Geophysical Survey
Pierceville Cemetery
Main Street and
Cary Street
Smithfield, Virginia

Prepared For:

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FES Project No. 22186

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1.0 Introduction

Forrest Environmental Services, Inc. (FES) performed a geophysical survey at the suspected Pierceville Cemetery located on Main Street and Cary Street in Smithfield, Virginia on the 23rd and 24th August 2022. The investigation consisted locating suspected unmarked graves.

The geophysical survey included a GPR survey at four locations within the property. GPR data was collected along linear 2-foot traverses at 0.1 feet measurements that are connected to a TOPCON GPS within a sub-meter accuracy. The survey boundaries covered four areas of approximately 100 feet by 200 feet at Site 1, 100 feet by 220 feet at Site 2, 100 by 280 feet at Site 3, and 650 feet by 550 feet at Site 4, and were selected by Thunderbird Archaeology.

Topographically, the site slopes to the southeast. The site mostly consists of grass pasture. Survey locations and physical features are shown in Figure 1.

Details of the geophysical survey are described in the following sections.

2.0 Equipment and Procedures

The GPR survey was performed using a Noggin Smart Cart with a shielded 250 megahertz (MHz) antenna. GPR is an EM method that detects interfaces between subsurface materials with contrasting dielectric constants. The GPR system consists of an antenna that consists of a transmitter and receiver that were connected to a computer that processes the received signal and locates the position of data collection.

The transmitter radiates repetitive short-duration EM waves into the earth from the antenna as it is moved across the ground surface. These radar waves are reflected back to the receiver by interfaces between materials with different dielectric constants. The intensity of the reflected signal is a function of the dielectric constant contrast at the interface, the conductivity of the material the wave is traveling through, and the frequency of the signal. Subsurface features that cause reflections are: 1) natural geologic conditions such as changes in sediment composition, bedding and cementation horizons, voids, and water content and 2) fill materials or changes in the subsurface such as soil backfill, buried debris, USTs, pipelines, and utilities. The controlling unit receives the signal from the antenna and produces a continuous cross-section of the subsurface interface reflections.

Depth of GPR signals is highly site-specific and is limited by signal attenuation or absorption of the subsurface. Signal attenuation is dependent on the electrical conductivity of subsurface materials. Signal attenuation is greatest in materials with high conductivity, such as clays or brackish groundwater, and lowest in low conductivity material, such as unsaturated sands or rock. GPR depth penetration is dependent on antenna frequency. Depth penetration increases with decreasing frequency; however, identification diminishes proportionally with smaller features. The depth penetration of this GPR survey was approximately 2.5 meters (8 feet) below surface for the 250 Mhz antenna.

The GPR survey used a 250 MHz antenna that was internally shielded from above ground and adjacent anthropogenic sources. The GPR survey was performed by a project geophysicist pulling the antenna at the EM anomalies. The location of the antenna along the transects lines were marked electronically from a survey wheel. Recorded data were collected at 0.1-foot intervals and stored on the laptop computer.

The GPR data were converted into a GPR depth model using Sensor's and Software pulse EKKO software. The GPR data was gained, migrated, and a low frequency response filter was included to the raw data.

