Schnabel
ENGINEERING

April 3, 2012

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

RE:
State Project: R-2519B
WBS Element: 35609.1.1
County: Yancey
Description: Micaville – US 19 East from NC 90 in Yancey County to Multi-Lane Section West of Spruce Pine in Mitchell County

Subject: **Project 11821014.07, Report on Geophysical Surveys**
Ben Howell Property, Yancey County, North Carolina

Dear Mr. 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 color figures and three 8.5x11 color figures.

INTRODUCTION

The work described in this report was performed on January 17, February 2 and 3, and March 6, 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 Ben Howell property is located east of NC 80 N and on the northeast side of US 19 E (5441 US 19 E). The purpose of the geophysical surveys was to investigate the presence of metal underground storage tanks (USTs) in the accessible areas of the right-of-way and/or easement.

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 and 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 the Howell Property are 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, reinforced concrete, or known site features (Figures 3 and 4). The GPR data collected around the pump island in front of the building that was previously Wilson General Store indicate the presence of two probable USTs, as shown on Figures 3 and 4. The GPR data indicate that the probable USTs (probable UST Nos. 1 and 2) are buried approximately 1.0 to 2.0 feet below ground surface, and are about 3.5 feet in diameter and about 7.5 feet long, equivalent to a capacity of about 560 gallons. The GPR data collected near the southwest corner of the building that was previously Wilson General Store indicate the presence of a probable UST, as shown on Figures 3 and 4. The GPR data indicate that the probable UST (probable UST No. 3) is buried approximately 1.5 to 2.5 feet below ground surface, and is about 3 feet in diameter and about 5 feet long, equivalent to a capacity of about 270 gallons. Example GPR images showing the reflections from the probable USTs are also shown on Figures 3 and 4. Photographs of the approximate locations of the probable USTs that were marked in the field are included on Figure 5.

CONCLUSIONS

Our evaluation of the geophysical data collected on the subject property on Project R-2519B in Micaville, NC indicates the following:

The geophysical data indicate the presence of three probable USTs on the Howell Property. Probable UST Nos. 1 and 2 are about 560-gallon capacity and are buried about 1.0 to 2.0 feet below ground surface. Probable UST No. 3 is about 270-gallon capacity and is buried about 1.5 to 2.5 feet below 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

Jeremy S. Strohmeyer, LG
Project Manager

Gerald C. Robblee, PE
Senior Associate

JW:JS:GR
Attachments: Figures (5)
CC: NCDOT, Terry Fox, LG
FILE: G:\2011-SDE-JOBS\11821014_00_NCDOT_2011_GEOTECHNICAL_UNIT_SERVICES\11821014_07_R-2519B_YANCEY_COUNTY\REPORT\HOWELL PROPERTY\SCHNABEL GEOPHYSICAL REPORT ON THE HOWELL PROPERTY (R-2519B).DOCX

