EXHIBIT L – GROUND PENETRATING RADAR & ELECONTROMAGNETIC INDUCTION SURVEY

Carnow, Conibear & Assoc., Ltd.
Environmental Consulting Services
600 W. Van Buren St., Suite 500, Chicago, IL 60607
t: 312.782.4486 f: 312.782.5145
www.ccaltd.com

CARNOW CONIBEAR

December 26, 2018

Mr. Richard Schleyer
Public Building Commission of Chicago
Richard J. Daley Center, Room 200
50 West Washington Street
Chicago, Illinois 60602

Re: Ground Penetrating Radar & Electromagnetic Induction Survey
Proposed Engine Company 115 – Site B
Northwest corner of S. Morgan St. and W. 119th St.
Chicago, Illinois 60643

Dear Mr. Schleyer:

The Public Building Commission of Chicago (PBCC) retained Carnow, Conibear, and Associates, Ltd. (Carnow Conibear) to conduct a ground penetrating radar (GPR) survey and an electromagnetic induction (EMI) survey to identify any anomalies buried at the Proposed Engine Company 115 – Site B (Site) which could be indicative of concrete building foundations, any existing or former underground storage tanks (USTs) or other metallic objects of concern.

Carnow Conibear worked with Ground Penetrating Radar Systems, LLC (GPRS) to conduct the GPR and EMI surveys. The EMI survey was completed on November 2, 2018 and the GPR survey was completed on November 6, 2018. The weather on both days was cloudy with temperatures around 40 degrees Fahrenheit.

The GPR and EMI surveys were conducted throughout the Site, which consists of a vacant asphalt parking lot. The Site is bounded to the north by residential properties and a park across W. 118th St; to the east by S. Morgan St., beyond which are residential and commercial properties; to the south by vacant former commercial and industrial properties across W. 119th St. and to the west by an automotive parts manufacturing facility. The GPR/EMI survey covered all the accessible areas of the Site, however, some vegetation and light stanchions within the Site were noted by the GPR technician as physical limitations to the survey. A copy of the GPRS subsurface investigation report summarizing the findings is provided in **Appendix A**.

The GPR survey was conducted using a 400 MHz GPR Antenna mounted within a stroller frame which rolls over the surface in a grid pattern. The data was displayed on a screen and marked in the field in real time. GPR works by sending pulses of energy into the subsurface and recording the strength and time required for the return of the reflected signal. Reflections are produced when energy pulses enter into a subsurface material with different electrical properties then the material it left. Based on the soil conditions at the Site, this equipment was effective to a depth of approximately 3.5 feet. The GPR survey was conducted in a grid pattern with a 3-5 foot spacing in both east-west and north-south directions. A site map of the GPR Survey is presented in **Exhibit I.**

The EMI survey was performed with a Profiler EMP-400 double coil mounted within a stroller frame. The EMI was field calibrated in an area that appears to be typical to the Site. Data was collected in a north-south orientation and post-processed to produce conductivity contour maps representing the data from approximately 3-6 feet deep. A site map of the EMI Survey is presented in **Exhibit II.**

Anomalies identified during the survey consisted of utilities such as site lighting and some storm and sewer lines. GPRS was able to locate anomalies that are consistent with possible soil change or previous excavations. GPRS was not able to definitively locate anomalies that are consistent with possible USTs.

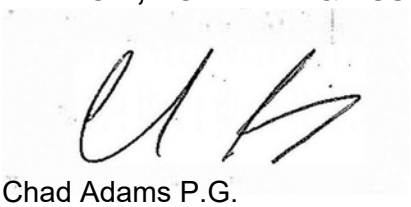
The GPR report provided by GPRS did identify two areas of possible debris or previous excavation. These areas are summarized in the following table. In addition, the EMI report indicated several areas of high conductivity and density throughout the Site. The EMI anomaly locations are presented in **Exhibit II.**

GPR Anomalies				
Anomalies	**Approximate Size**	**Location**	**Observations**	**Recommendation**
1	40’ north-south x 30’ east-west	West-central area of Site.	Possible soil change or previous excavation	Advance test pit to assess nature of soil change.
2	17.5’ north-south x 24’ east-west	East-central area of the Site.	Possible soil change or previous excavation	Advance test pit to assess nature of soil change.

If you have any questions regarding this report, please feel free to contact Nohemi Melero at (312) 762-2927.