Photo 1 - GPR meter

3.0 Survey Results and Conclusions

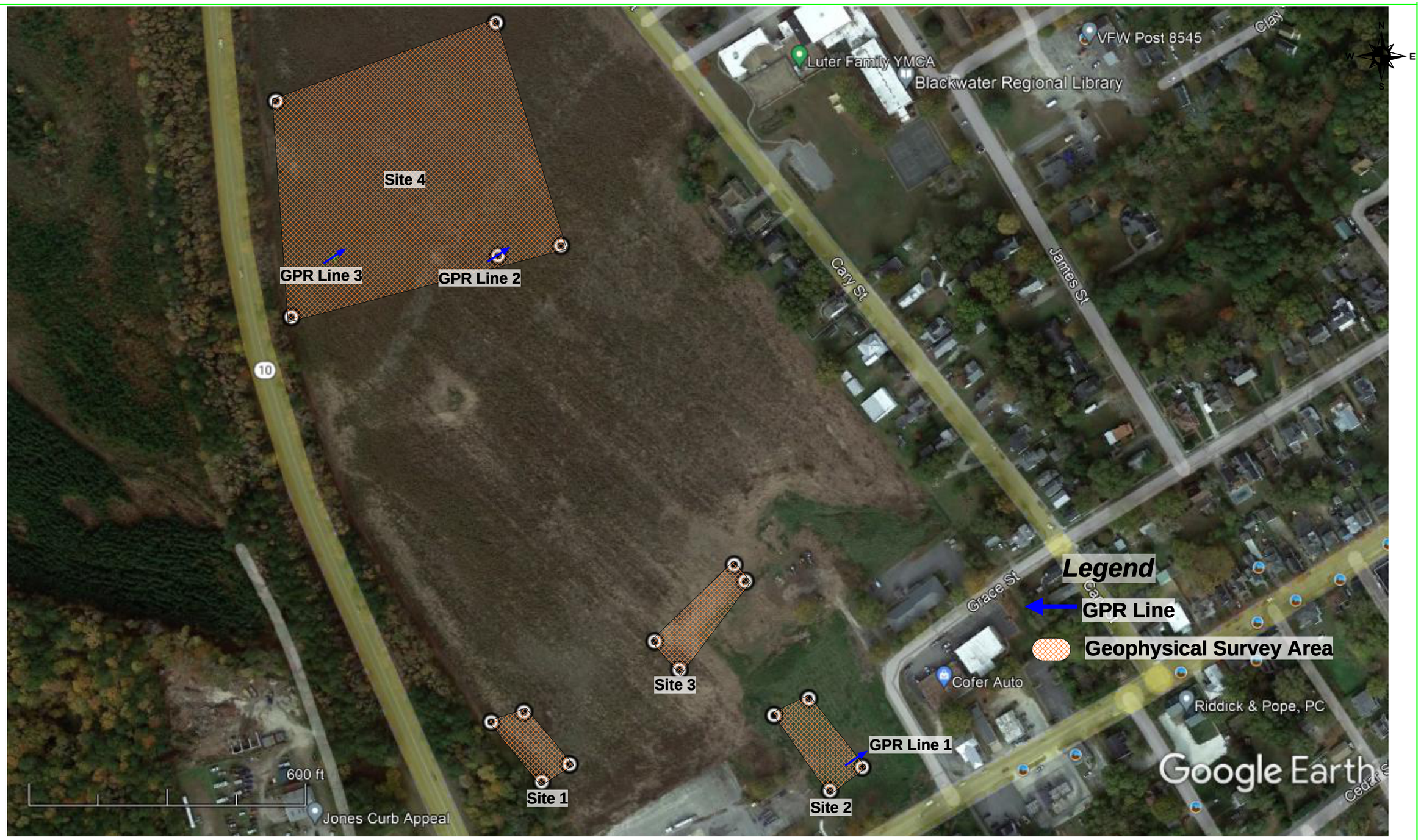
The objective of the geophysical survey was to determine the presence of unmarked suspected grave sites identified by Thunderbird Archaeology.

GPR Line 1 is located at the southeastern section of Site 2 (Figure 1). GPR Line 1 indicated an anomaly centered at approximately 11 feet East about 6 feet below ground surface (Figure 2). The anomaly appears to be a large mass of buried metal such as a UST.

GPR Line 2 is located at the southwestern section of Site 4 (Figure 1). GPR Line 2 indicated an anomaly centered at approximately 11 feet East about 4 feet below ground surface (Figure 2). The anomaly appears to be a large mass of buried metal such as a UST.

GPR Line 3 is located at the southeastern section of Site 4 (Figure 1). GPR Line 3 indicated an anomaly centered at approximately 14 feet East about 3 feet below ground surface (Figure 2). The anomaly appears to be a large mass of buried metal such as a septic tank.

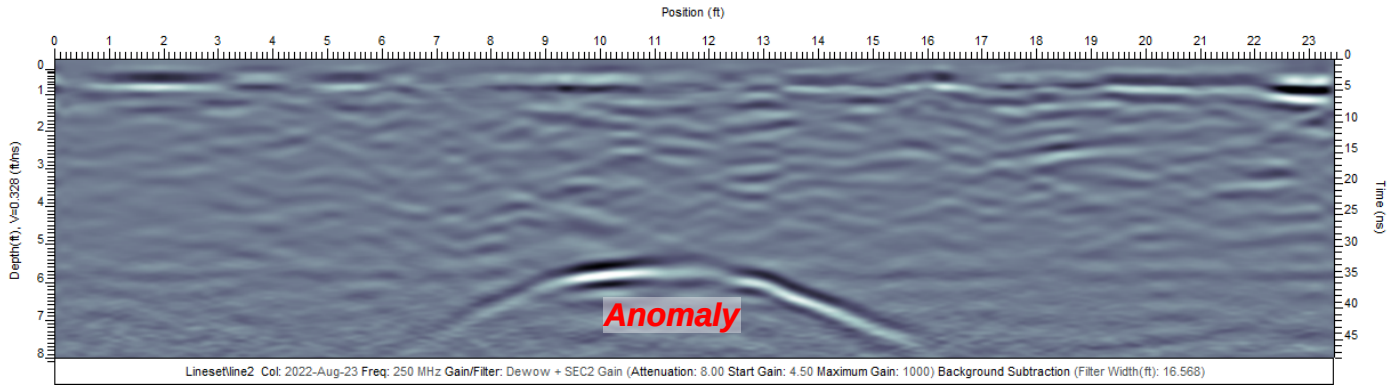
The GPR survey located approximately three anomalies that appear to be large mass of buried metal such as USTs and a septic tank (Figure 3). Orange pin flags were placed in the field at the three anomalies identified by the GPR survey. The geophysical survey indicated no buried graves within the survey area.



