Attachment B
Walkover Radiological Survey

Draft

Walkover Radiological Survey Report

Fort McClellan
Calhoun County, Alabama

Prepared for:

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Task Order CK10
Contract No. DACA21-96-D-0018
IT Project No. 796887

October 2002

Revision 0

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1.0 Introduction

IT conducted an airborne radiological survey in October 2001, over selected areas on the Main Post and Pelham Range at Fort McClellan in Calhoun County, Alabama. The survey used an array of detectors to measure the gamma emitting radioactive materials in the soil. During the airborne survey, several areas of elevated radioactivity (i.e., anomalies), shown on Figures 1 and 2, were identified at Pelham Range. Two of the identified anomalies (P1 and P2 on Figure 1, Rideout Field) were a radioactive waste disposal site undergoing remediation. This site contained cesium 137 (Cs-137) and cobalt 60 (Co-60) sources that had been used in training exercises. Remediation of this area has since been completed and the remediation contractor performed a final status survey. However, radiation "shine" from the uncovered waste masked the area surrounding the remediation site so that it could not be properly characterized during the airborne survey. The area included in the final status survey at Rideout Field is also shown in Figure 1. The other Pelham Range anomalies (P3 through P10) are areas where the elevated counts could not be definitely attributable to naturally occurring radioactive materials. Two anomalies were identified at the Main Post (M1 and M2) and one of these has subsequently been investigated (M1). The anomalies at the Main Post are shown on Figure 3.

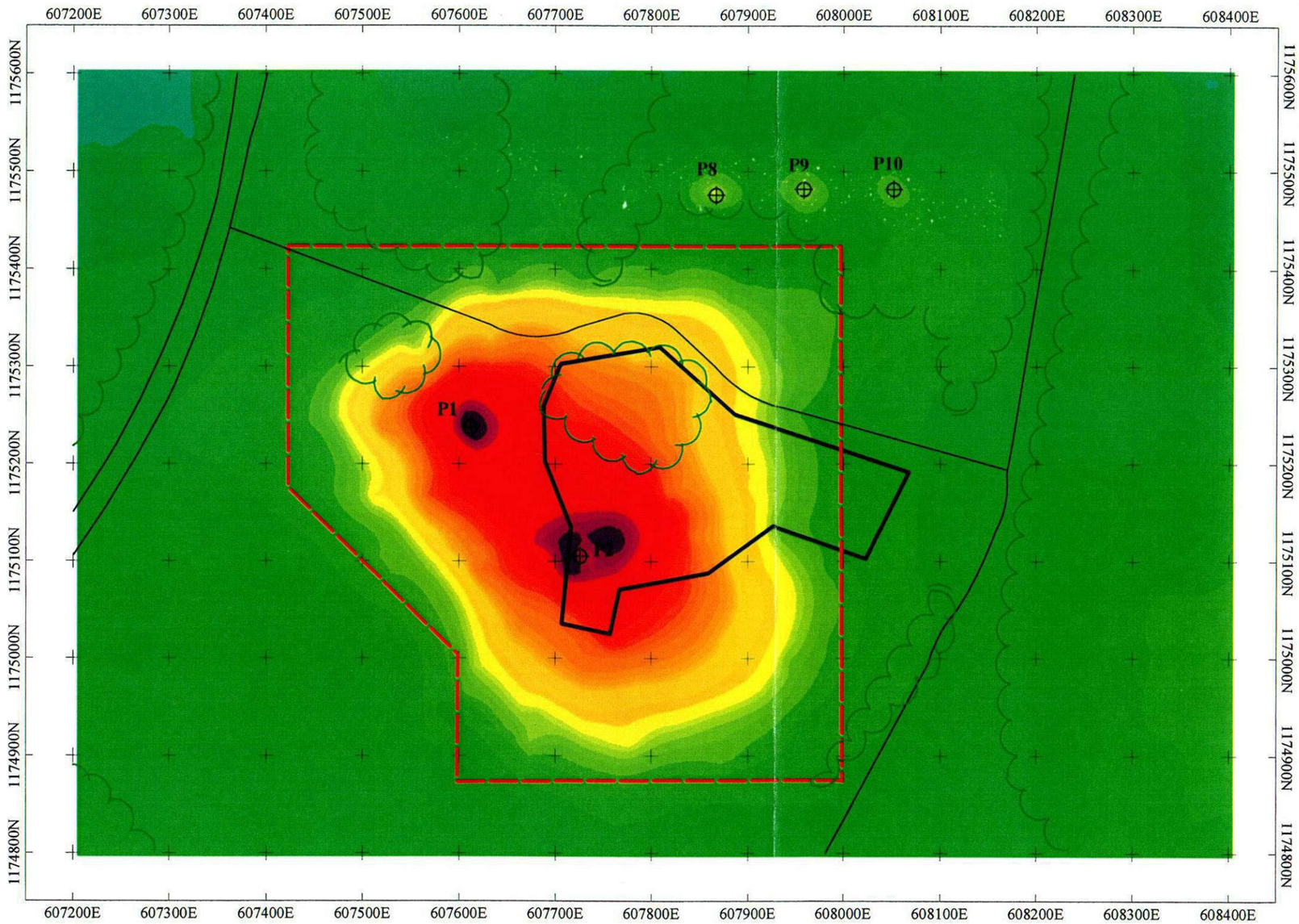
IT conducted further investigations on August 26 through 29, 2002, to complete the survey of the area surrounding the Rideout Field anomalies and to determine the nature of the radiological anomalies at Pelham Range and the one on the Main Post. The methods used to complete these investigations and the results are presented in the following sections.

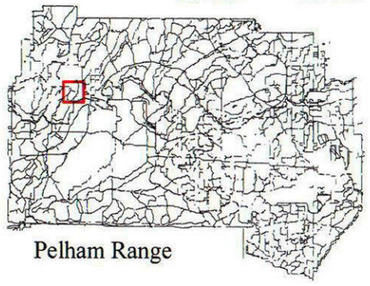
2.0 Completion of Radiological Survey at Rideout Field

This section describes the survey area and the field procedures and instruments used to complete the radiological investigation at Rideout Field, including survey area and control, data acquisition, and field verification of radiological anomalies identified during the course of this survey.

2.1 Survey Area

One area that contained anomalies (P1 and P2) identified during the airborne survey was a radioactive waste disposal site that was undergoing remediation (Rideout Field). The remediation contractor has since completed remediation and has performed a final status survey

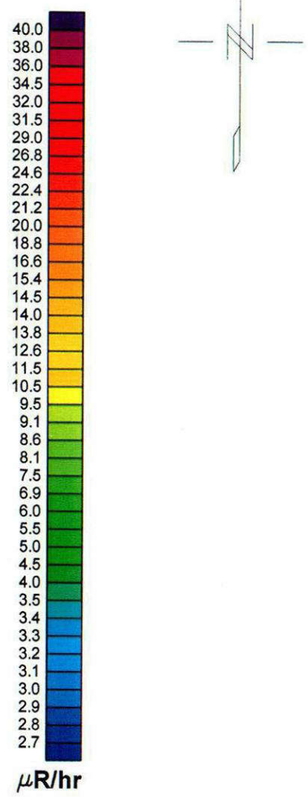




LEGEND

- ATG Final Status Survey Boundary determined from surveyed ATG stake locations
- Gridded Survey Area
- Road
- Treeline
- ⊕ Follow-up Survey Location

Note: The survey area is approximately 240650 sq. ft.
This does not include previous survey area as documented by ATG.
Coordinate System is NAD83, Alabama East State Plane.



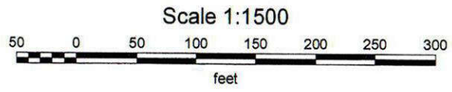


FIGURE 1

RIDEOUT FIELD ANOMALY
PELHAM RANGE
FORT McCLELLAN

AIRBORNE TOTAL EXPOSURE RATE DATA

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MOBILE DISTRICT
FORT McCLELLAN
CALHOUN COUNTY, ALABAMA
Contract No. DACA21-96-D-0018

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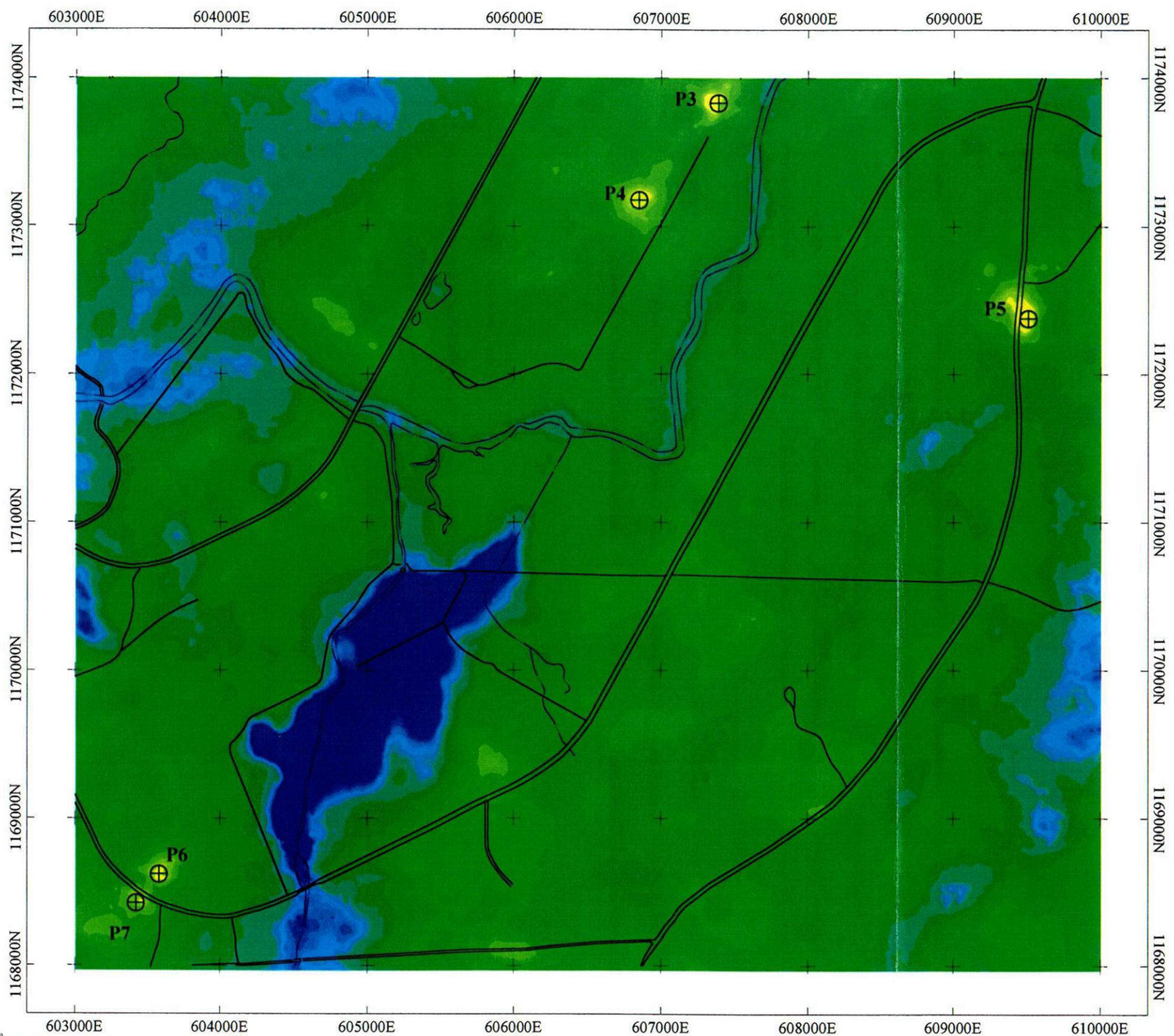


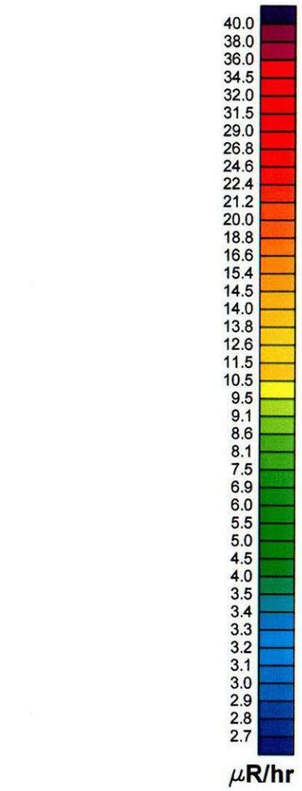
LEGEND

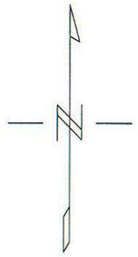
⊕ Follow-up Survey Location

——— Road

—·—·— River

Note: Coordinate System is NAD83, Alabama East State Plane.





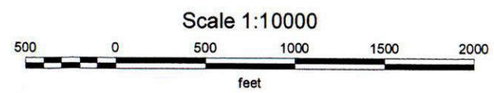


FIGURE 2

PELHAM RANGE ANOMALIES
PELHAM RANGE
FORT McCLELLAN

AIRBORNE TOTAL EXPOSURE RATE DATA

U.S. ARMY CORPS OF ENGINEERS
MOBILE DISTRICT
FORT McCLELLAN
CALHOUN COUNTY, ALABAMA
Contract No. DACA21-96-D-0018

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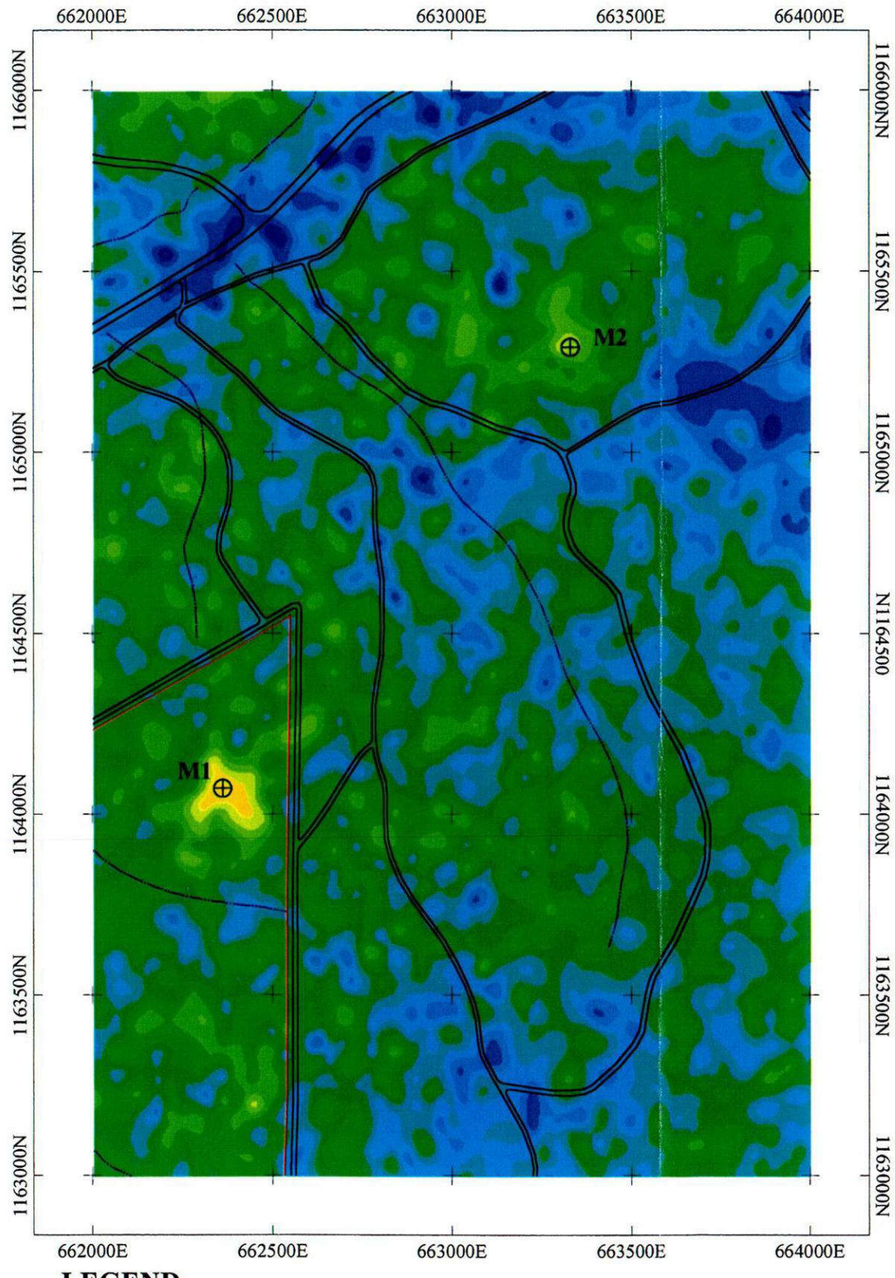

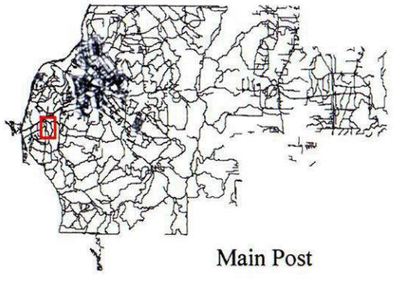

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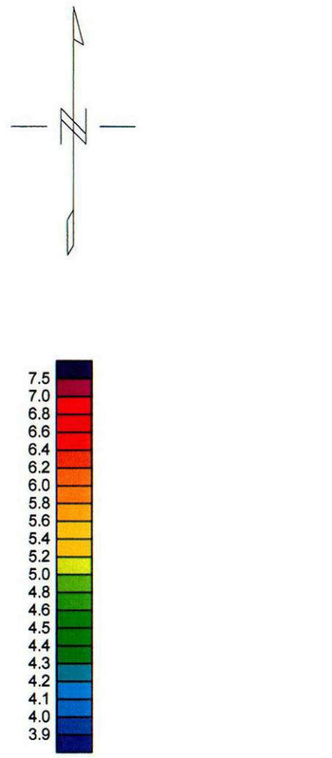

Scale 1:5000

250 0 250 500 750 1000

feet

FIGURE 3

MAIN POST ANOMALIES
MAIN POST
FORT McCLELLAN

AIRBORNE LOW ENERGY/ HIGH ENERGY RATIO DATA

U.S. ARMY CORPS OF ENGINEERS
MOBILE DISTRICT
FORT McCLELLAN
CALHOUN COUNTY, ALABAMA
Contract No. DACA21-96-D-0018

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to document that the site should be released from radiological controls. When the final status survey boundary is superimposed on the airborne survey map (Figure 1), it can be seen that the area containing the apparent anomalies is larger than the area remediated and included in the final status survey. This is expected due to "shine" from the radioactive sources uncovered during remediation of the site. In order to complete the radiological characterization of Rideout Field, a survey was performed outside the final status survey boundary and extending beyond the area affected by shine from the radioactive sources. The survey area is also shown on Figure 1.

