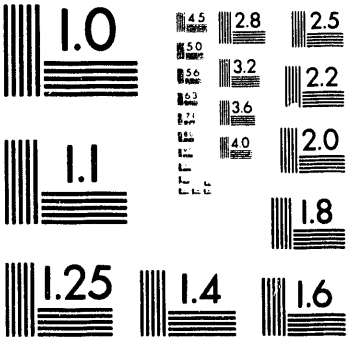

1.0
1.1
1.25
1.4
1.6
1.8
2.0
2.2
2.5
2.8
3.2
3.6
4.0
4.5
5.0
5.6
6.3
7.1
8.0
9.0

1 of 1

SUPPORTING DOCUMENT

1. Total Pages 8

2. Title	3. Number	4. Rev No.
Geophysical Investigation of 218-W-4C Trenches #3 and #4, 200 West	WHC-SD-EN-TI-174	0

5. Key Words

Radar, GPR

APPROVED FOR PUBLIC RELEASE
8/10/93 N. Solis

6. Author

Name: J. P. Kiesler
[illegible]

K.A. Bergstrom for J.P. Kiesler 7-9-93
Signature

Organization/Charge Code 81234/ATC24

7. Abstract

J. P. Kiesler, K. A. Bergstrom, T. H. Mitchell, 1993, Geophysical Investigation of 218-W-4C Trenches #3 and #4, 200 West, WHC-SD-EN-TI-174 Rev. 0, Westinghouse Hanford Company, Richland, Washington

8. PURPOSE AND USE OF DOCUMENT - This document was prepared for use within the U.S. Department of Energy and its contractors. It is to be used only to perform, direct, or integrate work under U.S. Department of Energy contracts. This document is not approved for public release until reviewed.

PATENT STATUS - This document copy, since it is transmitted in advance of patent clearance, is made available in confidence solely for use in performance of work under contracts with the U.S. Department of Energy. This document is not to be published nor its contents otherwise disseminated or used for purposes other than specified above before patent approval for such release or use has been secured, upon request, from the Patent Counsel, U.S. Department of Energy Field Office, Richland, WA.

DISCLAIMER - This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, nor any of their contractors, subcontractors or their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or any third party's use or the results of such use of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof or its contractors or subcontractors. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

9. Impact Level 4

10. RELEASE STAMP

OFFICIAL RELEASE (11)
BY WHC
DATE AUG 11 1993
Station # 12

A-6400-073 (11/91) (EF) WEF124

MASTER

DISTRIBUTION OF THIS DOCUMENT IS UNLIMITED

Preliminary Geophysical Investigation of Burial Ground 218-W-4C, Trenches #1 and #4, 200 West.

Objective

The objective of these surveys was to determine the effectiveness of Ground-Penetrating Radar (GPR) for defining the depth and location of barrels in Burial Ground 218-W-4C, 200 West area (Figure 1). GPR data were collected in a portion of trench #1-module 3 and trench #4.

Ground-Penetrating Radar Methodology

The Ground-Penetrating Radar (GPR) system used for this work utilized a 300-megahertz (MHz) antenna to transmit the electromagnetic (EM) energy into the ground. A percentage of the transmitted energy is reflected back to a receiving antenna where variations in the return signal are recorded. Common reflectors include natural geologic conditions such as bedding, cementation, moisture and clay, or man-made objects such as pipes, barrels, foundations and buried wires.

Depth of penetration, which varies with changes in geology, ranged from 10 to 15 feet for this survey. The method is limited in depth by transmit power, receiver sensitivity and attenuation of the transmitted energy. Depth of investigation is also limited by highly conductive materials, such as metal drums, which reflect all the transmitted energy, preventing investigation below such objects.

Display and interpretation of the data are similar to that of seismic reflection data. In some areas interpretations can be straight forward, however, unknown parameters within a highly variable subsurface often yield complex data.