Sincerely,

CARNOW, CONIBEAR & ASSOC., LTD.



Chad Adams P.G.
Licensed Professional Geologist

Nohemi Melero
Senior Project Manager

Attachments

Exhibit I: **GPR Survey Site Map**
Exhibit II: **EMI Survey Site Map**
Appendix A: **GPRS Report**

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Exhibits

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Date:	December 2018
Scale:	1"= 100'
Drawn by:	NM
Checked by:	DSB

Exhibit I: GPR Survey Map
Proposed Engine Company 115 - Site B
Northwest Corner of W. 119th St. & S. Morgan St.
Chicago, Illinois 60643

Your Environmental Resource

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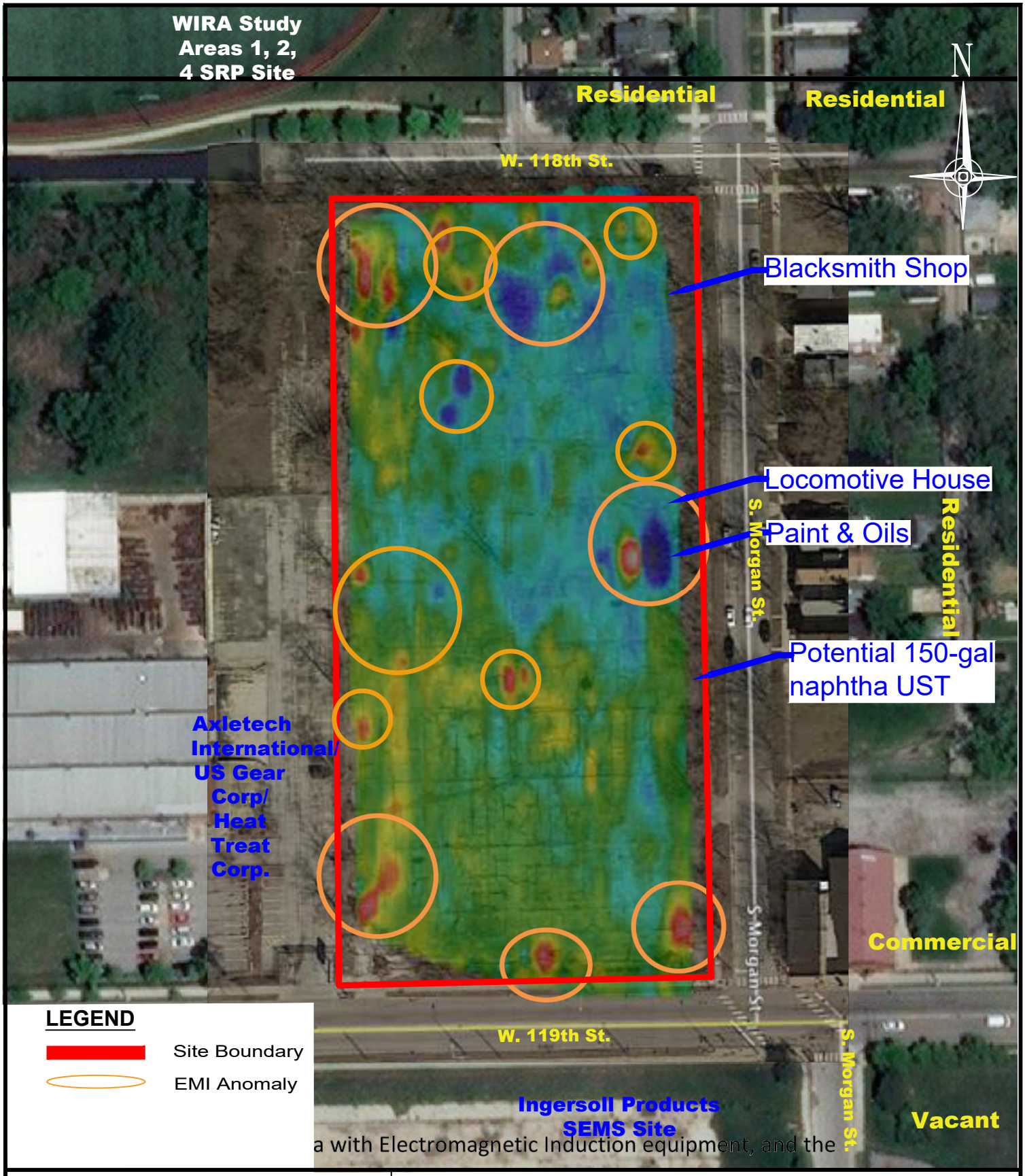

a with Electromagnetic Induction equipment, and the

Date:	December 2018
Scale:	1"= 100'
Drawn by:	NM
Checked by:	DSB

Exhibit II: EMI Survey Map
Proposed Engine Company 115 - Site B
Northwest Corner of W. 119th St. & S. Morgan St.
Chicago, Illinois 60643

