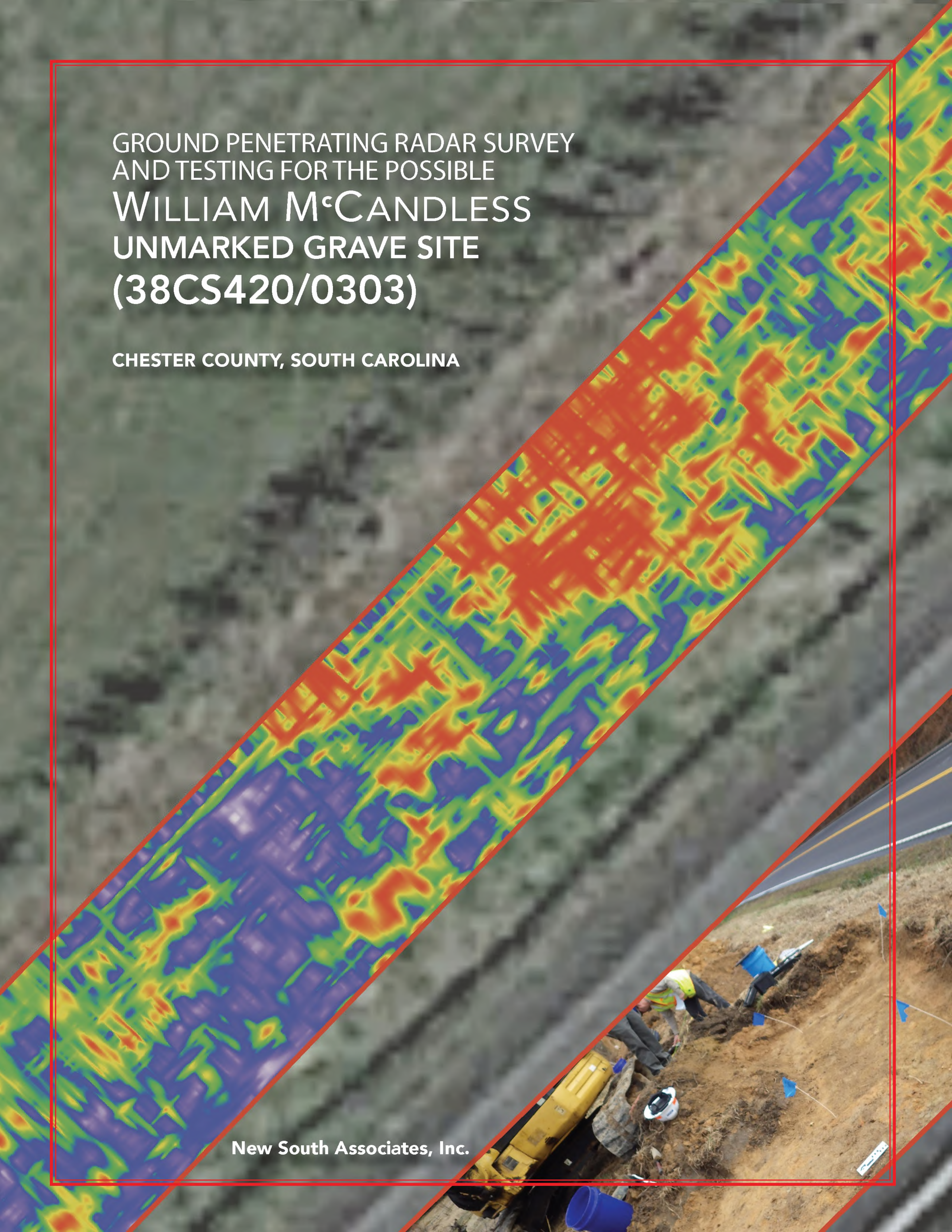
GROUND PENETRATING RADAR SURVEY AND TESTING FOR THE POSSIBLE WILLIAM McCANDLESS UNMARKED GRAVE SITE (38CS420/0303)

CHESTER COUNTY, SOUTH CAROLINA



New South Associates, Inc.

Ground Penetrating Radar Survey and Testing for the Possible William McCandless Unmarked Grave Site (38CS420/0303)

Chester County, South Carolina

Report submitted to:

South Carolina Department of Transportation • Environmental Services • 955 Park Street • Columbia, SC 29201-3959

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ABSTRACT

New South Associates, Inc. (New South) conducted a ground penetrating radar (GPR) survey and archaeological testing at the possible William McCandless Unmarked Grave Site within the area of potential effects (APE) associated with proposed improvements to the intersection of SC 72 (Saluda Road) and S-329 (McCandless Road) in Chester County, South Carolina. Based on oral history, McCandless was an Irish immigrant who lived northeast of the survey area. Tradition holds that he was buried in the survey area in 1881 and, though there is a memorial to McCandless in a nearby cemetery, the current landowner stated that his actual burial location was alongside present-day SC 72. The goal of the current project was to determine if a grave or graves was in fact present at the location specified by the landowner and within the APE of the proposed intersection improvements.

GPR data was collected over 0.04-acre (150 sq. m). Interpretations of the GPR data identified three anomalies with characteristics expected of historic graves. One trench was opened in each of the three areas containing GPR anomalies. One of the trenches revealed a feature consistent with a historic grave, while the other two did not expose any possible grave shafts. The feature was designated Site 38CS420/Resource 0303 and is interpreted as McCandless' burial site. It is recommended that this likely historic grave should be avoided through project design and marked to prevent unintended disturbance during construction. The grave should also be noted in property records so that its location will be known in the event of future work. If avoidance is not possible, the grave should be moved in accordance with the relevant South Carolina Codes (see South Carolina Code 27-43-10, Removal of Abandoned Cemeteries; 27-43-20, Removal to Plot Agreeable to Governing Body and Relatives; 27-43-30, Supervision of Removal Work; and 16-17-600, Destruction of Graves and Graveyards).

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I. INTRODUCTION

New South Associates, Inc. (New South) conducted ground-penetrating radar (GPR) survey and archaeological testing at the location identified as the possible unmarked grave of William McCandless in Chester County, South Carolina. The reported burial site is located on the road shoulder north of Saluda Road (SC 72) (Figure 1) and is inside the area that may be affected by proposed improvements to the intersection of SC 72 (Saluda Road) and S-329 (McCandless Road). The purpose of this geophysical survey and testing study was to identify and evaluate GPR anomalies that were consistent with historic graves. This report describes the methods and results of the study and provides recommendations with respect to further preservation work.

William McCandless was born about 1801 in Ireland. After immigrating to the United States, he settled in South Carolina. At the time of his death, McCandless was a prosperous farmer. There is a grave marker for him in the nearby Evergreen Cemetery (Find A Grave 2009), but family oral history contends that after his death, in about 1881, he was buried in a location now inside the survey area (Bill Jurgelski, personal communication 2018).

Margaret McCandless Hausman, the current landowner, is the great-great-niece of William McCandless and the primary informant for this project. According to Ms. Hausman, McCandless arrived in the United States around 1820 and settled in a log house northeast of the gravesite that had been in use as a stagecoach stop. Still standing, but decrepit, in the 1940s, the house was removed at the request of the highway department, which feared it would fall into the road. Remains of the house remain visible on the surface to the present (Bill Jurgelski, personal communication 2018). Family tradition states that McCandless was buried alone on a hill overlooking his home.

The survey area overlapped land proposed to be acquired as new right-of-way for the SC72/S-329 intersection improvement project on the north side of Saluda Road (SC 72) (Figure 2). The area reportedly containing McCandless' burial is located on a small rise with no surface indications of a grave. The soil within the survey area is mapped as well-drained Vance sandy loam, 2-6 percent slopes (Soil Survey Staff 2019).

The project involved a GPR survey followed by machine-assisted removal of topsoil and overburden to identify and investigate potential grave locations. The GPR survey was conducted on December 12, 2018 and the archaeological testing was performed on January 15, 2019.

Source: GoogleEarth (2018)

Figure 1.
Project Location Map

Figure 2.
Map of Survey Area and Right-of-Way

Imagery source: Google Earth 2018

This report is divided into four chapters. Chapter I introduced the investigation and described the project setting. Chapter II discusses methods employed during the field investigations, and Chapter III outlines the field investigation results. Conclusions and recommendations are provided in Chapter IV. Appendix A contains a copy of the Archaeological Site Form and Appendix B is the Historic Structures Form.

II. METHODS

The goal of the survey was to identify and investigate soil anomalies that could reflect the unmarked grave of William McCandless. The project used GPR to identify anomalies characteristic of historic graves. Machine-assisted removal of topsoil was then conducted to evaluate the GPR anomalies.

GPR SURVEY GRIDS

For the GPR data collection, one grid was established over a survey area measuring 0.04-acres (150 sq. m) (Figure 3). The grid was collected twice (along both the x- and y-axis) and each collection received a separate designation (i.e., GPR 1 and 2 cover the same area). When data were collected along the x-axis (GPR 2), the x-axis was 0.5 meters shorter to accommodate a fence at the western edge of the grid. The survey covered a total of 0.07 acres (285 sq. m). Transects were collected in both the north-south direction, perpendicular to the suspected grave orientation, and the east-west direction to maximize data resolution. Grid corners were mapped using a Trimble RTK GPS system with an R10 antenna and an average accuracy of two to four centimeters. All spatial data were downloaded from the GPS unit into ArcMap 10, ESRI's geographic information system (GIS) program. Separate shapefiles were then created for surface features, GPR interpretations, and grids.

Table 1. GPR Grids

Label	Acres	Square Meters
GPR 1	0.04	150
GPR 2	0.03	135
Total	0.07	285

GROUND-PENETRATING RADAR (GPR)

GPR is a remote sensing technique. In archaeological applications, it is typically used to prospect for potential subsurface cultural features. GPR is noninvasive, non-destructive, relatively quick, efficient, and highly accurate when used in appropriate situations. In cemeteries, GPR is commonly used to identify anomalies consistent with the expectations for human graves (Jones 2008; King et al. 1993).

