PYRAMID ENVIRONMENTAL & ENGINEERING, P.C.

PYRAMID ENVIRONMENTAL & ENGINEERING
(PROJECT 2013-149)

NCDOT PROJECT U-5305 (WBS 47025.1.1)

GEOPHYSICAL SURVEYS OF PARCEL 7 – UNDERGROUND STORAGE TANK INVESTIGATION

ASHEBORO, RANDOLPH COUNTY, NC

JUNE 28, 2013

Report prepared for:

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GEOPHYSICAL INVESTIGATION REPORT
NCDOT ROW GEOPHYSICAL SURVEY
PARCEL 7 – THOMAS TIRE SHOP, 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 majority of the non-cultural anomalies were likely due to buried metallic debris or utilities.
- A possible UST or multiple USTs are present at the location of the EM anomaly centered at X=80, Y=160 . The limited depth of penetration of the GPR unit prevented confirmation of the nature of this anomaly, but its lateral extent and signal are characteristic of a possible UST(s), or scattered buried metallic debris.

INTRODUCTION

Pyramid Environmental conducted a geophysical investigation for the North Carolina Department of Transportation (NCDOT) at Parcel 7 (Thomas Tire Shop), located on the south side of U.S. 64 across from Fisher Circle, Asheboro, NC. The NCDOT provided Pyramid with their requested geophysical survey boundaries. The survey area extended across the north and east sides of the parcel, with a maximum east/west distance of 280 feet and a maximum north/south distance of 220 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, 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 7.0 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 **Figures 2 and 3,** respectively. 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 anomalies centered at X=25, Y=175, X=60, Y=140, and X=70, Y=120 were the result of concrete posts connected by chain link. The EM anomaly at X=65, Y=100-120 was the result of metal sign posts. The EM anomaly at X=105, Y=165 was the result of a metal sign. The EM anomaly at X=105, Y=85 was the result of a concrete post and chain link. The EM anomalies at X=92, Y=65, X=100, Y=75, and X=105, Y=69 were the result of metal signs. The EM anomaly at X=160, Y=155 was the result of a vehicle. The EM anomaly at X=175, Y=30 was the result of a collection of street signs. The EM anomaly at X=195, Y=45 was the result of a collection of metal stakes. The EM anomalies at X=192, Y=100-120 were the result of the bases of old sign posts. The EM anomaly at X=220, Y=55 was the result of a storm drain. The EM anomaly at X=235, Y=110 was the result of a vehicle. The EM anomaly at X=300, Y=35 was the result of a reinforced concrete culvert cover. The EM anomaly at X=300, Y=70 was the result of a vehicle. The EM anomaly at X=285, Y=105 was the result of chain link. The EM anomaly at X=270, Y=120 was the result of a vehicle. 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 widespread feature centered at X=80, Y=160 was examined with multiple GPR scans. Additionally, anomalies at X=80, Y=230; at X=50, Y=230; at X=105, Y=110; at X=135, Y=135; at X=170, Y=120; and at X=180, Y=110 were investigated with GPR scans.

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 4** 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, 3 and 4 were performed from north to south or east to west across the large feature centered at X=80, Y=160. The nature of the EM anomaly was characteristic of a possible UST or multiple USTs, although the amplitude of the signal was lower than would be expected for a large metallic UST(s). GPR Transects 1-4 did not record any evidence of USTs in the vicinity of the EM anomaly at X=80, Y=160. However, it should be noted that the depth of penetration of the GPR unit at this parcel was limited to approximately 4 feet below the ground surface (bgs), due to the site geology and/or the depth of the water table. Therefore, it is possible that USTs, or some other large metallic object, is present at the location of this EM anomaly, but at a depth greater than 4 feet. For this reason, we are characterizing this area as containing a possible UST or multiple possible USTs, as categorized by the NCDOT system of labeling possible tanks. The geophysics were unable to delineate the depth or lateral extent of these possible tanks. It should be noted that this feature may also be the result of scattered buried metallic debris.

The remaining GPR Transects did not record any evidence of metallic USTs at the locations of the anomalies described above and shown in **Figure 4**. The anomaly at X=80, Y=230 exhibited characteristics of a possible utility line or buried debris. The remaining GPR transects indicated that the other anomalies investigated were likely the result of buried metallic debris.

