FINAL REPORT
GEOPHYSICAL INVESTIGATION
SULPHUR SPRINGS POOL SITE
TAMPA, FLORIDA

Prepared for City of Tampa
Tampa, FL

Prepared by GeoView, Inc.
St. Petersburg, FL

May 03, 2024

Ms. Deanna Bailey
City of Tampa
3402 W. Columbus Dr
Tampa, FL 33607

Subject: Transmittal of Final Report for GPR Survey
Sulphur Springs Pool Site
Tampa, Florida
GeoView Project Number 41188

Ms. Bailey,

GeoView, Inc. is pleased to submit the final report that summarizes and presents the results of the geophysical investigation performed at the above referenced site. Ground penetrating radar was used to help determine the presence of near surface voids that may be present at the project site. GeoView appreciates the opportunity to have assisted you on this project. If you have any questions or comments about the report, please contact us.

Sincerely,

GEOVIEW ASSOCIATES, INC.

Stephen Scruggs, P.G.
Senior Geophysicist
Florida Professional Geologist Number 2470

5709 First Avenue South
St. Petersburg, FL 33707
Tel.: (727) 209-2334
Fax: (727) 328-2477

1.0 Introduction

A geophysical investigation was performed on April 18, 2024 at the Sulphur Springs Pool site located at 701 E Bird Street in Tampa, Florida. Prior to this survey the pool was drained. Of concern was the possible presence of shallow voids below the pool.

2.0 Description of Geophysical Investigation

A ground penetrating radar (GPR) survey was conducted along a series of perpendicular transects spaced 5 feet (ft) apart and around the perimeter vertical walls of the deep end of the pool (Figure 1). The GPR data was collected using a GSSI FLEX NT with a 2,600 Mega-hertz (MHz) antenna along the perimeter vertical walls and a GSSI SIR 4000 with 900 MHz antenna on the pool floor. The GPR settings used for the survey are presented in Table 1.

Table 1
GPR Equipment Settings Used for Survey

Location	Antenna Frequency	Time Range (nano-seconds)	Estimated Depth of GPR Signal Penetration in ft below land surface (bls)
Perimeter	2600 MHz [1/]	25	1 to 1.5
Pool Floor	900 MHz	30	4 to 5

1/ MHz means mega-Hertz and is the mid-range operating frequency of the GPR antenna.
2/ bls means below land surface

A description of the GPR technique and the methods employed for geological characterization studies is provided in Appendix A2.2.

3.0 Identification of Possible Voids Using GPR

The features observed on GPR data that are most commonly associated with void formation are:

- A downwarping of GPR reflector sets, that are associated with suspected lithological contacts, toward a common center. Such features typically have a bowl or funnel shaped configuration and can be associated with a deflection of overlying sediment horizons caused by the migration of sediments into underlying voids. If the GPR reflector sets are sharply downwarping and intersect, they can create a “bow-tie” shaped GPR reflection feature, which often designates the apparent center of the GPR anomaly.
- A localized significant increase in the depth of the penetration and/or amplitude of the GPR signal response. The increase in GPR signal penetration depth or amplitude is often associated with void formation

- An increase in the amplitude of horizontal reflector sets below the concrete slab indicating an air space void.

The greater the severity of these features or a combination of these features the greater the likelihood that the soils are disturbed, and voids are possibly present.

