PYRAMID ENVIRONMENTAL & ENGINEERING, P.C.

PYRAMID ENVIRONMENTAL & ENGINEERING
(PROJECT 2013-149)

NCDOT PROJECT U-5305 (WBS 47025.1.1)

GEOPHYSICAL SURVEYS OF PARCEL 4 – 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 4 – MACK ROAD AND NC 49
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 non-cultural anomalies were likely due to buried metallic debris or utilities. No evidence was observed to indicate the presence of metallic USTs within the survey area that was directed by the NCDOT.
- A reconnaissance GPR survey was performed across a suspected tank field that was located outside of the formal survey area. Three known USTs were confirmed by this GPR survey.
- The geophysical investigation suggests that three known metallic USTs are present at the property, however, these tanks were outside of the survey area that was designated by the NCDOT. No evidence of metallic USTs was recorded within the directed survey area.

INTRODUCTION

Pyramid Environmental conducted a geophysical investigation for the North Carolina Department of Transportation (NCDOT) at Parcel 4, located at the intersection of Mack Road and NC 49, 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, spanning a distance of approximately 180 feet along Mack Road and approximately 160 feet along NC 49. The geophysical survey area extended approximately 60 feet at its maximum east/west distance from Mack Road west into the property, and 70 feet from NC 49 south into the property. Conducted on June 17 and 24,

2013, the geophysical investigation was performed to determine if unknown, metallic underground storage tanks (USTs) were present beneath the survey area.

In addition to the above-described survey area, evidence of three USTs was observed in the parking lot outside of the survey boundaries. These USTs were also specifically investigated further with reconnaissance geophysics, separate from the formal survey grid described above.

The site was relatively open, and consisted of a combination of asphalt parking space and grassy medians. Aerial photographs showing the survey area boundaries and ground-level photographs, as well as the approximate boundaries of the suspected UST field, are shown in **Figure 1**.

FIELD METHODOLOGY

Prior to conducting the geophysical investigation, a 10-foot by 10-foot survey grid was established across the geophysical survey areas 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 reconnaissance transects performed across the USTs were done so without establishing a formal grid.

The geophysical investigation consisted of electromagnetic (EM) induction-metal detection and ground penetrating radar (GPR) surveys. The EM survey was performed on June 17, 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 Transects were also performed across the suspected USTs outside of the formal survey grid. 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 areas 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 north/south oriented EM anomaly at the southeast portion of the survey area at X=25 from Y=100 to Y=200 was suspected to be the result of a buried storm drain pipe. The EM anomalies at X=35, Y=195 and X=40, Y=189 were the result of power/light poles. The EM anomaly at X=50, Y=185 was the result of a vehicle just outside of the survey area to the west. The EM anomaly at X=35, Y=100 was the result of a light pole. The EM anomaly at X=32, Y=50 was the result of a metal cap for a gas line. The EM anomaly centered at X=70, Y=65 was the combined result of

a metal pole and machine parts on the ground. The EM anomaly at X=60, Y=30 was the result of a sign post. The EM anomaly at X=75, Y=35 was the result of a telephone pole. The EM anomalies at X=95, Y=30 and at X=100, Y=50 were the result of sign posts. The EM anomaly at X=140, Y=55 was the result of a light pole. The EM anomaly at X=145, Y=40 was the result of a mailbox.

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 X=25 (suspected to be a storm drain pipe) was analyzed with the GPR. Additionally, anomalies at X=45, Y=145 and at X=58, Y=60 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 and 3 were performed from west to east across the suspected storm drain pipe at X=25. These scans confirmed the presence of an underground pipe across this area. GPR Transects 4 and 5 were performed from north to south across the anomaly centered at X=45, Y=145. These scans confirmed the presence of an unknown utility line extending across this area to the southwest. GPR Transect 6 was performed from east to west across the anomaly at X=58, Y=60, and recorded evidenced of possible buried metallic debris. No other significant features were recorded by the GPR within the formal survey grid that would be indicative of any large objects below the ground surface, such as metallic USTs.

Suspected UST Reconnaissance Survey: Reconnaissance GPR transects were performed across the area suspected of containing three USTs. The area was located to the southwest of the center of the survey grid. Three fill ports with concrete pads were observed in this area. According to the store owner, no USTs were actively being used at the shop. **Figure 5** presents the locations of the GPR Transects performed across the suspected UST field, as well as the transect images.