Figure 3.
Map of GPR Grids

Imagery source: Google Earth 2018

GPR data are acquired by transmitting pulses of radar energy into the ground from a surface antenna, reflecting the energy off buried objects, features, or bedding contacts, and then detecting the reflected waves back at the ground surface with a receiving antenna (Conyers 2004a). When collecting radar reflection data, surface radar antennas are moved along the ground in transects, typically within a survey grid, and a large number of subsurface reflections are collected along each line. As radar energy moves through various materials, the velocity of the waves will change depending on the physical and chemical properties of the material through which they are traveling (Conyers and Lucius 1996). The greater the contrast in electrical and magnetic properties at an interface between two materials, the stronger the reflected signal and the greater the amplitude of reflected waves (Conyers 2004b).

When travel times of energy pulses are measured, and their velocity through the ground is known, distance (or depth in the ground) can be accurately measured (Conyers and Lucius 1996). Each time a radar pulse traverses a material with a different composition or water saturation, the velocity changes and a portion of the radar energy reflects back to the surface and is recorded. The remaining energy continues to pass into the ground to be further reflected until it finally dissipates with depth.

The depths to which radar energy can penetrate, and the amount of resolution that can be expected in subsurface contexts, are partially controlled by the frequency (and therefore the wavelength) of the transmitted radar energy (Conyers 2004b). Standard GPR antennas emit radar energy varying from about 10 to 1,000 megahertz (MHz) in frequency. Low frequency antennas (10-120 MHz) generate long wavelength radar energy that can penetrate up to 50 meters in certain conditions but resolve only very large buried features. In contrast, the maximum depth of penetration of a 900 MHz antenna in typical materials is about one meter or less but the generated reflections can resolve features with a maximum dimension of a few centimeters. Thus, a trade-off exists between depth of penetration and subsurface resolution.

The success of GPR surveys in archaeology is largely dependent on soil and sediment mineralogy, ground moisture and moisture retention of subsurface material, the depth of buried features, feature preservation, surface topography, and vegetation. Electrically conductive or highly magnetic materials will quickly attenuate radar energy and prevent its transmission to depth. Depth penetration varies considerably depending on local conditions. Subsurface materials that absorb and retain large amounts of water can effect GPR depth penetration because of their low relative dielectric permittivity (RDP). In practical applications, this generally results in shallower than normal penetration because the radar signal is absorbed (attenuated) by the materials regardless of antenna frequency (Conyers 2004a; 2012; Conyers and Lucius 1996). Differential water retention can also positively affect data when a feature of interest retains more water than the surrounding soils and, therefore, presents a greater contrast.

The basic configuration for a GPR survey consists of an antenna (with both a transmitter and receiver), a harness or cart, and a wheel for calibrating distance. The operator pulls or pushes the antenna across the ground surface in a grid, systematically collecting data along transects. These data are then stored by the receiver and made available for processing.

The "time window" within which data were gathered was 60 nanoseconds (ns). This is the time during which the system "listens" for returning reflections from within the ground. The greater the time window, the deeper the system can potentially record reflections. To convert time in ns to depth, it is necessary to determine the elapsed time it takes the radar energy to be transmitted, reflected, and recorded back at the surface by doing a velocity test. Hyperbolas were found on reflection profiles and measured to yield a relative dielectric permittivity (RDP), which is a way to calculate velocity. The shape of hyperbolas generated in programs is a function of the speed at which electromagnetic energy moves in the ground and can therefore be used to calculate velocity (Conyers and Lucius 1996). The RDP for soils in the survey area was approximately 9.65, which, when converted to one-way travel time (the time it takes the energy to reach a reflection source), is approximately 9.7 centimeters/ns. All profiles and processed maps were converted from time in ns to depth in centimeters using this average velocity.

GPR FIELD METHODS

The first step of GPR fieldwork was to calibrate the antenna to local conditions by walking the survey area and adjusting the instrument's gain settings. This allows the user to obtain an average set of readings based on subtle changes in the RDP (Conyers 2004b). Field calibration was repeated as necessary to account for changes in soil and/or moisture conditions (Conyers 2004a). Effective depth penetration was approximately 2.3 meters (7.5 ft.). Slight signal attenuation occurred at the bottom of the profile.

The field survey was conducted using a GSSI SIR-4000 with a 350 MHz hyper-stacking antenna (Figure 4). The SIR 4000 is the most advanced control unit available from GSSI. It collects 32-bit data for high-resolution returns and is compatible with both digital and analog antennas. The 350 MHz HS antenna has a digital acquisition system that allows for a more detailed signal and filters out more air wave noise. The HS antenna emits high speed interpolated samples to reduce the dynamic range limitations. The antenna acquires multiple samples for each pulse and results in more detailed readings with deeper depth penetration than non-hyper stacking antennas. It is the best antenna for use in less than ideal conditions and is preferred for areas with coupling problems. A 350 MHz HS antenna is a center frequency antenna with an excellent compromise between depth penetration and resolution. It is within the frequency range that is commonly used for archaeology.

Figure 4.
Photograph of GPR Data Collection in Progress

It is generally standard practice to orient transects perpendicular to the long axis of suspected features. Data were collected roughly north to south, as Christian burials are normally oriented east to west. The same area was then also covered with collection along transects oriented east-west. Transect spacing for all grids was 50 centimeters, an interval that has been demonstrated to generate the best resolution possible while maintaining field efficiency (Pomfret 2005). Transects were collected in a zigzag pattern, alternating starting direction. Collection began in the southwest corner for both grids.

GPR DATA PROCESSING

All data were downloaded from the control unit to a laptop computer for post-processing. Radar signals are initially recorded by their strength and the elapsed time between their transmission and receipt by the antenna. Therefore, the first task in the data processing was to set "time zero", which tells the software where in the profile the true ground surface was. This is critical to getting accurate results when elapsed time is converted to target depth. Because background noise can make it difficult to visually interpret reflections, the data were filtered to remove the horizontal banding that can result from antenna energy "ringing" and outside frequencies such as cell phones and radio towers. Finally, range gains were applied to the data to make reflections from later in the time window more visible.

The next data processing step involved the generation of amplitude slice-maps (Conyers 2004b). These three-dimensional images allow differences in reflected amplitudes to be viewed across a given surface at various depths. Reflected radar amplitudes are of interest because they measure the degree of physical and chemical differences in the buried materials. Strong, or high amplitude reflections often indicate denser (or different) buried materials. Amplitude slice-maps are generated through comparison of reflected amplitudes between the reflections recorded in vertical profiles. Amplitude variations, recorded as digital values, are analyzed at each location in a grid of many profiles where reflections were recorded. The amplitudes of reflection traces are compared to the amplitudes of nearby traces along each profile. This database can then be "sliced" horizontally to show the variation in reflection amplitudes at a sequence of depths in the ground. The result is a map that shows amplitudes in plan and at different depths.

Slicing of the data was done with the mapping program *Surfer 8*. Slice maps are a series of x,y,z values, with x (east) and y (north) representing the horizontal locations within grids and z representing the amplitude of the reflected waves. All data were interpolated using the Inverse Distance to a Power method and then image maps were generated from the resulting files.

From the original .dzt files (raw reflection data), a series of image files was created for cross-referencing to the amplitude slice maps. Two-dimensional reflection profiles were also analyzed to determine the nature of the features identified on the amplitude slice maps. The reflection profiles show the geometry of the reflections, which can lend insight into whether the radar energy was reflected from a flat layer (seen as a distinct band on the profile) or a single object (a hyperbola in profile). Individual profile analysis was used in conjunction with amplitude slice maps to provide stronger interpretations about possible graves.

The final step in the data processing was to integrate the depth slices with other spatial data. This was done using ArcGIS, which can display and manipulate all forms of spatial data created for this project, including GPR results, features, grid data, and base graphics such as aerial photography and topographic maps. The resulting anomalies were digitized as individual features and referenced to the coordinate system.

GEOPHYSICS IN CEMETERIES

Many factors influence the overall effectiveness of geophysics for detecting anomalies consistent with graves, including soil type and acidity, moisture and precipitation, the soil's magnetic properties, age of probable graves, likely grave depth, and burial container (e.g., shroud, wood coffin, metal casket, concrete vault) (WSP, Inc. and New South Associates, Inc. 2018:98). Contrast between the remains, grave shaft, coffin, or casket and the surrounding soils is the most important variable. Remains that have a chemical or physical contrast from the materials surrounding them will cause GPR reflections. Age of the graves is critical to this contrast. Older graves typically have less contrast and are more difficult to detect because they have had more time to decompose and are less likely to have intact coffins or caskets.

The burial "container" that the physical remains may have been placed in is also important and includes simple linen or cloth shrouds, wooden boxes or coffins, metal caskets, and burial vaults. Nails, hinges, and/or handles may be present. Although there is a high degree of variation in specific container types among different geographical regions, each of these tends to have been used at certain times throughout history and correlates with the presumed age of the grave. For example, burial shrouds were common during the seventeenth and early eighteenth centuries before being replaced by wooden coffins. It must also be noted that cultural trends and patterns tended to persist much longer in rural and/or economically depressed areas than in urban centers.

Grave anomalies are typically identified in profile as point-source hyperbolas that are produced when radar waves reflect off of a single object, such as a grave shaft, burial container, or void. When hyperbolas occur in adjacent profiles, and the depth and geometry are consistent with a human grave, they are interpreted as a possible grave.

