



October 9, 2012

Mr. Richard Garrett, LG
Catlin Engineers and Scientists, Inc.
P.O. Box 10279
Wilmington, NC 28404-0279

RE: State Project: U-3338B
 WBS Element: 33932.1.1
 County: New Hanover
 Description: SR 1175 (Kerr Ave.) from Randall Parkway to SR 2649 (MLK, Jr. Parkway)

**Subject: Project 11821014.20, Report on Geophysical Surveys
 Parcel 48: RI CS5, LLC Property, Wilmington, North Carolina**

Dear Mr. Garrett:

SCHNABEL ENGINEERING SOUTH, PC (Schnabel) is pleased to present this report on the geophysical surveys we performed on the subject properties. The report includes two 11x17 color figures and four 8.5x11 color figures.

INTRODUCTION

The work described in this report was performed on September 11, and 20, 2012, by Schnabel under our 2011 contract with the NCDOT. The surveys were performed over the accessible areas of the property as indicated by the NCDOT to support their environmental assessment of the subject property. Photographs of the property are included on Figure 1. The property is located in the northwest quadrant of Kerr Avenue and US 17 (Market Street) in Wilmington, NC. The purpose of the geophysical surveys was to investigate the presence of metal underground storage tanks (USTs) over the accessible areas of the parcel.

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 instrument. The EM61 is a time domain metal detector that is used to locate metal objects buried up to about eight feet below ground surface. When collecting EM61 data, three or four time gates are recorded of the response decay rate. The GPR survey was performed over selected EM61 anomalies, including areas of reinforced concrete, using a Geophysical Survey Systems SIR-3000 system equipped with a 400 MHz antenna. Photographs of the equipment used are shown on Figure 2.

FIELD METHODOLOGY

Locations of geophysical data points were obtained using a sub-meter Trimble Pro-XRS DGPS system. 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 recorded the locations of existing site features (monitoring wells, signs, etc.) with the Trimble system for later correlation with the geophysical data and locations 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 collected along survey lines spaced one to two feet apart in orthogonal directions over areas of reinforced concrete. 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 48 is shown on Figures 3 and 4. The EM61 early time gate data are plotted on Figure 3. The early time gate data provide a more sensitive detection of metal objects than the later time gate data. Figure 4 shows the differential response between the top and bottom coils of the EM61 instrument. The differential response data filters 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.

The early time gate and differential results show anomalies of unknown cause, in addition to those apparently caused by buried utilities or known site features (Figures 3 and 4). The GPR data indicate that the EM anomalies of unknown cause are probably caused by reinforced concrete and surface metal. The GPR data collected over the tank pit area located immediately north of the building indicate the presence of five known USTs, as shown on Figures 3 and 4. Example GPR images showing the reflections from the known USTs are shown on Figures 3, 4, and 5. The GPR data indicate that known USTs Nos. 1 and 2 are buried approximately 3.5 to 4.5 feet below ground surface, and are about 8 feet in diameter and about 27.5 feet long, equivalent to a capacity of about 10,000 gallons. The GPR data indicate that known UST No. 3 is buried approximately 3.5 to 4.5 feet below ground surface, and is about 8 feet in diameter and about 16 feet long, equivalent to a capacity of about 6,000 gallons. The GPR data indicate that known UST No. 4 is buried approximately 3.5 to 4.5 feet below ground surface, and is about 5.5 feet in diameter and about 24 feet long, equivalent to a capacity of about 4,000 gallons. The GPR data indicate that known UST No. 5 is buried approximately 3.0 to 4.0 feet below ground surface, and is about 5.5 feet in diameter and about 12 feet long, equivalent to a capacity of about 2,000 gallons. Photographs of the approximate locations of the known USTs that were marked in the field are included on Figure 6.