Three known USTs were confirmed by the reconnaissance GPR survey. GPR Transects 7 and 8 were performed approximately from north to south, perpendicular to the three tanks. GPR Transects 9, 10 and 11 were performed across the length of each tank from east to west. The GPR indicated that the two southern tanks were approximately 8 feet wide x 30 feet long, and that the northern tank was approximately 10 feet wide x 20 feet long. The two southern tanks were observed to be at a depth of approximately 3.5 to 4 feet below the ground surface (bgs), and the northern tank was observed to be at a depth of approximately 2.5-3 feet bgs.

GPS points were taken at the center of each UST identified by the GPR survey. The GPS points were obtained using a Trimble AG-114 GPS unit coupled to an Allegro-CX field computer. Points were taken in the WGS84 datum and converted to North Carolina State Plane coordinates in the office. Table 1, presented below, presents the coordinates of the three tanks.

Table 1 - GPS Locations of USTs, Parcel 4

North Carolina State Plane, Center of Tanks

Northing	Easting
705055.548N	1750972.485E
705065.504N	1750973.089E
705078.171N	1750977.378E

The geophysical investigation suggests that three known metallic USTs are present at the property, however, these tanks were outside of the survey area that was designated by the NCDOT. No evidence of metallic USTs was recorded within the directed survey area.

