GEOPHYSICAL SURVEY USING GROUND-PENETRATING RADAR

ELISHA BATTLE CEMETERY (31ED324)

City of Rocky Mount, Edgecombe County, North Carolina

PREPARED FOR:

George Gordon Battle Cemetery Trust
c/o Richard Battle, Senior Trustee
2905 Montpelier Court
Raleigh, North Carolina 27609

July 2022

RICHARD GRUBB & ASSOCIATES, INC.

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Executive Summary

Richard Grubb & Associates, Inc. (RGA) conducted a geophysical survey using ground-penetrating radar (GPR) at the Elisha Battle Cemetery (31ED324) in the City of Rocky Mount, Edgecombe County, North Carolina. The non-invasive survey focused on the 0.23-acre (9,900 square foot) cemetery parcel north of NC97 that was surrounded by an active agricultural field. The George Gordon Battle Cemetery Trust plans to relocate the interments at the Elisha Battle Cemetery to the Old Town Cemetery. No gravemarkers are present inside the original cemetery area, but fourteen (14) graves were recorded during a visual inspection in 1995 by archaeologist John W. Clauser, Jr. The GPR survey was undertaken to ascertain the locations and number of potential burial anomalies in order to plan for relocation.

Approximately seven (7) anomalies that represent potential burials were identified within the GPR survey area. These anomalies were labeled as Possible Burial Anomalies. These possible burials lie in a similar arrangement with those identified during the previous investigation at the cemetery. A sizeable oak tree lies in the middle of the cemetery. A high density of root anomalies were observed stretching out across the cemetery, making it difficult to observe additional underlying anomalies. No unmarked burial anomalies were identified within the original (ca. 1930s) cemetery fence. A ca. 1935 memorial to Elisha Battle exists in the cemetery. The grave of James E. McNair lies outside the original cemetery fence and is marked by a monument erected by the current property owner.

It is possible that not all anomalies were detected during the GPR survey, and additional burials could be identified during relocation. Burials could also be beneath, or entangled with, the roots associated with the oak tree. As such, it is recommended that the topsoil and upper subsoil levels, as necessary, be carefully removed from the area covering the anomalies identified by GPR and those identified by John W. Clauser, Jr. These measures will allow the exposure of possible burials in the subsoil and help ensure that the Battle family interments are accounted for during the grave relocation process.

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1.0 Introduction

Richard Grubb & Associates, Inc. (RGA) conducted a geophysical survey using ground penetrating radar (GPR) at the Elisha Battle Cemetery in the City of Rocky Mount, Edgecombe County, North Carolina (Figure 1.1). The cemetery is situated in an agricultural field (Taylor Field) north of NC97 between Cool Springs Road and Treatment Plan Road and is registered with the North Carolina Office of the State Archaeologist (NCOSA) as site 31ED324 (Figure 1.2; OSA n.d.). The Elisha Battle Cemetery occupies a parcel that measures 100 feet by 90 feet (9,900 square feet, 0.23 acres; PIN 387183078300).

Elisha Battle settled at the Old Town Plantation, located north of NC97, in 1747 and was a North Carolina senator and Edgecombe County Court Judge. Soon after, the Elisha Battle Cemetery, or family cemetery, was established on their 400-acre property. A second Battle cemetery, called the Old Town Cemetery, was established afterwards. The Old Town Cemetery lies southeast of the Elisha Battle Cemetery in parcel number (PIN) 388110769800 on the Old Town Plantation. In 1983, the plantation house was moved to a location north of NC97 and west of the Elisha Battle Cemetery (Harris 1983; George Gordon Battle Cemetery Trust 2022). The Old Town Plantation (ED 0010) is listed in the National Register of Historic Places (Harris 1983).

The George Gordon Battle Cemetery Trust plans on relocating the interments from the Elisha Battle Cemetery to the Old Town Cemetery. A GPR survey was requested to ascertain the locations and number of potential unmarked burials in order to plan for the relocation. The survey included the limits of an approximate 0.23-acre survey area including the original cemetery and extension to the west (Figure 1.3). The GPR survey was performed in accordance with standard approaches to archaeological geophysics in cemeteries (Conyers 2006b; Doolittle and Bellantoni 2009; Leach 2021; Lowry 2016).

The grave relocation project requires the approval of the Rocky Mount City Council (West-Brake 2022). The Rocky Mount City Council will consider the request to relocate the graves within the Elisha Battle Cemetery to Old Town Cemetery as allowed by North Carolina General Statute 65-106 Removal of Graves. Cemeteries are protected under North Carolina General Statutes Chapter 14-148 and 14-149, and are afforded consideration under Chapter 65.

Paul J. McEachen, MA, RPA served as Principal Investigator and meets the professional qualifications standards of 36 CFR 61 set forth by the National Park Service (Appendix A). Cayla Cannon, BA served as the Geophysical Specialists with assistance from Ms. Emily Dale, MA, RPA. Ms. Cannon performed the fieldwork and post-processing of geophysical data and co-authored this report. Ms. Cannon produced the report graphics. Mr. McEachen edited and co-authored the report. Copies of this report and field data, notes, photographs, and project maps are on file at the offices of RGA in Cranbury, New Jersey.

This report includes a discussion of background research, environmental setting, GPR survey theory and methods, survey results and interpretations, and conclusions and management recommendations.

1.1 Background Research

Previous Archaeological Investigations

Archaeologist John W. Clauser Jr. examined the Elisha Battle Cemetery in 1995 and produced a plan map depicting fourteen (14) grave locations (Figure 1.4). All graves were oriented east-west and aligned in north-south rows within the cemetery fence. It is believed that Mr. Clauser performed a visual inspection for graves, and it is presumed that surface depressions were observed. It is unknown whether any probing was performed. The cemetery dates to the 18th century, and Elisha Battle, who passed away in 1799, is interred there. Elizabeth Ruth Sumner Battle, Elisha's wife (ca 1727-1794) is also believed to have been interred at the cemetery. A granite slab memorial to Mr. Battle, placed in 1935 by George Gordon Battle, is the only marker within the ca. 1930s fence.

A gravemarker dedicated to James E. McNair was erected outside the original 1930s fence following his interment in 2018. Mr. McNair was interred by Joel Boseman, who owns the Cool Spring Plantation (West-Brake 2022).

1.2 Environmental Setting

The survey area falls in the North Carolina Coastal Plain, which is characterized by flat land to gently rolling hills and valleys. Elevations range from sea level near the coast to about 600 feet above mean sea level (ASML) in the Sandhills of the southern Inner Coastal Plain. The survey area is underlain by the Yorktown and Duplin formations. The Yorktown formation is comprised of fossiliferous clay with varying amounts of fine-grained sand, bluish gray, shell material (North Carolina Geological Survey 1985). The Duplin Formation is comprised of shelly, medium to coarse-grained sand, sandy marl, and blueish gray limestone (North Carolina Geological Survey 1985). Elevation in the survey area lies at approximately 60 to 70 feet above mean sea level (U.S.G.S. 1981). The survey area occupies a stream terrace lowland topographic setting and lies approximately 800 feet north of the Tar River.

Soils in the survey area consist of Wickham sandy loam (WkB) with 0 to 4 percent slopes. Wickham sandy loam soils combine areas of Wickham and similar soils (90 percent) and minor components of other soils (approx. 5 percent). Wickham land is comprised of well-drained soils with low runoff, prime for farmland (NRCS 2022; Goodwin 1979). A typical Wickham sandy loam soil profile consists of 0-6 inches of fine sandy loam (Ap-horizon), underlain by a 6-50 inches of clay sandy loam subsoil (Bt-horizon) and 50-80 inches of loamy sand substratum (C-horizon). Minor components consist of 5 percent Roanoke, undrained. Roanoke, undrained land is comprised of depressions and backswamps on stream terraces (NRCS 2022). Parent materials are old loamy alluvium derived from igneous and metamorphic rock (NRCS 2022). Wickham series soils formed in fluvial sediments (Goodwin 1979). These well-drained, sandy loam soils provide adequate conditions for GPR survey methods with no signal attenuation.

Figure 1.1: USA Topo Map of project location in Rocky Mount, Edgecombe County, North Carolina (Copyright: 2013 National Geographic Society, I-Cubed).

Figure 1.2: Aerial image of project location and parcel (Esri, Maxar, Geoeye, Earthstar Geographics).

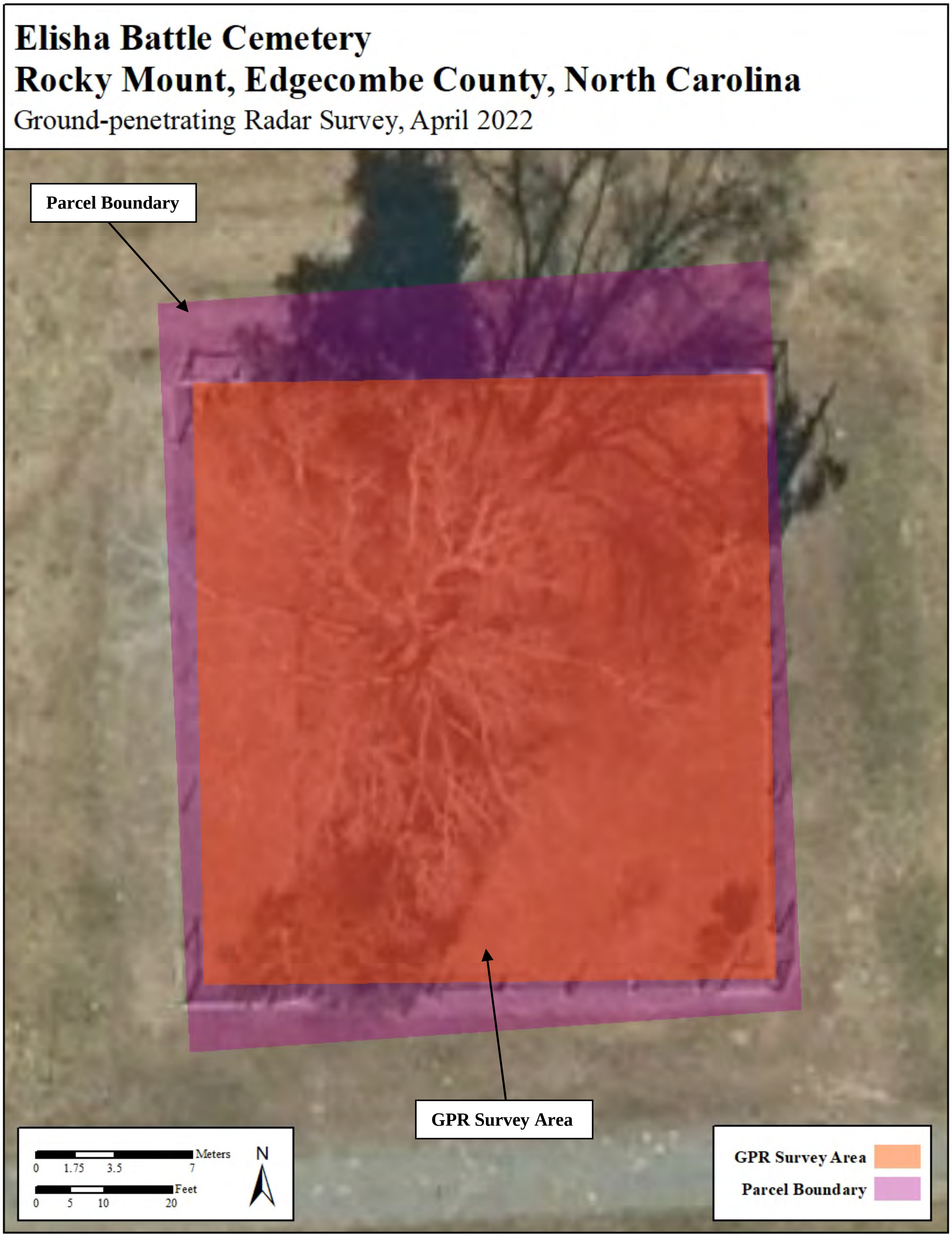

Figure 1.3: Aerial of parcel boundary and GPR survey area (Esri, Maxar, Geoeye, Earthstar Geographics).

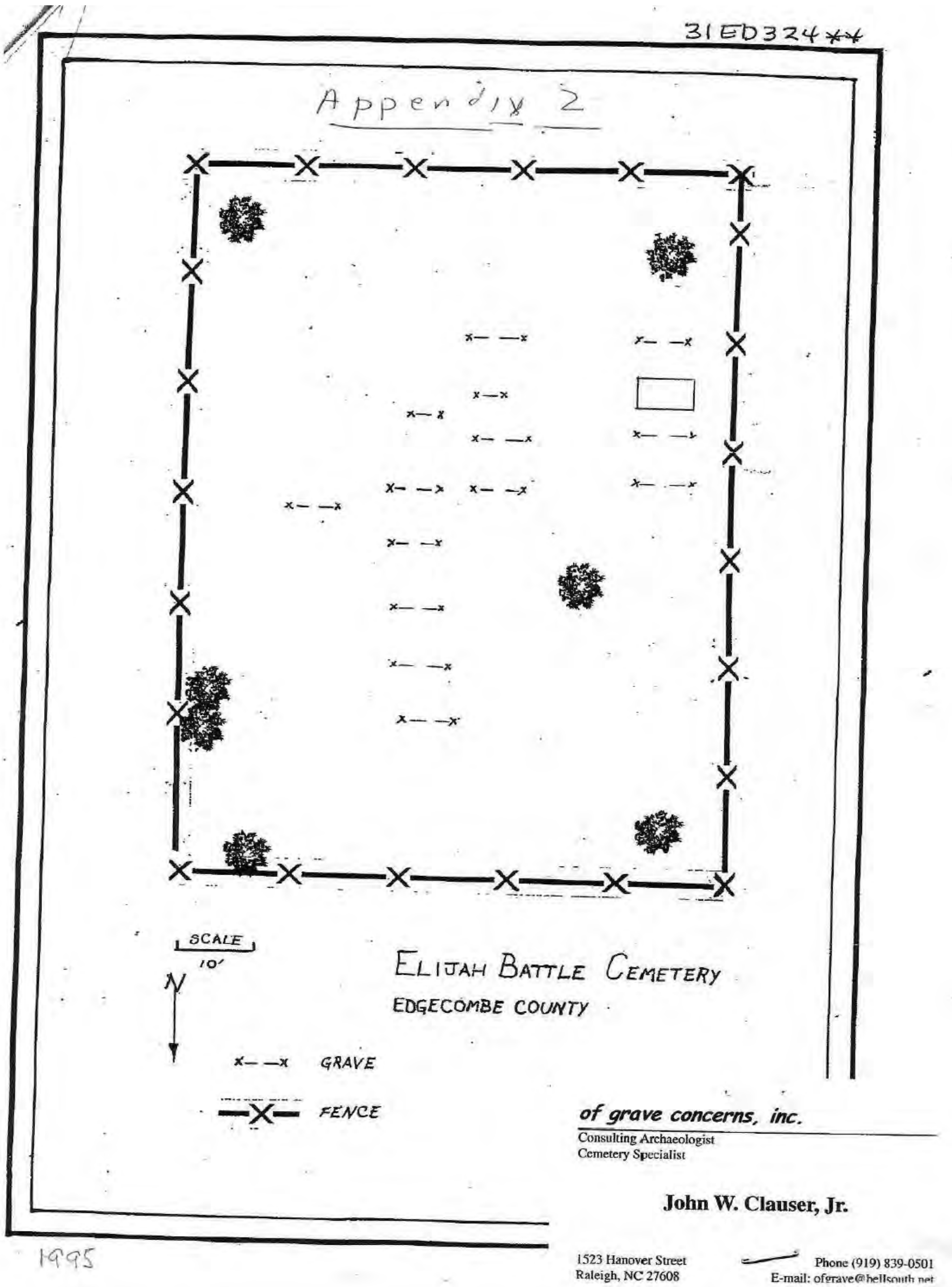

Figure 1.4: Archaeologist John W. Clauser, Jr. examined the Elisha Battle Cemetery in 1995 and produced a plan map depicting fourteen grave locations (Clauser 1995).

