

Ground Penetrating Radar Survey of Andersonville National Historic Site

Prepared For:

**National Park Service
Southeast Archeological Center**

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ABSTRACT

In June, 2005 the Georgia Department of Transportation partnered with the National Park Service (NPS) to survey portions of Andersonville National Historic Site using ground penetrating radar (GPR). The NPS requested the GPR survey in an attempt to answer specific research questions related to the Civil War prison camp. Questions addressed included locating the position of the South Gate, Third Hospital, Dead House, and interior prison features. A small portion of the cemetery was also surveyed in an attempt to document burial techniques for the earliest graves. A total of seven GPR grids were surveyed; six on the southern portion of the prison camp and one in the cemetery. Overall the GPR survey was very successful, producing dramatic results and locating many subsurface features. The location of the South Gate was identified as well as portions of the outer, middle, and inner stockade. The prison interior was rich with deep pit features that most likely represent hand dug wells or house pits. The location of the Third Hospital was possibly located, while unfortunately the Dead House was not. The survey determined that the earliest graves within cemetery were interred as single burials, predating mass burial practices utilized later when the number of dead increased.

ACKNOWLEDGEMENTS

In 2003 the Georgia Department of Transportation (GDOT) and the National Park Service (NPS), Southeast Archeological Center, formed a unique partnership. The partnership became official in 2005 when GDOT and the NPS signed a Memorandum of Understanding (MOU). This relationship consists of GDOT providing high quality GPR surveys to Georgia's National Parks while NPS assists GDOT in public outreach activities and provides technical expertise on various archaeological issues.

This survey of Andersonville National Historic Site was a team effort that included Jim Pomfret, Shawn Patch, and Terri Lotti from GDOT and John Cornelison and Steven Kidd from NPS. GDOT would like to thank NPS for the opportunity to work at Andersonville. Specifically we would like to thank John Cornelison and Steven Kidd for their assistance during the field work and for identifying areas within the park that would benefit from a GPR survey. Overall this GPR survey was a great success and has further strengthened the partnership between GDOT and NPS.

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INTRODUCTION

In June, 2005 the Georgia Department of Transportation partnered with the National Park Service (NPS) to survey portions of Andersonville National Historic Site using ground penetrating radar (GPR). The NPS requested the GPR survey in an attempt to answer specific research questions related to the Civil War prison camp. Questions addressed included locating the position of the South Gate, Third Hospital, Dead House, and interior prison features. A small portion of the cemetery was also surveyed in an attempt to document burial techniques for the earliest graves. A total of seven GPR grids were surveyed; six on the southern portion of the prison camp and one in the cemetery. Overall the GPR survey was very successful, producing dramatic results and locating many subsurface features.

METHODS

All of the GPR data were collected using a GSSI SIR-3000 with a 400MHz antennae. In all seven survey grids the data were collected at 50 cm intervals. The data were post processed using RADAN software. Post processing steps included setting time zero, removing background noise, and migration. These post processing steps improve the ability to view data and improves the accuracy of determining the size and depth of subsurface features. RADAN was also used to view the data in 3D. On each grid the data were analyzed in 3D by taking 30 cm slices at various depths. These depth slices were further analyzed and manipulated in the mapping software SURFER. All survey grid corner locations were recorded with a Leica GPS unit with an error of < 0.5 m. The survey grids and nearby surface features were also mapped using a total station. Half inch or quarter inch rebar were placed on two corners of each grid (except the cemetery) and driven into the ground.

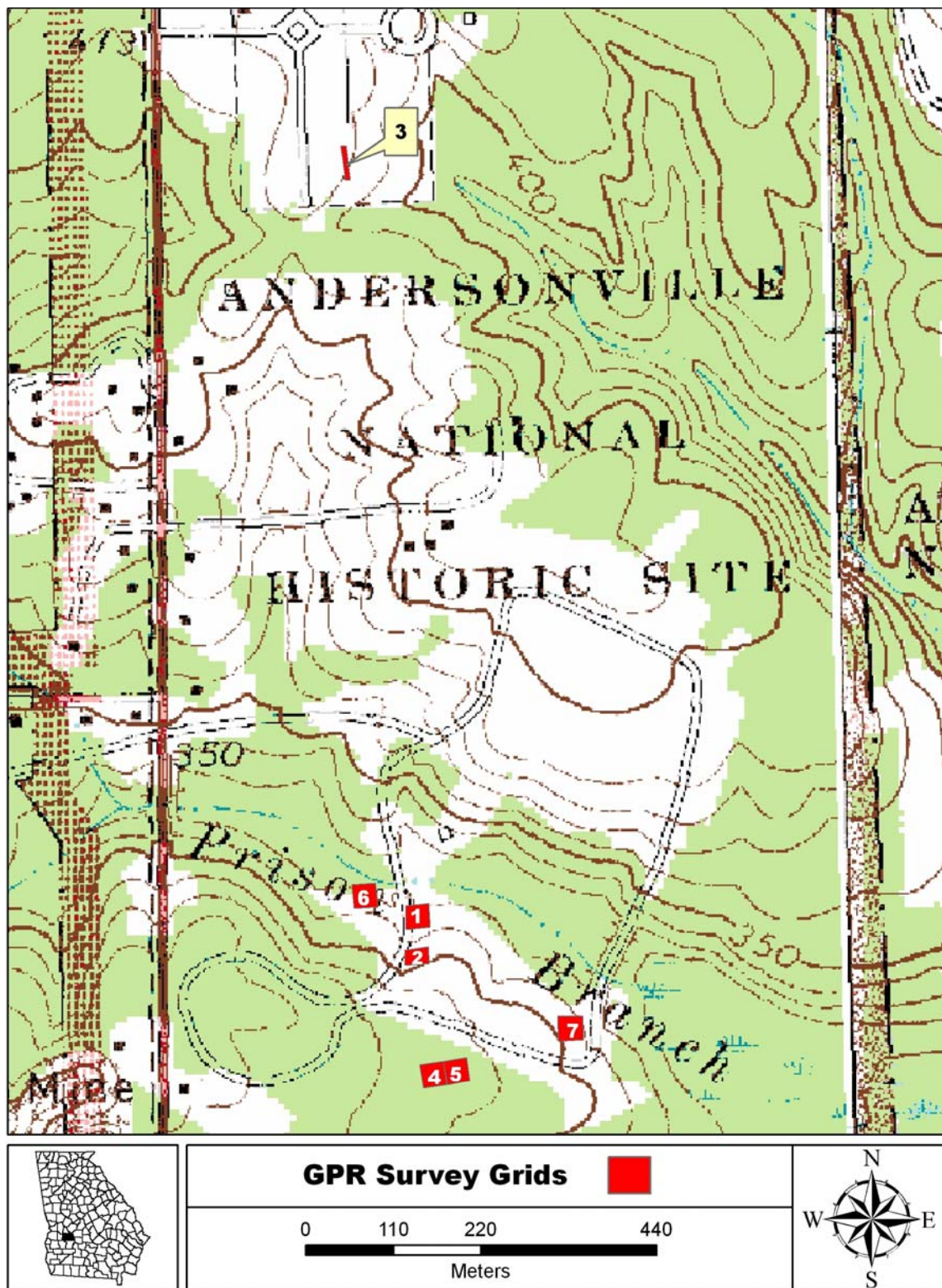


Figure 1. Location of GPR Survey Grids at Andersonville National Historic Site (Andersonville USGS 7.5 minute quadrangle).

ANOMALY POTENTIAL

The potential for locating subsurface anomalies at Andersonville is high. After analyzing historical records and maps it was clear that the prison area would likely contain large features that should be detected easily with the GPR. Such potential anomalies include buried stockade wall trenches, hand dug wells, pit features, and metal objects. This potential for anomalies, or features, has been documented in the recent past by archaeological investigations at Andersonville (Prentice and Mathison 1989; Prentice and Prentice 1990; Larson and Crook 1975).

According to historical accounts, the inner stockade walls of Andersonville were built by burying 22 foot pine logs vertically in a five foot deep wall trench (Prentice and Mathison 1989:6). In the 1989 investigations of the North Gate and inner stockade, Prentice and Mathison verified the historical accounts by excavating portions of the North Gate and associated inner stockade trench. Prentice and Mathison found a stockade trench that varied from 1.10 to 1.69 meters in depth. Intact pine logs were also observed within the trench (Figure 2). Features such as this should be detected with ease by the GPR.



Figure 2. Excavation of Inner Stockade by Prentice and Mathison in 1989 (adapted from Prentice and Mathison 1989).

The majority of the previous archaeological work has focused on the prison stockades on the north end of the prison, specifically at the North Gate. Little work has been done to document features within the interior of the prison. One pit feature, a horse burial, was identified in the northwest corner of the prison (Larson and Crook 1975: 27). Historical accounts and historical maps suggest that the interior of the prison should be feature rich

with hand-dug wells, crude dwellings, hearths, and sheds. Below is an excerpt from an expedition to Andersonville in 1865 by Clara Barton:

(<http://www.angelfire.com/ga2/Andersonvilleprison/report.html>)

“The scarcity of water, the want of occupation, and perhaps the desire to escape by tunneling, impelled the prisoners to dig wells. Forty of these, finished and unfinished, remain. Those on the highest ground being sunk in the hard soil to the depth of eighty feet. The work was done with knives, spoons, sticks, and other tools but little better. The diggers brought up the earth in their pockets and blouses, and sprinkled it about in the grounds to conceal in quantity. In some wells, excellent water was reached, and in others, horizontal galleries were attempted, for escape. In at least one instance, a tunnel was carved entirely through the hill, and a few prisoners are said to have got through. The steep face of the northern hill is burrowed throughout its whole extent. The little caves are scooped out of and arched in the form of ovens, floored, ceiled, and strengthened so far as the owners had means, with sticks and pieces of boards, and some of them are provided with fire-places and chimneys. It would seem that there were cases, during long rains, where the house would become the grave of its owner, by falling in upon him in the night. In these burrows are still found remnants of the wretched food, and rude utensils of the occupants—drinking cups made of sections of horns, platters and spoons wrought from parts of old canteens, kettles and pans made, without solder, from stray pieces of old tin or sheet iron. I brought away a considerable number of these articles, which may one day be of interest to the curious.”

Based on the description provided by Clara Barton, the interior of the prison should contain numerous large anomalies that should be easily detected by the GPR.

Outside of the prison stockade, there lies additional areas that may have the potential for subsurface anomalies. As one can see in the NPS park map (Figure 3), outside of the prison were numerous buildings and military fortifications. Two of the areas listed on this map, the Third Hospital and the Dead House, were selected as targets for this GPR investigation. It is unknown what subsurface anomalies, if any, may be associated with these structures.

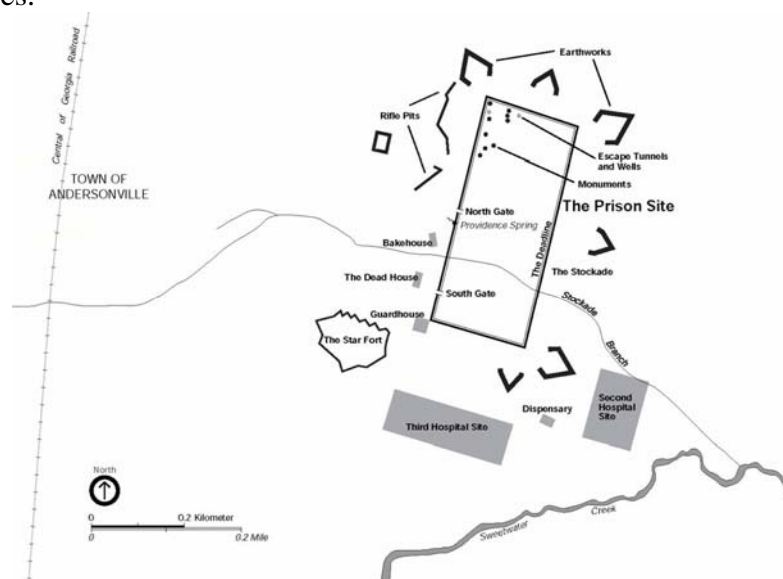


Figure 3. National Park Service Map of Andersonville National Historic Site.

GRID 1

GPR survey Grid 1 was located adjacent to the prison loop road in the southwest corner of the prison (Figure 4). The 30x30 m survey grid was orientated north-south and placed in an area that was intended to include the South Gate. Within the survey grid are two stone markers marking the location of the South Gate and two posts marking the location of the prison wall and dead line (Figure 5). Although the general location of the South Gate was known, its exact location had never been documented. The goal of this GPR survey grid was to locate the South Gate and any other undocumented subsurface features near the gate.

After post processing the data in RADAN and viewing select depth slices in SURFER, a number of anomalies were observed (Figure 6). The depth slices show a definite prison wall and South Gate in slices from 60-120 cmbs (centimeters below surface). Many other unknown subsurface features are present, most within the interior of the prison. These features most likely represent hand dug wells, pit features, and large metal objects. Various anomalies were selected for closer inspection (Figure 7).