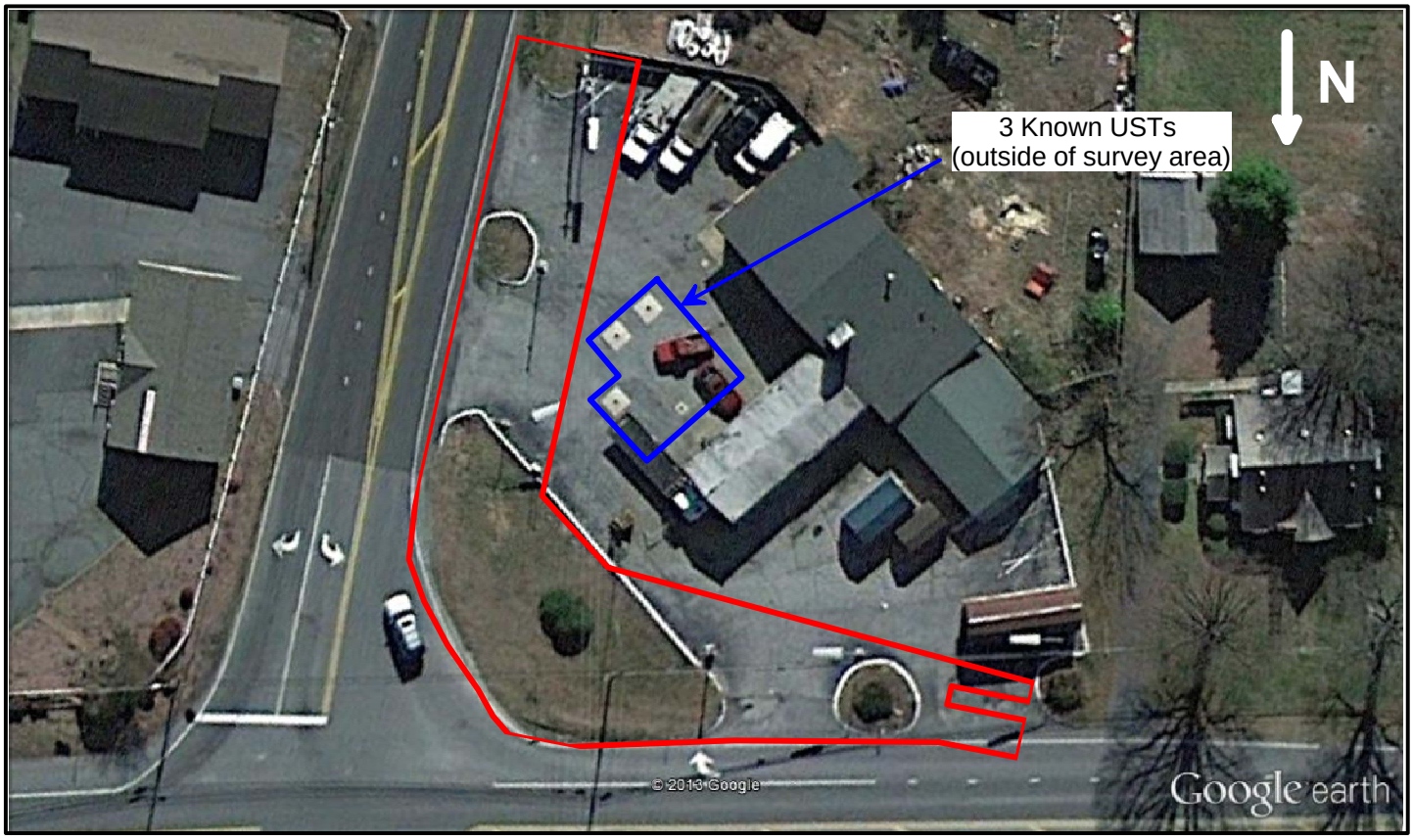
SUMMARY & CONCLUSIONS

Our evaluation of the EM61 and GPR data collected across Parcel 4, 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 non-cultural anomalies were likely due to buried metallic debris or utilities. No evidence was observed to indicate the presence of metallic USTs within the survey area that was directed by the NCDOT.
- A reconnaissance GPR survey was performed across a suspected tank field that was located outside of the formal survey area. Three known USTs were confirmed by this GPR survey.