2.0 Ground Penetrating Radar

Ground penetrating radar has been successfully utilized on historic period archaeological sites, including cemeteries, for several decades in the eastern United States. Geophysical survey methods, including GPR, are non-invasive approaches to identifying and mapping below-surface objects and unmarked graves, and for visualizing the current topography of the ground surface in relation to these underground anomalies (Conyers 2006a). Ground penetrating radar is effective on historic cemeteries (King et al. 1993). This method of remote sensing allows a glimpse into what may lie underground and can serve as one of many bases from which archaeological excavations can be undertaken. Geophysical survey methods are also used to identify possible prehistoric earthworks and monuments, large, buried soil features (i.e., fortifications and trenches) on battlefield sites, and spatial organization of early historic settlements, trading posts, farmstead and tavern sites, among others (Cornett and Ernenwein 2020; Ewen 2019; Heckman 2005; Horsley et al. 2014; Kvamme 2003).

The results from GPR and other remote sensing methods does not usually involve the identification of specific features, but rather the data provide differences in reflections from pulsed radar energy into the ground from the GPR antenna. Identifying potential graves in historic cemeteries does not usually involve the identification of physical human remains (i.e. skeletons) (Lowry 2016), but rather the difference in reflections from pulsed radar energy into the ground from the GPR antenna (Conyers 2006b). As the pulses encounter varying sub-surface features, they are reflected back to the GPR unit in varying degrees of strength and transmission time. Thus, changes in soil compaction and chemistry may transmit a contrasting signature than the surrounding matrix. For example, when using GPR to delineate cemeteries, usually a grave shaft, casket or coffin, spaces/voids, vaults, or burial goods are detected as dissimilar from the surrounding natural strata (Lowry 2016). Transmission time is the amount of time it takes for the radar pulse to be reflected back to the receiving antenna and is interpreted as depth (i.e., the longer the transmission takes the deeper the object lies).

The shape of the reflection may also give clues to the nature of a below-surface object. A parabolic shape in the profile usually suggests a single object, while a planar reflection may indicate a flat surface such as a floor or a change in stratigraphy (Conyers 2006a).

Ground-penetrating radar units vary by antenna frequency. While soil properties, surface condition (i.e., obstacles such as trees and shrubs) and water retention may affect transmission and data resolution, in general there is a relationship between antenna frequency and resolution. Low-range frequency antennas (50-100 MHz) may penetrate as much as 15 meters below surface under certain conditions. High-range frequency antennas (800-1000 MHz) may penetrate only a meter but have extremely high resolution, and are used to locate buried utilities, for example. Medium-range frequency antennas such as the 350 or 400 MHz are typically used in archaeology and are reliable to a depth of up to 3 meters below the surface, depending on the surface conditions (Conyers 2006a). The 350 MHz HyperStacking (HS) antenna is known to reduce noise via high-speed interpolated sampling (Kruske 2020).

In comparison with other archaeological features, burials can be a challenging target for geophysical survey methods. In some cases, the burials may provide too little contrast to permit detection. Human remains (i.e. bones) are likely to evade detection due to their limited size. Potential graves are identified by prospection methods when disruptions appear in the natural stratigraphy of the soil. Air filled cavities or less-compact soils are examples of such disruptions. Since contrast in soils is reduced over time, older burials may be very difficult, if not impossible, to identify (Horsley 2014).

It is important to note that, "The results and subsequent interpretations of geophysical surveys should not be treated as an absolute representation of the underlying features. It is normally only possible to prove the nature of anomalies through intrusive means, such as trial excavations" (Horsley 2014:10). Therefore, geophysical anomalies must be subjected to ground-truthing methods to determine whether they represent cultural features or other subsurface manifestations (Hargrave 2006; Ewen 2016). A recent literature review indicates that there has been a general lack of ground truthing to test geophysical anomalies (WSP, Inc. and New South Associates, Inc. 2018).

Ground-penetrating radar surveys in the Coastal Plain are successful and a commonly utilized method for archaeological purposes (Chadwick and LaVigne 2019). Limitations include survey in urban areas where buried and overhead utilities can produce too much "noise" to effectively identify archaeological features. Moist or water-logged clay can impede GPR penetration or survey results (Kvamme 2003). Other limiting factors include natural anomalies such as iron deposits, soil composition and burn episodes, and wooded areas or large trees with extensive root systems that could trigger false positives (Chadwick and LaVigne 2019: 104).

2.1 GPR Theory and Application

The antenna of a GPR transmits an electromagnetic wave that operates in the microwave range of frequencies, into the ground. The frequency of an antenna, such as the 350 MHz used in this survey, represents the center frequency of the antenna while the actual transmission is made up of a wide range of frequencies ranging from 100 MHz to 800 MHz (Balanis 1997). This wave of energy is emitted from a transmitter in the shape of a cone and reflects off sediment, rock, or buried materials and back to a receiver in the antenna. The reflected waves continually bounce between the subsurface and the receiver at the speed of light until the energy has dissipated due to a loss of heat and energy (Balanis 1997). As a result, the GPR antenna gathers a log of positive and negative amplitude reflections measured in deciBels (dB) as well as a measurement of time nanoseconds (ns). Across a GPR transect, each individual line scan is divided into 512 or 1024 samples, depending on the unit's settings, displaying the change in the amplitude of a reflection as depth, or time, increases (Evans 2003). These changes in amplitude of reflection and the changing speed of the radar wave as it moves through the subsurface are due to changes in the dielectric constant of the materials or sediments of the subsurface. For instance, radar waves travel fastest through air, which has a dielectric constant of 1, and slowest through water, which has a dielectric constant of 81. Soils generally range from 10 to 40 in terms of dielectric constant given changes in clay, silt, and sand content as well as conductivity and moisture content (Daniels 2004). Given this knowledge, GPR application and data interpretation relies on identifying strong reflective anomalies and hyperbolas during a survey. These black-white-black (negative-positive-negative amplitude reflections) and white-black-white (positive-negative-positive amplitude reflections) series of reflective bands represent significant changes in the dielectric constant of materials and potential anomalies or targets such as utilities, storage tanks, buried features, structures, or graves.

2.2 Methodology

Prior to fieldwork, background research and planning were performed to determine the best practices for the GPR survey. Based on aerial imagery and photos of the site, it was determined that only one survey grid would be needed to navigate around impediments, such as fences, trees, and other landscape features. Debris was cleared from the area prior to survey. Once in the field, one grid (Figure 2.1) was set up over the survey area with measuring tapes, plastic stakes, pin flags, and spray paint. Transects were collected in a bidirectional pattern from south-north at 0.25-meter line spacing to optimize coverage (Leach 2021: Figure 4-10). Grid lines were adjusted in the field to avoid trees, fences, and other surface impediments (Figure 2.2). Large, exposed roots and surface materials challenged data collection and created unintended anomalies in the radar data which were removed or diminished, when possible, in post-processing. The survey grid was expanded to the west inside the 2000s era fence to increase coverage.

Ground-penetrating radar data was collected using a Geophysical Survey Systems, Inc. (GSSI) SIR 4000 control unit with a 350 MHz digital HyperStacking (HS) antenna (transmitter and receiver) mounted on a three-wheeled cart with a survey wheel for distance calibration or single survey wheel. Grid corners and grave markers were mapped and recorded with a Trimble Geo 7X Handheld Receiver w/Terrasync Pro – Decimeter with sub-meter accuracy, along with measuring tapes, plastic stakes and pin flags, and spray paint.

A series of 100 GPR transects was collected in one grid at a 0.25-meter interval. The grid was laid out to cover the cemetery and maneuver around impediments. Grid 1 was 25 meters by 26 meters with 100 transects (Figure 2.3). Starting in the southeast (SW) corner, all transects were collected south to north in the Y-direction. Following the fieldwork, the GPR data was copied onto a GSSI SIR 4000 flash drive, processed using GPR-SLICE v7.MT imaging software, assembled with ArchaeoFusion, and mapped in ArcMap v10.8.1.

Using GPR-SLICE, the GPR data was appended into a 2D batch of files. File information was then created and edited based on collection parameters set in the field. The manufacturers' data was converted to GPR-SLICE format and dc-drift and wobble noise were removed from the converted radargrams. Transects were reversed and navigation was set to artificial markers since the survey wheel was employed. A time-zero adjustment was performed to remove the direct wave and some horizontal banding associated with the surface conditions. A vertical high pass/low pass filter was performed to remove horizontal banding and reduce graininess in the reflection profiles or radargrams. A background removal filter was then applied to further remove banding associated with surface conditions. A range gain was applied to the radargrams to compensate the signal attenuation, amplifying the appearance of the hyperbolic anomalies, and reducing contrast near the surface and bottom on the profiles outside the area of focus. Hyperbola matching was performed to calculate velocity and identify the true dielectric constant, increasing the accuracy of depth. Grids were processed separately. After filtering, the data was interpolated to create time slice grids which are downloaded as surfer files (GPR-SLICE User's Manual v7.MT 2019).

Surfer files from the GPR grid was then imported into ArchaeoFusion which filters and integrates multiple geophysical datasets collected at an archeological site or cemetery. After the grid was imported, a standardize function was performed to smooth out edges (ArchaeoFusion User Manual v1.0 2011). The grid was then exported as GeoTiffs to be displayed and viewed in ArcMap.

The results of the GPR survey are best viewed in selected radargram profiles associated with transects and in an interpolated 3D grid of all transects which displays time slices or depth. While viewing the radargrams, it became clear that the strongest positive and negative reflections appear roughly 30 to 120 centimeters (0.30 to 1.20 meters) below surface. A time variable range gain was applied to amplify these areas of interest and minimize contrast near the surface and bottom of the radargram profiles. A variety of color palates and transformations were used to display the anomalies identified.

It is possible that not all potential burial anomalies were detected. Due to surface conditions (roots) and environmental variables (i.e., electrical conductivity of the ground, contrast of electrical properties of the target and surrounding soil, and dense surface materials), a certain number of anomalies may exist that could not be defined. It is possible that identified anomalies could also represent false positives, which means that they appear to be consistent with known signatures but are not archaeologically significant (Lowry 2016). Conclusive identification requires ground truthing (i.e. excavation).

Figure 2.1: Aerial image of GPR survey grid and survey area (Esri, Maxar, Geoeye, Earthstar Geographics).

Figure 2.2: Trees and landscape features impede the survey area. In the center of the GPR grid lies a large, oak tree whose roots expand across the entire cemetery.

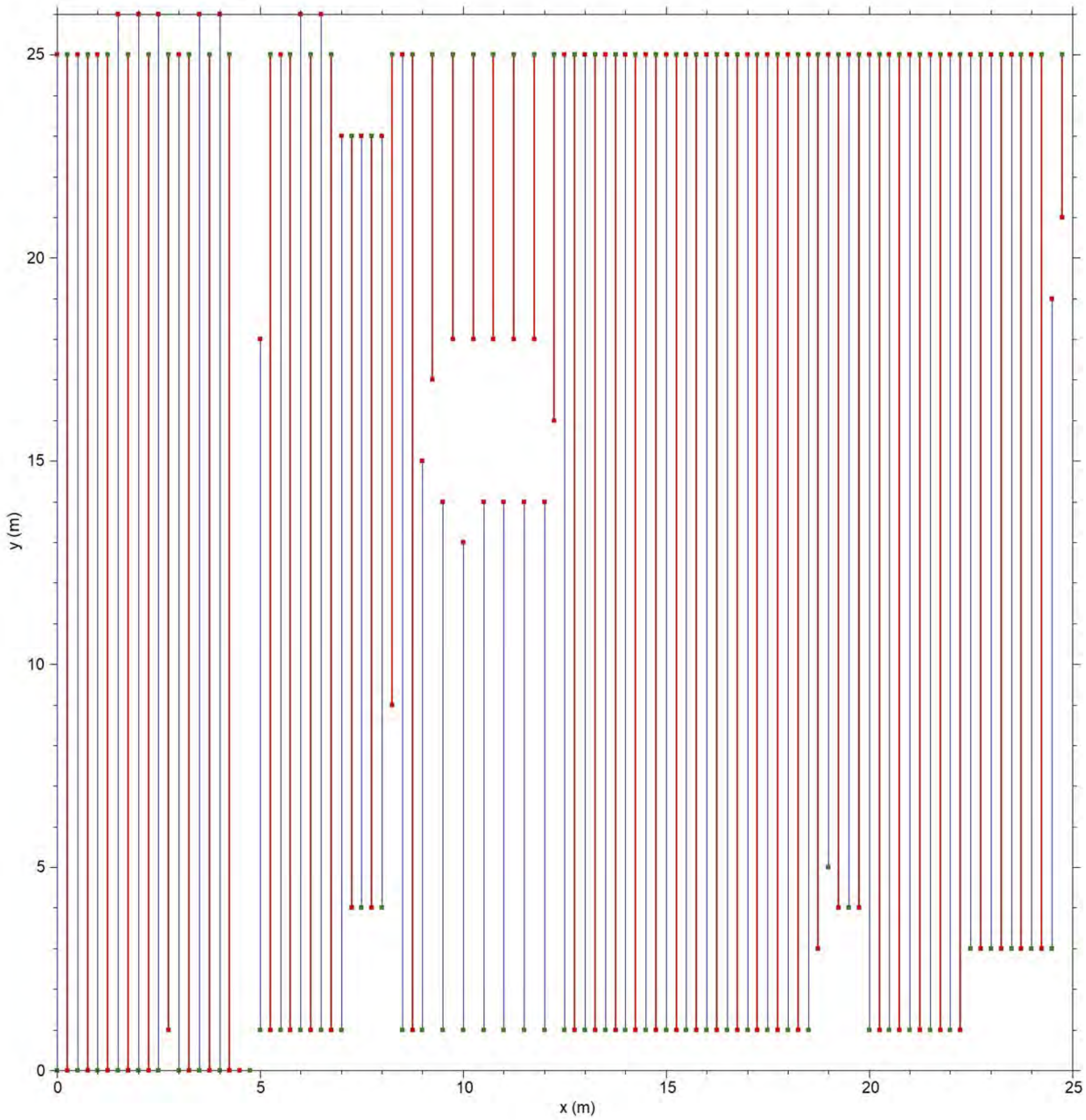

Figure 2.3: Grid 1 was 25 x 26 meters in length and collected bi-directionally at 0.25 meter spacing with 100 transects.

3.0 Survey Results and Interpretations

The GPR survey was performed on April 19, 2022, by Geophysical Specialist Cayla Cannon, BA, with assistance from Emily Dale, MA, RPA (Plate 3.1). The weather was cool with high winds and temperatures in the low 50s. The goal of this work was to identify potential unmarked burial anomalies within the limits of the Elisha Battle Cemetery. The data and interpretations presented herein were based on the conditions at the survey area at the time of survey.

The survey area contained limited surface features and impediments, including fencing, trees and ornamental landscape features. Manicured grass and roots covered the ground surface. Survey transects were performed as close to surface features and impediments as possible with some obstacles and areas being avoided. Topography within the survey area was relatively flat. Agricultural fields surround the cemetery to the west, north, and east. A dirt road lies to the south. The cemetery is enclosed by two fence lines: one erected in the early 1930s (Eatman 2001), the other erected in the 2000s. The earlier fence surrounds what is believed to be the original cemetery. The 2000s fence was built recently (i.e. post-2000) to include the 2018 burial of James. E. McNair outside the cemeteries' western fence. The recent fence was erected due to damage to the older fence from agricultural equipment (George Gordon Battle Cemetery Trust 2022). Overview photographs of the survey area and grids are presented in Plates 3.2 through 3.4.

