



January 13, 2016
Revised January 15, 2016

Mr. Mohammed A. Mulla, P.E., CPM, MCE
NCDOT, Geotechnical Engineering Unit
1020 Birch Ridge Drive
Raleigh, NC 27610

RE: State Project: U-3109A
 WBS Element: 34900.1.2
 County: Alamance
 Description: Mebane-NC 119 Relocation from I-40/85 to Mebane Rogers Rd.

Subject: Project 14821010.11, Report on Geophysical Surveys
Parcel 10, Luihn Four, Inc. Property, Mebane, North Carolina

Dear Mr. Mulla:

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 for Geophysical Surveys to Locate Possible USTs, dated October 19, 2015, as approved by Terry Farr (NCDOT) on November 13, 2015.

INTRODUCTION

The field work described in this report was performed on November 18, 2015 and December 4 and December 14, 2015, by Schnabel. The purpose of the geophysical surveys was to evaluate the potential presence of metal underground storage tanks (USTs) in the accessible areas of the NCDOT right-of-way and/or easement at Parcel 10. Photographs of the property are included on Figure 1. The property is located at the southwestern quadrant of the intersection of I-85/40 and NC 119 Hwy (South Fifth Street) in Mebane, 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 multiple

electromagnetic pulses and then measuring the response from metallic objects over time after each pulse is generated. We measure and record the response at several time increments after each 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 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 Geo7X 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 (signs, utilities, etc.) with the DGPS for later correlation with the geophysical data and a digital site plan provided by the NCDOT. The digital site plan for this project appears to show an offset from the GPS positions collected by our DGPS that is somewhat consistent in direction and distance at this site and the other sites (Parcel 12, Parcel 21) where we have collected geophysical data for this project. Based on our communication with Gordon Box about this issue, we did not shift the site plan data in an attempt to overlay it on the geophysical data accurately.

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 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 10 and the GPR survey area locations are shown on Figure 3, EM61 Early Time Gate Response, and Figure 4, EM61 Differential Response. We were not able to access some areas throughout the planned survey area due to the presence of thick vegetation, steep slopes, riprap, etc. There was also a vehicle parked in the survey area during multiple trips to the project sites, which the tenants were not able to move. Areas outside the colored, contoured EM61 data were not surveyed. 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.

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 reinforced concrete, buried utilities, 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 10 did not cover portions of the planned survey area due to the presence of thick vegetation, steep slopes, riprap, and a vehicle within the planned survey area. The EM data include responses from several visible metallic objects at grade (e.g. signs, utilities, etc.). We did not observe anomalies in the EM or the GPR geophysical data at the subject property that we interpret to be attributable to metallic USTs within about 6 feet of the ground surface.

LIMITATIONS

These services have been performed and this report prepared for 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
Project Geophysicist

DocuSigned by:
James Whitt
2135EEF814924D1...
1/21/2016



Joel C. Daniel, LG
Senior Geophysicist

DocuSigned by:
Joel C. Daniel
03A98DA013B4481...
1/22/2016

JWW:JCD

Attachments: Figures (4)

CC: Gordon Box - NCDOT

FILE: G:\2014\GREENSBORO\14821010.00_NCDOT_2014_GEOTECHNICAL_UNIT_SERVICES\14821010.11_U-3109A_ALAMANCE_CO\03-SE PRODUCTS\03-REPORTS\02-FINAL\GEOPHYSICS\PARCEL 10\SCHNABEL GEOPHYSICAL REPORT ON PARCEL 10 (U-3109A) FINAL.DOCX

Attachments:

- Figure 1 - Parcel 10 Site Photos
- Figure 2 - Photos of Geophysical Equipment Used
- Figure 3 - EM61 Early Time Gate Response
- Figure 4 - EM61 Differential Response



