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ARCHAEO-GEOPHYSICAL INVESTIGATION OF THE EMMANUEL A.M.E. CHURCH AND FORMER GLASGOW STREET LOCATION OF THE CHURCH PORTSMOUTH, VIRGINIA

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INTRODUCTION

This report details the results of the archaeo-geophysical investigation of the Emmanuel A.M.E. (African Methodist Episcopal) Church and the former Glasgow Street location of the Church. Duane Simpson and Ryan Peterson conducted the investigation from March 6-9, 2004. Drs. Cassandra Newby-Alexander and Jeff Littlejohn of Norfolk State University provided logistical support and invaluable historical background that helped to guide the investigation and interpretation of the data. Numerous members of the Emmanuel A.M.E. Church and the Monumental Methodist Church were also present at various stages of the investigations and contributed additional information about the areas that were investigated. An electrical resistance survey was conducted in three separate investigation areas. West of the Emmanuel A.M.E. Church, an investigation was conducted to locate buried features that may have been associated with a former parsonage that was located in this area and possibly additional features that may pre-date the parsonage. An area at the southeast corner of the Emmanuel A.M.E. Church was investigated to determine the potential presence of a tunnel associated with the Underground Railroad that was suspected to be located in this area. The final location investigated as part of this project was the former Glasgow Street location of the church that burned in the nineteenth century. The techniques utilized and the results of the investigations are included below.

PRINCIPLES OF ELECTRICAL METHODS

This brief introduction to resistance draws from various authors (Bevan 1983; Carr 1982; Clark 1996; Hasek 1999; Scollar et.al 1990; Weymouth 1986) who have discussed electrical methods in varying levels of detail. The principals described below provide a summary of electrical methods and provides a background for the interpretations that are provided below.

All materials allow some movement of electrical charge (Scollar et.al. 1990:306). If the material easily transmits the electrical charge, it is considered conductive, but if the flow is impeded the material is considered resistant to the flow of electricity. Metals and electrolytes (salts) are extremely conductive, whereas insulators like glass, plastics, air and ice are very weak in their ability to conduct electricity (Scollar et. al 1990). In the case of geophysical prospecting, the conductive medium for electrical current is soils. An understanding of the constituent parts of soils as well as particle size, structure and macro versus micro capillary pores is necessary to be able to determine the conductivity of different soil matrices.

Soils are comprised of three parts: air, water and mineral. The mineral and air portions of soils are insulators offering little in the way of conductivity. Rainfall, however, contains dissolved carbon dioxide and carbonic acid from the atmosphere, forming positive and negative conducting electrolytes by reaction with the minerals in the soil (Clark 1996:27). Soils with higher amounts of conductive minerals, salts or clayey soils, will allow greater conductivity (**Figure 1A**). As particle size increases, so does the resistance of the soil. This increase in resistance is due to two reasons. As particle size constituents increase, there is a reduction in the amount of free electrolytes within the soil due to the more rapid movement of water through the matrix, as well as the increase of macrocapillary versus microcapillary pores. The loss of salts or free electrolytes reduces the ability of the soil water to conduct the electrical current. Macrocapillary pores allow for the soil to drain more rapidly, with these void spaces being filled with air. Since air is an insulator it does not allow good conduction. Therefore, sandy soils will tend to be more resistant than clayey soils, since they are dominated by macro versus microcapillary pores. In the case of heavily saturated soils, macrocapillary pores are filled with water and therefore even coarse soils, such as sands, will become extremely conductive.

Soil properties are relatively homogenous within small areas, such as an archeological site, but isolated disturbances within the soil matrix will alter soil properties in confined areas, and can be recorded by their slight or pronounced contrast to the soil matrix. Since archeological features represent a type of disturbance to the soil matrix they can be measured along with other types of subsurface disturbances. Measuring of these disturbances is based upon a few basic electrical principles.

Movement of charged particles through a conductive medium causes an electrical current. As Clark (1996:27) explains, an electrical potential difference, or voltage, is applied between the ends of an electrical conductor, in this case soil, and a current flows through it, the size of the current depending upon the resistance of the conductor. This resistance will be altered due to isolated soil characteristics and the change can be measured across a site utilizing Ohm's Law (**Figure 1B**). In addition, the current is inversely proportional to the resistance of the medium, indicating the potential difference to current flow. Since the resistance is proportional, it can be compared across various mediums.

The raw resistance measurements can be converted into resistivity, a bulk property of soils and other materials. All materials possess a specific range of resistivity to the passage of a current. Resistivity ranges from approximately 1000 ohm for dry sand to as little as 10 ohm for clay. As explained previously, heavily saturated soils will make more resistant soils more conductive. Soils saturated by salt water can fall to less than 10 ohm in resistivity. In the case of the current project, heavily saturated soils were the norm limiting resistance ranges from 200 to 20 ohm.

The application of current to a soil medium produces a potential field gradient (**Figure 2A**), which expands away from the current electrodes in a hemispherical pattern. The function of the current electrodes is to establish this field gradient which is then sampled (**Figure 2B**) by the potential electrodes (Clark 1996:29). The distance between probes dictates the theoretical maximum depth penetration of the resistance meter, but differing amounts of soil moisture can either increase or decrease the actual depth penetration. **Figure 2C** shows this hemisphere of detection, which relates to the heavy dashed line in **Figure 2A**. The more current that passes through the anomaly the more easily delineated it becomes within the measurements. Thus the peak sensitivity of the instrument usually lies above its maximum depth penetration. The collection at the Glasgow and North street parcels utilized a 0.50 m probe spacing, which offered an average depth penetration of 0.35 to 0.65 meter below surface (bs) based on changing soil moisture conditions.

The resistance data was collected using the RM15 resistance meter made by Geoscan Research. This instrument utilizes a series of frame mounted probes to inject electrical current into the ground. A twin array was utilized (**Figure 1C**). The twin array splits the Wenner configuration (**Figure 2A**) into two separate arrays that facilitate the collection of the data and improve interpretation of archeological features.