Data for these surveys were collected with a Geophysical Survey Systems Inc. (GSSI) Subsurface Interface Radar (SIR)™ System 8, model 4800 and digitally stored on a GSSI DT6000A tape drive. A recording window of 100 nanoseconds, two-way travel time, was used.

Grid Location

The survey boundaries are rectangular, measuring 20 feet by 40 feet and 35 feet by 60 feet for trenches #1 and #4 respectively. Green stakes mark the corners of the grid. The long axis of each

---

™ A trademark of Geophysical Survey Systems Inc. (GSSI).

survey strikes approximately east-west and all distances were measured and posted in feet. The southwestern corner of the grids are designated E100/N100 and serve as the "origins" for the survey locations. The letters "N" or "E" refer to a direction that trends generally north or east respectively. The number refers to a distance in feet. For example, grid point E135/N120 lies 35 feet "east" and 20 feet "north" of grid point E100/N100.

Data were collected along two sets of profiles perpendicular to each other. Spacing between profiles was 5 feet .

Quality Control

These data were collected using procedures in WHC-CM-7-7 EII 11.2, Rev. 3, Environmental Investigations and Site Characterization Manual, Westinghouse Hanford Company. The data and records are stored in the Geophysics files. Figure 2 summarizes survey parameters.

Results

TRENCH #1, MODULE 3

The GPR data depicted three areas that are dominated by a strong reflective horizon 3-4 feet below the surface (Figure 3). The reflectors are interpreted to be the top of the uppermost barrels. GPR cannot see below this reflector. Two anomalies, seven and nine feet below the surface, were identified at N104/E133 and N118/E133. They appear to be isolated from the interpreted stack of barrels, but have a signature similar in character to that expected from an isolated barrel.

TRENCH #4

The western most edge of the buried barrels appears to be approximately E145 between N107 and N125, approaching E150 north of N125 (Figure 4). A north-south trending linear was detected about 4 feet below the surface near E142 between N110 and N135. The source of the linear is unknown but appears to be a result of localized soil conditions. Two additional disturbed zones were detected that may represent localized soil conditions, however, the possibility of the linear and disturbed zones being from buried man-made debris should not be eliminated without further investigation.

Recommendations

Locations and depths could be refined by using a 500-MHz antenna and by leveling the site prior to data collection. A 500-MHz

antenna will increase resolution but by itself would limit the depth of investigation to around 5 feet rather than the 10-15 feet achieved with the 300-MHz antenna. Collecting data with both 300-MHz and 500-MHz antennas would provide information from 5-15 feet and increase the resolution from 0-5 feet.

