



Stantec Consulting Services Inc.
12075 Corporate Parkway, Suite 200 Mequon WI 53092

August 2, 2016
File: 193703931

Attention: Nicolas Sparacio, AICP
Community Development Director
City of Manitowoc
900 Quay Street
Manitowoc, WI 54220-4543

Dear Mr. Sparacio:

Reference: Ground Penetrating Radar Survey Results
1037 S 26th Street
Manitowoc, Wisconsin 54220
USEPA Cooperative Agreement No. BF-00E01529-0
Stantec Project No. 193703931

On behalf of the City of Manitowoc (City), Stantec Consulting Services (Stantec) has conducted a geophysical survey using ground penetrating radar (GPR) survey techniques at the commercial Brownfield property located at 1037 S 26th Street in Manitowoc, Wisconsin (herein referred to as the "Site"). The location of the Site is illustrated on Figure 1. This work was completed utilizing petroleum Brownfield site assessment grant funds provided to the City by the United States Environmental Protection Agency (USEPA) in 2015 under cooperative agreement number BF-00E01529-0. The following sections summarize project background and define the problem statement and purpose, describe GPR survey methods used in the survey, and present the results and conclusions of the survey.

BACKGROUND AND PROBLEM STATEMENT

Historic Site Use. As illustrated on Figure 2, the Site was used for a significant portion of the 20th Century for automotive fueling/repair. Former occupants of the Site identified in the Endeavor (2016) *Phase I environmental site assessment (ESA)* have included Wide View Service Station (1930), Kaufman and Feder Filling Station (1936), Haelfrisch Geo Service Station (1949), Feder Service Station (1951), and Manitowoc Brake Service (1953-2013). As noted in the Endeavor (2016) Phase I ESA, the Site was purchased in 1975 by Mr. Richard Peltier who continued to operate the Site as Manitowoc Brake Service through 2013. During this time period, operations included automotive repair/fueling, which involved multiple USTs and at least two in-ground hydraulic lift systems. The former USTs were reportedly removed by Mr. Richard Peltier in 1997, residual impacts addressed, and the case closed by the Wisconsin Department of Natural Resources (WDNR) with continuing obligations. The remaining two hydraulic lift systems were reportedly abandoned in place by Mr. Peltier prior to 2013.

Underground Storage Tanks. State records indicate all registered underground storage tanks (USTs) have been removed from the Site. However, a notation on a figure contained in WDNR records suggests the possibility a waste oil UST was abandoned in place along the eastern wall of the building (see Figure 3). Further, it is possible hydraulic oil USTs associated with the two hydraulic lift systems may be abandoned in place.

Problem Statement. As summarized above, one or more USTs may have been abandoned in place at the Site. Other appurtenances of environmental significance may also be present.



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Therefore, a geophysical survey using ground penetrating radar survey techniques was warranted to evaluate the potential presence and location/status of USTs at the Site and evaluate potential preferential contaminant migration corridors and other subsurface anomalies including apparent backfilled excavations, to facilitate completion of a Phase I ESA and development of a Site-Specific Sampling and Analysis Plan for a Phase II ESA.

GPR SURVEY METHODS

GPR is a non-destructive geophysical surveying method that works by sending a series of radar pulses into the ground. As the radar pulses pass through the ground, the waves bend slightly when encountering a material with differing physical properties, such as materials of varying density and/or conductivity. Thousands of pulses are sent and received in a small area, and the received signals are combined to form a real-time image of sub-surface conditions. The various places where the radar waves bend are displayed as anomalies which can be interpreted as steel pipes, PVC conduits, underground storage tanks, voids, foundations, etc.

The GPR survey was completed on July 27, 2016 by Ground Penetrating Radar Systems, Inc (GPRS; Oconomowoc, Wisconsin) using a Geophysical Survey Systems Inc SIR-4000 GPR Radar unit with a 400 MHz antenna. GPR survey data was generated and interpreted in real-time using a custom software package. The GPR survey was completed using a grid-pattern with adjacent scans no more than three feet apart. Where access was limited in Scan Area #1 and Scan Area #2 by walls, equipment, and one vehicle in the southern repair bay, scanning was performed in as complete a manner as possible. Five focus areas were scanned as illustrated on Figure 1 and summarized below:

Focus Area
Scan Area #1
Scan Area #2
Hydraulic Lift System #1
Hydraulic Lift System #2
Apparent Excavation

For further evaluation, a Radiodetection RD 7000 pipe locator was used to trace the location and orientation of abandoned pipes beneath the concrete in Scan Area #1 and Scan Area #2. Due to site restrictions shown in photographs provided in Attachment A, measurements with the RD 7000 were limited to the immediate vicinity of the apparent pipes.

RESULTS AND CONCLUSIONS

GPRS noted that GPR was effective to a depth of approximately 5 feet below ground surface. Photographic documentation of survey areas is provided in Attachment A. The report provided by GPRS, including photographs and screenshots of the survey results, is provided in Attachment B.

Within the survey areas, neither the GPR survey nor the RD 7000 scan identified subsurface anomalies consistent with USTs abandoned in place. The survey identified subsurface conditions



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consistent with an excavation beneath the asphalt-paved parking lot on the west portion of the Site. Of additional note, the survey confirmed the floor drain in the southern repair bay is connected to the catch basin in the center of the garage.

We trust this information meets your needs. Please do not hesitate to call with questions.
Regards,

STANTEC CONSULTING SERVICES INC.

Harris L. Byers
Brownfields Project Manager
Phone: 414-581-6476
Harris.Byers@stantec.com

STANTEC CONSULTING SERVICES INC.

Richard J. Binder, P.G., CPG
QA/QC Manager
Phone: 262-643-9010
Rick.Binder@stantec.com

Attachments: Figures
A – Photographic Documentation
B – GPRS Report

LIMITATIONS

The geophysical survey was performed in accordance with generally accepted practices for the environmental consulting profession, undertaking similar studies at the same time and in the same geographical area as the work conducted by Stantec. Stantec observed the degree of care and skill that are generally exercised by the profession under similar circumstances and conditions. No other warranty is expressed or implied.

