Geophysical Survey Report
Charlotte Multimodal Rail Station

NC DOT Parcels
Charlotte, Mecklenburg County
North Carolina

H&H Job No. ROW-504
State Project P-3800
WBS Element #32213
March 13, 2015

hart hickman

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2923 South Tryon Street, Suite 100
Charlotte, NC 28203
704.586.0007 main

3334 Hillsborough Street
Raleigh, NC 27607
919.847.4241 main

www.harthickman.com

hart hickman
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Via Federal Express

March 13, 2015

NCDOT Geotechnical Engineering Unit
1020 Birch Ridge Drive
Raleigh, North Carolina 27610

Attention: Mr. Gordon Box, LG

Re: Geophysical Survey
Charlotte Multimodal Rail Station
State Project: P-3800
WBS Element: 32213
Charlotte, Mecklenburg County, North Carolina
H&H Job No. ROW-504

Dear Gordon:

1.0 Introduction and Background Information

Hart & Hickman, PC (H&H) has prepared this letter report documenting geophysical survey activities conducted on eleven parcels located near the proposed Charlotte Multimodal Rail Station in Charlotte, Mecklenburg County. A project location map is provided as Figure 1. The geophysical survey activities were conducted on behalf of the North Carolina Department of Transportation (NC DOT) in accordance with H&H's proposal dated November 21, 2014.

The purpose of the geophysical survey was to evaluate the potential for underground storage tank (UST) systems on eleven parcels that are currently owned by NCDOT. These parcels maybe used by NC DOT to facilitate a trade for a separate parcel related to the construction of the Charlotte Multimodal Rail Station (State Project P-3800). H&H subcontracted with GEL Geophysics, LLC (GEL) of Bluffton, SC to conduct the geophysical survey. The geophysical survey activities are discussed below.

2.0 Geophysical Survey Activities

H&H reviewed the results of the geophysical survey performed at the site by GEL in January 2015. GEL utilized electromagnetic (EM) induction technology and ground penetrating radar (GPR) to identify potential geophysical anomalies and potential USTs at the site. The geophysical survey activities were conducted on the properties listed below.

Parcel ID	Property Address
Parcel 004A	NC DOT - 533 W. Trade Street
Parcel 004B	NC DOT - 537 W. Trade Street
Parcel 005A	NC DOT - 511 W. Trade Street
Parcel 005B	NC DOT - 517 W. Trade Street
Parcel 005C	NC DOT - 525 W. Trade Street
Parcel 006	NC DOT - 518 W. 4th Street
Parcel 007A	NC DOT - 512 W. 4th Street
Parcel 007B	NC DOT - 510 W. 4th Street
Parcel 007C	NC DOT - 508 W. 4th Street
Parcel 008	NC DOT - 503 W. Trade Street
Parcel 0010	NC DOT - 508 W. 4th Street

The EM/GPR results indicate the presence of multiple subsurface anomalies on the parcels that were surveyed. Three anomalies were interpreted by GEL to be possible USTs. One possible UST was identified on Parcel 4B and two possible USTs were identified on Parcel 5B. Based on the size of the possible USTs shown on Figure 1 in GEL's report, H&H estimates that the USTs (if present) are approximately 1,500 gallons each in capacity. The remaining anomalies were attributed to buried debris, known metallic surface features, suspected underground utilities, etc. that were not characteristic of typical UST signatures. No other potential USTs were identified on the remaining parcels. GEL's report, including a site map depicting the results of the EM and GPR survey, is provided in Appendix A.

3.0 Conclusions

H&H has reviewed the results of a geophysical survey conducted on eleven parcels near the proposed Charlotte Multimodal Rail Station in Charlotte, Mecklenburg County. One possible UST was identified on Parcel 4B, and two possible USTs were identified on Parcel 5B. No other potential USTs were identified on the remaining parcels. The USTs (if present) and their contents should be removed in accordance with DENR regulations prior to future construction activities.