2.2 Survey Control

Prior to conducting the radiological survey, the boundary of the proposed survey area was located and marked using caution tape. A Trimble GPS Pathfinder® Pro XR unit was coupled to the radiological detector during data collection and provided the spatial control required for the investigation. GPS data were collected using the Alabama East State Plane Coordinate System, North American Datum 1983 (NAD83). In order to provide reasonable line of sight navigation during the radiological data collection, marks were made on the ground using surveyor's paint down the line the surveyor walked during the data collection process. Paint marks were placed along the outside edge of the Ludlum 2221 rate meter detector swath in order to provide alignment for the adjacent survey line. A known surveyed location (monitor well) was used to check GPS accuracy daily.

2.3 Radiological Surveys

The radiation detection system used during the investigation consisted of a Ludlum 2221 scaler/ratemeter with a Ludlum 44-10 2" x 2" sodium iodide (NaI) detector sensitive to gamma radiation. Prior to collecting radiological data, the Ludlum 2221/44-10 instruments were background and response checked using a known source and the readings recorded in a logbook.

The Ludlum 2221/44-10 was then coupled with a Trimble GPS Pathfinder® Pro XR unit so that the data from the rate meter were logged in real-time by the GPS data logger. The survey was performed by holding the detector close to the ground surface and swinging the detector in a "S"-shaped pattern while walking at approximately 0.5 meters per second (m/s). One member of the survey team followed the operator with surveyor's paint and made marks on the ground to provide visual indicators of the survey path.

Prior to beginning the survey of the Rideout Field anomalies, a reference area (approximately 10 meters by 10 meters) within the boundary of the final status survey was selected and surveyed

using the methods described above (see Figure 1). This reference area was selected because of similar geological makeup to the survey area. In addition, a final status survey has been completed in this area in support of license termination; therefore, survey results in this area should represent acceptable radiation levels for Rideout Field. An additional reference area was surveyed in an unimpacted area at Main Post (Figure 4). This area was selected to provide data for comparison to surveys conducted at the Main Post where the geological makeup of the soils is different from the soils at the Rideout Field area of Pelham Range. This reference area was at the intersection of Diamond Drive and Realm Street.

The survey data were collected at 1-second intervals (approximately 0.5- to 1.0- meter (m) intervals) along roughly north-south (N-S) oriented survey lines spaced approximately 1 meter apart for most of the survey area. Data were collected in random directions in areas that were less accessible due to either thick brush or tree cover. The survey data were downloaded to a laptop computer at midday and at day's end to verify that the data were recorded properly and that there were no data gaps in the survey coverage. The survey data were backed up on compact disc (CD) and are retained in project files.

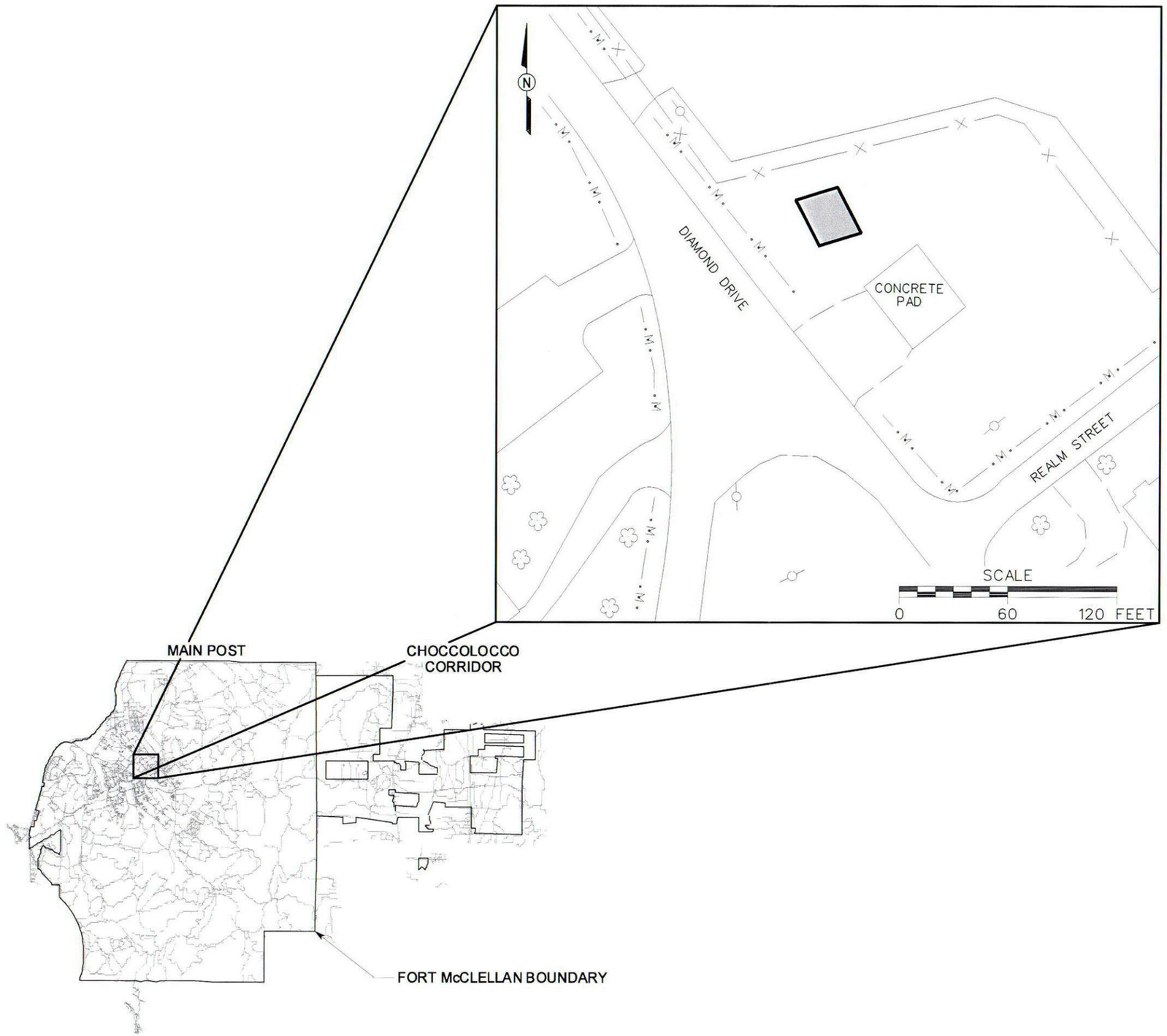
2.4 Anomaly Verification

Following the field survey, preliminary color-contour maps of the radiological data were generated and field-checked. Anomalies caused by topographic features (e.g., gullies) were labeled as such on the field data maps.

2.5 Data Processing

Contour maps of radiological data were generated using OASIS Montaj® data processing and analysis system from Geosoft, Inc. These maps were color-enhanced to aid with interpreting subtle anomalies. Select contour maps are presented as Figures 5 through 7.

A series of data processing steps were required to generate the contour maps of radiological data. Initially, field positional and radiological data were downloaded from the TDC1 GPS data logger to a laptop computer using Trimble Pathfinder® Office. Using Trimble Pathfinder® Office, the data were exported in an ASCII-format. GPS base station data provided by Intergraph Corporation were used to differentially correct the positional data. Preliminary data processing included assessing the ASCII-format data files for correct line and station ranges, removing unwanted characters and incomplete data records, and assessing overall data quality. Data file names were recorded on data file tracking forms.



LEGEND

- UNIMPROVED ROADS AND PARKING
- PAVED ROADS AND PARKING
- CONCRETE PAD
- TREES
- REFERENCE AREA
- MANMADE SURFACE DRAINAGE FEATURE
- FENCE
- UTILITY POLE

FIGURE 4
MAIN POST REFERENCE AREA

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MOBILE DISTRICT
FORT McCLELLAN
CALHOUN COUNTY, ALABAMA
Contract No. DACA21-96-D-0018

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DRAWN BY: D. BOMAR	ENGR. CHCK. BY: S. MORAN	PROJ. MGR.: J. YACOUB	PROJ. NO.: 796887
DATE LAST REV.:	DRAWN BY:		

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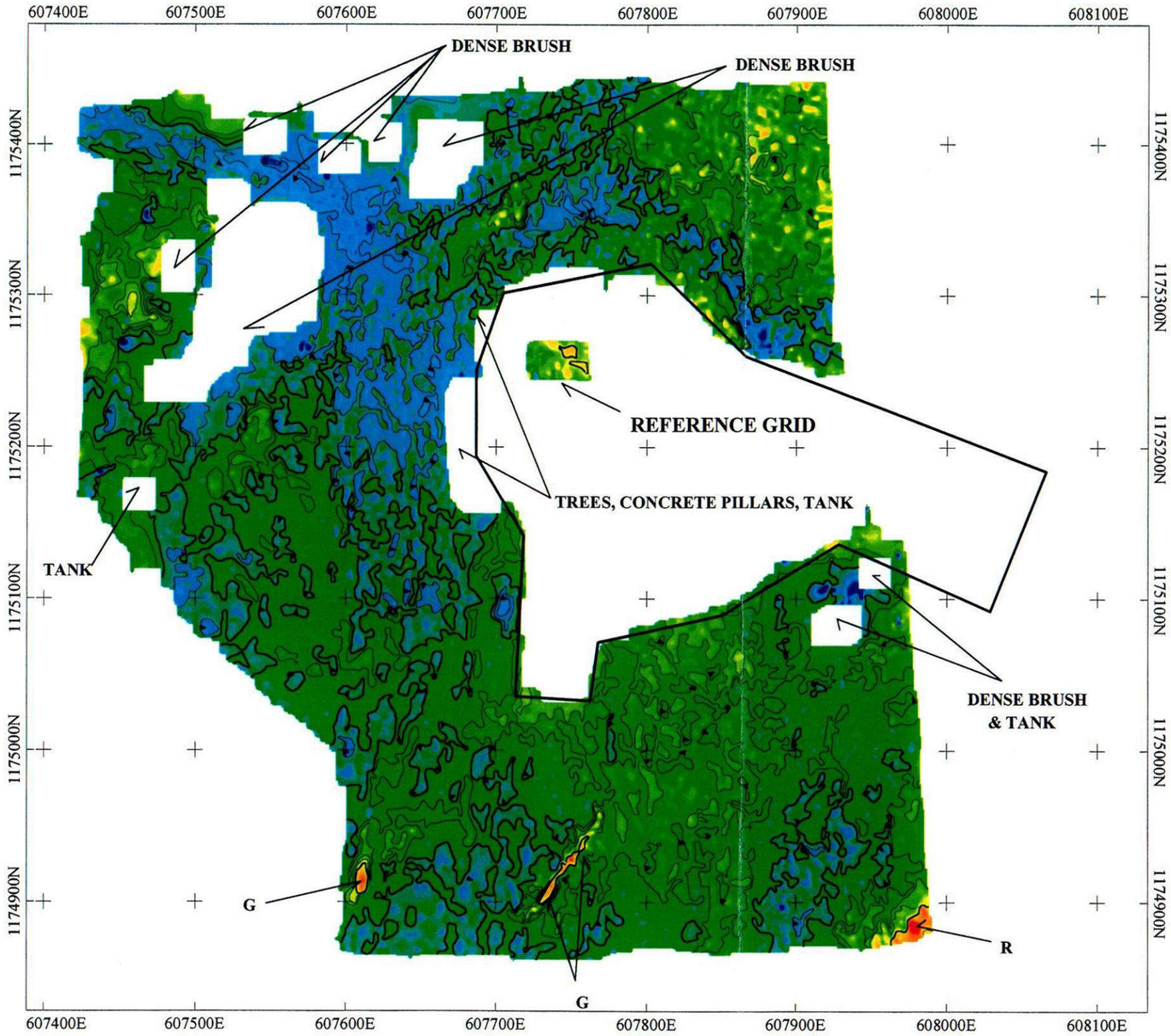

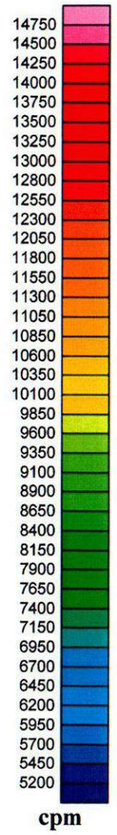

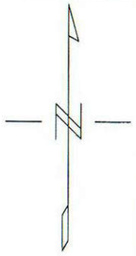

Scale 1:1020

50 0 50 100 150 200

foot

MINIMUM CONTOUR INTERVAL: 500 counts per minute

NOTE: Coordinate system is NAD83, Alabama East State Plane

LEGEND

	ATG Final Status Survey Boundary
R	Anomaly caused by a gravel road
G	Anomaly caused by a gully

NAME: Nicholas Muloshi	DATE: September 11, 2001
PROJECT NUMBER 796887	LOCATION: c:\ITprojects\ftmc\modified.map

FIGURE 5

RIDEOUT FIELD RADIOLOGICAL SURVEY
PELHAM RANGE
FORT McCLELLAN

TOTAL COUNT MAP

U.S. ARMY CORPS OF ENGINEERS
MOBILE DISTRICT
FORT McCLELLAN
CALHOUN COUNTY, ALABAMA
Contract No. DACA21-96-D-0018

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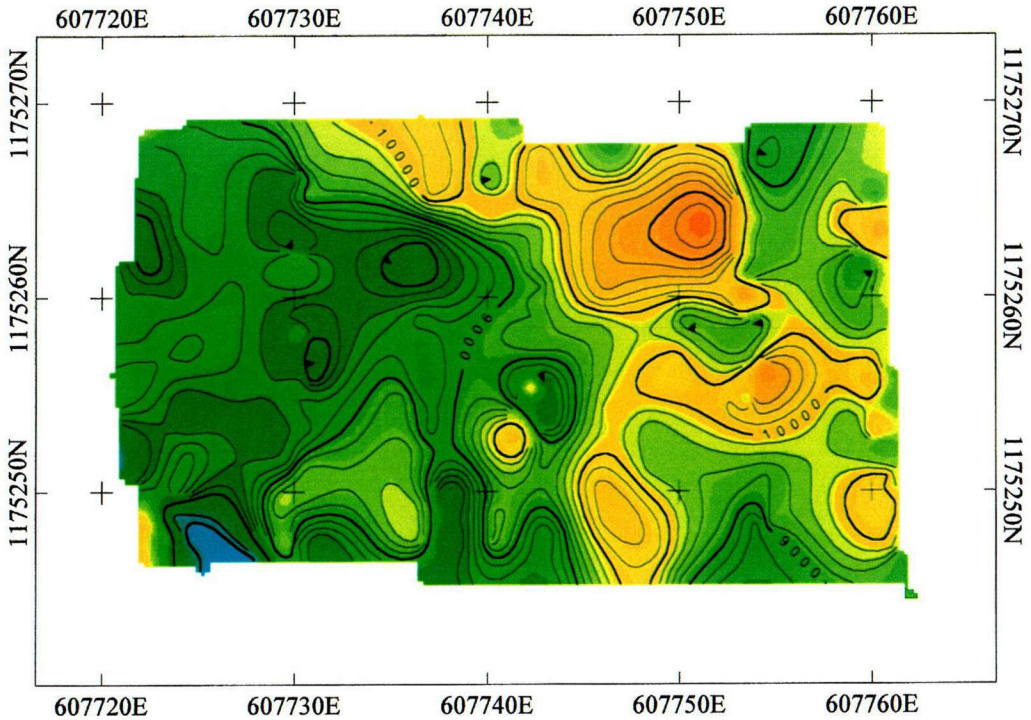