Stantec's observations, findings, and opinions should not be considered as scientific certainties, but only as opinion based on our professional judgment concerning the significance of the data gathered during the course of this investigation. Specifically, Stantec cannot represent that the Site does not contain hazardous or toxic materials/wastes or other latent conditions/appurtenances beyond that observed by Stantec during the course of the investigation. Additionally, due to limitations of this investigation process and the necessary use of data furnished by others, Stantec and its subcontractors cannot assume liability if actual conditions differ from the information presented in this report.

FIGURES

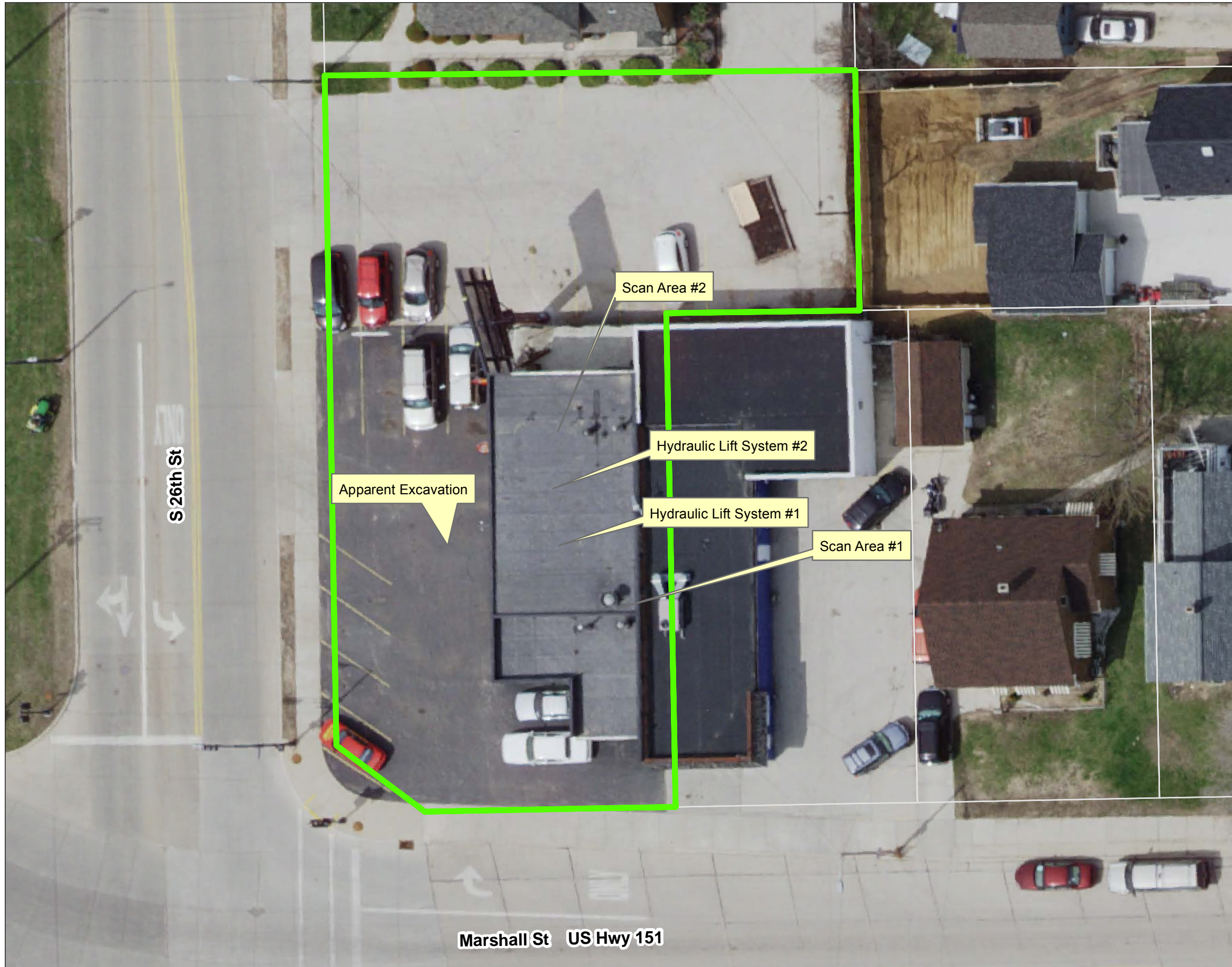


Figure No.
1


Title
Figure 1. Site Basemap and GPR Scan Areas

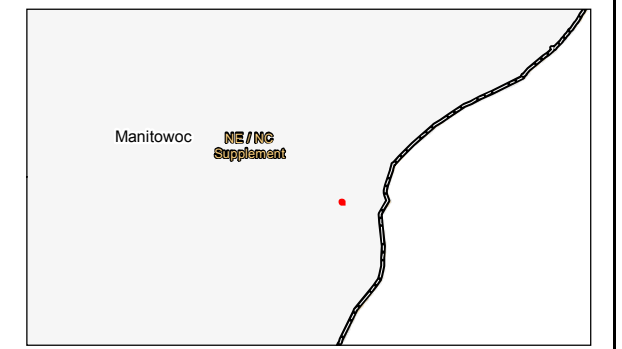
Client/Project
City of Manitowoc
USEPA Brownfield Assessment Grant
Petroleum Substances