CONCLUSIONS

Our evaluation of the geophysical data collected on the subject property on Project U-3338B in Wilmington, NC indicates the following:

The geophysical data indicate the presence of five known USTs on Parcel 48. Known USTs Nos. 1 and 2 are about 10,000-gallon capacity and are buried about 3.5 to 4.5 feet below ground surface. Known UST No. 3 is about 6,000-gallon capacity and is buried about 3.5 to 4.5 feet below ground surface. Known UST No. 4 is about 4,000-gallon capacity and is buried about 3.5 to 4.5 feet below ground surface. Known UST No. 5 is about 2,000-gallon capacity and is buried about 3.0 to 4.0 feet below ground surface.

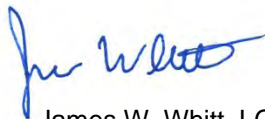
LIMITATIONS

These services have been performed and this report prepared for Catlin Engineers and Scientists, 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.

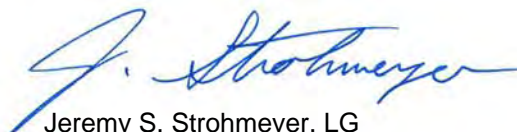
We appreciate the opportunity to have provided these services. Please call if you need additional information or have any questions.

Sincerely,

SCHNABEL ENGINEERING SOUTH, PC



James W. Whitt, LG
Senior Staff Geophysicist



Jeremy S. Strohmeyer, LG
Project Manager

JW:JS

Attachments: Figures (6)

CC: Terry Fox, NCDOT

FILE: G:\2011-SDE-JOBS\11821014_00_NCDOT_2011_GEOTECHNICAL_UNIT_SERVICES\11821014_20_U-3338B_NEW_HANOVER_COUNTY\REPORT\PARCEL 48\SCHNABEL GEOPHYSICAL REPORT ON PARCEL 48 (U-3338B).DOCX



Parcel 48 (RI CS5, LLC Property), looking north



Parcel 48 (RI CS5, LLC Property), looking east



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.