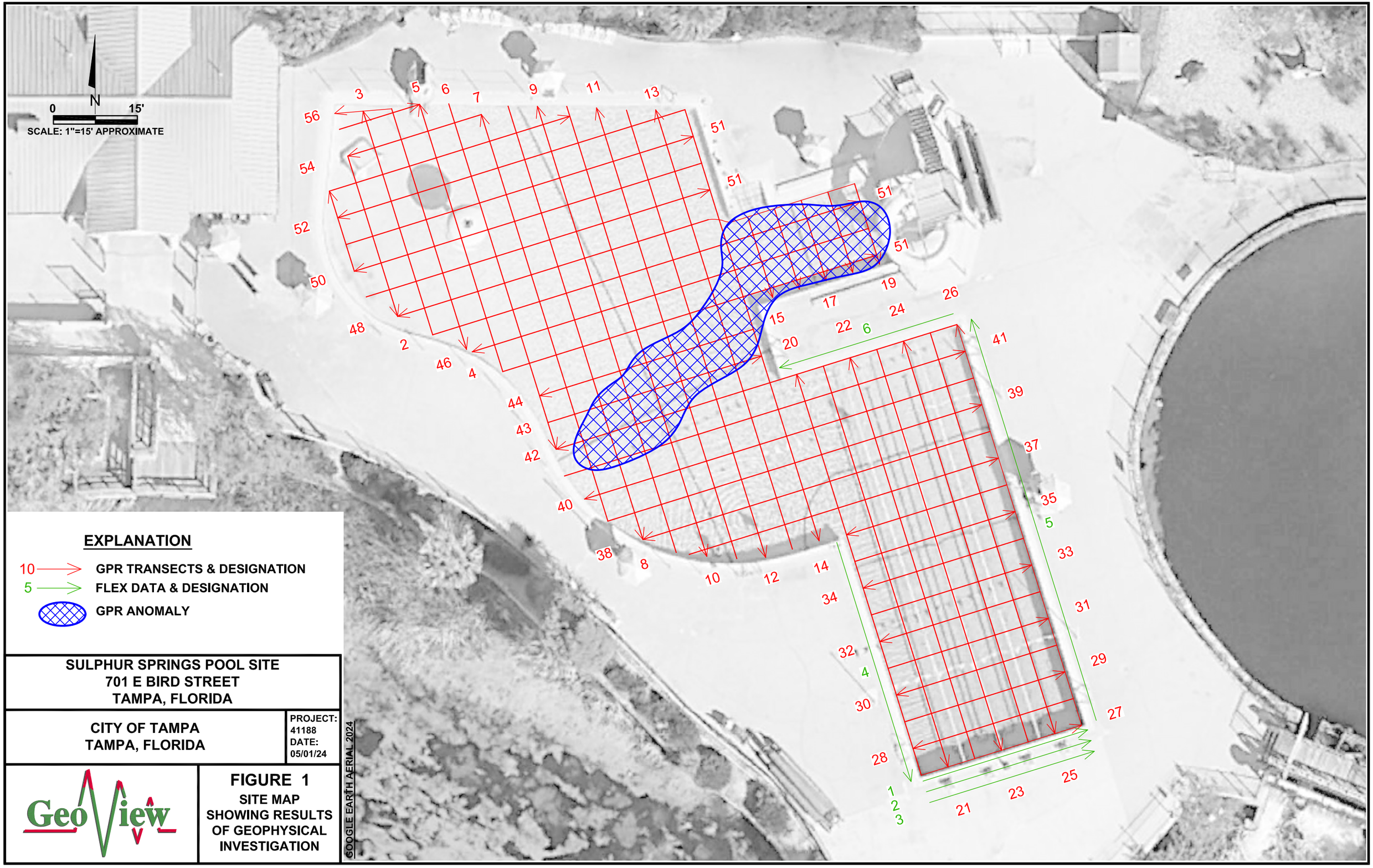
4.0 Survey Results

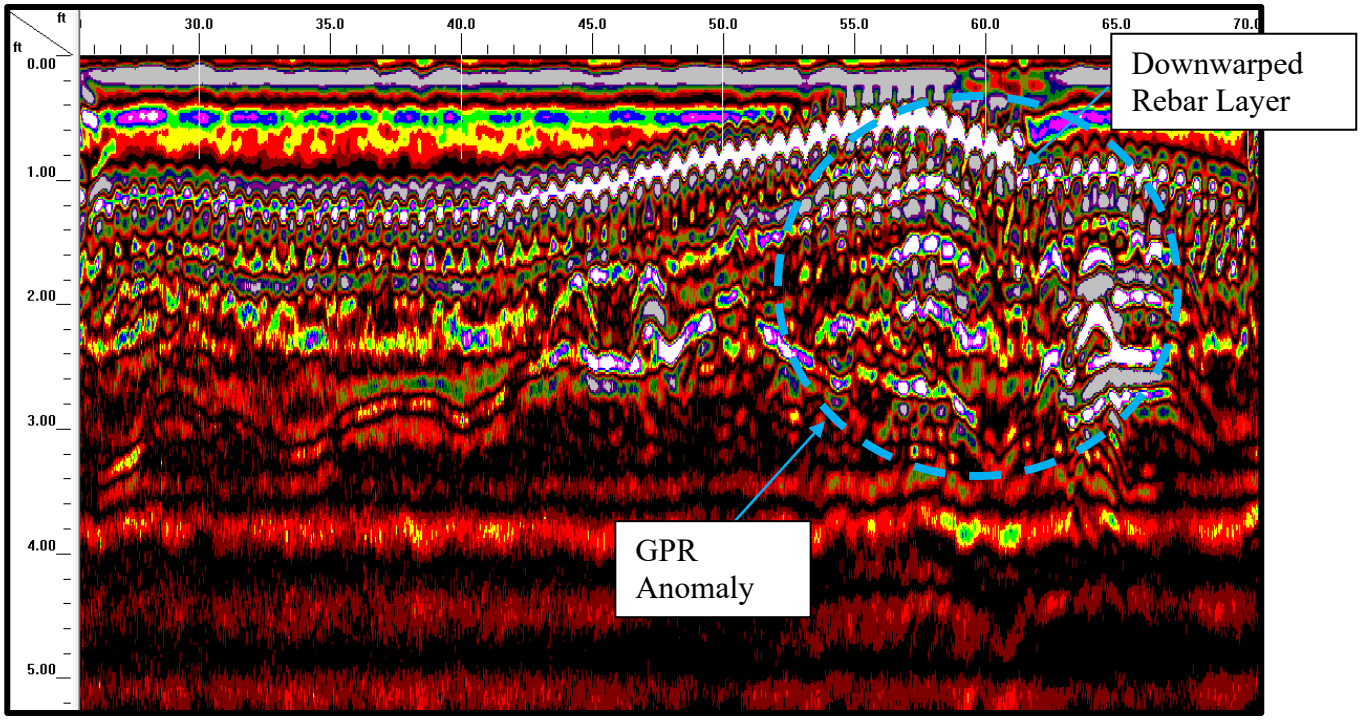
The results of the GPR investigation are presented in Figure 1. The GPR investigation identified an anomalous area below the central portion of the pool slab. The GPR anomaly was characterized by localized increase in the amplitude of the GPR signal underlying the base of the concrete to a depth of approximately 2 to 3 ft below the slab. In addition, the rebar reinforcement in the concrete slab appears to downwarp near the center of the anomaly. The location of the anomaly area is shown in blue on Figure 1.

Based on the geophysical results it is not possible to determine whether this identified feature is associated with loose soils that could potentially lead to structural damage or settlement of the pool. It is recommended that further testing with a test boring within the anomaly area be performed in order to ascertain the nature of the identified anomaly.

