PYRAMID ENVIRONMENTAL & ENGINEERING, P.C.

PYRAMID ENVIRONMENTAL & ENGINEERING
(PROJECT 2013-149)

NCDOT PROJECT U-5305 (WBS 47025.1.1)

GEOPHYSICAL SURVEYS OF PARCEL 9 – UNDERGROUND STORAGE TANK INVESTIGATION

ASHEBORO, RANDOLPH COUNTY, NC

JUNE 28, 2013

Report prepared for:

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C257: GEOLOGY C1251: ENGINEERING

GEOPHYSICAL INVESTIGATION REPORT
NCDOT ROW GEOPHYSICAL SURVEY
PARCEL 9 – ECONO OIL, WEST U.S. 64
Asheboro, Randolph County, North Carolina

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EXECUTIVE SUMMARY

- EM61 and GPR surveys were performed within the areas directed by the NCDOT.
- The majority of the EM61 anomalies detected could be attributed to visible objects at the ground surface such as signs and utilities. The GPR surveys across remaining areas at the property indicated that the non-cultural anomalies were likely due to utilities or reinforced concrete.
- The geophysical investigation did not record any evidence of metallic USTs within the directed survey area.

INTRODUCTION

Pyramid Environmental conducted a geophysical investigation for the North Carolina Department of Transportation (NCDOT) at Parcel 9 (Econo Oil West 64), located on the northeast quadrant of U.S. 64 and Fisher Circle, Asheboro, NC. The NCDOT provided Pyramid with their requested geophysical survey boundaries. The survey area extended across the south and west sides of the parcel, with a maximum east/west distance of 560 feet and a maximum north/south distance of 170 feet. Conducted on June 19 and 24, 2013, the geophysical investigation was performed to determine if unknown, metallic underground storage tanks (USTs) were present beneath the survey area.

The site was relatively open (with the exception of two inaccessible drainage ditch areas), and consisted of a combination of asphalt/gravel parking space and grassy medians. Aerial photographs showing the survey area boundaries and ground-level photographs are shown in **Figure 1**.

FIELD METHODOLOGY

Prior to conducting the geophysical investigation, a 20-foot by 10-foot survey grid was established across the geophysical survey area using measuring tapes and water-based marking paint. These grid marks were used as X-Y coordinates for location control when collecting the geophysical data and establishing base maps for the geophysical results

The geophysical investigation consisted of electromagnetic (EM) induction-metal detection and ground penetrating radar (GPR) surveys. The EM survey was performed on June 19, 2013, using a Geonics EM61 metal detection instrument. 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. All of the EM61 data were digitally collected at approximately 0.8 foot intervals along north-south trending or east-west trending, parallel survey lines spaced five feet apart. All of the data were downloaded to a computer and reviewed in the field and office using the Geonics DAT61 and Surfer for Windows Version 11.0 software programs.

GPR data were acquired on June 24, 2013, across selected EM61 differential anomalies using a GSSI SIR-2000 unit equipped with a 400 MHz antenna. Data were collected generally from east to west and north to south across specific EM61 anomalies. All of 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 8 feet, based on an estimated two-way travel time of 8 nanoseconds per foot. GPR transect and image files were saved to the hard drive of the SIR unit.

DISCUSSION OF RESULTS

Contour plots of the EM61 bottom coil and differential results obtained across the survey area at the property are presented in **Figure 2**. The bottom coil results represent the most

sensitive component of the EM61 instrument and detect metal objects regardless of size. The bottom coil response can be used to delineate metal conduits or utility lines, small, isolated metal objects, and areas containing insignificant metal debris. The differential results are obtained from the difference between the top and bottom coils of the EM61 instrument. The differential results focus on the larger metal objects such as drum and UST-size objects and ignore the smaller insignificant metal objects.

Discussion of EM Anomalies: The EM anomaly at X=80, Y=25 was the result of a power pole. The EM anomaly at X=95, Y=50 was the result of a sign post. The EM anomalies at X=160, Y=40 and at X=265, Y=35 were the result of storm drains. The EM anomalies at X=265, Y=25 and at X=275, Y=30 were the result of street signs. The EM anomaly at X=335, Y=50 was the result of a light pole. The EM anomalies at X=365, X=405, and X=495 at Y=20 were the result of street signs. The EM anomaly at X=575, Y=45 was the result of a mailbox. The EM anomaly at X=575, Y=25 was the result of a stop sign. The feature that is generally observed at Y=35 between the two inaccessible drainage ditch areas was attributed to a storm drain pipe extending across this area (see photos on **Figure 3**). The remaining anomalies could not be attributed to objects at the ground surface.