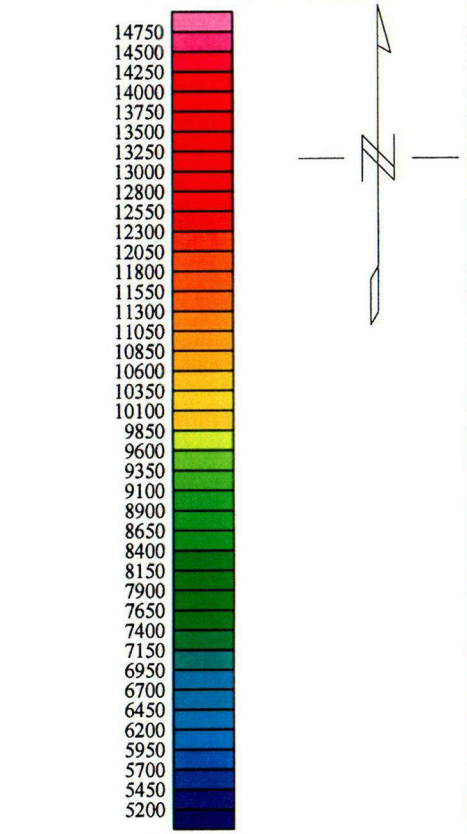

Scale 1:120

5 0 5 10

foot

MINIMUM CONTOUR INTERVAL: 200 counts per minute

FIGURE 6

RIDEOUT FIELD RADIOLOGICAL SURVEY
PELHAM RANGE (Reference Grid)
FORT McCLELLAN

TOTAL COUNT MAP

U.S. ARMY CORPS OF ENGINEERS
MOBILE DISTRICT
FORT McCLELLAN
CALHOUN COUNTY, ALABAMA
Contract No. DACA21-96-D-0018

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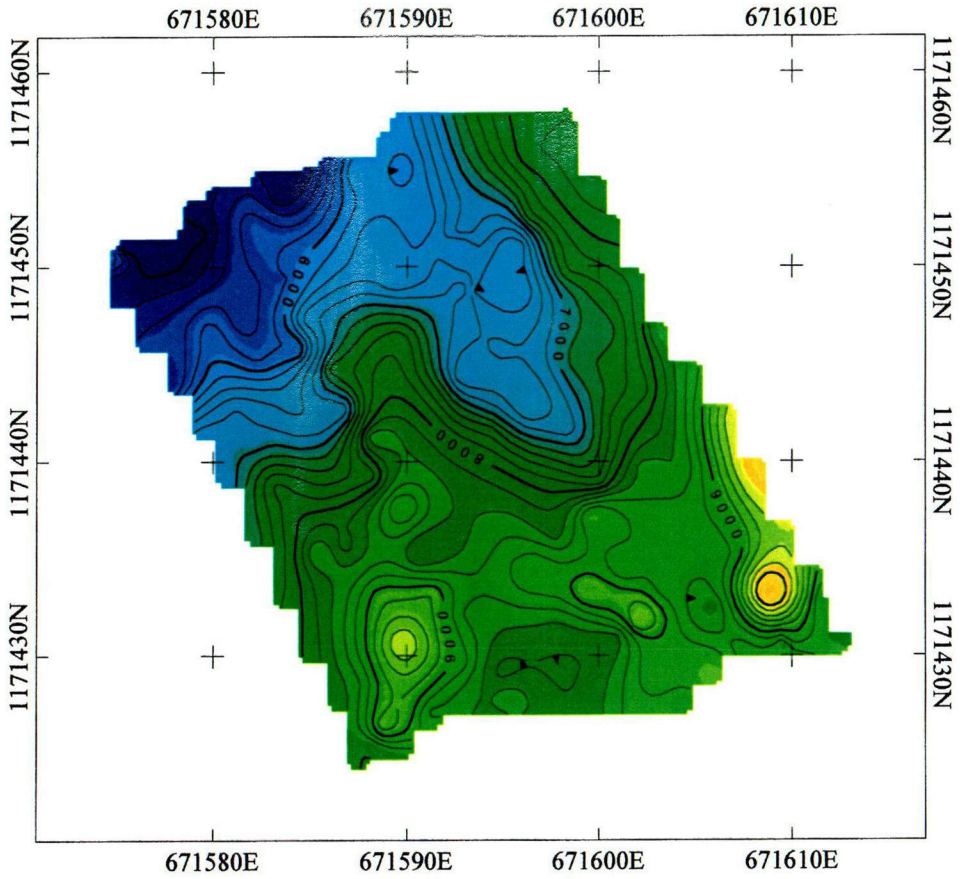
C06

NAME:	DATE:
Nicholas Muloshi	September 11, 2001
PROJECT NUMBER	LOCATION:
796887	c:\ITprojects\ftmc\pelhamRF.map

Note: Coordinate system is NAD83, Alabama East State Plane



14750
14500
14250
14000
13750
13500
13250
13000
12800
12550
12300
12050
11800
11550
11300
11050
10850
10600
10350
10100
9850
9600
9350
9100
8900
8650
8400
8150
7900
7650
7400
7150
6950
6700
6450
6200
5950
5700
5450
5200

cpm

Scale 1:120

5 0 5 10

foot

MINIMUM CONTOUR INTERVAL: 200 counts per minute

FIGURE 7

RADIOLOGICAL SURVEY
MAIN POST (Reference Grid)
FORT McCLELLAN

TOTAL COUNT MAP

U.S. ARMY CORPS OF ENGINEERS
MOBILE DISTRICT
FORT McCLELLAN
CALHOUN COUNTY, ALABAMA
Contract No. DACA21-96-D-0018

C07

NAME:	DATE:
Nicholas Muloshi	September 11, 2001
PROJECT NUMBER	LOCATION:
796887	c:\ITprojects\ftmc\mainpost_RF.map

Note: Coordinate system is NAD83, Alabama East State Plane

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Final, edited ASCII-format data files containing Alabama East State Plane, NAD83 coordinates (X, Y) and the radiological measurement (Z) were converted to OASIS Montaj® format and imported into the data processing and analysis software. Data in the OASIS Montaj® database were reviewed in profile form to verify completeness of data editing. Since two detectors were used for surveying, the count rates were adjusted to a common base level. This correction was determined from the source check and reference grid data. The data were then gridded with the minimum curvature gridding module using an Akima spline. The grid cell size for the radiological data was chosen to be 0.30 meters. A color contouring scale was selected to enhance data anomalies of interest to this investigation. The names of files generated and processing parameters used were recorded on data processing forms. Final processed map names are shown in the data processing box found in the lower left corner of each contour map presented. The processed radiological data and the completed radiological data quality control forms are retained in project files.

2.6 Results

Results of the surveys conducted at Rideout Field and the two reference areas are found on Figures 5 through 7. Results for the survey area are within expected ranges for the type of soil at Pelham Range. These results are comparable to the results measured for the Rideout Field and Main Post reference areas. Anomalies identified during the course of this survey can be attributed to the makeup of the soils and the geometry of the measurement. For example, clay soils typically have a higher natural radiation background than sandy soils. Surveys performed in a gully will be higher for a given soil type since the detector is surrounded by the source material thus allowing more of the gamma rays to interact in the detector resulting in a higher count rate. These anomalies are identified on Figure 5 as either a gully or gravel road. Blank spaces on the survey map represent areas than were inaccessible due to obstructions such as concrete pillars, army tanks, or dense brush. There is no indication that radiological anomalies exist in these inaccessible areas (i.e., no elevated counts near these areas).

2.7 Conclusions

The radiological investigation at Rideout Field was completed by performing a walkover survey using a Ludlum 2221/44-10 gamma scintillation detector. Accessible areas outside the boundary of the final status survey and extending into the area unaffected by radiation shine from the waste disposal site were surveyed. Survey results were within the expected range for naturally occurring radioactive materials in soil. Anomalies identified during the course of the survey

were due to variability in soil types and measurement conditions (i.e., geometry). There is no indication that radiological anomalies were present in inaccessible areas.

3.0 Investigation of Radioactive Anomalies

This section describes the selection and location of radioactive anomalies identified from the results of the airborne survey and the methods used for investigation.

3.1 Selection of Radioactive Anomalies

Radioactive anomalies were identified from the results of the airborne survey at Pelham Range and Main Post. Two of the anomalies at Pelham Range were due to the ongoing remediation of a radioactive waste site during the course of the survey. The remediation contractor has since completed remediation and has performed a final status survey of the affected area. Eight anomalies at Pelham Range (P3 through P10) were selected for further investigation based on elevated exposure rates measured during the airborne survey and on historical land use (see Figures 1 and 2).

Two anomalies at the Main Post (M1 and M2) were selected for further investigation (Figure 3) based on the results of the airborne survey. One of these was selected because of the presence of elevated counts in the Cs-137 region and the other was selected because of an elevated Low-E:High-E ratio. The Low-E:High-E ratio is an analysis tool used to help identify potential locations of man-made radiation since the low-energy portion of the spectrum contains the energy from the man-made sources of interest and the high-energy portion of the spectrum is dominated by natural radiation.

IT investigated the Cs-137 anomaly (M1) on February 1, 2002 using a Ludlum Model 19 microR meter and a Ludlum 2221 with a Ludlum 44-10 NaI detector. Subsequent sampling and gamma spectroscopy analysis confirmed the presence of Cs-137.

3.2 Investigative Method

The radioactive anomalies on the Main Post and Pelham Range were investigated using an Exploranium Gr-135 Identifier portable gamma spectrometer. The GR-135 is used to search for, locate, and identify gamma-emitting radioactive materials. The instrument contains a 4 cubic inch NaI detector and associated analysis software for identification of radioactive material using the built in gamma-ray library.

The GR-135 was stabilized each morning prior to use and again at the end of each day. The instrument was stabilized by placing it in the docking station that contained a small Cs-137 check source. Stabilization "fine-tunes" the system by adjusting the internal gain and aligning the spectrometer with the Cs-137 peak.

Reference spectra were collected at the Rideout Field and the Main Post Reference areas (Figures 8 and 9). These spectra were used for comparison to the spectra collected at the Pelham Range and Main Post anomalies, respectively.

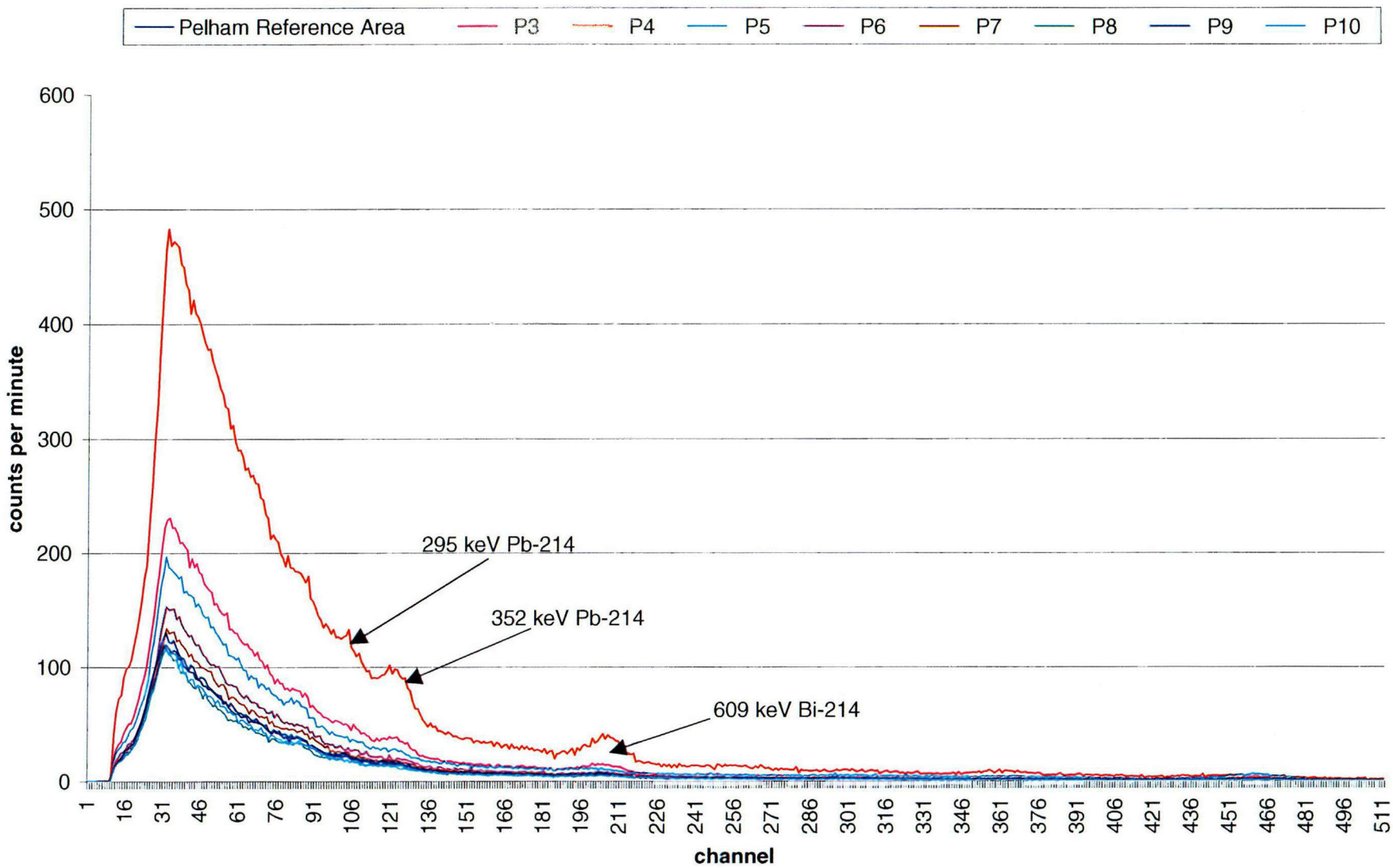
Each anomaly was located and staked using the coordinates from the airborne survey. Initially, the area around each stake was surveyed with a Ludlum 2221/44-10 NaI detector (as described in Section 2.3) to identify the area in the vicinity of the anomaly with the highest count rate. After the highest count rate area was identified, the portable gamma spectrometer was used to identify the radiological contaminants at the location by placing the instrument on the ground and collecting a spectrum for 30 minutes. The GR-135 was used in the "Identify" mode. In this mode the instrument collects a spectrum for the preset time and, at the conclusion of the count, automatically performs spectrum analysis to identify the nuclides in the spectrum based on the reference library. The spectrum analysis indicates the nuclide type (i.e. Industrial, Special Nuclear Material, or Medical), isotope, and relative size for each identified nuclide. Each spectrum collected was stored for download to a PC.

In addition to the spectrometer measurements, exposure rate measurements were made at the ground surface and at 1 meter above ground surface using a microR meter. Gamma spectrometer and exposure rate readings were also collected within the final status survey reference area and the Main Post reference area. The gamma spectroscopy measurement locations were marked with surveyor's paint unless the highest reading was found at the location of the stake.