- The geophysical investigation suggests that three known metallic USTs are present at the property, however, these tanks were outside of the survey area that was designated by the NCDOT. No evidence of metallic USTs was recorded 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

Northern Portion of Geophysical Survey Area
(Facing Approximately West)

Eastern Portion of Geophysical Survey Area
(Facing Approximately South)

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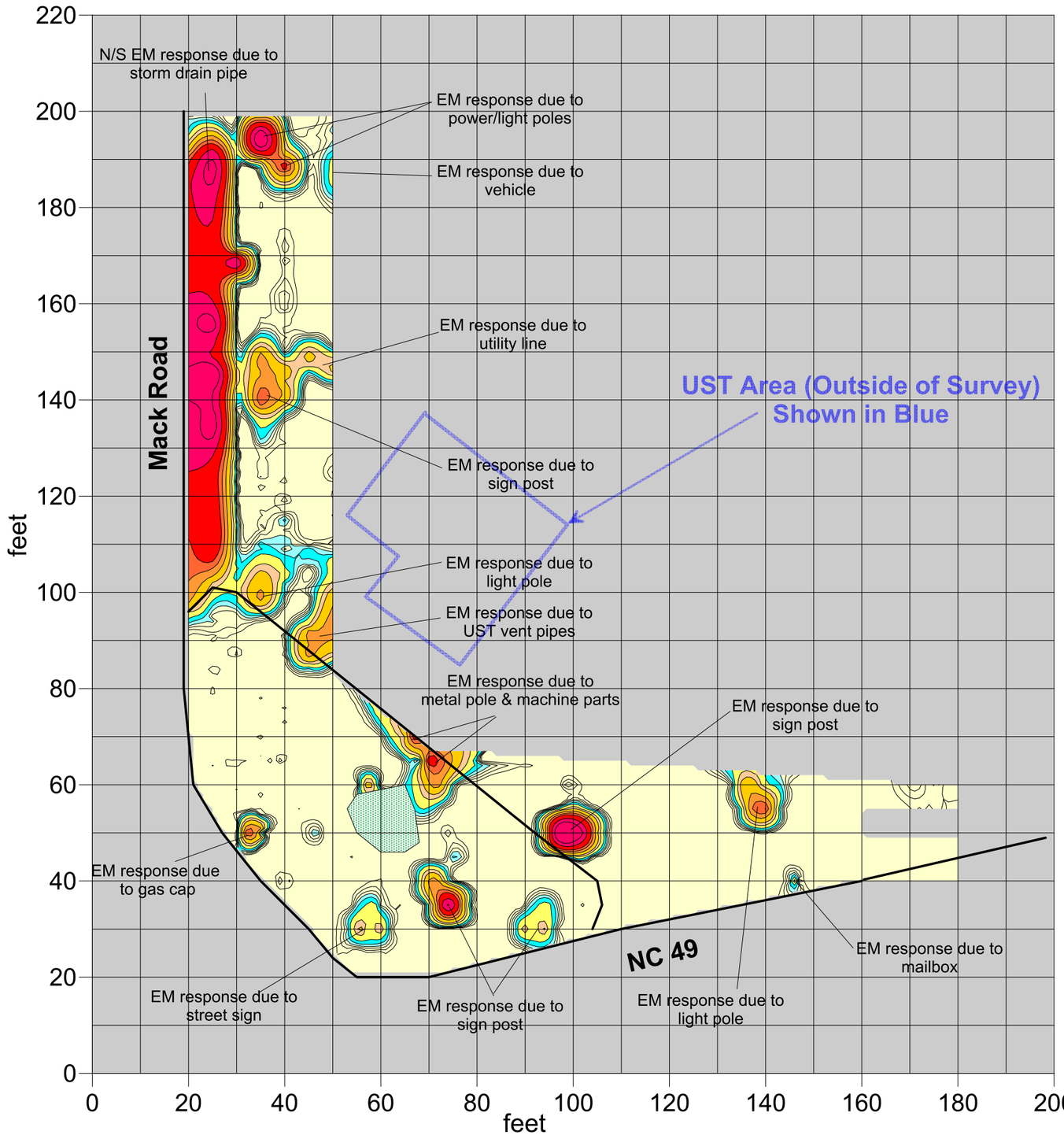
CLIENT	NC DEPARTMENT OF TRANSPORTATION	DATE	06/26/13	DRWN	ECC
SITE	PARCEL 4, RANDOLPH COUNTY (DOT ROW PROJECT)	LAY		CHKD	
CITY	ASHEBORO	STATE	NORTH CAROLINA	DWG	
TITLE	GEOPHYSICAL RESULTS			J.NO.	2013-131