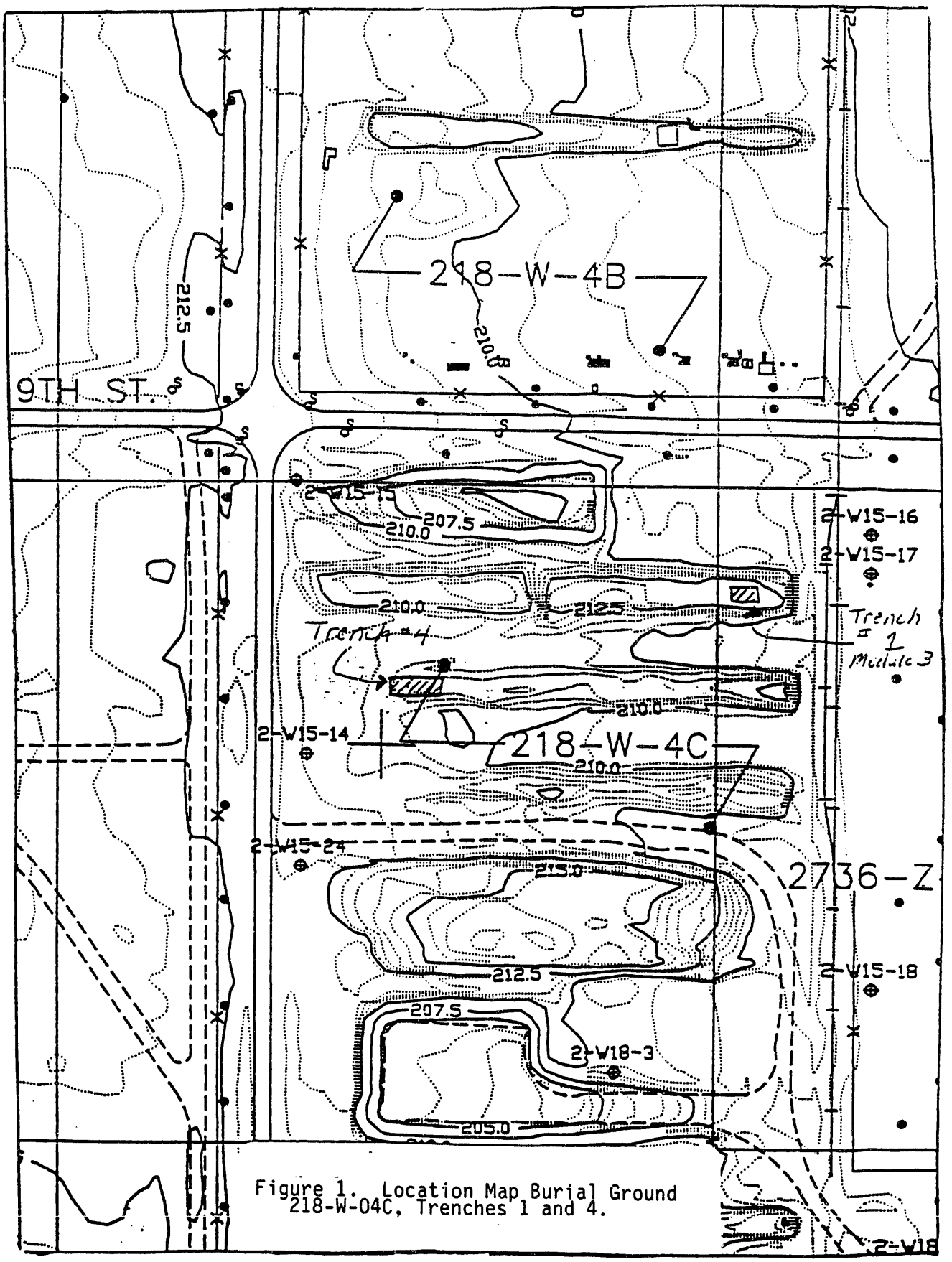


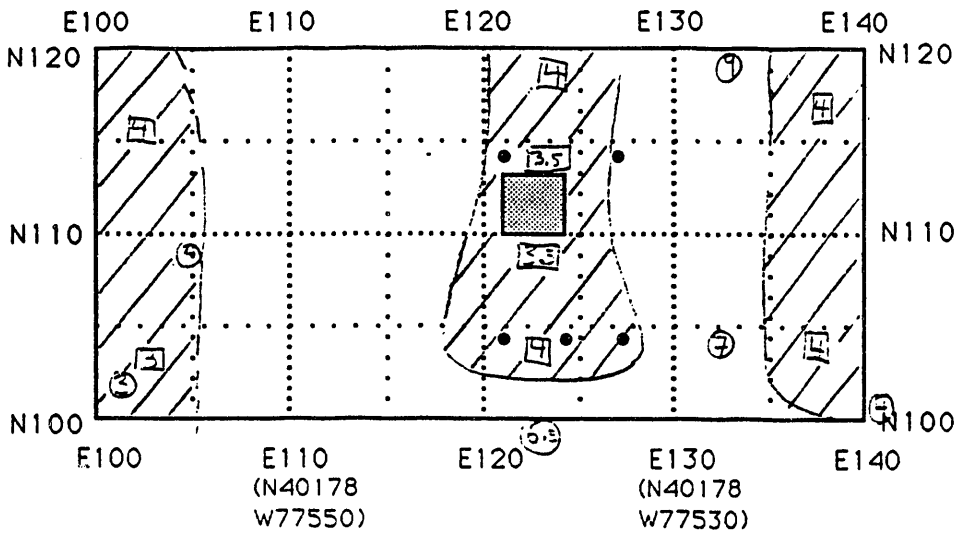
Figure 1. Location Map Burial Ground 218-W-04C, Trenches 1 and 4.

