring locations B-12 and B-13, facing southwest.



APPENDIX V

LABORATORY ANALYTICAL RESULTS



Hydrocarbon Analysis Results

Client: F&R

Address: Raleigh

Samples taken

Samples extracted

Samples analysed

Tuesday, June 24, 2014

Tuesday, June 24, 2014

Wednesday, June 25, 2014

Contact: Ben Whitley

Operator

Rachel Menoher

Project: NCDOT R-5523

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	P8 B-8 0-1	23.0	<1.1	<1.1	35.93	35.93	32.85	5.14	0.037	37.7	45.1	17.2	V.Deg.PHC 80.2%
s	P8 B-10 6-7	21.0	<1	1.31	1.31	2.62	1.19	0.13	<0.021	81.6	16.2	2.2	Deg Gas (FCM) 63.4%
s	P8 B-11 1-2	19.0	<0.9	<0.9	14.34	14.34	13.13	2.23	<0.019	53.7	35.8	10.5	V.Deg.PHC 76.9%
s	P8 B-12 6-7	154.0	<7.7	<7.7	187.7	187.7	173.6	67.8	4.99	19.4	52.2	28.4	V.Deg.PHC 51.4%
s	P8 B-13 6-7	19.0	<1	17.43	8.7	26.13	3.44	0.54	<0.019	97.4	1.8	0.8	Deg Gas (FCM) 42.5%
s	P12 B-3 1-2	11.0	<0.5	<0.5	0.43	0.43	0.39	0.1	<0.011	51.8	26.1	22.1	V.Deg.PHC 72.7%
s	P12 B-4 5-6	20.0	<1	<1	1.68	1.68	1.54	0.4	<0.02	56.7	22.1	21.2	V.Deg.PHC 67.1%
s	P12 B-5 7-8	19.0	<0.9	<0.9	1.34	1.34	<0.19	<0.02	<0.019	0	36.7	63.3	Deg.Fuel (FCM) 71.6%
s	P12 B-6 4-5	19.0	<0.9	<0.9	0.99	0.99	0.91	0.27	<0.019	38.2	37.2	24.6	V.Deg.PHC 60.8%