South Gate

The South Gate and associate stockade wall was clearly identified in Grid 1 (Figure 7). Although the location of the stockade wall is correctly identified by park markers, the South Gate stone markers appear to be offset by approximately 8 m too far to the north (Figure 5). The posts for the stockade and South Gate extend to a depth of approximately 120-135 cmbs. This depth corresponds to the depth of posts excavated at the North Gate by Prentice and Mathison in 1989. They documented that the bottom of the stockade wall trench ranged from 1.1 m to 1.69 m in depth (Prentice and Mathison 1989:36-58). The width of the South Gate is approximately 8 m. This 8 m north-south dimension of the South Gate matches very closely to the north-south dimension of the North Gate. Prentice and Mathison documented the width of the North Gate to be 8.4 m. The western edge of the South Gate lies beneath the pavement of the park road and outside the boundary of Grid 1.

Anomaly A

Anomaly A is located in the northeast corner of Grid 1, within the prison interior. This anomaly is approximately 2 m in diameter and over 1.5 m in depth. This anomaly may represent a hand dug well feature.

Anomaly B

Anomaly B is located near the center of Grid 1, within the prison interior. This anomaly is approximately 1.5 m in diameter and over 1.5 m in depth. Like anomaly A, this feature may represent a hand dug well feature.

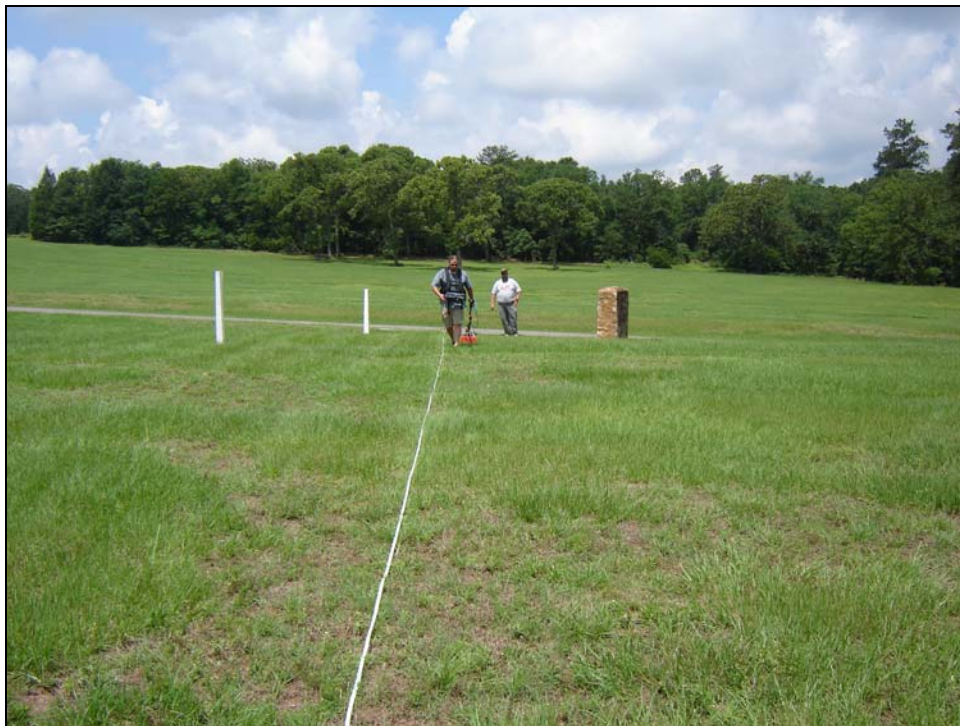


Figure 4. Survey of Grid 1.

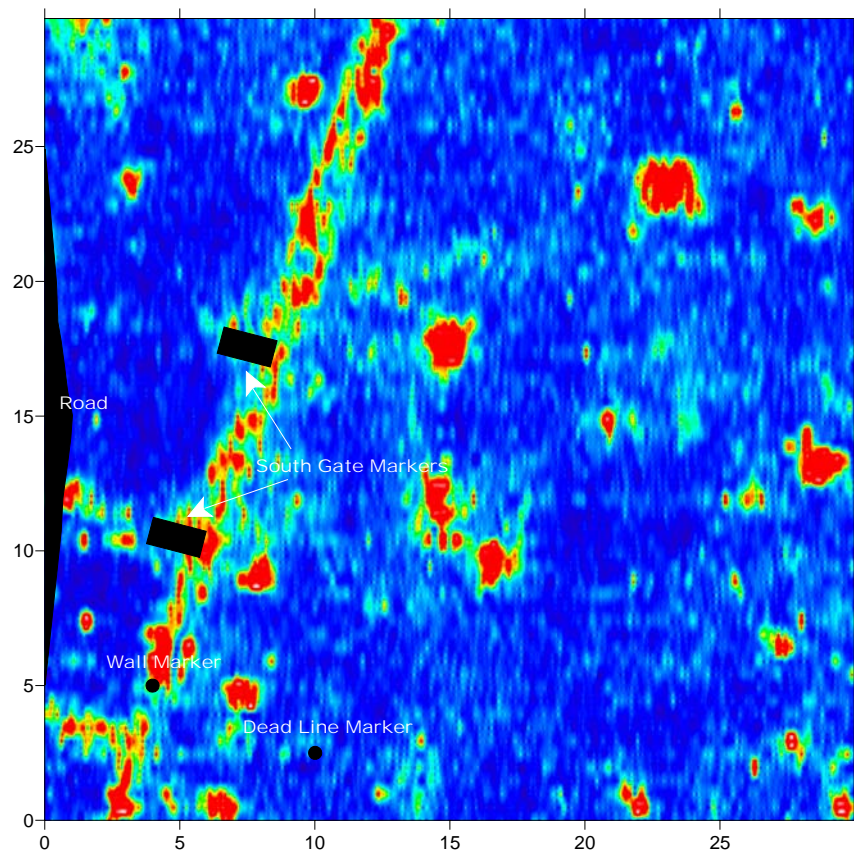


Figure 5. Existing Surface Features and Park Markers in Grid 1.

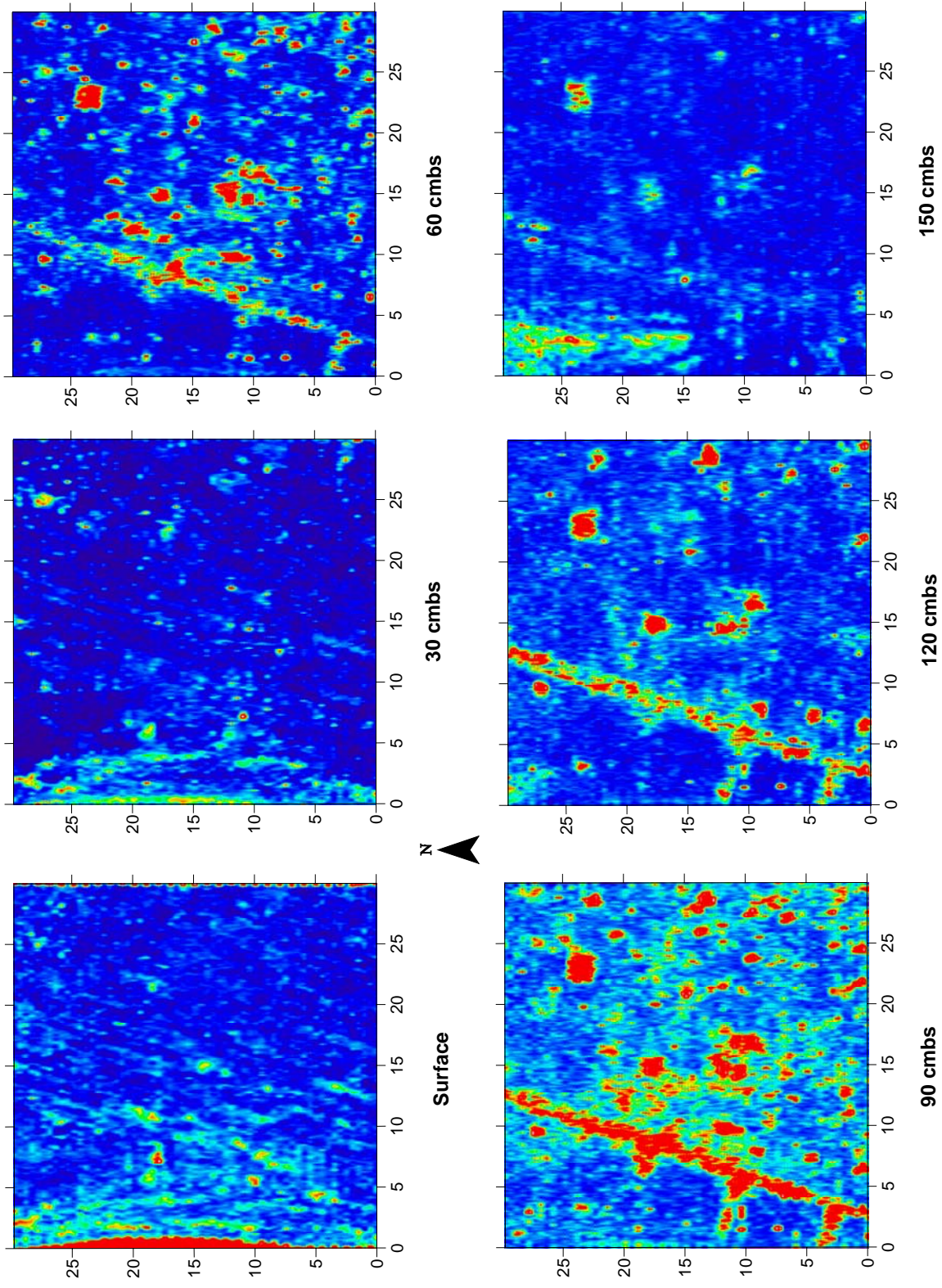


Figure 6. Slices from Various Depths in Grid 1.

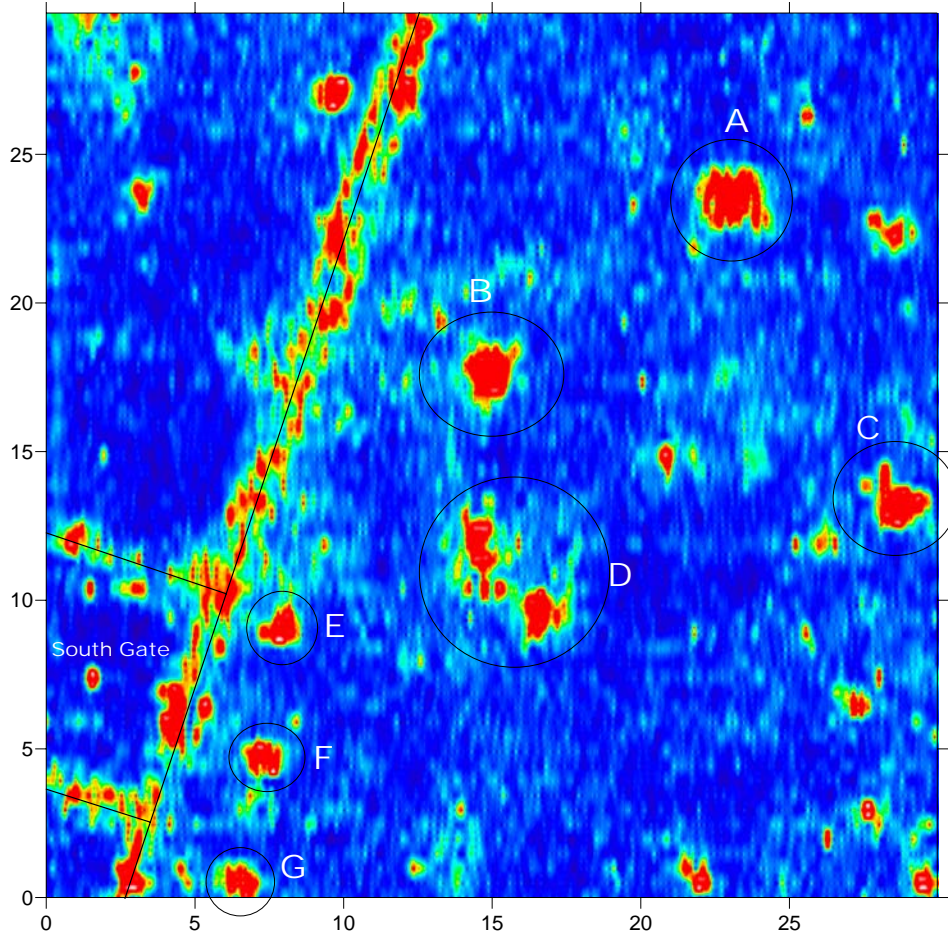


Figure 7. Strong Anomalies Located in Grid 1, 120 cmbs.

Anomaly C

Anomaly C, located on the eastern edge of Grid 1 is a strong anomaly located between 50-120 cmbs. This 1 m diameter anomaly may represent a well or pit feature.

Anomaly D

Anomaly D, is located on the interior of the prison, near the center of Grid 1. This semi-circular pattern of high reflective targets appears to contain a scatter of metal objects. Many of the targets exhibit the typical “ringing down” affect that is seen when radar waves hit metal (Conyers 2004). This 5 m diameter scatter may represent some sort of small structure within the prison.