3.3 Data Processing

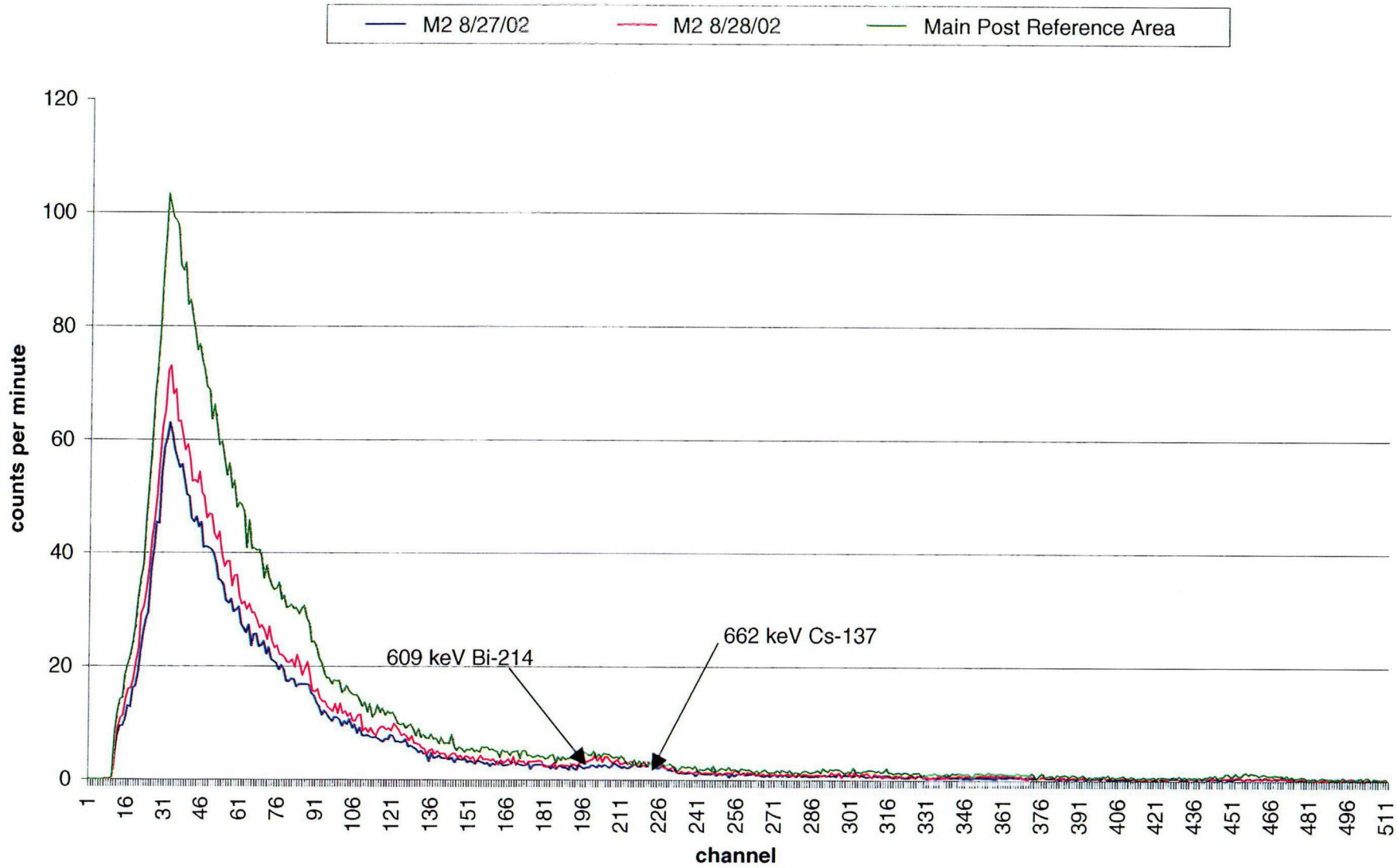
Spectra collected in the reference areas and at each of the anomalies were downloaded to a PC using the Exploranium Identiview software. The spectra were also converted to a text file and imported to an Excel spreadsheet for inspection and graphical presentation of the data. Use of the Identiview software and Excel enabled the data from the reference areas to be viewed with the anomalies for direct comparison of the spectra.

Figure 8
Pelham Range Anomalies and Reference Area
Pelham Range
Fort McClellan



803

Figure 9
Main Post Anomaly and Reference Area
Main Post
Fort McClellan



3.4 Results

Gamma spectra collected at the eight Pelham Range anomalies and the Rideout Field reference area are shown on Figure 8. The only nuclides identified in these spectra were naturally occurring uranium series radionuclides (Pb-214, Bi-214) and potassium 40 (K-40). In some cases, the elevated exposure rates were attributable to visible shale outcroppings or clayey soil. Surface exposure rates ranged from 8 microroentgens per hour (μR/hr) for the reference area to 42 μR/hr at Anomaly P4. Relevant comments regarding the Pelham Range anomalies are provided in Table 1.

As mentioned previously, the Main Post Anomaly was selected from the results of the airborne survey because of a high Low-E:High-E ratio. A spectrum was collected at the Main Post Anomaly on August 27. This anomaly is located on a topographic high and had a low exposure rate. No elevated count rate areas were found in the vicinity of the stake that marked the anomaly therefore the measurement was made at the stake. Upon completion of the count, the GR-135 identified Cs-137 in the spectrum. There was some concern that the apparent Cs-137 peak had been misidentified due to thermal drift of the detector (i.e., that the 609 keV Bi-214 peak had been identified as the 662 keV Cs-137 peak). A decision was made to repeat the measurement on August 28 after stabilization of the instrument.

A spectrum was collected at the same location (Main Post Anomaly) during the morning of August 28. No nuclides were identified in this spectrum. A spectrum was also collected at the Main Post Reference Area on August 28.

3.5 Conclusions

Eight Pelham Range anomalies were investigated due to elevated exposure rates determined during the airborne survey and based on historical use of the site. The investigations were conducted using an Exploranium GR-135 portable gamma spectrometer. Only naturally occurring radioactive materials (uranium series radionuclides and potassium) were identified in any of these spectra. Elevated count rate areas were associated with clayey soil and visible shale outcroppings. No further radiological investigation of these anomalies is needed.

The Main Post Anomaly (M2) was selected for further investigation due to a high Low-E:High-E ratio. A high ratio for this parameter could be indicative of the presence of man-made radioactive materials such as Cs-137 or Co-60. However, the counts in the Co-60 and Cs-137 channels were low, as was the total exposure rate; therefore, the high Low-E:High-E ratio was probably an

Table 1

Pelham Range Anomalies
Fort McClellan, Calhoun County, Alabama

Anomaly Number	Surface Exposure Rate (μR/hr)	1-meter Exposure Rate (μR/hr)	Comments
P1	8	8	Anomalies P1 and P2 have been remediated. These measurements were made at the Pelham range reference area.
P2	8	8	
P3	17	13	Visible shale outcropping.
P4	42	21	Extensive shale outcropping. Measurement made on shale.
P5	16	12	Shale outcropping. Readings taken in washout gully.
P6	12	10	Kudzu field.
P7	11	9	Clay.
P8	6.5	5.5	
P9	8	7.5	
P10	8	5	

Measurements were made with a Ludlum Model 19 MicroR meter.

μR/hr – Microroentgens per hour.

artifact due to the low natural exposure rate. A higher natural exposure rate would have increased the counts in the 609 keV Bi-214 peak and would have masked the low levels of Cs-137 that are present in soils due to fallout from nuclear weapons testing. Figure 9 shows the spectrum from the Main Post Reference Area and the two spectra collected at the Main Post Anomaly M-2. It is concluded that the identification of Cs-137 at the Main Post anomaly was due to thermal drift of the detector and/or the low natural exposure rate at that location. Regardless of the reason, it can be seen on Figure 9 that the counts in the overall spectrum are lower at the anomaly than at the reference area. Therefore, further radiological investigation of this anomaly is not recommended.

Attachment C
Groundwater Investigation

Draft

Groundwater Investigation Report
Burial Mound at Rideout Field, Parcel 202Q-RD

Fort McClellan
Calhoun County, Alabama

Prepared for:

U.S. Army Corps of Engineers, Mobile District
109 St. Joseph Street
Mobile, Alabama 36602

Prepared by:

IT Corporation
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Task Order CK10
Contract No. DACA21-96-D-0018
IT Project No. 796887

October 2002

Revision 0

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1.0 Introduction

This report summarizes the results of the groundwater investigation conducted by IT Corporation (IT) at the Burial Mound at Rideout Field, Parcel 202Q-RD, at Fort McClellan in Calhoun County, Alabama. The groundwater investigation was conducted for the U.S. Army from May through August 2002 at the request of the U.S. Nuclear Regulatory Commission (NRC). The NRC requested that an evaluation be conducted to determine the presence or absence of cesium-137 (Cs-137), cobalt-60 (Co-60), and strontium-90 (Sr-90) in groundwater at the site.

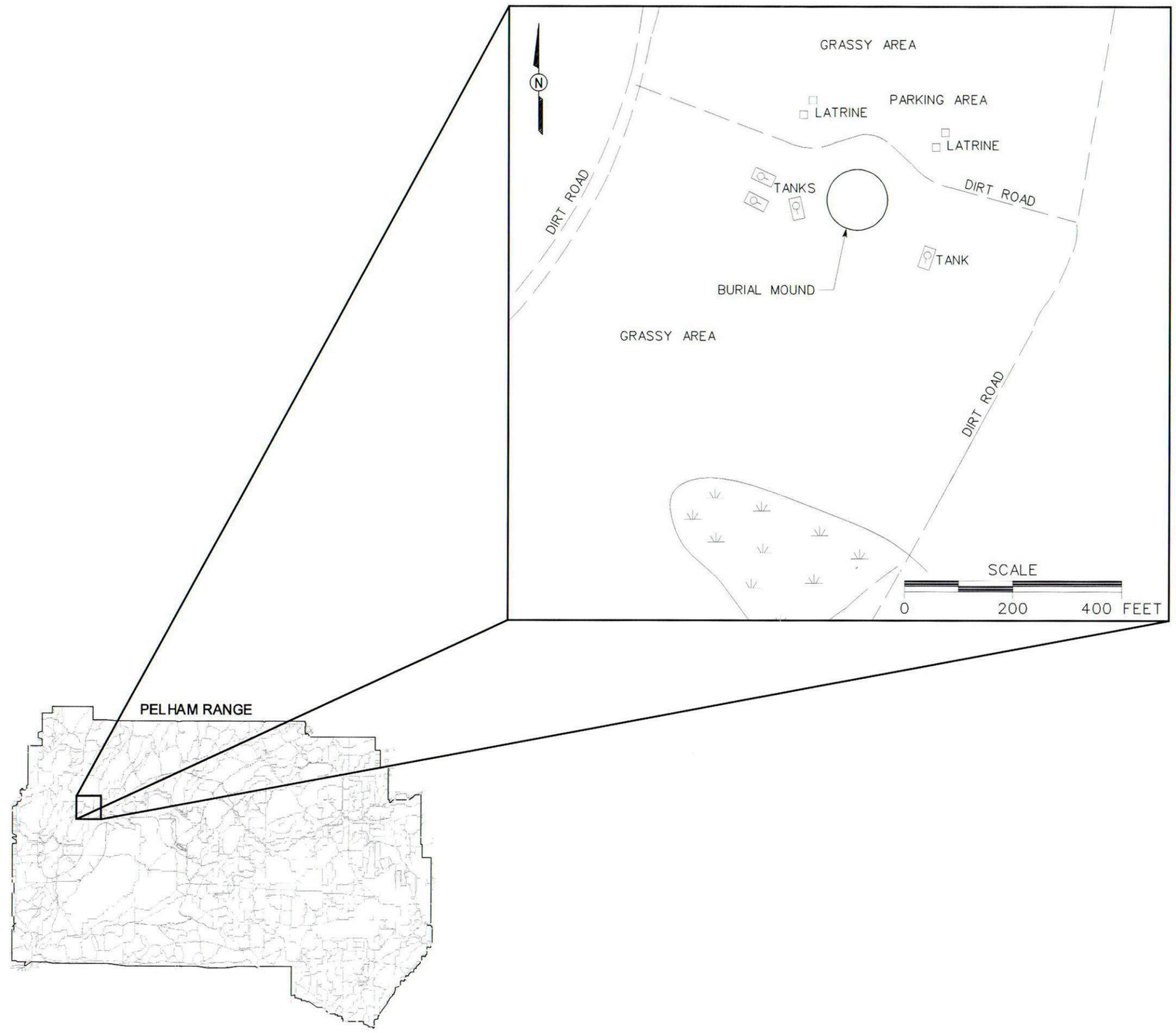
2.0 Site Description and History

The Burial Mound site (Parcel 202Q-RD) is located at the north end of Rideout Field in the western portion of Pelham Range (Figure 1). Rideout Field was used as part of the U.S. Army Chemical School's Radiological Survey Training Facility from 1965 to 1972 and as a burial site for radioactive material. The Rideout Field Survey Training Area was cleared, leveled, and designated as a burial ground in 1957.

Radioactive waste from the waste burial ground on the Main Post (Iron Mountain site) was transferred to Pelham Range and buried at the site during the same year. Burial of waste, mostly laboratory waste (Cs-137, Co-60, and possibly Sr-90), continued throughout the 1960s. Other items buried included leaking Co-60 sources that were placed in cut-down 55-gallon drums and soils contaminated from leaking Co-60 sources (U.S. Army Center for Health Promotion and Preventative Medicine [CHPPM], 1999). In 1972-73, the site was cleared and the burial mound was created during the excavation of the burial site (response by John May, U.S. Army Chemical School). The burial mound, which covered approximately 0.1 acre (Figure 2), was removed by an Army contractor in 2001-2002. Pelham Range, including the area of the former burial mound, is currently used for military training activities by the Alabama Army National Guard.

3.0 Previous Investigations

In 1996, CHPPM conducted an industrial radiation study to assess radiation health hazards associated with potential contamination and to determine if residual radioactivity at the Burial Mound site was in compliance with NRC guidance for release for unrestricted use. Results of the study indicated Cs-137 and Co-60 activities above soil release criteria and subsurface measurements indicative of buried radioactive sources or substantial contamination pockets in



LEGEND

- UNIMPROVED ROADS AND PARKING
- MARSH / WETLANDS
- SURFACE DRAINAGE / CREEK

FIGURE 1
SITE LOCATION MAP
BURIAL MOUND AT RIDEOUT FIELD

U. S. ARMY CORPS OF ENGINEERS
MOBILE DISTRICT
FORT McCLELLAN
CALHOUN COUNTY, ALABAMA
Contract No. DACA21-96-D-0018

IT CORPORATION
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DRAFT. CHCK. BY:
ENGR. CHCK. BY: S. MORAN
INITIATOR: T. WINTON
PROJ. MGR.: J. YACOUB
DWG. NO.: ...\796887es.526
PROJ. NO.: 796887
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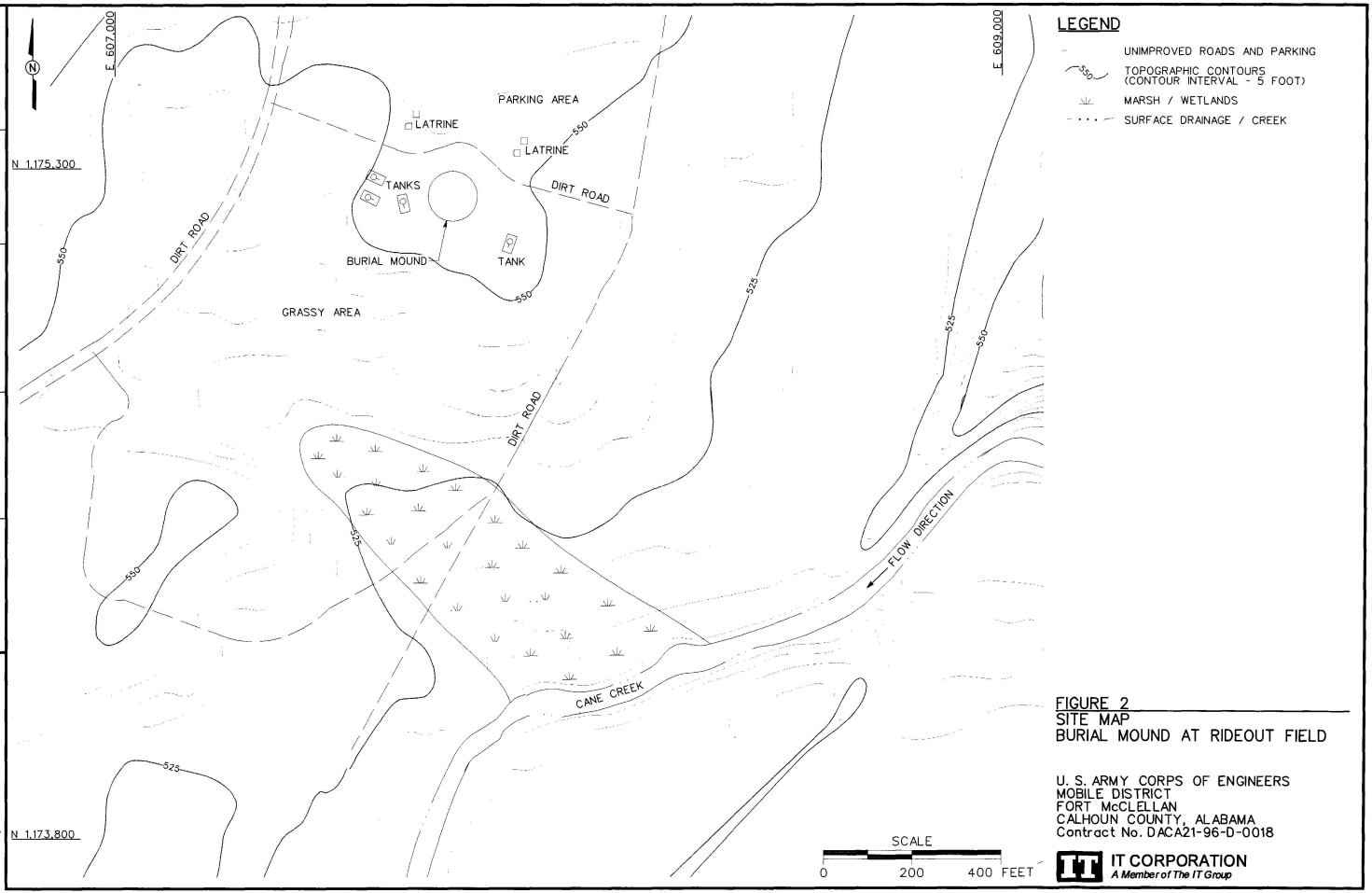

LEGEND

- UNIMPROVED ROADS AND PARKING
- TOPOGRAPHIC CONTOURS (CONTOUR INTERVAL - 5 FOOT)
- MARSH / WETLANDS
- SURFACE DRAINAGE / CREEK

FIGURE 2
SITE MAP
BURIAL MOUND AT RIDEOUT FIELD

U. S. ARMY CORPS OF ENGINEERS
MOBILE DISTRICT
FORT McCLELLAN
CALHOUN COUNTY, ALABAMA
Contract No. DACA21-96-D-0018

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the subsurface environment. CHPPM recommended the excavation, removal, and proper disposal of the surface and subsurface contamination and a final status survey of the Burial Mound to support release of this area for unrestricted use.