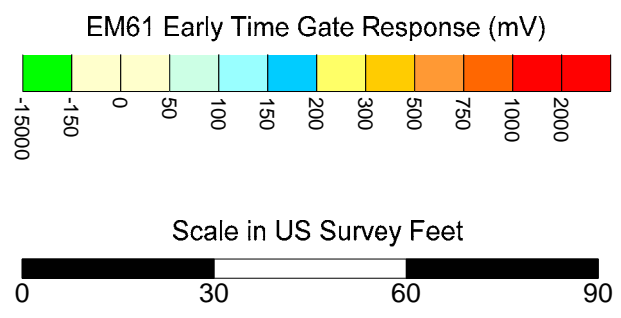
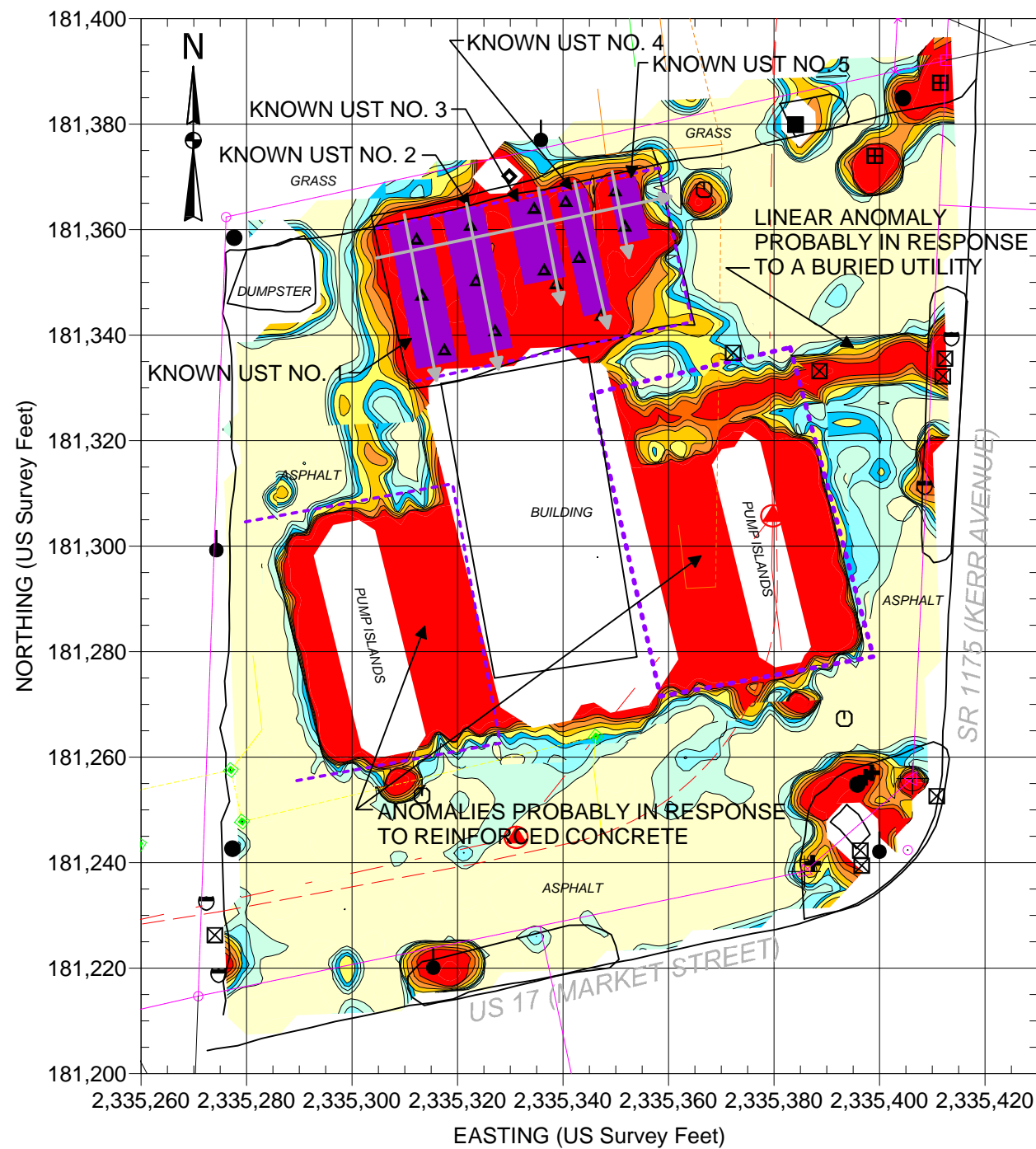