MACHINE-ASSISTED REMOVAL OF TOPSOIL

Historic period grave shafts typically appear as distinct, dark, mottled stains visible against the subsoil. Formal grave shafts tend to measure 1.5-2.0 meters (5 -7 ft.) long and consist of rectilinear soil stains with the long axis usually running from east to west. Once the topsoil is removed, the grave shaft may be defined by sharp lines, while the shaft fill generally retains more moisture and is less compact than the surrounding undisturbed subsoil. Individual adult graves are normally easy to see, although local soil conditions and age of a grave can affect this (Matternes et al. 2012). Older graves and those in disturbed areas can be difficult to identify because over time, natural soil processes, plowing, and root growth can make the interfaces between the grave soils and the surrounding matrix less distinct (Damiata et al. 2013; Matternes and Richey 2014; Matternes et al. 2012; Schultz and Martin 2012)

Trenches were placed in a roughly north-south alignment to have the highest potential of bisecting the long axis of possible graves identified in the GPR results. The trenches involved removing surface materials to a depth sufficient to expose subsoil, where grave shafts were expected to be visible, while minimizing disturbance and the chances of encountering human remains.

Three trenches were excavated to test three GPR anomalies (Table 2). A large, amorphously defined disturbed area was also identified during the GPR survey. The disturbed area overlapped with two of the GPR anomalies. It was not examined in its entirety via trenching, but portions of it were exposed in the trenches excavated to examine the two overlapping anomalies. Upon excavation, the disturbed area was interpreted to be related to the former presence of a large cedar tree.

Each trench used the UTM coordinates of the GPR anomaly as its center point (Figure 5). A Trimble handheld GPS unit with 50-centimeter to one-meter accuracy was used to locate the anomalies. Trench numbers corresponded with the GPR anomaly numbers (i.e., Trench 1 tested GPR anomaly 1). Trenches were initially three meters (10 ft.) long. Trench 1 was expanded during excavation to follow possible features and ensure that the potential feature identified during the GPR survey was fully exposed. Each trench was excavated to a depth where undisturbed sandy clay subsoils were clearly exposed and subsurface features could be identified and recorded. New South hired Benjamin Leaphart as a backhoe operator. He provided a backhoe with a three-foot (0.9 m) wide toothless bucket to excavate the trenches. Trench excavation was closely monitored to ensure that any potential graves were identified before they could be substantially impacted.

Figure 5.
Trench Locations and Interpreted GPR Results

Imagery source: Google Earth 2018

Table 2. Trench Dimensions

Trench	Orientation	Length and Width	Total Depth
1	N-S*	4.0 x 3.2 m	0.25 m
2	SW-NE	3.0 x 1.6 m	0.35-0.44 m
3	SW-NE	3.0 x 1.3 m	0.65 m

*See description above

The sides and floor of each trench were cleaned with trowels and shovels and then examined for evidence of grave shafts. Each completed trench was sketched, photographed, and documented with notes. Soil colors were defined following the 1994 edition of Munsell Soil Color charts and soil characteristics were described following Schoeneberger et al. (2012). Each distinct soil stratum was assigned an individual number. When data collection was completed, trenches were backfilled. Grave and trench locations were recorded with a GPS unit.

No human remains or artifacts were encountered during excavations. Had any human remains been encountered, all work would have ceased, SCDOT would have been contacted, and the remains would have been covered and secured until a recommendation on how to proceed was received. If grave furniture, mortuary artifacts, or non-mortuary artifacts had been found, they would have been documented, examined, and reburied where found.

IV. RESULTS AND RECOMMENDATIONS

GPR RESULTS

The purpose of the GPR survey was to identify geophysical anomalies having the expected attributes of graves. GPR results were based on analysis of the 350 MHz HS data, including individual reflection profiles (Figures 6 and 7) and amplitude slice maps (Figures 8-14).

Three anomalies with the characteristics expected of historic graves were noted in the interpreted GPR results (Table 3, see Figure 5). These consisted of point-source hyperbolas in profile, which are typically produced by a single object, such as the bottom of a grave shaft, burial container, or void space (see Figure 6).

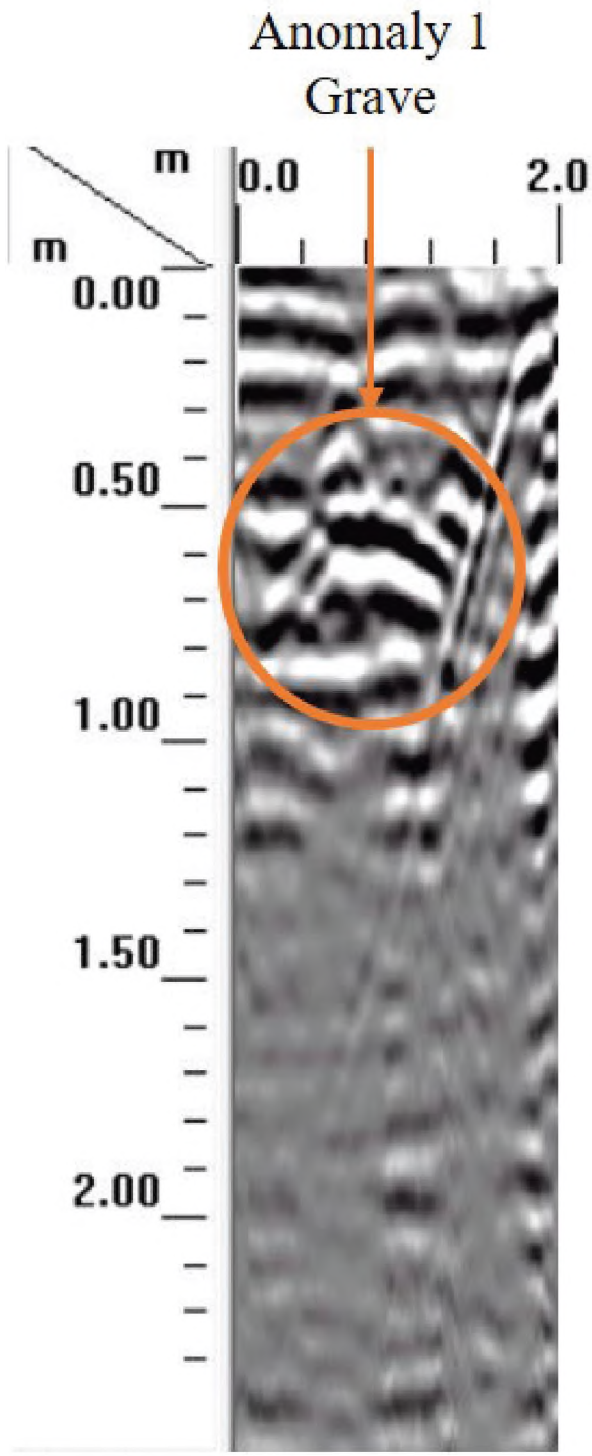
Table 3. Anomaly Depths and Locations

Anomaly	Label	Depth (cm below surface)	UTM Coordinates, Zone 17 North (NAD 83)	
			Northing	Easting
1	Probable Grave	30-70	3843504.497600	483596.891296
2	Probable Grave	40-90	3843507.648040	483601.655472
3	Probable Grave	40-60	3843513.380140	483607.230359
4	Disturbance	20-90	3843507.262200	483600.570626

New South takes a conservative approach to the identification of graves based on GPR data. The possible graves in the surveyed area were characterized on the basis of size, shape, depth, orientation, and overall reflective attributes in plan and profile. Many factors influence the overall effectiveness of GPR for detecting anomalies consistent with graves, including soil type and acidity, moisture and precipitation, age of probable graves, likely depth, and burial container. In general, if the anomaly has any of the characteristics of a grave, it is considered a potential grave. This can result in false positive identifications but, in general, this is preferred to possibly missing graves.

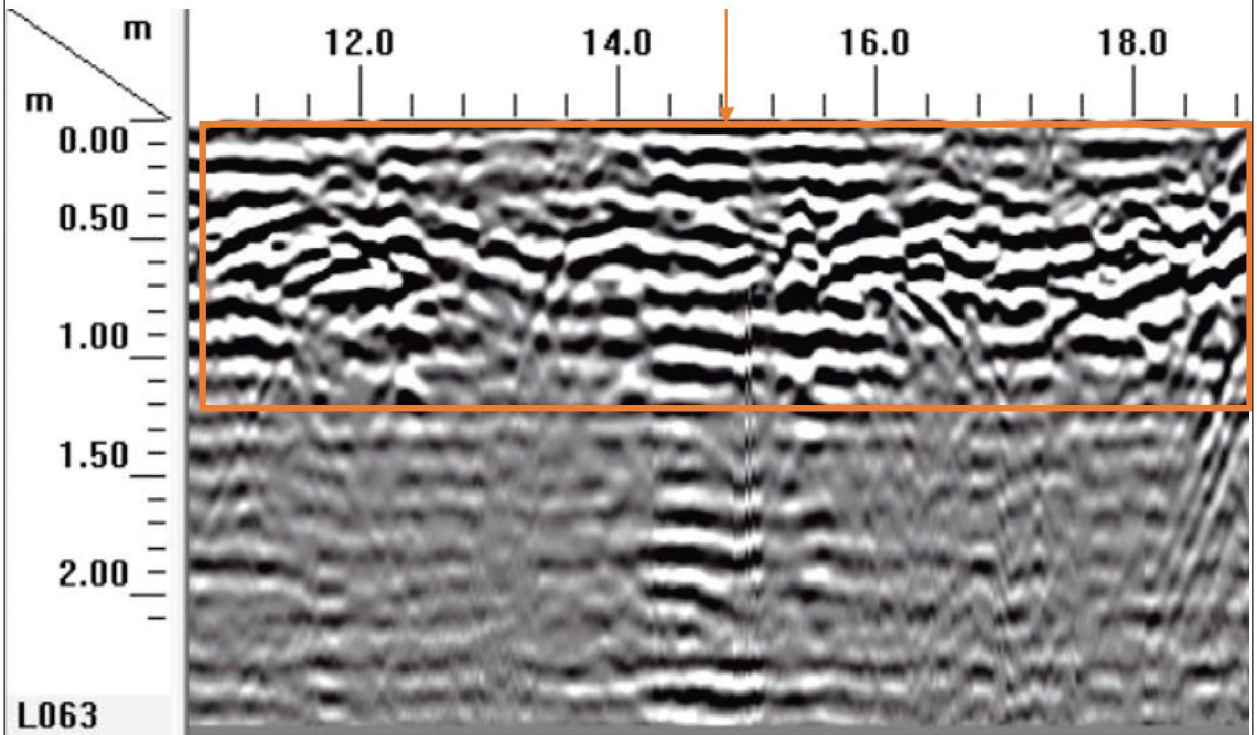
A large area of disturbed subsurface stratigraphy, designated Anomaly 4, was identified in profile (see Figures 5 and 7). A mature cedar tree reportedly stood in the area of this disturbance and Anomaly 4 probably represented decomposing roots (Bill Jurgelski, personal communication 2018).