SURVEY BOUNDARIES &
SITE PHOTOGRAPHS

FIGURE 1

EM61 Bottom Coil Results



THREE KNOWN METALLIC USTs OBSERVED OUTSIDE OF GEOPHYSICAL SURVEY AREA

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 17, 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 4 - EM61 BOTTOM COIL RESULTS CONTOUR MAP

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

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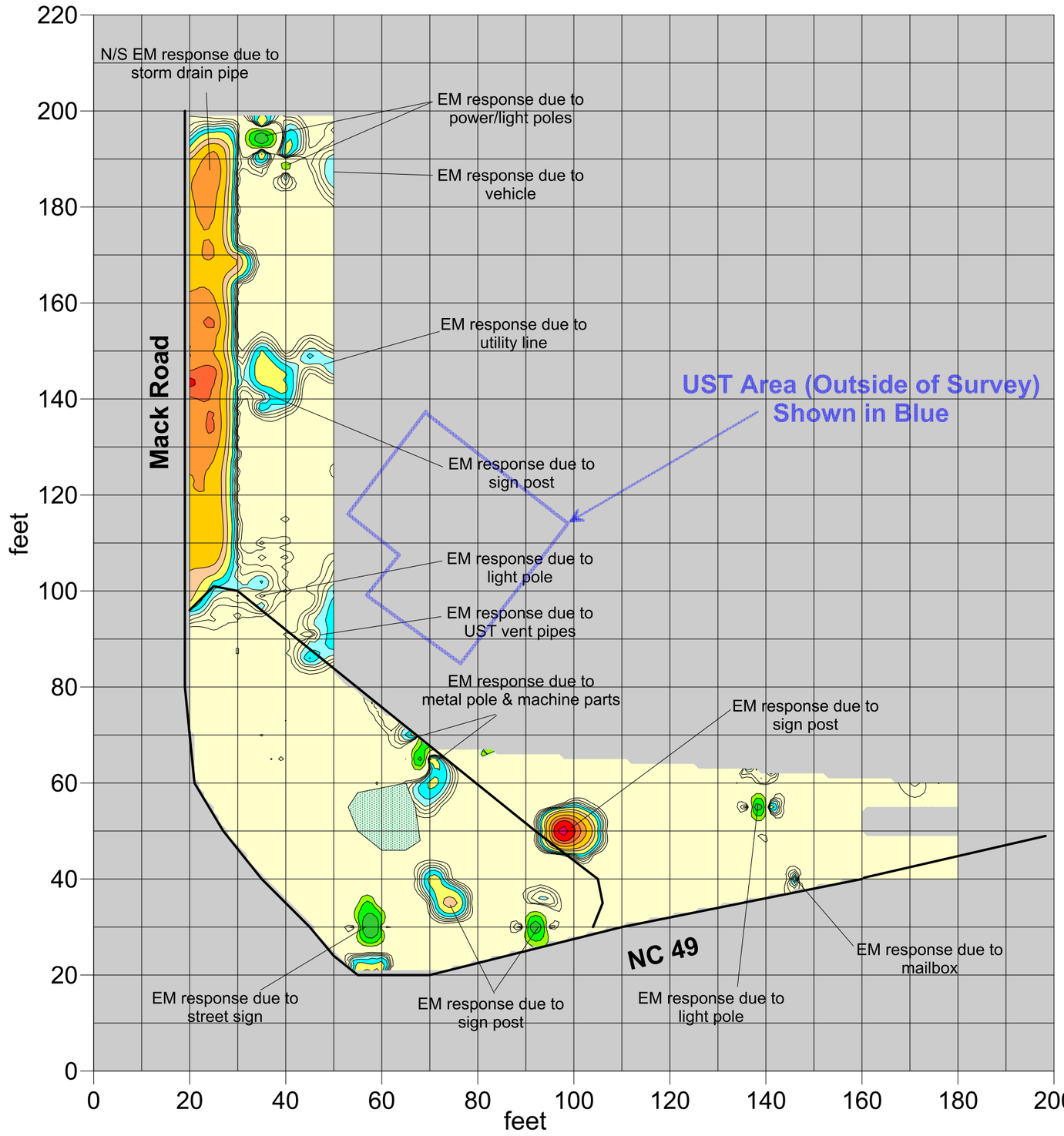
License # C1251 Eng. / License # C257 Geology