The GPR survey identified seven (7) potential anomalies through post-processing (Figure 3.1). All seven (7) anomalies were identified as Possible Burial Anomalies and are in line with previous investigation at the cemetery. In addition, a burial anomaly associated with James E. McNair was identified in the northwest corner of the survey area. A high density of root anomalies can be seen stretching out across the cemetery, making it difficult to observe potential underlying anomalies. No unmarked burial anomalies were identified outside the original cemetery fence. High amplitude reflections associated with possible burial anomalies are depicted.

Figure 3.1 is a plan view time slice map showing seven (7) potential burial anomalies identified through post processing of collected field data. All seven (7) were identified as Possible Burial Anomalies (<50%) and are associated with weak hyperbolic reflections seen in at least two consecutive radargrams/transects (Figures 3.2 and 3.3). These Possible Unmarked Burials lie within a depth range of 80 to 120 centimeters (0.8 to 1.2 meters) below surface, a common depth for historic burials. No Probable Burial Anomalies (>50%) were identified in the GPR data. This can be due to a few factors. Tree roots produce a similar radar signature to burials. Although root anomalies are generally more shallow and smaller than burial anomalies, the oak tree in the middle of the cemetery produced large, burial sized anomalies (Figure 3.4). This is likely due to its age and size. Expanding out from the tree, the roots covered almost all the fenced in area, producing strong reflections (Figure 3.5). These strong reflections can cloud the radar data making it difficult to observe potential underlying anomalies. More burial anomalies could be present but are currently being overshadowed by the large oak tree roots.

The following observations are presented regarding the survey results at Elisha Battle Cemetery. The burials could be producing almost identical signatures to the tree roots, making it difficult to discern which are roots and which are burials (Figure 3.6). It is also possible that due to age (200+ years), the burials could exhibit reduced preservation and therefore were not detected. These factors were taken into consideration when identifying the Possible Burial Anomalies.

The potential burial anomalies lie in a series of three (3) haphazard parallel rows running south to north, meaning their headstones would have been facing east to west. This is a common cemetery arrangement (Conyers 2006b), although some cemeteries contain different orientations (Leach 2021). These rows are in line with the previous archaeological investigations conducted by Clauser in 1995 (Figure 3.7). During his visual inspection, Clauser (1995) observed fourteen (14) grave locations. At the time no gravemarkers were present and it is unknown whether any probing was performed.

The results of this survey indicate a depth range from 30 to 120 centimeters (0.30 to 1.20 meters) below surface where potential anomalies were identified. Data used to make the above interpretation was extracted from time slice maps that are available for review in Figures 3.8 through 3.22.

Plate 3.1: GPR operated by Geophysical Specialist Cayla Cannon;
Photo view: South; Photographer: Emily Dale; Date: April 19, 2022.

Plate 3.2: Overview of Elisha Battle Cemetery;
Photo view: North; Photographer: Cayla Cannon; Date: April 19, 2022.

Plate 3.3: Elisha Battle Memorial erected in 1935 by George Gordon Battle;
Photo view: East; Photographer: Cayla Cannon; Date: April 19, 2022

Plate 3.4 "Lee-Lee" James E. McNair Apr. 2, 1966 – Mar. 1, 2018;
Photo View: East; Photographer: Emily Dale; Date: April 19, 2022.

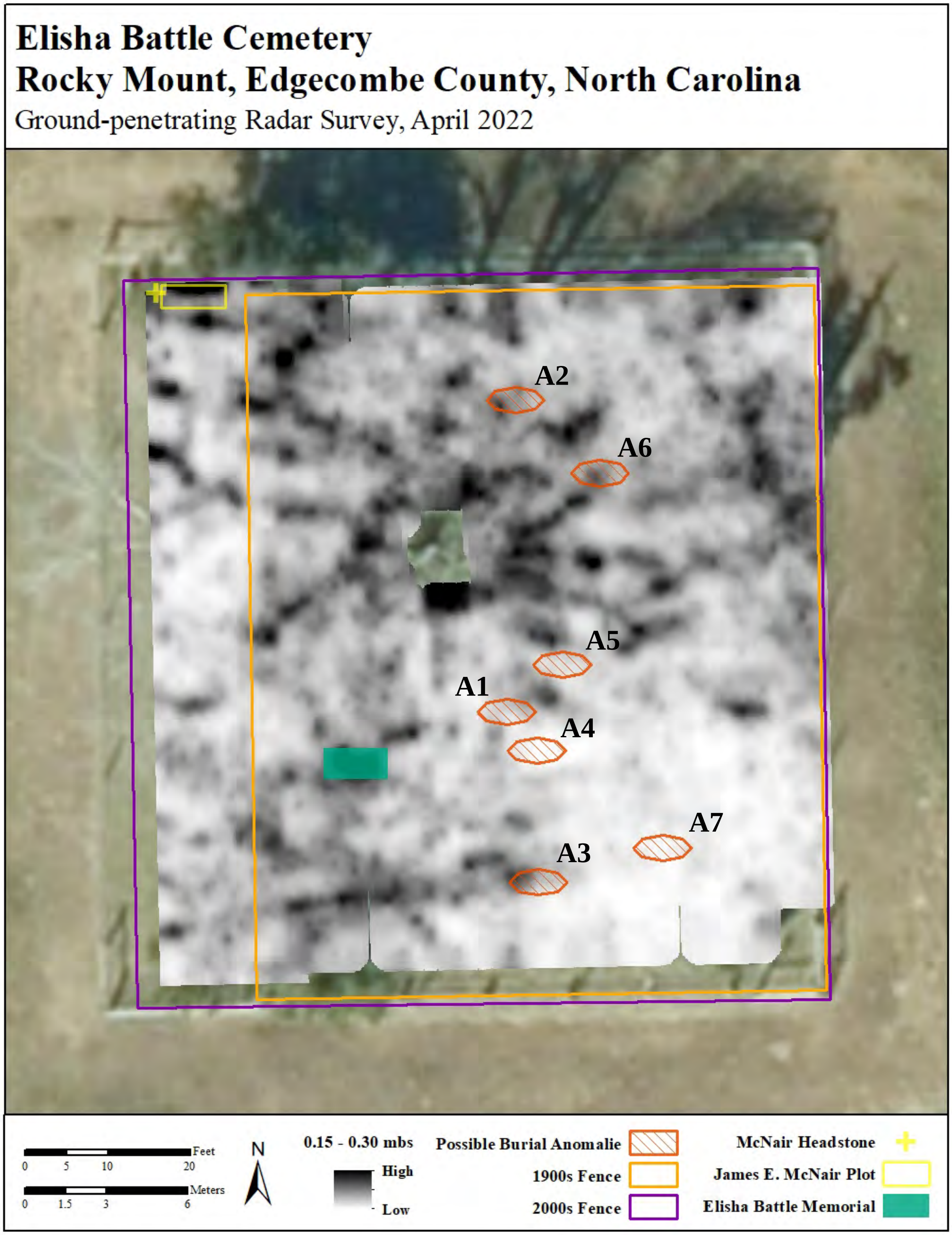

Figure 3.1: A plan view time slice map showing all anomalies in association with one another at different depths.

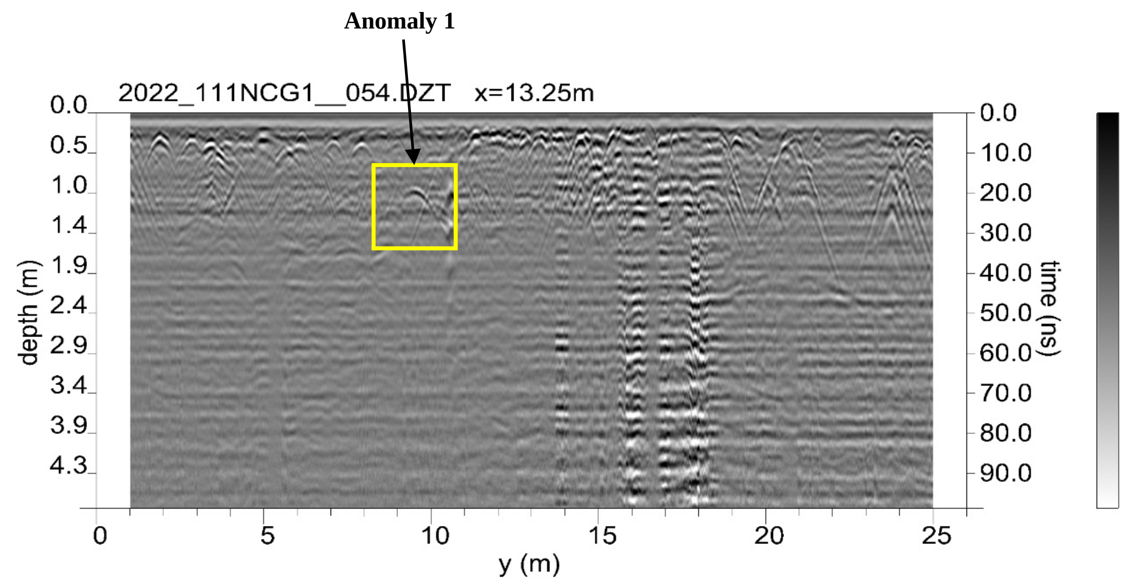

Figure 3.2: Radargram L054 shows a weak hyperbolic reflection of a potential burial anomaly. Anomaly 1 is shown in the yellow box.

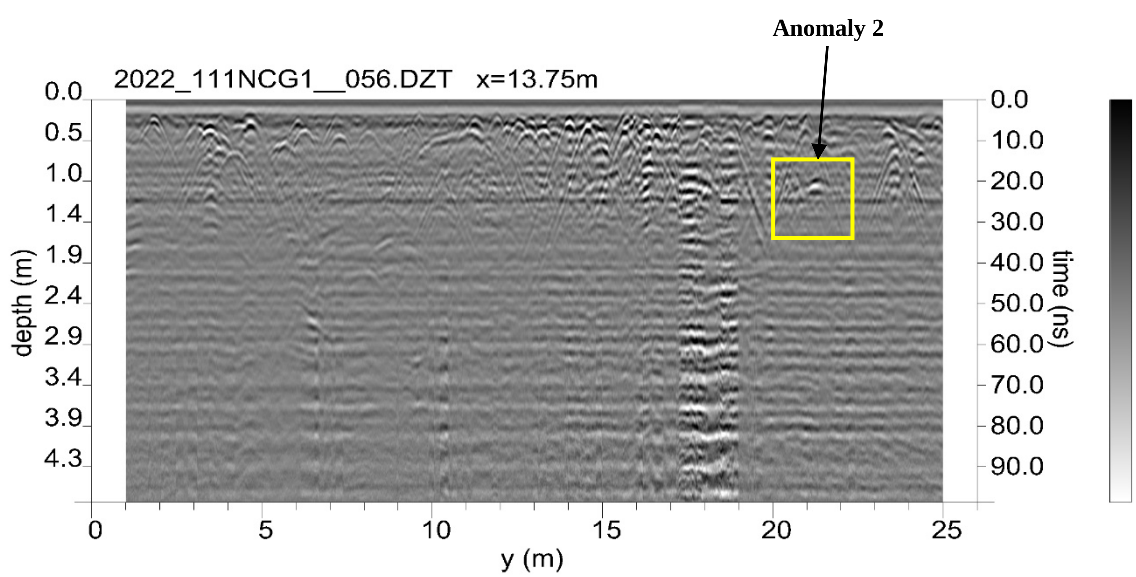

Figure 3.3: Radargram L056 shows a weak hyperbolic reflection of a potential burial anomaly. Anomaly 2 is shown in the yellow box.

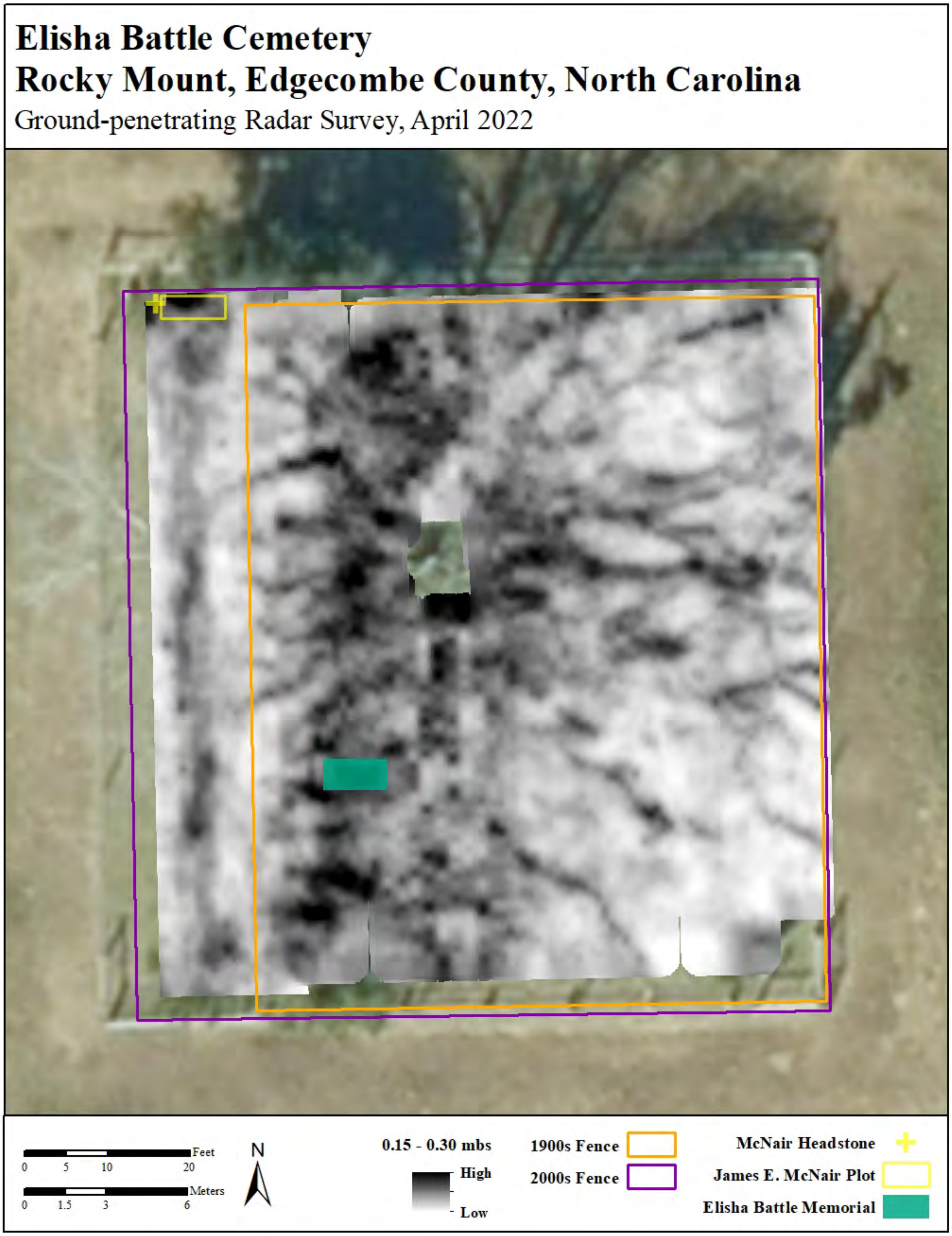

Figure 3.4: GPR survey grids with large tree roots stretching across the cemetery.

