

January 19, 2022

Craig E. Haden
NC Department of Transportation
1589 Mail Service Center
Raleigh, NC 27699-1589

**Reference: GeoEnvironmental Investigation Summary Letter
TIP Number B-5985
WBS Number 47749.1.1
Parcel #006, Taylor Insurance Agency, Inc.
No Physical Address
PIN 939175070700
Lumberton, Robeson County, North Carolina
WR Project No. 02191306.11**

Dear Mr. Haden:

WithersRavenel, Inc. (WR) is pleased to submit this summary letter describing limited GeoEnvironmental Investigation activities for the above referenced property. The investigation was conducted in accordance with verbal and email correspondence between Mr. Haden of NCDOT and WR on December 8, 2021; WR's Proposal dated December 10, 2021; and Limited Services Contract #7000020477 between the NCDOT and WithersRavenel, dated April 15, 2020. These assessment activities were completed at the request of NCDOT in support of replacing Bridge #770125 over the Lumber River on NC 41/72 and Bridge #770175 over the Lumber River on SR 1600.

The project site is located in Lumberton at Parcel #006 (no current street address), identified by Robeson County PIN number 939175070700 (hereafter referred to as the site). The project limits have been defined as additional proposed right-of-way at Parcel #006 at the southeastern corner of the intersection of W. 2nd Street (NC 41/72) and N. Water Street. The additional right of way (ROW) is required for the installation of a signal pole at the intersection.

Parcel #006 consists of a 0.64-acre parcel of commercial land that is currently improved upon with an abandoned one-story retail building, and the footprint of a former structure that was demolished. Concrete pavement is located in the area of the proposed ROW. In addition, the remnant of a former dispenser island is located on the northwestern portion of the site in the vicinity of the proposed ROW.

WR visited the site on December 21, 2021, in an effort to locate possible UST system components and other subsurface features within the proposed NCDOT right-of-way. WR subcontracted Geo Solutions Limited, Inc. (Geo Solutions), who utilized multi-frequency electromagnetic (EM) and ground penetrating radar (GPR) methods to perform the geophysical survey. The EM evaluation

was performed using a Geophex Model GEM-2 profiler. The EM data was collected with a hand-held logger and location information was recorded using a sub-meter global positioning system (GPS) unit. Geo Solutions also completed a GPR evaluation using a GSSI SIR 4000 connected to a 400 MHz antenna. The spacing of survey transects were three feet or less across the site during both methods.

Based upon the results of the EM and GPR surveys, three (3) probable USTs were identified along the southern proposed ROW line. The three USTs are estimated to be approximately five (5) feet in length and four (4) feet in diameter. Fill ports were observed at the southern end of the probable USTs.


The following table describes the USTs located during the geophysical survey:

UST ID	Confidence Level	Location	Contents	Dimensions L x Dia.
UST 1	Probable	NE corner of site, near N. Water St.	Unknown	5' x 4'
UST 2	Probable	NE corner of site, near N. Water St.	Unknown	5' x 4'
UST 3	Probable	NE corner of site, near N. Water St.	Unknown	5' x 4'

Geo Solutions' findings are presented in their *Technical Report - Geophysical Evaluation*, attached to this letter. The locations of the USTs relative to the proposed ROW line can be seen in Figures 3 through 5, and photographs of the USTs are provided in Appendix A. of Geo Solutions' report.

Please contact us if you have any questions or comments regarding this report.

Sincerely,
WithersRavenel

DocuSigned by:

146C3C179A8A468... 01/31/2022



Benjamin Whitley, PE
Senior Project Manager - Environmental

R.S. (Butch) Lawter, Jr., PE
Vice President - Environmental Services

Attached: *Technical Report - Geophysical Evaluation*, Geo Solutions Limited, Inc.,

Technical Report

Geophysical Evaluation

NCDOT U-5985 – Lumberton, NC



Prepared For:

WithersRavenel

Prepared By:

Geo Solutions Limited, Inc.

January 11, 2022



P.O. Box 293
Conway, NC 27820
(252) 578-3233

Revised January 11, 2022

Benjamin Whitley, PE
WithersRavenel
115 MacKenan Drive
Cary, NC 27511

Re: Geophysical Evaluation – NCDOT U-5985 – Lumberton, NC

File: Report

Dear Mr. Whitley:

Geo Solutions Limited, Inc. (Geo Solutions) is pleased to submit this report to WithersRavenel of a geophysical evaluation in support of an environmental site assessment of a North Carolina Department of Transportation (NCDOT) right of way (ROW) located at the southeast corner of the intersection of N. Water Street and W. 2nd Street in Lumberton, North Carolina.

Background

WithersRavenel is completing an environmental site assessment of the NCDOT ROW at the intersection of N. Water Street and W. 2nd Street in Lumberton, North Carolina. The NCDOT is planning to widen this intersection. WithersRavenel recently contracted Geo Solutions to complete a geophysical evaluation of Parcels 005 and 006 which were formally occupied by fuel service stations and are currently occupied by auto repair shops. Here, several probable underground Storage Tanks (USTs) were detected near the NCDOT ROW. Subsequently, the NCDOT requested that WithersRavenel evaluate the southeast corner of the intersection for the potential presence of USTs. As such, WithersRavenel again contracted Geo Solutions to complete a geophysical evaluation of this area. The

objective of the geophysical evaluation was to detect and map any potential USTs or other buried structure that may impact the NCDOT widening project. Figure 1 below is a site map with the geophysical evaluation boundary delineated.



Figure 1. Site map of the area of the southeast corner of the NCDOT intersection widening project with the geophysical evaluation boundary delineated in magenta.

Technical Approach

Geo Solutions completed the evaluation utilizing two geophysical methods to investigate the southeast corner of the intersection of N. Water Street and W. 2nd Street in Lumberton, North Carolina.