Your Environmental Resource
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Appendix A: GPRS Report

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Subsurface Investigation for Storage Tanks/Anomalies

Prepared For: Carnow & Conibear

Prepared By:
Shaun Ashley
Project Manager-Midwest Region
11/7/2018

GPRS SUBSURFACE SCANNING SOLUTIONS

November 7, 2018

Carnow & Conibear
Attn: Nohemi Melero
Site: 118th and Morgan St. Chicago, IL

We appreciate the opportunity to provide this report for our work completed on 11.6.18 at the above address in Chicago, IL.

PURPOSE

The purpose of this project was to search for any underground storage tanks (UST's) or UST-related piping at the above address.

EQUIPMENT

- **400 MHz GPR Antenna.** The antenna is mounted in a stroller frame which rolls over the surface. The surface needs to be reasonably smooth and unobstructed in order to obtain readable scans. Obstructions such as curbs, landscaping, and vegetation will limit the feasibility of GPR. The data is displayed on a screen and marked in the field in real time. GPR works by sending pulses of energy into a material and recording the strength and the time required for the return of the reflected signal. Reflections are produced when the energy pulses enter into a material with different electrical properties from the material it left. The strength of the reflection is determined by the contrast in signal speed between the two materials. The total depth achieved can be as much as 8' or more with this antenna but can vary widely depending on the conductivity of the materials. Depths provided should always be treated as estimates as their accuracy can be affected by multiple factors. For more information, please visit: Link
- **Electromagnetic Pipe Locator.** The EM locator can detect the electromagnetic fields from live power or radio frequency signals. It can also be used in conjunction with a transmitter to connect directly to accessible, metallic pipes, risers, or tracer wires. A current is sent through the pipe or tracer wire at a specific frequency and the resulting EM field can then be detected by the receiver. The receiver is moved over the surface without coming in contact with the ground so it is not affected by terrain. Depths provided should always be treated as estimates as their accuracy can be affected by multiple factors. Depths achieved can be as much as 20' depending on the type of signal being traced or methods used. For more information, please visit: Link
- **Electromagnetic Induction (EMI).** EMI instruments contain two sets of coils that are located on opposite ends of the tool. One set of coils is used to transmit a primary magnetic field, which generates an electrical current into the ground. The induced current then generates a secondary magnetic field, which is sensed by the coils in the receiver end of the instrument. The EMI is moved over the surface without coming in contact with the surface so it is not affected by the terrain. However, EMI results are affected by surface features including vehicles, reinforced concrete, and buildings. Data is then displayed on a control unit indicating the conductivity of the earth or buried objects. The data is post-processed and displayed in a color-coded contour map which shows relative changes in conductivity. Link

PROCESS

The EM pipe locator was used to connect to accessible, traceable pipes that may be tank-related such as vent pipes or product lines. A current is induced onto the pipe which creates an electromagnetic field that can be traced using the receiver. We can then attempt to trace these pipes to their origin or end point and paint or flag their locations.

Initial GPR scans were collected in order to evaluate the data and calibrate the equipment. Based on these findings, a scanning strategy is formed, typically consisting of scanning the entire area in a grid with 3'-5' scan spacing in order to locate any potential UST's that may remain at the site. The GPR data is interpreted in real time and anomalies in the data are located and marked on the surface along with their depths using spray paint, pin flags, etc. Depths are dependent on the dielectric of the materials being scanned so depth accuracy can vary throughout a site. Relevant scan examples were saved and will be provided in this report.

The EMI is first calibrated in an area that appears to be typical to the site. Data is then collected with a 3'-5' scan spacing in one orientation across the site. The findings are post-processed to produce contour maps of the conductivity values that were obtained.