NC DEPT. OF TRANSPORTATION
STATE PROJECT U-3338B
NEW HANOVER COUNTY, NC
PROJECT NO. 11821014.20

PHOTOS OF
GEOPHYSICAL
EQUIPMENT USED

FIGURE 2

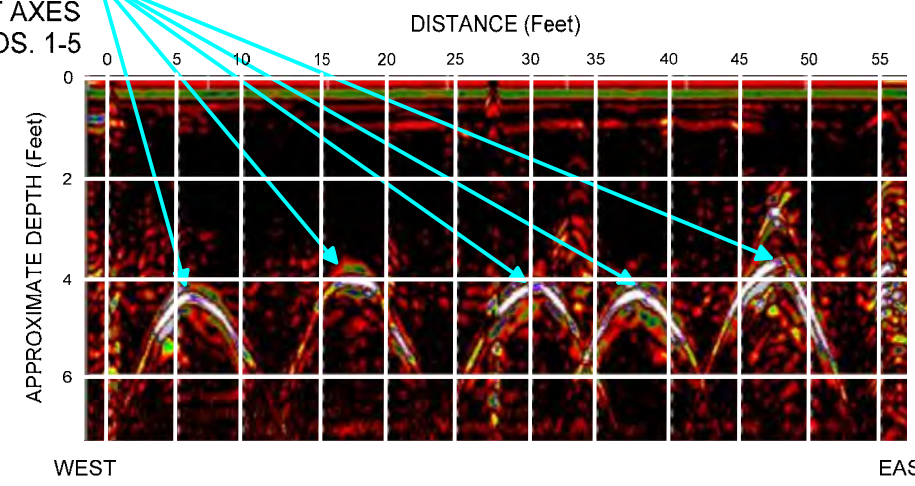
PARCEL 48



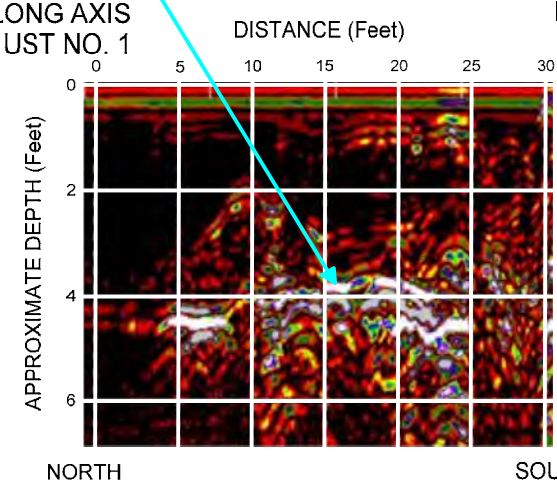
EXPLANATION	
	SIGN
	MISCELLANEOUS METALLIC OBJECT
	UTILITY MANHOLE, METER, BOX, ETC.
	STORMSEWER INLET
	VENT PIPE
	GUY WIRE
	LIGHTPOLE
	UST FILLPORT OR ACCESS PLATE
	MONITORING WELL
	UTILITY POLE
	EDGE OF NCDOT PROPOSED R/W
	PROPERTY LINE
	EXAMPLE GPR LINE LOCATION
	GPR SURVEY AREA
	LOCATION OF KNOWN OR SUSPECT USTS MARKED ON SITE

REF.: NCDOT FILE: u3338b_rdy_psh_s12.dgn (FOR SOME SITE FEATURES)