(A)

Increasing Conductivity ↑

- Metal
- Saline soil
- Clay
- Organic soil
- Silt and loam
- Sand and gravel
- Rock
- Air voids

source: (Bevan 1983:51)

(B) Ohm's Law

For an electrical circuit, Ohm's law gives the formula below for measuring resistance (R) within a circuit, where V and I are the potential difference across a resistor and the current passing through it respectively (Reynolds 1997).

$$R = V / I$$

This formula indicates that resistance is a ratio of potential difference to current flow. If we rearrange the formula, as shown below, we can measure the degree of difference between the resistance of different materials (Clark 1996:27). The specific resistance is known as resistivity.

$$V = I \times R$$

(C)

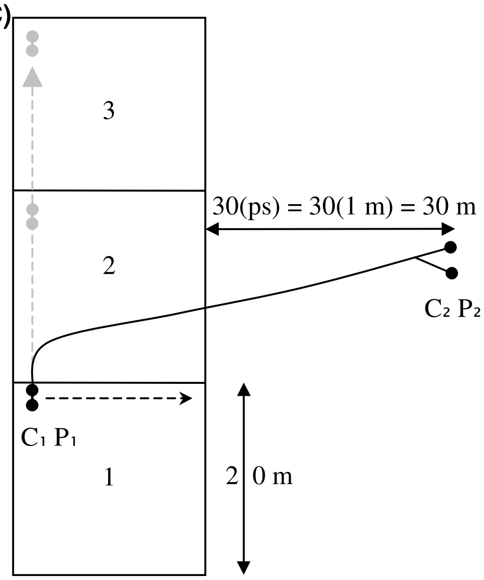

Figure 1A: Chart indicating approximate degree of conductivity of various earth materials. This list would simply be inversed when referring to the *resistance of these same materials.*

1B: Formula for Ohm's Law and the calculation of specific resistance or *resistivity*.

1C: Twin array configuration showing the fixed probes (C_1P_1) and the mobile array (C_2 P_2). The distance of the fixed probes from the nearest point of the mobile array is 30x the probe spacing (ps). This distance will minimize the degree of noise between the probes to less than 3%. The twin array splits the Wenner array configuration in half (**Figure 2A**) making collection and interpretation of subsurface anomalies easier.

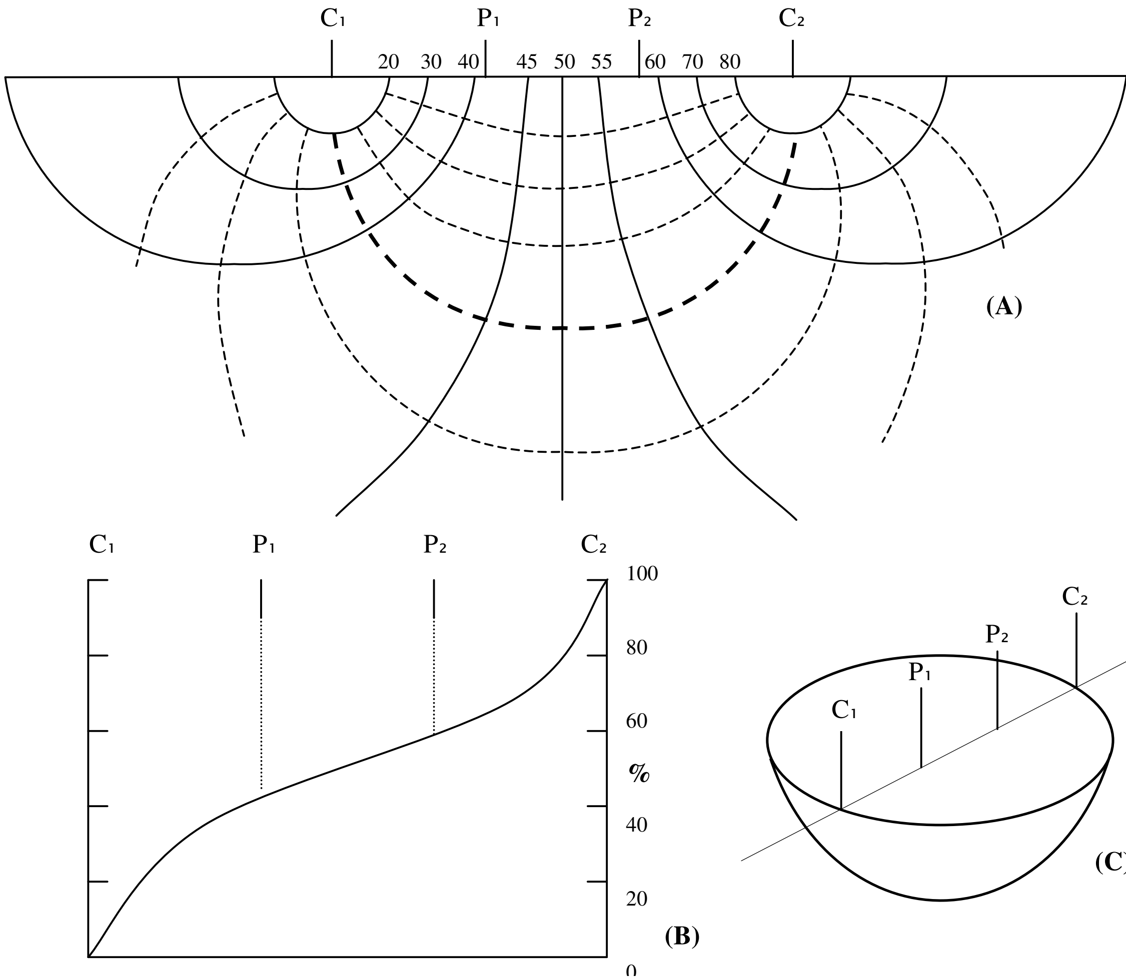

Figure 2A: Cross sectional slice through the ground showing potential gradient based on standard Wenner array, based on (Clark 1996:29). The equipotential lines are marked with the percentage of the total potential difference they represent. Current flow is indicated by the dashed lines, which are orthogonal to the equipotential lines. The heavy dashed current line indicates the maximum extent of penetration. The peak sensitivity of this array is located above the heavy dashed line.

2B: Plot of the potential gradient between the current probes (C), indicating the peak sensitivity area of the potential sample probes (P), based on (Clark 1996:29).

2C: The hemisphere of detection for a standard Wenner array, based on (Clark 1996:30). The twin array utilized for the testing at Black Hoe splits the Wenner into two C_1P_1 pairs. One pair is mobile the other fixed, with the mobile pair acting as the detector probes. The twin probe array spacing can be half as wide as the Wenner and achieve the same depth penetration.