Should you have any questions or need additional information, please do not hesitate to contact us at (704) 586-0007.

Sincerely,

Hart & Hickman, PC

NORTH CAROLINA PROFESSIONAL 3/13/15 SEAL 25069 ENGINEER MATTHEW V. BRAMBLETT

David Graham
Senior Project Geologist

Matt Bramblett, PE
Principal and Project Manager

Attachments

N

APPROXIMATE

0 2000 4000

SCALE IN FEET

U.S.G.S. QUADRANGLE MAP

CHARLOTTE, NC 2013

QUADRANGLE
7.5 MINUTE SERIES (TOPOGRAPHIC)

TITLE

PROJECT LOCATION MAP

PROJECT

NC DOT PARCELS
CHARLOTTE, MECKLENBURG COUNTY, NC

hart hickman
SMARTER ENVIRONMENTAL SOLUTIONS
2923 South Tryon Street-Suite 100
Charlotte, North Carolina 28203
704-586-0007 (p) 704-586-0373 (f)

DATE:	2-10-15	REVISION NO:	0
JOB NO:	ROW-504	FIGURE:	1

Appendix A

GEL Geophysics, LLC Geophysical Survey Letter Report

GEL Geophysics LLC
a member of The GEL Group INC

PO Box 1015
Bluffton, SC 29910
P 843.473.4409 F 843.769.7397
www.gelgeophysics.com

February 25, 2015

Mr. David Graham
Hart & Hickman, PC
2923 South Tryon Street, Suite 100
Charlotte, NC 28203

Re: Report for Geophysical Survey to Identify Underground Utilities and Potential Underground Storage Tanks
11 DOT Parcels-400 W. Trade Street
Charlotte, North Carolina

Dear Mr. Graham,

GEL Geophysics, LLC appreciates the opportunity to provide Hart & Hickman with this report of our geophysical investigation for the referenced project. This investigation was designed to determine the potential presence of underground storage tanks (USTs) at the site and underground utilities that would obstruct drilling activities at the site. The geophysical field investigation was successfully performed on January 17 through January 18, 2015.

1.0 Summary of Results

Multiple subsurface anomalies were identified in the geophysical data. Figure 1 depicts the approximate location and size of the anomalies as well as the known metallic surface objects present at the time of the investigation. The actual location of 7 GPR anomalies and 6 TDEM anomalies were identified in the field with marking paint. Three anomalies were denoted as a "Possible USTs" while the remaining anomalies were not characteristic of USTs. The anomalies not denoted as USTs in post processed data in Figure 1 are consistent with known metallic surface objects, underground utilities or cultural interference. Although geophysical methods provide a high level of assurance for the location of subsurface objects, the possibility exists that not all features can or will be identified. Therefore, due caution should be used when performing any subsurface excavation, and GEL Geophysics, LLC will not be liable for any damages that may occur. Descriptions of the technologies employed during this geophysical investigation are provided below.

2.0 Overview of Geophysical Investigation

The geophysical evaluation included the deployment of radio-frequency electromagnetic (EM), ground penetrating radar (GPR) and time-domain electromagnetic (TDEM) technologies to the site. These technologies were used in concert with one another in order to identify the presence of potential underground utilities and USTs at the site. A brief description of each technology is presented in the following paragraphs.

Radio-Frequency Electromagnetic

Radio-Frequency Electromagnetic (EM) utility locating equipment consists of a transmitter and a dual-function receiver. The receiver can be operated in a “passive” mode or in an “active” mode. The two modes of operation provide various levels of detection capabilities depending on the specific target or application.

The EM system is operated in the “active” mode by either inducting or conducting a signal into the underground utility to be traced. A transmitter is placed over and in line with a suspected buried utility. The transmitter induces a signal, which propagates along the buried utility. As the receiver is moved back and forth

across the suspected path of the utility, the trace signal induces a signal into the receivers coil sensor. A visual and audio response indicates when the receiver is directly over the buried utility.