Multifrequency Electromagnetic (EM) Evaluation

A high resolution electromagnetic (EM) evaluation was completed using a Geophex Model GEM-2 multifrequency electromagnetic profiler which collects at a rate of 30 times per second. The EM data was collected on a hand-held data logger that communicated with the

GEM-2 unit via Bluetooth. The GEM-2 was connected to a Hemisphere Model A-325 GPS unit which is augmented by the Wide Area Augmentation System (WAAS) and is capable of submeter accuracy. The EM profile spacing was approximately 3 feet or less. The EM method is useful at evaluating the shallow subsurface for both metallic and non-metallic conductive materials such as USTs and variations in soil conductivity which may be related to former land use.

Ground-penetrating Radar (GPR) Evaluation

Geo Solutions completed a ground penetrating radar (GPR) evaluation over the two sites. Here, a GSSI SIR 4000 connected to a 400 MHz antenna mounted on a three-wheel cart was utilized. Parallel profiles spaced 3 feet or less were collected over the area of evaluation. Anomalous areas detected during the EM evaluation were scanned in greater detail. The GPR records were post processed with GSSI Radan 7 software.

Results

Multifrequency Electromagnetic Evaluation

Geo Solutions completed an EM evaluation of the site with parallel profiles spaced approximately 3 feet apart (Figure 2). Once adequate survey coverage was achieved, the EM field data were post-processed to produce a comma separated variable (CSV) file that was then transferred to a laptop computer. These data were then processed using software developed by Geophex to calculate the apparent conductivity and in-phase values for each EM frequency collected (1470Hz, 4110 Hz, 9810 Hz, 32,190 Hz, 60000 Hz, and 90030 Hz). Typically, the in-phase data (sometimes referred to as the metal detection mode) is more representative of buried metallic materials whereas the apparent conductivity is more representative of non-metallic conductive buried materials. The apparent conductivity response can also be elevated in the presence of large metal features. By evaluating both the in-phase and apparent conductivity responses, the horizontal extents of conductive and metallic materials can be characterized. All the frequencies were evaluated and the 9,810

Hz data was chosen to create figures for this report as it provided the best contrast to background site conditions and was the frequency selected to display in the report of the earlier evaluation. Shown on Figure 3 and Figure 4 are the EM in-phase (metal detection) and apparent conductivity maps respectively with explanations for the anomalous conditions observed in the EM data. Here, anomalous conditions are shown as orange to red hues. The in-phase (metal detection) and apparent conductivity responses were indicative of the presence of probable USTs at the southern side of the area of evaluation at the NCDOT ROW. Shown on Figure 4 is an area of elevated apparent conductivity within the NCDOT ROW near the northwest side of the area of evaluation. This EM response is not characteristic of a UST moreover, there was no in-phase (metal detection) response in this area. This may be related to conductive soil characteristics such as fill in this area.

Ground-penetrating Radar (GPR) Evaluation

Figure 5 is a map documenting the results of the GPR evaluation. The anomalous area detected during the EM evaluation was further evaluated with GPR. Here, three (3) probable USTs were detected. Fill ports were visible at the surface on the southern end of the probable USTs. The probable USTs were identified in the field with orange ground-marking paint (Appendix A. Photographic Log). The dimensions of each of the probable USTs were approximately 5'X4'. The distance to the closest UST from N. Water Street is approximately 14' and the distance from W. 2nd Street is approximately 28'. This is shown on Figure 5. Parallel GPR profiles were collected over the entire area of evaluation. A suspected unknown utility was detected near the northwest corner of the area of evaluation. This subsurface feature was identified in the field with white ground-marking paint. The location of this subsurface feature is also displayed on Figure 5. It is unknown if this suspected utility is related to the probable USTs. Shown on Figure 6 are cross sectional images of the probable USTs from the GPR data. The locations from which these GPR cross sections were collected are displayed on Figure 5. The top of the probable USTs were found to be between 2' and 2.5' below the land surface (bls). Figure 7 is a map

with the geophysical results overlaid on the NCDOT design plan. This figure displays the results of both the EM and GPR evaluations.

Conclusions

- Geo Solutions completed a detailed EM and GPR evaluation over the southeast corner of the intersection of N. Water Street and W. 2nd Street in Lumberton, North Carolina where the NCDOT plans to widen the roadway.
- Three (3) probable USTs were detected. The probable USTs have fill ports visible at the surface. These probable USTs appear to be within the NCDOT ROW.
- A suspected unknown utility was detected at the northwest corner of the area of evaluation. This is likely within the NCDOT ROW. It is unknown if this suspected utility is related to the probable USTs.
- An area of elevated EM apparent conductivity was detected near the northwest corner of the area of evaluation. This EM response is not characteristic of a UST.

Limitations

The detection of subsurface objects is dependent upon parameters that include size, physical composition, and depth of burial. The combination of these parameters may produce a response that is below the detection threshold for a given geophysical method.

Please don't hesitate to call if you have any questions concerning this report. We appreciate the opportunity to have worked with you on this project.

Very truly yours,

GEO SOLUTIONS LIMITED, INC.

A handwritten signature in black ink that reads "John DeLoatch". The signature is written in a cursive, flowing style.