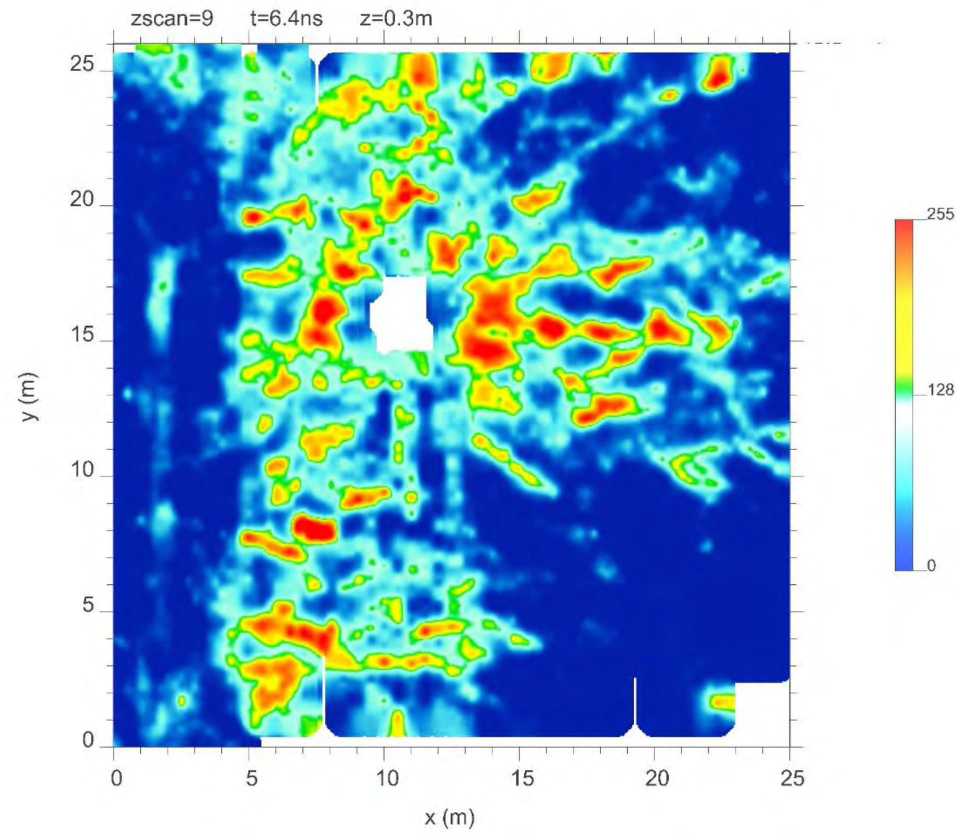

Figure 3.5: Plan view time slice map of large oak tree roots at 0.3 meters below surface. The size and expanse of these roots can overshadow potential burial anomalies.

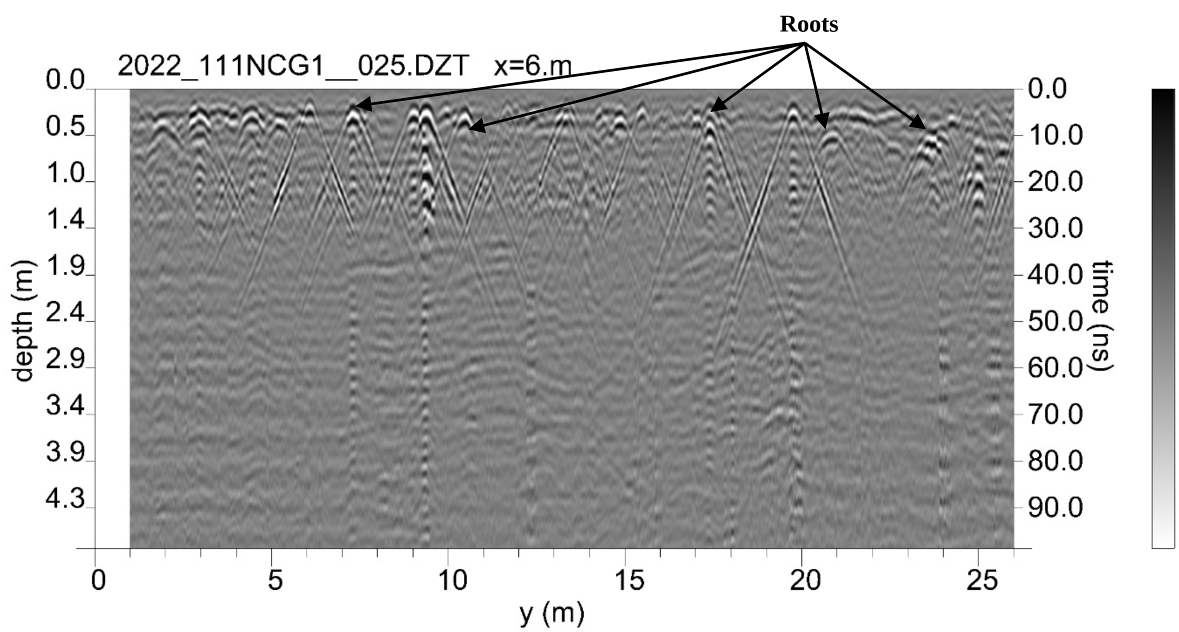

Figure 3.6: Radargram L025 shows strong hyperbolic reflections of roots in Grid 1. Roots and burials have similar radar signatures making it hard to differentiate one from the other.

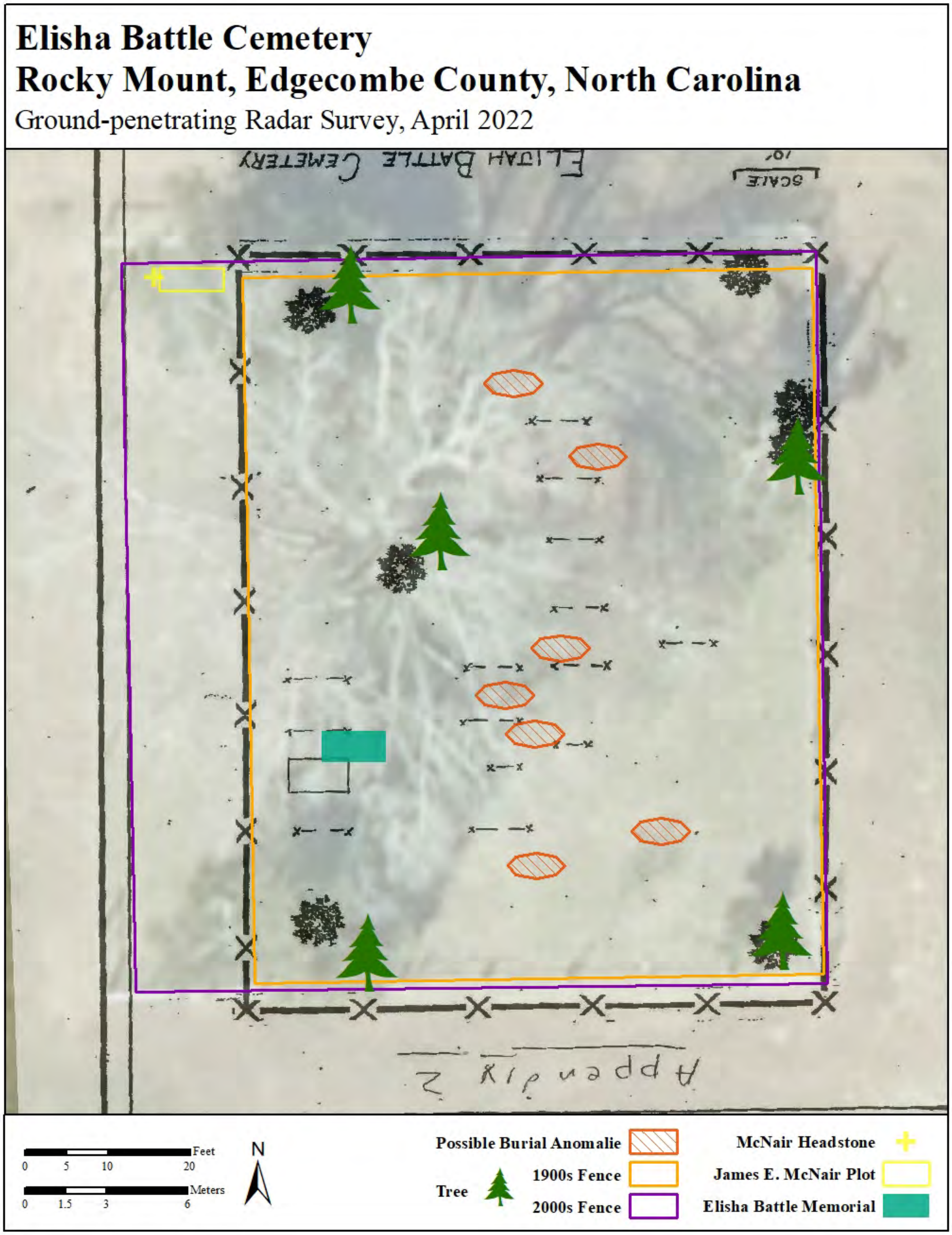

Figure 3.7: Georeferenced 1995 cemetery map with GPR survey results (Clauser 1995). Scaling between the two data sets do not entirely lineup but appear to convey a similar burial orientation.

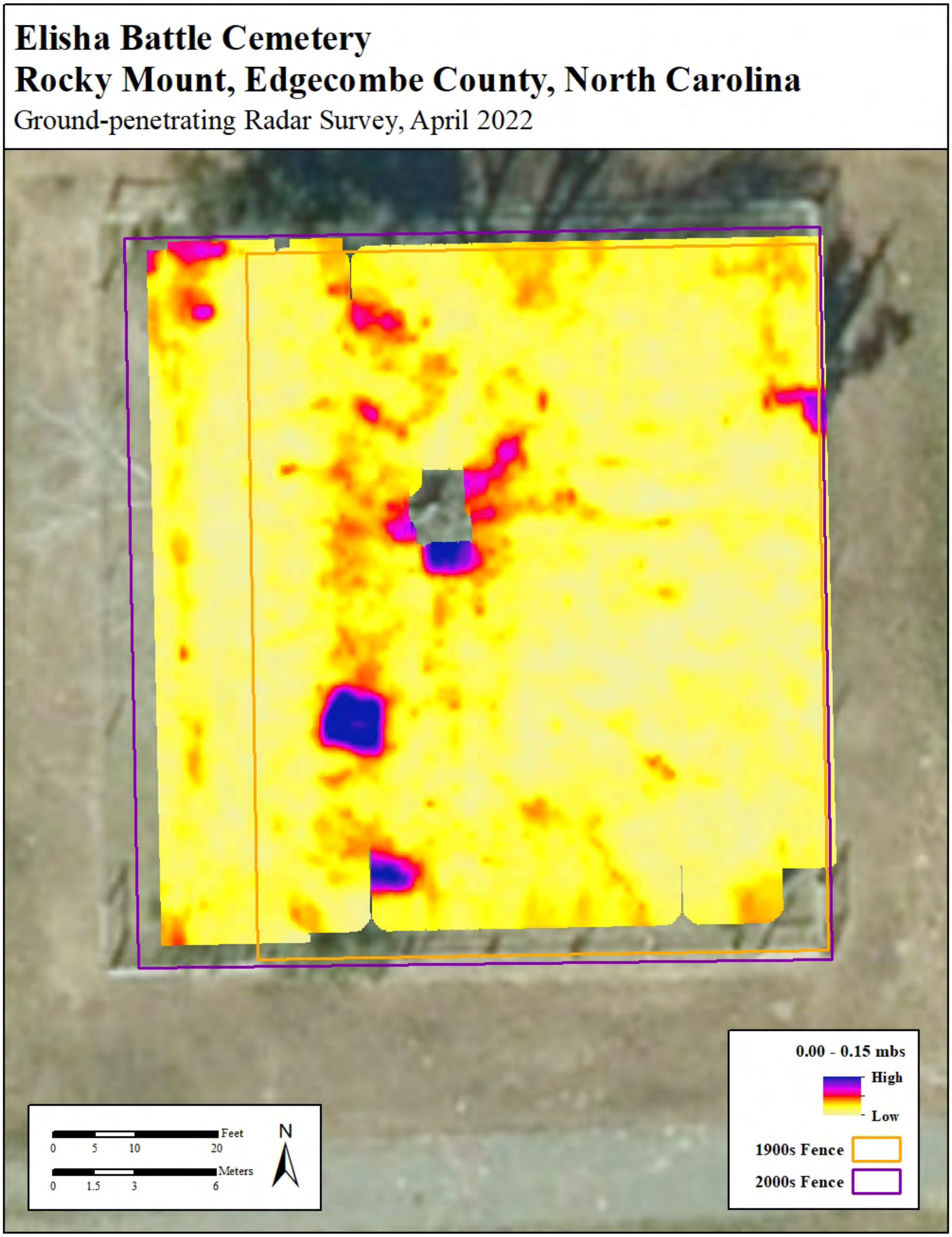

Figure 3.8: GPR survey grids at approximately 0.00-0.15 meters below surface.

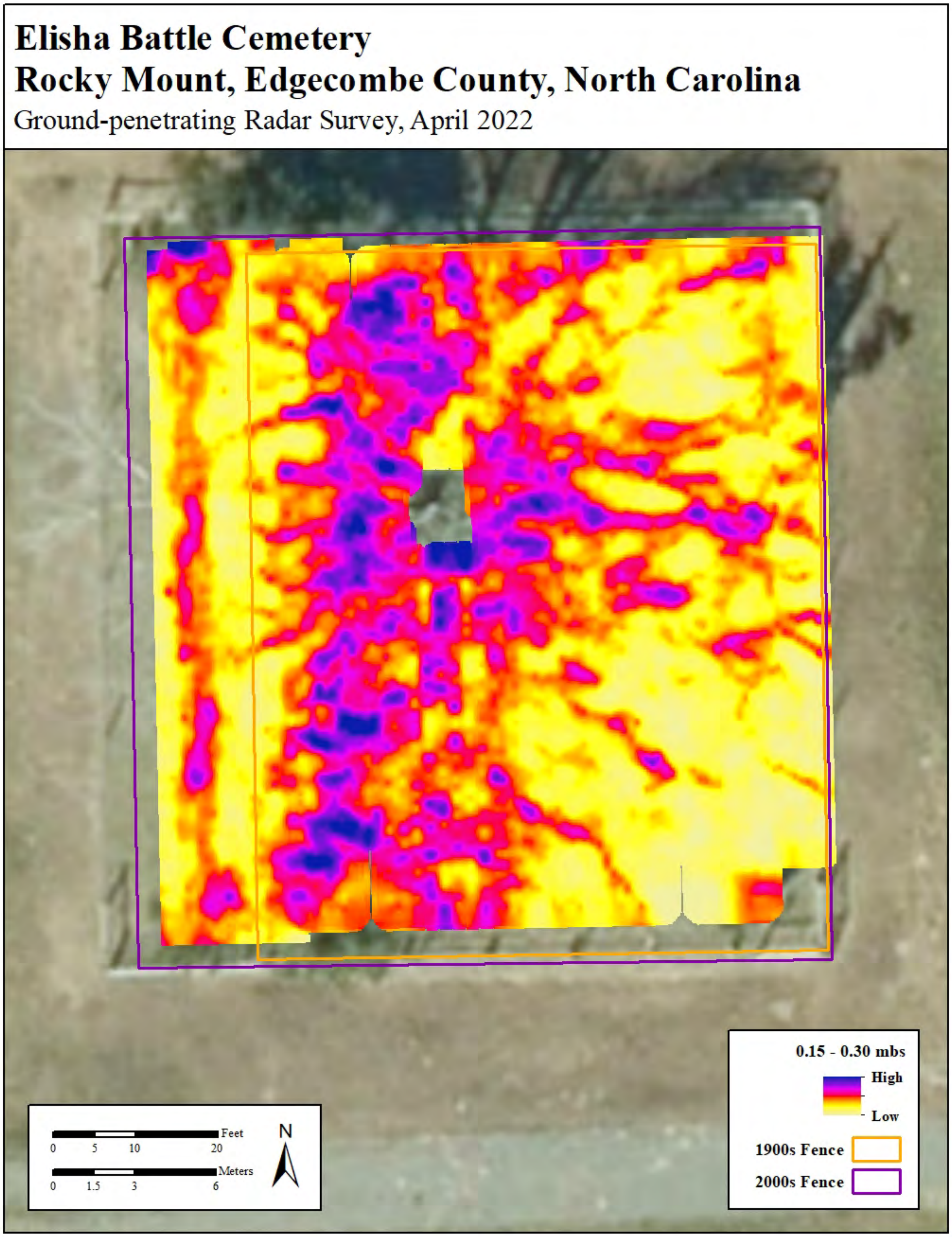

Figure 3.9: GPR survey grids at approximately 0.15-0.30 meters below surface.