Anomalies that could not be directly attributed to visible objects at the ground surface were investigated further with the GPR. Specifically, the north/south feature at the west edge of the survey grid was examined with multiple GPR scans. Additionally, the anomaly at X=200, Y=45-50 was investigated with the GPR unit.

The GPR data were viewed in real time as the equipment was surveyed across the anomalies. Transects across EM anomalies were saved to the hard drive for post-processing in the office. **Figure 3** presents an aerial photograph showing the location of the GPR transects performed across the unexplained EM anomalies as well as the GPR images that were collected.

GPR Transects 1, 2, and 3 were oriented from east to west across the north/south anomaly at X=20-30. These transects recorded evidence of a utility line or storm drain pipe extending from south to north across this location. GPR Transect 4 was oriented

from south to north across the anomaly at X=200. This transect recorded evidence of reinforcement (rebar) within the concrete at this location, which resulted in the high amplitude EM response. The anomaly was observed to terminate at the same location that the concrete switched back to unreinforced asphalt. No evidence of any metallic structures that would be indicative of USTs was observed in the GPR scans.

The geophysical investigation did not record any evidence of metallic USTs within the directed survey area.

SUMMARY & CONCLUSIONS

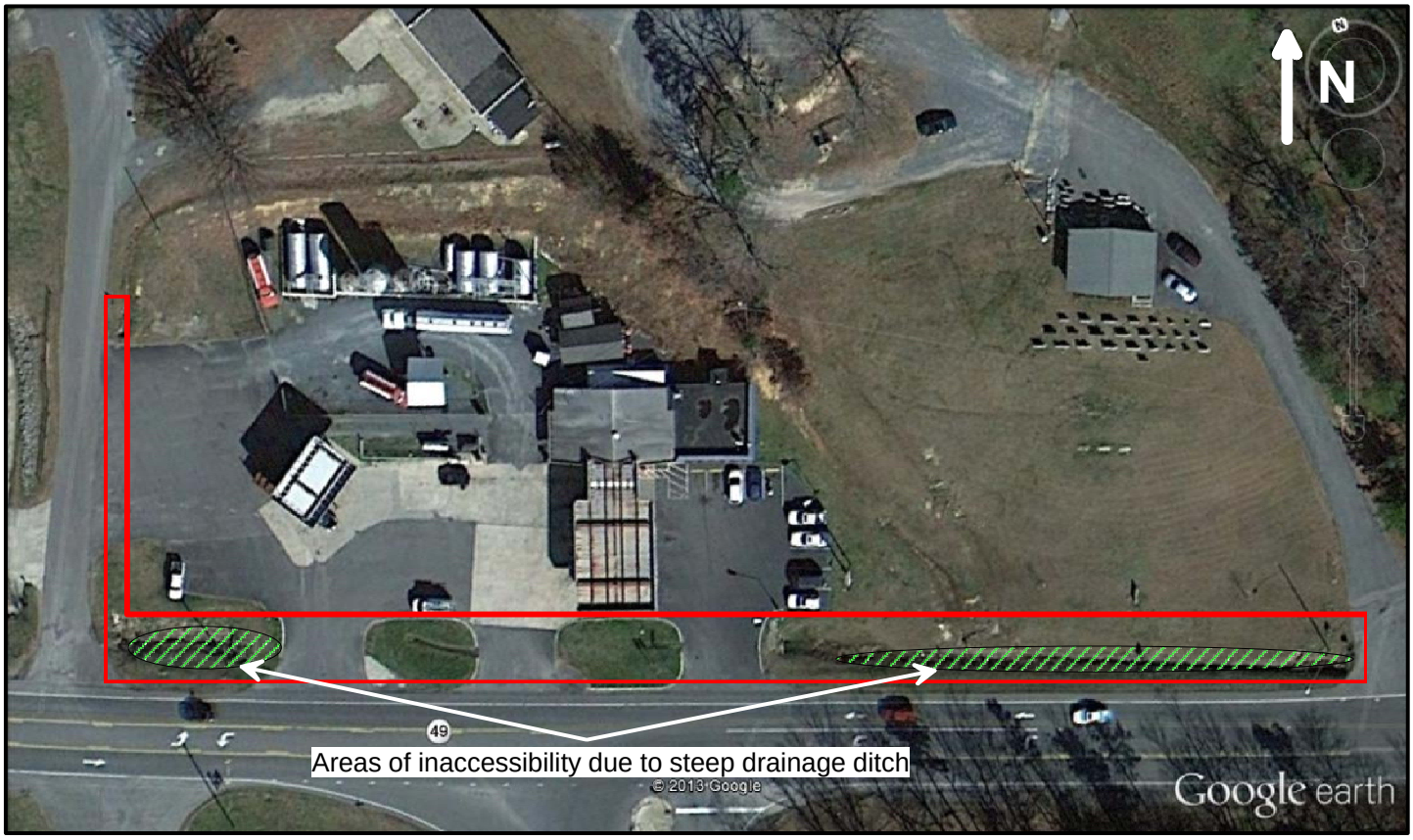
Our evaluation of the EM61 and GPR data collected across Parcel 9, Asheboro, North Carolina provides the following summary and conclusions:

- The EM61 and GPR surveys provided reliable results for the detection of metallic USTs within the geophysical survey area.
- The majority of the EM61 anomalies detected could be attributed to visible objects at the ground surface such as signs and utilities. The GPR surveys across remaining areas at the property indicated that the non-cultural anomalies were likely due to utilities or reinforced concrete.
- The geophysical investigation did not record any evidence of metallic USTs within the directed survey area.

LIMITATIONS

Geophysical surveys have been performed and this report prepared for the NCDOT 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 that metallic USTs do not lie within the survey area of the Randolph County property, but that none were detected, other than those discussed above outside of the formal survey grid. Additionally, it should be understood that areas containing vehicles or other restrictions to the accessibility of the geophysical instruments could not be investigated.



Aerial Photograph Showing Approximate Geophysical Survey Boundaries

View of East Portion of Survey Area
(Facing Approximately Southeast)

View of West Portion of Survey Area
(Facing Approximately West)

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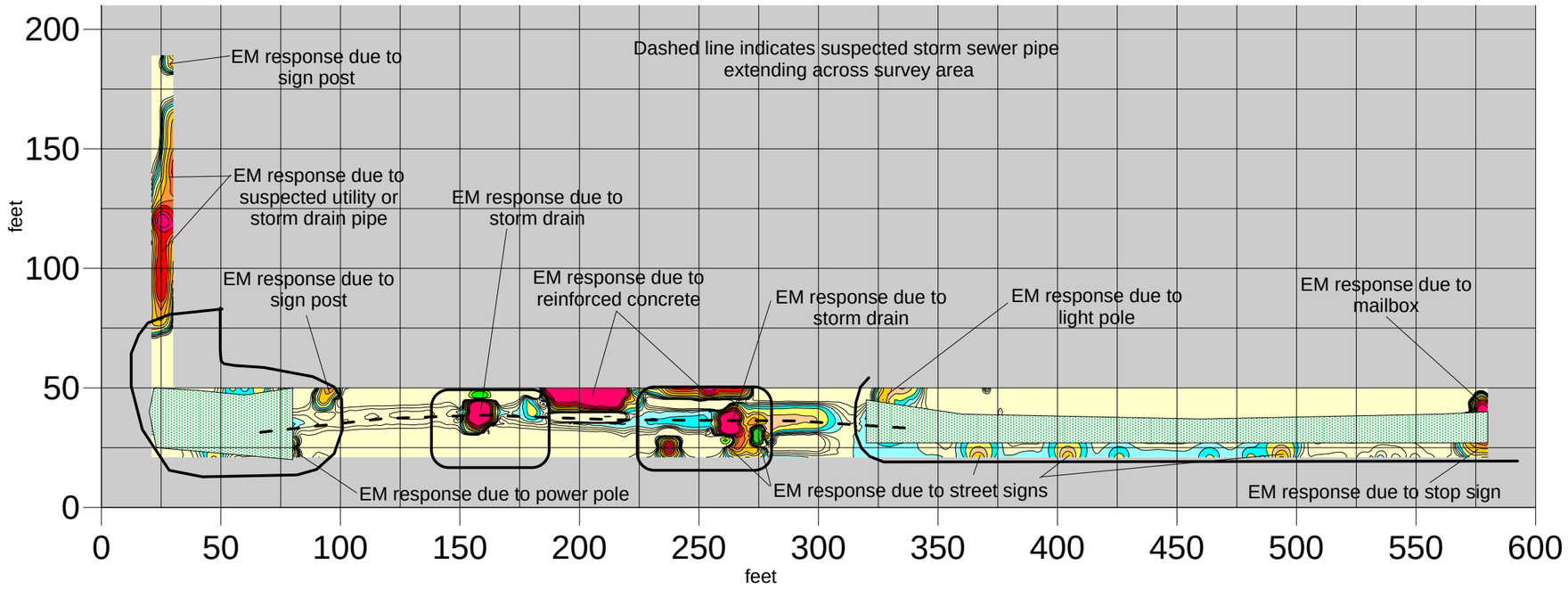
CLIENT	NC DEPARTMENT OF TRANSPORTATION	DATE	06/26/13	DRWN	ECC
SITE	PARCEL 9, RANDOLPH COUNTY (DOT ROW PROJECT)	LAY		CHKD	
CITY	ASHEBORO / STATE: NORTH CAROLINA	DWG			
TITLE	GEOPHYSICAL RESULTS	JNO.	2013-131	FIGURE	