Another means of detecting in the "active" mode utilizes a method to "conduct" a signal within the buried utility. To accomplish this, a cable from the transmitter is clamped onto an exposed section of the buried utility and a signal propagates along the buried line. This technique minimizes any interference caused by parasitic emissions from adjacent cables in congested areas. When the system is utilized in the "passive" mode, the receiver is responding to a 60 Hertz cycle current energized by underground utilities.

Interference can and may occur when buried utilities intersect or are adjacent to each other. This effect referred to as "bleed-off" may provide a false response to the identification of the tracked utility. "Bleed-off" is caused by utilities that may be energized in the "active" or "passive" mode.

Ground Penetrating Radar Methodology

A RAMAC digital radar control system configured with a 250 Megahertz (MHz) antenna array was used in this investigation. GPR is an electromagnetic geophysical method that detects interfaces between subsurface materials with differing dielectric constants. The GPR system consists of an antenna which houses the transmitter and receiver, a digital control unit which both generates and digitally records the GPR data, and a color video monitor to view data as it is collected in the field.

The transmitter radiates repetitive short-duration electromagnetic waves (at radar frequencies) into the earth from an antenna moving across the ground surface. These radar waves are reflected back to the receiver from the interface of materials with different dielectric constants. The intensity of the reflected signal is a function of the contrast in the dielectric constant between the materials, the conductivity of the material through which the wave is traveling, and the frequency of the signal.

Subsurface features that commonly cause such reflections are: 1) natural geologic conditions, such as changes in sediment composition, bedding, and cementation horizons and voids; or 2) unnatural changes to the subsurface such as disturbed soils, soil backfill, buried debris, tanks, pipelines, and utilities. The digital control unit processes the signal from the receiver and produces a continuous cross-section of the subsurface interface reflection events.

GPR data profiles were collected along transects covering the entire rights of ways. Depth of investigation of the GPR signal is highly site-specific and is limited by signal attenuation (absorption) in the subsurface materials. Signal attenuation is dependent upon the electrical conductivity of the subsurface materials. Signal attenuation is greatest in materials with relatively high electrical conductivities such as clays, brackish groundwater, or groundwater with a high dissolved solid content from natural or manmade sources. Signal attenuation is lowest in relatively low conductivity materials such as dry sand or rock. Depth of investigation is also dependent on the antenna's transmitting frequency. Depth of investigation generally increases as transmitting frequency decreases; however, the ability to resolve smaller subsurface features is diminished as frequency is decreased. The average depth of penetration at this site was approximately 2-4 feet below the surface.

The GPR antenna used at this site is internally shielded from aboveground interference sources. Accordingly, the GPR response is not affected by overhead power lines, metallic buildings, or nearby objects.

Time Domain Electromagnetic Methodology

TDEM methods measure the electrical conductivity of subsurface materials. The conductivity is determined by inducing (from a transmitter) a time or frequency-varying magnetic field and measuring (with a receiver) the

amplitude and phase shift of an induced secondary magnetic field. The secondary magnetic field is created by subsurface conductive materials behaving as an inductor as the primary magnetic field is passed through them.

The Geonics EM-61 system used in this investigation operates within these principles. However, the EM-61 TDEM system can discriminate between moderately conductive earth materials and very conductive metallic targets. The EM-61 consists of a portable coincident loop time domain transmitter and receiver with a 1.0-meter by 0.5-meter coil system. The EM-61 generates 150 pulses per second and measures the response from the ground after transmission or between pulses. The secondary EM responses from metallic targets are of longer duration than those created by conductive earth materials. By recording the later time EM arrivals, only the response from metallic targets is measured, rather than the field generated by the earth material.