0 15 30 Feet 1937003931
Prepared by HLB on 5-24-16

Legend

Target Property



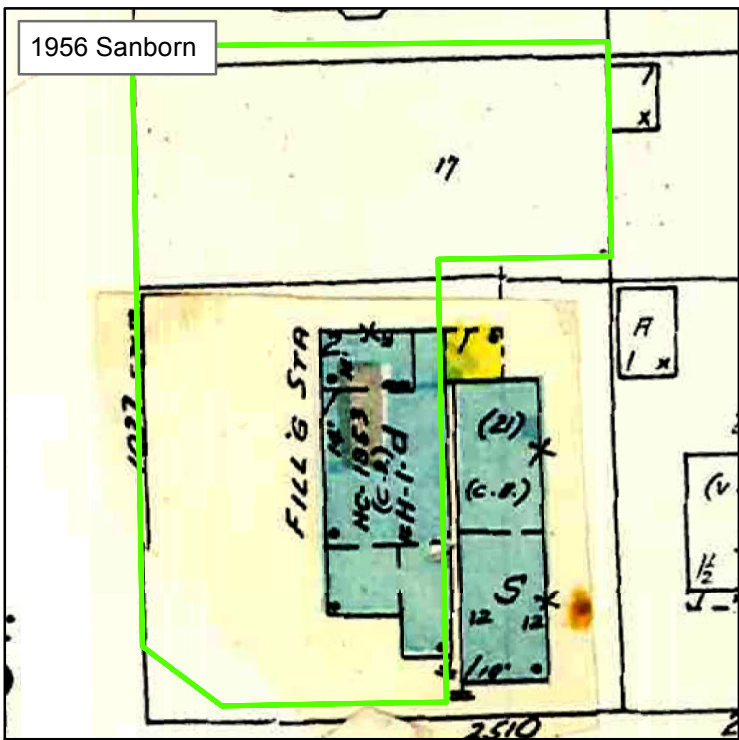
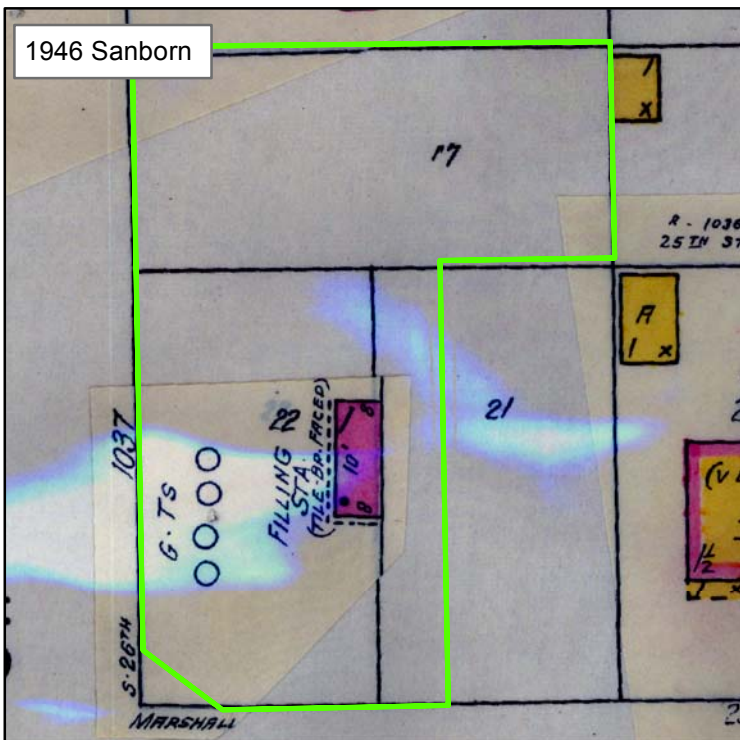
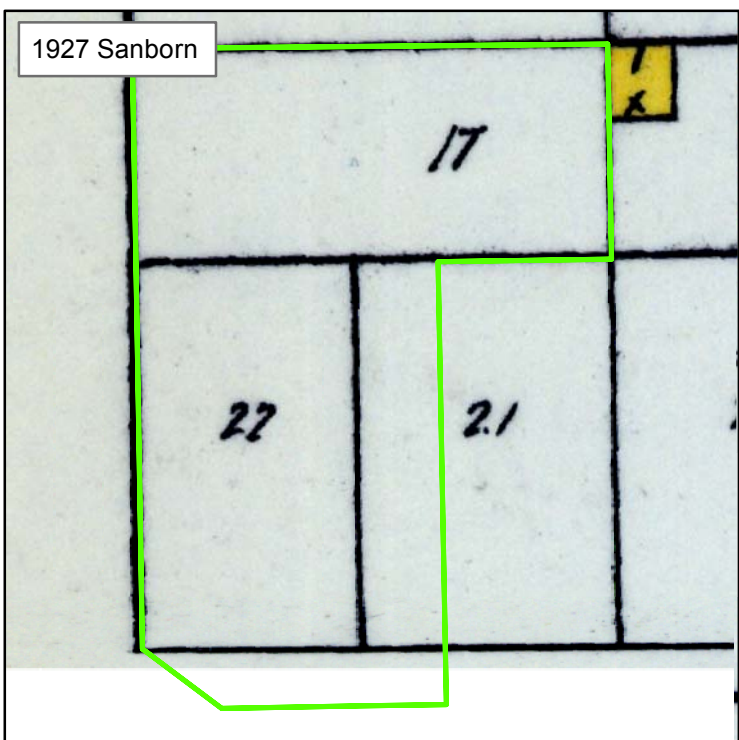
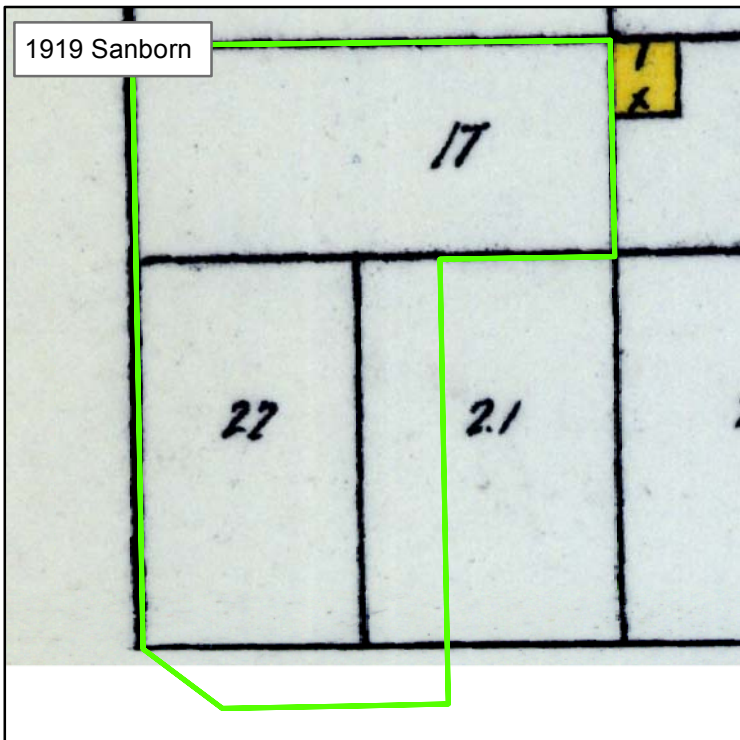