4.0 Study Area Investigation

Initially, IT installed four residuum groundwater monitoring wells at the site to collect groundwater samples for laboratory analysis. Three of the residuum wells were installed downgradient of the Burial Mound, and one well was installed upgradient of the Burial Mound (Figure 3). However, groundwater was not encountered in residuum at three of the four monitoring well locations. Therefore, IT installed three additional wells in the bedrock water-bearing zone. The bedrock wells were installed to depths of approximately 82 to 92 feet below ground surface (bgs) at each of the dry residuum well locations. Investigation field activities are summarized in the following sections.

4.1 Monitoring Well Installation and Development

IT installed seven permanent monitoring wells at the Burial Mound at Rideout Field to provide site-specific geological and hydrogeological data and to collect groundwater samples for laboratory analysis. The monitoring well locations are shown on Figure 3. IT contracted Miller Drilling Company to provide drilling services for installation of the wells. The field work was performed in accordance with the *Site-Specific Work Plan (SSWP) for the Groundwater Investigation at the Burial Mound at Rideout Field, Parcel 202Q-RD-Pelham Range* (IT, 2001) and the site-specific safety and health plan (SSHP) attachment presented with the SSWP. The SSWP was used in conjunction with the SSHP as attachments to the installation-wide work plan (IT, 2002a) and the installation-wide sampling and analysis plan (SAP) (IT, 2002b).

Residuum Monitoring Wells. The residuum monitoring wells were drilled and installed using the hollow-stem auger drilling methodology specified in the SAP. The monitoring well consisted of new 2-inch inside diameter (ID), Schedule 40, threaded, flush-joint polyvinyl chloride (PVC) riser pipe with a 10-foot section of new, threaded, flush-joint, 0.010-inch continuous wrap PVC well screen. A threaded PVC end cap was attached to the bottom of the well screen. The monitoring well construction details are summarized in Table 1, and the well construction logs are included in Appendix A.

Split-spoon soil samples were collected at 5-foot intervals from ground surface to the bottom of the borehole during hollow-stem auger drilling to provide a detailed lithologic log (Appendix A). The

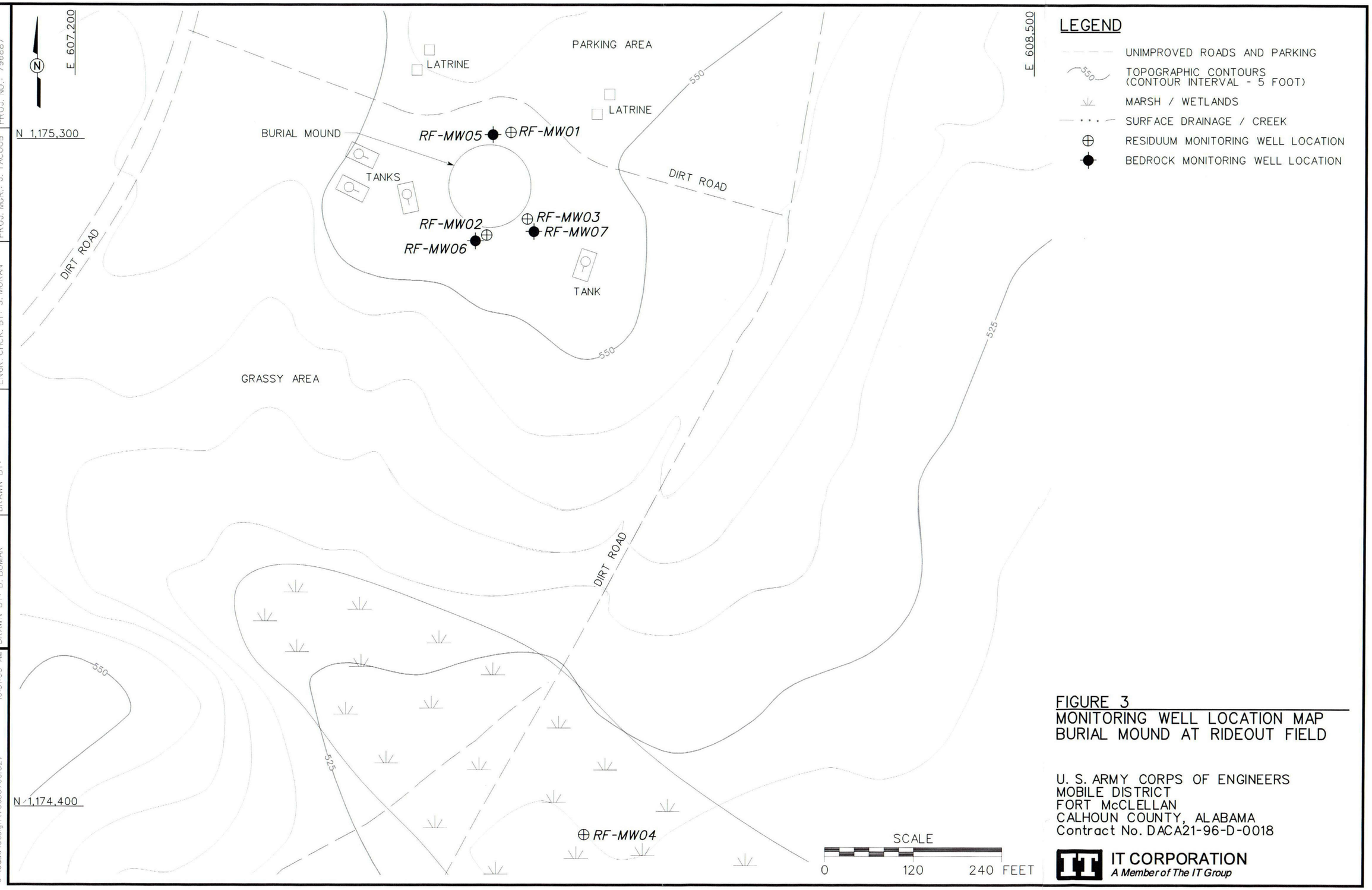

FIGURE 3
MONITORING WELL LOCATION MAP
BURIAL MOUND AT RIDEOUT FIELD

U. S. ARMY CORPS OF ENGINEERS
MOBILE DISTRICT
FORT McCLELLAN
CALHOUN COUNTY, ALABAMA
Contract No. DACA21-96-D-0018

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INITIATOR: T. WINTON	
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DRAFT. CHCK. BY:	
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DATE LAST REV.:	
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Table 1

Monitoring Well Construction Summary
Burial Mound at Rideout Field, Parcel 202Q-RD
Fort McClellan, Calhoun County, Alabama

Well Location	Well Type	Northing	Easting	Ground Elevation (ft amsl)	TOC Elevation (ft amsl)	Well Depth (ft bgs)	Screen Length (ft)	Screen Interval (ft bgs)	Well Material
RF-MW01	Residuum	1175307.40	607793.63	553.15	555.41	23	10	13 - 23	2" ID Sch. 40 PVC
RF-MW02	Residuum	1175169.35	607761.15	550.50	552.63	23.5	10	13.5 - 23.5	2" ID Sch. 40 PVC
RF-MW03	Residuum	1175190.89	607815.86	552.01	554.24	20	10	10 - 20	2" ID Sch. 40 PVC
RF-MW04	Residuum	1174360.65	607894.02	518.70	520.96	20	10	10 - 20	2" ID Sch. 40 PVC
RF-MW05	Bedrock	1175304.31	607769.39	552.75	554.85	91.9	25	66.5 - 91.5	4" ID Sch. 80 PVC
RF-MW06	Bedrock	1175161.46	607745.86	550.01	552.16	81.9	20	61.9 - 81.9	4" ID Sch. 80 PVC
RF-MW07	Bedrock	1175173.97	607824.70	549.79	551.92	85.5	25	60.2 - 85.2	4" ID Sch. 80 PVC

Residuum wells installed using hollow-stem auger; bedrock wells installed using air rotary.
Horizontal coordinates referenced to the U.S. State Plane Coordinate System, Alabama East Zone, North American Datum of 1983 (NAD83).
Elevations referenced to the North American Vertical Datum of 1988 (NAVD88).
2" ID Sch. 40 PVC - 2-inch inside diameter, Schedule 40, polyvinyl chloride.
4" ID Sch. 80 PVC - 4-inch inside diameter, Schedule 80, polyvinyl chloride.
bgs - Below ground surface.
ft - Feet
amsl - Above mean sea level.

samples were collected using a 2-foot-long, 2-inch-diameter, carbon-steel, split-spoon sampler. The soil borings were logged in accordance with American Society for Testing and Materials Method (ASTM) D 2488 using the Unified Soil Classification System. During drilling activities associated with monitoring well installation, two undisturbed soil samples were collected and archived for potential future geotechnical analysis. The undisturbed soil samples were collected with 2-foot-long, 3-inch outside diameter, thin-walled metal (Shelby) tubes following procedures outlined in ASTM Method D 1587. One undisturbed soil sample was collected from RF-MW02 at 16 to 18 feet bgs, and the second undisturbed soil sample was collected from RF-MW03 at 12 to 14 feet bgs. Upon retrieval, each Shelby tube was capped with wax at both ends and transported to the IT field compound for storage.

Prior to initiating drilling activities, radiological screening was conducted using a Ludlum Model 19 gamma radiation survey meter. Ambient background radiation levels in the area were established prior to screening by selecting ten locations in nearby unaffected areas and taking radiation level measurements. The drilling locations were screened and compared to the earlier established background radiation levels. Furthermore, as soils were retrieved from the boreholes, radiation levels were monitored and compared to background radiation levels. At no time during the drilling activities did the radiation levels reach or exceed 1.5 times background radiation levels.

Bedrock Monitoring Wells. The bedrock monitoring wells were installed using an air-rotary drill rig equipped with a 12- and/or 14-inch rotary bit and a 7-7/8-inch percussion bit. The borehole at each well location was advanced from ground surface to approximately 5 feet into competent bedrock. Eight-inch ID carbon steel International Pipe Standard (IPS) outer casing was installed in the borehole from ground surface to the bottom of the borehole. A minimum annular space of two inches was maintained between the outer casing and the borehole wall. The outer casing was grouted in place using a tremie pipe suspended in the annulus outside the casing. Bentonite-cement grout, consisting of approximately 6.5 to 7 gallons of water and 5 pounds of bentonite per 94-pound bag of Type II Portland cement, was used to grout the casing in place. After allowing the grout to cure for a minimum of 48 hours, a 7-7/8-inch air percussion bit was used to drill into competent bedrock from the bottom of the outer casing to the total depth of the borehole. However, prior to using the percussion bit at one location (RF-MW07), core samples were collected continuously from the bottom of the outer casing to the total depth of the borehole using a PQ wireline core barrel. After coring was completed, a 7-7/8-inch air percussion bit was used to ream the hole from the bottom of the outer casing to the total depth of the borehole. Water was the only lubricant used during drilling operations. Lithologic logs of the bedrock wells are presented in Appendix A.

The bedrock monitoring wells were completed by placing the well screen and casing materials through the outer casing according to the methodology specified in the SAP. The well consisted of 4-inch ID, threaded, flush-joint, Schedule 80 PVC riser pipe and 20 or 25 feet of threaded, flush-joint, 0.010-inch continuous wrap PVC well screen attached to the bottom of the well casing. A threaded PVC end cap was attached to the bottom of the well screen. The monitoring well construction details are summarized in Table 1, and the well construction logs are included in Appendix A.

Well Development. Monitoring wells RF-MW04, RF-MW05, RF-MW06, and RF-MW07 were developed by surging and pumping with a submersible pump in accordance with methodology outlined in the SAP. The remaining wells could not be developed because they did not contain water. The submersible pump used for well development was moved in an up-and-down fashion to encourage any residual well installation materials to enter the well. These materials were then pumped out of the well in order to re-establish the natural hydraulic flow conditions. Development of the residuum well (RF-MW04) continued for eight hours. Development of the bedrock wells continued until the water turbidity was less than 20 nephelometric turbidity units or for a maximum of 12 hours. Development of RF-MW07 was considered complete after the well had been pumped/bailed dry and allowed to recharge three times. The well development logs are included in Appendix C.

4.2 Groundwater Sampling and Analysis

Groundwater samples were collected from four of the seven monitoring wells (water was not present in three wells) in accordance with procedures outlined in the SAP. Groundwater samples were collected after purging a minimum of three well volumes and after field parameters (i.e., temperature, pH, dissolved oxygen, specific conductivity, oxidation-reduction potential, and turbidity) stabilized. Purging and sampling were performed with a mechanical pump (i.e., peristaltic or bladder pump) equipped with Teflon™ tubing, except at well location RF-MW07. At well location RF-MW07, purging was performed using a bladder pump and the sample was collected using a bailer. Groundwater field parameters were measured using a calibrated water-quality meter, as summarized in Table 2. Sample collection logs are included in Appendix B.

The groundwater samples were analyzed for gamma-emitting radionuclides (including Cs-137 and Co-60) and Sr-90 using U.S. Environmental Protection Agency analytical methods (Table 3). Sample documentation and chain-of-custody records were completed as specified in the SAP. Completed analysis request and chain-of-custody records (Appendix B) were secured and included with each shipment of sample coolers to EMAX Laboratories, Inc. in Torrance, California.

Table 2

Groundwater Field Parameters
Burial Mound at Rideout Field, Parcel 202Q-RD
Fort McClellan, Calhoun County, Alabama

Sample Location	Sample Date	Specific Conductivity (mS/cm)	Dissolved Oxygen (mg/L)	ORP (mV)	Temperature (°C)	Turbidity (NTU)	pH (SU)
RF-MW04	30-Jul-02	0.435	0.67	-160	21.40	5.3	6.96
RF-MW05	30-Jul-02	0.429	6.19	122	21.32	3.7	7.01
RF-MW06	2-Aug-02	0.486	8.21	88	21.99	8.1	7.28
RF-MW07	2-Aug-02	0.505	9.06	139	21.70	111	7.23

°C - Degrees Celsius.
mg/L - Milligrams per liter.
mS/cm - Millisiemens per centimeter.
mV - Millivolts.
NTU - Nephelometric turbidity units.
ORP - Oxidation-reduction potential.
SU - Standard units.

Table 3

Groundwater Sample Designations and Analytical Parameters
Burial Mound at Rideout Field, Parcel 202Q-RD
Fort McClellan, Calhoun County, Alabama

Sample Location	Sample Designation	QA/QC Samples		Analytical Parameters
		Field Duplicates	MS/MSD	
RF-MW04	RF-MW04-GW-HV3005-REG	RF-MW04-GW-HV3004-FD		Gamma Scan (including Cs-137 and Co-60) and Sr-90
RF-MW05	RF-MW05-GW-HV3006-REG			Gamma Scan (including Cs-137 and Co-60) and Sr-90
RF-MW06	RF-MW06-GW-HV3007-REG			Gamma Scan (including Cs-137 and Co-60) and Sr-90
RF-MW07	RF-MW07-GW-HV3008-REG			Gamma Scan (including Cs-137 and Co-60) and Sr-90

Co-60 - Cobalt 60.
Cs-137 - Cesium 137.
FD - Field duplicate.
MS/MSD - Matrix spike/matrix spike duplicate.
QA/QC - Quality assurance/quality control.
REG - Field sample.
Sr-90 - Strontium 90.