Anomalies E, F, and G

Anomalies E, F, and G represent three post-like features that are located directly in front of the South Gate. It is unknown what function these large posts would have served. It is possible that they were somehow associated with the deadline.

GRID 2

Grid 2 was placed in the southwest corner of the prison, within the stockade wall. The purpose of this 30x20 m grid was to locate interior prison features. A map of Andersonville drawn by Dr. Hamlin in 1865 shows five 120x20 ft sheds in this area (Prentice and Mathison 1989:7).

Analysis of depth slices from Grid 2 did not show any distinctive anomaly patterns (Figure 8). However, many high amplitude, circular anomalies were observed. Various anomalies from 120 cmbs were selected for closer analysis (Figure 9).

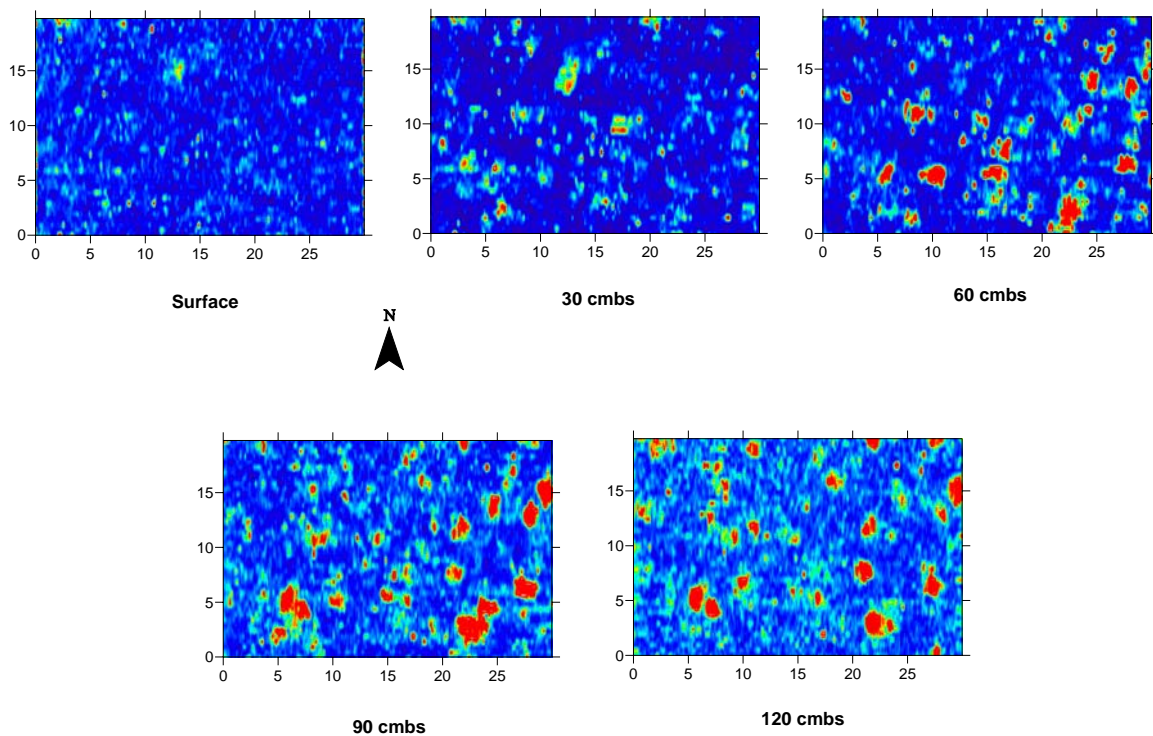


Figure 8. Depth Slices from Grid 2.

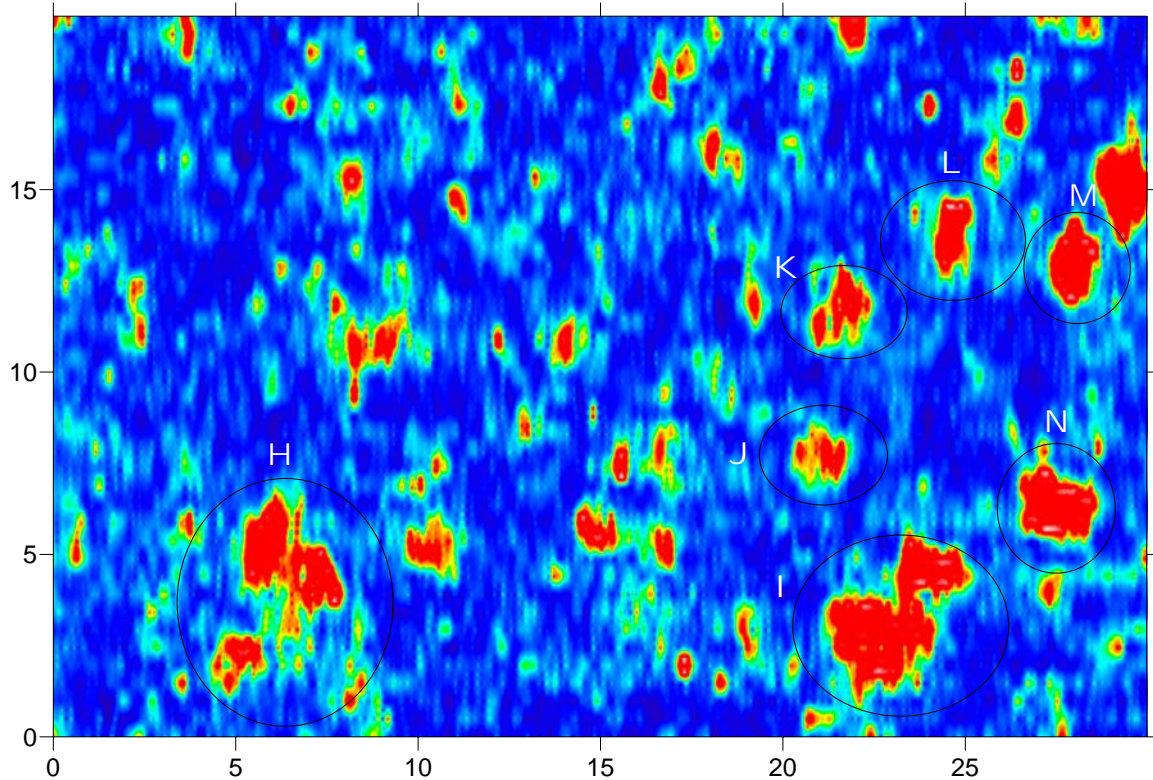


Figure 9. Strong Anomalies Located in Grid 2, 120 cmbs.

Anomalies H-N

Anomalies H-N are all strong anomalies that range in depth from 50-120 cmbs. Although the exact nature of these subsurface anomalies is uncertain, they appear to be deep pit features, possibly hand-dug wells.

GRID 3

Grid 3 was placed in the cemetery over the earliest POW graves (Figure 10). The burial of POWs at Andersonville began as single shafts and then as the number of dead increased, trench burials were conducted. This 6x45 m GPR grid was intended to look for the area where trench burials were begun. It was thought that a massive disturbance associated with trench burials should look very different from single burials.

Depth slices from 0-180 cmbs were analyzed (Figure 11). In the depth slices between 90-150 cmbs it appears that all of the graves in this early part of the cemetery were single burials. The bottom depth for the graves is 150-180 cmbs.



Figure 10. Grid 3, POW Cemetery.

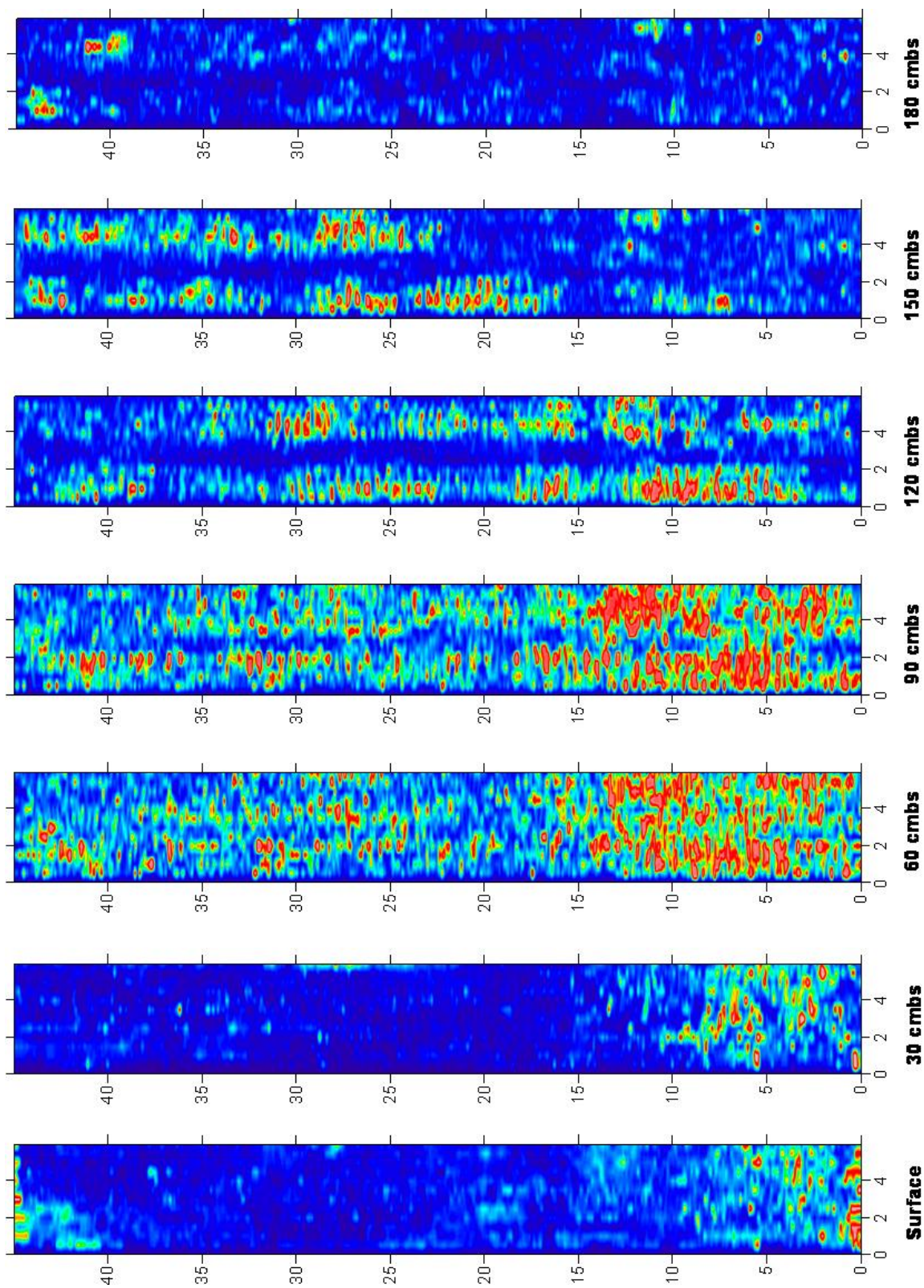


Figure 11. Depth Slices, Grid 3.

GRIDS 4 and 5

Grids 4 and 5 were each 30x30 m in size and placed adjacent to each other (Figure 12). Due to the fact that they were laid out with two common grid corners, they were able to be analyzed as one large 30x60 m grid. The purpose of this large grid was to find evidence of the Third Hospital. Park maps show the location of the Third Hospital between the Star Fort and the Second Hospital, just south of the park road.

Depth slices from 0-90 cmbs were examined for anomalies. Two areas of interest were selected for closer examination (Figure 13). Analysis of the line scan images revealed that these grids contain a great deal of metal objects.



Figure 12. Survey of Grids 4 and 5.