EQUIPMENT AND METHODOLOGY

Magnetic and electrical-based geophysical instruments have proven effective in numerous environmental and archaeological site types around the world. The preferred instrument for the present investigation is the RM15 electrical resistance meter produced by Geoscan Research. This instrument has a proven track record throughout the world, is specifically designed for archaeology, and is becoming recognized throughout the United States as an effective non-invasive tool to determine the presence subsurface archaeological deposits and features. Due to the high incidence of iron noted the areas that were investigated and the degree to which iron interferes with the magnetic signal of archaeological deposits, a magnetic-based survey was not conducted as a part of this project.

The RM15 meter has a fixed frame unit (PA-5), with a number of different probe spacing alternatives. Theoretically, the distance between probes is equal to the depth of penetration of the electrical current; hence the reason why the machine possesses different measured probe spaces, providing an array of different target depths from 0.25 to 2.0 m. A twin-probe array configuration was used for the present investigation. This configuration utilizes a pair of fixed probes within the PA-5 frame connected to a set of remote probes, creating a complete circuit. The RM15 resistance meter is fully computerized and is capable of storing 30,000 measurements for later downloading.

The data collection involved the establishment of a 10-x-10-m survey grids at each investigation area. Partial grids were also established at locations where obstacles were present. Grid points were referenced to surrounding landmarks or recorded with a GPS unit. The final step in preparing the investigation area was the creation of a base map of surface conditions within the grids, focusing on above ground obstructions and depressions. Detailed observations of the surface facilitate more efficient and accurate data collection.

The resistance meter data sets were then collected. Measured ropes marked every 0.25 m were used to guide the RM-15, ensuring proper placement throughout the data collection. The RM-15 resistance investigation was conducted at a transect interval of 25 cm and sampling interval of four measurements per meter.

A BRIEF HISTORY OF THE EMMANUEL A.M.E. CHURCH

The following summary of the history of the present Emmanuel A.M.E. Church is summarized from the work by Stewart (1944), the Emmanuel A.M.E. Church history, and personal communication with Dr. Newby-Alexander and members of the church. The original church, Monumental Methodist Church, was built at the Glasgow Street location in 1772. In 1831, the “black codes” were developed as a result of the Nat Turner Rebellion. The result was the requirement of separate places of worship for blacks and whites. The white portion of the congregation moved to the Dinwiddie Street Methodist Church and passed the Old Glasgow Church to the members of the black congregation. The Old Glasgow Street Church became known as the African Church and served as a place of worship until it mysteriously burned on September 26, 1856. The current Emmanuel A.M.E. Church was constructed in 1857. Between the church and Green Street a two-story parsonage was constructed during the pastorate of Rev. W. G. Alexander (1883-1887) during the late nineteenth century. The parsonage was demolished sometime after the 1940s, and no evidence of this structure is presently visible on the ground surface.

RESULTS AND INTERPRETATIONS

The methodology for interpreting the data collected from both the Glasgow Street and North Street investigation areas will rely heavily on three main factors, including standard geophysical theory, site-specific geomorphology, and local historical records.

Emmanuel A.M.E. Church - North Street Parcel

The lot on which the Emmanuel A.M.E. Church is located is on North Street near its intersection with Green Street. The church still stands in the original location on which it was constructed in 1857. The parsonage was located on the west side of the church between the church and Green Street, and was constructed during the period of 1883 through 1887 (**Figure 3**). The parsonage was demolished sometime after the 1940s. The investigation of this area extended from the short retaining wall along the sidewalk that forms the northern boundary of the lot and extends 30 m to the south, in the vicinity of tire ruts that have been formed by church members parking in the area. The church delineates the eastern boundary of the investigation area, while the western boundary is defined by another short retaining wall along the present sidewalk. Three trees currently stand in the center of the area surveyed. The southernmost tree seems old enough to have been living while the parsonage was still standing. The two trees further to the north are likely located within the footprint of the former parsonage. Ground cover throughout the parcel consisted of a mowed lawn. The area was generally flat with a few noticeable surface depressions. A historical marker and a wooden cross are located in the northwest corner of the lot (**Figure 4**). A fence post was also noted near the center of the grid adjacent to a tree.