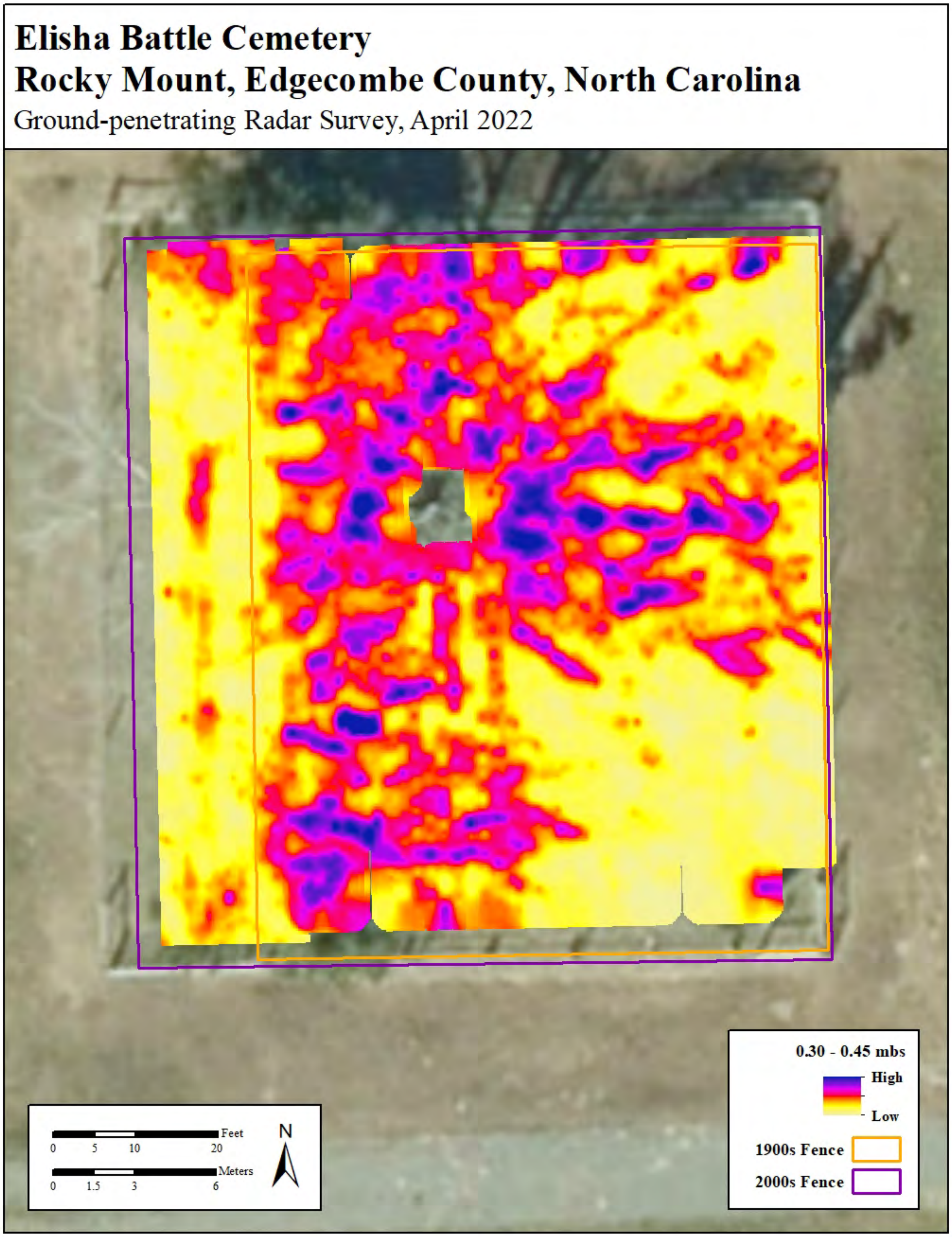

Figure 3.10: GPR survey grids at approximately 0.30-0.45 meters below surface.

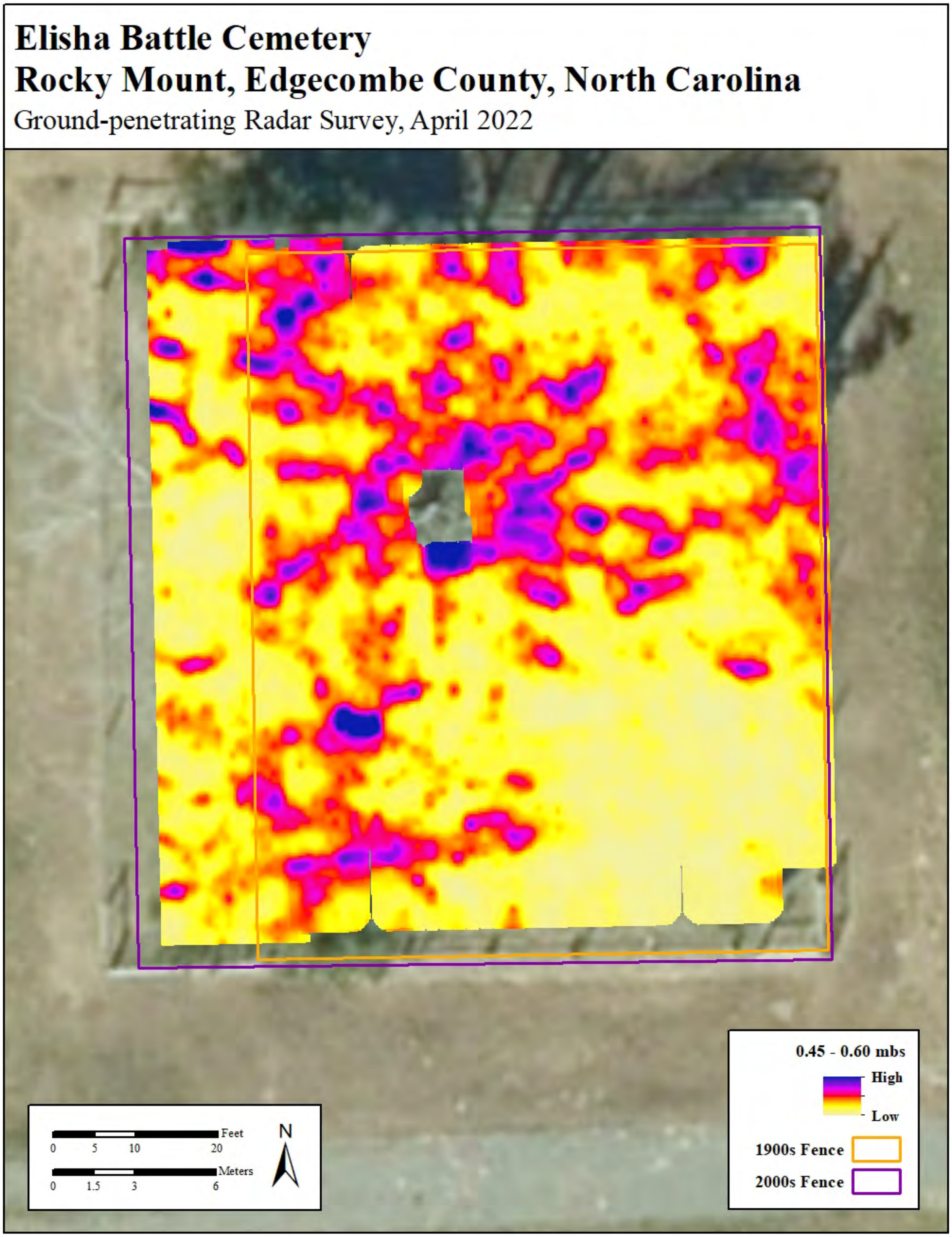

Figure 3.11: GPR survey grids at approximately 0.45-0.60 meters below surface.

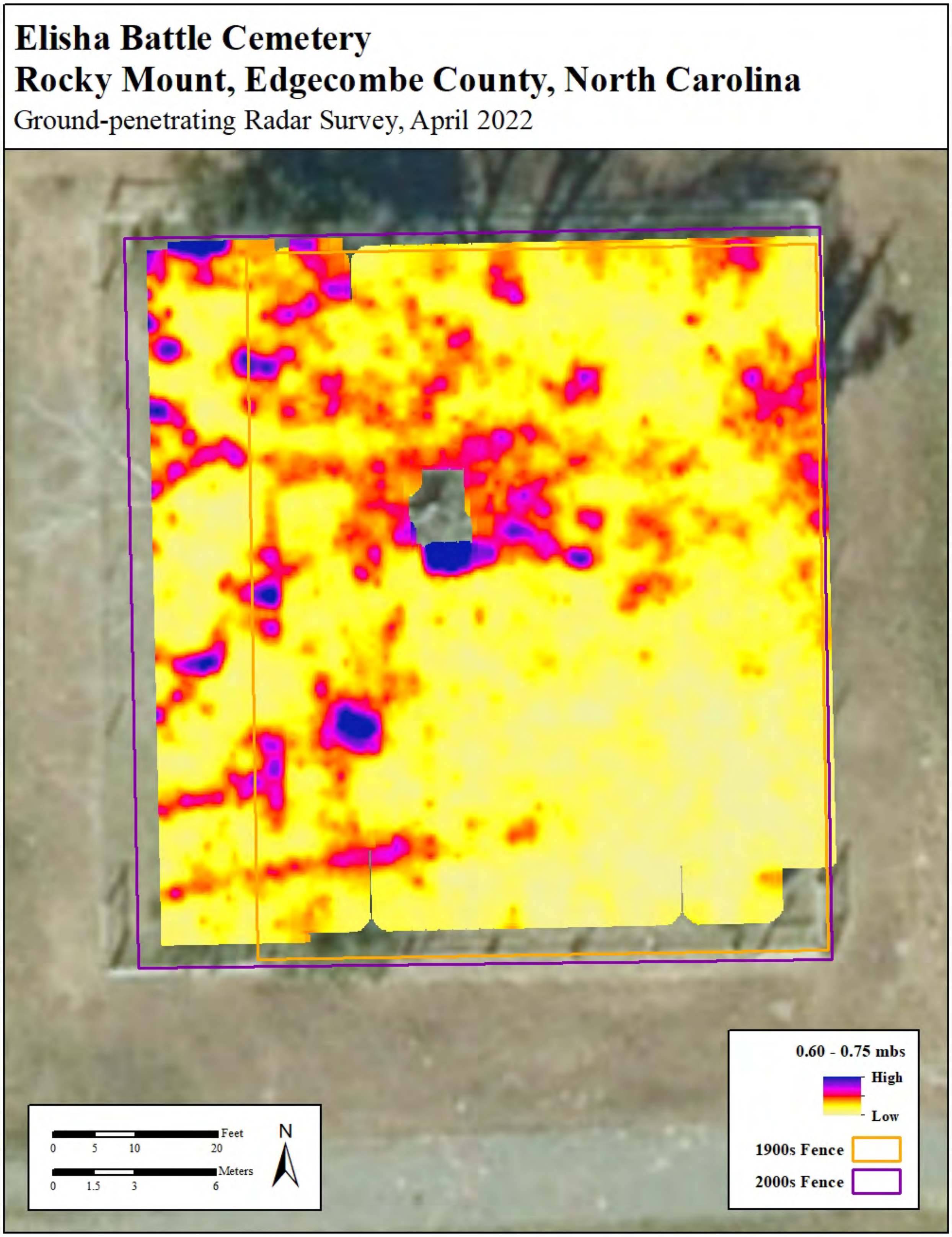

Figure 3.12: GPR survey grids at approximately 0.60-0.75 meters below surface.

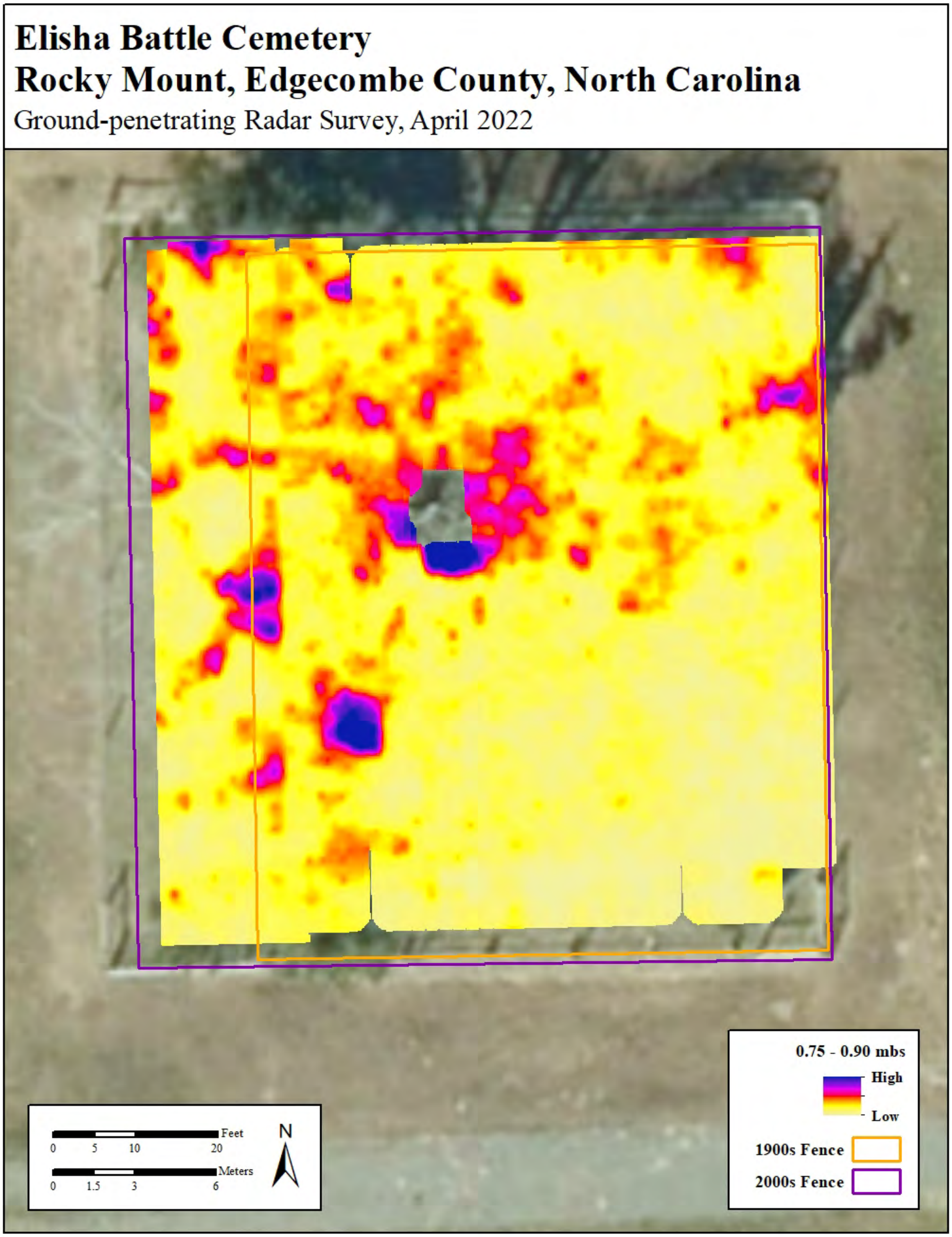

Figure 3.13: GPR survey grids at approximately 0.75-0.90 meters below surface.