4.3 Water Level Measurements

The depth to groundwater was measured in monitoring wells at the site on September 16, 2002, following procedures outlined in the SAP. Depth to groundwater was measured with an electronic water level meter. The meter probe and cable were cleaned before use at each well, following decontamination methodology presented in the SAP. The monitoring wells were left uncapped for at least 48 hours prior to measurement to allow the groundwater in the wells to equilibrate to atmospheric conditions. Measurements were referenced to the top of the inside PVC well casing, as summarized in Table 4. A groundwater elevation map was constructed using the September 2002 data, as shown on Figure 4.

4.4 Surveying of Well Locations

The monitoring well locations were surveyed using global positioning system and conventional civil survey techniques described in the SAP. Horizontal coordinates were referenced to the U.S. State Plane Coordinate System, Alabama East Zone, North American Datum of 1983. Elevations were referenced to the North American Vertical Datum of 1988. Horizontal coordinates and elevations are included in Appendix D.

4.5 Investigation-Derived Waste Management and Disposal

Investigation-derived waste (IDW) was managed and disposed as outlined in the SAP. The IDW generated during the groundwater investigation at the Burial Mound at Rideout Field was segregated as follows:

- Drill cuttings
- Purge water from well development, sampling activities, and decontamination fluids
- Personal protective equipment.

Solid IDW was stored on site in lined roll-off bins prior to characterization and final disposal. Solid IDW was characterized using toxicity characteristic leaching procedure analyses, Sr-90 analysis, and full gamma scan (including Cs-137 and Co-60). Based on the results, drill cuttings and personal protective equipment generated during the investigation were disposed as nonregulated waste at the Three Corners Landfill in Piedmont, Alabama.

Liquid IDW was contained in a portable frac tank at the site. Liquid IDW was characterized by volatile organic compound (VOC), semivolatile organic compound (SVOC), and metals analyses as well as Sr-90 analysis and full gamma scan (including Cs-137 and Co-60). Based on the analyses, liquid IDW was discharged as nonregulated waste to the FTMC wastewater treatment plant on the Main Post.

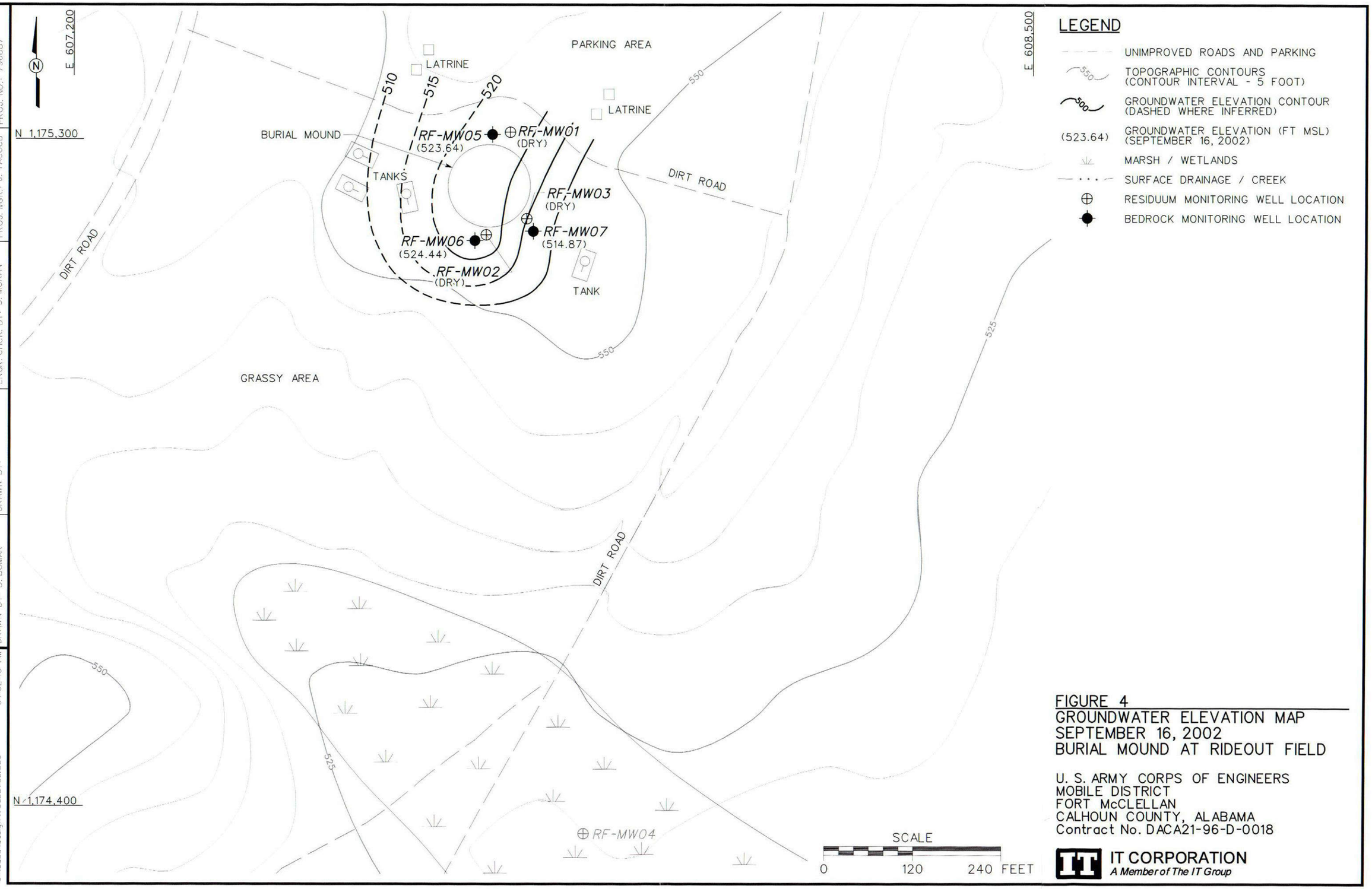
Table 4

Groundwater Elevations
Burial Mound at Rideout Field, Parcel 202Q-RD
Fort McClellan, Calhoun County, Alabama

Well Location	Date	Depth to Water (ft BTOC)	Top of Casing Elevation (ft amsl)	Ground Elevation (ft amsl)	Groundwater Elevation (ft amsl)
RF-MW04	16-Sep-02	4.25	520.96	518.70	516.71
RF-MW05	16-Sep-02	31.21	554.85	552.75	523.64
RF-MW06	16-Sep-02	27.72	552.16	550.01	524.44
RF-MW07	16-Sep-02	37.05	551.92	549.79	514.87

Elevations referenced to the North American Vertical Datum of 1988 (NAVD88).

BTOC - Below top of casing
ft - Feet
amsl - Above mean sea level



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PROJ. NO.: 796887
INITIATOR: D. ALLAN
PROJ. MGR.: J. YACOUB
DRAFT. CHCK. BY:
ENGR. CHCK. BY: S. MORAN
DATE LAST REV.:
STARTING DATE: 09/16/02
DRAWN BY:
DRAWN BY: D. BOMAR

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FIGURE 4
GROUNDWATER ELEVATION MAP
SEPTEMBER 16, 2002
BURIAL MOUND AT RIDEOUT FIELD

U. S. ARMY CORPS OF ENGINEERS
MOBILE DISTRICT
FORT McCLELLAN
CALHOUN COUNTY, ALABAMA
Contract No. DACA21-96-D-0018

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5.0 Physical Characteristics of Study Area

5.1 Meteorology

FTMC is situated in a temperate, humid climate. Summers are long and hot, and winters are usually short and mild to moderately cold. The climate is influenced by frontal systems moving from northwest to southeast, and temperatures change rapidly from warm to cool due to the inflow of northern air. The average annual temperature is 63 degrees Fahrenheit (°F). Summer temperatures usually reach 90°F or higher about 70 days per year, but temperatures above 100°F are rare. Freezing temperatures are common in winter but are usually of short duration. The first frost may arrive by late October. Snowfall averages 0.5 to 1 inch. On rare occasions, several inches of snow accumulate from a single storm. At Anniston, the average date of the first 32°F temperature is November 6, and the last is March 30. This provides a growing season of 221 days (ESE, 1998).

The average annual rainfall is approximately 53 inches and is well distributed throughout the year (National Climatic Data Center, 2001). The more intense rains usually occur during the warmer months, and some flooding occurs nearly every year. Drought conditions are rare, though the entire southeastern United States has been experiencing drought conditions for the three years previous to this writing. Approximately 80 percent of the flood-producing storms are of the frontal type and occur in the winter and spring, lasting from 2 to 4 days each. Summer storms are usually thunderstorms with intense precipitation over small areas, and these sometimes result in serious local floods. Occasionally, several wet years or dry years occur in series. Annual rainfall records indicate no characteristic order or pattern.

Winds in the FTMC area are seldom strong and frequently blow down the valley from the northeast. However, there is no truly persistent wind direction. Normally, only light breezes or calm prevails, except during passages of cyclic disturbances, when destructive local wind storms develop, some into tornadoes, with winds of 100 miles per hour or more.

5.2 Geology

5.2.1 Regional Geology

Calhoun County includes parts of two physiographic provinces, the Piedmont Upland Province and the Valley and Ridge Province. The Piedmont Upland Province occupies the extreme eastern and southeastern portions of the county and is characterized by metamorphosed sedimentary rocks. The generally accepted range in age of these metamorphics is Cambrian to Devonian.

The majority of Calhoun County, including the Main Post of FTMC, lies within the Appalachian fold-and-thrust structural belt (Valley and Ridge Province), where southeastward-dipping thrust faults with associated minor folding are the predominant structural features. The fold-and-thrust belt consists of Paleozoic sedimentary rocks that have been asymmetrically folded and thrust-faulted, with major structures and faults striking in a northeast-southwest direction.

Northwestward transport of the Paleozoic rock sequence along the thrust faults has resulted in the imbricate stacking of large slabs of rock, referred to as thrust sheets. Within an individual thrust sheet, smaller faults may splay off the larger thrust fault, resulting in imbricate stacking of rock units within an individual thrust sheet (Osborne and Szabo, 1984). Geologic contacts in this region generally strike parallel to the faults, and repetition of lithologic units is common in vertical sequences. Geologic formations within the Valley and Ridge Province portion of Calhoun County have been mapped by Warman and Causey (1962), Osborne and Szabo (1984), and Moser and DeJarnette (1992) and vary in age from Lower Cambrian to Pennsylvanian.

The basal unit of the sedimentary sequence in Calhoun County is the Cambrian Chilhowee Group. The Chilhowee Group consists of the Cochran, Nichols, Wilson Ridge, and Weisner Formations (Osborne and Szabo, 1984) but in Calhoun County is either undifferentiated or divided into the Cochran and Nichols Formations and an upper, undifferentiated Wilson Ridge and Weisner Formation. The Cochran is composed of poorly sorted arkosic sandstone and conglomerate with interbeds of greenish gray siltstone and mudstone. Massive to laminated greenish gray and black mudstone makes up the Nichols Formation, with thin interbeds of siltstone and very fine-grained sandstone (Osborne et al., 1988). These two formations are mapped only in the eastern part of the county.

The Wilson Ridge and Weisner Formations are undifferentiated in Calhoun County and consist of both coarse-grained and fine-grained clastics. The coarse-grained facies appears to dominate the unit and consists primarily of coarse-grained, vitreous quartzite and friable, fine- to coarse-grained, orthoquartzitic sandstone, both of which locally contain conglomerate. The fine-grained facies consists of sandy and micaceous shale and silty, micaceous mudstone, which are locally interbedded with the coarse clastic rocks. The abundance of orthoquartzitic sandstone and quartzite suggests that most of the Chilhowee Group bedrock in the vicinity of FTMC belongs to the Weisner Formation (Osborne and Szabo, 1984).

The Cambrian Shady Dolomite overlies the Weisner Formation northeast, east, and southwest of the Main Post and consists of interlayered bluish gray or pale yellowish gray sandy dolomitic

limestone and siliceous dolomite with coarsely crystalline, porous chert (Osborne et al., 1989). A variegated shale and clayey silt have been included within the lower part of the Shady Dolomite (Cloud, 1966). Material similar to this lower shale unit was noted in core holes drilled by the Alabama Geologic Survey on FTMC (Osborne and Szabo, 1984). The character of the Shady Dolomite in the FTMC vicinity and the true assignment of the shale at this stratigraphic interval are still uncertain (Osborne, 1999).

The Rome Formation overlies the Shady Dolomite and locally occurs to the northwest and southeast of the Main Post, as mapped by Warman and Causey (1962) and Osborne and Szabo (1984), and immediately to the west of Reilly Airfield (Osborne and Szabo, 1984). The Rome Formation consists of variegated, thinly interbedded grayish red-purple mudstone, shale, siltstone, and greenish red and light gray sandstone, with locally occurring limestone and dolomite. The Conasauga Formation overlies the Rome Formation and occurs along anticlinal axes in the northeastern portion of Pelham Range (Warman and Causey, 1962; Osborne and Szabo, 1984) and the northern portion of the Main Post (Osborne et al., 1997). The Conasauga Formation is composed of dark gray, finely to coarsely crystalline, medium- to thick-bedded dolomite with minor shale and chert (Osborne et al., 1989).

Overlying the Conasauga Formation is the Knox Group, which is composed of the Copper Ridge and Chepultepec dolomites of Cambro-Ordovician age. The Knox Group is undifferentiated in Calhoun County and consists of light medium gray, fine to medium crystalline, variably bedded to laminated, siliceous dolomite and dolomitic limestone that weather to a chert residuum (Osborne and Szabo, 1984). The Knox Group underlies a large portion of the Pelham Range area.

The Ordovician Newala and Little Oak Limestones overlie the Knox Group. The Newala Limestone consists of light to dark gray, micritic, thick-bedded limestone with minor dolomite. The Little Oak Limestone consists of dark gray, medium- to thick-bedded, fossiliferous, argillaceous to silty limestone with chert nodules. These limestone units are mapped as undifferentiated at FTMC and in other parts of Calhoun County. The Athens Shale overlies the Ordovician limestone units. The Athens Shale consists of dark gray to black shale and graptolitic shale with localized interbedded dark gray limestone (Osborne et al., 1989). These units occur within an eroded "window" in the uppermost structural thrust sheet at FTMC and underlie much of the developed area of the Main Post.

Other Ordovician-aged bedrock units mapped in Calhoun County include the Greensport Formation, Colvin Mountain Sandstone, and Sequatchie Formation. These units consist of

various siltstones, sandstones, shales, dolomites, and limestones and are mapped as one, undifferentiated unit in some areas of Calhoun County. The only Silurian-age sedimentary formation mapped in Calhoun County is the Red Mountain Formation. This unit consists of interbedded red sandstone, siltstone, and shale with greenish gray to red silty and sandy limestone.

The Devonian Frog Mountain Sandstone consists of sandstone and quartzitic sandstone with shale interbeds, dolomudstone, and glauconitic limestone (Osborne et al., 1988). This unit occurs locally in the western portion of Pelham Range.

The Mississippian Fort Payne Chert and the Maury Formation overlie the Frog Mountain Sandstone and are composed of dark to light gray limestone with abundant chert nodules and greenish gray to grayish red phosphatic shale, with increasing amounts of calcareous chert toward the upper portion of the formation (Osborne and Szabo, 1984). These units occur in the northwestern portion of Pelham Range. Overlying the Fort Payne Chert is the Floyd Shale, also of Mississippian age, which consists of thin-bedded, fissile brown to black shale with thin intercalated limestone layers and interbedded sandstone. Osborne and Szabo (1984) reassigned the Floyd Shale, which was mapped by Warman and Causey (1962) on the Main Post of FTMC, to the Ordovician Athens Shale based on fossil data.

The Pennsylvanian Parkwood Formation overlies the Floyd Shale and consists of a medium to dark gray, silty, clay shale and mudstone with interbedded light to medium gray, very fine to fine grained argillaceous, micaceous sandstone. Locally the Parkwood Formation also contains beds of medium to dark gray argillaceous, bioclastic to cherty limestone and beds of clayey coal up to a few inches thick (Raymond et al., 1988). The Parkwood Formation in Calhoun County is generally found within a structurally complex area known as the Coosa deformed belt. In the deformed belt, the Parkwood Formation and Floyd Shale are mapped as undifferentiated because their lithologic similarity and significant deformation make it impractical to map the contact (Thomas and Drahovzal, 1974; Osborne et al., 1988). The undifferentiated Parkwood Formation and Floyd Shale are found throughout the western quarter of Pelham Range.

The Jacksonville thrust fault is the most significant structural geologic feature in the vicinity of the Main Post of FTMC, both for its role in determining the stratigraphic relationships in the area and for its contribution to regional water supplies. The trace of the fault extends northeastward for approximately 39 miles between Bynum, Alabama, and Piedmont, Alabama. The fault is interpreted as a major splay of the Pell City fault (Osborne and Szabo, 1984). The Ordovician sequence that makes up the Eden thrust sheet is exposed at FTMC through an eroded window, or

fenster, in the overlying thrust sheet. Rocks within the window display complex folding, with the folds being overturned and tight to isoclinal. The carbonates and shales locally exhibit well-developed cleavage (Osborne and Szabo, 1984). The FTMC window is framed on the northwest by the Rome Formation; north by the Conasauga Formation; northeast, east, and southwest by the Shady Dolomite; and southeast and southwest by the Chilhowee Group (Osborne et al., 1997). Two small klippen of the Shady Dolomite, bounded by the Jacksonville fault, have been recognized adjacent to the Pell City fault at the FTMC window (Osborne et al., 1997).