Initial Calibrator QC check

OK

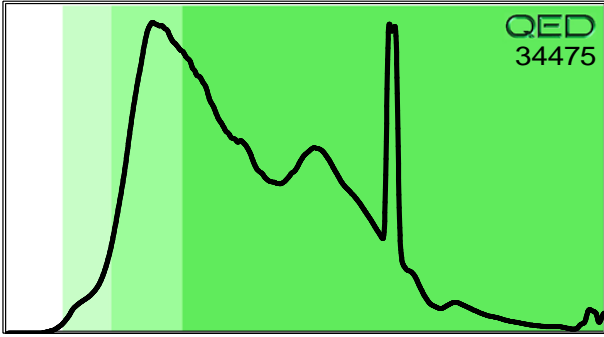
Final FCM QC Check

OK

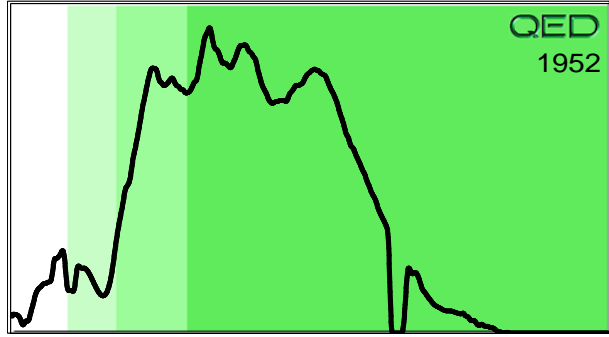
90.8%

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

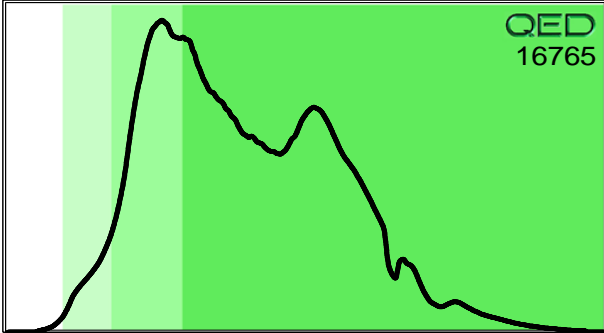
V.Deg.PHC 80.2% P8 B-8 0-1



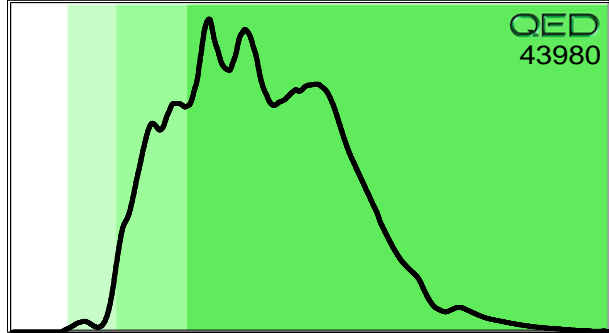
Deg Gas (FCM) 63.4% P8 B-10 6-7



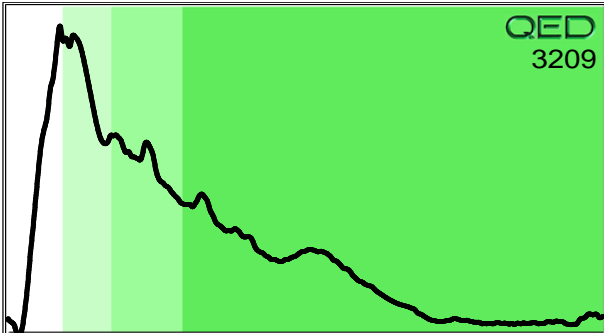
V.Deg.PHC 76.9% P8 B-11 1-2



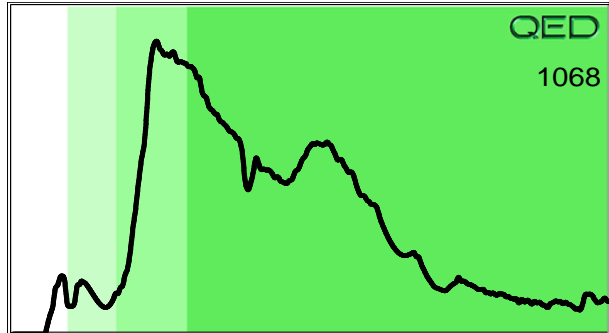
V.Deg.PHC 51.4% P8 B-12 6-7



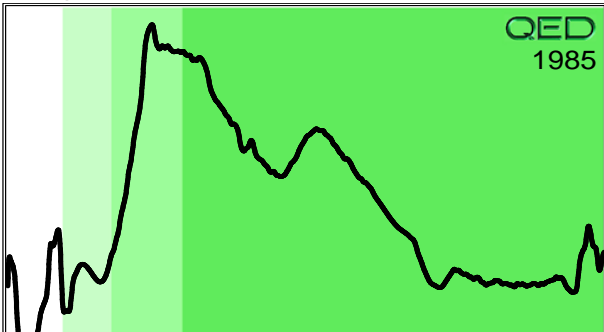
Deg Gas (FCM) 42.5% P8 B-13 6-7



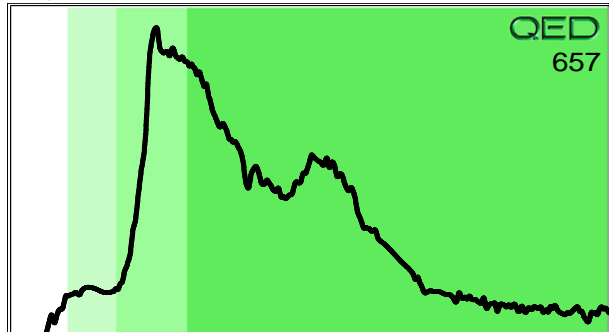
V.Deg.PHC 72.7% P12 B-3 1-2



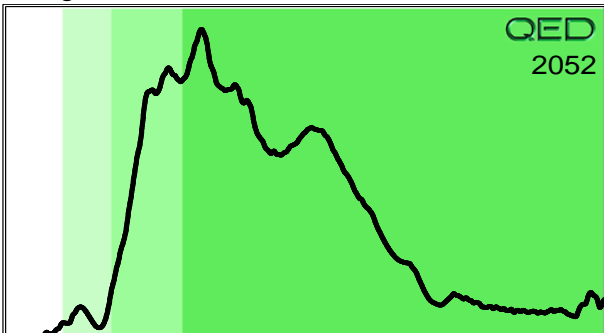
V.Deg.PHC 67.1% P12 B-4 5-6



Deg.Fuel (FCM) 71.6% P12 B-5 7-8

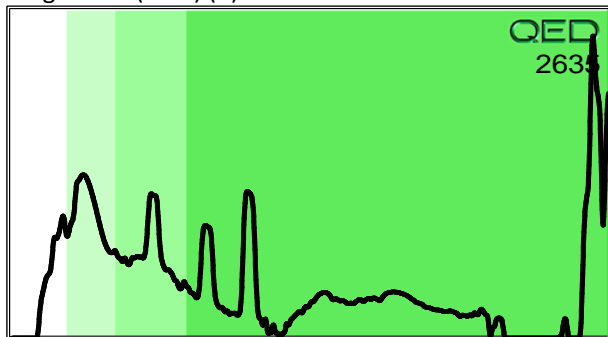


V.Deg.PHC 60.8% P12 B-6 4-5



Deg.Diesel (FCM) (P) 38.3%

Parcel 8 SB-9



SINCE



1881