An example of the GPR data collected across the anomaly area is provided in Appendix 1. A discussion of the limitations of the GPR technique in void development studies is provided in Appendix 2.

APPENDIX 1
FIGURE AND EXAMPLE OF GPR DATA


N
0
15'
SCALE: 1"=15' APPROXIMATE
3
5
6
7
9
11
13
56
54
52
50
48
2
46
4
44
43
42
40
38
8
10
12
14
51
51
51
51
19
17
15
22
6
24
26
20
41
39
37
35
5
33
31
34
32
4
30
29
28
27
1
2
3
21
23
25
EXPLANATION
10 GPR TRANSECTS & DESIGNATION
5 FLEX DATA & DESIGNATION
GPR ANOMALY
SULPHUR SPRINGS POOL SITE
701 E BIRD STREET
TAMPA, FLORIDA
CITY OF TAMPA
TAMPA, FLORIDA
PROJECT: 41188
DATE: 05/01/24
GeoView
FIGURE 1
SITE MAP SHOWING RESULTS OF GEOPHYSICAL INVESTIGATION
GOOGLE EARTH AERIAL 2024



GPR TRANSECT 47 ACROSS GPR ANOMALY

APPENDIX 2
DESCRIPTION OF GEOPHYSICAL METHODS, SURVEY METHODOLOGIES AND LIMITATIONS

A2.1 On Site Measurements

The measurements that were collected and used to create the site map were made using a fiberglass measuring tape. The degree of accuracy of such an approach is typically +/- 2.5% for lengths and +/- 2.5 degrees for angles.