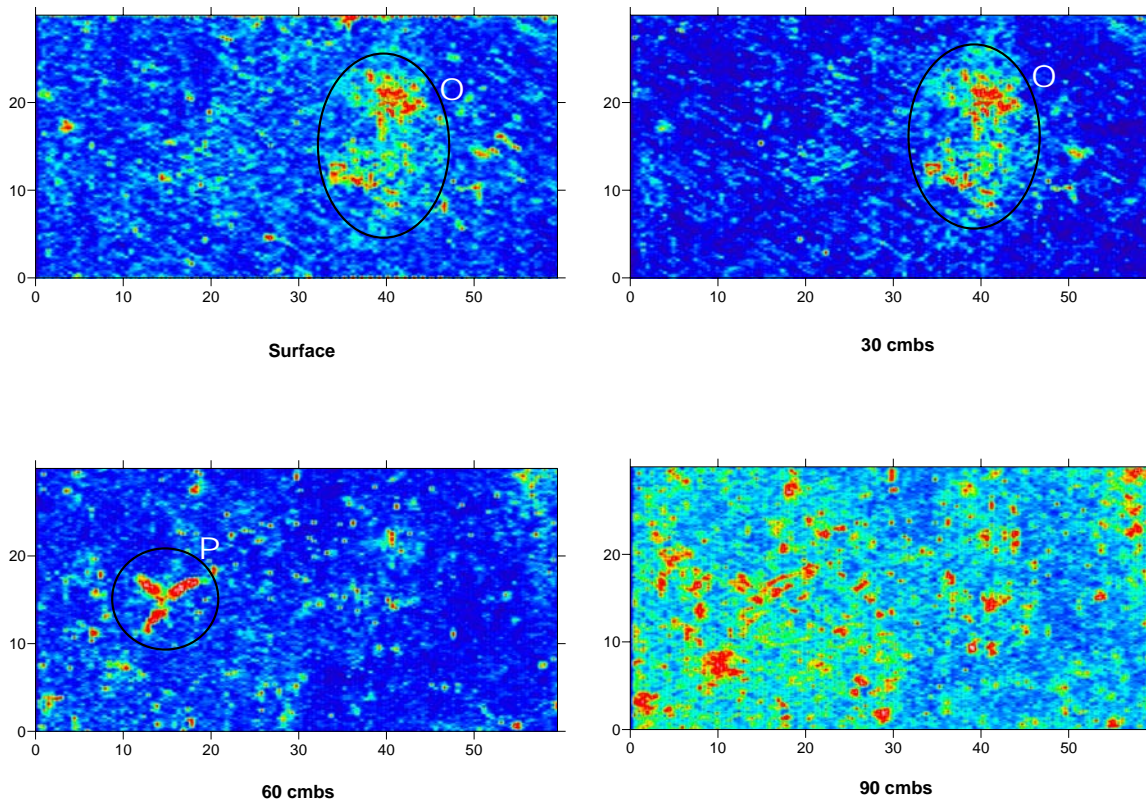


Figure 13. Anomalies Observed in Depth Slices from Grids 4 and 5.

Anomaly O

Anomaly O is visible near the center of Grid 5 from 0-30 cmbs. This anomaly initially was thought to be a debris field, however after close examination of the line scan images, it appears to be a discontinuous, highly reflective stratum. This may be the previous location of a structure.

Anomaly P

Anomaly P is a “Y” shaped anomaly near the center of Grid 4 at approximately 60 cmbs. The nature of this anomaly is a mystery and should be ground-truthed in the future.

GRID 6

Grid 6 was located in an open field just south of Prison Branch and just west of the South Gate. This 30x30 m grid was an attempt to find remnants of the Dead House. The Dead House is depicted on a 1900 map by the National Women's Relief Corps Survey (Prentice and Mathison 1989:10).

Analysis of depth slices revealed two very strong linear anomalies between 30-150 cmbs (Figure 14). No other anomaly patterns were observed and the Dead House was not located. The two parallel, linear features begin near the northeast corner of the grid and continue to the south, outside of the grid. The western most linear anomaly is highly reflective and the more prevalent of the two. The most likely explanation of these two linear features is that they represent segments of the outer and middle stockades. In 1975 Larson and Crook archaeologically documented a portion of the outer and middle stockade walls in the northern portion of the prison. The trench widths and depths were very similar to the dimensions documented for the inner stockade. Larson and Crook reported that the outer and middle stockades were 20 ft apart and the middle and inner stockades were 175 ft apart (1975:5-14). In Grid 6 the two linear anomalies are approximately 20 ft apart and they are oriented parallel to the inner stockade wall feature documented in Grid 1 (Figure 15). The potential middle stockade of Grid 6 is also approximately 183 ft from the inner stockade in Grid 1, corresponding to the results from 1975.

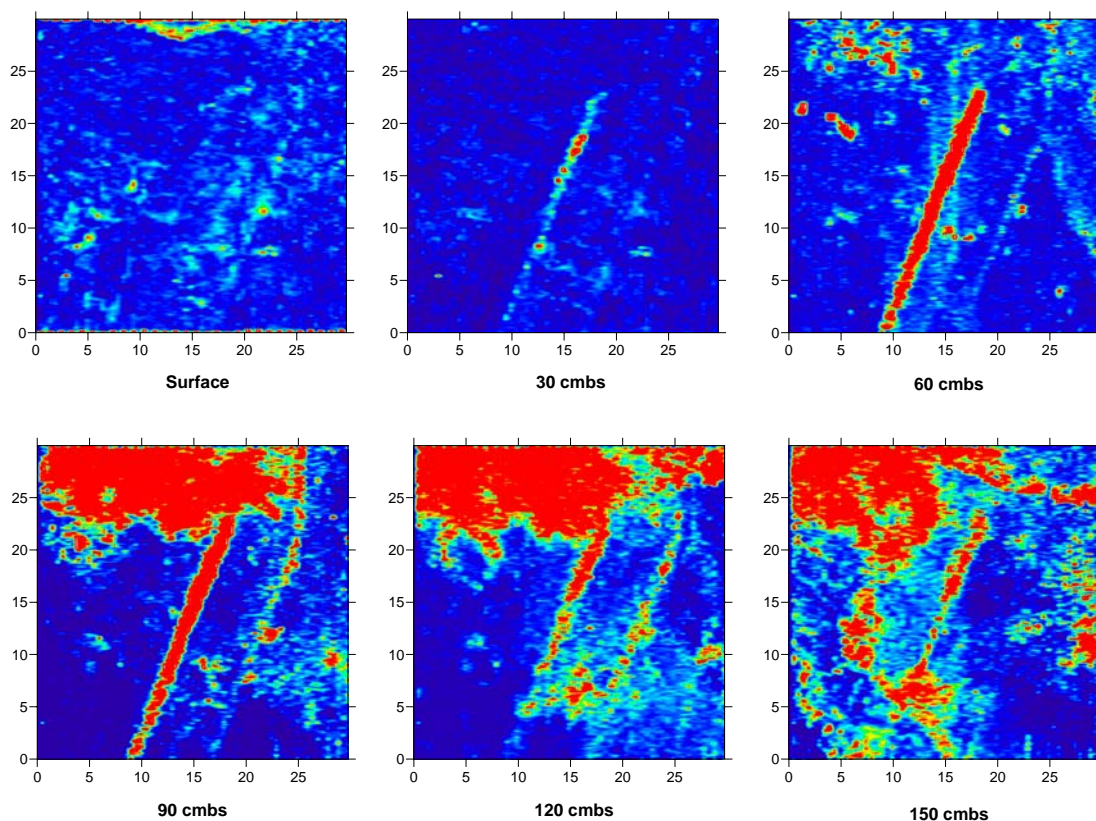


Figure 14. Depth Slices from Grid 6.

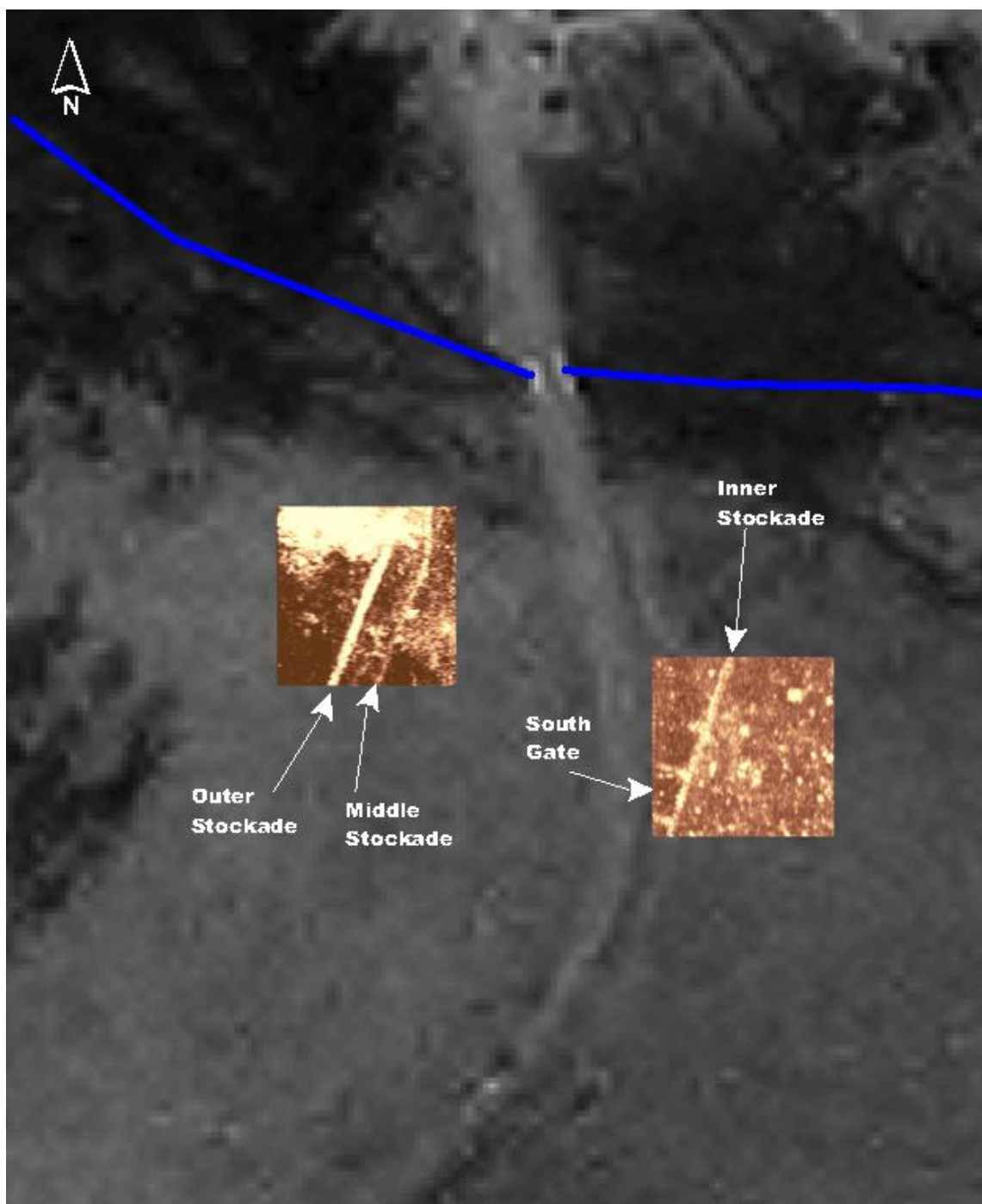


Figure 15. Outer, Middle, and Inner Stockades located in Grids 1 and 6.

GRID 7

Grid 7 was placed in the southeast corner of the prison. This area was previously investigated by Prentice and Prentice in 1990. The purpose of this 30x30 m grid was to locate features within the prison stockade and to see what a previously excavated area would look like with the GPR.

Analysis of the depth slices from Grid 7 revealed a well defined stockade wall corner and numerous anomalies within the prison walls (Figure 16).

Southeast Corner

The southeast prison corner is clearly visible in all slices between 0-150 cmbs. The upper most slices also revealed the trenches created by the box blade used in the 1990 investigation (Prentice and Prentice 1990).

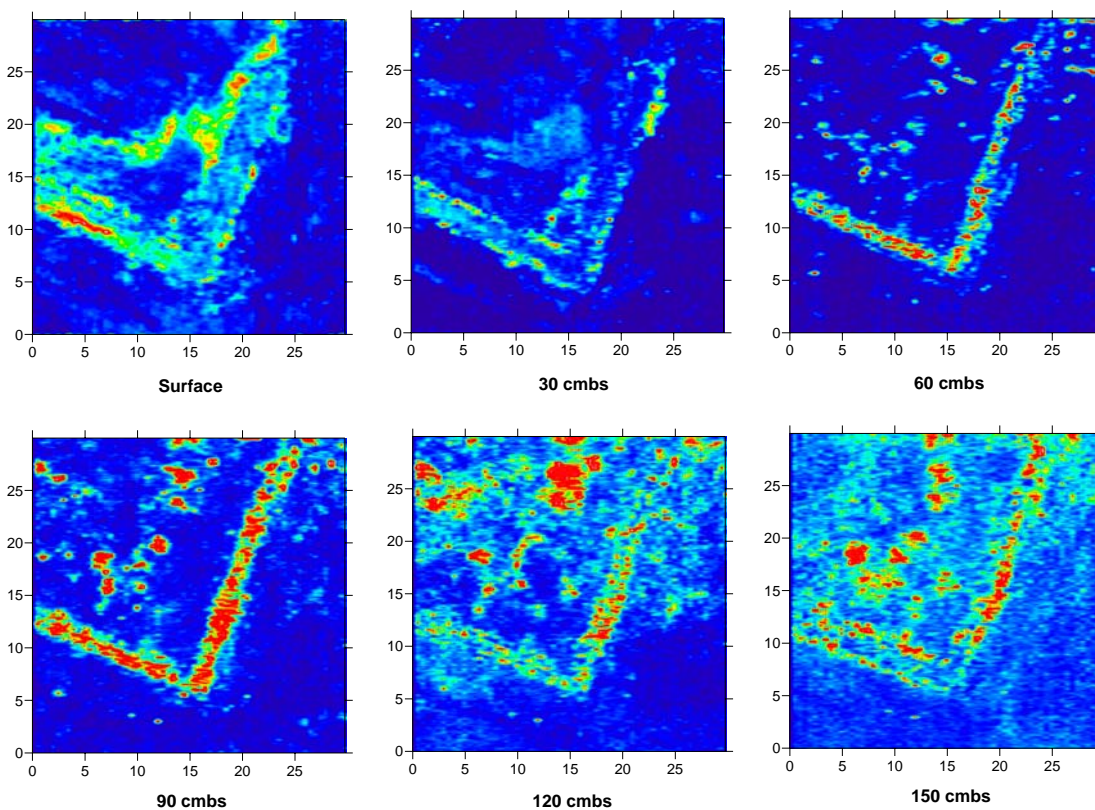


Figure 16. Depth Slices from Grid 7.