Figure 6.
Example of a Grave Identified in Profile View



Grid 2, profile 27, 13 meters in the y-direction

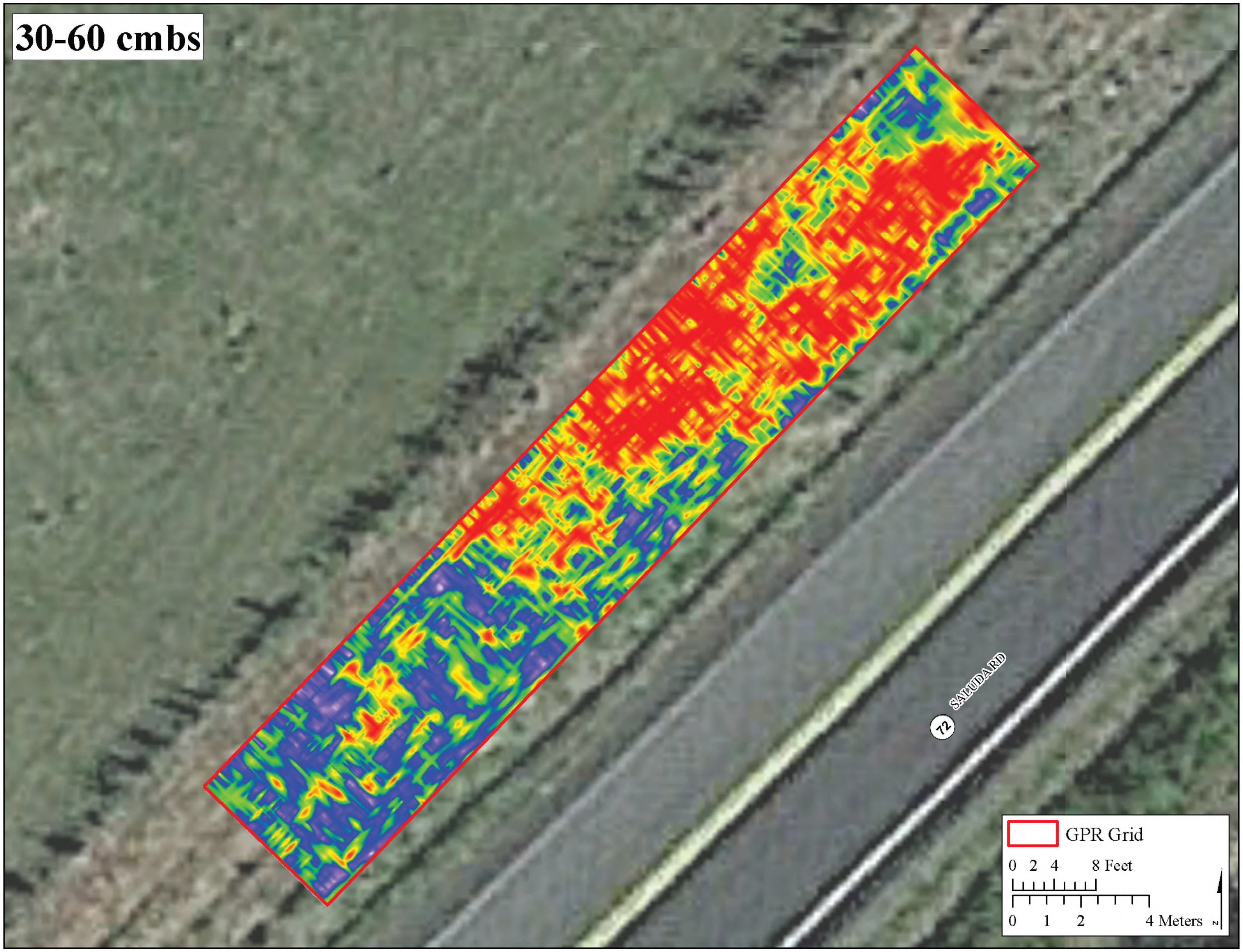
Figure 7.
Example of Area of Disturbance Identified in Profile View



Grid 1, profile 63, 0.5 meters in the x-direction

Source: GoogleEarth (2018)

Figure 8.
GPR Amplitude Slice Map, 0-30 Centimeters Below Surface (cmbs)

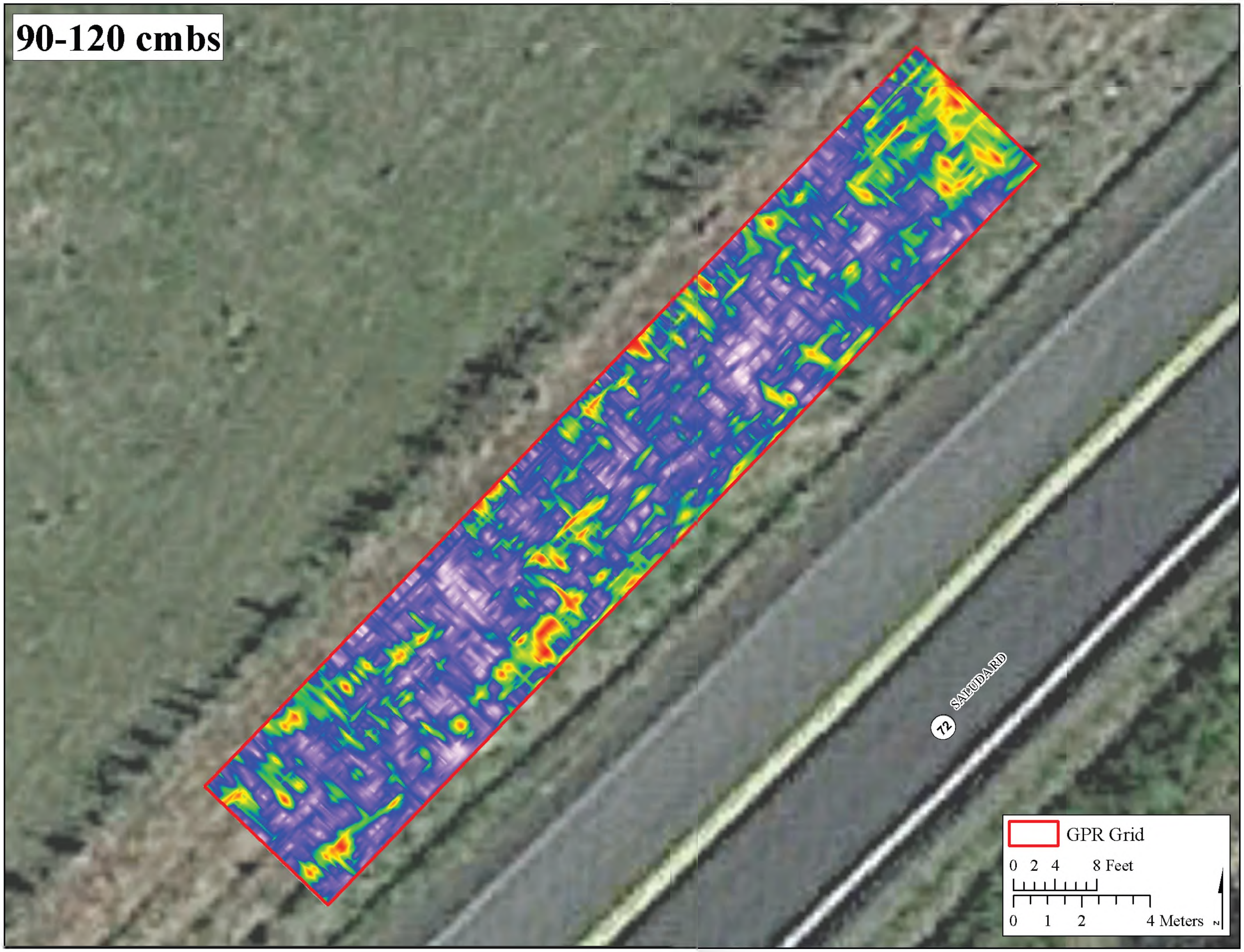


Source: GoogleEarth (2018)