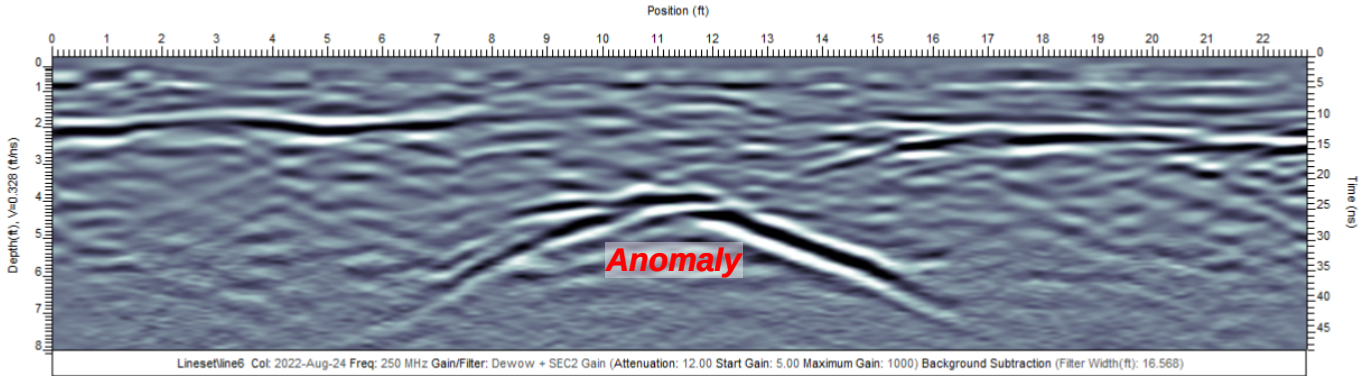
Forrest Environmental Services, Inc. Oak Hill, Virginia (703) 648-9090 www.fesinc.net	DATE Sept. 2022	SCALE 1 inch ~ 200 ft.	TITLE ***Geophysical Site Map*** ***Pierceville Cemetery*** ***Main Street*** ***Smithfield, Virginia***	
	DRAWN BY	APPROVED BY		
	JOB NO. 22186	DWG. NO./ REV. NO. CCRMPierceF1	CLIENT Circa~Cultural Resource	FIGURE **1**