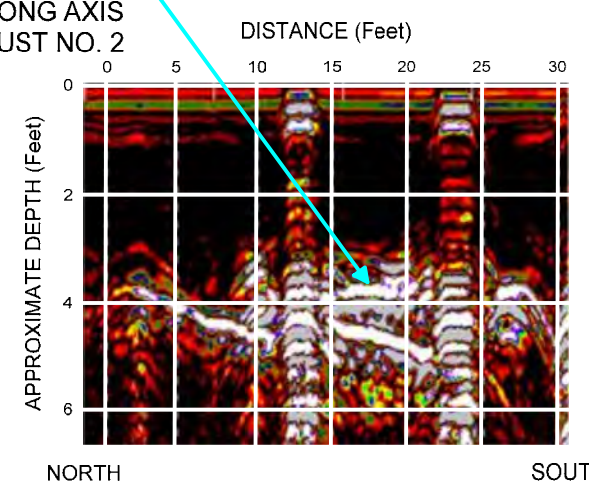
EXAMPLE GPR RESPONSES FROM THE SHORT AXES OF KNOWN UST NOS. 1-5



EXAMPLE GPR RESPONSE FROM THE LONG AXIS OF KNOWN UST NO. 1



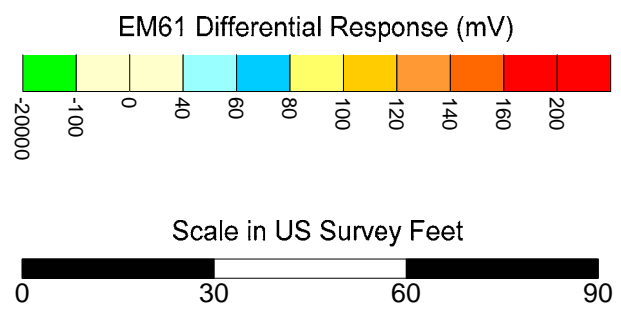
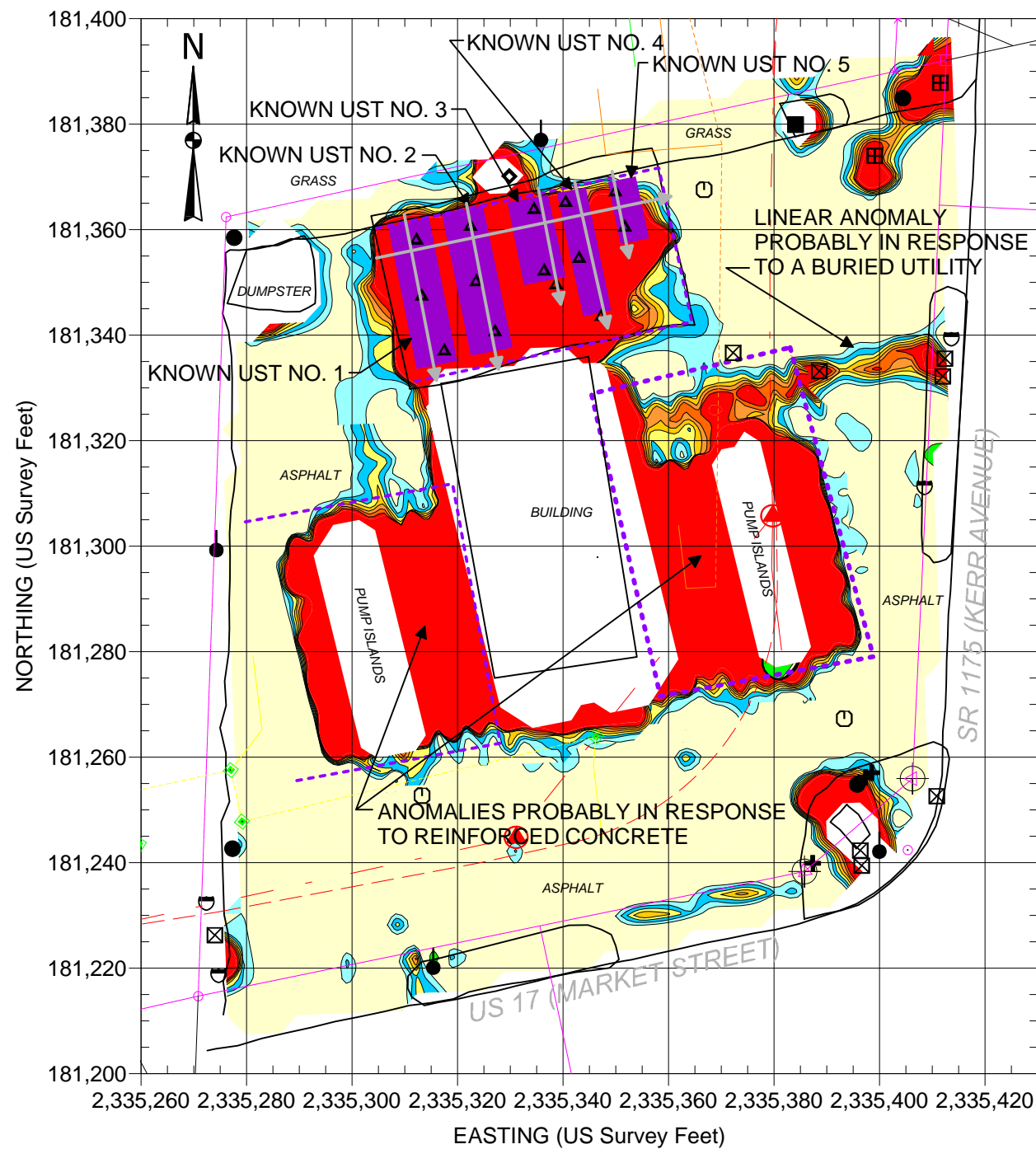
EXAMPLE GPR RESPONSE FROM THE LONG AXIS OF KNOWN UST NO. 2



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 September 11, 2012, 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 September 20, 2012, using a Geophysical Survey Systems SIR 3000 equipped with a 400 MHz antenna.