The geophysical investigation suggests that a possible UST or multiple USTs are present at the location of the EM anomaly centered at X=80, Y=160 . The limited depth of penetration of the GPR unit prevented confirmation of the nature of this anomaly, but its lateral extent and signal are characteristic of a possible UST(s). The area containing the possible UST(s) is shown on **Figure 5**. The remaining portions of 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 7, 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 majority of the non-cultural anomalies were likely due to buried metallic debris or utilities.
- A possible UST or multiple USTs are present at the location of the EM anomaly centered at X=80, Y=160 . The limited depth of penetration of the GPR unit prevented confirmation of the nature of this anomaly, but its lateral extent and signal are characteristic of a possible UST(s), or scattered buried metallic debris.

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

Eastern Portion of Geophysical Survey Area
(Facing Approximately South)

Western Portion of Geophysical Survey Area
(Facing Approximately West)

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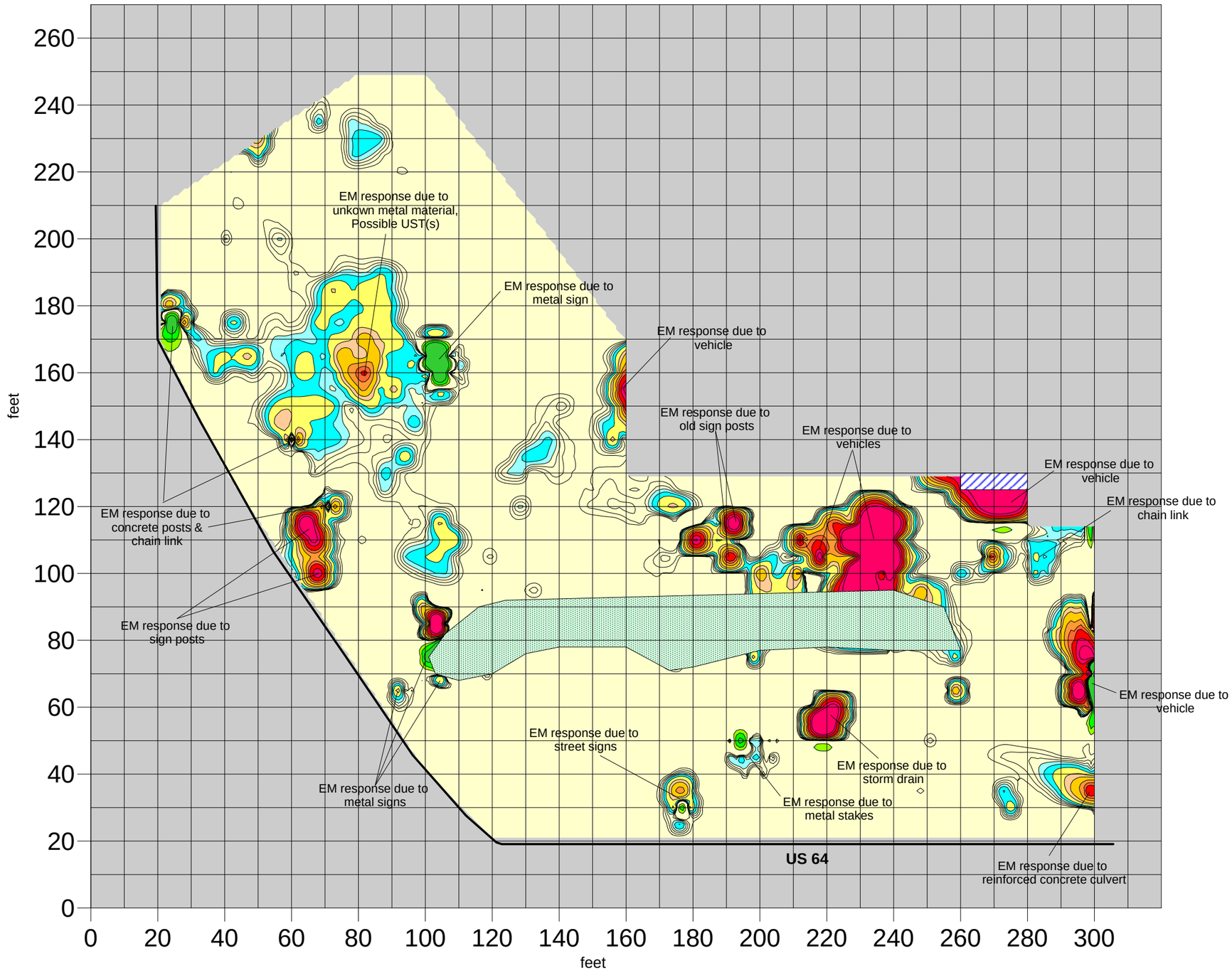
CLIENT	NC DEPARTMENT OF TRANSPORTATION	DATE	06/26/13	DRWN	ECC
SITE	PARCEL 7, RANDOLPH COUNTY (DOT ROW PROJECT)	LAY		CHKD	
CITY	ASHEBORO / STATE: NORTH CAROLINA	DWG			
TITLE	GEOPHYSICAL RESULTS	J.NO.	2013-131	FIGURE	