The Pell City fault serves as a fault contact between the bedrock within the FTMC window and the Rome and Conasauga Formations. The trace of the Pell City fault is also exposed approximately nine miles west of the FTMC window on Pelham Range, where it traverses northeast to southwest across the western quarter of Pelham Range. Here, the trace of the Pell City fault marks the boundary between the Pell City thrust sheet and the Coosa deformed belt.

The eastern three-quarters of Pelham Range is located within the Pell City thrust sheet, while the remaining western quarter of Pelham is located within the Coosa deformed belt. The Pell City thrust sheet, a large-scale thrust sheet containing Cambrian and Ordovician rock, is relatively less structurally complex than the Coosa deformed belt (Thomas and Neathery, 1982). The Pell City thrust sheet is exposed between the traces of the Jacksonville and Pell City faults along the western boundary of the FTMC window and along the trace of the Pell City fault on Pelham Range (Thomas and Neathery, 1982; Osborne et al., 1988). The Coosa deformed belt is a narrow (approximately 5 to 20 miles wide and approximately 90 miles in length) zone of complex structure consisting mainly of thin, imbricate thrust slices. The structure within these imbricate thrust slices is often internally complicated by small-scale folding and additional thrust faults (Thomas and Drahovzal, 1974).

5.2.2 Site-Specific Geology

Soils at Rideout Field consist of Anniston and Allen gravelly loams, six to ten percent slopes, eroded (AcC2) (U.S. Department of Agriculture [USDA], 1961). Some severely eroded areas may be common on the surface for this soil type, as well as a few shallow gullies. The depth to bedrock ranges from 2 feet to greater than 10 feet. The typical soil description is 2 to 10 feet of well-drained stony loam to clay loam over stratified local alluvium, limestone, or shale bedrock. The depth to the water table is likely greater than 20 feet (USDA, 1961).

Site-specific soils were assessed using lithologic logs prepared by IT during installation of the monitoring wells at the site. In general, the residuum at the Burial Mound at Rideout Field, Parcel 202Q-RD, is reddish brown to brownish orange, medium stiff to hard, clayey sand to clay with

minor amounts of silt and gravel from land surface to approximately 23 feet bgs. At monitoring well RF-MW04, located approximately 840 feet south-southeast of the Burial Mound, the residuum is light brown to olive gray, stiff to hard clay with minor amounts of silt from ground surface to 8 feet bgs. Hard, dark gray to black clay was encountered from approximately 8 to 13 feet bgs.

Bedrock beneath the Burial Mound at Rideout Field is mapped as Ordovician Athens Shale and Ordovician Newala Limestone (Osborne et al., 1989). The Athens Shale consists of dark gray to black shale and graptolitic shale with localized interbedded dark gray limestone. The Newala Limestone consists of light gray to dark gray, micritic, thick-bedded limestone with minor dolomite.

Based on lithologic logs prepared by IT (Appendix A) during the groundwater investigation, moderately hard, slightly weathered to unweathered, lightly to highly fractured, light gray to light bluish gray, microcrystalline limestone with some shale and clay-filled fractures was encountered underlying the residuum. This rock type is typical of the Newala Limestone. At monitoring well RF-MW04, which is located approximately 840 feet south-southeast of the Burial Mound, weathered black shale, typical of the Athens Shale, was encountered during drilling.

No faults have been mapped within the area of investigation; however, two faults (trending northeast to southwest) have been mapped near the site (Osborne et al., 1989). One fault is mapped approximately 400 feet west of the site and the other is mapped approximately 1,000 feet east of the site.

5.3 Hydrology

5.3.1 Surface Hydrology

The Cane/Cave Creek watershed is among six major watersheds in Calhoun County. Cane Creek and its tributaries originate on FTMC. These creek systems originate in the Choccolocco Mountains on the eastern boundary of the installation and flow west through Main Post. They are fed by springs originating in underlying limestone strata. Cane Creek also passes through the entire length of Pelham Range, but its size and volume are greatly increased by the time it reaches this area. Cane Creek eventually discharges into the Coosa River, approximately 10 miles east of Pelham Range (SAIC, 2000).

Cane Creek, which flows westward across the center of Pelham Range, and its tributaries drain almost all of Pelham Range. Drainage entering the range from the south originates in the Anniston

Army Depot, which joins Pelham Range to the south. One drainage located in the southwestern corner traverses this low approximately 800 yards to the north, and all water collected in the low eventually drains into Cane Creek. Drainage from the Cane/Cave Creek watershed on FTMC and Pelham Range ultimately empties into the Coosa River. Floodplains up to 2,500 feet wide traverse this sector and slope toward the center of the range. The wide floodplains are absent in the southern portion of the range (SAIC, 2000).

A study completed by the U.S. Geologic Survey (USGS) reported a 7-day, 2-year low flow of 1.9 cubic feet per second as characteristic of Cane Creek near Anniston (USGS, 1994). The station location for this reading was a bridge on a county road located 0.5 miles northwest of State Highway 11 and 5 miles north of Anniston. Cane Creek, which is located approximately 1,100 feet south of the former Burial Mound, is perennial at the location downgradient from Rideout Field. Surface water runoff from the former Burial Mound site follows site topography and flows generally to the south towards Cane Creek (Figure 2).

5.3.2 Groundwater Flow and Hydrogeology

Groundwater was encountered in limestone at depths ranging from approximately 60 to 90 feet bgs during well installation activities at the Burial Mound at Rideout Field. Groundwater was not encountered in residuum in the immediate vicinity of the Burial Mound (i.e., in monitoring wells RF-MW01, RF-MW02, and RF-MW03).

The groundwater elevation data collected on September 16, 2002, are presented on Figure 4. Based on the September 2002 data, groundwater elevations range from approximately 524 feet above mean sea level in RF-MW05 to approximately 515 feet above mean sea level in RF-MW07. Groundwater elevation measurements in September were collected after allowing the monitoring wells to vent for approximately 48 hours prior to measurement to allow for atmospheric equilibration. Based on the groundwater elevation data, groundwater flow direction in bedrock appears to conform to surface topography and is toward Cane Creek. As shown on Figure 4, there is a component of groundwater flow to the east toward Cane Creek. The figure also shows inferred groundwater flow directions to the south and southwest toward Cane Creek, mimicking topography.

The thickness of the unsaturated zone at monitoring wells RF-MW05, RF-MW06, and RF-MW07 ranges from approximately 60 feet (at RF-MW05) to 90 feet (at RF-MW07).

6.0 Summary of Groundwater Analytical Results

The four groundwater samples collected at the Burial Mound at Rideout Field were analyzed for gamma-emitting radionuclides (including Cs-137 and Co-60) and Sr-90. None of the three radionuclides of concern (Cs-137, Co-60, and Sr-90) was detected in any of the samples. Only two naturally occurring radionuclides were detected in the groundwater samples collected. Bismuth-214 (Bi-214) and lead-214 (Pb-214) were detected at 21 and 21.6 picocuries per liter (pCi/L), respectively, in one well (RF-MW06). Because no federal drinking water standards exist for these radionuclides, the analytical results were compared to U.S. Department of Energy (DOE) groundwater screening levels to determine whether the activities of these radionuclides pose a potential threat to human health. The DOE groundwater screening levels are derived for a dose equivalent of 4 millirem per year by multiplying the DOE derived concentration guide (DCG) by 4 percent. DCGs are published in DOE Order 5400.5, *Radiation Protection of the Public and the Environment* (DOE, 1993) and are concentrations of radionuclides in air or water that, under conditions of continuous exposure for one year by one exposure mode (e.g., inhalation, ingestion) would result in a dose of 100 millirem to the public.

As shown in Table 5, the detected radionuclide activities were well below DOE screening levels of 24,000 pCi/L for Bi-214 and 8,000 pCi/L for Pb-214. Complete analytical results are provided in Appendix E.

7.0 Conclusions

Groundwater is not present in residuum groundwater monitoring wells in the vicinity of the former burial mound. The analytical results of the groundwater samples collected from residuum monitoring well RF-MW04 (located approximately 800 feet south-southeast of the former burial mound) and bedrock monitoring wells RF-MW05, RF-MW06, and RF-MW07 indicate that the radionuclides of concern (Cs-137, Co-60, and Sr-90) were not present in groundwater at the site. Two naturally occurring radionuclides (Bi-214 and Pb-214) were detected in one well (RF-MW06) at the site; however, the activities of these radionuclides were well below DOE groundwater screening levels.

Table 5

Groundwater Analytical Results
Burial Mound at Rideout Field
Fort McClellan, Calhoun County, Alabama

Sample Location			RF-MW04		RF-MW05		RF-MW06		RF-MW07	
Sample Number			HV3005		HV3006		HV3007		HV3008	
Sample Date			30-Jul-02		30-Jul-02		2-Aug-02		2-Aug-02	
Parameter	Units	DOE Screening Level[a]	Result	>DOE Screening Level	Result	>DOE Screening Level	Result	>DOE Screening Level	Result	>DOE Screening Level
GAMMA SCAN										
Bi-214	pCi/L	24,000	ND	No	ND	No	21	No	ND	No
Pb-214	pCi/L	8,000	ND	No	ND	No	21.6	No	ND	No

[a] U.S. Department of Energy (DOE) groundwater screening level. Derived for a dose equivalent of 4 millirem per year (mrem/yr) by multiplying the DOE Derived Concentration Guide (DCG) by 4 percent. DCGs are published in DOE Order 5400.5, *Radiation Protection of the Public and the Environment.*

Bi - Bismuth.
Pb - Lead.
pCi/L - Picocuries per liter.

8.0 References

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ATTACHMENT 1

LIST OF ABBREVIATIONS AND ACRONYMS

List of Abbreviations and Acronyms

2,4-D	2,4-dichlorophenoxyacetic acid
2,4,5-T	2,4,5-trichlorophenoxyacetic acid
2,4,5-TP	silvex
3D	3D International Environmental Group
AB	ambient blank
AbB3	Anniston gravelly clay loam, 2 to 6 percent slopes, severely eroded
AbC3	Anniston gravelly clay loam, 6 to 10 percent slopes, severely eroded
AbD3	Anniston and Allen gravelly clay loams, 10 to 15 percent slopes, eroded
Abs	skin absorption
ABS	dermal absorption factor
AC	hydrogen cyanide
ACAD	AutoCadd
AcB2	Anniston and Allen gravelly loams, 2 to 6 percent slopes, eroded
AcC2	Anniston and Allen gravelly loams, 6 to 10 percent slopes, eroded
AcD2	Anniston and Allen gravelly loams, 10 to 15 percent slopes, eroded
AcE2	Anniston and Allen gravelly loams, 15 to 25 percent slopes, eroded
ACGIH	American Conference of Governmental Industrial Hygienists
AdE	Anniston and Allen stony loam, 10 to 25 percent slope
ADEM	Alabama Department of Environmental Management
ADPH	Alabama Department of Public Health
AEC	U.S. Army Environmental Center
AEL	airborne exposure limit
AET	adverse effect threshold
AF	soil-to-skin adherence factor
AHA	ammunition holding area
AL	Alabama
ALAD	-aminolevulinic acid dehydratase
amb.	amber
amsl	above mean sea level
ANAD	Anniston Army Depot
AOC	area of concern
APEC	areas of potential ecological concern
APT	armor-piercing tracer
AR	analysis request
ARAR	applicable or relevant and appropriate requirement
AREE	area requiring environmental evaluation
AS/SVE	air sparging/soil vapor extraction
ASP	Ammunition Supply Point
ASR	Archives Search Report
AST	aboveground storage tank
ASTM	American Society for Testing and Materials
AT	averaging time
ATSDR	Agency for Toxic Substances and Disease Registry
ATV	all-terrain vehicle
AUF	area use factor
AWARE	Associated Water and Air Resources Engineers, Inc.
AWQC	ambient water quality criteria
AWWSB	Anniston Water Works and Sewer Board
'B'	Analyte detected in laboratory or field blank at concentration greater than the reporting limit (and greater than zero)
BCF	blank correction factor; bioconcentration factor
BCT	BRAC Cleanup Team
BERA	baseline ecological risk assessment
BEHP	bis(2-ethylhexyl)phthalate
BFB	bromofluorobenzene
BFE	base flood elevation
BG	Bacillus globigii
BGR	Bains Gap Road
bgs	below ground surface
BHC	betahexachlorocyclohexane
BHHRA	baseline human health risk assessment
BIRTC	Branch Immaterial Replacement Training Center
bkg	background
bls	below land surface
BOD	biological oxygen demand
Bp	soil-to-plant biotransfer factors
BRAC	Base Realignment and Closure
Braun	Braun Intertec Corporation
BSAF	biota-to-sediment accumulation factors
BSC	background screening criterion
BTAG	Biological Technical Assistance Group
BTEX	benzene, toluene, ethyl benzene, and xylenes
BTOC	below top of casing
BTV	background threshold value
BW	biological warfare; body weight
BZ	breathing zone; 3-quinuclidinyl benzilate
C	ceiling limit value
Ca	carcinogen
$CaCO_3$	calcium carbonate
CAA	Clean Air Act
CAB	chemical warfare agent breakdown products
CAMU	corrective action management unit
CBR	chemical, biological, and radiological
CCAL	continuing calibration
CCB	continuing calibration blank
CCV	continuing calibration verification
CD	compact disc
CDTF	Chemical Defense Training Facility
CEHNC	U.S. Army Engineering and Support Center, Huntsville
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CERFA	Community Environmental Response Facilitation Act
CESAS	Corps of Engineers South Atlantic Savannah
CF	conversion factor
CFC	chlorofluorocarbon
CFDP	Center for Domestic Preparedness
CFR	Code of Federal Regulations
CG	carbonyl chloride (phosgene)
CGI	combustible gas indicator
ch	inorganic clays of high plasticity
CHPPM	U.S. Army Center for Health Promotion and Preventive Medicine
CK	cyanogen chloride
cl	inorganic clays of low to medium plasticity
Cl	chlorinated
CLP	Contract Laboratory Program
cm	centimeter
CN	chloroacetophenone
CNB	chloroacetophenone, benzene, and carbon tetrachloride
CNS	chloroacetophenone, chloropicrin, and chloroform
CO	carbon monoxide
CO_2	carbon dioxide
Co-60	cobalt-60
CoA	Code of Alabama
COC	chain of custody; chemical of concern
COE	Corps of Engineers
Con	skin or eye contact
COPC	chemical(s) of potential concern
COPEC	chemical(s)/constituent(s) of potential ecological concern
CPSS	chemicals present in site samples
CQCSM	Contract Quality Control System Manager
CRDL	contract-required detection limit
CRL	certified reporting limit
CRQL	contract-required quantitation limit
CRZ	contamination reduction zone
Cs-137	cesium-137
CS	ortho-chlorobenzylidene-malononitrile
CSEM	conceptual site exposure model
CSM	conceptual site model
CT	central tendency
ctr.	container
CWA	chemical warfare agent; Clean Water Act
CWM	chemical warfare material; clear, wide mouth
CX	dichloroformoxime
'D'	duplicate; dilution
D&I	detection and identification
DAAMS	depot area air monitoring system
DAF	dilution-attenuation factor
DANC	decontamination agent, non-corrosive
°C	degrees Celsius
°F	degrees Fahrenheit
DCA	dichloroethane
DCE	dichloroethene
DDD	dichlorodiphenyldichloroethane
DDE	dichlorodiphenyldichloroethene
DDT	dichlorodiphenyltrichloroethane