	NC DEPARTMENT OF TRANSPORTATION STATE PROJECT U-3338B NEW HANOVER COUNTY, NC PROJECT NO. 11821014.20	EM61 EARLY TIME GATE RESPONSE FIGURE 3
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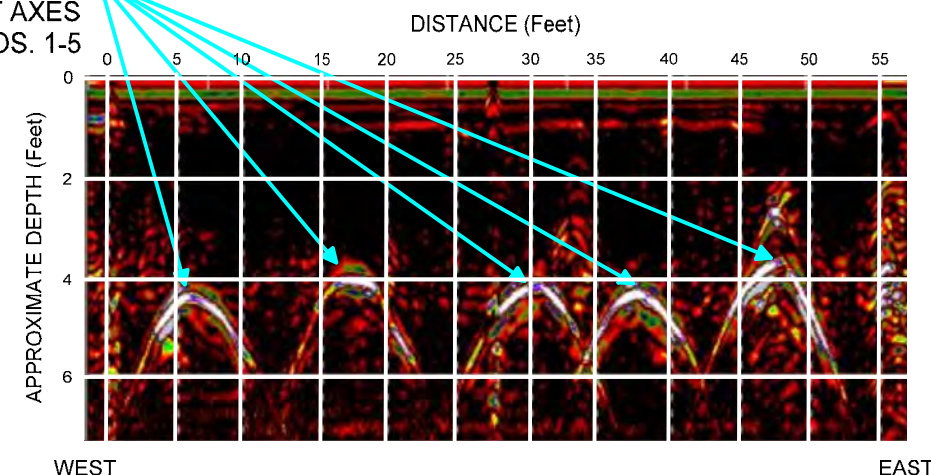
PARCEL 48



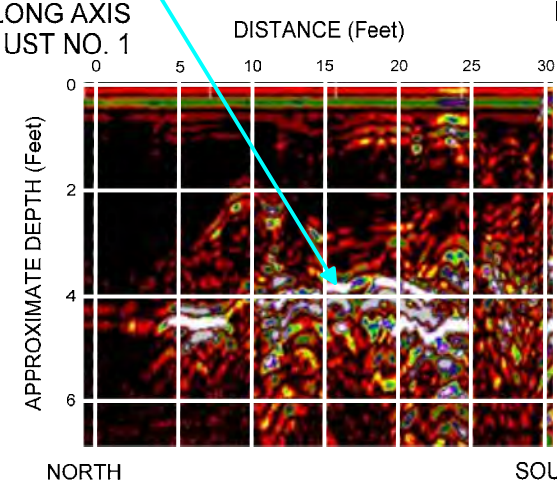
EXPLANATION	
	SIGN
	MISCELLANEOUS METALLIC OBJECT
	UTILITY MANHOLE, METER, BOX, ETC.
	STORMSEWER INLET
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	EDGE OF NCDOT PROPOSED R/W
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(FOR SOME SITE FEATURES)