SURVEY BOUNDARIES &
SITE PHOTOGRAPHS

FIGURE 1

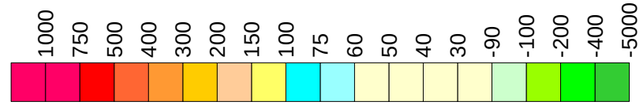
EM61 Bottom Coil Results



EVIDENCE OF POSSIBLE METALLIC UST(s) OBSERVED

The contour plots show the bottom coil (most sensitive) and results of the EM61 instrument in millivolts (mV). The bottom coil response shows buried metallic objects regardless of size. The EM61 data were collected on June 19, 2013 using a Geonics EM61 instrument. Ground penetrating radar (GPR) data were aquired on June 24, 2013 using a GSSI SIR 2000 unit coupled to a 400 MHz antennae.

EM61 Metal Detection Response (millivolts)



N

TITLE

PARCEL 7 - EM61 BOTTOM COIL RESULTS CONTOUR MAP

PROJECT

NC DEPARTMENT OF TRANSPORTATION
ROW IMPROVEMENT PROJECT
ASHEBORO, RANDOLPH COUNTY, NC

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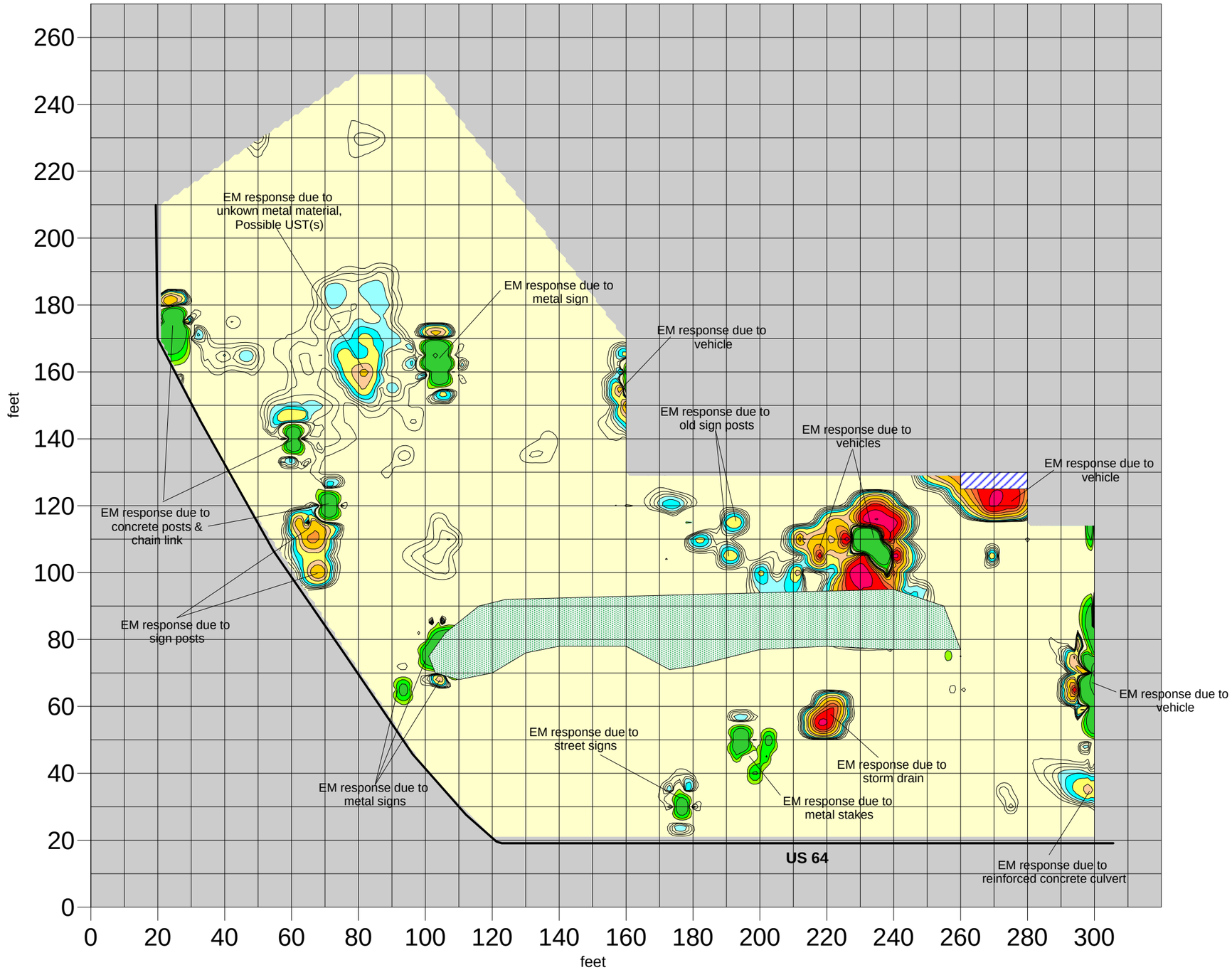
DATE 06/25/2013	CLIENT NCDOT
PYRAMID PROJECT #: 2013-149	**FIGURE 2**