- Notes**
1. Coordinate System: NAD 1983 StatePlane Wisconsin South FIPS 4803
 2. Feet
 3. Data Sources Include:
Orthophotography: 2015 City of Manitowoc



P:\GIS\client\Manitowoc\MapX\1037_5_24\1037.mxd - Revised: 2016-08-02 by: hbvrs

Disclaimer: Stantec assumes no responsibility for data supplied in electronic format. The recipient accepts full responsibility for verifying the accuracy and completeness of the data. The recipient releases Stantec, its officers, employees, consultants and agents, from any and all claims arising in any way from the content or provision of the data.



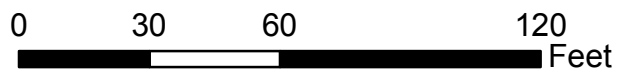
State Location



County Location

Legend

Target Site



Stantec
12075 Corporate Parkway
Suite 200
Mequon, WI 53092
(262) 643-9174

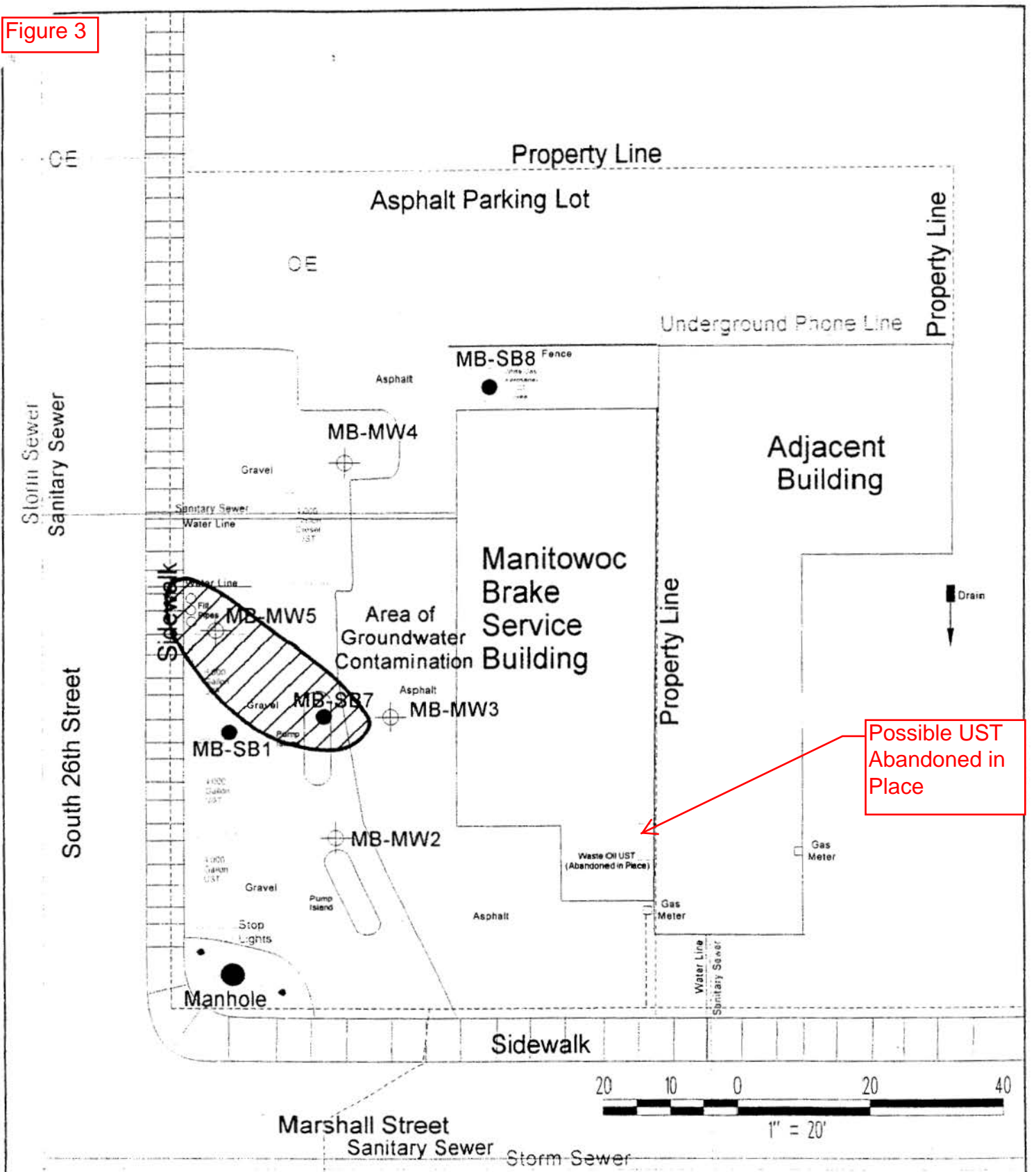
The information on this map has been compiled by Stantec staff from a variety of sources and is subject to change without notice. Stantec makes no representations or warranties, express or implied, as to accuracy, completeness, timeliness, or rights to the use of such information.