LIMITATIONS

Please keep in mind that there are limitations to any subsurface investigation. The equipment may not achieve maximum effectiveness due to soil conditions, above ground obstructions, reinforced concrete, and a variety of other factors. No subsurface investigation or equipment can provide a complete image of what lies below. Our results should always be used in conjunction with as many methods as possible including consulting existing plans and drawings, exploratory excavation or potholing, visual inspection of above ground features, and utilization of services such as One Call/811.

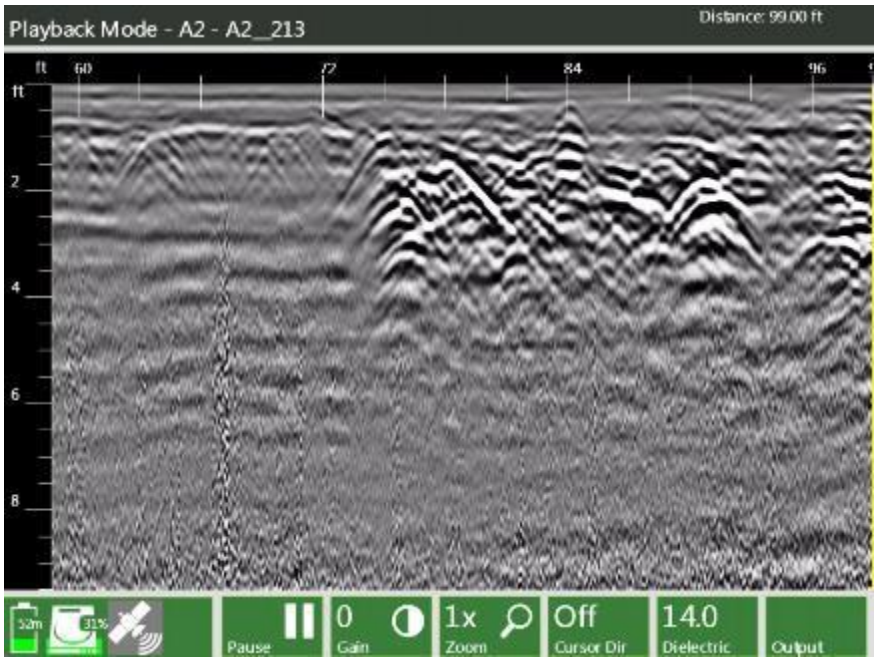
At this site, our scans were limited by curbs around landscaping and uneven surfaces.

FINDINGS

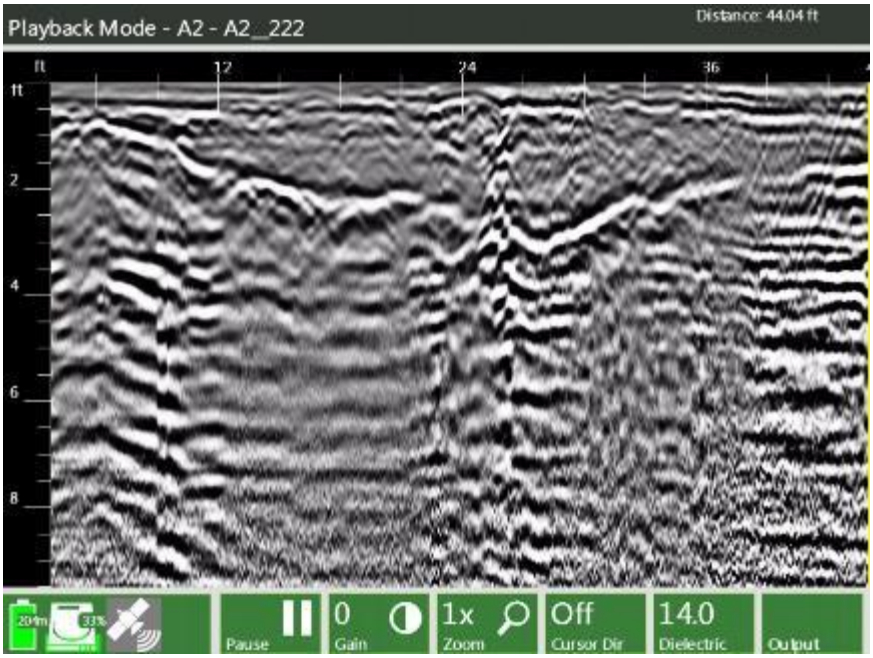
We found that the soil allowed for maximum GPR depth penetration of 3.5' in most areas. We were able to locate utilities such as site lighting and some storm lines using either the GPR or RD. GPRS did not locate water, gas or communication within the scanned area. **The site was scanned in attempt to locate evidence of utilities and for other significant anomalies near boring locations. Once all of the target areas were scanned, GPRS was able to locate anomalies that would be consistent of possible soil change or previous excavation. GPRS was NOT able to locate anomalies that would be consistent of possible UST with the GPR.** Further investigation may be required. GPRS located what we were able to locate given site conditions/obstructions, scanning constraints and equipment limitations.