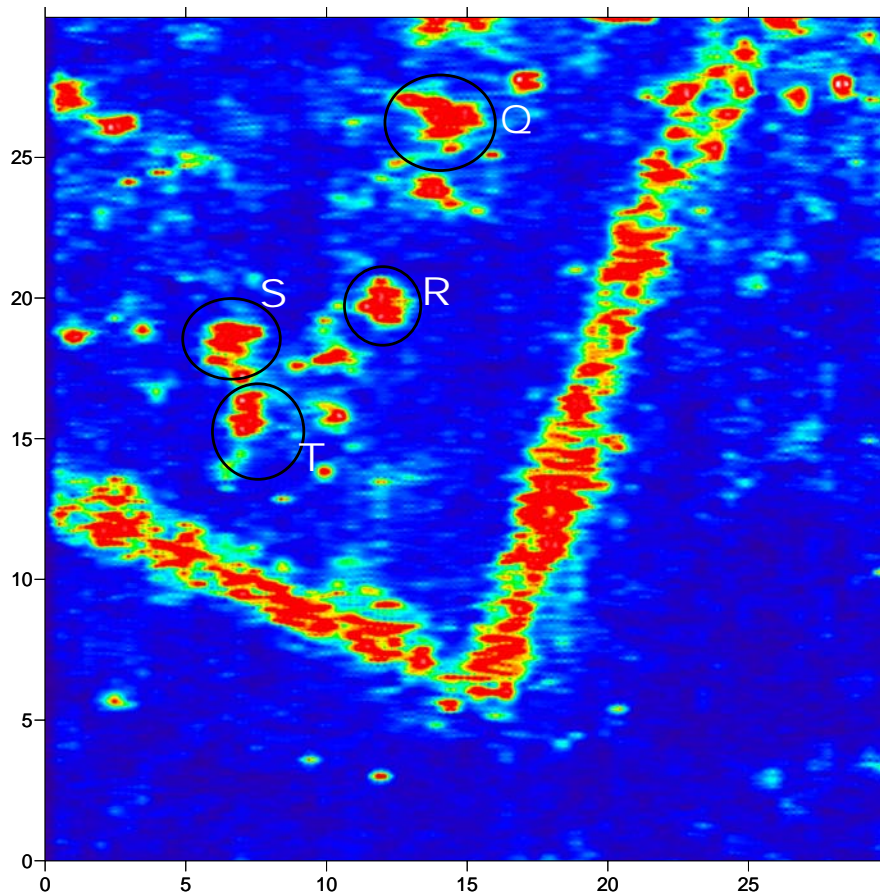


Figure 17. Strong Anomalies Located in Grid 7.

Anomalies Q-T

Anomalies Q-T vary slightly when viewed as 2-D line scan images. They all appear to be deep pit-like features. Only ground truthing will reveal their true nature.

CONCLUSIONS

The GPR survey of Andersonville National Historic Site proved to be a great success. A large number of subsurface anomalies were detected in each of the seven GPR grids. Some of these anomalies, such as stockade walls and the South Gate, were distinct enough to evaluate exactly what they represent. The interior of the prison contained numerous deep circular pit features that most likely represent hand dug wells and pits dug for shelter. The soil conditions and nature of the subsurface anomalies provided near optimal conditions for producing quality GPR data. Each of the seven GPR grids produced strong anomalies that should be the target of future subsurface investigation in order to compare the GPR results with archaeological investigations. It is also recommended that any future archaeological work at Andersonville utilize GPR as an initial survey technique.

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Prentice, Guy and Marie Mathison

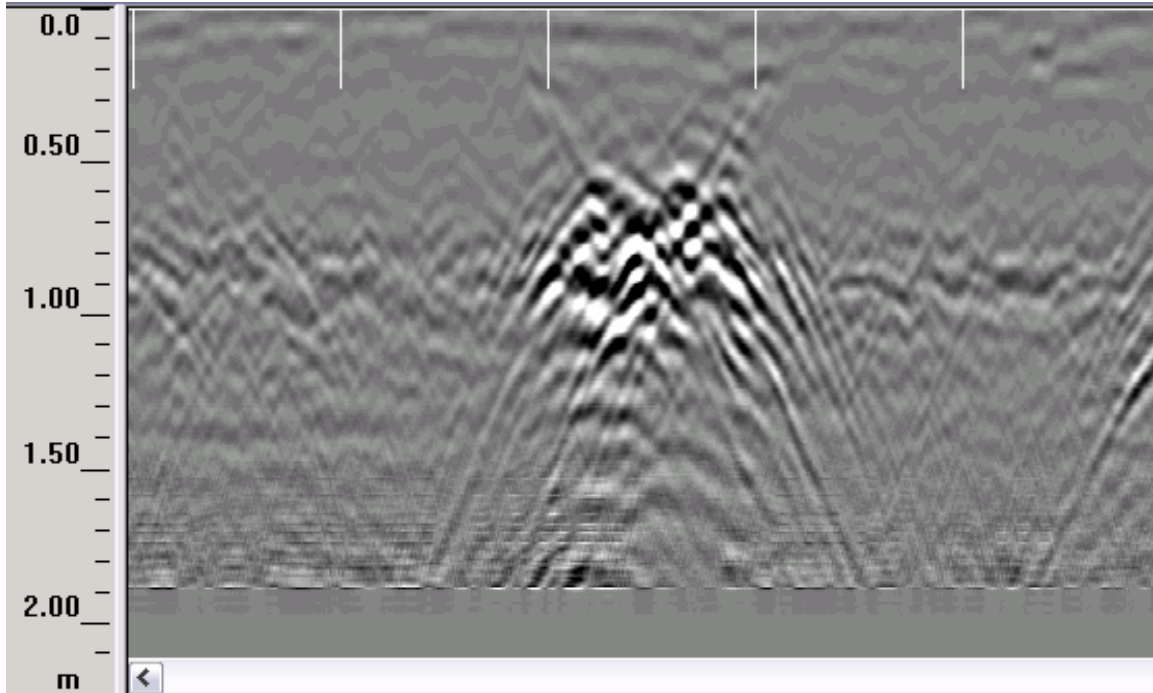
1989 Archeological Investigations of the North Gate at Andersonville National Historic Site. National Park Service, Southeast Archeological Center, Tallahassee.

Prentice, Marie and Guy Prentice

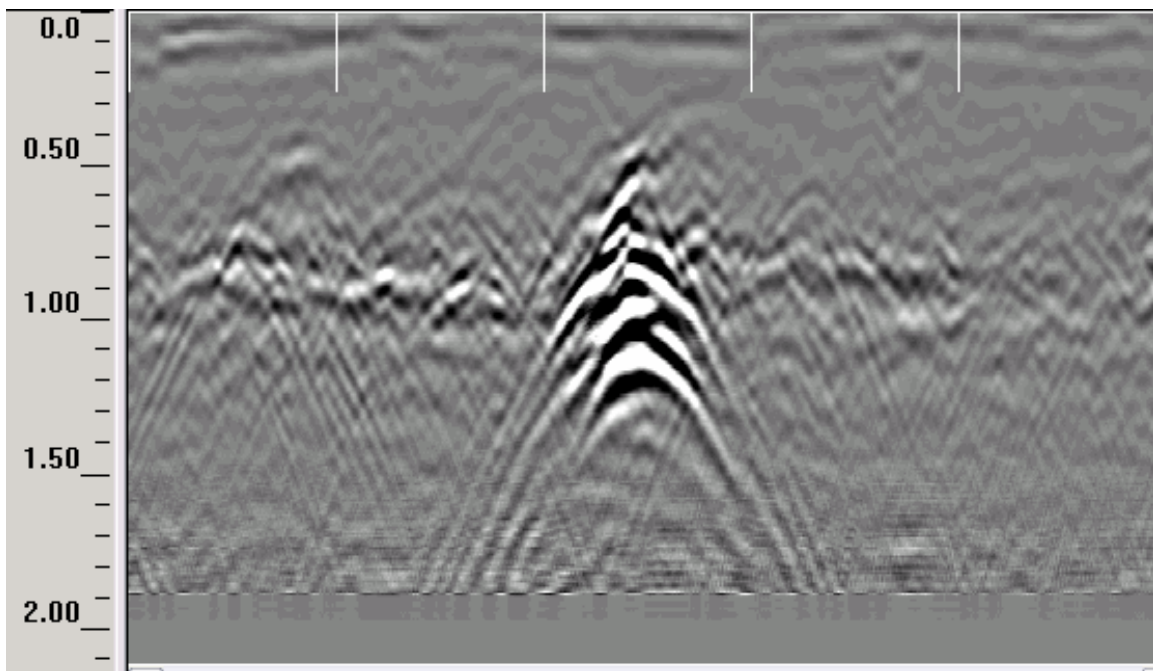
1990 Archeological Investigations of the Southeast Corner of the Inner Stockade at Andersonville National Historic Site, Georgia. National Park Service, Southeast Archeological Center, Tallahassee.

APPENDIX A

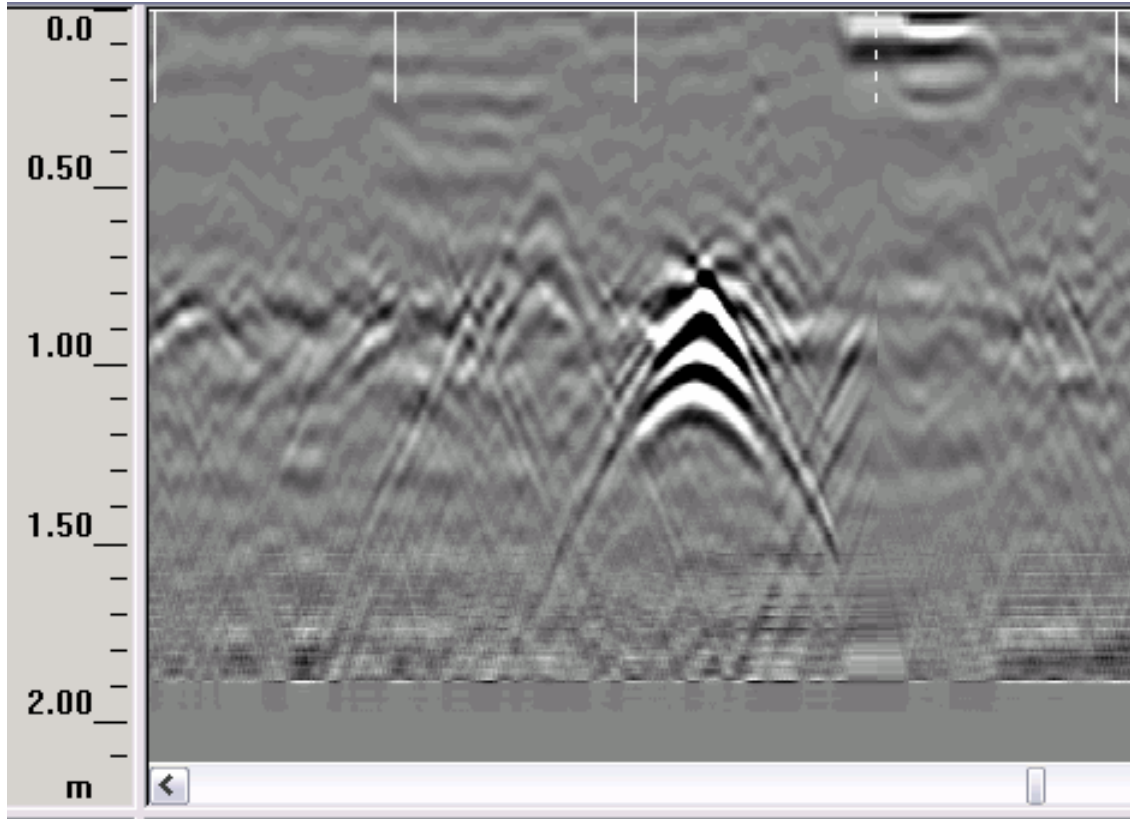
LINE SCAN IMAGES OF SELECTED ANOMALIES



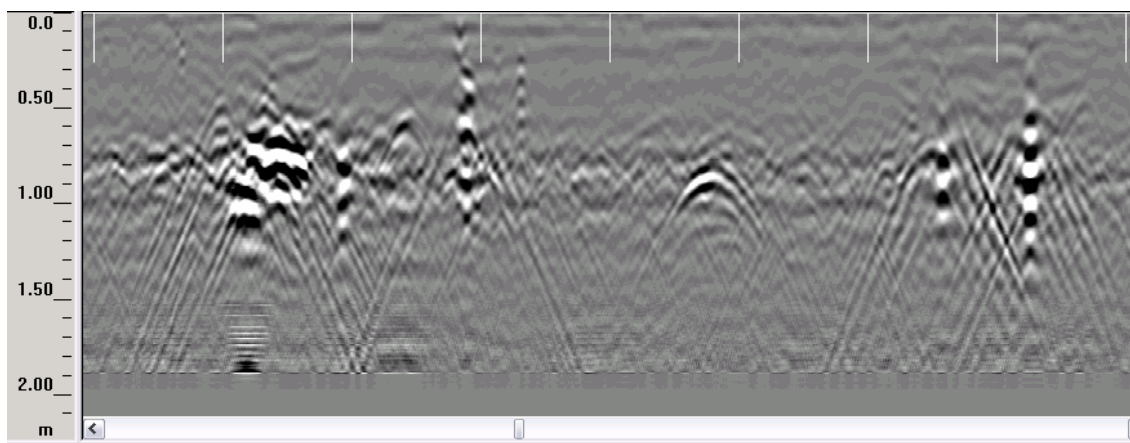
Anomaly A, Grid 1.