1037 S 26th St
Manitowoc, Wisconsin

Figure 2
Historic Sanborn
Fire Insurance Maps

DWG: 03.mxd
DATE: May 2016
PROJ NO: 193703931

Figure 3



Possible UST
Abandoned in
Place

GHD Inc. Environmental Services
Manitowoc Brake Service
1037 South 26th Street
Manitowoc, WI 54220

Figure 1
Area of Groundwater
Contamination

Prepared By: RLJ Date: 09/14/01

⊕ Monitoring Well Location
● Soil Boring Locations

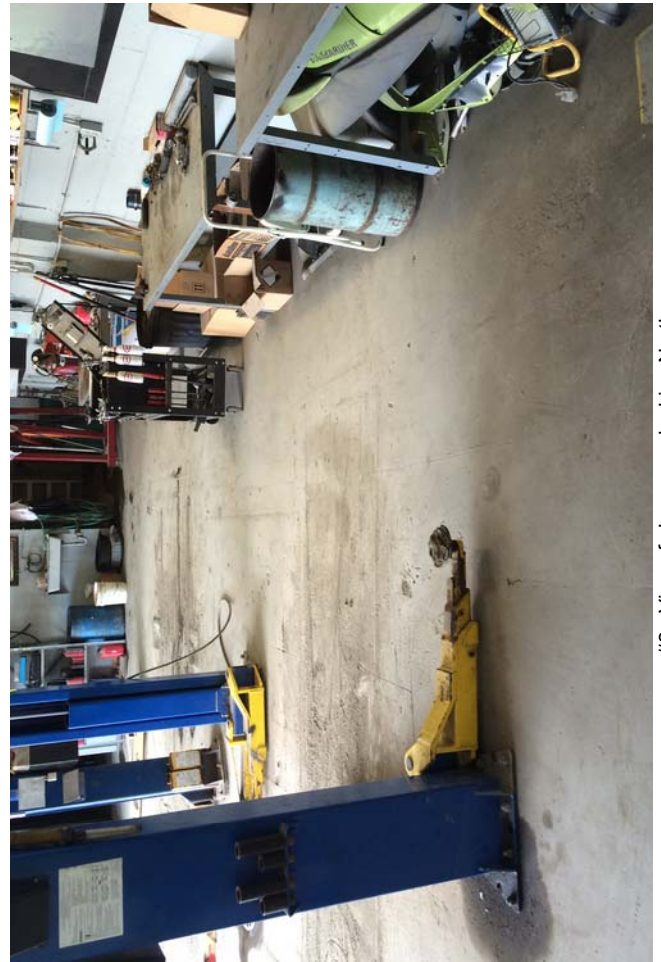


ATTACHMENT A

PHOTOGRAPHIC DOCUMENTATION



#1 - View of Scan Area #1



#2 - View of shop area, looking North



#3 - View of abandoned hydraulic lift system #1, looking west



#4 - View of hydraulic lift system #1, looking east



#5 - View of hydraulic lift system #2, looking east



#6 - View of Scan Area #2, looking North



#7 - View of Scan Area #2, looking west

ATTACHMENT B

GPRS REPORT



**GROUND
PENETRATING
RADAR
SYSTEMS, INC.**

July 30, 2016

Stantec Consulting Services

Attn: Harris Byers

Phone: (414) 581-6476

Email: Harris.Byers@stantec.com

Re: GPR/RD Investigation for Underground Storage Tanks (UST's)

Site: AutoWerks - 1037 S 26th Street in Manitowoc, WI.

We appreciate the opportunity to provide this summary report for our work completed on 7/27/2016 at the above referenced site.

Purpose

The purpose for the ground penetrating radar and radio detection investigation was to locate remaining UST's on the property.

Equipment:

- **Ground Penetrating Radar (GPR), Manufacturer: GSSI, Model: SIR-4000 processing unit with 400 MHz antenna.** GPR works by sending pulses of energy into a material and recording the strength and the time require for the return of the reflected signal. Reflections are produced when the energy pulses enter into a material with different electrical conduction properties from the material it left. The strength of the reflection is determined by the contrast in conductivity between the two materials. The total depth achieved can be as much as 8' with this antenna but can vary widely depending on the dielectric properties of the materials.
- **RD7000 pipe locator, Manufacturer: Radiodetection.** The RD7000 can detect the electromagnetic fields from live power or radio frequency signals. It can also be used in conjunction with a trasmitter to connect directly to accessible, metallic pipes, risers, or tracer wires. A tone is sent through the pipe or tracer wire at a specific frequency which can then be detected by the receiver.

Process

GPR/RD Investigation: Our process involves using Ground Penetrating Radar (GPR) and RD7000 within the scan area. Our process begins with locating utilities using RD7000 equipment. If any utilities are present above ground, a tracer signal will be sent along them to attempt to follow them underground using RD7000. Upon location, any utilities will be painted and/or flagged directly on the ground surface with their approximate depths (if requested); this is our typical and standard output. GPR uses electromagnetic pulses through the ground that reflect back to the antenna at different speeds off of different materials. GPRS, Inc. used a 400 MHz antenna with the SIR-4000 processing unit manufactured by GSSI. These represent the latest in GPR utility locating technology. With the GPR we scan in a grid formation and mark the center of any anomalies such as utilities, underground structures, underground storage tanks, voids, and other significant anomalies.