The following pages will provide photos and further explanation of our findings.

Scan Area Outlined in Yellow	N	118th and Morgan St Chicago, IL	GPRS



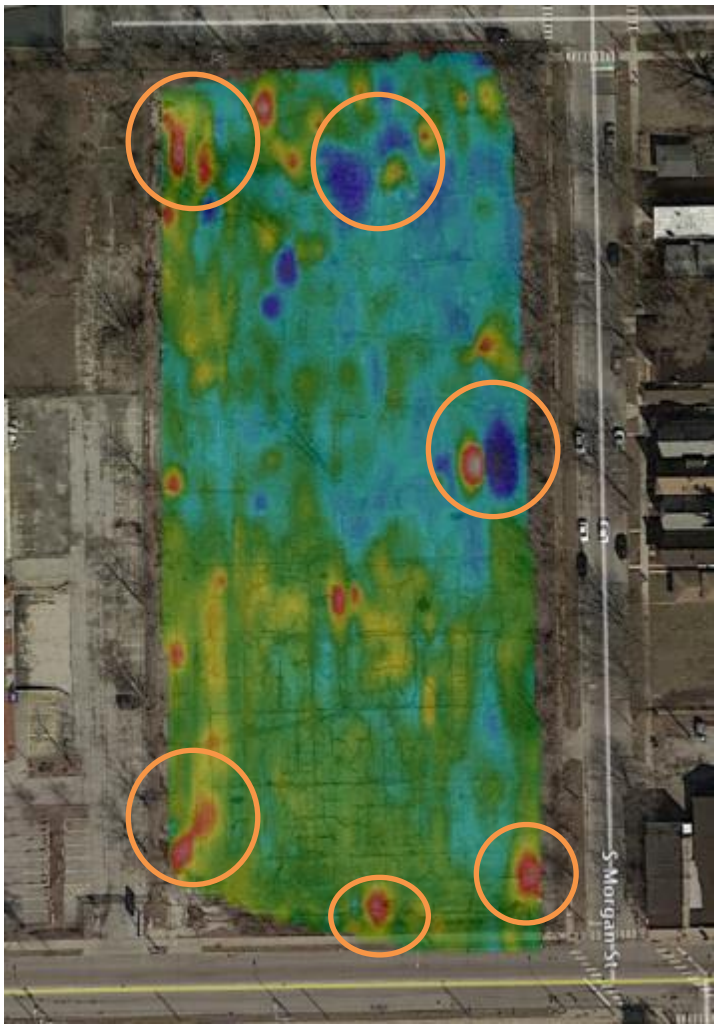
GPR data screenshot



GPR data screenshot

GPR Data Screenshots of possible debris or previous excavation. Further investigation may be required.	118th and Morgan St Chicago, IL	GPRS

Overview of findings	118th and Morgan St Chicago, IL	GPRS



GPRS scanned the area with Electromagnetic Induction equipment, and the following conductivity maps represent the data collected from the scanning process (approximately 3'-6' deep). These conductivity maps provide information as it relates to the conductivity of the area(s) scanned. GPRS is providing this information for your interpretation. GPRS will simply point out the areas of higher conductivity (circled in red). It is the responsibility of the customer to further analyze/investigate the information provided. There may be limited data from the EMI due the buildings obstructing the GPS if present

EMI Data	118th and Morgan St Chicago, IL	GPRS

CLOSING

GPRS, Inc. has been in business since 2001, specializing in underground storage tank location, concrete scanning, utility locating, and shallow void detection for projects throughout the United States. I encourage you to visit our website (www.gprsinc.com) and contact any of the numerous references listed.

GPRS appreciates the opportunity to offer our services, and we look forward to continuing to work with you on future projects. Please feel free to contact us for additional information or with any questions you may have regarding this report.

Signed,

Shaun Ashley
Project Manager — Midwest Region

GPRS SUBSURFACE SCANNING SOLUTIONS

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