

**United States
Department of
Agriculture**

**Natural Resources
Conservation
Service**

**5 Radnor Corporate Center,
Suite 200
Radnor, PA 19087-4585**

Subject: Geophysical Assistance -- Archaeological

Date: 2 November 1998

To: Margo L. Wallace
State Conservationist
USDA-NRCS,
16 Professional Road
Storrs, Connecticut 06268-1299

PURPOSE:

To assist Connecticut NRCS Staff, the Connecticut State Archaeologist, and students enrolled in the Hartford Renaissance Magnet program at the Lewis Fox Middle School assess the number and locations of African-American graves within the "Ancient Burying Grounds", Hartford, Connecticut.

PARTICIPANTS:

Nicholas Bellantoni, Connecticut State Archaeologist, University of Connecticut, Storrs, CT
Rudy Chlanda, Geologist, USDA-NRCS, Amherst, MA
Howard Denslow, Resource Conservationist, USDA-NRCS, Storrs, CT
Jim Doolittle, Research Soil Scientist, USDA-NRCS, Radnor, PA
Shawn McVey, Asst. State Soil Scientist, USDA-NRCS, Storrs, CT
Pamela Silvestri, Archaeologist, Vernon, CT

ACTIVITIES:

All field activities were completed on 26 October 1998.

EQUIPMENT:

The ground-penetrating radar (GPR) unit used in this study was the Subsurface Interface Radar (SIR) System-2, manufactured by Geophysical Survey Systems, Inc.¹ The SIR System-2 consists of a digital control unit (DC-2) with keypad, VGA video screen, and connector panel. A 12-volt battery powered the system. Morey (1974), Doolittle (1987), and Daniels and others (1988) have discussed the use and operation of GPR. The antenna used was the model 5103 (400 mHz).

To help summarize the results of this study, the SURFER for Windows software program developed by Golden Software Inc. was used to construct two-dimensional simulations.² Grids were created using kriging methods.

BACKGROUND:

A group of Hartford middle-students initiated a research project to better understand the histories of slaves and freed African-Americans interred within the "Ancient Burying Grounds," Hartford, Connecticut. These students have found evidence that over 300 African-Americans were buried within the "Ancient Burying Grounds" in unmarked graves. At the request of the student's teacher, Ms. Billie Anthony, and the Connecticut State Archaeologist, Nicholas Bellantoni, NRCS provided ground-penetrating radar field assistance.

¹ Trade names have been used in this report to provide specific information. Their use does not constitute endorsement.

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Killam (1990) believes that most bones are too small and not directly detectable with GPR. This author noted that the disruption of soil horizons makes most graves and some cultural features detectable. However, in soils that lack contrasting horizons or geologic strata, the detection of a grave shaft is improbable. In addition, with the passage of time, natural soil-forming processes erase signs of disturbances.

In highly attenuating soils, profiling depths are restricted and many subsurface features are not directly sensed with GPR. Under highly attenuating conditions, the location and identification of buried cultural features are frequently inferred from bowed, disrupted, or disturbed soil horizons. At many sites, the most distinctive feature of a grave is the disturbed soil materials that fill and cover the grave shaft (Bevan, 1991). However, caution must be exercised in interpreting these features as a number of artificial and natural processes can produce disturbed soil conditions.

Cultural features are difficult to distinguish in soils having numerous rock fragments, roots, animal burrows, modern cultural features, debris or fill layers. These scattering bodies produce undesired subsurface reflections that complicate radar imagery and can mask reflections from buried cultural features. Frequently, "desired" cultural features are indistinguishable from background clutter. In soils having numerous scattering bodies, GPR surveys often provide little meaningful information to supplement traditional sampling methods (Bruzewicz et al., 1986). The identification of buried cultural features were complicated by scattering bodies in surveys conducted by Bevan (1991), Dolphin and Yetter (1985), Doolittle (1988), and Vaughan (1986).

Results:

Radar profiles collected within the cemetery were interpretable and contained an abundance of subsurface information. Depth of observation, while unconfirmed, was considered adequate for the detection of burials (a scanning time of 40 nanoseconds was used). A cursory review of the radar profiles revealed numerous point and planar reflectors. The radar records contain an abundance of additional, less expressed point reflectors. These may also represent burials. However, because of their poor expression, interpretations were considered imprudent without some ground-truth verification of the faint imagery. Other reflectors were more strongly expressed on radar profiles. Forty-seven of these reflectors were considered to be *very conspicuous*. Some of these prominent point reflectors are believed to represent burials. Some may represent rock fragments, roots, or other buried cultural features.

The approximate locations of point reflectors are plotted in Figure 1. The alignment of two or more point reflectors frequently provides strong evidence of a burial. In Figure 1, several point reflectors located in adjacent rows are aligned. These aligned reflectors provide stronger indications of possible burials. A prominent, subsurface planar reflector was evident on 6 radar traverses. Though irregularly shaped, the area occupied by this reflector was adjoining on consecutive radar profiles. The strong reflection from this reflector suggests a buried cultural layer or feature.