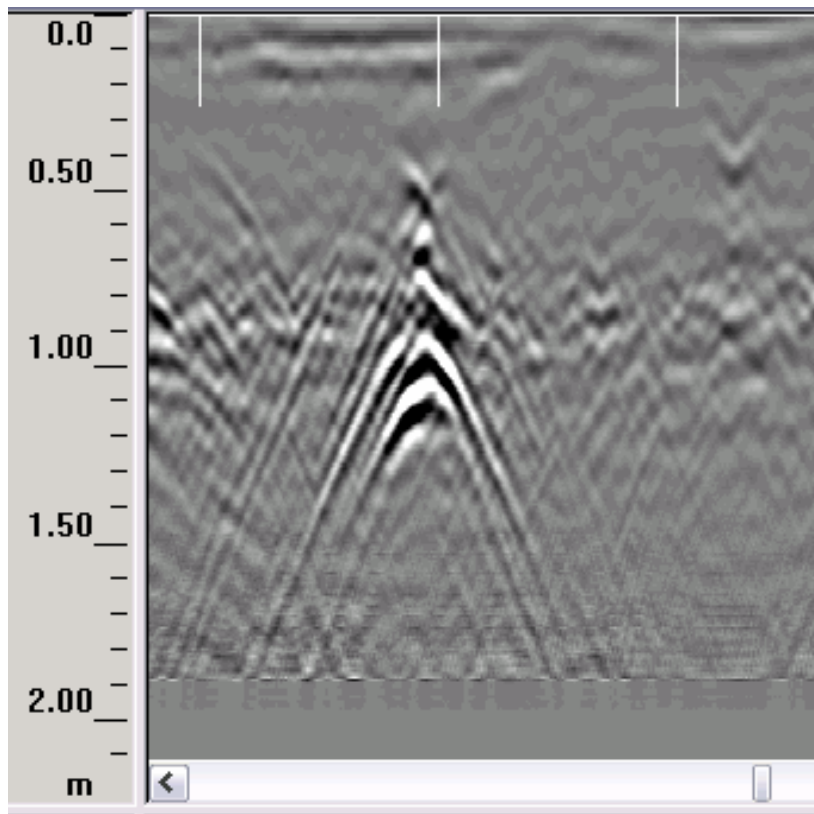
Anomaly B, Grid 1.



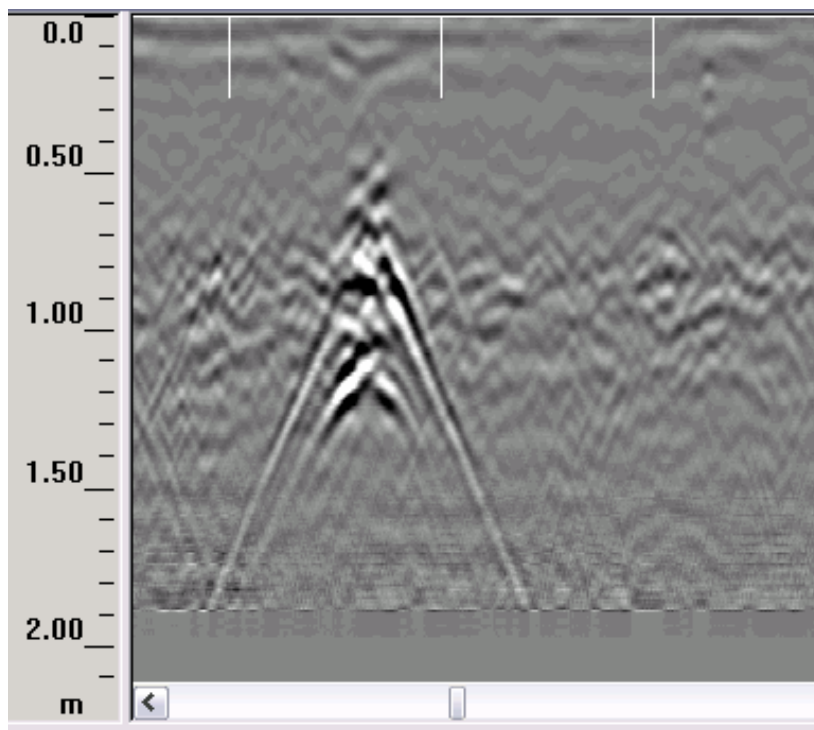
Anomaly C, Grid 1.



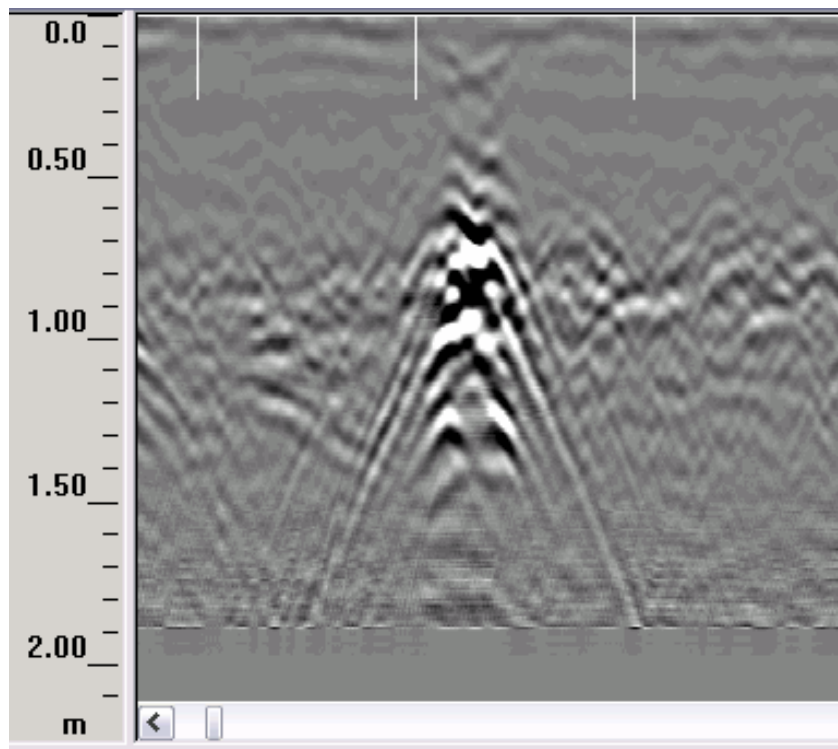
Anomaly D, Grid 1.



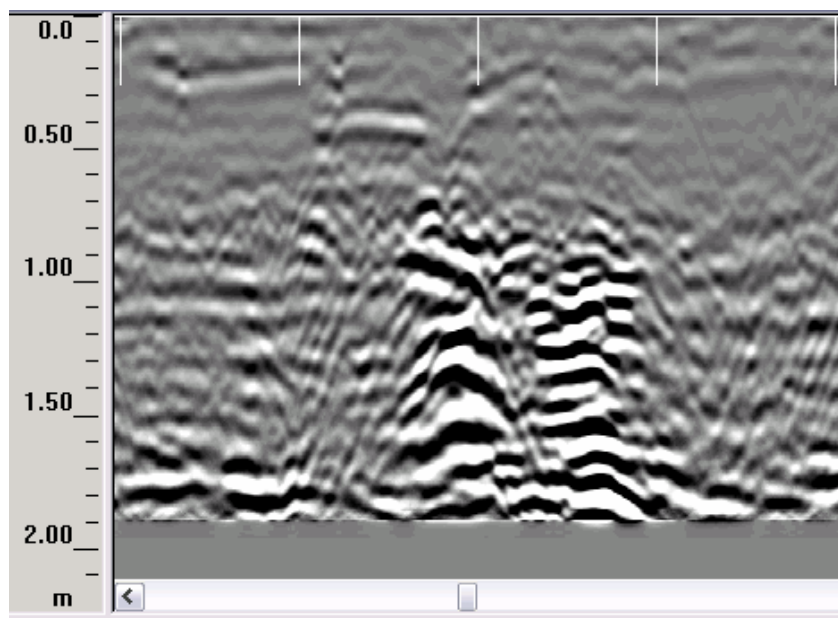
Anomaly E, Grid 1.



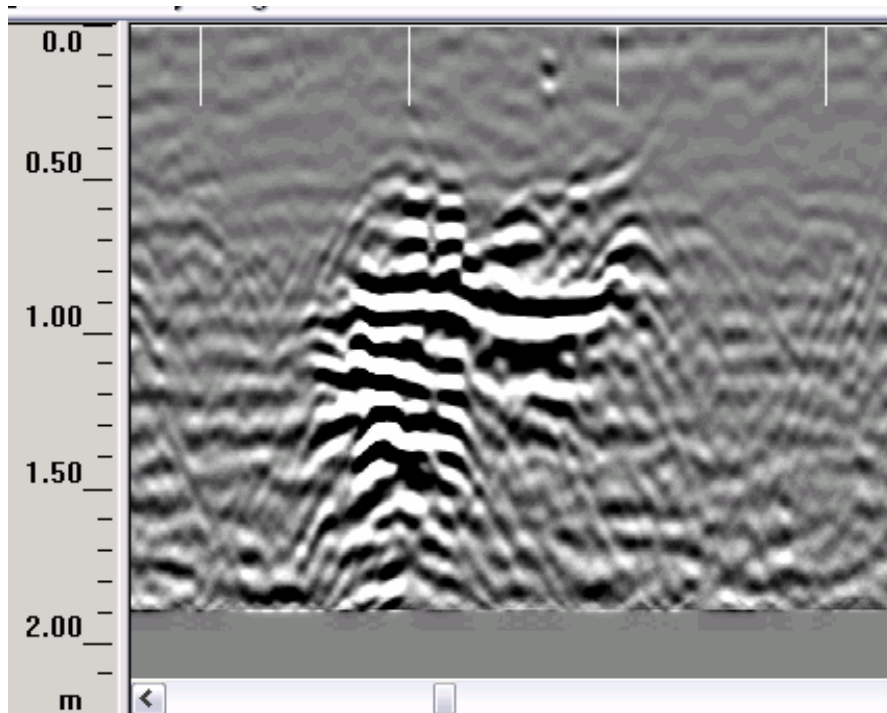
Anomaly F, Grid 1.



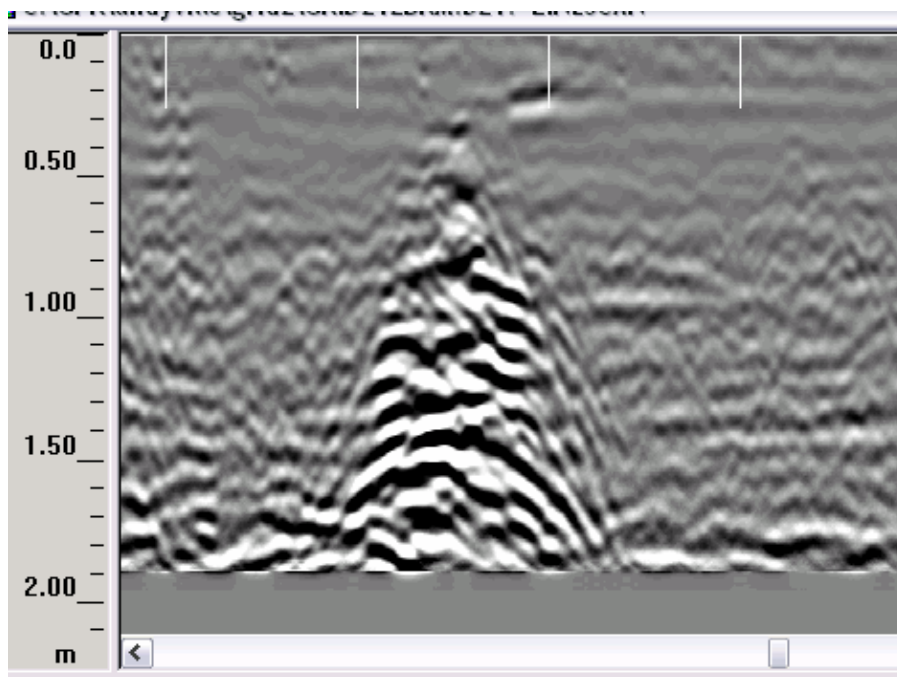
Anomaly G, Grid 1.