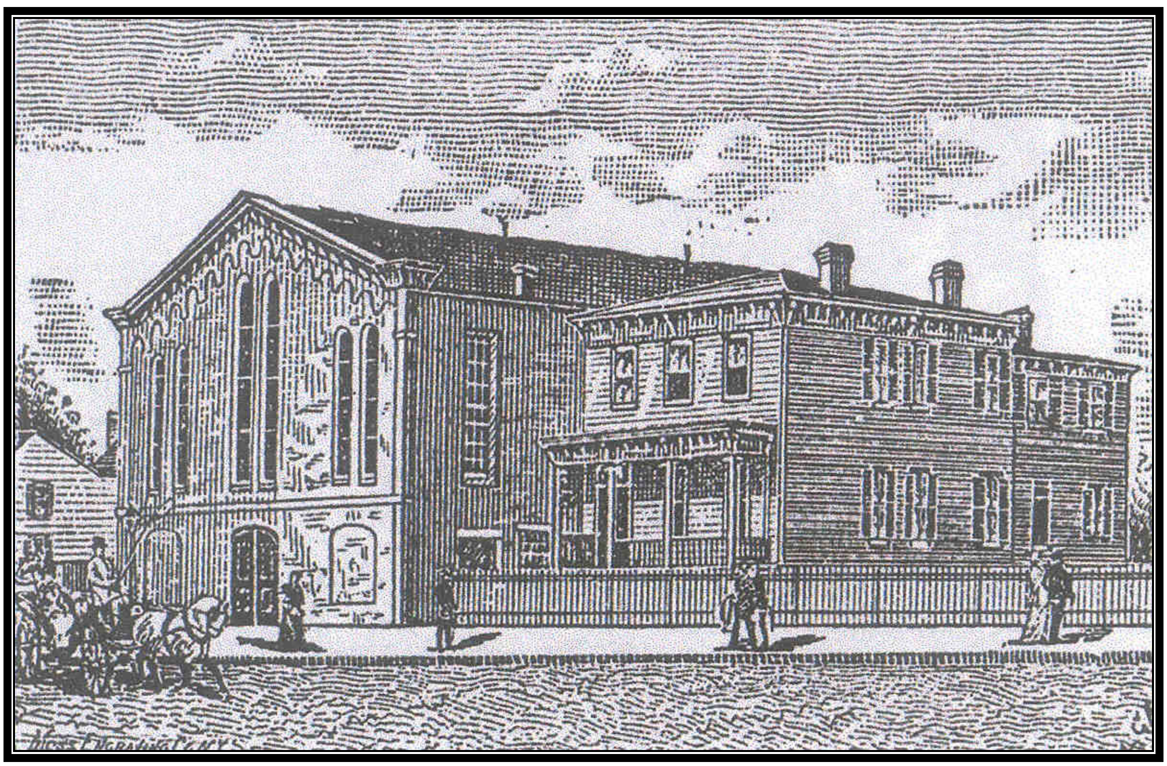

Figure 3. Late nineteenth century image of the Emmanuel A.M.E. Church and adjacent parsonage.

Figure 4. Photograph of the area investigated adjacent to the Emmanuel A.M.E. Church (southeast view).

Geophysical Survey Results and Interpretations

A total of nine 10-x-10-m contiguous grids were placed across the parsonage lot directly west of the church location. As indicated above, a total of three trees and one dense bush were the only above ground impediments to a complete survey of the area. These trees are noted within **Figure 5** as circles with green cross-hatching. The parsonage lot contains a number of overlapping high and low resistant anomalies, as would be expected given the urban area. The other areas of no data (demarcated as green values) relate to areas covered by concrete, sidewalks or utility closets (**Figure 5**). While the data is difficult to interpret, there are a number of unusual anomalies that may relate to previous historic constructions were identified within the data.

A tentative interpretation and identification was made based on the survey results (**Figure 6**). These interpretations are tenuous given the degree of disturbance observed within the data, and the probability that succeeding historic occupations of the area have obscured or obliterated portions of older structures. The investigation identified a number of interesting linear anomalies throughout the survey grids. The linear anomalies along the southwestern section of the grid appear to correspond with the current road orientation and may relate to more recent historical activity (**Figure 6**). The curved linear anomalies that occur in the central grid do not appear to be related to the other linear anomalies. The explanation of these anomalies is unknown at this time.

In addition to the linear anomalies, there a three roughly square, high resistance anomalies that occur within the investigation area (**Figure 6**). The square anomaly in the southeast corner of the survey area was the only one associated with a surface depression. All three anomalies measure approximately 1.0 to 1.25 m wide (3.2 to 4.1 ft) by 2.0 m long (6.6 ft). The dimensions are very similar to possible grave locations. Anomalies of similar size and strength were noted at the Glasgow Street investigation (discussed below). One of the Glasgow Street anomalies was identified through excavation as a brick capped grave. This interpretation is tentative at best based on the small sample of graves known through geophysics in the area. Additional coring and investigations would be necessary to properly investigate and determine the exact nature of these three anomalies. The linear and square anomalies may be associated with the utilization of the lot for the A.M.E. parsonage. The remaining identified anomalies appear to directly correspond to the utilization of the lot for the parsonage.

The most obvious anomaly in the resistance data is the low conductive linear anomaly that extends from the northern edge of the survey to the far southwestern corner (**Figure 6**). This linear anomaly is believed to relate to a utility line of some sort, and appears to directly connect with the concrete cap in the southwestern section of the site. The utility line does not appear to extend into the church and appears therefore to relate the previous location of the parsonage. Based on an assessment of the historical documentation provided by Dr. Newby-Alexander, the utility line should extend directly into or under the parsonage location.

Along the northern edge of the lot there are two entrances marked by a series of steps. Two wide linear anomalies extend south from each of these entrances, both are denoted by a dashed line (**Figure 6**). The eastern entrance anomaly is short and displays medium to high resistance. The higher resistance readings are probably due to soil compression. The entrance would have been located directly in front of the parsonage residence entrance and would have received substantial foot traffic. The western entrance is long and produced low resistance readings. This entrance allowed access to a manicured garden area to the west of the parsonage, probably receiving less foot traffic as compared to the eastern entrance. The lower resistance is probably associated with high water content in the area and less compaction than seen on the eastern entrance. In association with the western entrance is an extensive square area and small circular area of low conductivity that extends east from the entrance (**Figure 6**). The square area and central circular anomaly are outlined in **Figure 6** using a small dotted line. Based on photographic evidence provided during the survey, these low conductive areas are interpreted to be associated with a series of shrubs or planting beds that extended along the western side of the parsonage and along North Street. While proposed features associated with the parsonage appear to have been identified in the data the parsonage footprint was not, and the reason is unknown. The parsonage may have been built on piers that would leave little if any construction trace or removal of the parsonage may have disturbed the area obscuring any subsurface signature.