John DeLoatch, PG
Project Manager



Geophysical Boundary —

Proposed ROW —

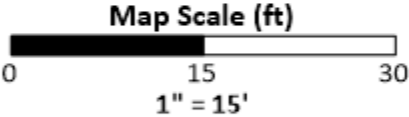
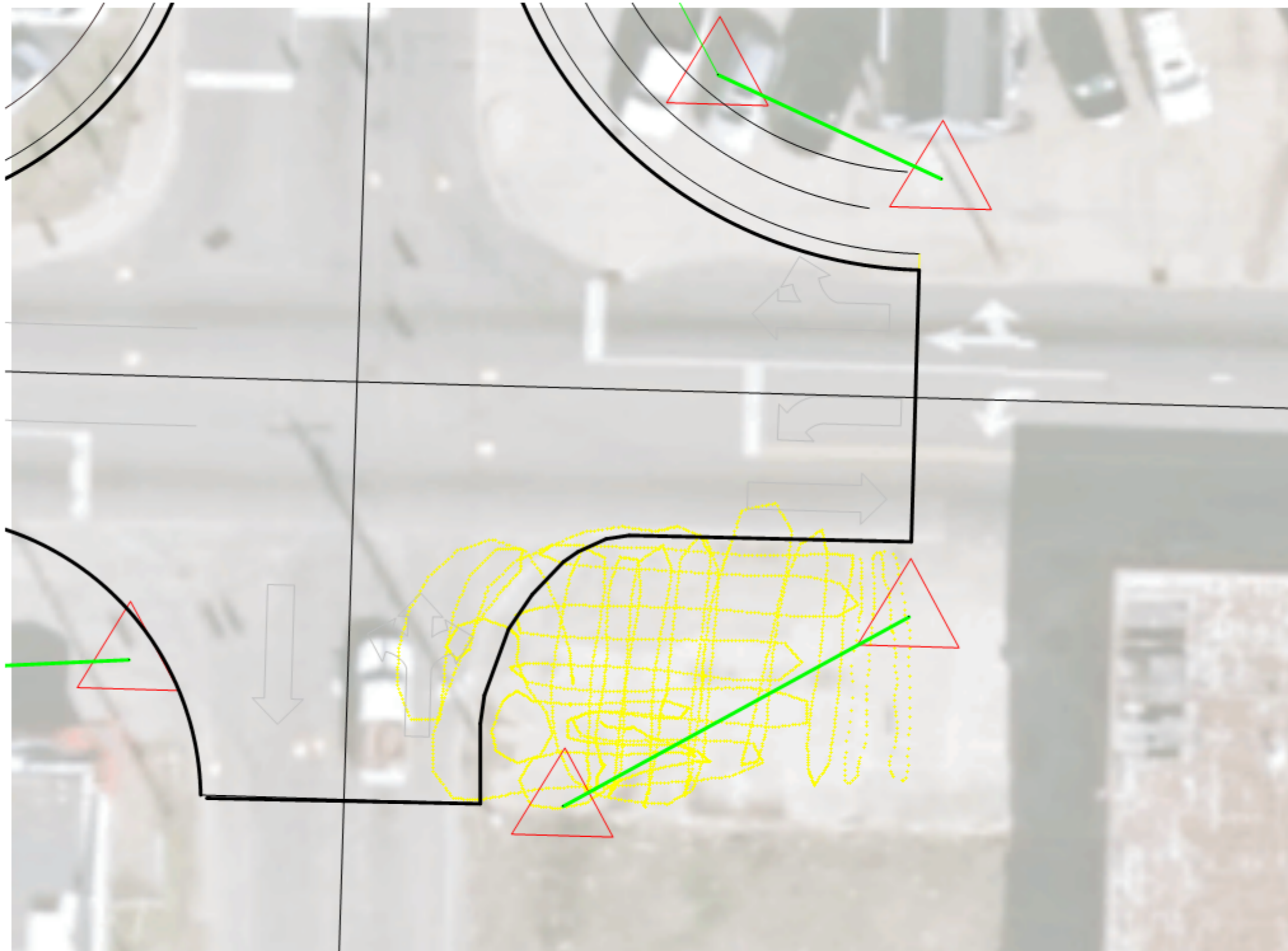
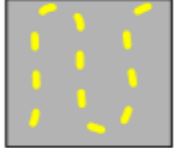



Figure 1	Geophysical Evaluation Site Map
	NCDOT U-5985 SE Corner of N. Water Street and W. 2nd Street Lumberton, NC
Geo Solutions Ltd.	




LEGEND

- Indicates Location of EM Data Point 
- Proposed ROW 

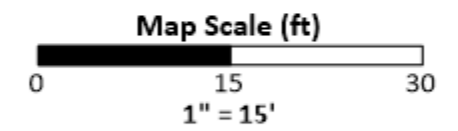



Figure 2	Geophysical Evaluation EM Profile Location Map
NCDOT U-5985 SE Corner of N. Water Street and W. 2nd Street Lumberton, NC	
	