Figure 9.
GPR Amplitude Slice Map, 30-60 cmbs

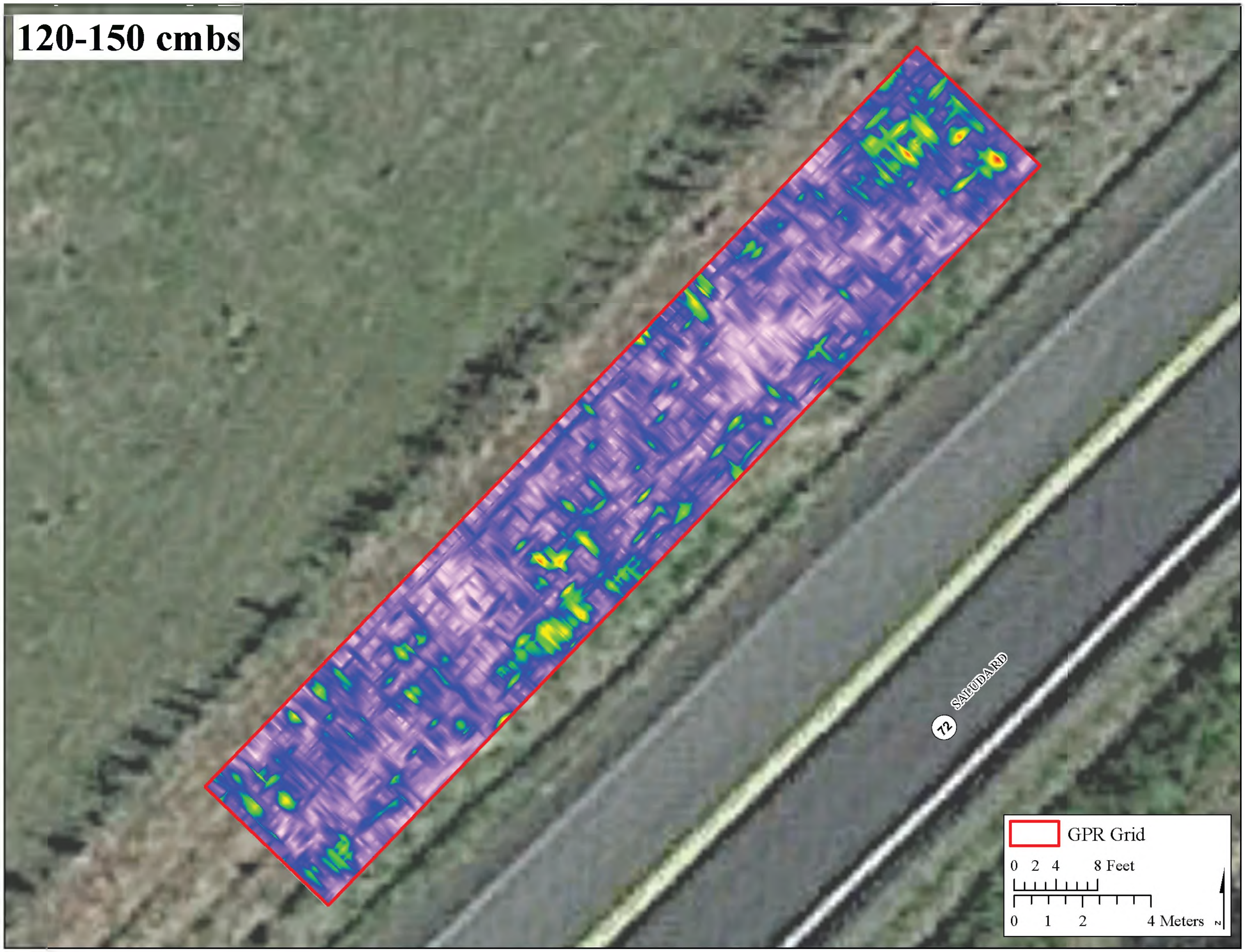
Source: GoogleEarth (2018)

Figure 10.
GPR Amplitude Slice Map, 60-90 cmbs



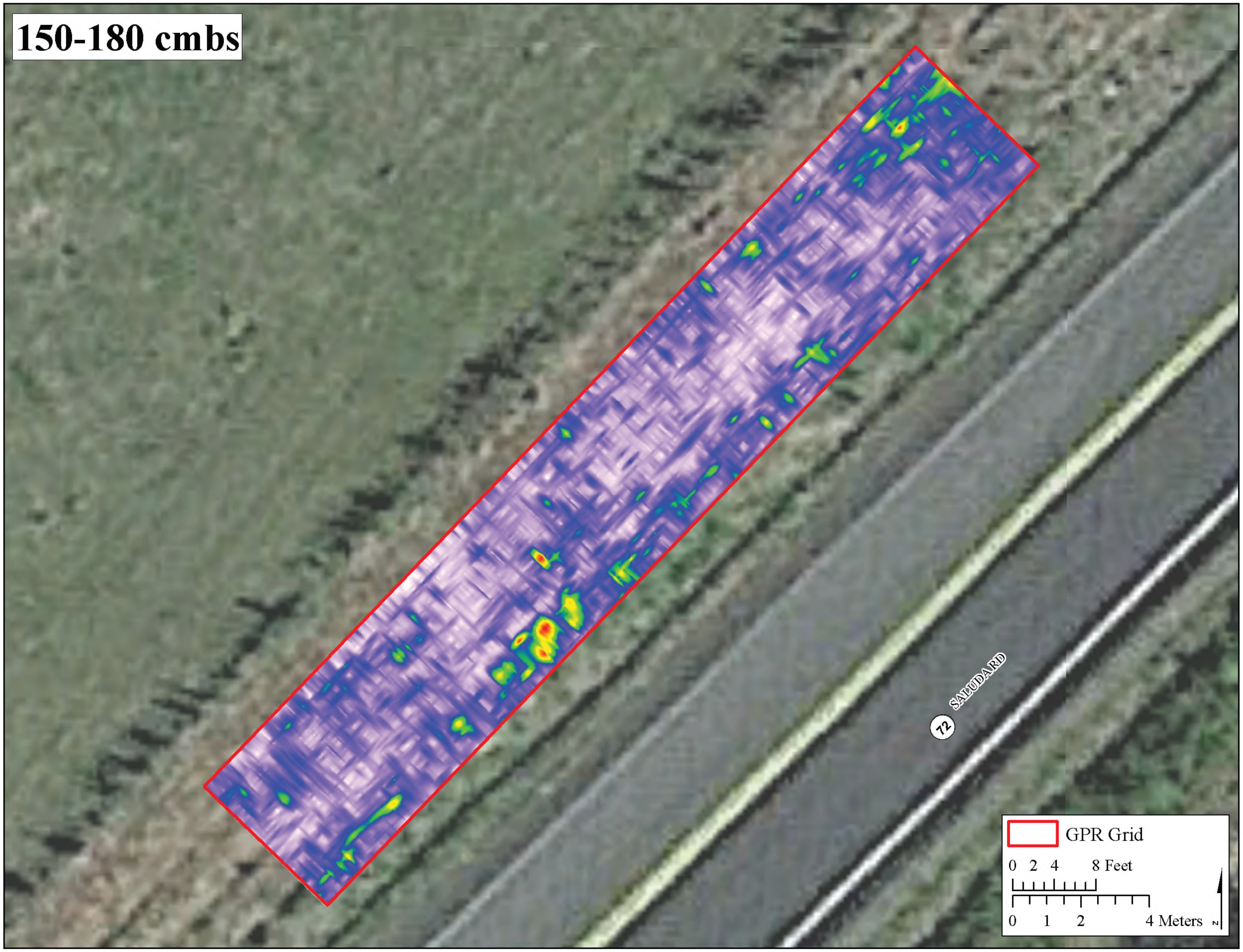
Source: GoogleEarth (2018)

Figure 11.
GPR Amplitude Slice Map, 90-120 cmbs



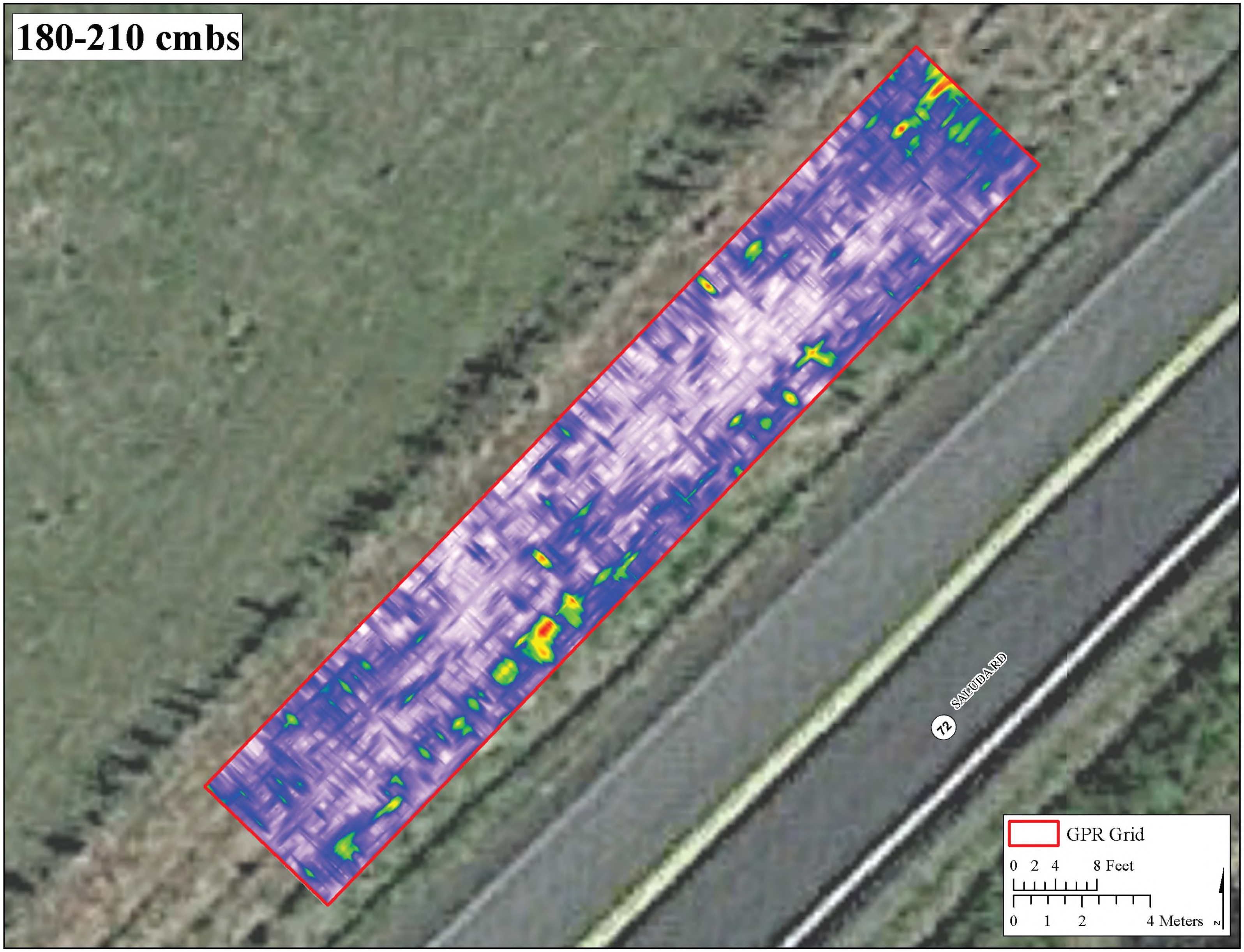
Source: GoogleEarth (2018)

Figure 12.
GPR Amplitude Slice Map, 120-150 cmbs



Source: GoogleEarth (2018)

Figure 13.
GPR Amplitude Slice Map, 150-180 cmbs



Source: GoogleEarth (2018)

Figure 14.
GPR Amplitude Slice Map, 180-210 cmbs

SUBSURFACE ARCHAEOLOGICAL TESTING RESULTS

SITE STRATIGRAPHY

The test trenches exposed three strata. Stratum I consisted of very dark grayish brown (10YR 3/2) to dark grayish brown (10YR 4/2) sandy clay loam A horizon. Yellowish brown (10YR 5/4) to light yellowish brown (10YR 6/4) sandy loam to sandy clay loam represented Stratum II. Stratum III, the subsoil, was strong brown (7.5YR 4/6) to brown (10YR 6/3) clay to sandy clay.