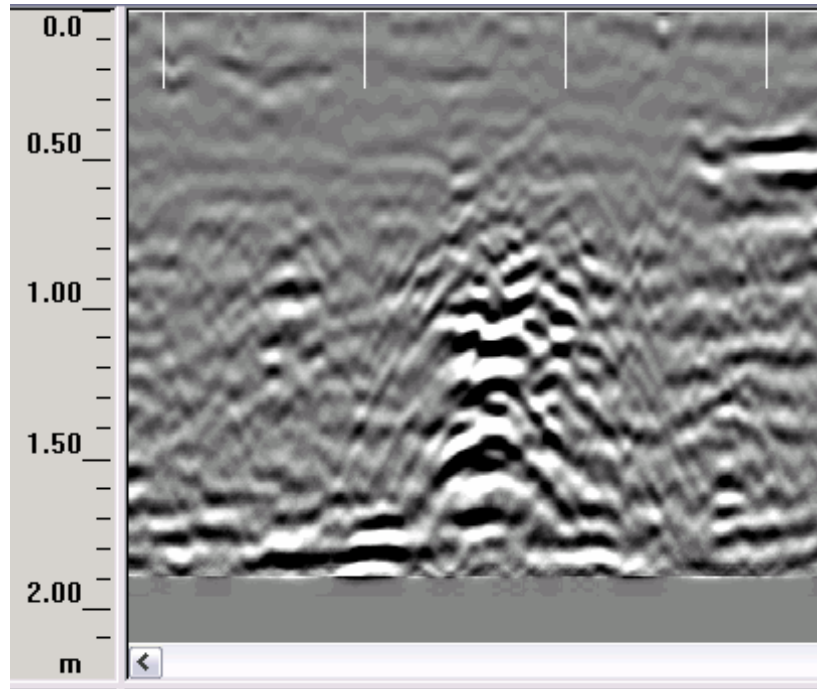
Anomaly H, Grid 2.



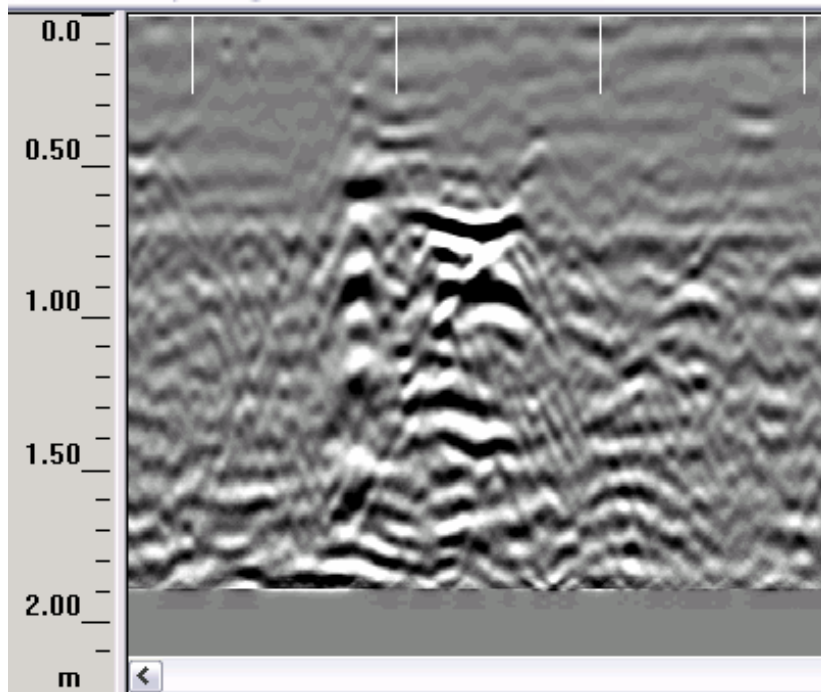
Anomaly I, Grid 2.



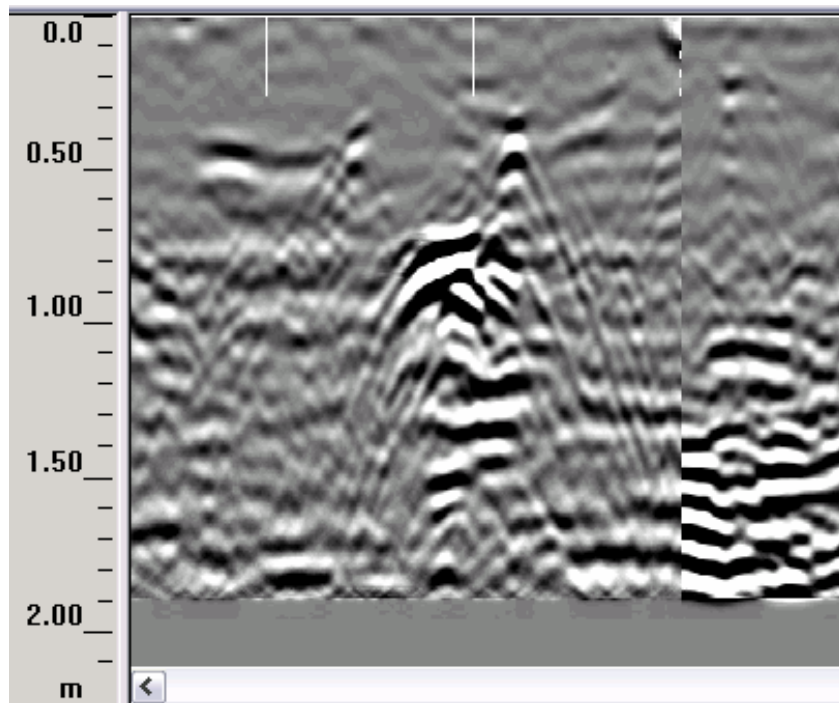
Anomaly J, Grid 2.



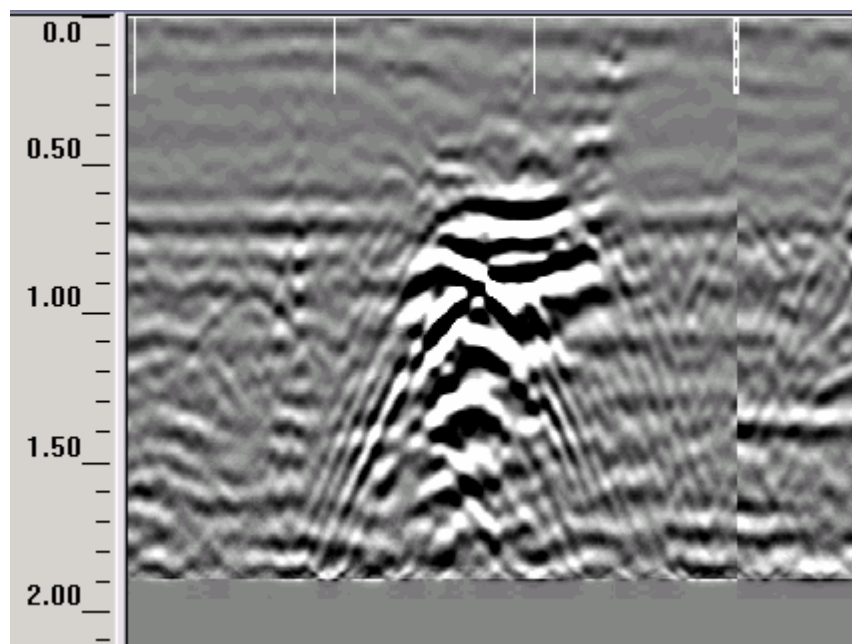
Anomaly K, Grid 2.



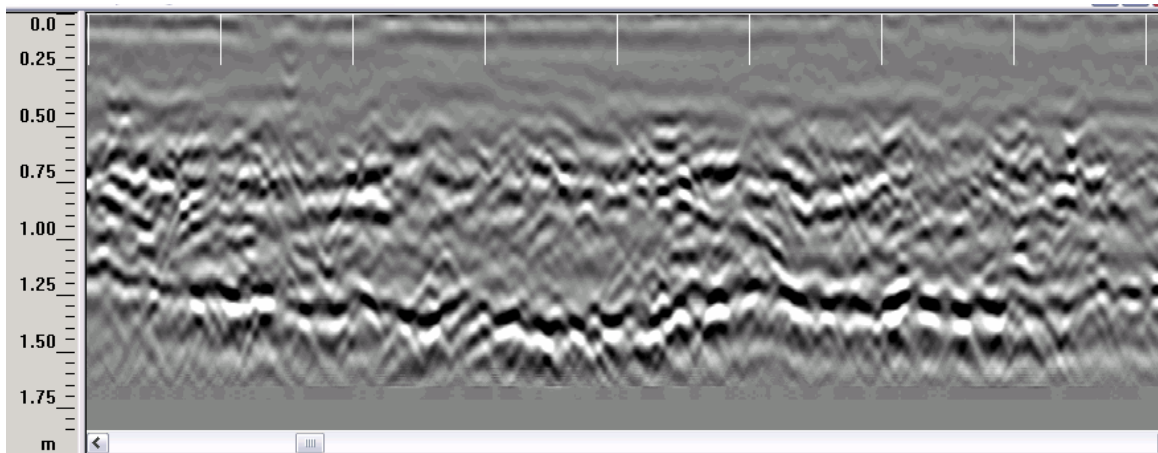
Anomaly L, Grid 2.



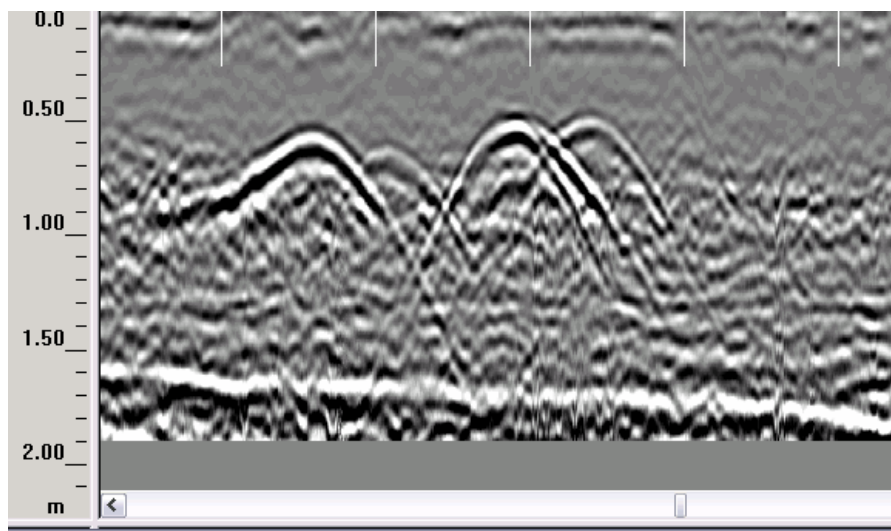
Anomaly M, Grid 2.



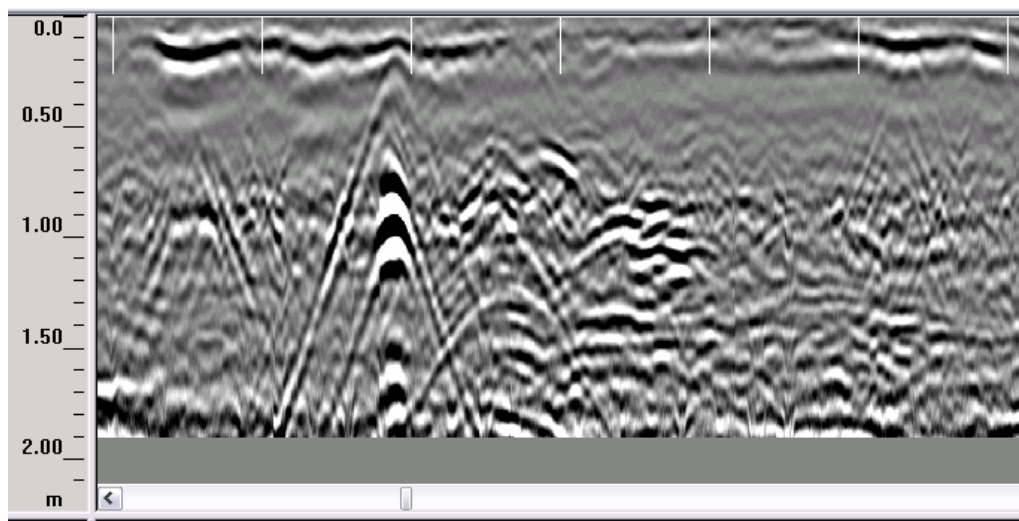
Anomaly N, Grid 2.