Ben Howell Property, looking northwest

Ben Howell Property, looking north

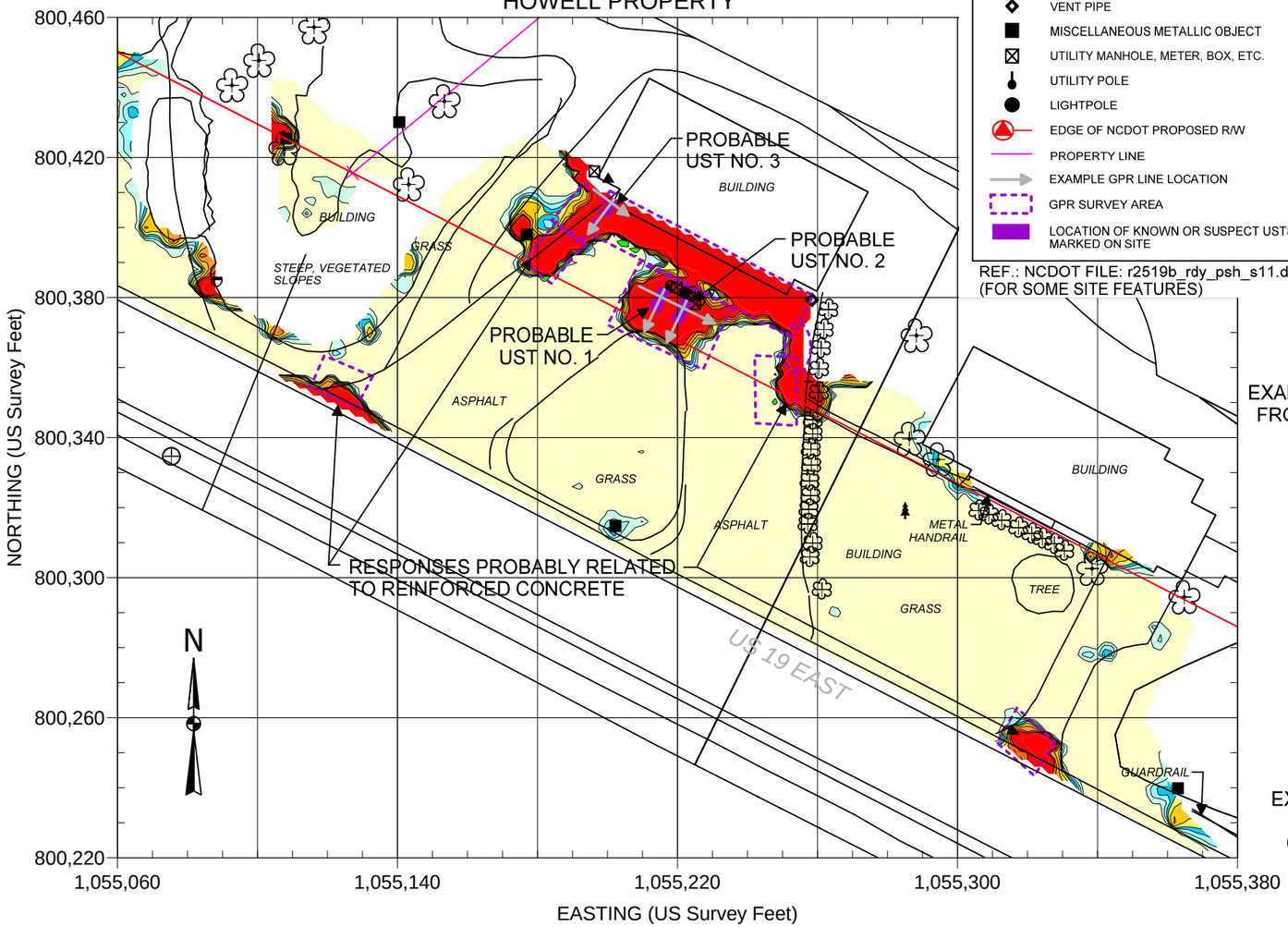
Schnabel ENGINEERING	STATE PROJECT R-2519B NC DEPT. OF TRANSPORTATION YANCEY COUNTY, NC PROJECT NO. 11821014.07	BEN HOWELL PROPERTY SITE PHOTOS FIGURE 1

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.

Schnabel ENGINEERING	STATE PROJECT R-2519B NC DEPT. OF TRANSPORTATION YANCEY COUNTY, NC PROJECT NO. 11821014.07	PHOTOS OF GEOPHYSICAL EQUIPMENT USED FIGURE 2



EXPLANATION

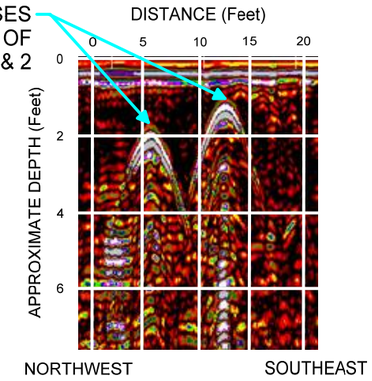
- FILLPORT
- VENT PIPE
- MISCELLANEOUS METALLIC OBJECT
- UTILITY MANHOLE, METER, BOX, ETC.
- UTILITY POLE
- LIGHTPOLE
- EDGE OF NCDOT PROPOSED R/W
- PROPERTY LINE
- EXAMPLE GPR LINE LOCATION
- GPR SURVEY AREA
- LOCATION OF KNOWN OR SUSPECT USTS MARKED ON SITE

REF.: NCDOT FILE: r2519b_rdy_psh_s11.dgn
(FOR SOME SITE FEATURES)

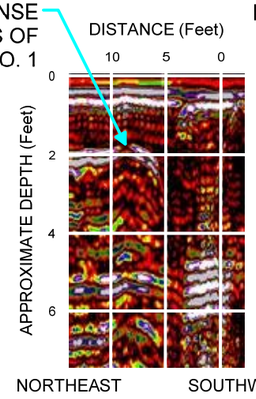
Scale in US Survey Feet
0 40 80 120

EM61 Early Time Gate Response (mV)
-15000 -100 0 50 100 150 200 300 500 750 1000 2000