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

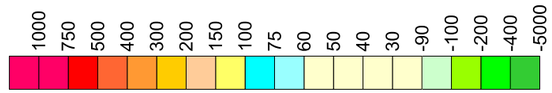
EM61 Differential Results



THREE KNOWN METALLIC USTs OBSERVED OUTSIDE OF GEOPHYSICAL SURVEY AREA

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 17, 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 4 - EM61 DIFFERENTIAL RESULTS CONTOUR MAP
PROJECT	NC DEPARTMENT OF TRANSPORTATION ROW IMPROVEMENT PROJECT ASHEBORO, RANDOLPH COUNTY, NC

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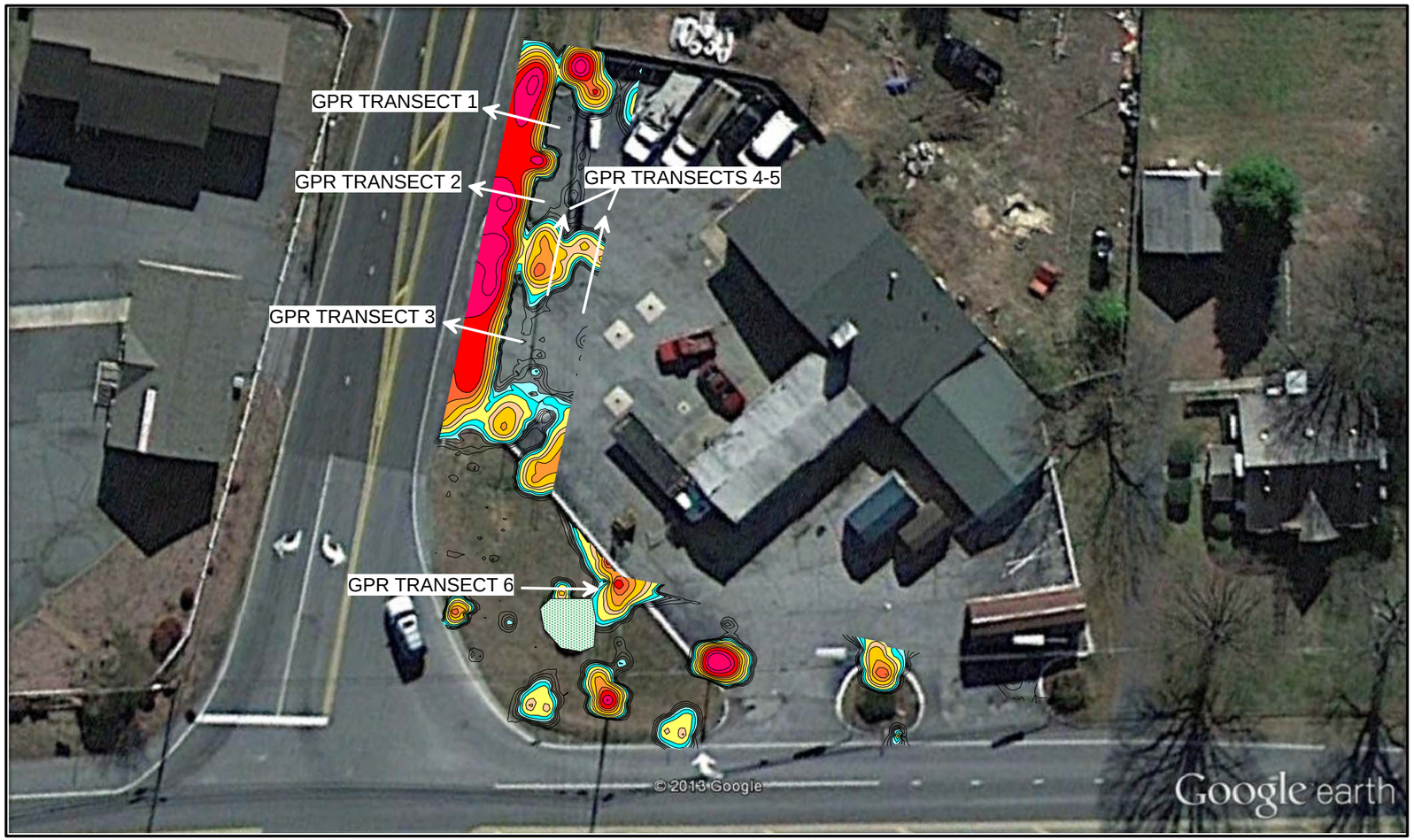
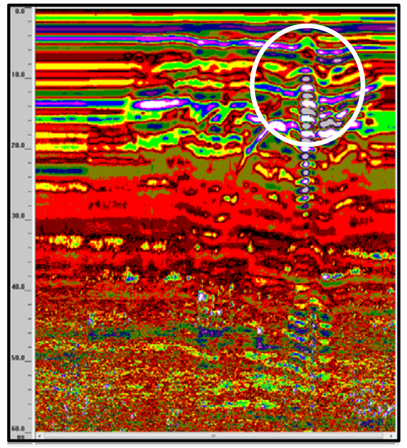
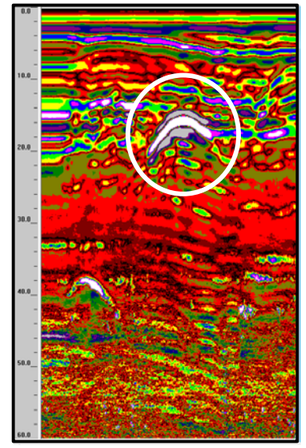
DATE	06/25/2013	CLIENT	NCDOT
PYRAMID PROJECT #:	2013-149	**FIGURE 3**	