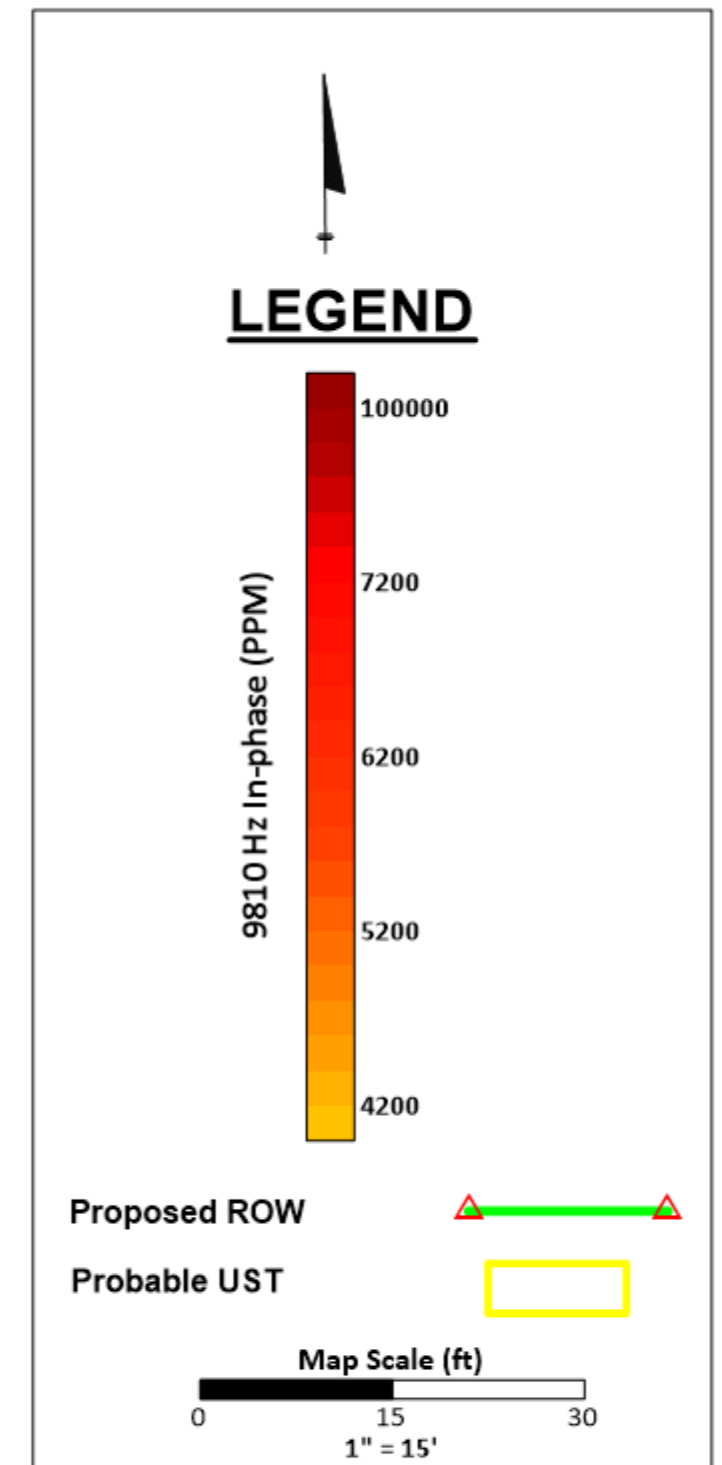
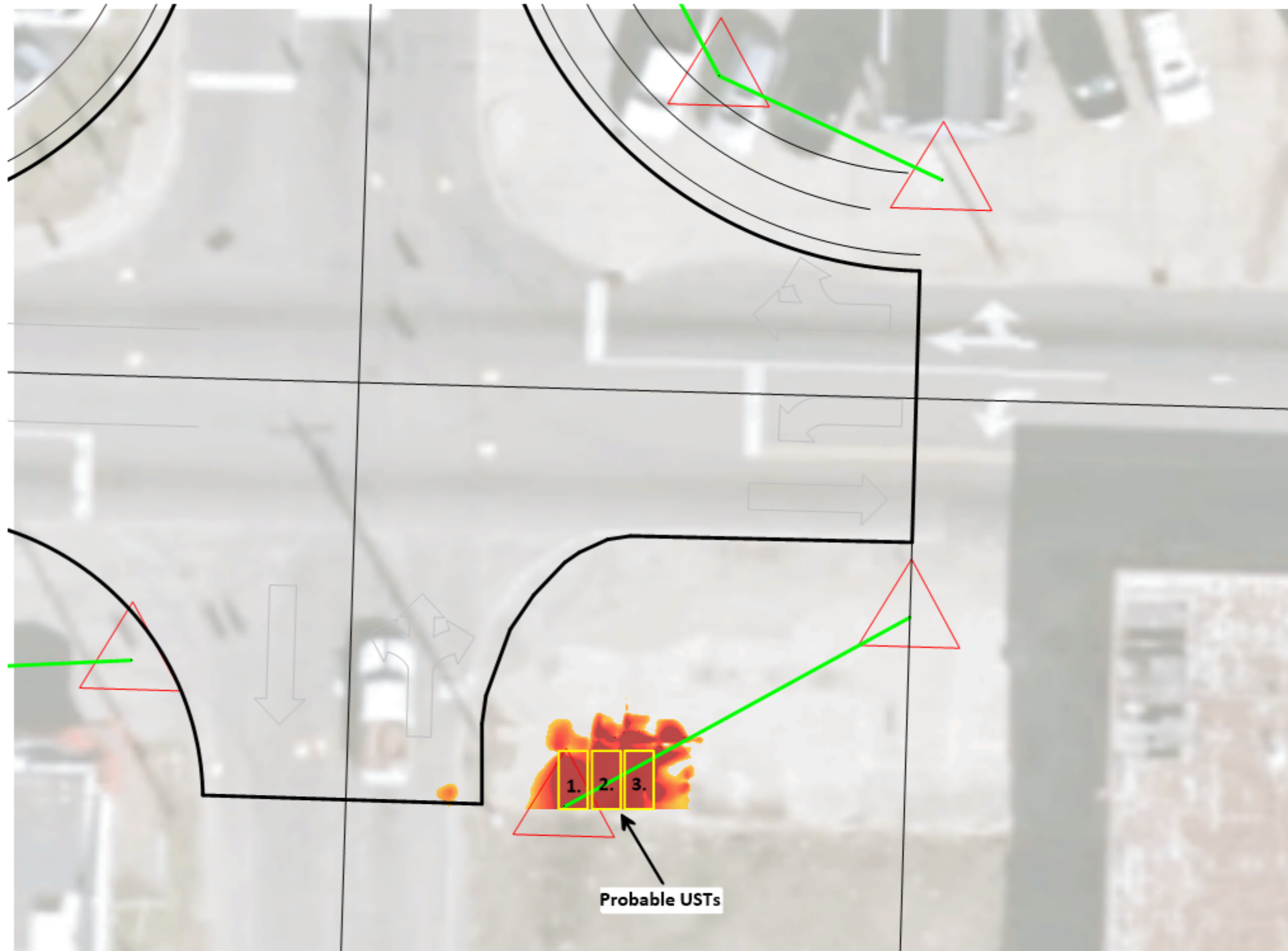


Figure 3	Geophysical Evaluation EM In-phase (Metal Detection) Results Map
	NCDOT U-5985 SE Corner of N. Water Street and W. 2nd Street Lumberton, NC
Geo Solutions Ltd.	