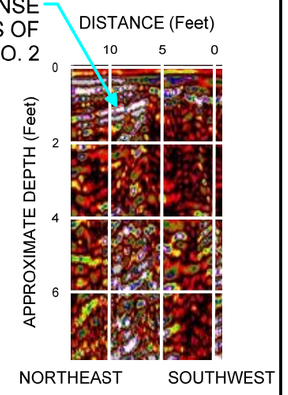
EXAMPLE GPR RESPONSES FROM THE SHORT AXES OF PROBABLE UST NOS. 1 & 2



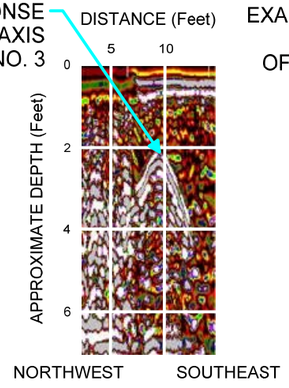
EXAMPLE GPR RESPONSE FROM THE LONG AXIS OF PROBABLE UST NO. 1



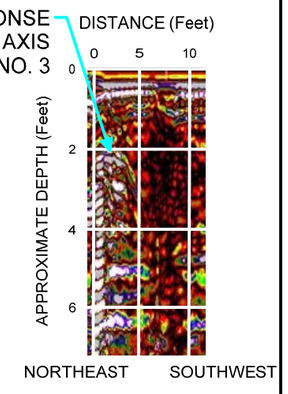
EXAMPLE GPR RESPONSE FROM THE LONG AXIS OF PROBABLE UST NO. 2



EXAMPLE GPR RESPONSE FROM THE SHORT AXIS OF PROBABLE UST NO. 3



EXAMPLE GPR RESPONSE FROM THE LONG AXIS OF PROBABLE UST NO. 3



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 January 17 and March 6, 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 February 2 and 3 and March 6, 2012, using a Geophysical Survey Systems SIR 3000 equipped with a 400 MHz antenna.

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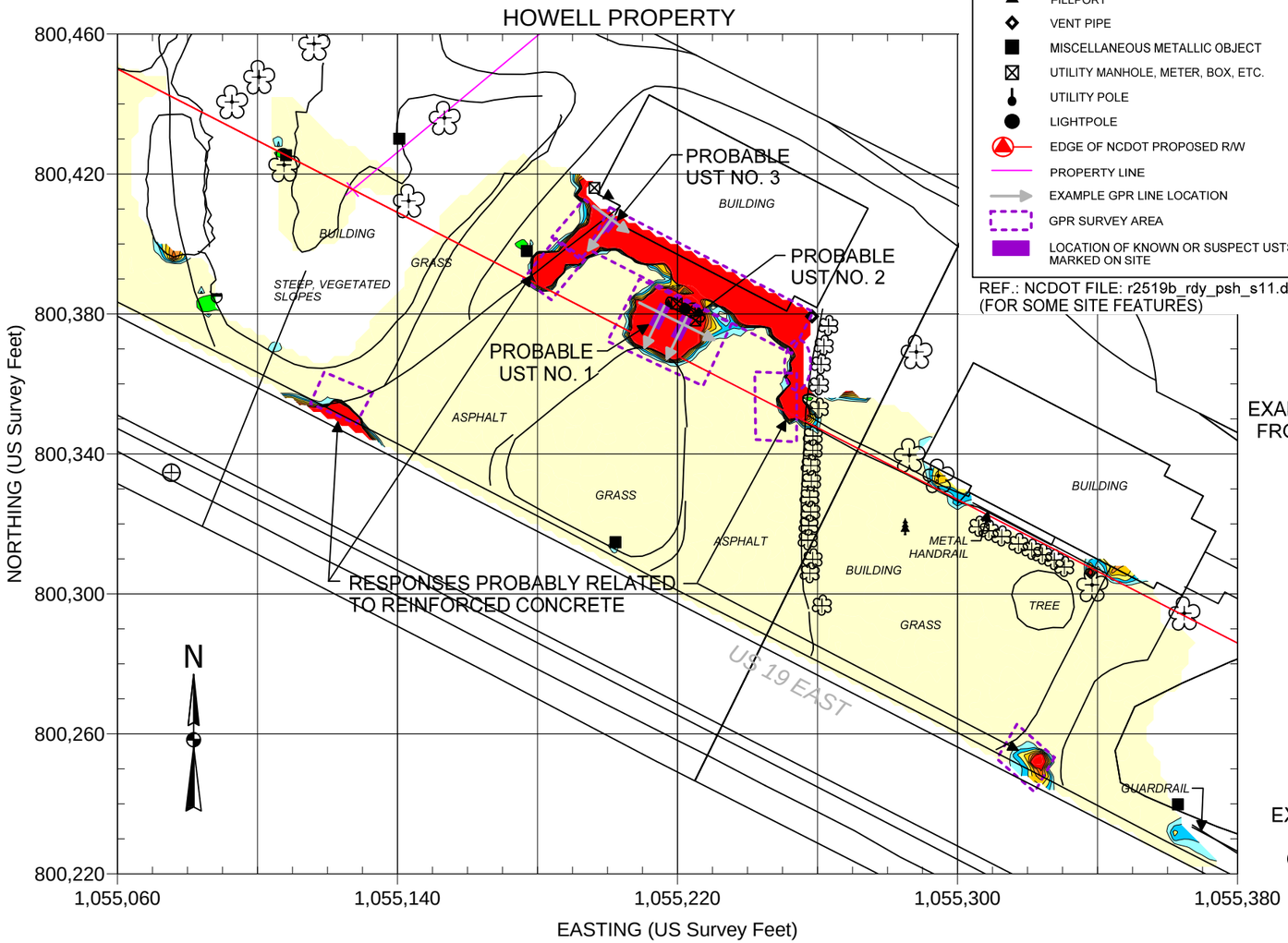
EM61 EARLY TIME GATE RESPONSE AND EXAMPLE GPR DATA