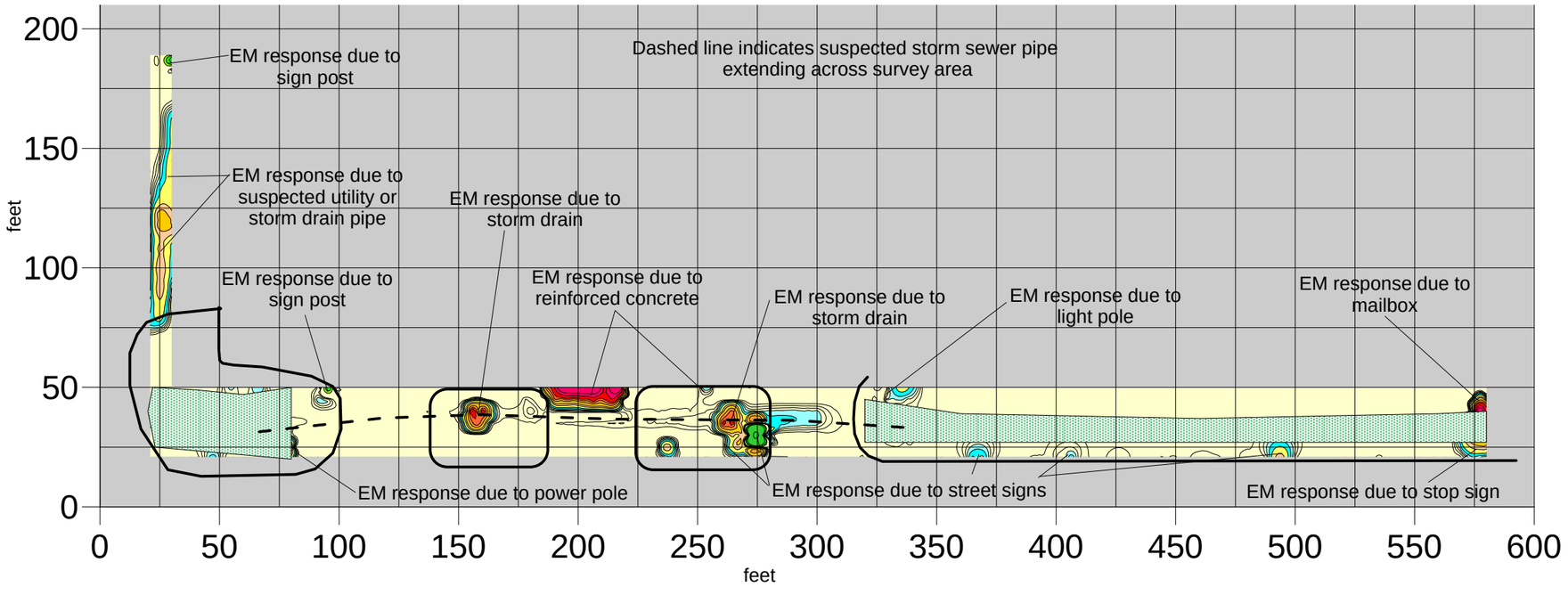
SURVEY BOUNDARIES &
SITE PHOTOGRAPHS

FIGURE 1

EM61 Bottom Coil Results



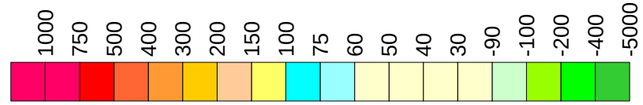
EM61 Differential Results



NO EVIDENCE OF METALLIC USTs OBSERVED

The contour plots show the bottom coil (most sensitive) and differential results of the EM61 instrument in millivolts (mV). The bottom coil response shows buried metallic objects regardless of size. The differential response focuses on larger, buried metallic objects such as drums and USTs and ignores smaller miscellaneous buried, metal debris.The EM61 data were collected on June 19, 2013 using a Geonics EM61 instrument. Ground penetrating radar (GPR) data were collected on June 24, 2013, using a GSSI SIR 2000 unit coupled to a 400 MHz antennae. Green blanked out areas represent zones of inaccessibility due to streep drainage ditches.