Findings

The site contained mainly reinforced concrete and asphalt surfaces. The GPR equipment was able to penetrate up to 5' in most accessible areas. The GPR equipment was unable to detect the presence of any anomalies similar to that of an underground storage tank inside the facility or on the exterior. The area scanned is indicated on *Figure 1* on the following pages.

The interior was believed to contain UST's for car lifts. The GPR was unable to detect the possible tanks. These tanks may have been too small or too close to the existing piping of the lift to detect. This information was relayed to the site contact. GPRS also searched for a possible abandoned tank in the SE corner of the facility where an exposed pipe came from above ground. GPRS investigated this area and was unable to detect any significant anomalies. The GPR equipment was unable to scan within 3' of the walls or other obstructions.

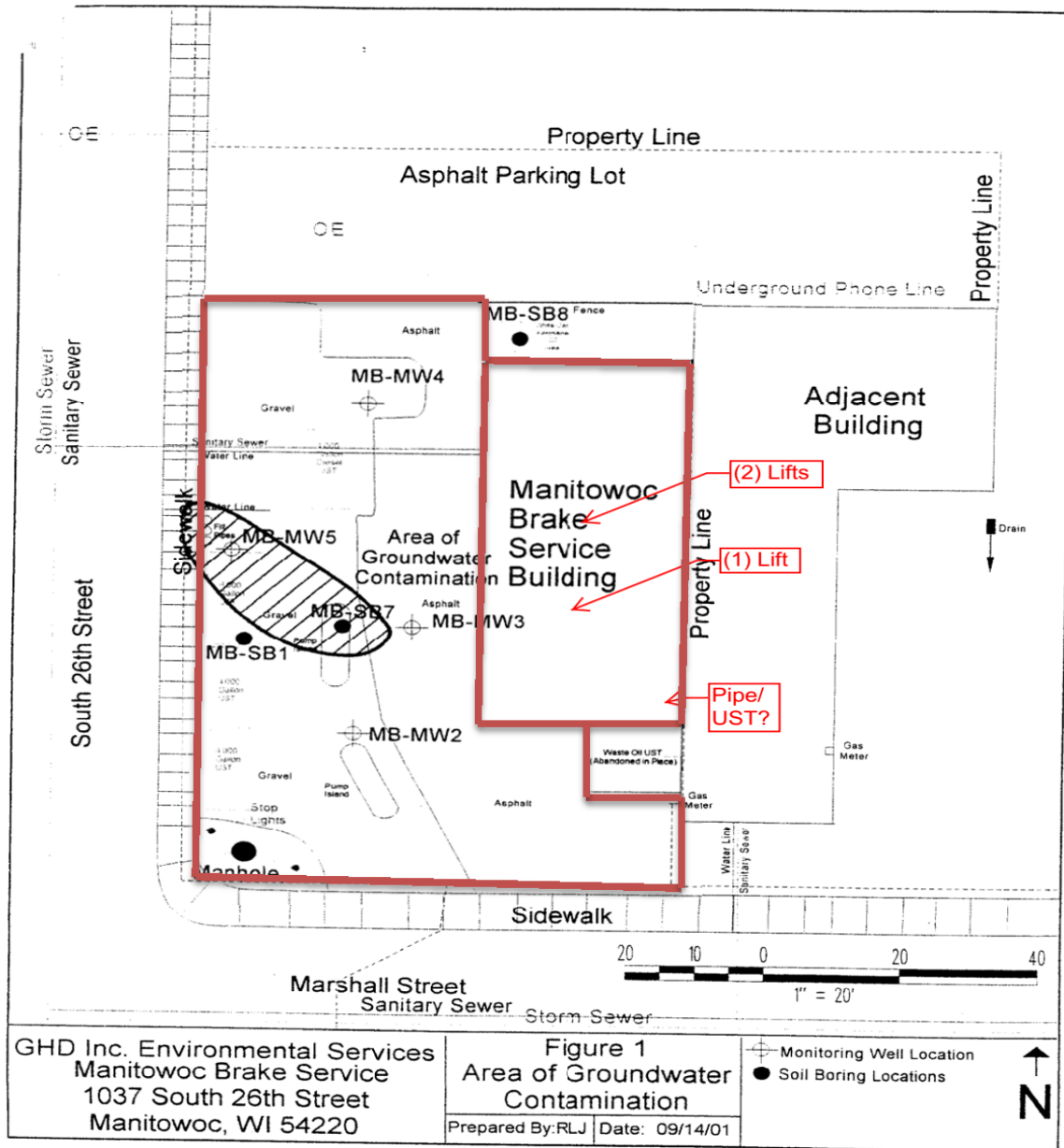
GPRS scanned the parking lot to search for any remaining UST's. The parking lot contained asphalt surfaces. GPRS scanned the area as thoroughly as possible around vehicles. The GPR equipment was unable to detect any significant anomalies or anomalies similar to an underground storage tank. The GPR equipment was able to penetrate +/- 5' deep on the exterior of the facility.

Limitations:

GPRS Inc. was able to scan up to three feet of any obstruction. Obstructions inside the facility consisted of walls, equipment, lifts, and one vehicle. Obstructions on the exterior of the facility consisted of parked vehicles. Where an obstruction existed, GPRS, Inc. scanned around the obstruction as thoroughly as possible. Please note that 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.