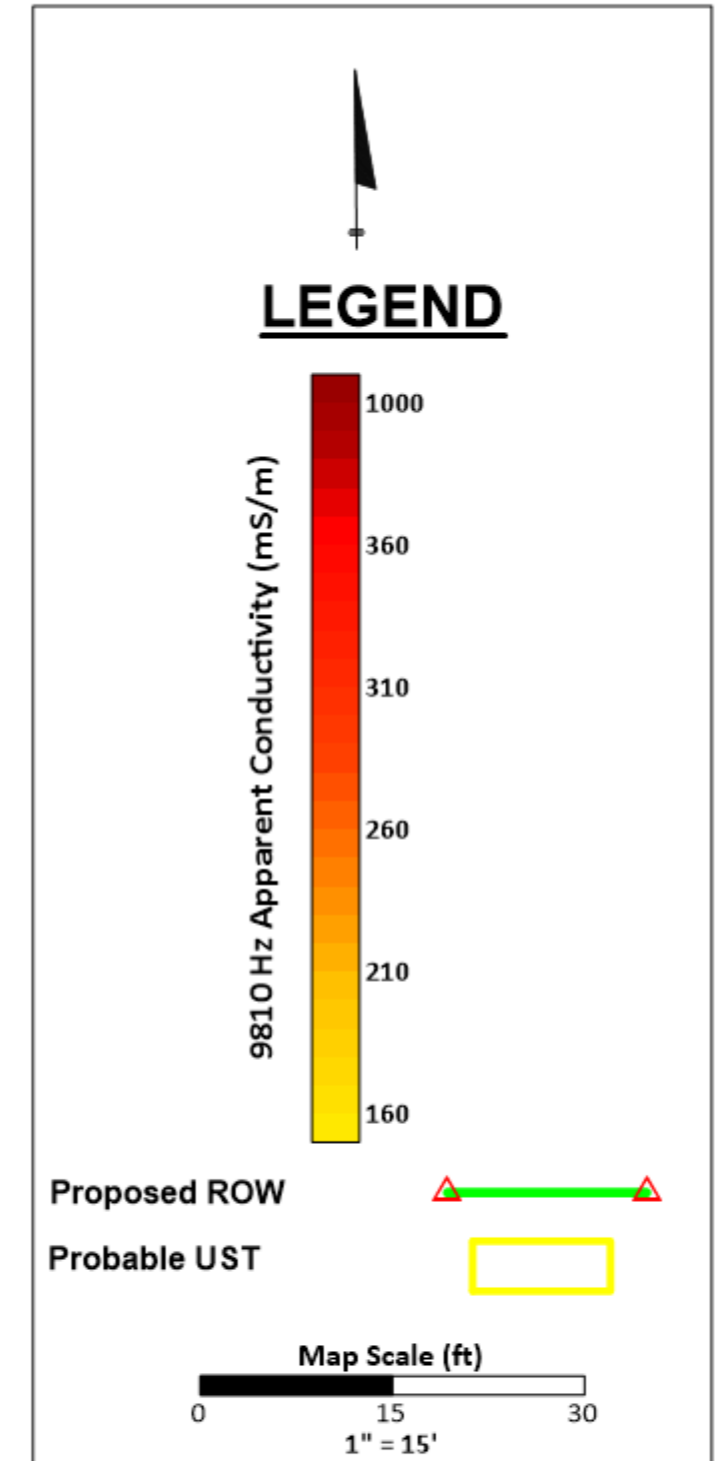
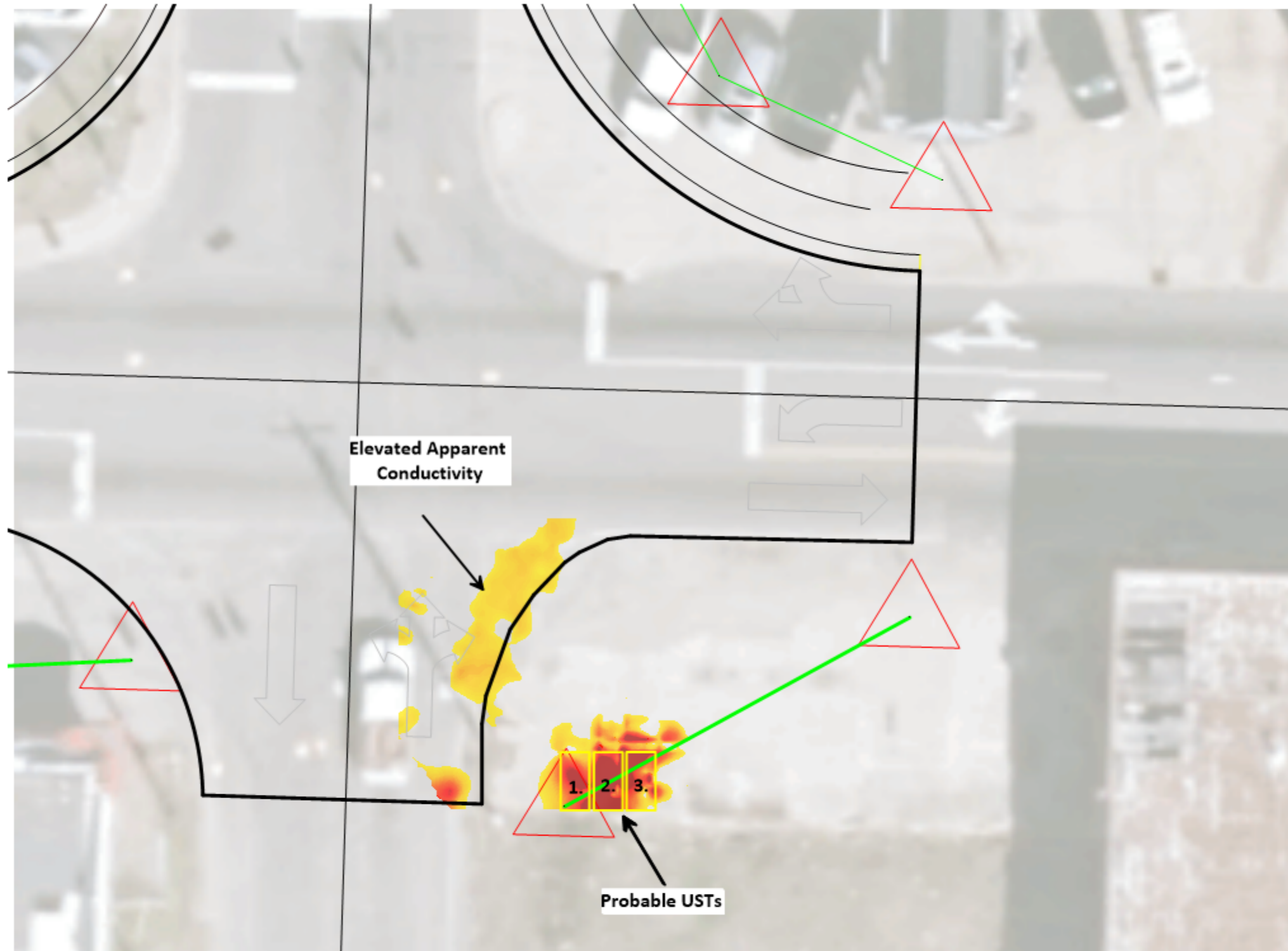