EM61 Metal Detection Response (millivolts)



N

TITLE
PARCEL 9 - EM61 BOTTOM COIL & DIFFERENTIAL RESULTS CONTOUR MAP

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ASHEBORO, RANDOLPH COUNTY, NC

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DATE	CLIENT
06/25/2013	NCDOT
PYRAMID PROJECT #: 2013-149	**FIGURE 2**

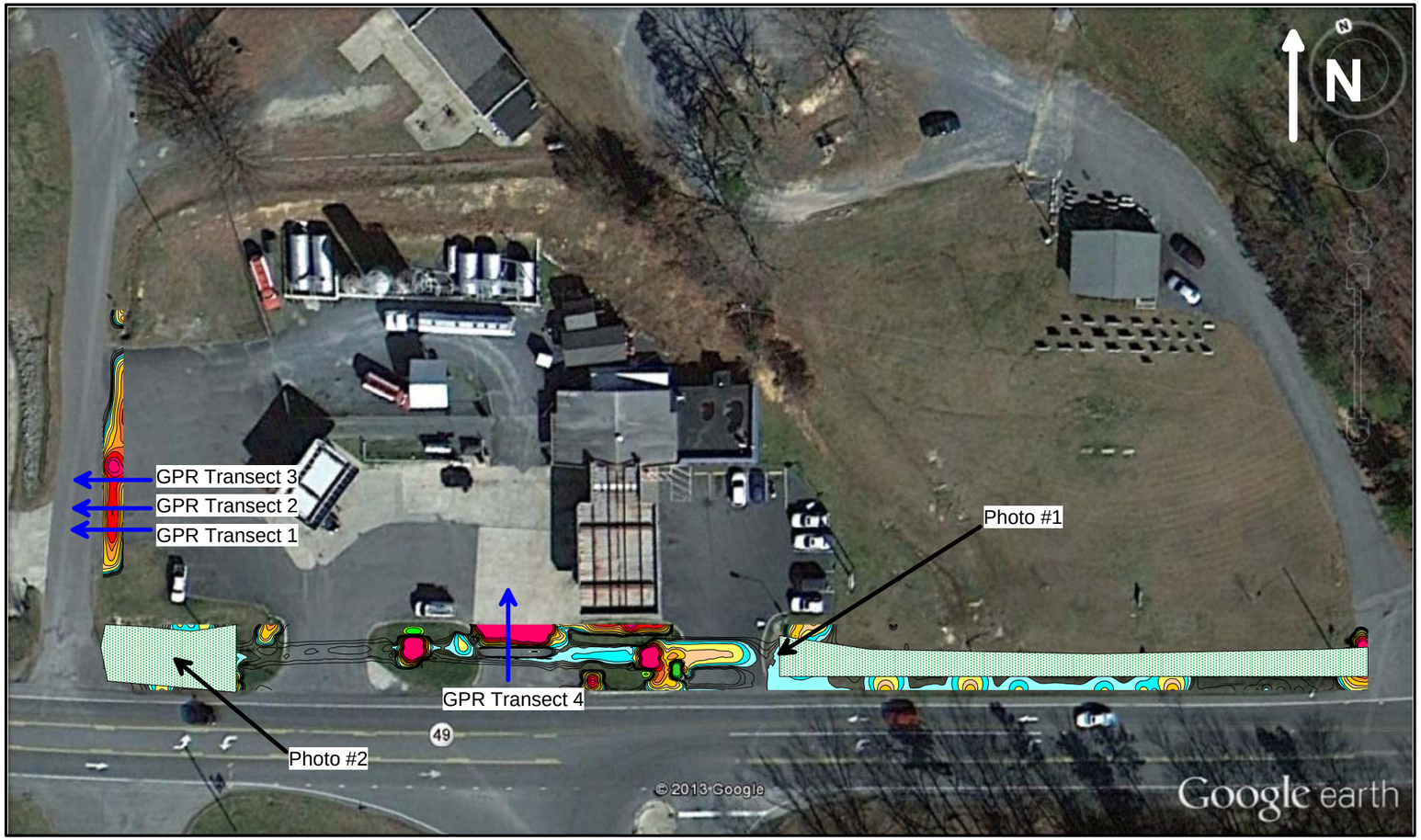
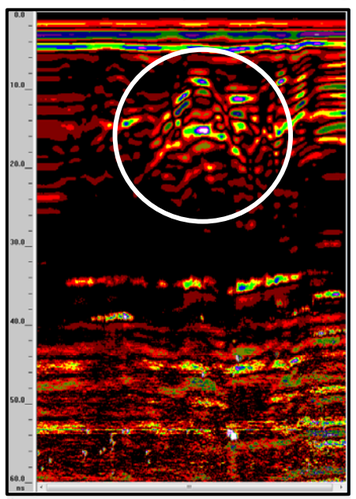