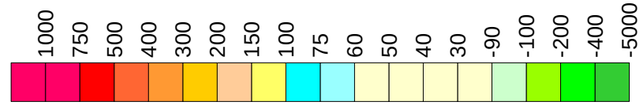
EM61 Differential Results



EVIDENCE OF POSSIBLE METALLIC UST(s) OBSERVED

The contour plots show the differential results of the EM61 instrument in millivolts (mV). 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 aquired on June 24, 2013 using a GSSI SIR 2000 unit coupled to a 400 MHz antennae.

EM61 Metal Detection Response (millivolts)



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TITLE

PARCEL 7 - EM61 DIFFERENTIAL RESULTS CONTOUR MAP

PROJECT

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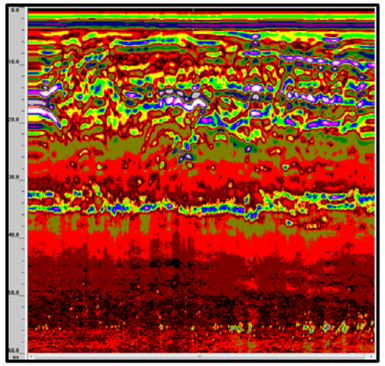
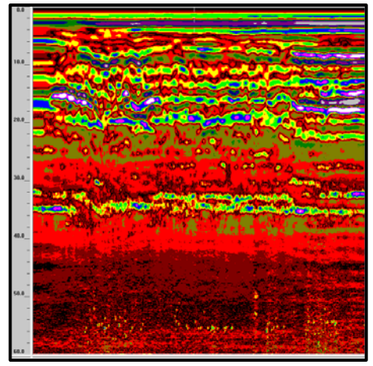
PYRAMID PROJECT #: 2013-149	**FIGURE 3**

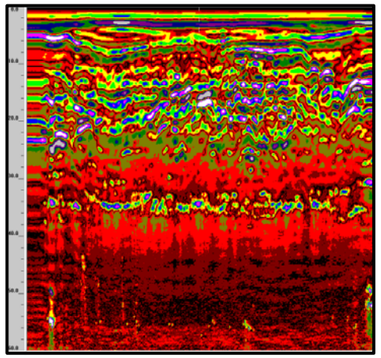
GPR Transects Across Possible UST Field (No evidence of USTs observed in GPR data)