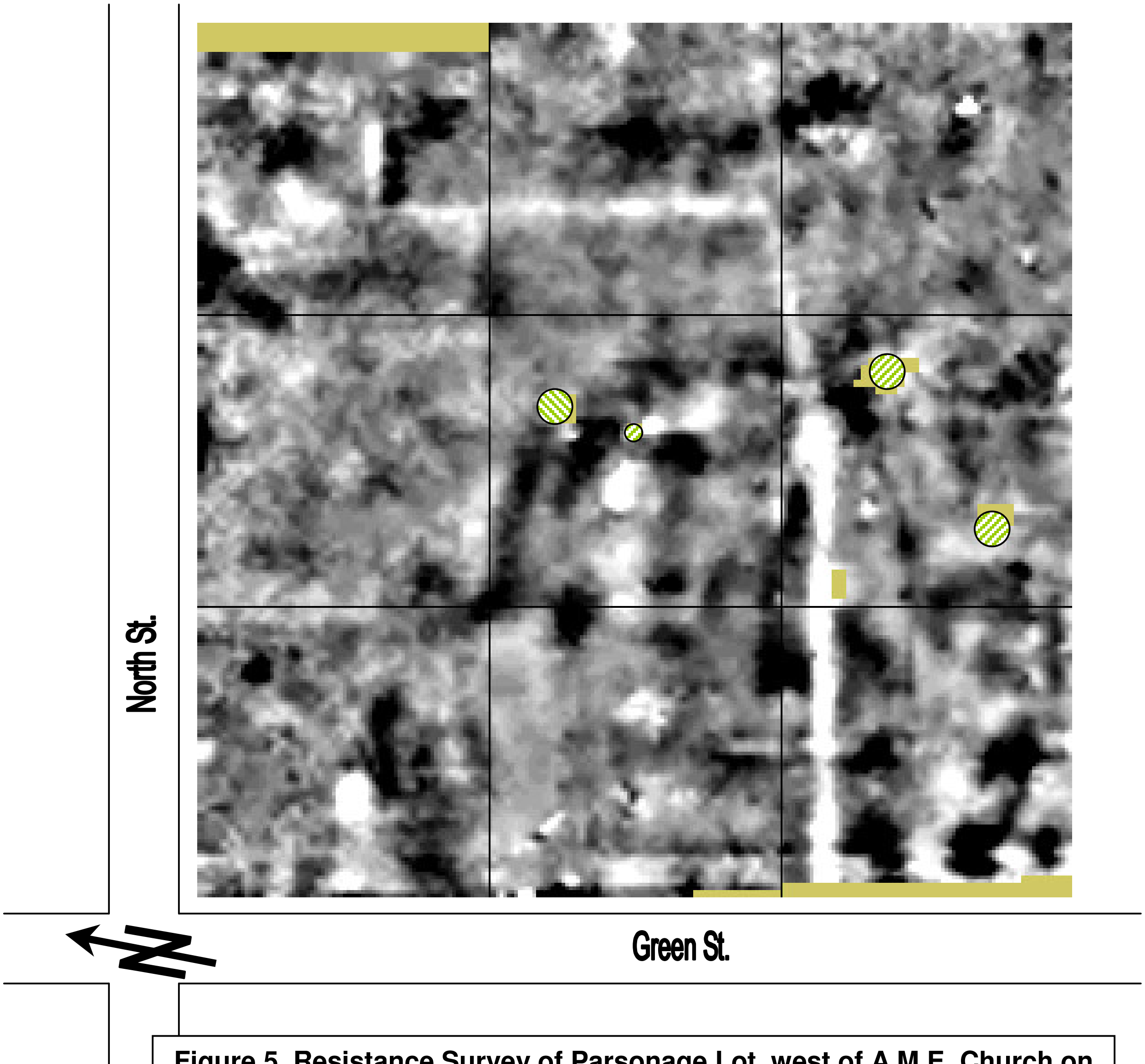

Figure 5. Resistance Survey of Parsonage Lot, west of A.M.E. Church on North Street.

- The green hatched circles mark locations of trees or bushes.
- Areas of solid green mark areas that were unable to be surveyed due to surface concrete.

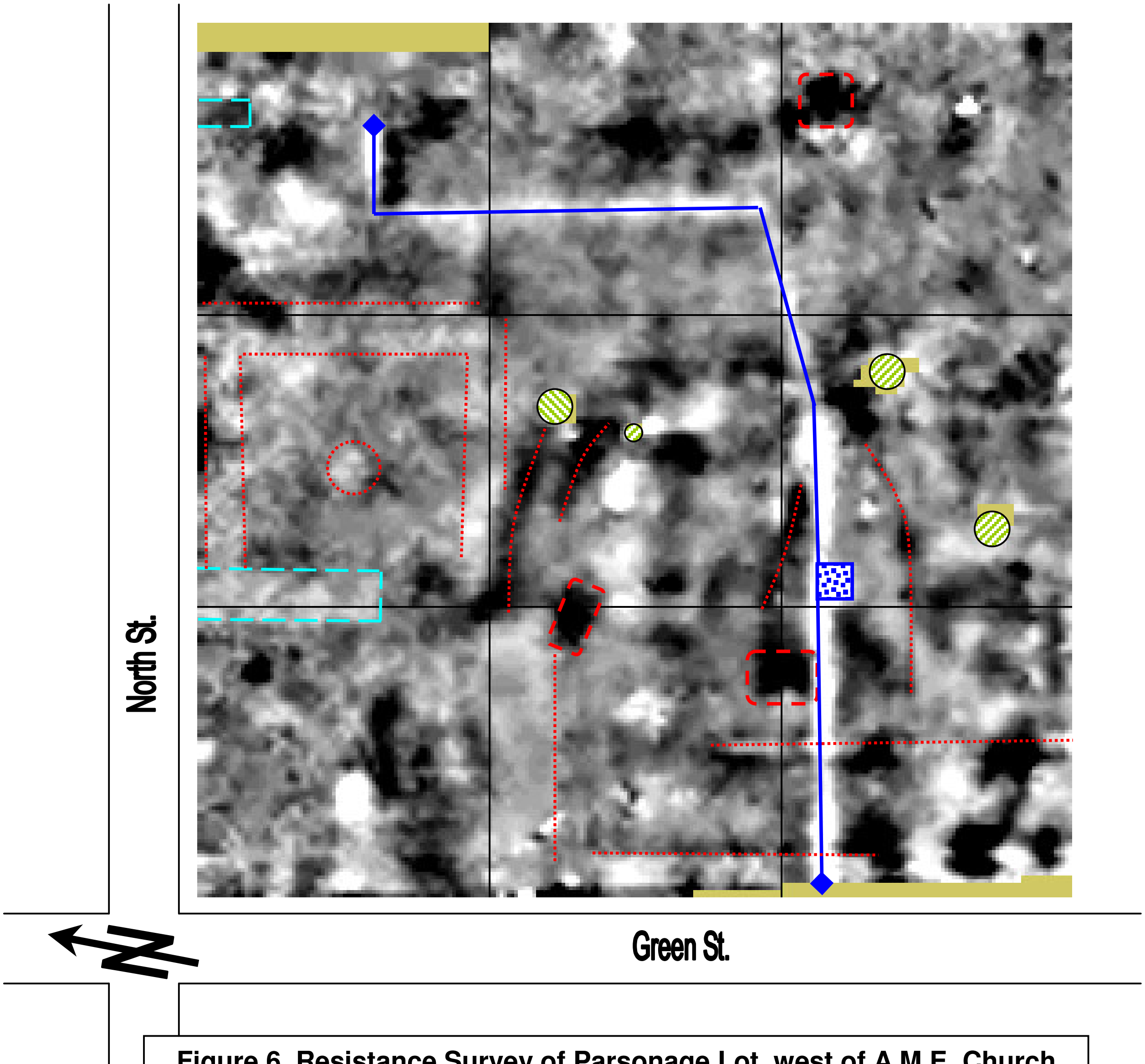

Figure 6. Resistance Survey of Parsonage Lot, west of A.M.E. Church on North Street, including interpretations.