3.0 Field Procedures and Results

The geophysical field investigation was successfully performed on January 17 through January 18, 2015 at the 11 DOT parcels located in the immediate vicinity of 400 W. Trade Street in Charlotte, NC. Interpretation of the GPR data was conducted in the field and any potential anomalies were marked in the field. GPR data processing typically included band pass filtering, background removal, horizontal smoothing, and gain adjustments. TDEM was also used to scan the project site. Any electromagnetic anomalies detected during field activities that were indicative of buried metallic objects were also marked in the field.

Multiple subsurface anomalies were identified in the geophysical data on Figure 1. Figure 1 depicts the approximate location and size of the anomalies as well as the known metallic surface objects present at the time of the investigation. The UST level of confidence rating system developed by NCDOT in May 2009 (“Known UST,” “Probable UST,” “Possible UST,” or “No Confidence”) was used in the interpretation and presentation of this report. The results by parcel are as follows:

DOT Parcel 4A (0.21 acres)- Two geophysical anomalies were detected during the investigation of Parcel 4A as depicted in Figure 1. Neither anomaly was indicative of a "Possible UST" or "Probable" UST.

DOT Parcel 4B (0.3 acres)- Three geophysical anomalies were detected during the investigation of Parcel 4B as depicted in Figure 1. One anomaly was indicated as being a "Possible UST" as indicated on Figure 1.

DOT Parcel 5A (0.19 acres)- There were no subsurface geophysical anomalies detected within Parcel 5A during this investigation. The anomalies represented in the data shown on Figure 1 are indicative of known metallic surface features.

DOT Parcel 5B (0.24 acres)- Multiple geophysical anomalies exist in Parcel 5B as indicated on Figure 1. Two of the anomalies are representative of "Possible USTs" as noted on the Figure. The additional anomalies present within this parcel are interpreted as either buried debris, cultural interference or known metallic surface features.

DOT Parcel 5C (0.38 acres)- There were no geophysical anomalies within Parcel 5C that were representative of a "Possible UST," "Probable UST" or "Known UST." All responses are interpreted to be cultural interference or known metallic surface features present at the time of the investigation.

DOT Parcel 6 (0.51 acres)- One geophysical anomaly was indicated within Parcel 6 on Figure 1. This anomaly was not representative of a "Possible UST," "Probable UST" or "Known UST." Additional responses are visible in Figure 1, but are representative of cultural interference or known metallic surface features.

DOT Parcel 7A (0.11 acres)- Two geophysical anomalies were identified within Parcel 7A on Figure 1. Both anomalies are interpreted to be associated with buried metallic debris based on visual evidence of a debris field on the surface. Additional responses are visible within this parcel but are representative of cultural interference or known metallic surface features.

problem solved

DOT Parcel 7B (0.08 acres)- There were no geophysical anomalies within Parcel 7B that were representative of a "Possible UST," "Probable UST" or "Known UST." All responses are interpreted to be cultural interference or known metallic surface features present at the time of the investigation.

DOT Parcel 7C (0.16 acres)- There were no geophysical anomalies within Parcel 7C that were representative of a "Possible UST," "Probable UST" or "Known UST." All responses are interpreted to be cultural interference or known metallic surface features present at the time of the investigation.

DOT Parcel 8 (0.17 acres)- Multiple geophysical anomalies exist within Parcel 8 as shown on Figure 1. All of the anomalies are representative of either known metallic surface features, suspected underground utilities, or cultural interference.

DOT Parcel 10 (0.11 acres)- Two geophysical anomalies were identified within Parcel 10 on Figure 1. Neither anomaly was indicative of a "Possible UST," "Probable UST" or "Known UST." These anomalies are interpreted as buried debris based on visual evidence on the surface.

Additional TDEM responses were present in the data, but correlated to surface metallic debris and/or above ground metal structures and are not considered to be representative of “Potential USTs.”

The locations of underground utilities were designated using EM and GPR equipment, and their locations were marked with paint on the land surface, and additionally shown in Figure 1.