GPR ANOMALY 1 (TRENCH 1)

Trench 1 was placed perpendicular to the long axis of GPR Anomaly 1 (see Figure 5) and was near the reported location of the McCandless grave indicated by the landowner. This general area was also identified as the probable grave location by another informant, Ms. Erin Culp, who had surveyed the area with dowsing rods and marked the location of the McCandless grave just south-southeast of the anomaly.

Trench 1 was laid out to measure three meters (10 ft.) long in a roughly north-south orientation. After negative findings in the initial excavation area, the trench was expanded to 4.0 meters (13 ft.) southwest-northeast and 3.2 meters (10.5 ft.) northwest-southeast (Figure 15). The expanded trench area reached a total depth of 25 centimeters (0.8 ft.) below surface. A large red cedar stump and root mass were identified in the southern half of the trench. The root stain was brown (10YR 5/3) clay with pale yellow (2.5Y 7/4) edges. At the northeast corner of the root mass, a distinct soil change was identified that appeared to reflect a grave shaft (Feature 1). The stripped area was expanded to the northeast to expose the entire feature.

All strata were represented in this trench (Figures 15 and 16). In the northeastern trench profile, Stratum I was at the surface and overlay Stratum II, with Stratum III at the base. In plan, Stratum II had an interface alongside Stratum III, the subsoil, in the northwest section of the trench. Stratum III extended across the remainder of the trench floor.

Feature 1

Feature 1 was identified and fully exposed within the expanded area of Trench 1. It had distinct edges and a rectangular shape measuring 2.2x1.0 meters (7.0x3.3 ft.). The feature fill consisted of dark grayish brown (10YR 4/2) sandy loam. The feature was adjacent to the cedar tree remains, which was consistent with the family's oral history.

Figure 15.
Plan and Profile View of Trench 1

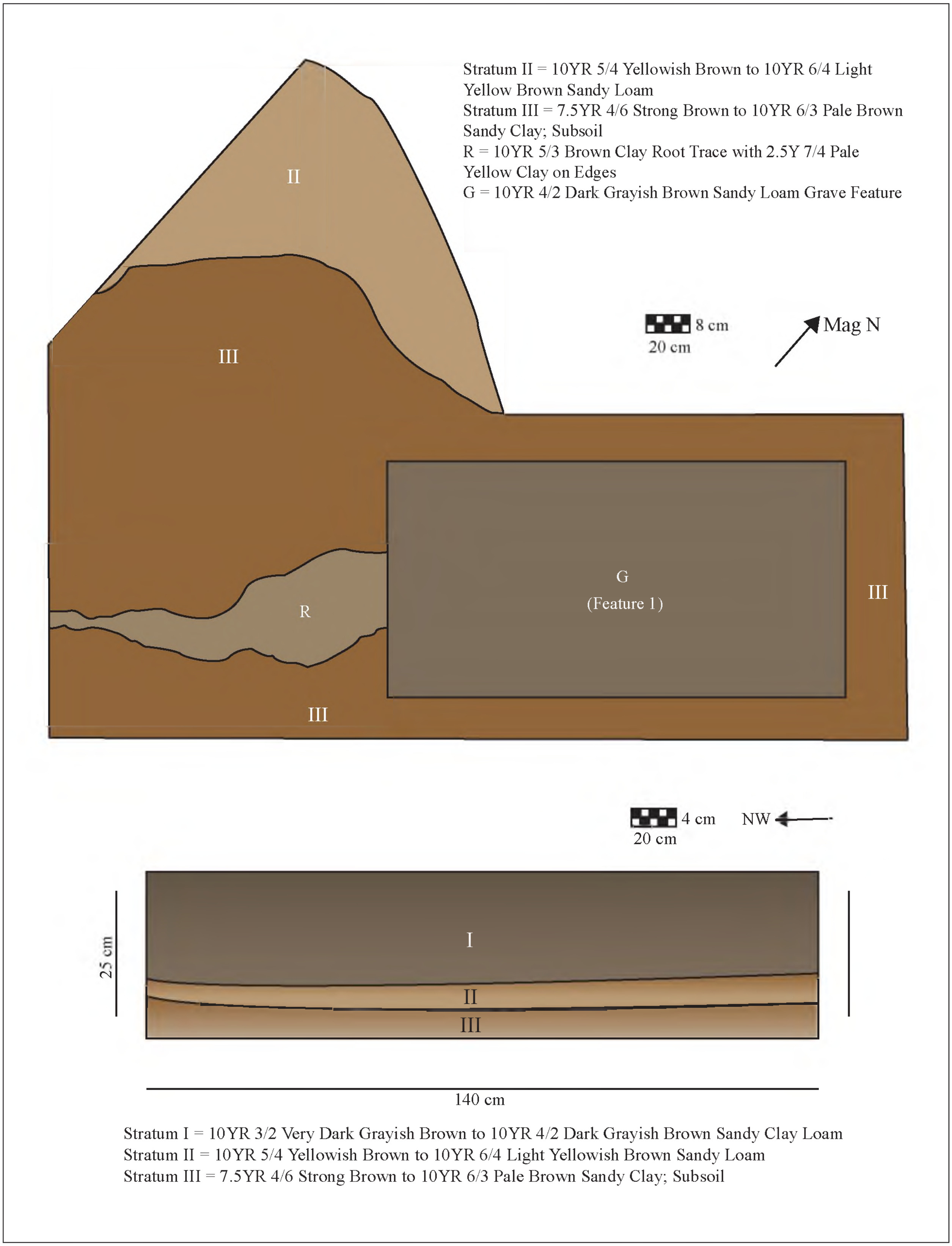


Figure 16.
Photographs of Trench 1 and Feature 1

A. Trench 1, Facing Northeast

B. Feature 1, Facing Southeast

Feature 1 corresponds with GPR Anomaly 1. The anomaly and feature were 50 centimeters (1.6 ft.) apart, which is within the margin of error for a Trimble handheld GPS device. As a result of the rectangular shape, distinct edges, and general orientation of Feature 1, it is interpreted as a grave. Based on the oral history, it is thought to belong to William McCandless. This feature received the designation Site 38CS420/Resource 0303.

GPR ANOMALY 2 (TRENCH 2)

Trench 2 was situated perpendicular to the long axis of GPR Anomaly 2 (Figure 4) and measured 3.0x1.6 meters (9.8x5.2 ft.) (Figures 17 and 18). The trench excavation extended to 35-44 centimeters (1.14-1.44 ft.) below the surface, which was within the depth range of the anomaly estimated by the GPR.

In the northern profile of the trench, all of the strata were present. In plan, an oval section of Stratum I with reddish stains at its edges was identified in the southwestern half of the trench surrounded by Stratum III. This soil stain appeared to be the remains of a burned tree and was likely the source of the GPR anomaly. No cultural materials were located in the trench and there were no features consistent with the expectations for historic graves.

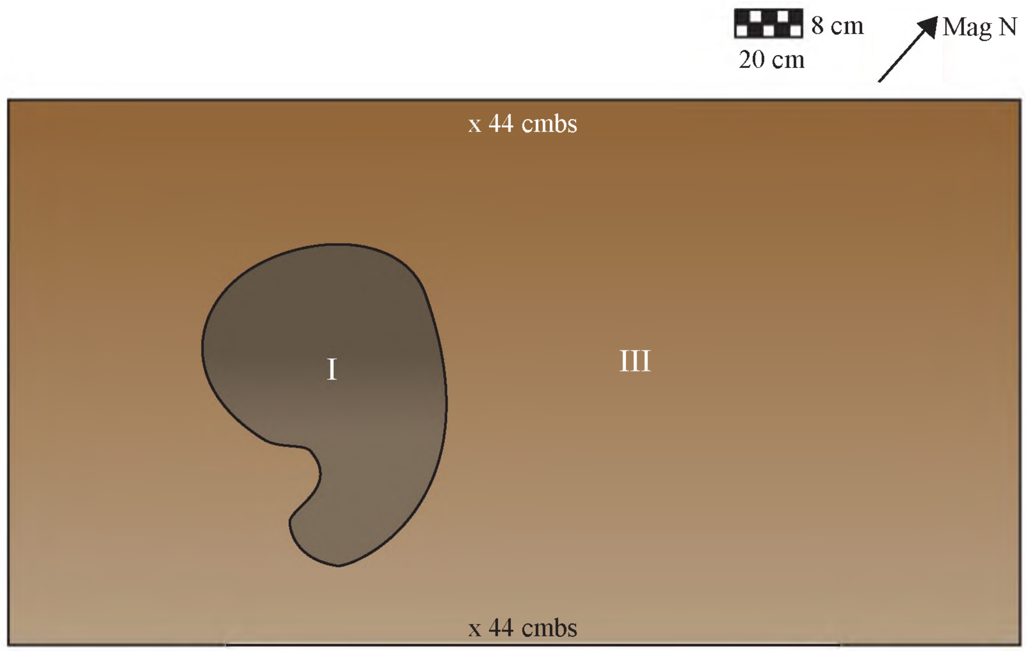
GPR ANOMALY 3 (TRENCH 3)

Trench 3 was perpendicular to the long axis of GPR Anomaly 3 (Figure 5). The trench was 3.0x1.3 meters (9.8x4.3 ft.) (Figures 19 and 20) and reached a depth of 58-65 centimeters (1.9-2.1 ft.) below the surface. This is within the anomaly depth range indicated in the GPR results (Table 2).