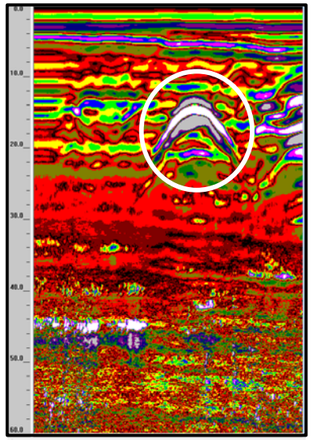
Suspected Storm Drain Pipe



GPR Transect 1



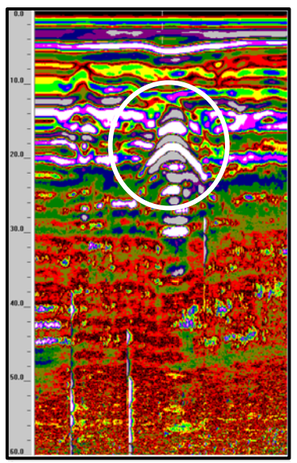
GPR Transect 2



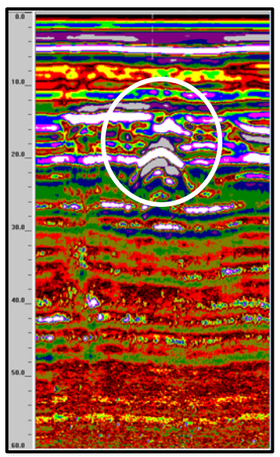
GPR Transect 3

N

Suspected Utility Line

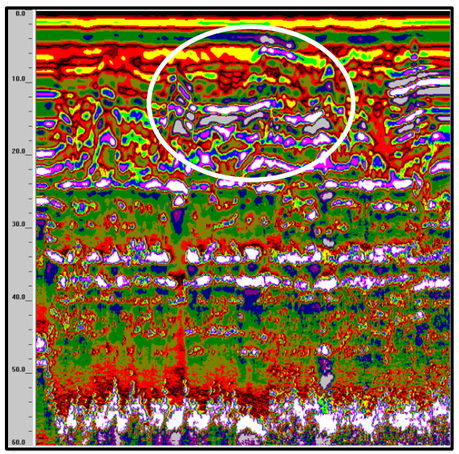


GPR Transect 4



GPR Transect 5

Suspected Buried Metallic Debris



GPR Transect 6

TITLE

PARCEL 4 - GPR TRANSECT IMAGES
ACROSS UNKNOWN ANOMALIES

PROJECT

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

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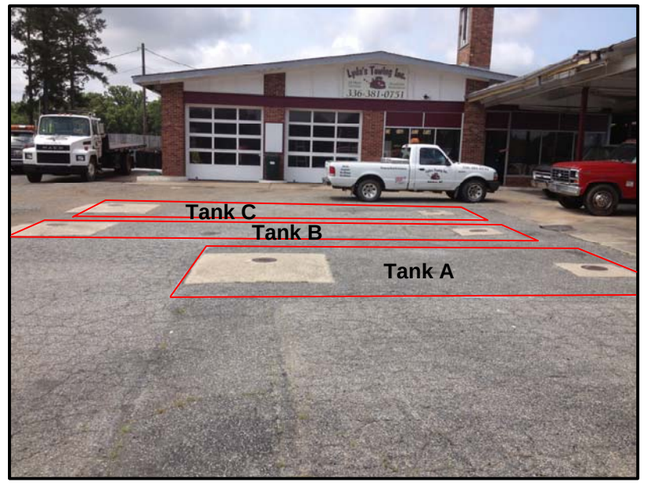
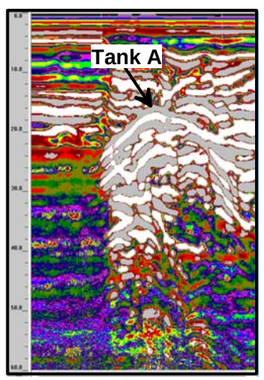
DATE	06/25/2013	CLIENT	NCDOT
PYRAMID PROJECT #:	2013-149		**FIGURE 4**