Locations of data points were obtained using a Trimble R6 GPS antenna, which obtained sub-meter accuracy using corrections provided by the North Carolina RTN network.

4.0 Closing

GEL Geophysics appreciates the opportunity to assist Hart & Hickman with this project. If you have any questions or need further information regarding the project, please do not hesitate to call me at (843) 697-1571.

Yours very truly,

William S. Dovell
Project Manager

enclosures
fc: hahi00115_rpt.doc

Site Photos

Photo 1: Parcels 5B, 5C, and 4B looking northwest from Parcel 5A.

Photo 2: Looking northwest from Parcel 7C.

Photo 3: Looking southeast towards Parcel 5A and Parcel 8.

Photo 4: Looking northwest from Parcel 7C.

Photo 5: Looking northeast across Parcel 5C and 5B.

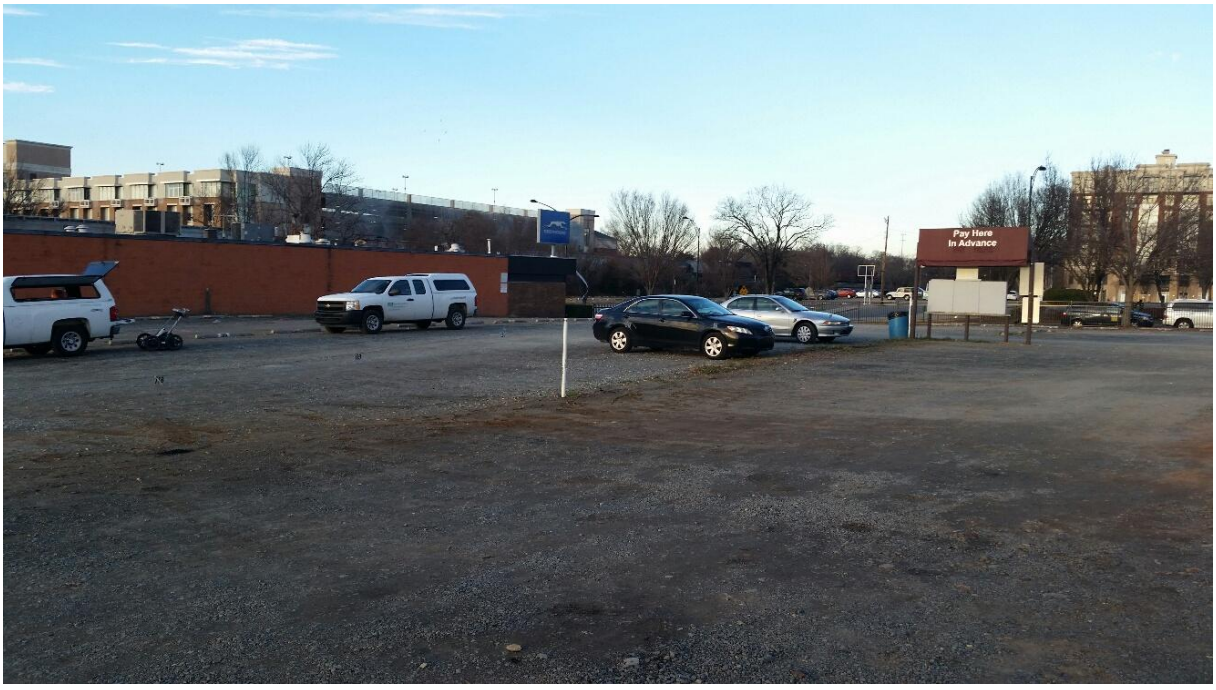


Photo 6: Looking north across Parcels 4A, 4B and 5C.

Photo 7: Looking south towards Parcel 10.

Photo 8: Looking west across Parcel 6.

Photo 9: Showing GPR anomaly and "Possible UST" (upper left) in Parcel 4B.