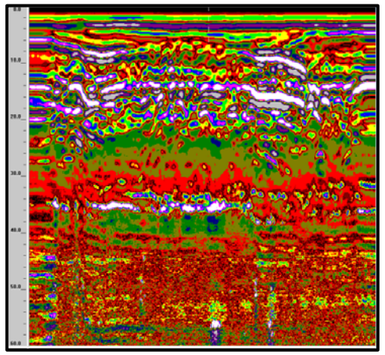
GPR Transect 1



GPR Transect 2



GPR Transect 3

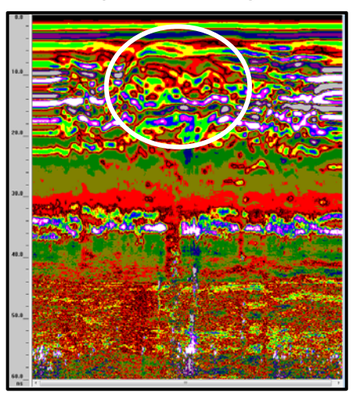


GPR Transect 4

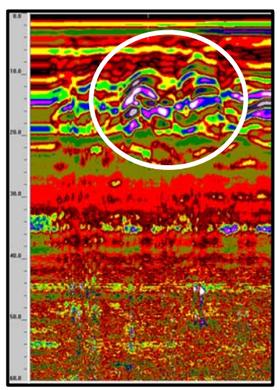
N

Suspected debris or possible utility

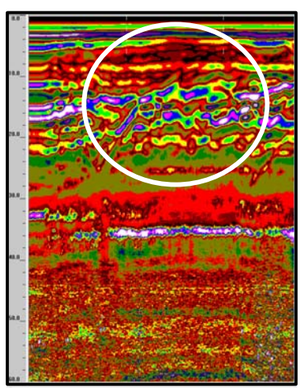
Transects 6-10: Suspected areas of isolated buried metallic debris



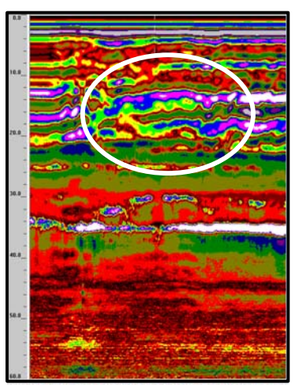
GPR Transect 5



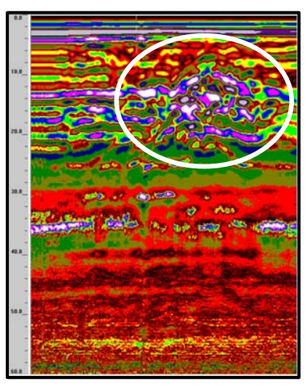
GPR Transect 6



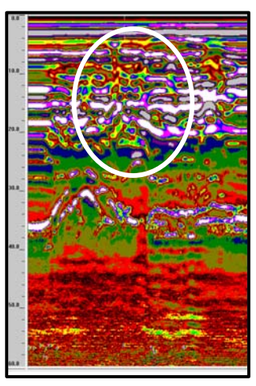
GPR Transect 7



GPR Transect 8



GPR Transect 9



GPR Transect 10

TITLE

PARCEL 7 - GPR TRANSECT LOCATIONS AND IMAGES

PROJECT

NC DEPARTMENT OF TRANSPORTATION
ROW IMPROVEMENT PROJECT
ASHEBORO, RANDOLPH COUNTY, NC

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DATE	06/25/2013	CLIENT	NCDOT
PYRAMID PROJECT #:	2013-149		**FIGURE 4**

N

The nature of the EM anomaly was characteristic of a possible UST or multiple USTs, although the amplitude of the signal was lower than would be expected for a large metallic UST(s). GPR Transects 1-4 did not record any evidence of USTs in the vicinity of the EM anomaly at X=80, Y=160. However, it should be noted that the depth of penetration of the GPR unit at this parcel was limited to approximately 4 feet below the ground surface (bgs), due to the site geology and/or the depth of the water table. Therefore, it is possible that USTs, or some other large metallic object, is present at the location of this EM anomaly, but at a depth greater than 4 feet. For this reason, we are characterizing this area as containing a possible UST or multiple possible USTs, as categorized by the NCDOT system of labeling possible tanks. The geophysics were unable to delineate the depth or lateral extent of these possible tanks. It should be noted that this feature may also be the result of scattered buried metallic debris.

TITLE

PARCEL 7 - LOCATION OF POSSIBLE UST(s)

PROJECT

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ROW IMPROVEMENT PROJECT
ASHEBORO, RANDOLPH COUNTY, NC

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PYRAMID PROJECT #:	2013-149	**FIGURE 5**	

LEGEND

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

N

0 50 100

FEET

TITLE: EM61 BOTTOM COIL RESULTS CONTOUR MAP OVERLAY	
PROJECT: NCDOT ROW PROJECT U-5305 PARCEL 007 ASHEBORO, NORTH CAROLINA	
PYRAMID ENVIRONMENTAL & ENGINEERING, P.C.	503 INDUSTRIAL AVENUE GREENSBORO, NC 27406 336.335.3174 (p) 336.691.0648 (f) License # C1251 Eng. / #C257 Geology
DATE: 7-19-13	REVISION NO. 0
PYRAMID PROJECT NO. 2012-228	FIGURE NO. 6