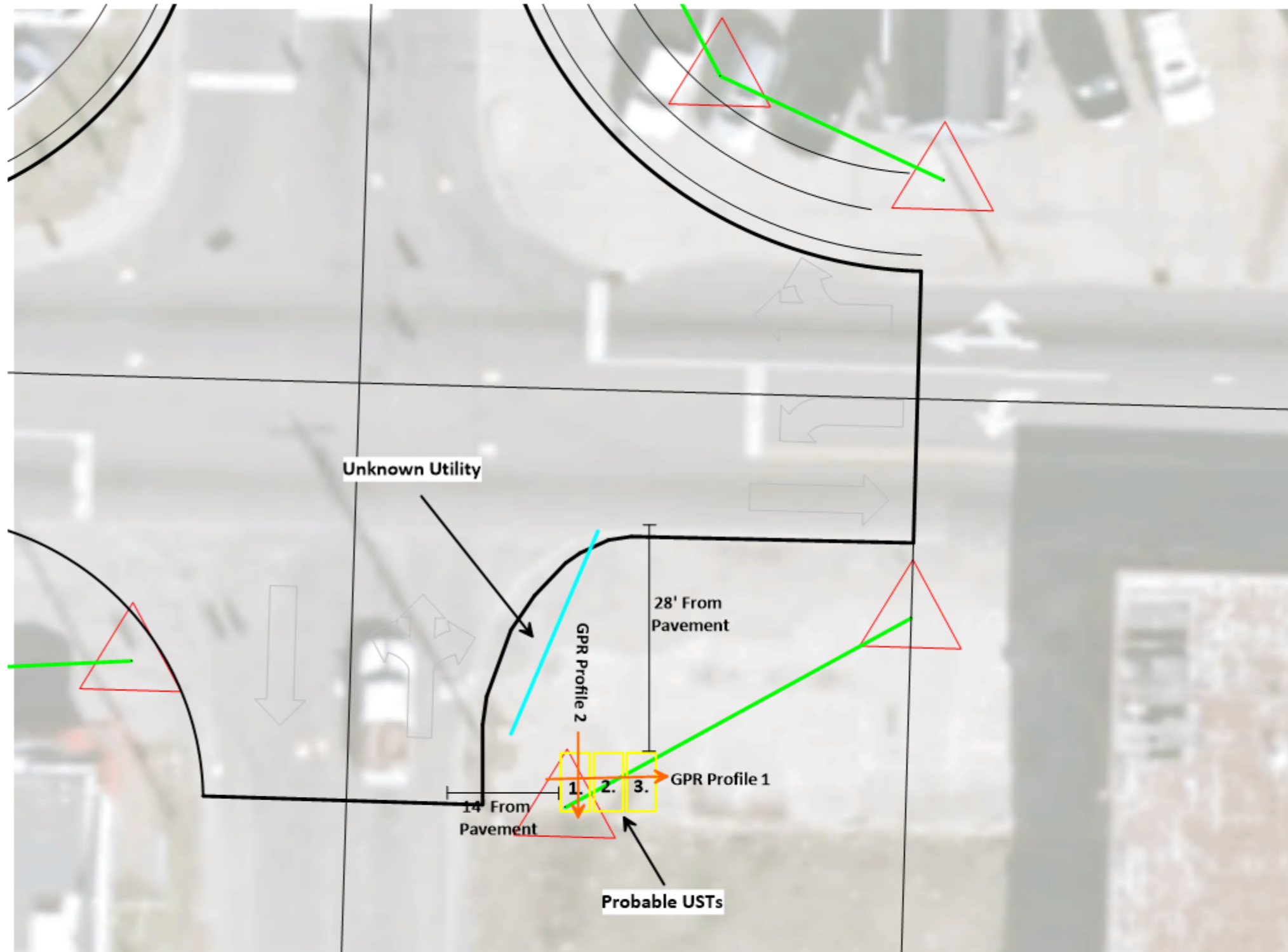