Parcel 10 (Luihn Four, Inc. Property), looking north



Parcel 10 (Luihn Four, Inc. Property), looking southwest



Geonics EM61-MK2 Metal Detector with Trimble DGPS Unit



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

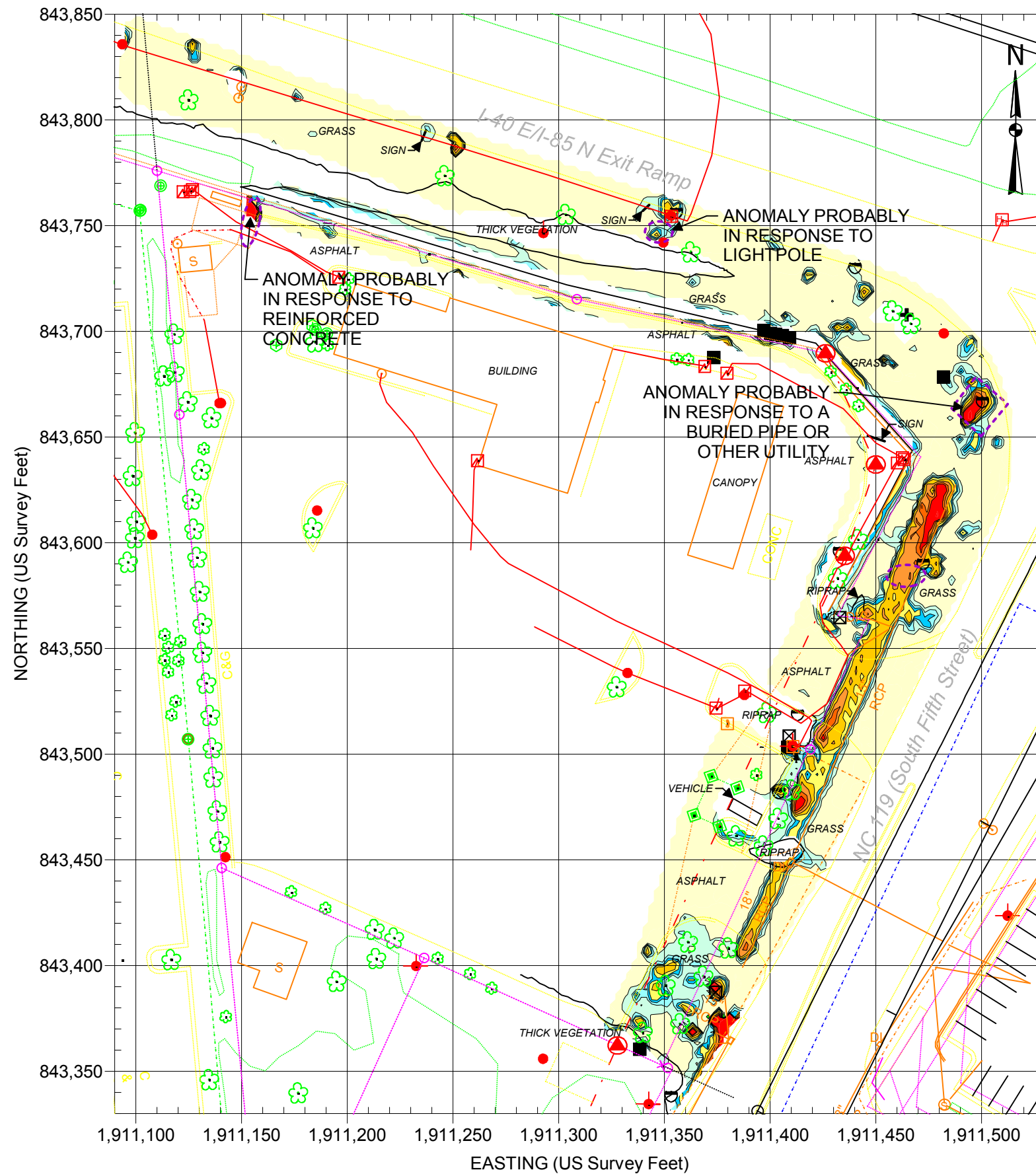
Note: Stock photographs – not taken on site.



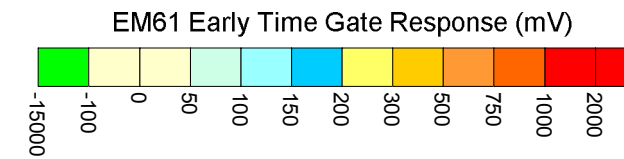
STATE PROJECT U-3109A
NC DEPT. OF TRANSPORTATION
ALAMANCE CO., NORTH CAROLINA
PROJECT NO. 14821010.11

PHOTOS OF
GEOPHYSICAL
EQUIPMENT USED

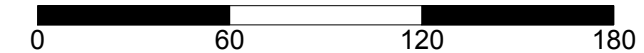
FIGURE 2



PARCEL 10 - Luihn Four, Inc. Property



Scale in US Survey Feet: 1 in = 60 ft



EXPLANATION	
	MISCELLANEOUS METALLIC OBJECT
	UTILITY MANHOLE, METER, BOX, ETC.
	SIGN
	GUY WIRE
	EDGE OF NCDOT PROPOSED RW
	GPR SURVEY AREA