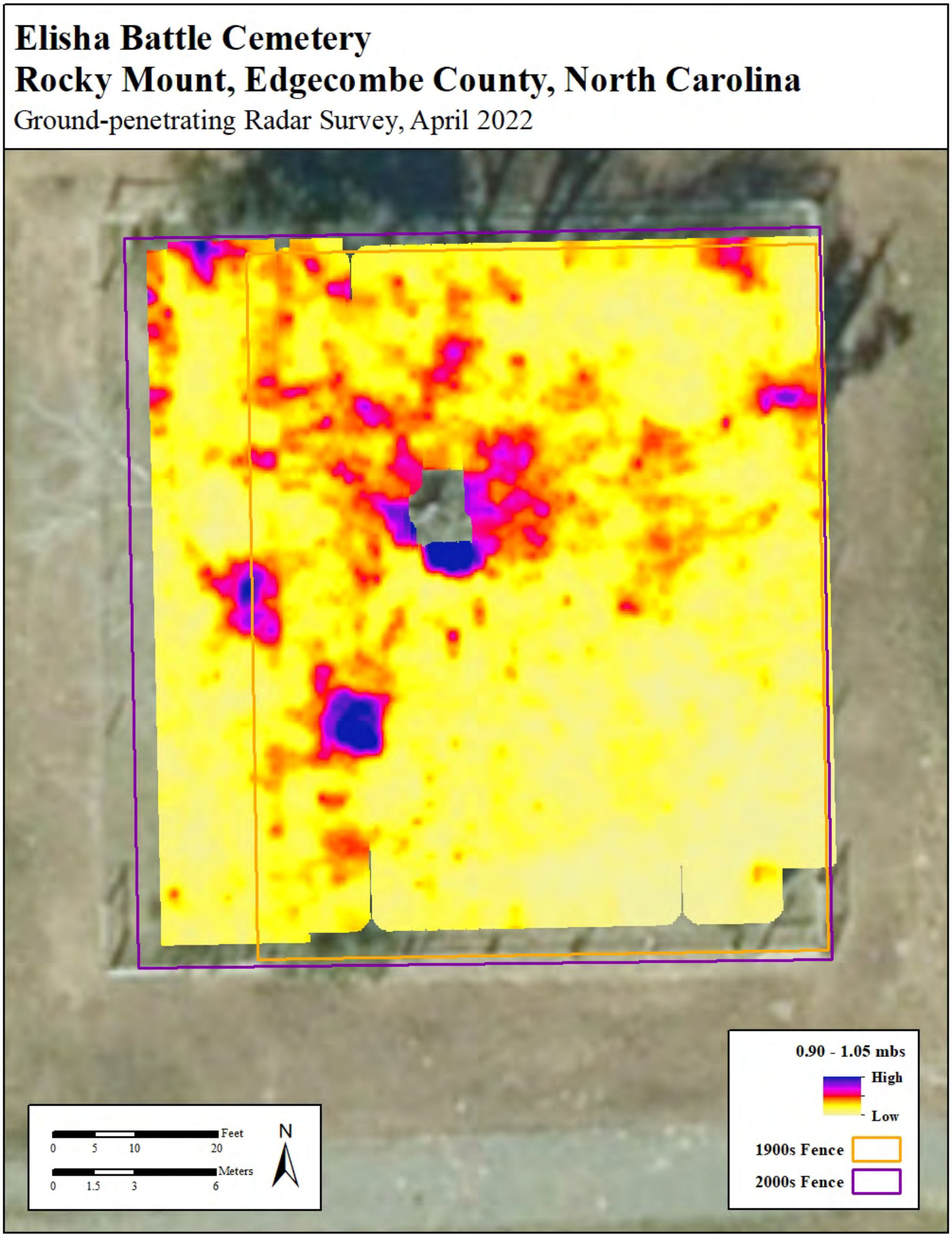

Figure 3.14: GPR survey grids at approximately 0.90-1.05 meters below surface.

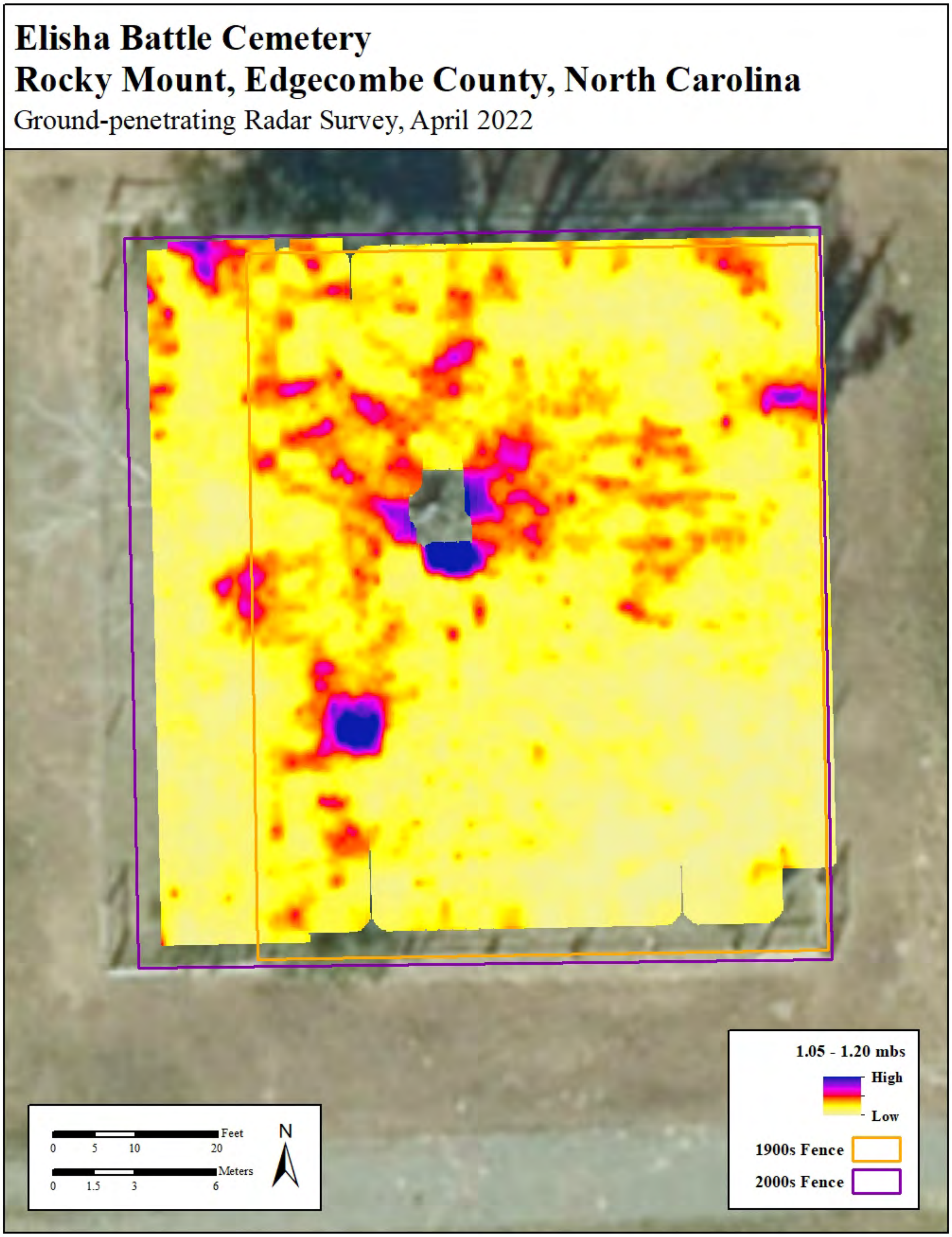

Figure 3.15: GPR survey grids at approximately 1.05-1.20 meters below surface.

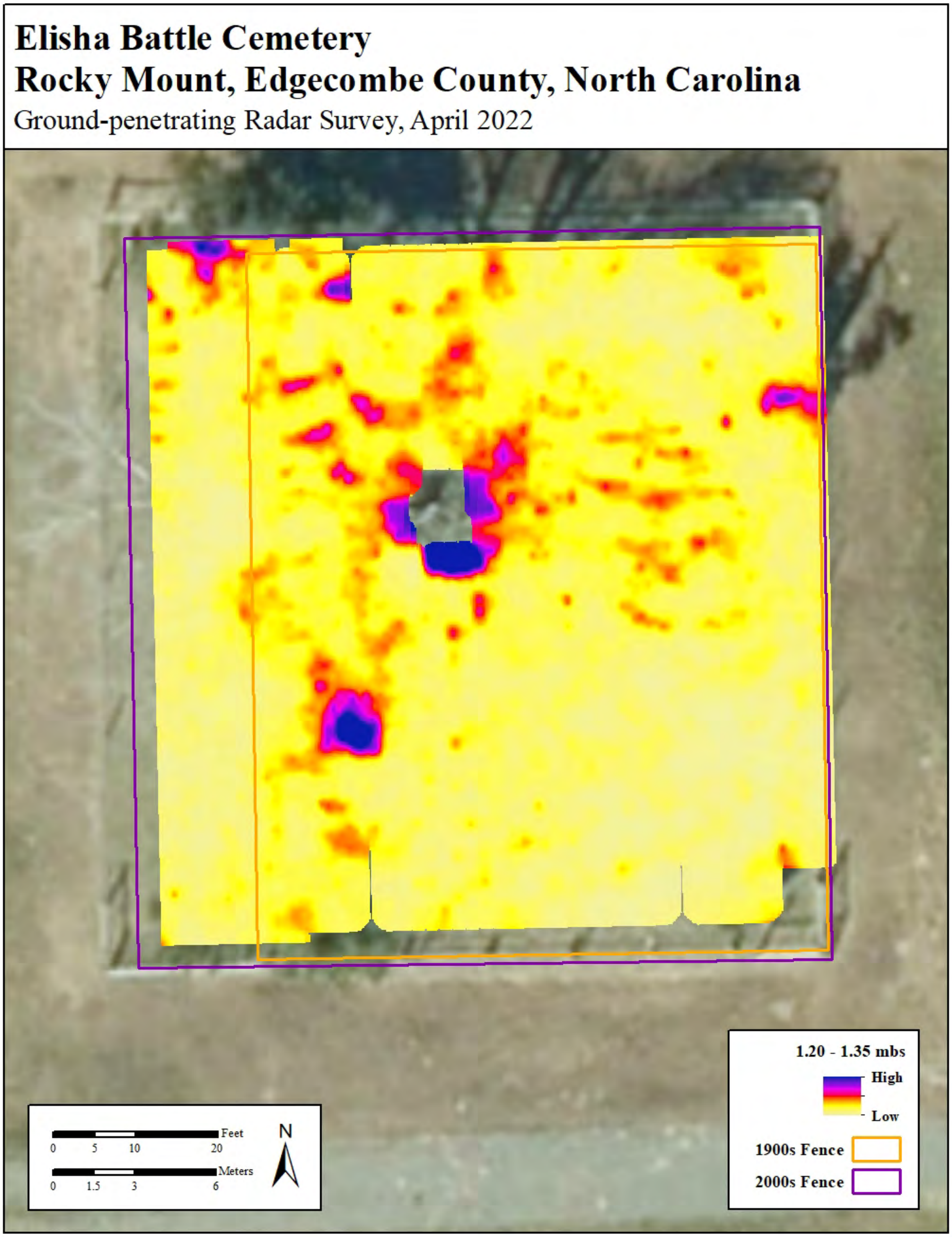

Figure 3.16: GPR survey grids at approximately 1.20-1.35 meters below surface.

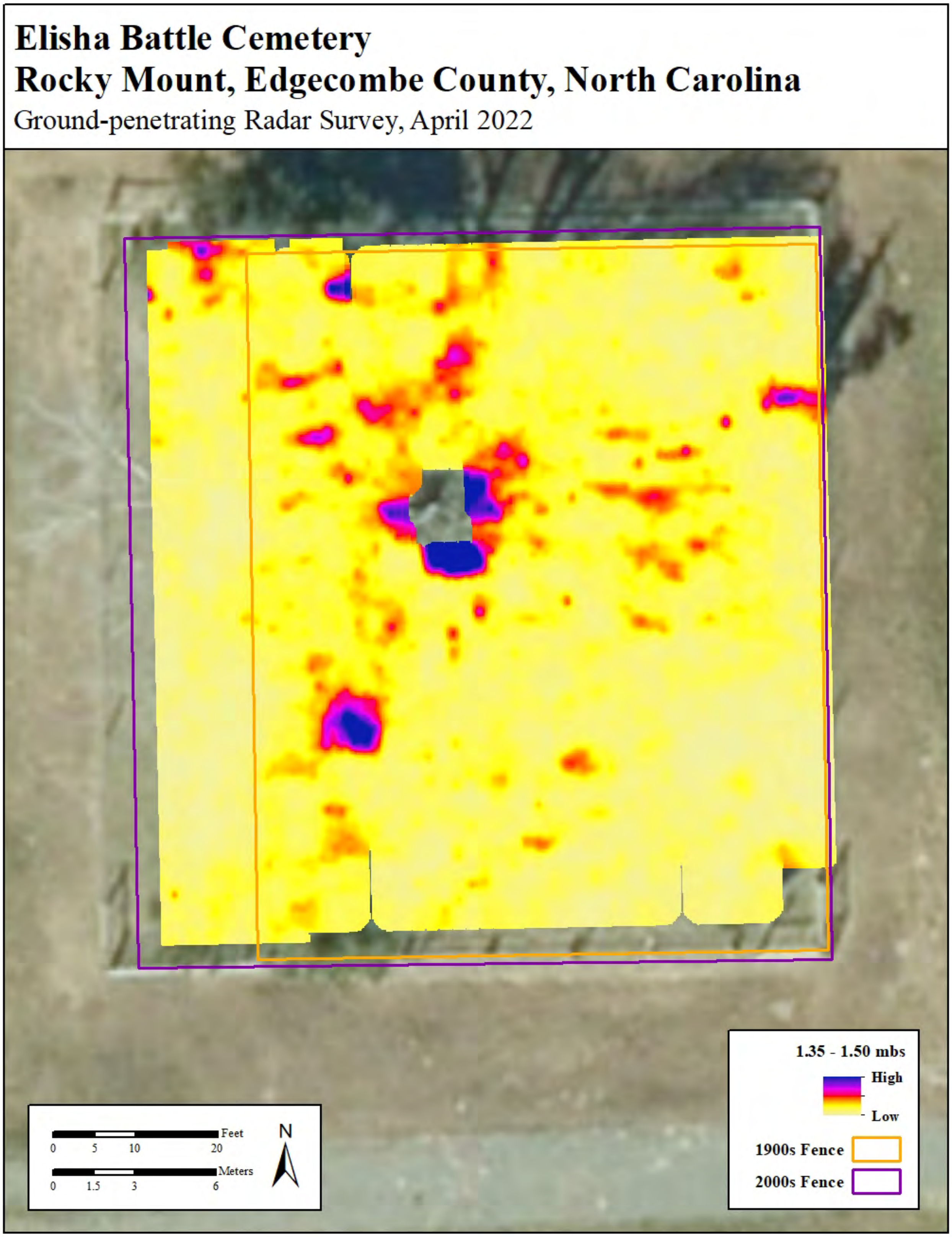

Figure 3.17: GPR survey grids at approximately 1.35-1.50 meters below surface.