CONCLUSIONS:

1. Interpretations contained in this report are considered preliminary estimates of site conditions. These interpretations do not substitute for direct observations, but rather reduce their number, direct their placement, and supplement their interpretations. Interpretations should be verified by ground-truth observations.
2. A large number of buried point reflectors were identified within the grid. Some of these reflectors are believed to represent burials. A review of the radar profiles showed that several point reflectors are aligned and suggest eleven likely burials. Location maps have been prepared for the two surveyed areas. These maps may help archaeologists develop search strategies.
3. A high probability exists that unmarked graves are present in the area surveyed with GPR. As the radar detects but does not identify subsurface features, it is uncertain whether these features represent the graves of African-Americans.
4. Copies of the radar profiles from the Ancient Burial Grounds have been turned over to Nicholas Bellantoni for use and further interpretations.

It was my pleasure to be of some assistance to you, your staff, and the students of the Lewis Fox Middle School.

With kind regards,

James A. Doolittle
Research Soil Scientist

cc:

N. Bellantoni, State Archaeologist, Connecticut State Museum of Natural History, U-214, Storrs, CT 06269-4214
J. Culver, Acting Director, USDA-NRCS, National Soil Survey Center, Federal Building, Room 152, 100 Centennial Mall North, Lincoln, NE 68508-3866
H. Denslow, Resource Conservationist, USDA-NRCS, 16 Professional Park Road, Storrs, CT 06268-1299
C. Olson, National Leader, Soil Survey Investigations, USDA-NRCS, National Soil Survey Center, Federal Building, Room 152, 100 Centennial Mall North, Lincoln, NE 68508-3866.
S. McVey, Assistant State Soil Scientist, USDA-NRCS, 16 Professional Park Road, Storrs, CT 06268-1299
H. Smith, Director of Soils Survey Division, USDA-NRCS, Room 4250 South Building, 14th & Independence Ave. SW, Washington, DC 20250

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Locations of Prominent Point Anomalies
Detected with GPR
"Ancient Burying Ground"
Hartford, Connecticut

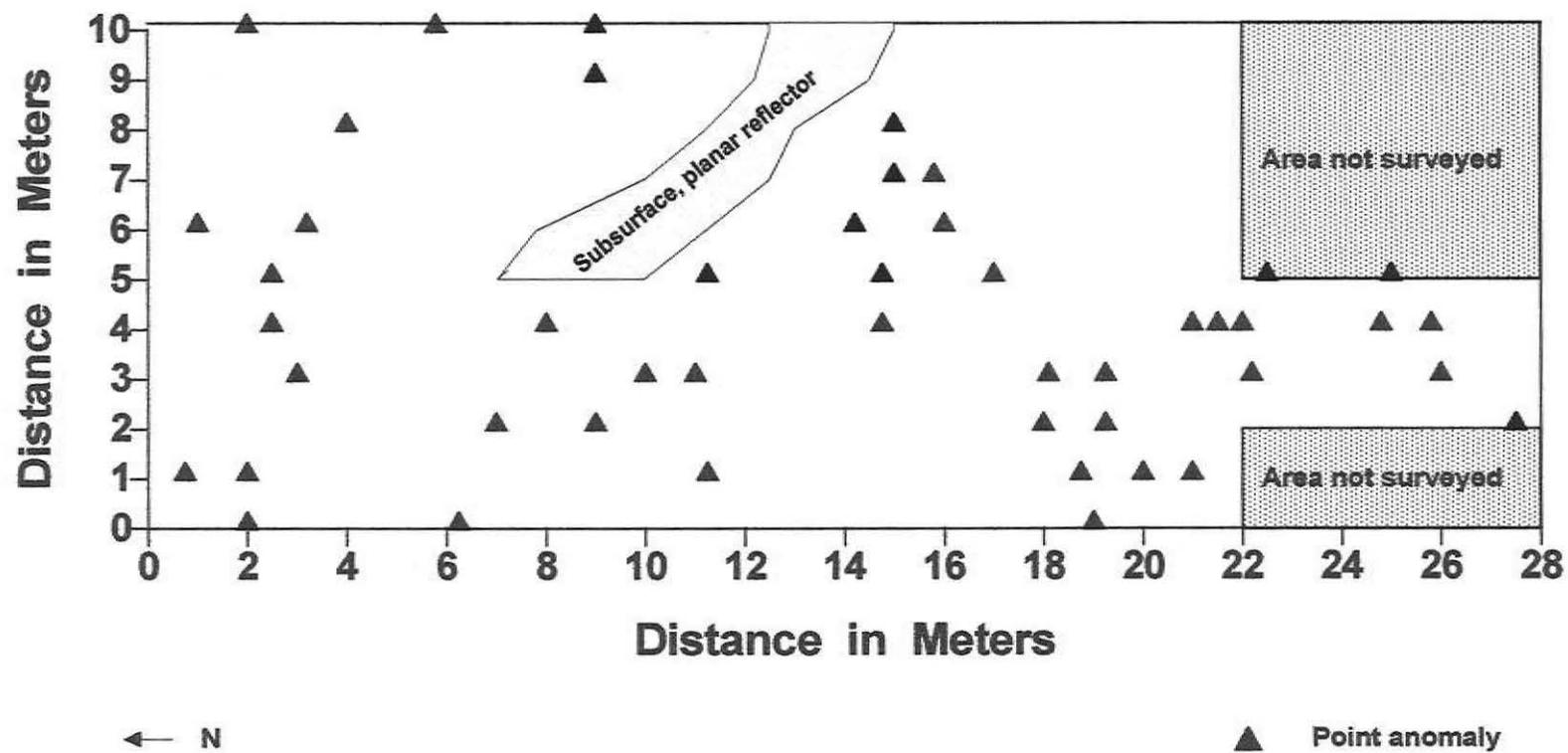


Figure 1