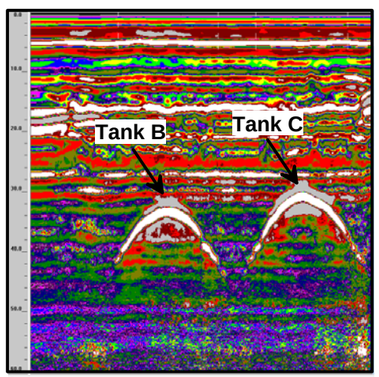


Approximate locations of known USTs

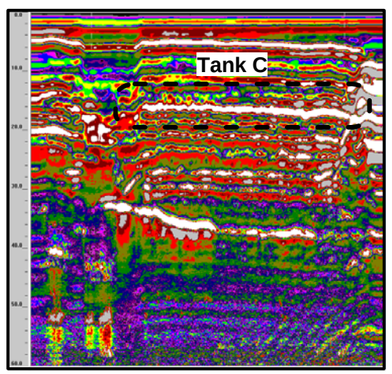
N



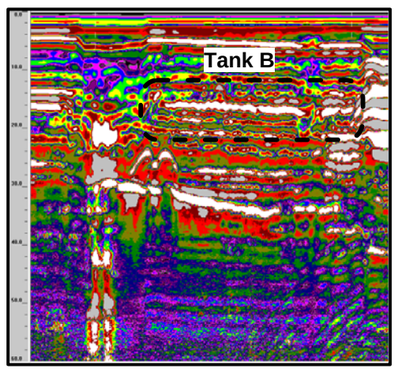
GPR Transect 7



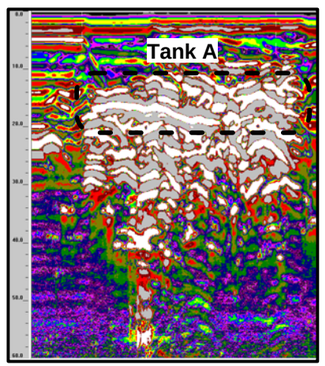
GPR Transect 8



GPR Transect 9



GPR Transect 10



GPR Transect 11

TITLE

PARCEL 4 - GPR TRANSECT LOCATIONS AND TRANSECT IMAGES ACROSS USTs

PROJECT

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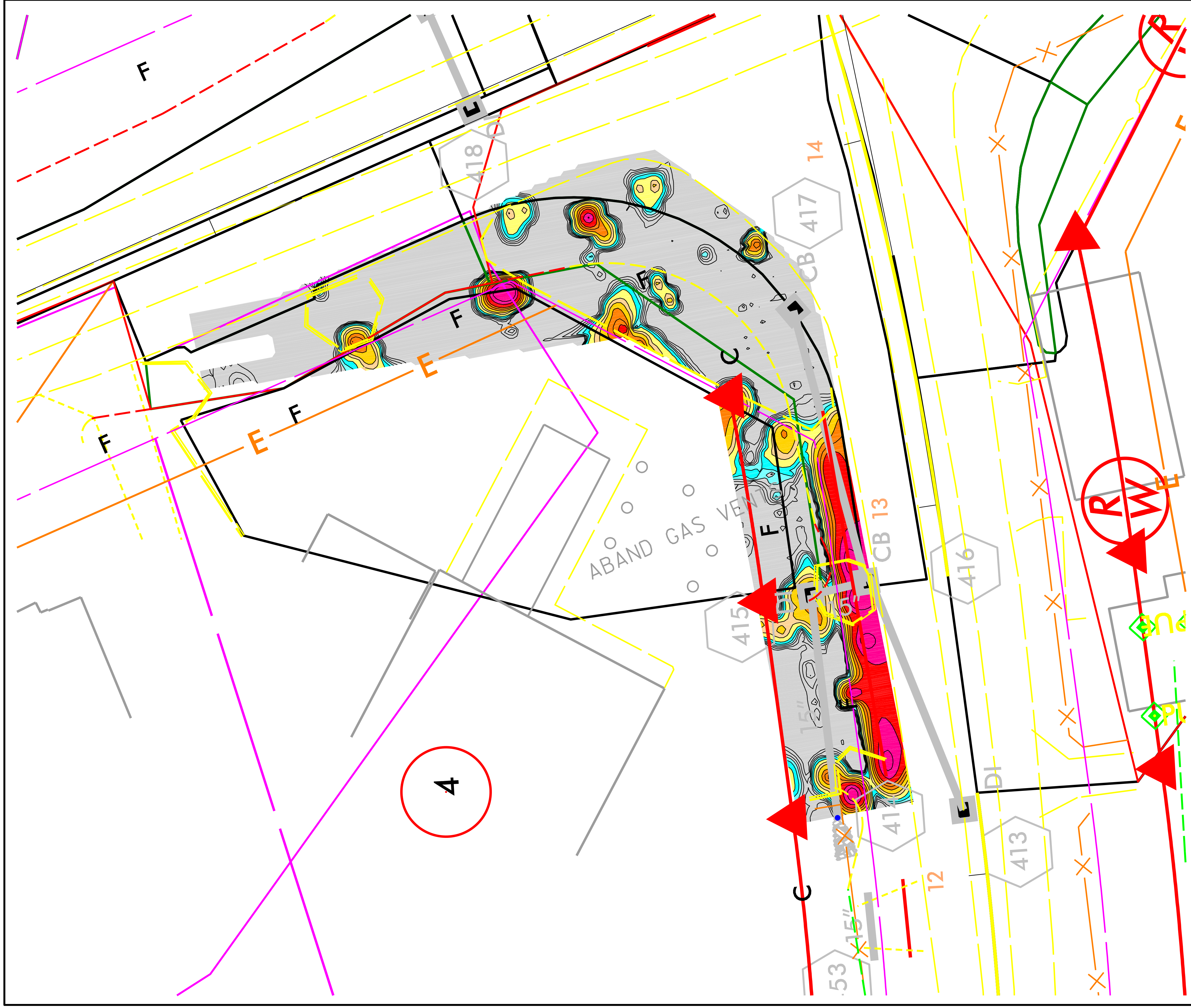
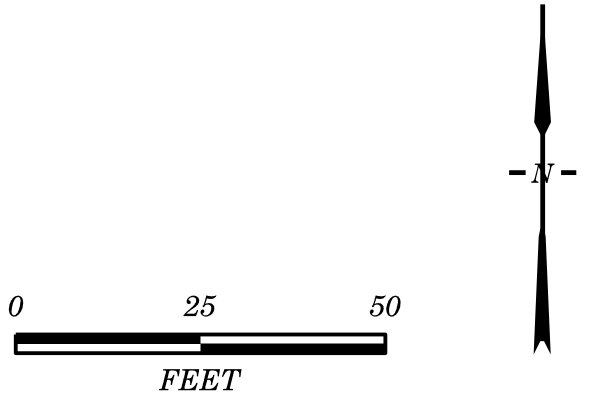
DATE	06/25/2013	CLIENT	NCDOT
PYRAMID PROJECT #:	2013-149		**FIGURE 5**



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



TITLE

EM61 BOTTOM COIL RESULTS
CONTOUR MAP OVERLAY

PROJECT

NCDOT ROW PROJECT U-5305
PARCEL 004
ASHEBORO, NORTH CAROLINA

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DATE: 7-19-13	REVISION NO. 0
PYRAMID PROJECT NO. 2012-228	FIGURE NO. 6