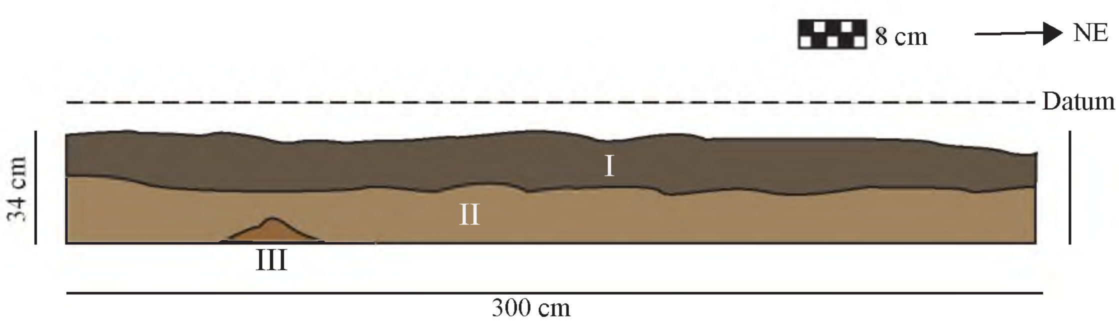
All of the strata were observed in the northern profile of the trench. Stratum III varies slightly in this trench, being mottled in its lowest portion with pale brown (10YR 6/3) sandy clay. A lens of gray (10YR 5/1) weathered quartz was within Stratum III in the center of the profile. In plan, an irregularly shaped deposit of the quartz was mixed with the pale yellow mottling in Stratum III in the northwest center portion of the trench.

The lens of gray quartz in the plan and profile of the trench was interpreted as the source of GPR Anomaly 3. It appeared to be an area of weathered bedrock lying close to the surface that created a contrast in the GPR data. No cultural features consistent with historic graves were found in Trench 3 and no artifacts were found.

Figure 17.
Plan and Profile Views of Trench 2



Stratum I = 10YR 3/2 Very Dark Grayish Brown to 10YR 4/2 Dark Grayish Brown Sandy Clay Loam
Stratum III = 7.5YR 4/6 Strong Brown Clay to 10YR 6/3 Pale Brown Sandy Clay Mottled with 7.5YR 5/6 Strong Brown Sandy Clay; Subsoil



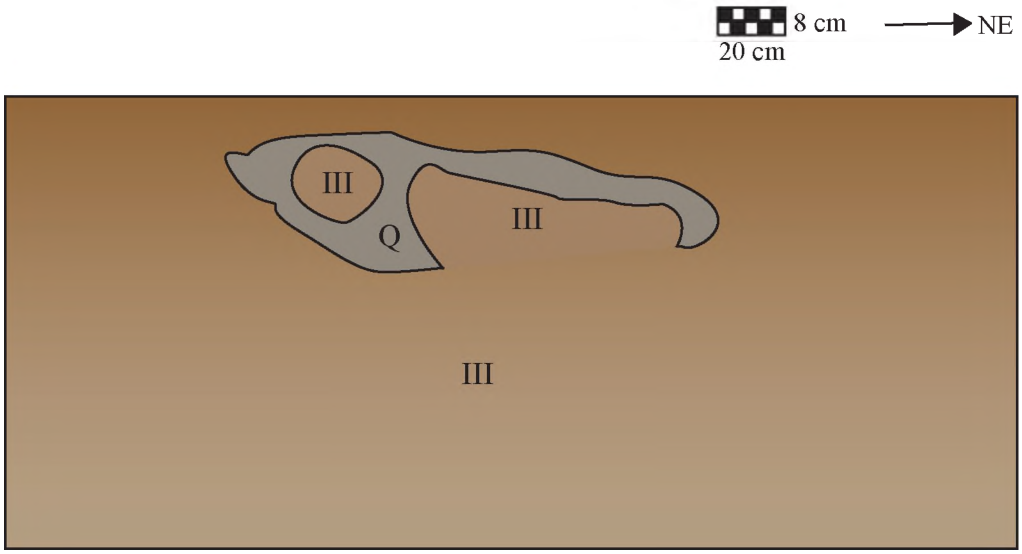
Stratum I = 10YR 3/2 Very Dark Grayish Brown to 10YR 4/2 to Dark Grayish Brown Sandy Clay Loam
Stratum II = 10YR 5/4 Yellowish Brown Sandy Loam to 10YR 6/4 Light Yellowish Brown Sandy Clay Loam
Stratum III = 7.5YR 4/6 Strong Brown Clay to 10YR 6/3 to Pale Brown Sandy Clay; Subsoil

Figure 18.
Photographs of Trench 2

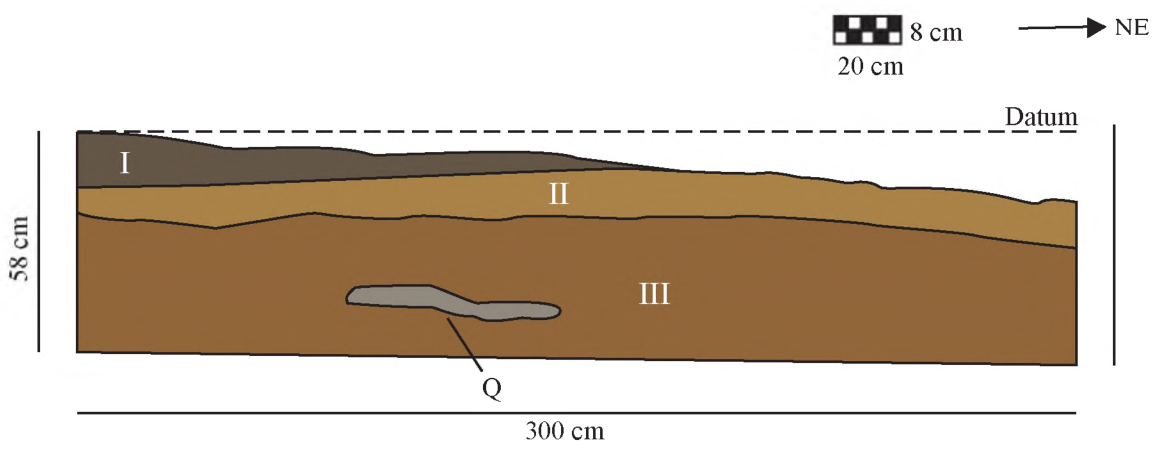
A. North Profile

B. Plan, Facing Southwest

Figure 19.
Plan and Profile Views of Trench 3



Stratum III = 7.5YR 4/6 Strong Brown Clay to 10YR 6/3 Pale Brown Sandy Clay Mottled with 2.5 Y 7/4 Pale Yellow Clay Sand; Subsoil
Q = 10YR 5/1 Gray Weathered Quartz



Stratum I = 10YR 3/2 Very Dark Grayish Brown to 10YR 4/2 Dark Grayish Brown Sandy Clay Loam
Stratum II = 10YR 5/4 Yellowish Brown Sandy Loam to 10YR 6/4 Light Yellowish Brown Sandy Clay Loam
Stratum III = 7.5YR 4/6 Strong Brown Clay to 10YR 6/3 Pale Brown Sandy Clay; Subsoil
Q = 10YR 5/1 Gray Weathered Quartz

Figure 20.
Photographs of Trench 3

A. North Profile

B. Plan, Facing Southwest

IV. CONCLUSIONS AND RECOMMENDATIONS

The GPR survey conservatively identified anomalies whose signatures were consistent with expectations for subsurface mortuary features. All anomalies with any characteristics expected of graves were considered as probable burial locations. The GPR survey identified three such anomalies.

Machine-assisted removal of topsoil revealed that GPR Anomaly 1 was associated with a feature consistent with a historic grave shaft. GPR Anomaly 2 proved to be bioturbation and possibly the remains of a burned stump or tree root, while GPR Anomaly 3 was found to represent a relatively shallow deposit of bedrock.

Feature 1 correlated with GPR Anomaly 1. The feature's attributes are consistent with a historic grave shaft and also corresponded closely with the location of William McCandless' burial spot as indicated and marked by informants. New South interprets Feature 1 as the likely grave of William McCandless (Table 4) and the site has been designated Site 38CS420/0303.

Table 4. Interpretation of Trenches Placed in the Project Area

Trench	Justification	Interpretation	Potential Source for GPR Anomaly
1	GPR Anomaly	Potential Gravesite	Historic Feature/Natural Soil Deposits
2	GPR Anomaly	Not a Grave	Plant Disturbance
3	GPR Anomaly	Not a Grave	Decaying Bedrock Lens

RECOMMENDATIONS

A single probable historic grave (Site 3838CS420/0303) was identified. New South recommends that the grave should be avoided during construction and a temporary fence should be placed around the perimeter of a 5x5-meter (16.4x16.4-ft.) square centered on the grave to protect it during construction. Finally, the grave should be recorded on the property deed.

If the burial cannot be avoided through project design, then the grave should be moved in accordance with the relevant South Carolina Codes (see South Carolina Code 27-43-10, Removal of Abandoned Cemeteries; 27-43-20, Removal to Plot Agreeable to Governing Body and Relatives; 27-43-30, Supervision of Removal Work; and 16-17-600, Destruction of Graves and Graveyards).