- The green hatched circles mark locations of trees or bushes.
- Areas of solid green mark areas that were unable to be surveyed due to surface concrete.
- Red dotted lines denote linear anomalies.
- Red dashed squares denote possible grave locations.
- Light blue dashed lines denote entrances into parsonage lot.
- Blue line and square denotes utility line and associated closet.

Emmanuel A.M.E. Church - Suspected Tunnel Location

Based upon documentary evidence in the form of a slave narrative and an unusual architectural feature inside of the southeast portion of the church, Dr. Newby-Alexander believed that a tunnel that would have been part of the Underground Railroad might be present in this area. Additional investigation was conducted along the southeast corner of the church where the tunnel was suspected. A resistance survey was conducted in this area with a twin probe array (described above). Modifications to the investigation in this area involved increasing the spacing of the mobile probes to 1 m separation and increasing the sensitivity of the RM-15 by adjusting the gain and slowing the data logging rate. An area measuring 10 m north-south by 2 m east-west was investigated (**Figure 7**). The grid was bound on the north by a large gray power unit and extended 10 m south to the vicinity of the red door (see **Figure 7**). Subsequent analysis of the data collected revealed no evidence of a tunnel or hidden subterranean room that extends beyond the foundation of the church in this area (**Figure 8**).

Figure 7. Southeast corner of the Emmanuel A.M.E. Church - area of suspected tunnel.

Geophysical Survey Results and Interpretations

As indicated above the resistance results provided no evidence of a linear anomaly extending from the church toward the parking lot as would be expected if a tunnel or ditch extended out of the church in this location (**Figure 8**). While there are some smaller anomalies, these probably represent construction disturbance from one of the number of building episodes that have taken place within the area.

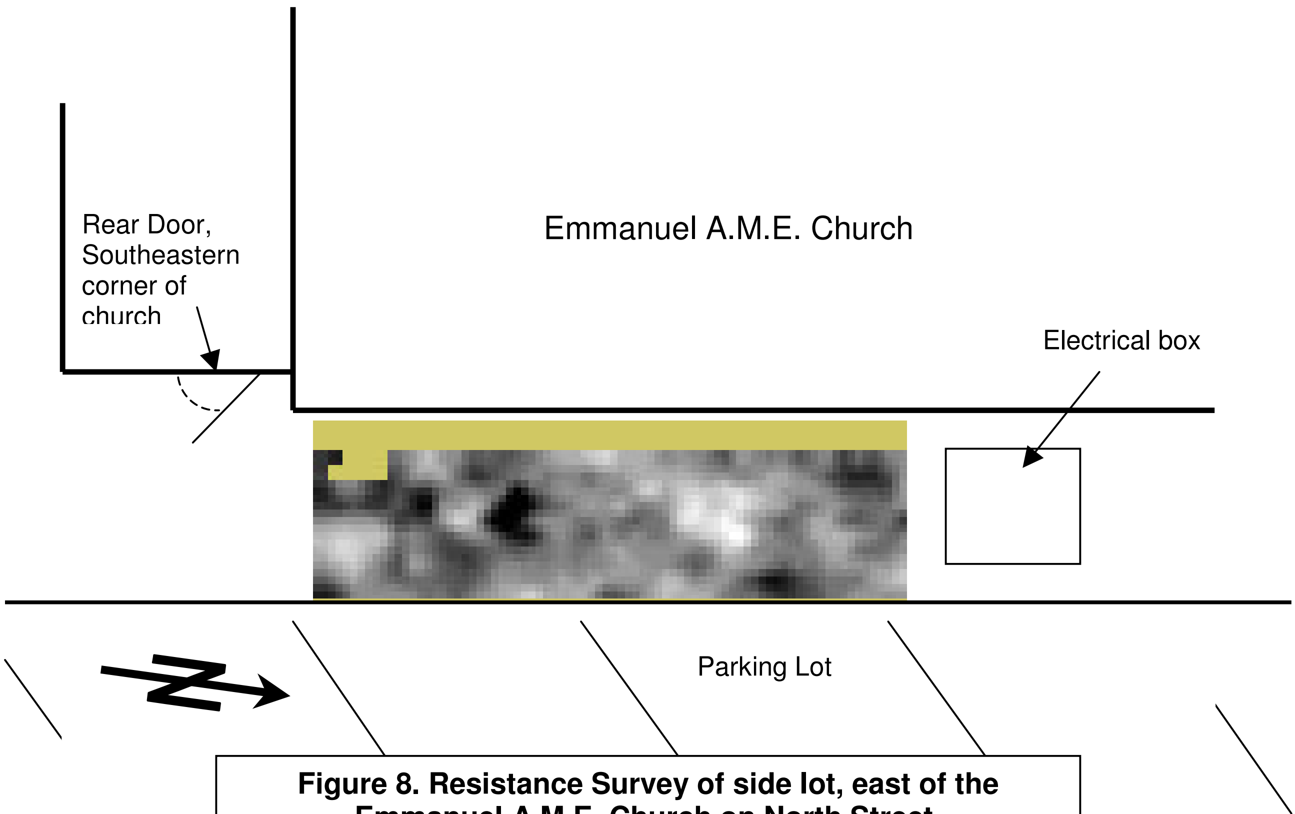

Figure 8. Resistance Survey of side lot, east of the Emmanuel A.M.E. Church on North Street.

The survey extended from the rear door north to the electrical box, pictured in **Figure 6** and east from the edge of the church to the current parking lot.

Glasgow Street Church Parcel

The former location of the Glasgow Street Church is located on the south side of Glasgow Street, between Dinwiddie and Court Streets (**Figure 9**). The area in which the former church was located is currently used as a small neighborhood park. During the twentieth century, a reinforced concrete pad was constructed on a portion of this lot and a Quonset hut was built at this location. The Quonset hut and the associated concrete were recently removed. Following the removal of the concrete, archaeologists from the Virginia State Archaeologist's office conducted investigations at the Glasgow Street Church location. A historic burial location was discovered in the area that was formerly covered by concrete. The brick and/or stone covered burial was identified approximately 15-20 cm below the present ground surface during the excavation of a 50-x-50-cm unit. The burial was not removed and the unit was backfilled. The location of the unit was still evident at the time of the geophysical investigation.