FIGURE 3



EXPLANATION

- FILLPORT
- VENT PIPE
- MISCELLANEOUS METALLIC OBJECT
- UTILITY MANHOLE, METER, BOX, ETC.
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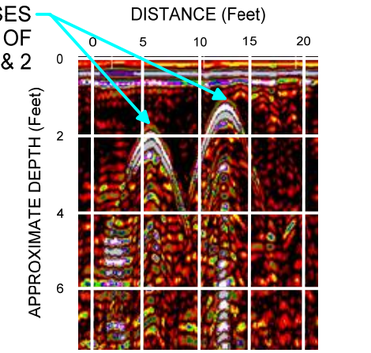
- EDGE OF NCDOT PROPOSED R/W
- PROPERTY LINE
- EXAMPLE GPR LINE LOCATION
- GPR SURVEY AREA
- LOCATION OF KNOWN OR SUSPECT USTS MARKED ON SITE

REF.: NCDOT FILE: r2519b_rdy_psh_s11.dgn
(FOR SOME SITE FEATURES)

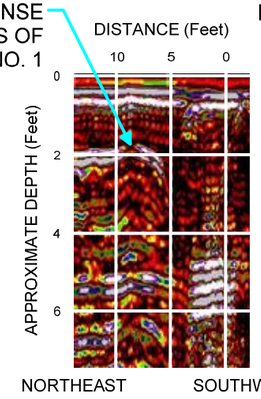
Scale in US Survey Feet
0 40 80 120

EM61 Differential Response (mV)
-20000 -100 0 40 60 80 100 120 140 160 200

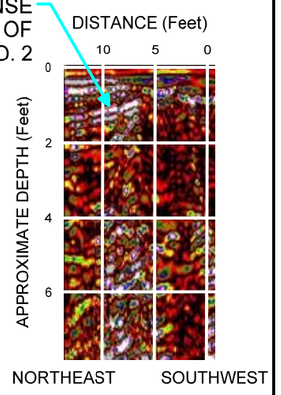
EXAMPLE GPR RESPONSES FROM THE SHORT AXES OF PROBABLE UST NOS. 1 & 2



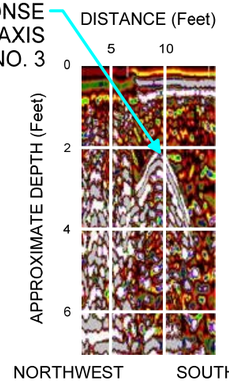
EXAMPLE GPR RESPONSE FROM THE LONG AXIS OF PROBABLE UST NO. 1



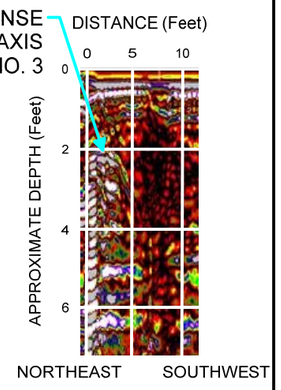
EXAMPLE GPR RESPONSE FROM THE LONG AXIS OF PROBABLE UST NO. 2



EXAMPLE GPR RESPONSE FROM THE SHORT AXIS OF PROBABLE UST NO. 3



EXAMPLE GPR RESPONSE FROM THE LONG AXIS OF PROBABLE UST NO. 3



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 January 17 and March 6, 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 February 2 and 3 and March 6, 2012, using a Geophysical Survey Systems SIR 3000 equipped with a 400 MHz antenna.

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EM61 DIFFERENTIAL RESPONSE AND EXAMPLE GPR DATA

FIGURE 4

Howell Property, looking northeast. Photo shows marked approximate locations of probable UST Nos. 1 and 2 south of the pump island in front of the former Wilson General Store.

Howell Property, looking northeast. Photo shows marked approximate location of probable UST No. 3 near the southeastern corner of the former Wilson General Store.

Schnabel ENGINEERING	STATE PROJECT R-2519B NC DEPT. OF TRANSPORTATION YANCEY COUNTY, NC PROJECT NO. 11821014.07	PHOTOS OF UST LOCATIONS FIGURE 5