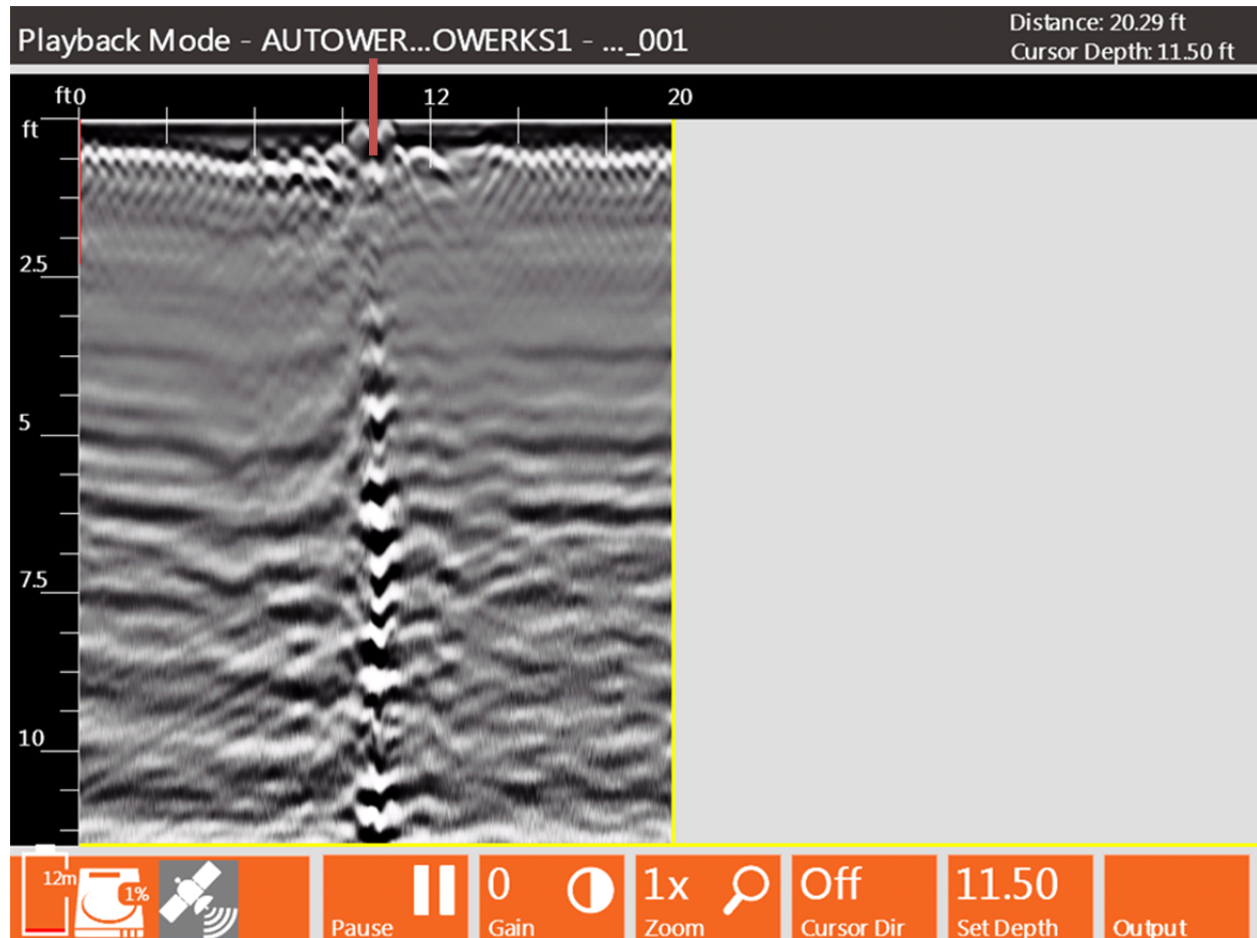
The following pages will further explain the findings.

Figure 1 – Autowerks



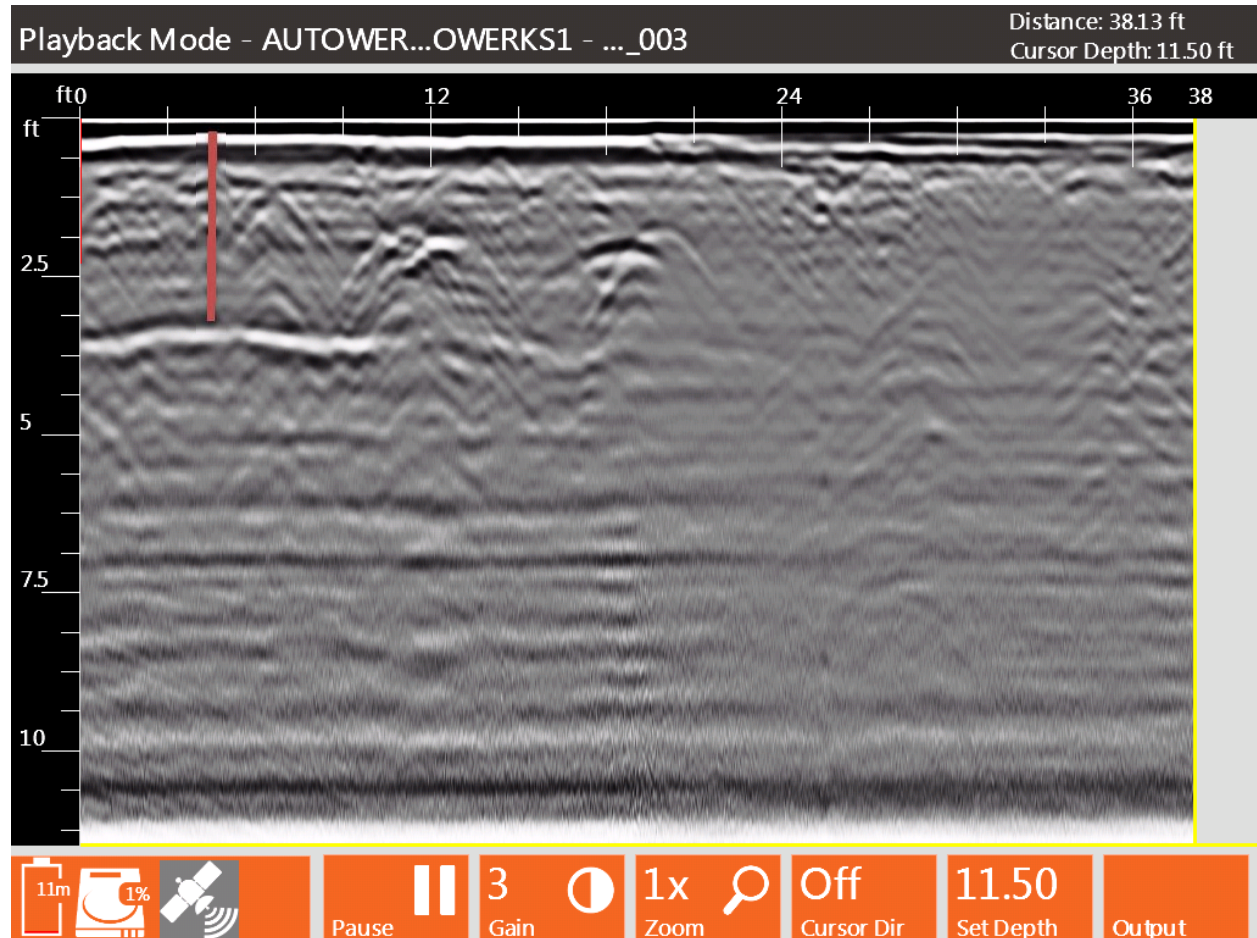
The above image is an aerial of the site. GPRS scanned areas within the facility and the exterior which is outlined in red. The UST's indicated by the red arrows were unable to be confirmed. This drawing was provided by Stantec Consulting Services.