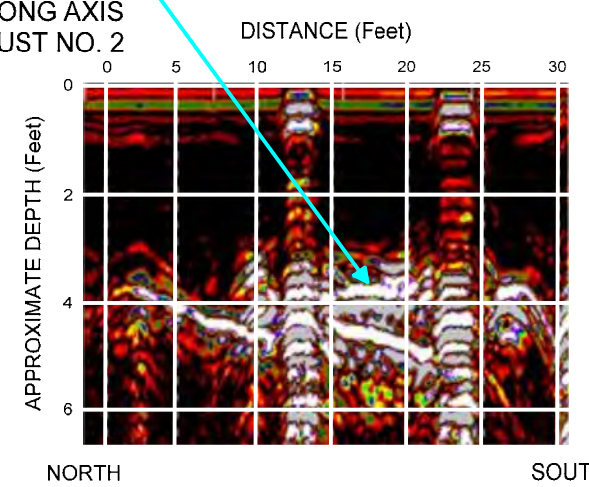
EXAMPLE GPR RESPONSES FROM THE SHORT AXES OF KNOWN UST NOS. 1-5



EXAMPLE GPR RESPONSE FROM THE LONG AXIS OF KNOWN UST NO. 1



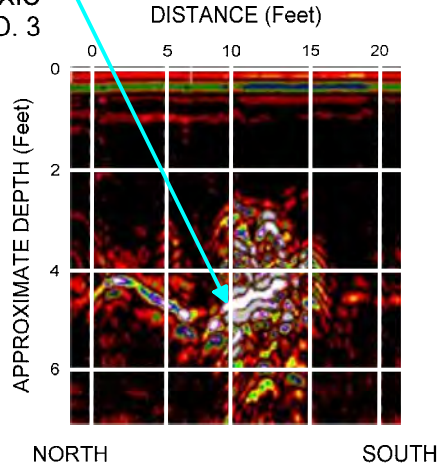
EXAMPLE GPR RESPONSE FROM THE LONG AXIS OF KNOWN UST NO. 2



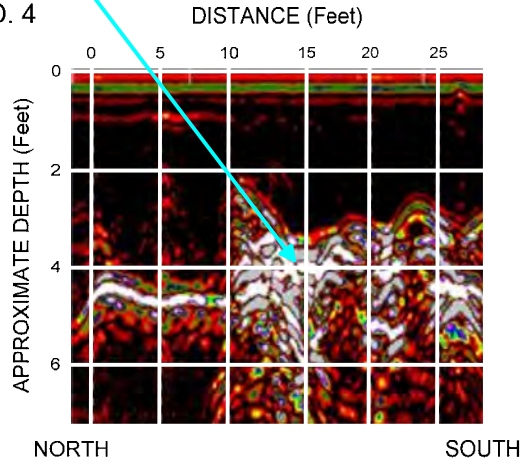
Note: The contour plot shows the difference, in millivolts (mV), between the readings from the top and bottom coils of the EM61. The difference is taken to reduce the effect of shallow metal objects and emphasize anomalies caused by deeper metallic objects, such as drums and tanks. The EM data were collected on September 11, 2012, 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 3200 Zone, using the NAD 1983 datum. GPR data were acquired on September 20, 2012, using a Geophysical Survey Systems SIR 3000 equipped with a 400 MHz antenna.

	NC DEPARTMENT OF TRANSPORTATION STATE PROJECT U-3338B NEW HANOVER COUNTY, NC PROJECT NO. 11821014.20	EM61 DIFFERENTIAL RESPONSE
	FIGURE 4	
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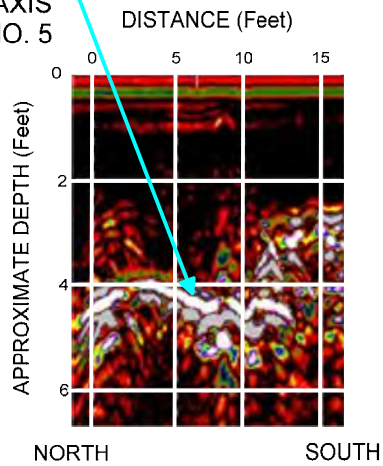
EXAMPLE GPR RESPONSE
FROM THE LONG AXIS
OF KNOWN UST NO. 3



EXAMPLE GPR RESPONSE
FROM THE LONG AXIS
OF KNOWN UST NO. 4



EXAMPLE GPR RESPONSE
FROM THE LONG AXIS
OF KNOWN UST NO. 5





Parcel 48 (RI CS5, LLC Property), looking north. Photo shows approximate marked location of known UST Nos. 1 and 2 near the northwest corner of the building.



Parcel 48 (RI CS5, LLC Property), looking north. Photo shows approximate marked location of known UST Nos. 3, 4, and 5 near the northeast corner of the building.