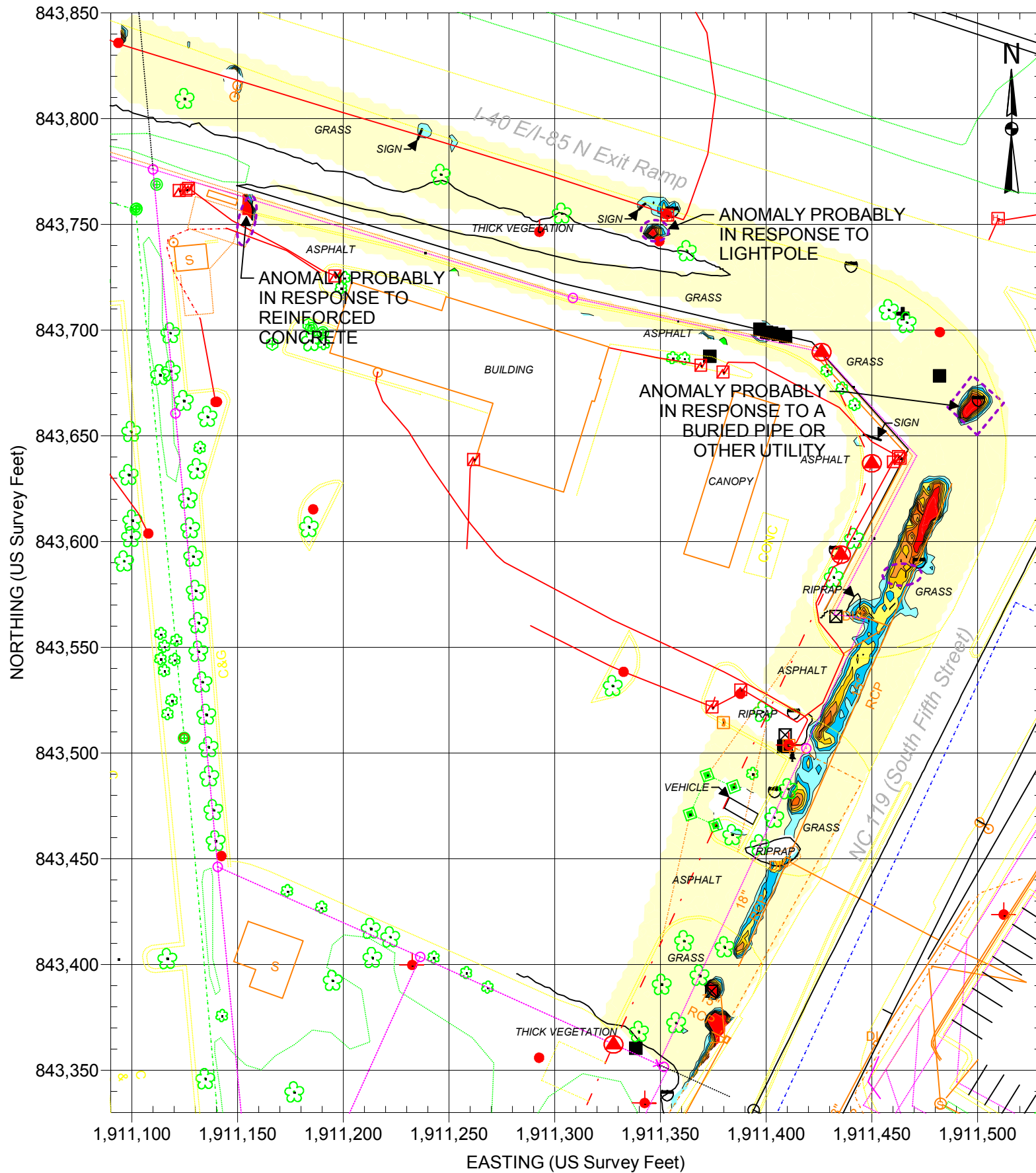
BASE PLAN FROM NCDOT FILE:
 U3109a_ncdot_fs.dgn &
 U3109A_Rdy_row
 (FOR SOME SITE FEATURES)

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 November 18, 2015, using a Geonics EM61-MK2 instrument. Positioning for the EM61 survey was provided using a submeter Trimble Geo7X 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 December 4 and December 14, 2015, using a Geophysical Survey Systems SIR 3000 equipped with a 400 MHz antenna.

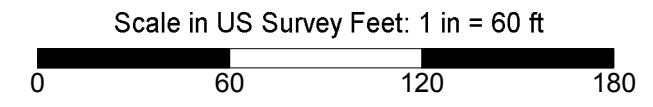
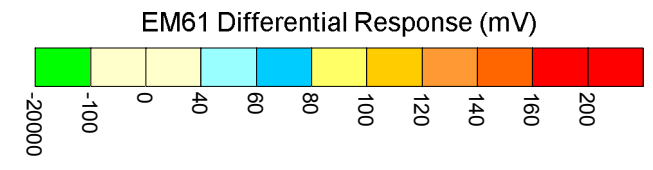


STATE PROJECT U-3109A
 NC DEPARTMENT OF TRANSPORTATION
 ALAMANCE COUNTY, NC
 PROJECT NO. 14821010.11

EM61
 EARLY TIME GATE
 RESPONSE



PARCEL 10 - Luihn Four, Inc. Property



EXPLANATION	
■	MISCELLANEOUS METALLIC OBJECT
⊠	UTILITY MANHOLE, METER, BOX, ETC.
⊙	SIGN
+	GUY WIRE
⊠	EDGE OF NCDOT PROPOSED RW
⊠	GPR SURVEY AREA

BASE PLAN FROM NCDOT FILE:
 U3109a_ncdot_fs.dgn &
 U3109A_Rdy_row
 (FOR SOME SITE FEATURES)

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 November 18, 2015, using a Geonics EM61-MK2 instrument. Positioning for the EM61 survey was provided using a submeter Trimble Geo7X 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 December 4 and December 14, 2015, using a Geophysical Survey Systems SIR 3000 equipped with a 400 MHz antenna.

	STATE PROJECT U-3109A NC DEPARTMENT OF TRANSPORTATION ALAMANCE COUNTY, NC PROJECT NO. 14821010.11	EM61 DIFFERENTIAL RESPONSE
		FIGURE 4