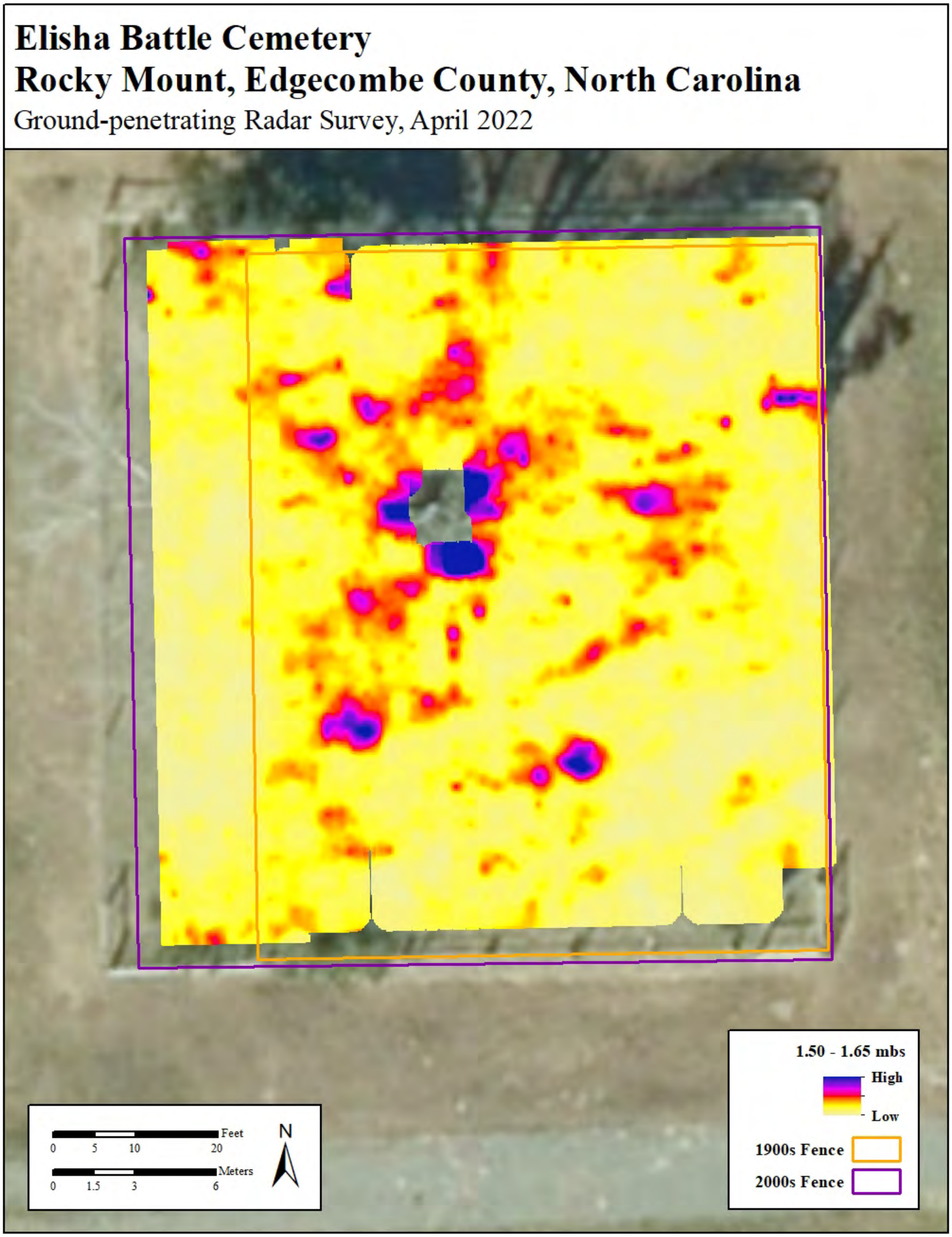

Figure 3.18: GPR survey grids at approximately 1.50-1.65 meters below surface.

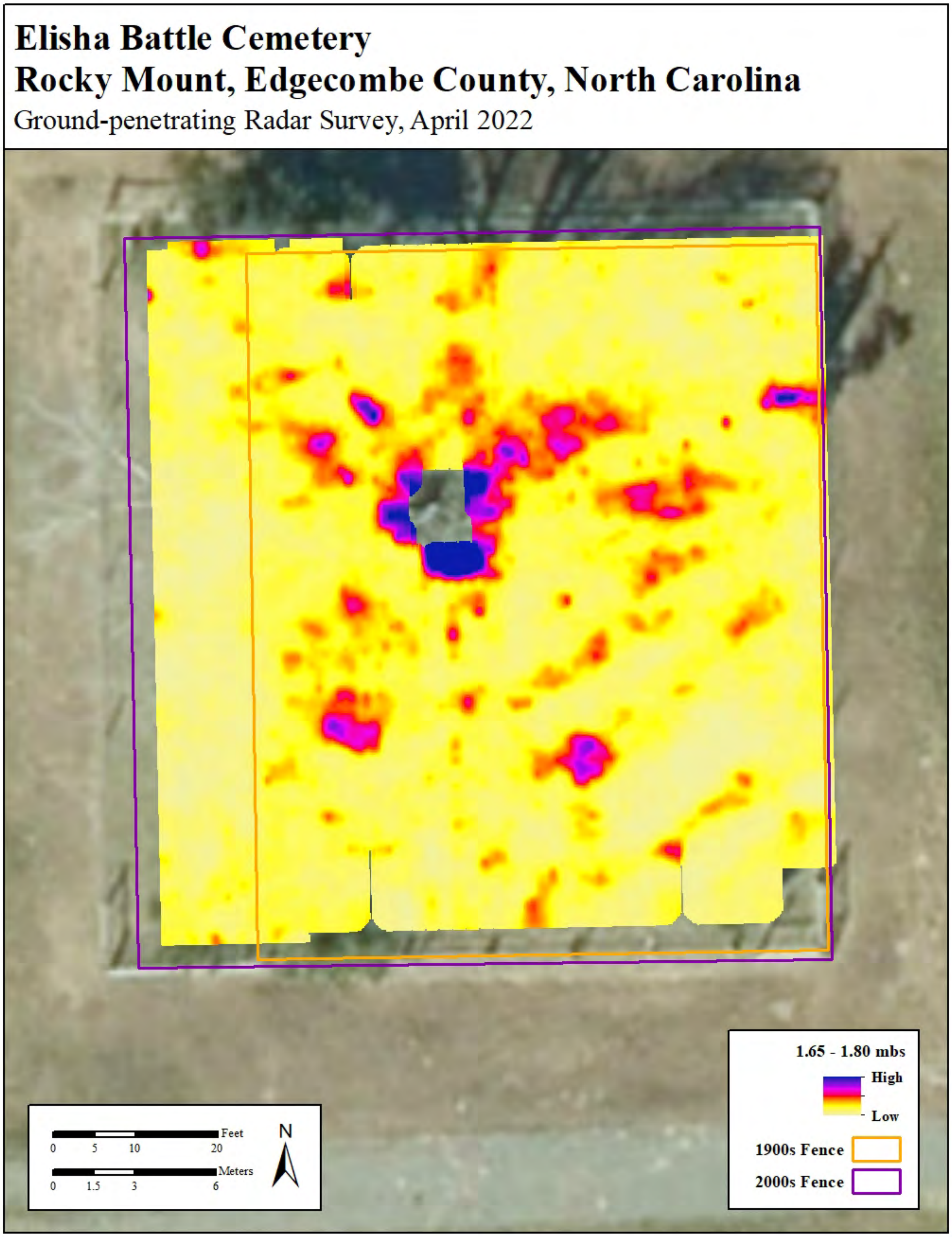

Figure 3.19: GPR survey grids at approximately 1.65-1.80 meters below surface.

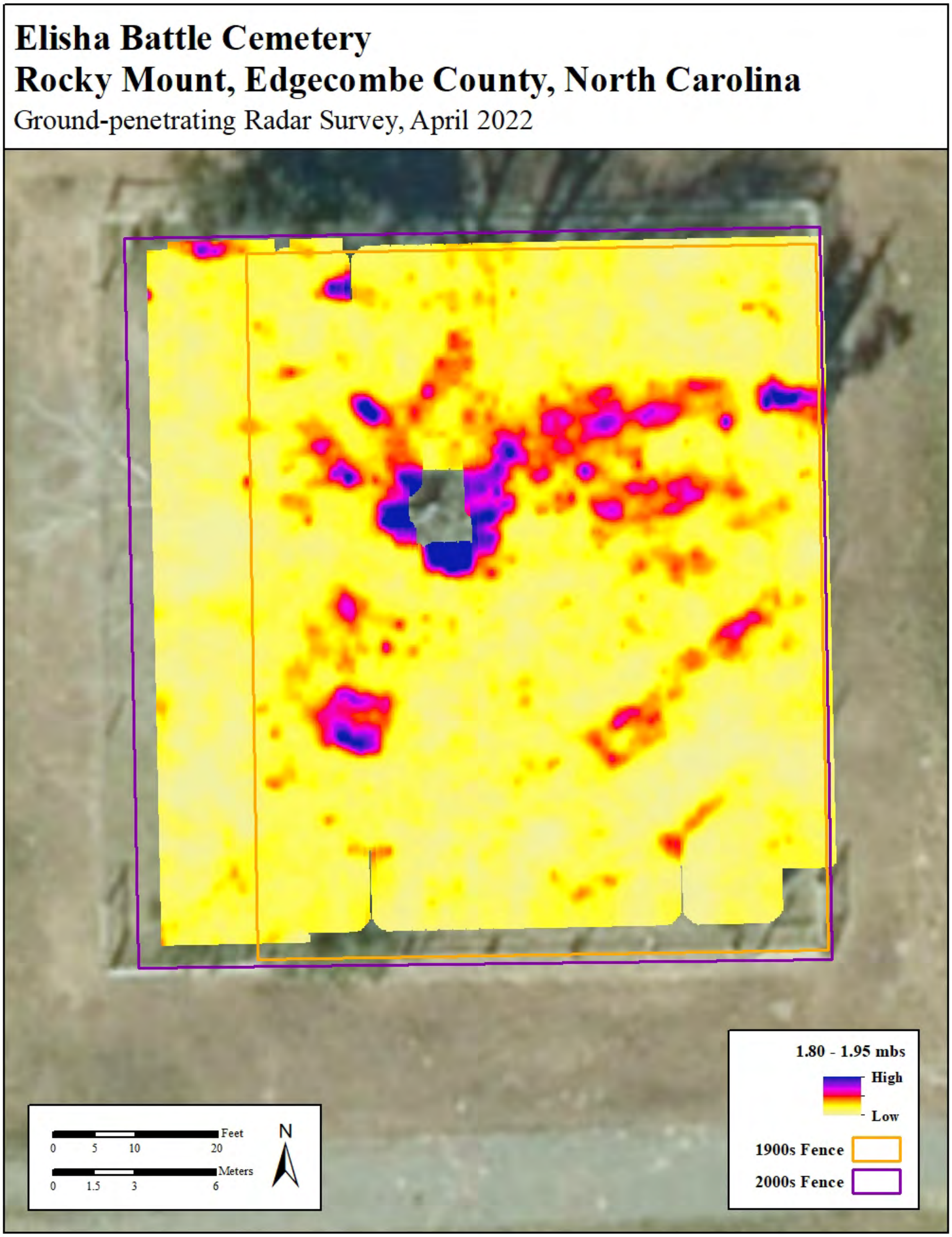

Figure 3.20: GPR survey grids at approximately 1.80-1.95 meters below surface.

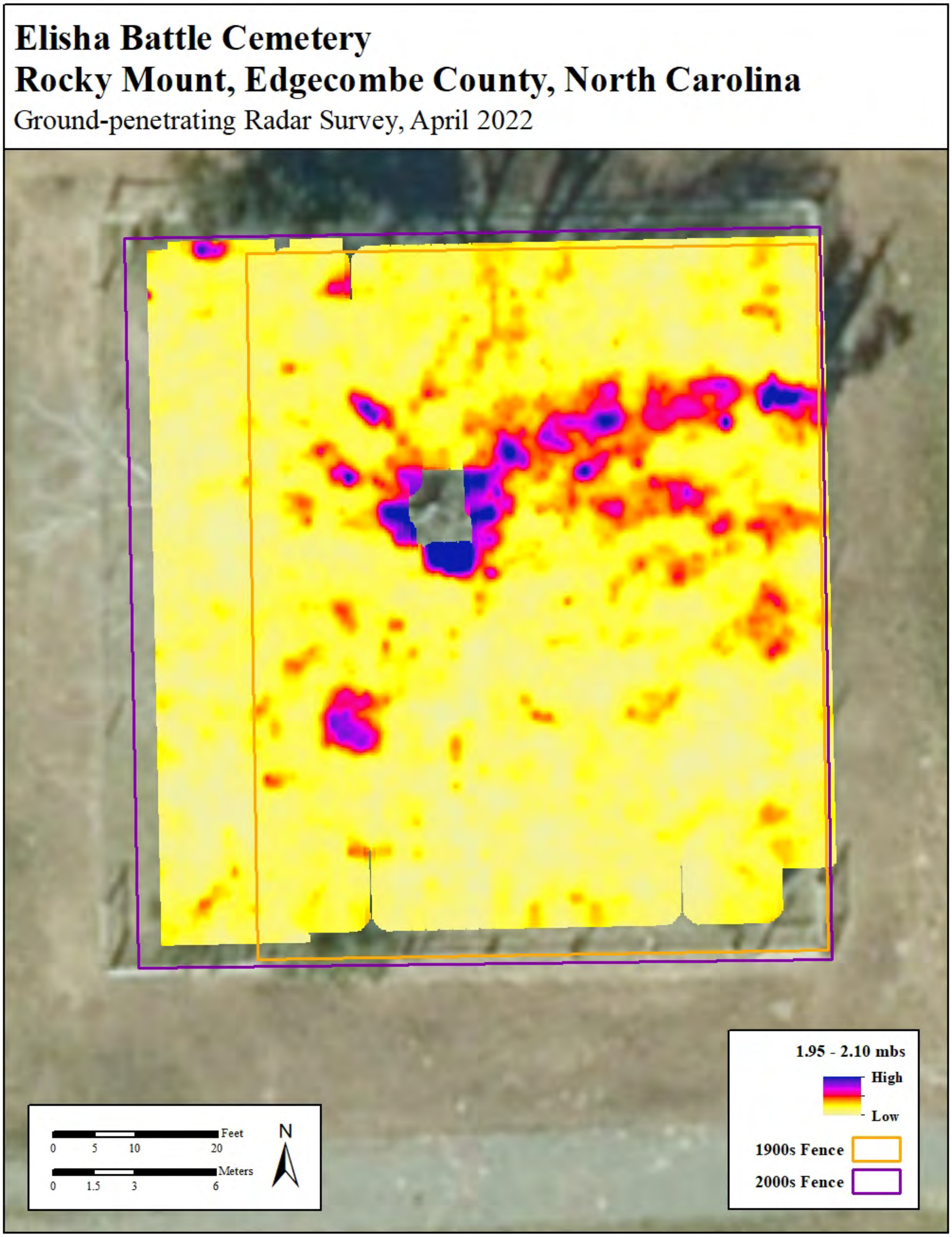

Figure 3.21: GPR survey grids at approximately 1.95-2.10 meters below surface.