West **East**

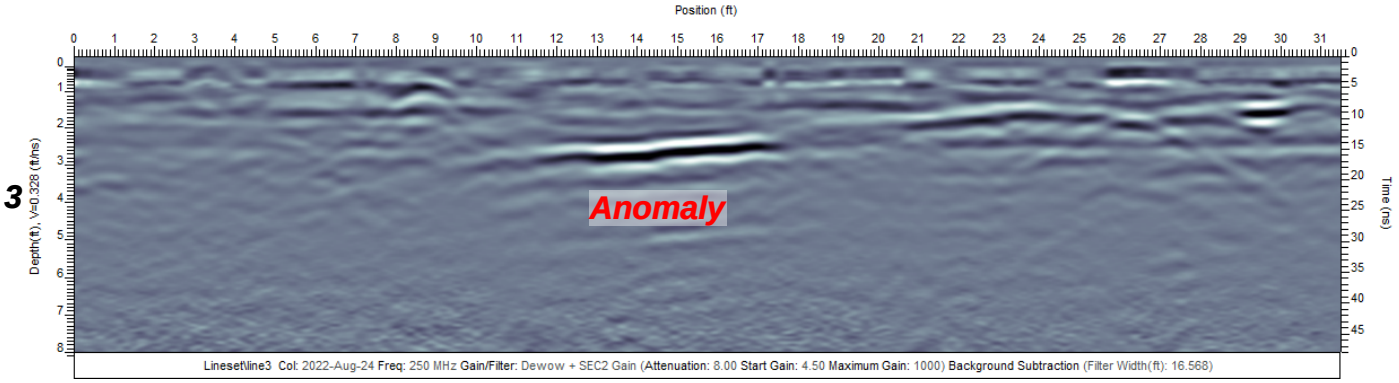
GPR Line 1



GPR Line 2



GPR Line 3



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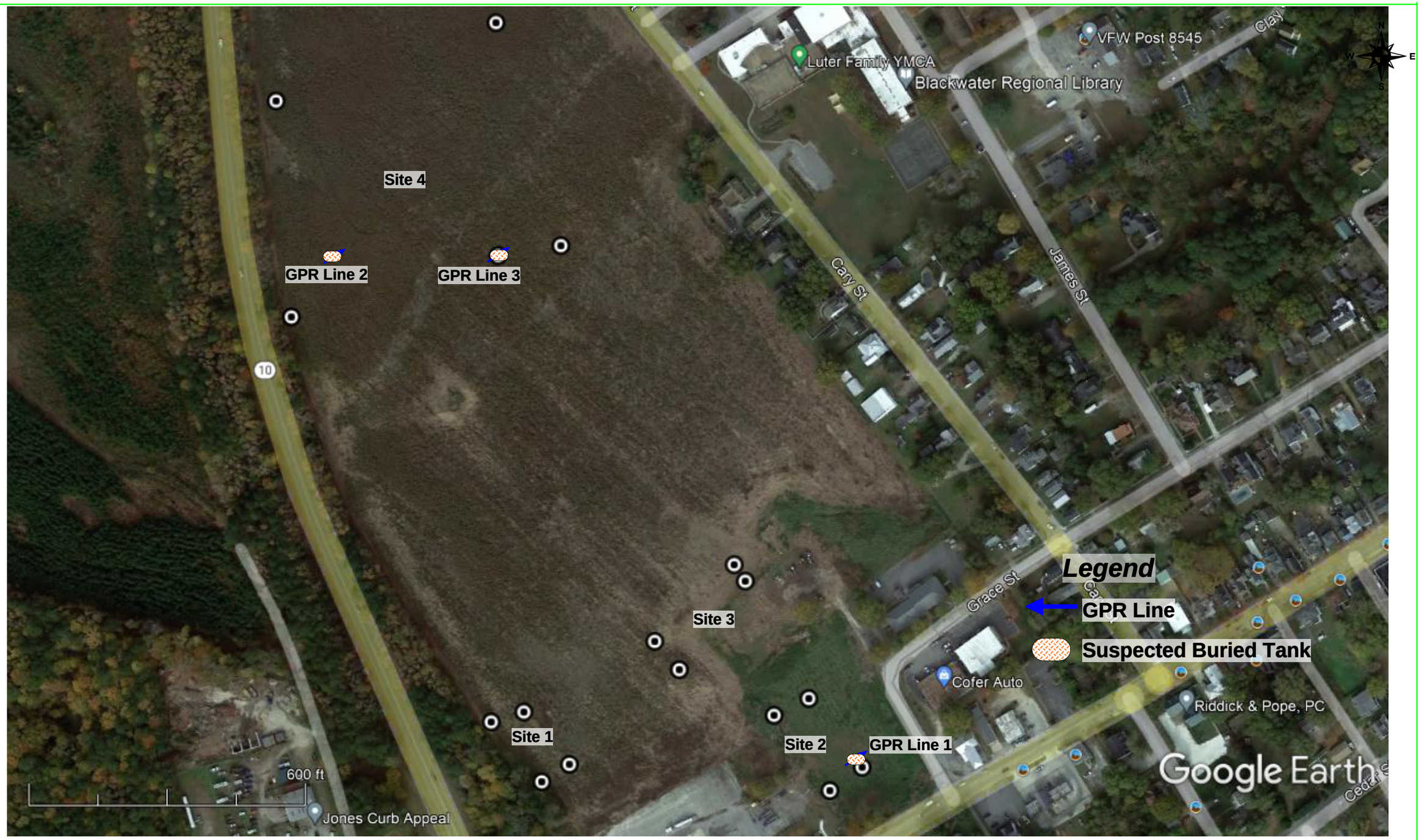
DATE: Sept. 2022	SCALE: shown	TITLE: ***GPR Lines 1 through 3 Pierceville Cemetery Main Street Smithfield, Virginia***	
DRAWN BY:	APPROVED BY:		
JOB NO.: 22186	DWG. NO./ REV. NO.: CCEMPVAF2	CLIENT: Circa~Cultural Resource Management	FIGURE: **2**



Forrest Environmental Services, Inc. Oak Hill, Virginia (703) 648-9090 www.fesinc.net	DATE: Sept. 2022	SCALE: 1 inch ~ 200 ft.	TITLE: ***Geophysical Anomaly Map*** ***Pierceville Cemetery*** ***Main Street*** ***Smithfield, Virginia***
	DRAWN BY	APPROVED BY	
	JOB NO.: 22186	DWG. NO./ REV. NO.: CCRMPierceF3	CLIENT: Circa~Cultural Resource
			FIGURE: **3**