Figure 9. Resistance survey at the former Glasgow Street Church site (south view).

Geophysical Survey Results and Interpretations

As with the survey of the parsonage area along North Street, the area of the Glasgow Street church has experienced a substantial level of disturbances. Based on the number of overlapping high and low resistant anomalies, this is to be expected given the location in the heart of a well established urban area. A single tree, denoted by a green hatched circle, was the only obstruction within the grid that hindered data collection. The areas of no data (demarcated as green values) relate to areas that were not surveyed due to disturbance or surface barriers (**Figure 10**). Although disturbance levels were high, some probable cultural anomalies were identified within the data.

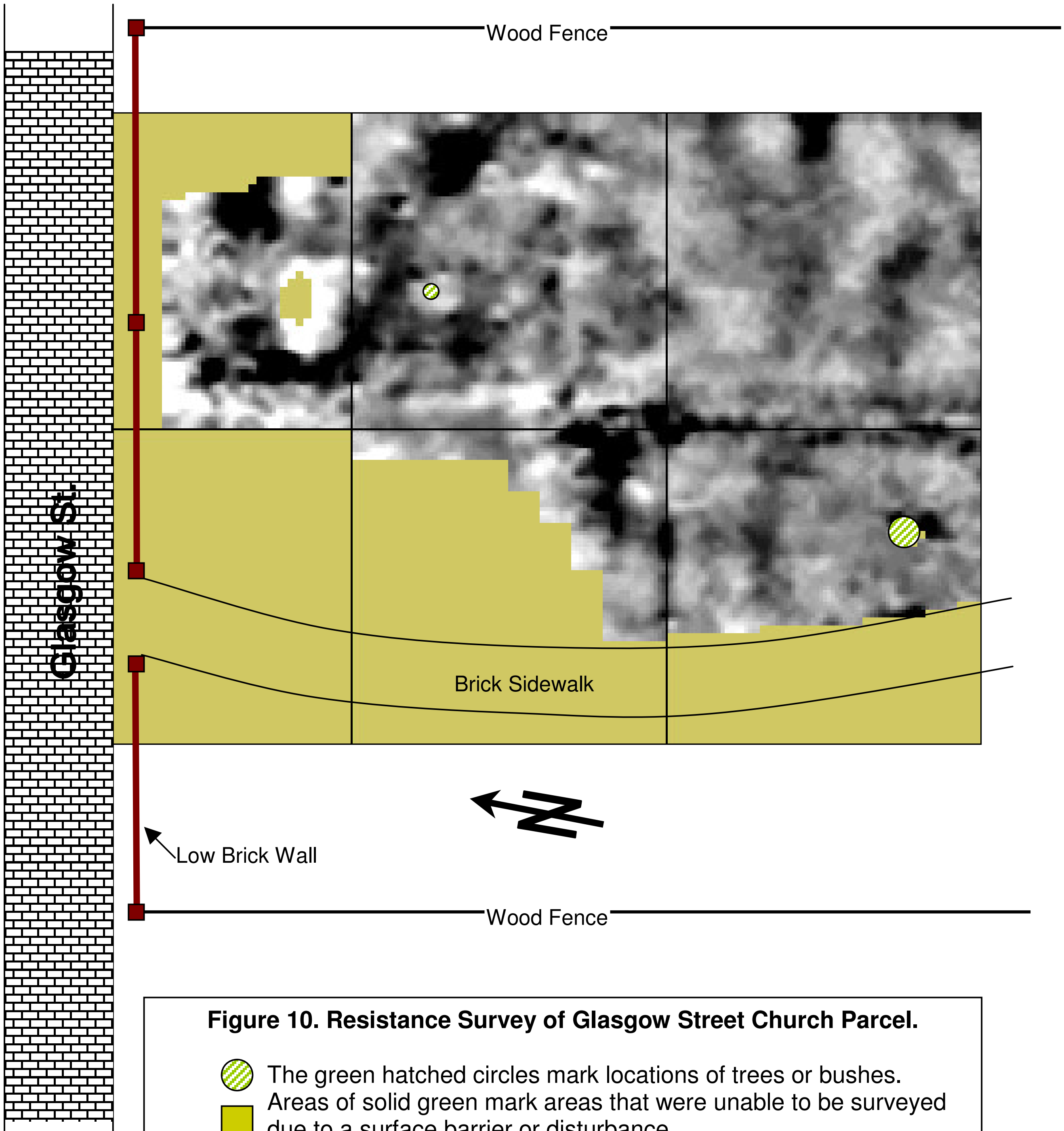

Figure 10. Resistance Survey of Glasgow Street Church Parcel.

The green hatched circles mark locations of trees or bushes.
Areas of solid green mark areas that were unable to be surveyed due to a surface barrier or disturbance.

A tentative interpretation and identification of the anomalies was made based on the survey results (**Figure 11**). These interpretations are tenuous given the degree of disturbance observed within the data, and the probability that succeeding historic occupations of the area have obscured or obliterated portions of older construction activity. Unlike the interpretations offered for the Emmanuel A.M.E. parsonage lot, there has been some archeological excavations conducted by the State Archaeologist within the Glasgow Street parcel. One of the excavations identified a brick capped grave located along the eastern side of the lot. This burial is shown as a high resistant anomaly along the eastern edge of the survey grid, labeled as grave 1, shown in **Figure 11**. The second test unit is denoted as a small light blue square (**Figure 11**). In addition to this specific ground-truthed burial, additional roughly rectangular anomalies were identified within the data. These anomalies, denoted by dashed red squares, are also believed to be graves, some though do not appear to have been capped given the reduced resistance strength noted within the data (**Figure 11**). Some of these possible graves run perpendicular to the linear anomalies identified in the data.