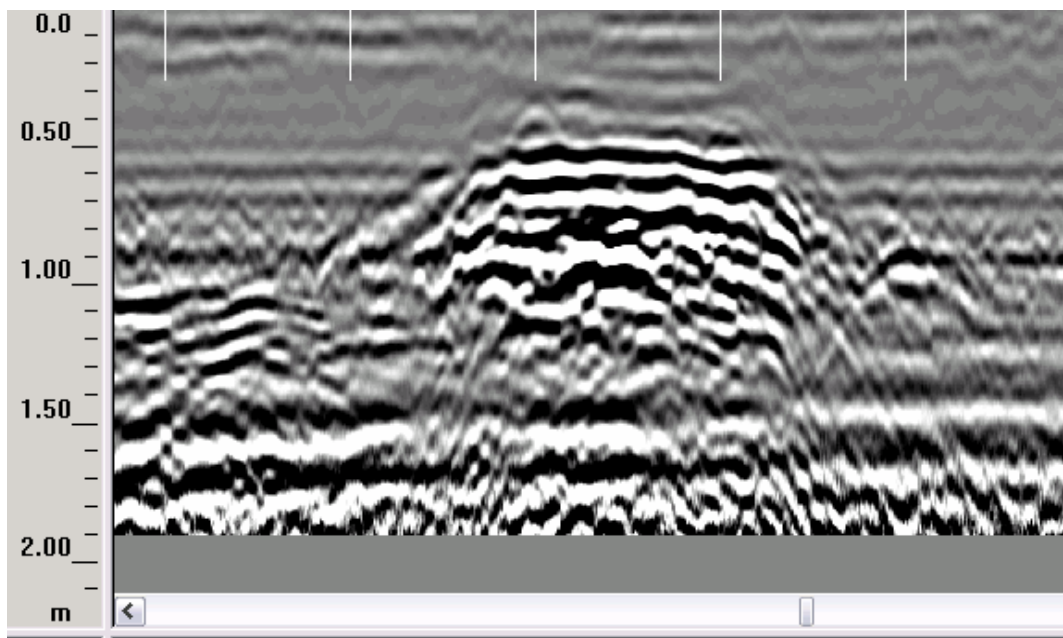
Grid 3 Anomalies.



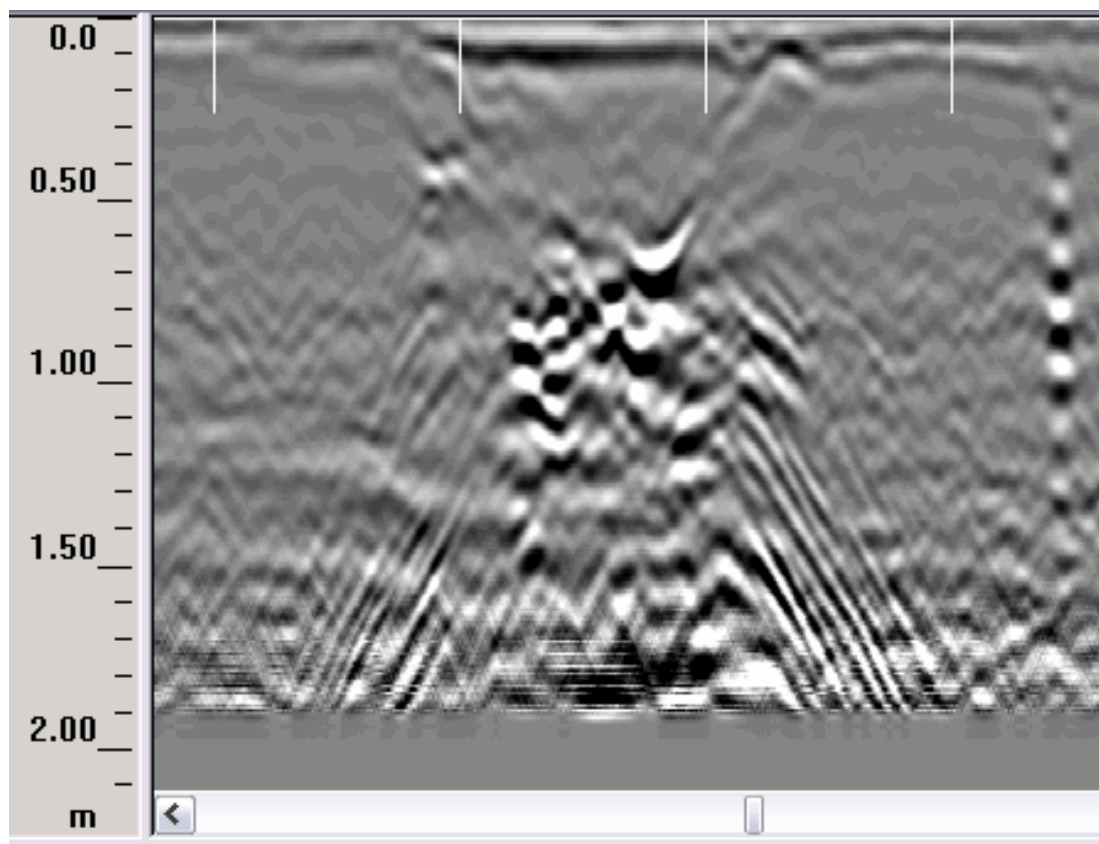
Anomaly P, Grid 4.



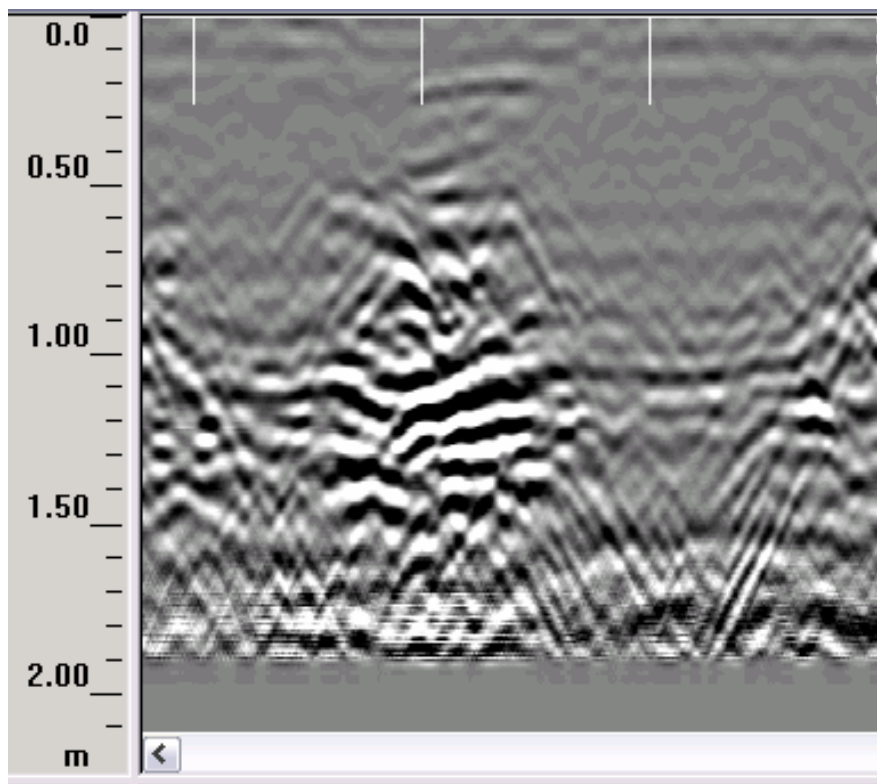
Anomaly O, Grid 5.



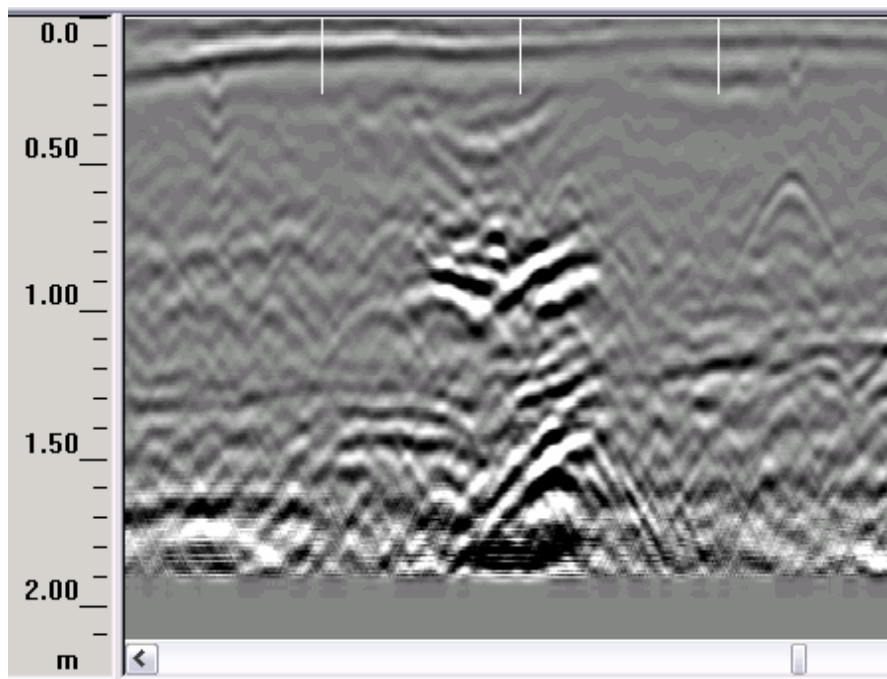
Linear Anomaly, Grid 6.



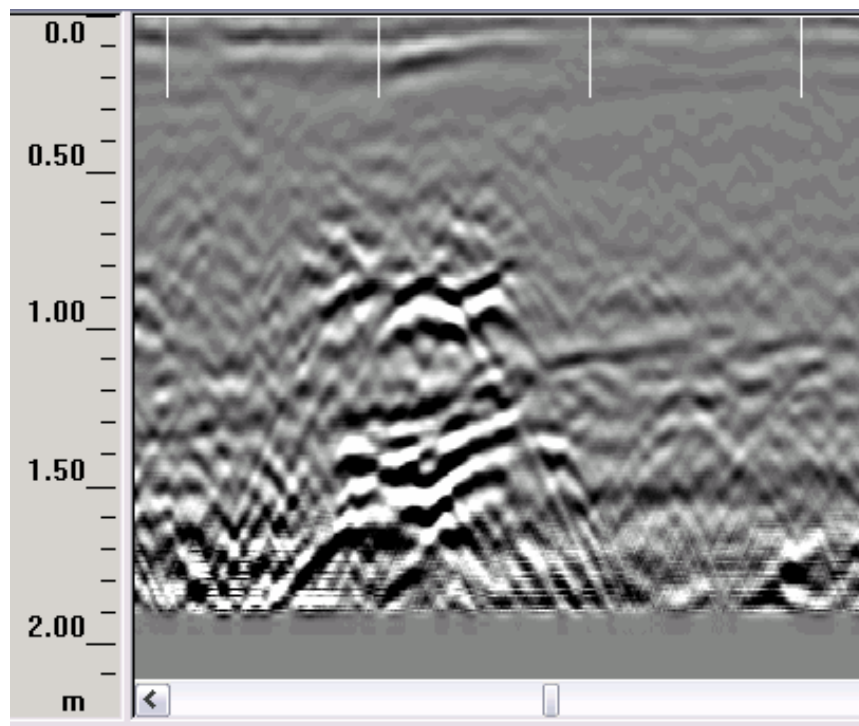
Stockade Wall, Grid 7.



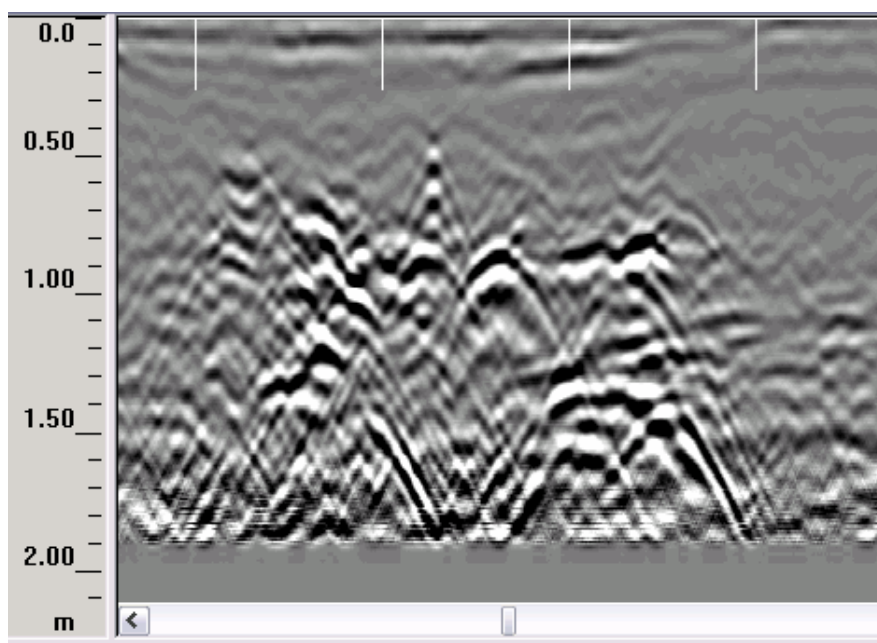
Anomaly Q, Grid 7.



Anomaly R, Grid 7.



Anomaly S, Grid 7.



Anomaly T, Grid 7.