GROUND PENETRATING RADAR (GPR) SURVEY

Team Geophysics, Westinghouse Hanford Operations

TITLE: 218-W-4C TRENCHES 1 &4	DATE: 5-25-93
LOCATION: 200 West Area, West of PFP	
CLIENT: Mark Kerns	DATA COLLECTED BY K.A. Bergstrom & T.H. Mitchell
EQUIPMENT USED: GSSI System 8, model 4800 Calibrator Model P731 Digital Tape Recoder DT6000A	ANTENNA(S) USED: 100 ____ 300 XX 100 BISTATIC ____
	LOG BOOK: EFL 1052
	TIME WINDOW (NS): 100
PROCEDURES FOLLOWED: WHC-CM-7-7 EII 11.2, REV. 3	
GRID : 35x60(4) 20x40'(1) NO. OF PROFILES: 33 TOTAL FOOTAGE COLLECTED: 1200	
PARAMETERS: Both sites had Two sets of perpendicular profiles; five feet between profiles.	
DATA TAPE NO.: 93-14 RECORDS LOCATION: Geophysical files	
TAPE ADDRESS :0-12588 12588-17307 CALIBRATION ADDRESS: 16858-17307	
INTERPRETED BY : K. A. Bergstrom REVIEWED BY : T.H. Mitchell	
INTERPRETATION DELIVERED TO Mark Kerns DATE : ____	
OBJECTIVE(S): To determine the effectiviness of GPR in the 200 burial grounds.	
NOTES: Antenna pulled by hand at 1-2 mph. 50-meter cable. Pulled on south and east side of survey marks.	