GPR Data Screen Shots – Autowerks



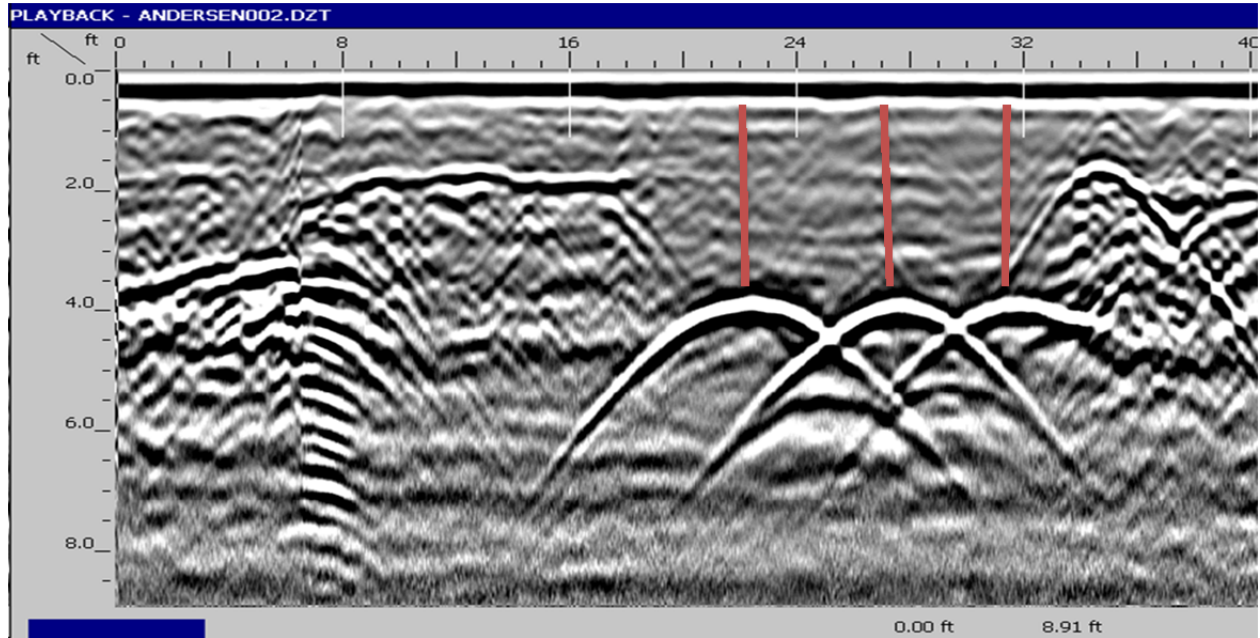
The above data screen shot was taken from the site. The depth of the scan is on the left and the length of the scan is across the top creating a cross section view of the subsurface. This scan was taken inside the facility near the lifts. The GPR equipment was able to penetrate +/- 5' in this area and is representative of the rest of the area scanned within the facility. The reaction indicated by the red line occurred when scanning near the abandoned lift. In this area there is believed to be a UST, but the GPR equipment was unable to confirm a significant anomaly to pinpoint the location or confirm its existence.

GPR Data Screen Shots – Autowerks



The above data screen shot was taken from the site. The depth of the scan is on the left and the length of the scan is across the top creating a cross section view of the subsurface. This scan was taken on the exterior of the facility. The GPR equipment was able to penetrate +/- 5' in this area and is representative of the rest of the area scanned on the exterior of the facility. In this GPR data screen shot the GPR detected what could indicate a change in soil. Per the client this area is believed to be a former pump island. The GPR data screen shot does not indicate the presence of any significant anomaly similar to that of an underground storage tank.

GPR Data Screen Shots – Example



The above data screen shot was taken from a DIFFERENT site. The depth of the scan is on the left and the length of the scan is across the top creating a cross section view of the subsurface. The red lines indicate the location of three confirmed underground storage tanks. This is example is used to allow for comparison to the GPR data at AutoWerks.

Conclusion

Thank you for the opportunity to serve you on this project. I hope this report has answered the questions you have regarding this site. Please note that this report was put together by a non-practicing geologist and is an interpretation by an employee trained to use this type of equipment by GSSI. If there is further concern of UST's remaining on the site, GPRS advises to consult a geophysicist for further evaluation.

Thank you,

Christopher A. Geary – Regional Manager
Ground Penetrating Radar Systems, Inc.
Chris.Geary@gp-radar.com
414.795.6845