Photo 10: Showing GPR anomaly and monitoring well in Parcel 6.

Photo 11: Showing GPR anomaly in Parcel 10.

Photo 12: Showing "Possible UST" in Parcel 4B.

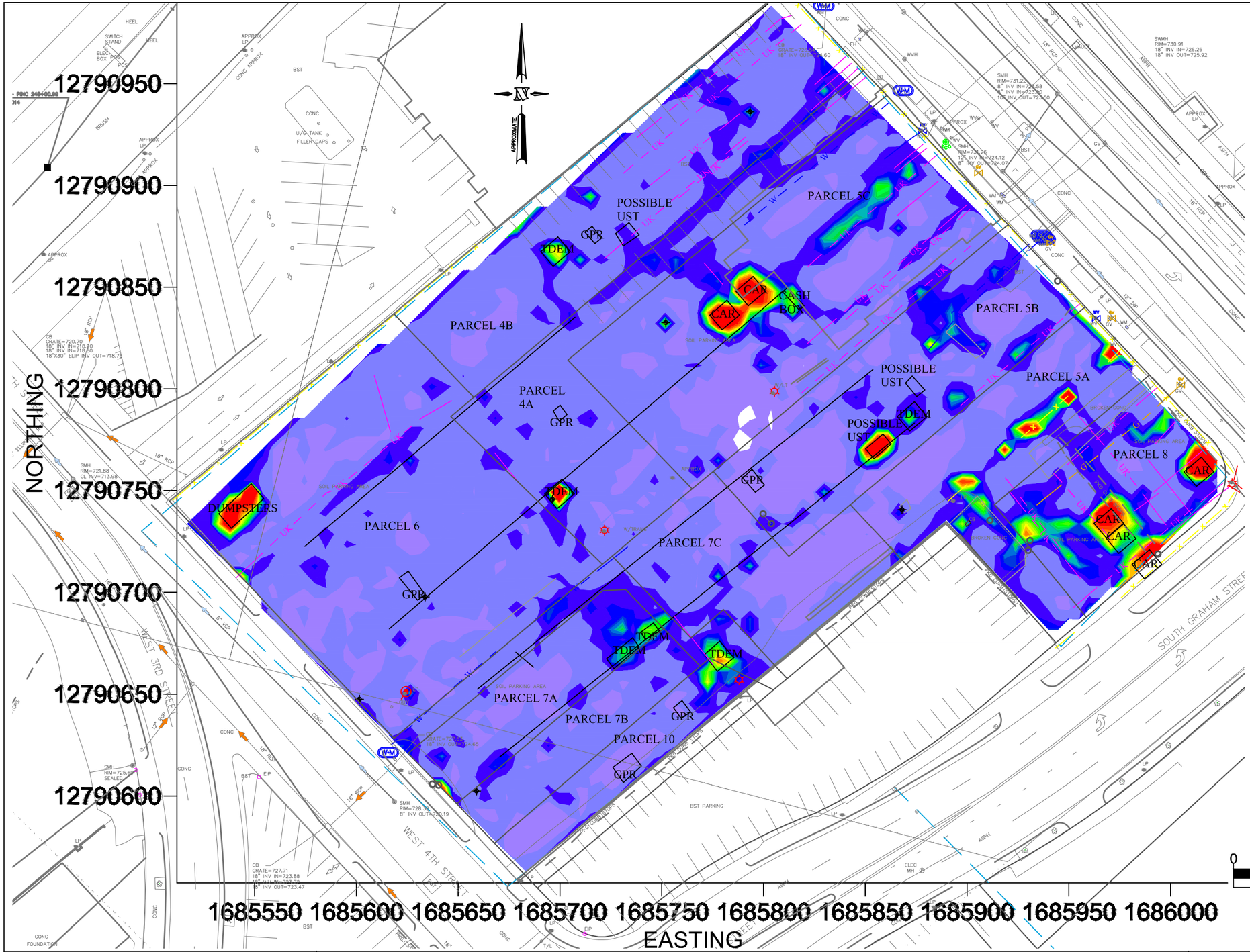
Photo 13: Looking west from Parcel 5A.