Figure 2



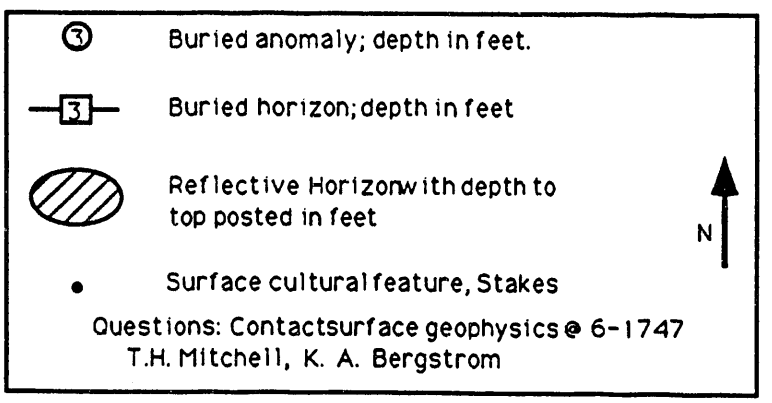
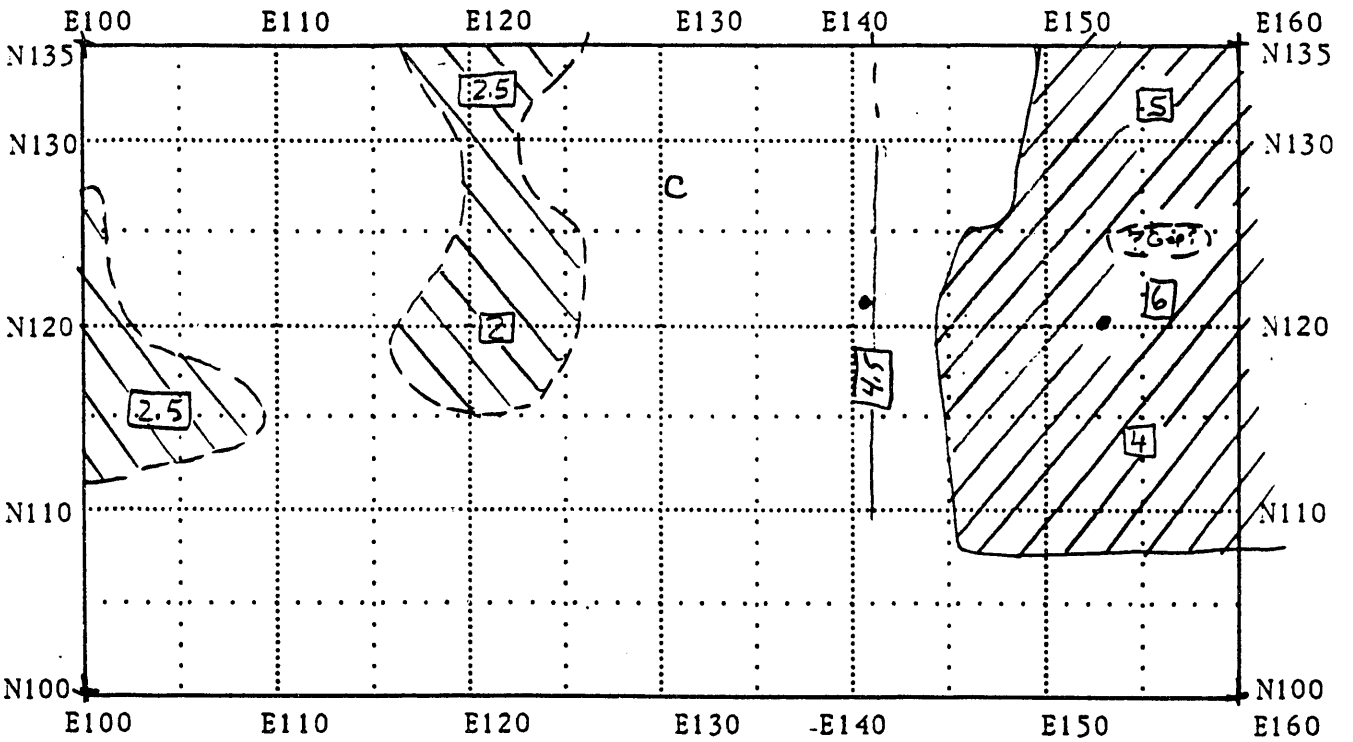


Figure 3 Geophysical survey intepretation map of 218-W-4C, trench #1.



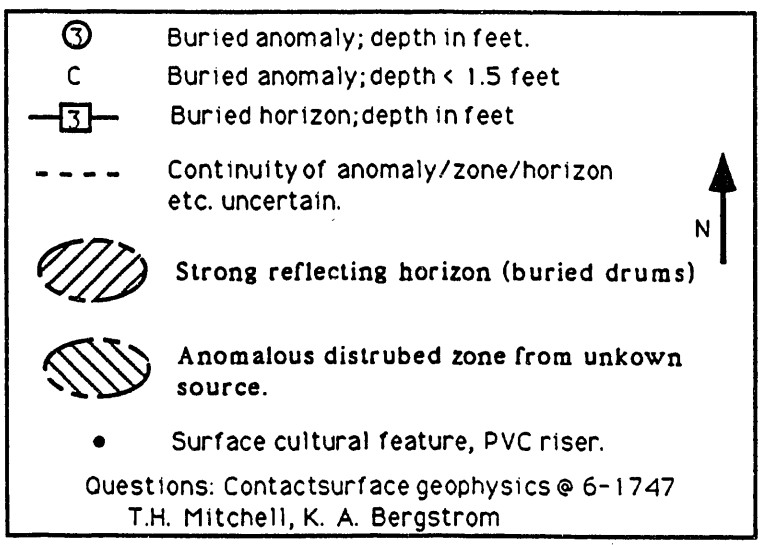


Figure 4 . Interpretation Map. 218-W-4C, Trench #4, 200 West.

DATE

FILMED

10/12/93

END