A2.2 Ground Penetrating Radar

Ground Penetrating Radar (GPR) consists of a set of integrated electronic components which transmits high frequency (200 to 1500 megahertz [MHz]) electromagnetic waves into the ground and records the energy reflected back to the ground surface. The GPR system consists of an antenna, which serves as both a transmitter and receiver, and a profiling recorder that both processes the incoming signal and provides a graphic display of the data. The GPR data can be reviewed as both printed hard copy output or recorded on the profiling recorder's hard drive for later review. GeoView uses Mala and GSSI GPR systems. Void studies are typically conducted using a 400 to 2600 MHz antenna.

A GPR survey provides a graphic cross-sectional view of subsurface conditions. This cross-sectional view is created from the reflections of repetitive short-duration electromagnetic (EM) waves that are generated as the antenna is pulled across the ground surface. The reflections occur at the subsurface contacts between materials with differing electrical properties. The electrical property contrast that causes the reflections is the dielectric permittivity that is directly related to conductivity of a material. The GPR method is commonly used to identify such targets as underground utilities, underground storage tanks or drums, buried debris, voids, rebar or geological features.

The greater the electrical contrast between the surrounding materials (earth or concrete) and target of interest, the greater the amplitude of the reflected return signal. Unless the buried object is metal, only part of the signal energy will be reflected back to the antenna with the remaining portion of the signal continuing to propagate downward to be reflected by deeper features. If there is little or no electrical contrast between the target interest and surrounding earth materials it will be very difficult if not impossible to identify the object using GPR.

A GPR survey is conducted along survey lines (transects), which are measured paths along which the GPR antenna is moved. Electronic marks are placed in the data by the operator at designated points along the GPR transects. These marks allow for a correlation between the GPR data and the position of the GPR antenna on the

ground.

The depth of penetration of the GPR signal is also reduced as the antenna frequency is increased. However, as antenna frequency is increased the resolution of the GPR data is improved. Therefore, when designing a GPR survey a tradeoff is made between the required depth of penetration and desired resolution of the data. As a rule, the highest frequency antenna that will still provide the desired maximum depth of penetration should be used. A relatively high frequency is often used for void development studies.

A GPR survey is conducted along survey lines (transects) which are measured paths along which the GPR antenna is moved. Electronic marks are placed in the data by the operator at designated points along the GPR transects. These marks allow for a correlation between the GPR data and the position of the GPR antenna on the ground.

Depth estimates are determined by dividing the time of travel of the GPR signal from the ground surface to the top of the feature by the velocity of the GPR signal. The velocity of the GPR signal is usually obtained from published tables of velocities for the type and condition (saturated vs. unsaturated) of soils underlying the site. The accuracy of GPR-derived depths typically ranges from 20 to 40 percent of the total depth.

A2.3 Limitations

The analysis and collection of GPR data is both a technical and interpretative skill. The technical aspects of the work are learned from both training and experience. Having the opportunity to compare GPR data collected in numerous settings to the results from geotechnical studies performed at the same locations develops interpretative skills for void development studies.

The ability of GPR to collect interpretable information at a project site is limited by the attenuation (absorption) of the GPR signal by underlying soils. Once the GPR signal has been attenuated at a particular depth, information regarding deeper geological conditions will not be obtained. GPR data can only resolve subsurface features that have a sufficient electrical contrast between the feature in question and surrounding earth materials. If an insufficient contrast is present, the subsurface feature will not be identified.

GeoView can make no warranties or representations of geological conditions that may be present beyond the depth of investigation or resolving capability of the GPR equipment or in areas that were not accessible to the geophysical investigation.