Figure 4 Geophysical Evaluation
EM Apparent Conductivity
Results Map
NCDOT U-5985
SE Corner of N. Water Street and W. 2nd Street
Lumberton, NC

Geo Solutions Ltd.




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- Probable UST
- Unknown Utility
- Proposed ROW
▲
▲

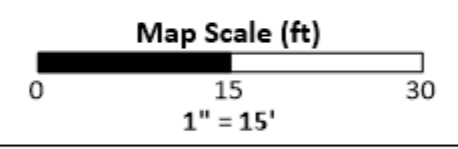

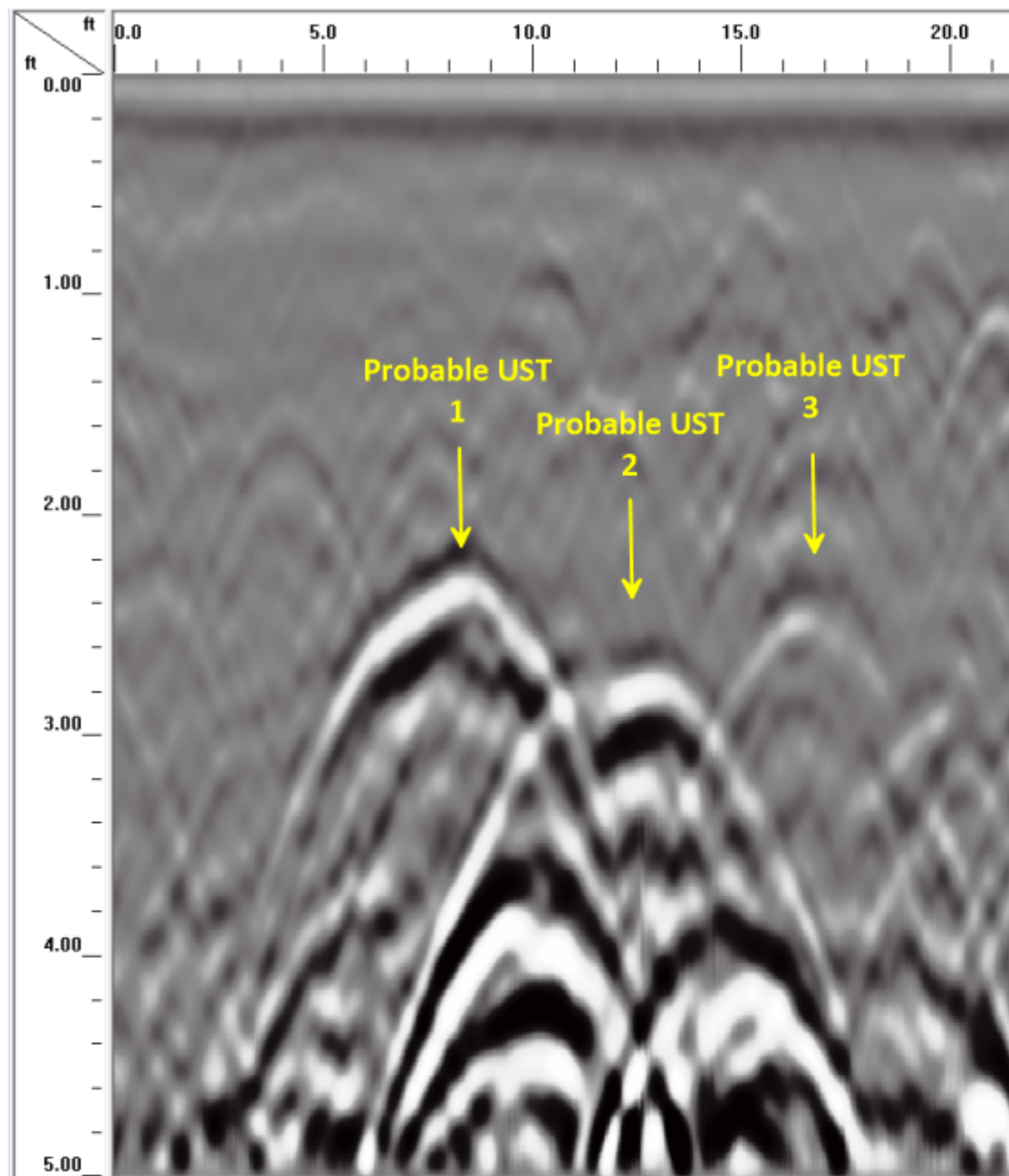
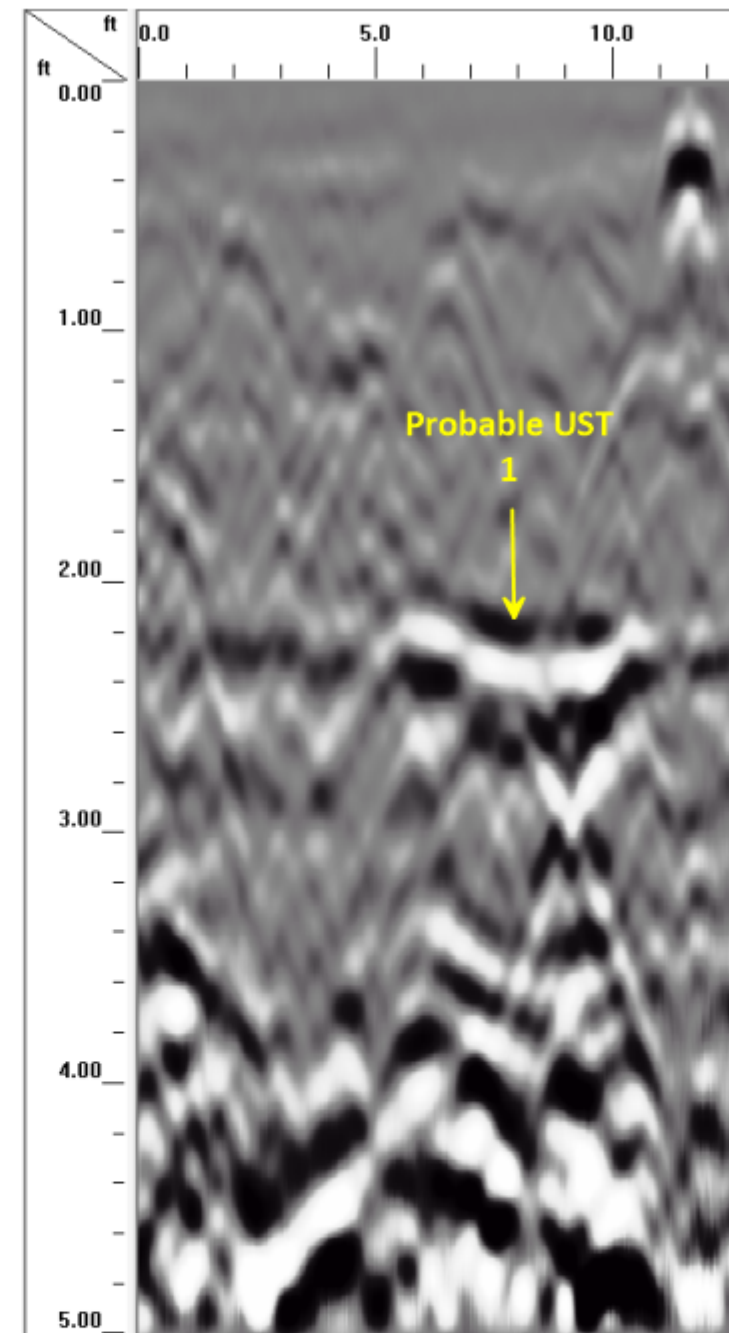