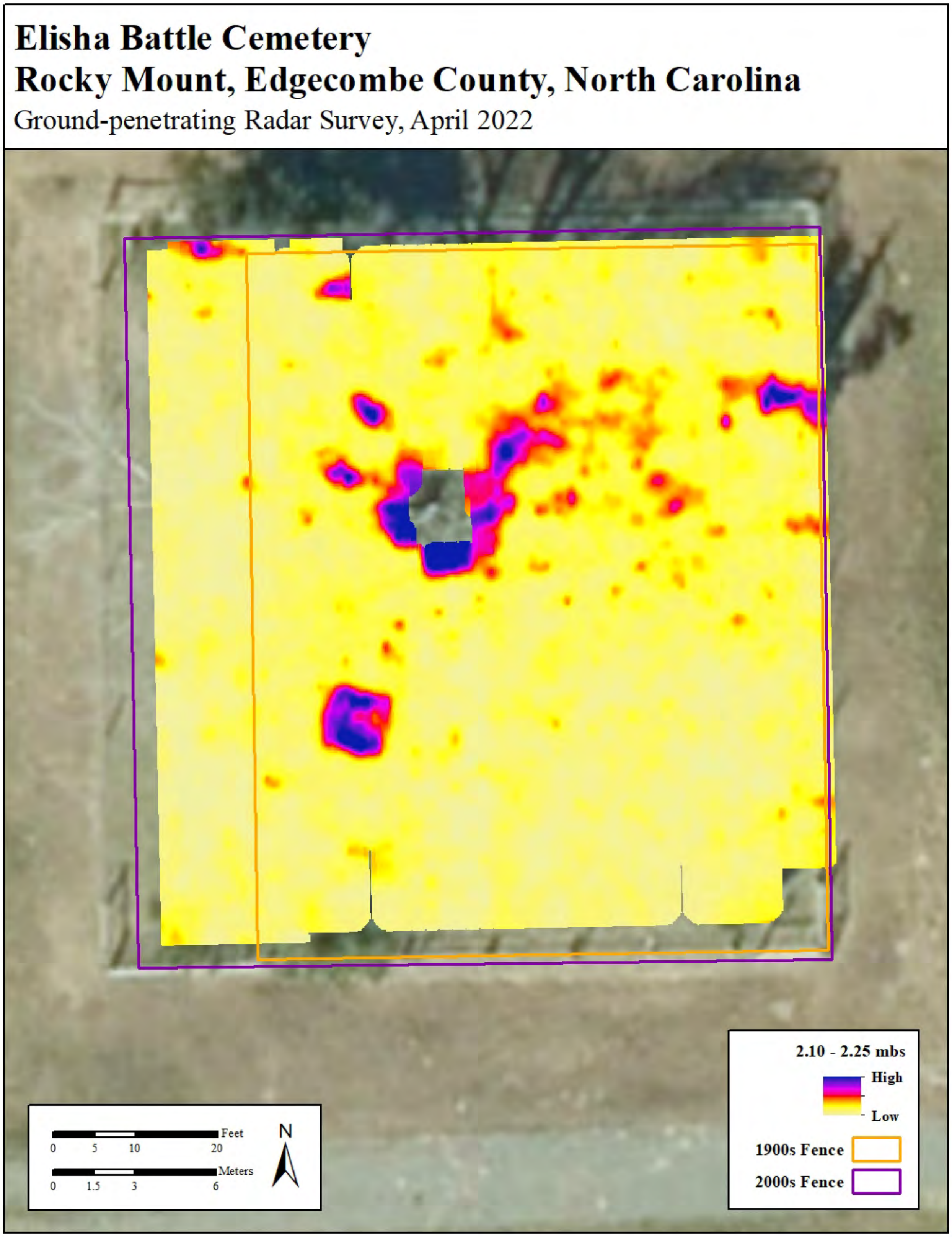

Figure 3.22: GPR survey grids at approximately 2.10-2.25 meters below surface.

4.0 Conclusions and Recommendations

Richard Grubb & Associates, Inc. (RGA) conducted a geophysical survey using ground-penetrating radar (GPR) at the Elisha Battle Cemetery (31ED324) in the City of Rocky Mount, Edgecombe County, North Carolina. The non-invasive survey focused on a 0.23-acre (9,900 square foot) parcel that is surrounded by an agricultural field. The George Gordon Battle Cemetery Trust plans on relocating the interments at the Elisha Battle Cemetery to the Old Town Cemetery nearby. No gravemarkers are present inside the original cemetery area, but fourteen (14) were recorded during a visual inspection in 1995 by Archaeologist John W. Clauser, Jr. The cemetery was surveyed to ascertain the locations and number of potential burial anomalies in order to plan for relocation.

Approximately seven (7) anomalies that represent Possible Burial Anomalies were identified during the GPR survey at the Elisha Battle Cemetery. These possible burials lie in a similar arrangement (i.e. orientation) with those identified during the previous investigation by Mr. Clauser. No marked graves are present. However, a memorial to Elisha Battle is present proximate to an oak tree in the cemetery. A high density of root anomalies can be seen stretching out across the cemetery, making it difficult to observe additional underlying anomalies. The possible burials in the cemetery are believed to date to the mid-to-late eighteenth century and likely include the remains of Elisha (d. 1799) and Elizabeth Ruth Sumner Battle (d. 1794) and related family members. The interment of James McNair (d. 2018) lies outside the limits of the 1930s cemetery fence.

It is possible that additional burials could be identified during relocation. Burials could be situated beneath, or possibly entangled with, the roots associated with the oak tree. As such, it is recommended that the topsoil and upper subsoil levels, as necessary, be carefully removed from the area covering the anomalies identified by GPR and those identified by John W. Clauser, Jr. These measures will allow the exposure of possible burials in the subsoil and help ensure that the Battle family interments are accounted for during the grave relocation process.

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Appendix A: Qualifications of the Geophysical Specialist and Principal Investigator

CAYLA M. CANNON
GEOPHYSICAL SPECIALIST/ARCHAEOLOGIST

Years of Experience
With this firm: 2021-Present
With other firms: 3

Education
MS (In progress)
East Tennessee State University (ETSU)
Geosciences

BA 2014
East Tennessee State University (ETSU)
Anthropology

Professional Training
Python for Everyone, ESRI Web Course

Using Lidar Data in ArcGIS 10, ESRI Web Course

Managing Lidar Data Using LAS Datasets, ESRI Web Course

Professional societies
Southeastern Archaeological Conference (SEAC)

Computer Applications and Quantitative Methods in Archaeology (CAA)

Current Research in Tennessee Archaeology (CRITA)

East Tennessee Geographic Information Conference (ETNGIC)

Cayla M. Cannon's experience includes conducting archaeological field investigations and geophysical surveys. Ms. Cannon specializes in ground penetrating radar (GPR) and magnetometer surveys, cemetery delineation and identification, historical archaeology, and archaeological prehistory of the southeastern United States. She has worked extensively in upper East Tennessee on late prehistoric and contact era sites. She has collaborated with the Eastern Band of Cherokee Indians Tribal Historic Preservation Office, Tennessee Valley Authority (TVA), and the Tennessee Historical Commission. She has also worked on archaeological sites in New Jersey, Pennsylvania, North Carolina, Utah, France, and Israel.

REPRESENTATIVE PROJECT EXPERIENCE

Arch Street Meeting House, City of Philadelphia, Philadelphia County, PA (Sponsor: Arch Street Meeting House Preservation Trust) Ms. Cannon performed a GPR survey at the Arch Street Meeting House in Philadelphia. New outdoor exhibits are proposed over what was once a Quaker burial ground. The goal of this work was to identify burial anomalies and provide a map showing their location. Interments were initiated on the property in the late seventeenth century, and ended in 1880. This work will ensure that potential burials are not inadvertently impacted during the installation of the exhibits, and educate meeting members about the history of the property.

Kiser-Huffstetler Cemetery, Cherryville Township, Gaston County, NC (Sponsor: Private Client) Ms. Cannon conducted a GPR survey of the Kiser-Huffstetler cemetery in western North Carolina. The family cemetery contains interments dating from the late 18th century through the early 20th century. Eighty (80) potential burial anomalies were identified through survey and post processing via GPR Slice. A map of burial anomalies was provided that will facilitate future preservation efforts.

Old Farmer Cemetery, City of Wilson, Wilson County, NC (Sponsor: City of Wilson) Geophysical specialist for a GPR survey at the Old Farmer Cemetery (WL0500). Approximately thirty-five (35) anomalies (unmarked) that represent potential burials were identified. A potential small structure was also identified that could be related to domestic use of the property by the Farmer family during the late 18th-early 19th century or a later occupation. If present, such resources could potentially contribute to the NR-listed Wilson Central Business-Tobacco Warehouse Historic District (WL0442). The preservation of the Old Farmer Cemetery area was recommended.

329 North Taylor Street Lot, Wake Forest, Wake County, NC (Sponsor: Town of Wake Forest) Ms. Cannon performed a GPR survey on a lot adjoining Wake Forest Cemetery. The goals this work was to identify subsurface anomalies, such as possible grave shafts, vaults, or coffins. The GPR survey was conducted with a GSSI Model SIR 4000 GPR unit with a 350 MHz Hyperstacked antenna. The survey results suggested that no potential unmarked burials were present within the survey area.

Brainerd Cemetery, Cranbury Township, Middlesex County, NJ (Sponsor: First Presbyterian Church of Cranbury) In partnership with the First Presbyterian Church of Cranbury, a geophysical survey was initiated at the historic Brainerd cemetery. The survey is focused on the African American section where there are presumed unmarked graves. This work was conducted to identify subsurface anomalies related to the African American interments. A map showing the location of potential unmarked burials will help facilitate site operations by cemetery caretakers.

Carter Mansion, Elizabethton, Carter County, TN (Performed with ETSU) Principal Investigator for Phase II geophysical and archaeological survey of a 2-acre State Historic site containing the oldest frame house in Tennessee. The site comprises historic and prehistoric components. GPR, magnetometry, and electromagnetic induction were performed to differentiate between the historic and prehistoric layers. Several anomalies were identified in the geophysical data, including the remains of the Carter family's barn, prehistoric fire pits, and Native American and historic period burials. Test excavations followed to obtain AMS and OSL samples for dating.

PAUL J. MCEACHEN
PRINCIPAL SENIOR ARCHAEOLOGIST (36 CFR 61)

YEARS OF EXPERIENCE

With this firm: 1998-Present

With other firms: 3

EDUCATION

MA 1996
Memorial University
Anthropology

BA 1993
University of Windsor
Anthropology and Classics

PROFESSIONAL TRAINING

CRM Essentials: Restoring Your Skills

Section 106 Workshop

PROFESSIONAL REGISTRATION

Register of Professional Archaeologists (RPA)

PROFESSIONAL SOCIETIES

Southeastern Archaeological Conference (SEAC)

Society for American Archaeology

Eastern States Archaeological Federation (ESAF)

Middle Atlantic Archaeological Conference (MAAC)

Paul J. McEachen, Director of Archaeological Services, provides technical oversight on archaeological projects undertaken in Pennsylvania and throughout the eastern United States. Mr. McEachen has served as a Principal Investigator on all phases of archaeological investigations and specializes in prehistoric archaeology. Mr. McEachen has prepared and directed cultural resources surveys in accordance with Section 106 of the National Historic Preservation Act, NEPA, and various municipal and state cultural resource regulations. He exceeds the qualifications set forth in the Secretary of Interior's Standards for Archaeologists [36 CFR 61].

REPRESENTATIVE PROJECT EXPERIENCE

Bay View and Greenwood Cemeteries, Town of Morehead City, Carteret County, NC (Sponsor: Town of Morehead City) Co-Principal Investigator for an archaeological survey of two cemeteries damaged by during Hurricane Florence. Five exposed root masses and tree fall cavities were investigated to identify disturbed cemetery materials, burials, and/or archaeological sites prior to the removal of the fallen trees and other woody debris from the cemeteries. Three of the fallen trees had disturbed cemetery structures and two archaeological sites were identified. No human remains were identified. It was recommended that an archaeological monitor be present during the removal of fallen trees and additional ground disturbance within the cemeteries during debris removal. The project was sponsored by FEMA.

NC 42 Extension, Clayton, Johnston County, NC (Sponsor: NCDOT) Principal Investigator for an archaeological survey as part of planning studies for the proposed extension of NC 42 East to connect with SR 1563 (Little Creek Church Road). Based on coordination with the NCDOT, an APE of approximately 70 acres was subject to archaeological survey. A small family cemetery dating to the 1930/1940s was observed in the APE and recorded via a Trimble unit with sub-meter accuracy. A North Carolina Cemetery Site form was prepared, and an evaluation of National Register eligibility performed. The archaeological survey results were presented on an NCDOT survey form to facilitate review. This work was performed pursuant to Section 106 of the NRHP.

Davis Family Cemetery, Rural Retreat, Smyth County, VA (Sponsor: Harold Davis) Project Manager for a ground penetrating radar (GPR) survey of a 19th century family cemetery in southwestern Virginia. The goals this work was to identify subsurface anomalies, such as possible grave shafts, vaults or coffins, and map existing grave markers. Over 60 anomalies representing potential burials were identified and a detailed cemetery map was created. Consultation with Virginia Department of Historic Resources (DHR) was performed with respect to the applicability of the State's burials laws. RGA recommended avoidance of the anomalies.

Green Acres Cemetery, Mooresville, Iredell County, NC (Sponsor: Town of Mooresville) Co-Project Manager for a ground penetrating radar (GPR) survey of a municipal cemetery adjacent to the Watkins Chapel African Methodist Episcopal (AME) Zion Church. The goals of this work was to identify subsurface anomalies, such as possible grave shafts, vaults or coffins, and map existing grave markers. The survey included a 1.65-acre area, which consisted primarily of the historic 19th and early 20th century section of the cemetery. Over 280 anomalies representing potential burials were identified. Avoidance of the potential burial anomalies was recommended.

Sunset Cemetery, Shelby, Cleveland County, NC (Sponsor: Diversity Project Committee, Earl Scruggs Center) Co-Project Manager for a GPR survey of the African American section of Sunset Cemetery. The cemetery was established in 1841 and the African American section spans approximately one acre. Only a few graves are marked in this section, and it is believed that hundreds of individuals are buried there according to a 1939 WPA survey report. The project goals are to better recognize the African American presence at Sunset Cemetery and the GPR fieldwork was performed to ascertain the number and extent of burials.

Appendix B: Annotated Bibliography

Authors:	Cayla Cannon and Paul J. McEachen
Title:	Geophysical Survey Using Ground-Penetrating Radar, Elisha Battle Cemetery (31ED324), Rocky Mount, Edgecombe County, North Carolina
Date:	July 2022
RGA Database Title:	Elisha Battle Cemetery GPR
RGA Project No:	2022-111NC
State:	North Carolina
County:	Edgecombe
Municipality:	City of Rocky Mount
U.S.G.S. Quad:	Hartsease, NC
Drainage Basin:	Tar River
Regulation:	City of Rocky Mount
Project Type:	Private: Cemetery
Project Sponsor:	George Gordon Battle Cemetery Trust
Client:	George Gordon Battle Cemetery Trust
Level of Survey:	Geophysical Survey (i.e. GPR)
Cultural Resources:	Elisha Battle Cemetery (31ED324)