These linear anomalies, denoted by dotted red lines, may relate to the walls of the original church locale (**Figure 11**). These linear anomalies are not consistent across the entire length of the lot. The lack of continuity probably relates to obliteration of the possible wall foundations by later utilization of the lot. The possible grave locations run up to, and perpendicular to, the possible church walls. The placement is similar to graves noted at the present Church location on North Street. This similarity may help to further corroborate the evidence that these rectangular anomalies are in fact historic grave locations. As with the parsonage data, these interpretations are tentative based on the small sample of graves known through geophysics in the area. Additional coring and investigations would be necessary to properly investigate and determine the exact nature of these rectangular anomalies.

SUMMARY AND RECOMMENDATIONS

Intriguing results were obtained at the present Emmanuel A.M.E. Church and at the former Glasgow Street church site. Additional archival research as well as ground-truthing of the anomalies would serve to further refine the interpretations presented above. Prior to the commencement of ground disturbing activities, archaeological investigation may be necessary. At a minimum, any known graves or probable grave locations identified by the geophysical data should be investigated, relocated, or avoided, in accordance with state, local, and Federal laws.

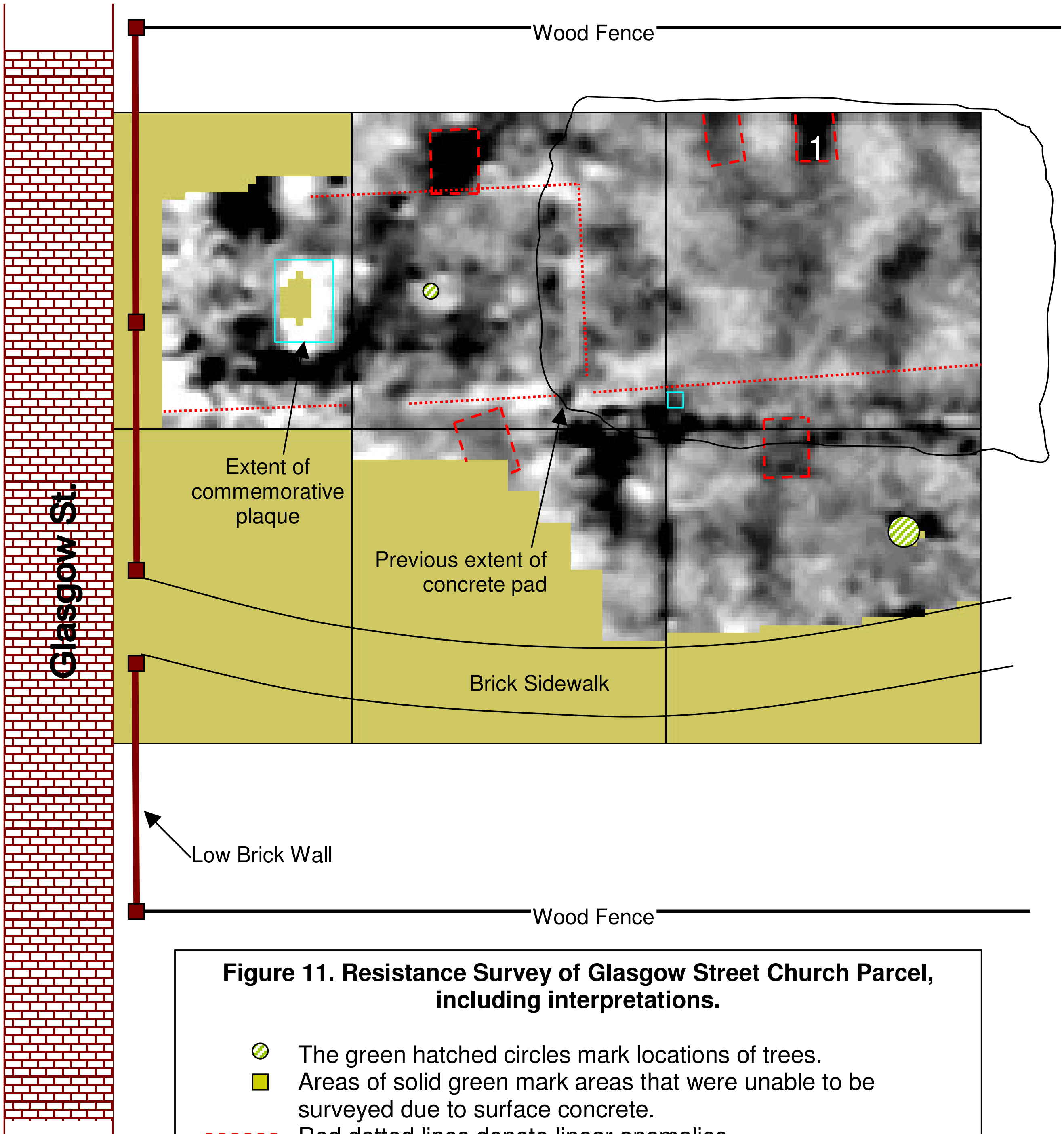

Figure 11. Resistance Survey of Glasgow Street Church Parcel, including interpretations.

- The green hatched circles mark locations of trees.
- Areas of solid green mark areas that were unable to be surveyed due to surface concrete.
- Red dotted lines denote linear anomalies.
- Red dashed squares denote possible grave locations.
- Light blue square denotes location of previous test unit.

REFERENCES CITED

Bevan, B.
1983 Electromagnetics for mapping Earth Features. *Journal of Field Archeology,* 10(1): 47-54.

Carr, C.
1982 *Handbook on Soil Resistivity Surveying.* Center for American Archeology Press, Evanston, Illinois.

Clark, A.
1996 *Seeing Beneath the Soil: Prospecting Methods in Archaeology.* B.T. Batsford Ltd, London.

Hasek, V.
1999 *Methodology of Geophysical Research in Archaeology.* BAR International Series 769. British Archaeological Reports, Oxford.

Scollar, I., A. Tabbagh, A. Hesse and I. Herzog
1990 *Archaeological Prospecting and Remote Sensing.* Cambridge University Press, Cambridge UK.

Stewart, C.
1944 *The African Society becomes Emmanuel A.M.E. Church*. Guide Quality Press: Norfolk, VA.

Weymouth, J.W.
1986 Geophysical Methods of Archaeological Site Surveying. In *Advances in Archaeological Method and Theory*, edited by M.B. Schiffer, pp. 311-396. Academic Press, New York.

Various excerpts from the history of the Emmanuel A.M.E. Church recorded by past pastors and other members of congregation. Original Manuscripts on file at the Emmanuel A.M.E. Church.