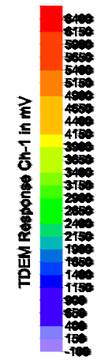
Photo 14: Showing TDEM anomaly in Parcel 5B.

Photo 15: Looking southeast from Parcel 5C.

Photo 16: Showing "Possible UST" in Parcel 5B.

Photo 17: Showing GPR anomaly in Parcel 5B.





LEGEND

- UK — APPROXIMATE LOCATION OF SUSPECTED UNDERGROUND UNKNOWN UTILITY LINE
- W — APPROXIMATE LOCATION OF SUSPECTED UNDERGROUND WATER LINE
- SD — APPROXIMATE LOCATION OF SUSPECTED STORMWATER DRAIN LINE
- G — APPROXIMATE LOCATION OF SUSPECTED UNDERGROUND GAS LINE
- E — APPROXIMATE LOCATION OF SUSPECTED UNDERGROUND ELECTRICAL POWER LINE
- X — CHAIN LINK FENCE
- END OF DESIGNATION OR UNKNOWN DESIGNATION
- POWER POLE
- METALLIC SURFACE FEATURE
- STORM DRAIN MANHOLE
- STORM DRAIN DROP INLET
- WATER VALVE
- WATER METER
- GAS VALVE
- GAS METER
- MONITORING WELL

NOTES

1) UNDERGROUND FEATURES WERE LOCATED USING VISUAL EVIDENCE, GROUND PENETRATING RADAR (GPR), RADIO-FREQUENCY ELECTROMAGNETIC (EM) AND TIME DOMAIN ELECTROMAGNETIC (TDEM) METHODS. OTHER BURIED UTILITIES AND STRUCTURES MAY EXIST BUT WERE NOT DETECTED DUE TO LIMITATIONS OF THE GEOPHYSICAL METHODS, SITE ACCESS, AND/OR HIGH TARGET CONGESTION. THEREFORE, DUE CAUTION SHOULD BE USED WHEN PERFORMING SUBSURFACE EXCAVATION ACTIVITIES WHERE POTENTIAL CONFLICTS EXIST. GEL GEOPHYSICS, LLC. IS NOT RESPONSIBLE FOR DAMAGES THAT MAY OCCUR. IDENTIFYING THE LOCATION OF SOME UTILITIES AND STRUCTURES MAY ONLY BE POSSIBLE WITH VACUUM OR OTHER EXCAVATION METHODS.
2) FIELD SURVEY CONDUCTED ON 1/17/15-1/18/15.
3) DATA FROM GEONICS, LTD. EM-61 MKII AND MALA GEOSCIENCE GROUND PENETRATING RADAR.
4) GEL GEOPHYSICS, LLC. IS NOT RESPONSIBLE FOR ACCURACY OF BASE MAP PROVIDED BY HART & HICKMAN.

GRAPHIC SCALE

0 25 50 100 200

(IN FEET)
1 inch = 50 ft.

GEL GEOPHYSICS, LLC
a Member of THE GEL GROUP, INC.
P.O. BOX 30712 CHARLESTON, SC 29417
2040 SAVAGE ROAD 29407
(843) 769-7379 FAX (843) 769-7397
WWW.GELGEOPHYSICS.COM

PROJECT: HAHI00115

UST INVESTIGATION OF
11 PARCELS W.TRADE ST AND S. GRAHAM ST
CHARLOTTE, NORTH CAROLINA
NCDOT RAIL PSA PROJECT

DATE: FEBRUARY 25, 2015

RESULTS OF GEOPHYSICAL INVESTIGATION

DRAWN BY: WSD APPRV. BY: EJB

FIGURE
1