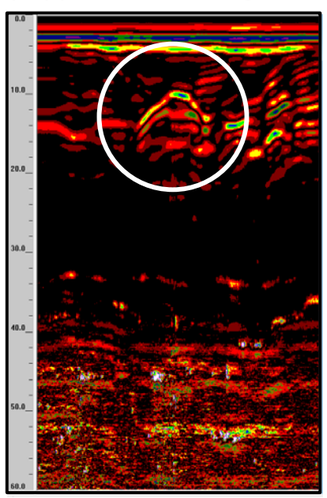
Photo #1: Drainage pipe extending under east driveway entrance

Photo #2: Drainage pipe extending under west driveway entrance

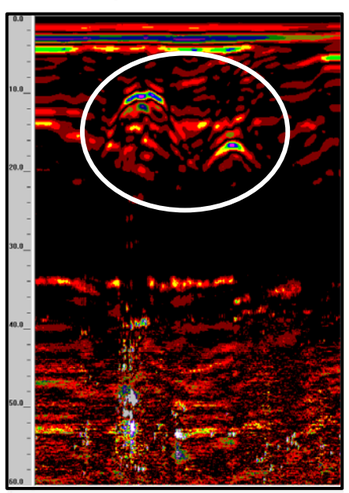
Suspected drainage pipe(s) or utilities along west side of survey area



GPR Transect 1

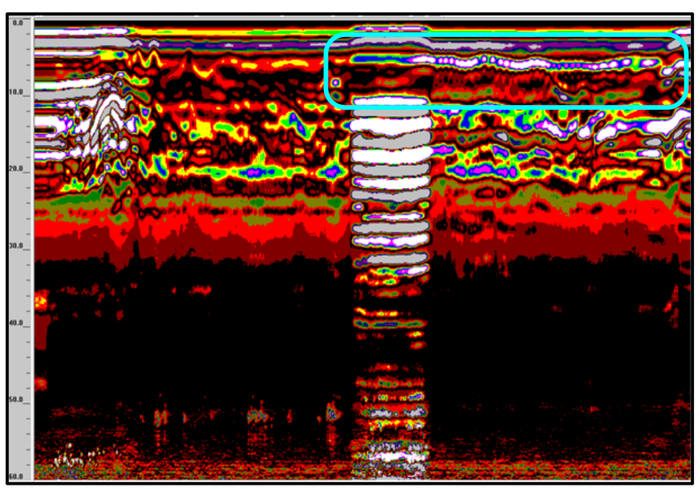


GPR Transect 2



GPR Transect 3

Reinforement in the concrete slab



GPR Transect 4

N

TITLE

PARCEL 9 - GPR TRANSECT LOCATIONS AND IMAGES

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DATE	06/25/2013	CLIENT	NCDOT
PYRAMID PROJECT #:	2013-149	**FIGURE 3**	

LEGEND

- PROPOSED UTILITY EASEMENT
- EXISTING ROW
- EXISTING PROPERTY BOUNDARY
- PROPOSED ROW
- PROPOSED CONST. EASEMENT
- PROP. DRAINAGE UTIL. EASEMENT
- PROPOSED SS CUT LINE
- PROPOSED SS FILL LINE
- PROPOSED SS TRANSITION LINE
- PROPOSED DRAINAGE PIPING

0 50 100

FEET

N

TITLE: EM61 BOTTOM COIL RESULTS CONTOUR MAP OVERLAY	
PROJECT: NCDOT ROW PROJECT U-5305 PARCEL 009 ASHEBORO, NORTH CAROLINA	
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DATE: 7-19-13	REVISION NO. 0
PYRAMID PROJECT NO. 2012-228	FIGURE NO. 4