Figure 5	Geophysical Evaluation Ground-penetrating Radar Results Map NCDOT U-5985 SE Corner of N. Water Street and W. 2nd Street Lumberton, NC
	



Profile 1. Transect collected across the axis of the three probable USTs.



Profile 2. Transect collected along the axis of Probable UST 1.

Figure 6	Ground-penetrating Radar Evaluation Cross Sections of Probable USTs.
NCDOT U-5985 SE Corner of N. Water Street and W. 2nd Street Lumberton, NC	
	

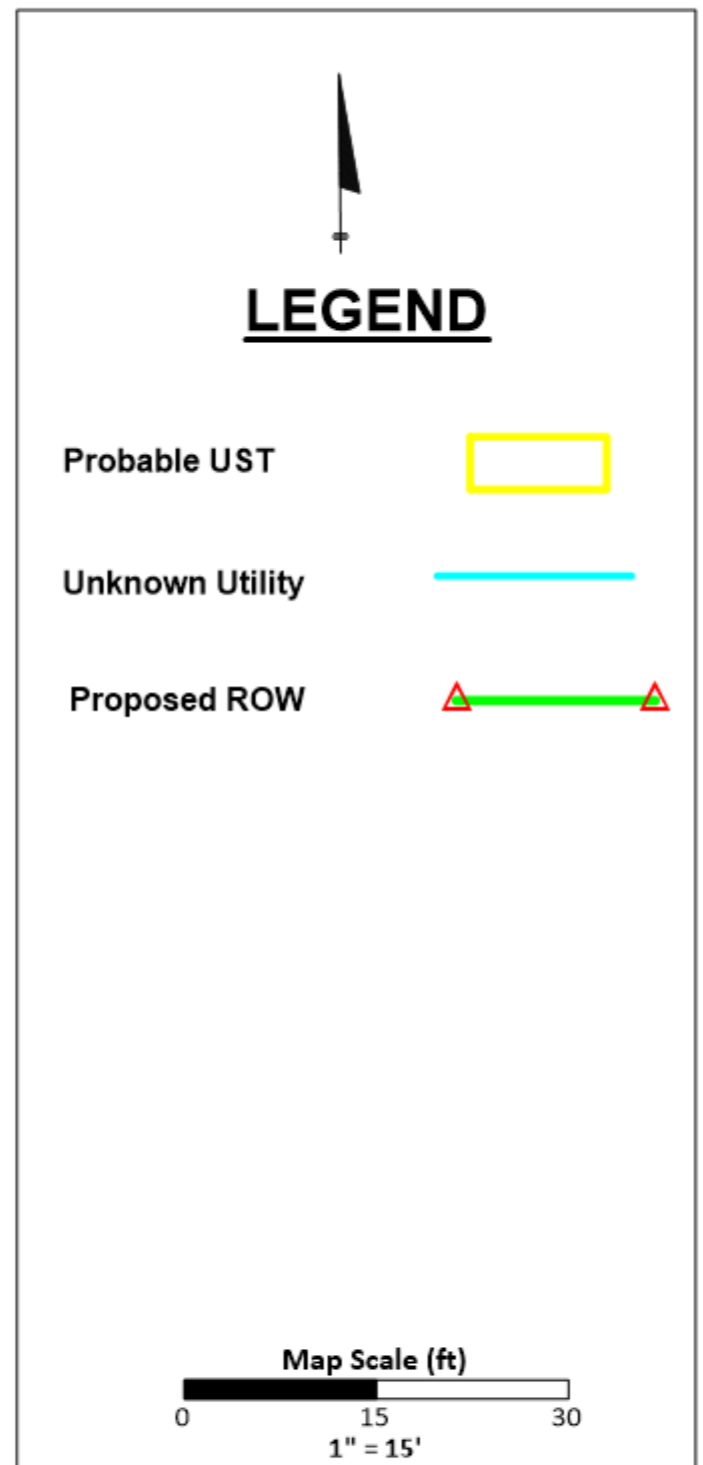


Figure 7 Geophysical Evaluation
 Geophysical Results Map overlaid
 on NCDOT Design Plan
 NCDOT U-5985
 SE Corner of N. Water Street and W. 2nd Street
 Lumberton, NC

Geo Solutions Ltd.

Appendix A. Photograph Log – NCDOT U-5985 – Lumberton, NC



Photograph 1. Probable USTs identified with orange ground-marking paint.



Photograph 2. Fill port visible at the surface.



Photograph 3. Suspected unknown utility identified with white ground-marking paint.