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APPENDIX A. ARCHAEOLOGICAL SITE FORM

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Is this a revisit? No

SOUTH CAROLINA INSTITUTE OF ARCHAEOLOGY AND ANTHROPOLOGY
UNIVERSITY OF SOUTH CAROLINA
SITE INVENTORY RECORD
(68-1 Rev. 2015)

STATE: SC COUNTY: Chester SITE NUMBER: 38CS420

Recorded By: Sarah Lowry Affiliation: New South Associates, Inc. Date (MM/DD/YYYY): 01/31/2019

A. GENERAL INFORMATION

1. Site name: McCandless Grave Site Project: Intersection improvement of SC 72 (Saluda Rd) and South 329 (McCandless Rd
2. USGS Quadrangle: Chester Date: 2017 Scale: 7.5 minute
3. UTM: Zone 17 Easting 483598.52 Northing 3843504.30 Reference Datum/Year NAD83
4. Other map reference: ____
5. Descriptive site type (see handbook):
   Prehistoric ____ Historic Cemetery
6. Archaeological investigation: Survey Y Testing Y Excavation ____
7. Property owner: Margaret McCandless Hausman Phone number: ____
8. Address: 909 Saluda Road, Chester, SC 29706
9. Other site designations: ____
10. National Register of Historic Places recommendation: Eligible ____ Not Eligible ____ Additional work ____
11. Level of significance: National ____ State ____ Local ____
12. Justification:

NRHP evaluation was not part of the current project, further research would be needed to determine if the grave site is eligible.

Office Use Only

Determined eligible: ____ Determined not eligible: ____ Date: ____
On NRHP: ____ Date Listed: ____

B. ENVIRONMENT AND LOCATION

1. General physiographic province: Piedmont
2. Landform location: Ridge nose Site elevation (above MSL): 560 (in feet)
3. On site soil type: Sandy Loam Soil classification: Vance
4. Major river system: Santee Nearest river/stream: Rocky Creek
5. Current vegetation: Pine/coniferous ____ Hardwood ____ Mixed pine/hardwood ____ Old Field ____
   Grass/pasture ____ Agricultural/crops Y Wetlands/freshwater ____
   Wetlands/saltwater ____ Other ____ Comments: ____
6. Description of groundcover: Light

C. SITE CHARACTERISTICS

1. Estimated site dimensions: 4 meters by 2 meters
2. Site depth: Unknown cm.
3. Cultural features (type and number):

One unmarked historic grave, thought to belong to William McCandless, buried in approximately 1881. There is no marker. The grave was identified through communications with the landowner, ground penetrating radar survey, and test trenches.

4. Presence of: Midden ____ Floral remains ____ Faunal remains ____ Shell ____ Charcoal ____
5. Human skeletal remains: Present Preservation: ____
6. General site description:

This site consists of one unmarked grave purported to belong to William McCandless (1801-1881). McCandless family oral history indicates the presence of the single grave at this location. The presence of the grave was confirmed in January of 2019 through the use of ground penetrating radar and trenching to remove the topsoil.

7. Verbal description of location:

Site is located on a slight rise on the north side of SC 72 (Saluda Road) approximately 530 meters (1760 feet) northeast of the intersection with SC329 (McCandless Road).

INCLUDE SITE MAP(S) AT END OF FORM

D. ARCHAEOLOGICAL COMPONENT

Paleo Indian		Late Woodland		16th Century	
Early Archaic		Any Woodland		17th Century	
Middle Archaic		Mississippian		18th Century	
Late Archaic		Late Prehistoric		19th Century	Y
Any Archaic		Contact Era Prehistoric		20th Century	
Early Woodland		Unknown Prehistoric		Unknown Historic	
Middle Woodland	–				

E. DATA RECOVERED

-------INCLUDE INVENTORY AT END OF FORM------- total number of artifacts: 0

F. DATA RECOVERY METHODS

1. Ground surface visibility: 0% ____ 1-25% Y 26-50% ____ 51-75% ____ 76-100% ____
2. Number of person hours spent collecting (total hours X total people): 0
3. Description of surface collection methods:

Type: grid collection ____ grab collection ____ controlled sampling ____ other (specify): ____

Extent: complete ____ selective ____ no collection made Y

4. Description of testing methods:

Method: Systematic

Comments: Used GPR and targeted trenching to locate grave

	Number	Size	Depth	
Auger				cm
Posthole				cm
Shovel				cm
Other				cm

5. Description of excavation units:

Number	Size	Depth		Comments:
3	1x3 m	50-70	cm	

Put additional sizes in comments.

G. MANAGEMENT INFORMATION

1. Present land use:

Agricultural	Y	Residential, high density	
Forest		Commercial	
Fallow		Industrial	
Residential, low density		Other (specify)	

Road Shoulder

2. Present condition/integrity of site:

Type: Intact

Extent: ____

Nature of Damage: erosion ____ cultivation ____ logging ____ development ____ vandalism ____ inundation ____ other (specify) ____

3. Potential impacts and threats to site:

Potential threat: Low

Nature of Threat: erosion ____ cultivation ____ logging ____ development Y vandalism ____ inundation ____ other (specify) ____

Impact Zone: Indeterminate

4. Recommendations for further work:
Survey ______ Testing ______ Excavation ______ Archival ______ None Y Other: ______
Comments:
Grave location should remain undisturbed unless it is threatened by construction. It is recommended that the grave be marked for further protection.

5. References: Historic/archival documentation ______

Archaeological documentation Yes

Lowry, Sarah, Maeve Herrick, and David Amrine, 2019 Ground Penetrating Radar Survey and Testing for the Possible William McCandless Unmarked Grave Site. New South Associates: Stone Mountain, Georgia. Report submitted to the South Carolina Department of Transportation.

6. Additional management information/comments:

7. Location of existing collections: None

8. Location of photographs: None

9. Location of special samples: ______
Type of special samples: ______

Signature of observer: Sarah Lo Date: ______

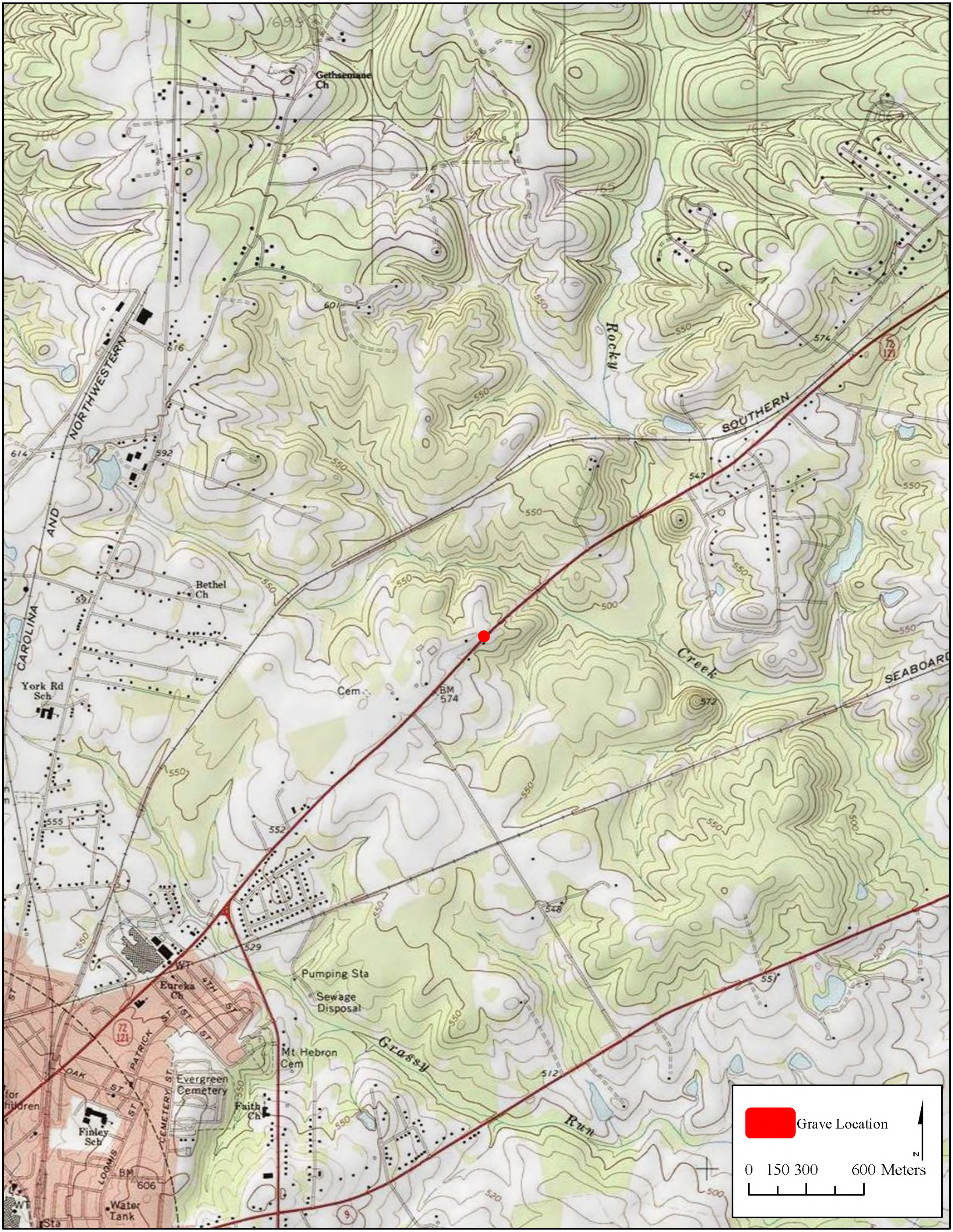
---------------**INITIAL THE FOLLOWING**---------------

I have compared the map location to the GPS coordinates: ______

I have included a site map: ______

I have included an artifact inventory: ______

Please combine your site map and artifact tables with the Site Form in **a single PDF**, placing them at the end of the document. The PDF should be emailed to dertingk@mailbox.sc.edu or delievered using www.wetransfer.com. Shapefiles/geodatabases are welcome additions to the submission.



Source: USGS Topo Quad 7.5' Chester

Source: USGS Topo Quad 7.5' Chester

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