List of Abbreviations and Acronyms *(Continued)*

DEH	Directorate of Engineering and Housing
DEP	depositional soil
DFTPP	decafluorotriphenylphosphine
DI	deionized
DID	data item description
DIMP	di-isopropylmethylphosphonate
DM	dry matter; adamsite
DMBA	dimethylbenz(a)anthracene
DMMP	dimethylmethylphosphonate
DOD	U.S. Department of Defense
DOJ	U.S. Department of Justice
DOT	U.S. Department of Transportation
DP	direct-push
DPDO	Defense Property Disposal Office
DPT	direct-push technology
DQO	data quality objective
DRMO	Defense Reutilization and Marketing Office
DRO	diesel range organics
DS	deep (subsurface) soil
DS2	Decontamination Solution Number 2
DSERTS	Defense Site Environmental Restoration Tracking System
DWEL	drinking water equivalent level
E&E	Ecology and Environment, Inc.
EB	equipment blank
EBS	environmental baseline survey
EC_{50}	effects concentration for 50 percent of a population
ECBC	Edgewood Chemical/Biological Command
ED	exposure duration
EDD	electronic data deliverable
EF	exposure frequency
EDQL	ecological data quality level
EE/CA	engineering evaluation and cost analysis
Elev.	elevation
EM	electromagnetic
EMI	Environmental Management Inc.
EM31	Geonics Limited EM31 Terrain Conductivity Meter
EM61	Geonics Limited EM61 High-Resolution Metal Detector
EOD	explosive ordnance disposal
EODT	explosive ordnance disposal team
EPA	U.S. Environmental Protection Agency
EPC	exposure point concentration
EPIC	Environmental Photographic Interpretation Center
EPRI	Electrical Power Research Institute
ER	equipment rinsate
ERA	ecological risk assessment
ER-L	effects range-low
ER-M	effects range-medium
ESE	Environmental Science and Engineering, Inc.
ESMP	Endangered Species Management Plan
ESN	Environmental Services Network, Inc.
ESV	ecological screening value
ET	exposure time
EU	exposure unit
Exp.	explosives
E-W	east to west
EZ	exclusion zone
FAR	Federal Acquisition Regulations
FB	field blank
FD	field duplicate
FDA	U.S. Food and Drug Administration
Fe^{+3}	ferric iron
Fe^{+2}	ferrous iron
FedEx	Federal Express, Inc.
FEMA	Federal Emergency Management Agency
FFCA	Federal Facilities Compliance Act
FFE	field flame expedient
FFS	focused feasibility study
FI	fraction of exposure
Fil	filtered
Flt	filtered
FMDC	Fort McClellan Development Commission
FML	flexible membrane liner
FMP 1300	Former Motor Pool 1300
f_{oc}	fraction organic carbon
FOMRA	Former Ordnance Motor Repair Area
FOST	Finding of Suitability to Transfer
Foster Wheeler	Foster Wheeler Environmental Corporation
FR	Federal Register
Frtn	fraction
FS	field split; feasibility study
FSP	field sampling plan
ft	feet
ft/day	feet per day
ft/ft	feet per foot
ft/yr	feet per year
FTA	Fire Training Area
FTMC	Fort McClellan
FTRRA	FTMC Reuse & Redevelopment Authority
g	gram
g/m^3	gram per cubic meter
G-856	Geometrics, Inc. G-856 magnetometer
G-858G	Geometrics, Inc. G-858G magnetic gradiometer
GAF	gastrointestinal absorption factor
gal	gallon
gal/min	gallons per minute
GB	sarin
gc	clay gravels; gravel-sand-clay mixtures
GC	gas chromatograph
GCL	geosynthetic clay liner
GC/MS	gas chromatograph/mass spectrometer
GCR	geosynthetic clay liner
GFAA	graphite furnace atomic absorption
GIS	Geographic Information System
gm	silty gravels; gravel-sand-silt mixtures
gp	poorly graded gravels; gravel-sand mixtures
gpm	gallons per minute
GPR	ground-penetrating radar
GPS	global positioning system
GRA	general response action
GS	ground scar
GSA	General Services Administration; Geologic Survey of Alabama
GSBP	Ground Scar Boiler Plant
GSSI	Geophysical Survey Systems, Inc.
GST	ground stain
GW	groundwater
gw	well-graded gravels; gravel-sand mixtures
H&S	health and safety
HA	hand auger
HCl	hydrochloric acid
HD	distilled mustard
HDPE	high-density polyethylene
HEAST	Health Effects Assessment Summary Tables
Herb.	herbicides
HHRA	human health risk assessment
HI	hazard index
H_2O_2	hydrogen peroxide
HPLC	high performance liquid chromatography
HNO_3	nitric acid
HQ	hazard quotient
HQ_{screen}	screening-level hazard quotient
hr	hour
HRC	hydrogen releasing compound
HSA	hollow-stem auger
HTRW	hazardous, toxic, and radioactive waste
'I'	out of control, data rejected due to low recovery
IATA	International Air Transport Authority
ICAL	initial calibration
ICB	initial calibration blank
ICP	inductively-coupled plasma
ICRP	International Commission on Radiological Protection
ICS	interference check sample
ID	inside diameter
IDL	instrument detection limit
IDLH	immediately dangerous to life or health

List of Abbreviations and Acronyms (Continued)

IDM	investigative-derived media
IDW	investigation-derived waste
IEUBK	Integrated Exposure Uptake Biokinetic
IF	ingestion factor; inhalation factor
ILCR	incremental lifetime cancer risk
IMPA	isopropylmethyl phosphonic acid
IMR	Iron Mountain Road
in.	inch
Ing	ingestion
Inh	inhalation
IP	ionization potential
IPS	International Pipe Standard
IR	ingestion rate
IRDMIS	Installation Restoration Data Management Information System
IRIS	Integrated Risk Information Service
IRP	Installation Restoration Program
IS	internal standard
ISCP	Installation Spill Contingency Plan
IT	IT Corporation
ITEMS	IT Environmental Management System™
'J'	estimated concentration
JeB2	Jefferson gravelly fine sandy loam, 2 to 6 percent slopes, eroded
JeC2	Jefferson gravelly fine sandy loam, 6 to 10 percent slopes, eroded
JfB	Jefferson stony fine sandy loam, 0 to 10 percent slopes have strong slopes
JPA	Joint Powers Authority
K	conductivity
K_d	soil-water distribution coefficient
kg	kilogram
KeV	kilo electron volt
K_{oc}	organic carbon partioning coefficient
$KMnO_4$	potassium permanganate
K_{ow}	octonal-water partition coefficient
L	lewisite; liter
L/kg/day	liters per kilogram per day
l	liter
lb	pound
LBP	lead-based paint
LC	liquid chromatography
LCS	laboratory control sample
LC_{50}	lethal concentration for 50 percent population tested
LD_{50}	lethal dose for 50 percent population tested
LEL	lower explosive limit
LOAEL	lowest-observed-advserse-effects-level
LRA	land redevelopment authority
LT	less than the certified reporting limit
LUC	land-use control
LUCAP	land-use control assurance plan
LUCIP	land-use control implementation plan
max	maximum
MB	method blank
MCL	maximum contaminant level
MCLG	maximum contaminant level goal
MCPA	4-chloro-2-methylphenoxyacetic acid
MCS	media cleanup standard
MD	matrix duplicate
MDC	maximum detected concentration
MDCC	maximum detected constituent concentration
MDL	method detection limit
mg	milligrams
mg/kg	milligrams per kilogram
mg/kg/day	milligram per kilogram per day
mg/kgbw/day	milligrams per kilogram of body weight per day
mg/L	milligrams per liter
mg/m^3	milligrams per cubic meter
mh	inorganic silts, micaceous or diatomaceous fine, sandy or silt soils
MHz	megahertz
µg/g	micrograms per gram
µg/kg	micrograms per kilogram
µg/L	micrograms per liter
µmhos/cm	micromhos per centimeter
MeV	mega electron volt
min	minimum
MINICAMS	miniature continuous air monitoring system
ml	inorganic silts and very fine sands
mL	milliliter
mm	millimeter
MM	mounded material
MMBtu/hr	million Btu per hour
MNA	monitored natural attenuation
MnO_4-	permanganate ion
MOGAS	motor vehicle gasoline
MOUT	Military Operations in Urban Terrain
MP	Military Police
MPA	methyl phosphonic acid
MPM	most probable munition
MQL	method quantitation limit
MR	molasses residue
MRL	method reporting limit
MS	matrix spike
mS/cm	millisiemens per centimeter
mS/m	millisiemens per meter
MSD	matrix spike duplicate
MTBE	methyl tertiary butyl ether
msl	mean sea level
MtD3	Montevallo shaly, silty clay loam, 10 to 40 percent slopes , severely eroded
mV	millivolts
MW	monitoring well
MWI&P	Monitoring Well Installation and Management Plan
Na	sodium
NA	not applicable; not available
NAD	North American Datum
NAD83	North American Datum of 1983
$NaMnO_4$	sodium permanganate
NAVD88	North American Vertical Datum of 1988
NAS	National Academy of Sciences
NCEA	National Center for Environmental Assessment
NCP	National Contingency Plan
NCRP	National Council on Radiation Protection and Measurements
ND	not detected
NE	no evidence; northeast
ne	not evaluated
NEW	net explosive weight
NFA	No Further Action
NG	National Guard
NGP	National Guardsperson
ng/L	nanograms per liter
NGVD	National Geodetic Vertical Datum
Ni	nickel
NIC	notice of intended change
NIOSH	National Institute for Occupational Safety and Health
NIST	National Institute of Standards and Technology
NLM	National Library of Medicine
NO_3^-	nitrate
NPDES	National Pollutant Discharge Elimination System
NPW	net present worth
No.	number
NOAA	National Oceanic and Atmospheric Administration
NOAEL	no-observed-adverse-effects-level
NR	not requested; not recorded; no risk
NRC	National Research Council
NRCC	National Research Council of Canada
NRHP	National Register of Historic Places
ns	nanosecond
N-S	north to south
NS	not surveyed
NSA	New South Associates, Inc.
nT	nanotesla
nT/m	nanoteslas per meter
NTU	nephelometric turbidity unit
nv	not validated
O_2	oxygen
O_3	ozone
O&G	oil and grease
O&M	operation and maintenance

List of Abbreviations and Acronyms (Continued)

OB/OD	open burning/open detonation
OD	outside diameter
OE	ordnance and explosives
oh	organic clays of medium to high plasticity
OH•	hydroxyl radical
ol	organic silts and organic silty clays of low plasticity
OP	organophosphorus
ORC	Oxygen Releasing Compound
ORP	oxidation-reduction potential
OSHA	Occupational Safety and Health Administration
OSWER	Office of Solid Waste and Emergency Response
OVM-PID/FID	organic vapor meter-photoionization detector/flame ionization detector
OWS	oil/water separator
oz	ounce
PA	preliminary assessment
PAH	polynuclear aromatic hydrocarbon
PARCCS	precision, accuracy, representativeness, comparability, completeness, and sensitivity
Parsons	Parsons Engineering Science, Inc.
Pb	lead
PBMS	performance-based measurement system
PC	permeability coefficient
PCB	polychlorinated biphenyl
PCDD	polychlorinated dibenzo-p-dioxins
PCDF	polychlorinated dibenzofurans
PCE	perchloroethene
PCP	pentachlorophenol
PDS	Personnel Decontamination Station
PEF	particulate emission factor
PEL	permissible exposure limit
PERA	preliminary ecological risk assessment
PES	potential explosive site
Pest.	pesticides
PETN	pentarey thritol tetranitrate
PFT	portable flamethrower
PG	professional geologist
PID	photoionization detector
PkA	Philo and Stendal soils local alluvium, 0 to 2 percent slopes
PM	project manager
POC	point of contact
POL	petroleum, oils, and lubricants
POTW	publicly owned treatment works
POW	prisoner of war
PP	peristaltic pump; Proposed Plan
ppb	parts per billion
PPE	personal protective equipment
ppm	parts per million
PPMP	Print Plant Motor Pool
ppt	parts per thousand
PR	potential risk
PRA	preliminary risk assessment
PRG	preliminary remediation goal
PS	chloropicrin
PSSC	potential site-specific chemical
pt	peat or other highly organic silts
PVC	polyvinyl chloride
QA	quality assurance
QA/QC	quality assurance/quality control
QAM	quality assurance manual
QAO	quality assurance officer
QAP	installation-wide quality assurance plan
QC	quality control
QST	QST Environmental, Inc.
qty	quantity
Qual	qualifier
R	rejected data; resample; retardation factor
R&A	relevant and appropriate
RA	remedial action
RAO	remedial action objective
RBC	risk-based concentration; red blood cell
RCRA	Resource Conservation and Recovery Act
RD	remedial design
RDX	cyclonite
ReB3	Rarden silty clay loams
REG	regular field sample
REL	recommended exposure limit
RFA	request for analysis
RfC	reference concentration
RfD	reference dose
RGO	remedial goal option
RI	remedial investigation
RL	reporting limit
RME	reasonable maximum exposure
ROD	Record of Decision
RPD	relative percent difference
RRF	relative response factor
RSD	relative standard deviation
RTC	Recruiting Training Center
RTECS	Registry of Toxic Effects of Chemical Substances
RTK	real-time kinematic
SA	exposed skin surface area
SAD	South Atlantic Division
SAE	Society of Automotive Engineers
SAIC	Science Applications International Corporation
SAP	installation-wide sampling and analysis plan
SARA	Superfund Amendments and Reauthorization Act
sc	clayey sands; sand-clay mixtures
Sch.	Schedule
SCM	site conceptual model
SD	sediment
SDG	sample delivery group
SDWA	Safe Drinking Water Act
SDZ	safe distance zone; surface danger zone
SEMS	Southern Environmental Management & Specialties, Inc.
SF	cancer slope factor
SFSP	site-specific field sampling plan
SGF	standard grade fuels
SHP	installation-wide safety and health plan
SI	site investigation
SINA	Special Interest Natural Area
SL	standing liquid
SLERA	screening-level ecological risk assessment
sm	silty sands; sand-silt mixtures
SM	Serratia marcescens
SMDP	Scientific Management Decision Point
s/n	signal-to-noise ratio
SO_4^{-2}	sulfate
SOD	soil oxidant demand
SOP	standard operating procedure
SOPQAM	U.S. EPA's *Standard Operating Procedure/Quality Assurance Manual*
sp	poorly graded sands; gravelly sands
SP	submersible pump
SPCC	system performance calibration compound
SPCS	State Plane Coordinate System
SPM	sample planning module
SQRT	screening quick reference tables
Sr-90	strontium-90
SRA	streamlined human health risk assessment
SRM	standard reference material
Ss	stony rough land, sandstone series
SS	surface soil
SSC	site-specific chemical
SSHO	site safety and health officer
SSHP	site-specific safety and health plan
SSL	soil screening level
SSSL	site-specific screening level
SSSSL	site-specific soil screening level
STB	supertropical bleach
STC	source-term concentration
STD	standard deviation
STEL	short-term exposure limit
STL	Severn-Trent Laboratories
STOLS	Surface Towed Ordnance Locator System®
Std. units	standard units

SU	standard unit
SUXOS	senior UXO supervisor
SVOC	semivolatile organic compound
SW	surface water
SW-846	U.S. EPA's *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods*
SWMU	solid waste management unit
SWPP	storm water pollution prevention plan
SZ	support zone
TAL	target analyte list
TAT	turn around time
TB	trip blank
TBC	to be considered
TCA	trichloroethane
TCDD	2,3,7,8-tetrachlorodibenzo-p-dioxin
TCDF	tetrachlorodibenzofurans
TCE	trichloroethene
TCL	target compound list
TCLP	toxicity characteristic leaching procedure
TDEC	Tennessee Department of Environment and Conservation
TDGCL	thiodiglycol
TDGCLA	thiodiglycol chloroacetic acid
TERC	Total Environmental Restoration Contract
THI	target hazard index
TIC	tentatively identified compound
TLV	threshold limit value
TN	Tennessee
TNT	trinitrotoluene
TOC	top of casing; total organic carbon
TPH	total petroleum hydrocarbons
TR	target cancer risk
TRADOC	U.S. Army Training and Doctrine Command
TRPH	total recoverable petroleum hydrocarbons
TSCA	Toxic Substances Control Act
TSDF	treatment, storage, and disposal facility
TWA	time-weighted average
UBR	upper background range
UCL	upper confidence limit
UCR	upper certified range
'U'	not detected above reporting limit
UIC	underground injection control
UF	uncertainty factor
USACE	U.S. Army Corps of Engineers
USACHPPM	U.S. Army Center for Health Promotion and Preventive Medicine
USAEC	U.S. Army Environmental Center
USAEHA	U.S. Army Environmental Hygiene Agency
USACMLS	U.S. Army Chemical School
USAMPS	U.S. Army Military Police School
USATCES	U.S. Army Technical Center for Explosive Safety
USATEU	U.S. Army Technical Escort Unit
USATHAMA	U.S. Army Toxic and Hazardous Material Agency
USC	United States Code
USCS	Unified Soil Classification System
USDA	U.S. Department of Agriculture
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
UST	underground storage tank
UTL	upper tolerance level; upper tolerance limit
UXO	unexploded ordnance
UXOQCS	UXO Quality Control Supervisor
UXOSO	UXO safety officer
V	vanadium
VC	vinyl chloride
VOA	volatile organic analyte
VOC	volatile organic compound
VOH	volatile organic hydrocarbon
VQlfr	validation qualifier
VQual	validation qualifier
VX	nerve agent (O-ethyl-S-[diisopropylaminoethyl]-methylphosphonothiolate)
WAC	Women's Army Corps
Weston	Roy F. Weston, Inc.
WP	installation-wide work plan
WRS	Wilcoxon rank sum
WS	watershed
WSA	Watershed Screening Assessment
WWI	World War I
WWII	World War II
XRF	x-ray fluorescence
yd^3	cubic yards

APPENDIX A

BORING LOGS AND WELL CONSTRUCTION LOGS

BORING LOGS

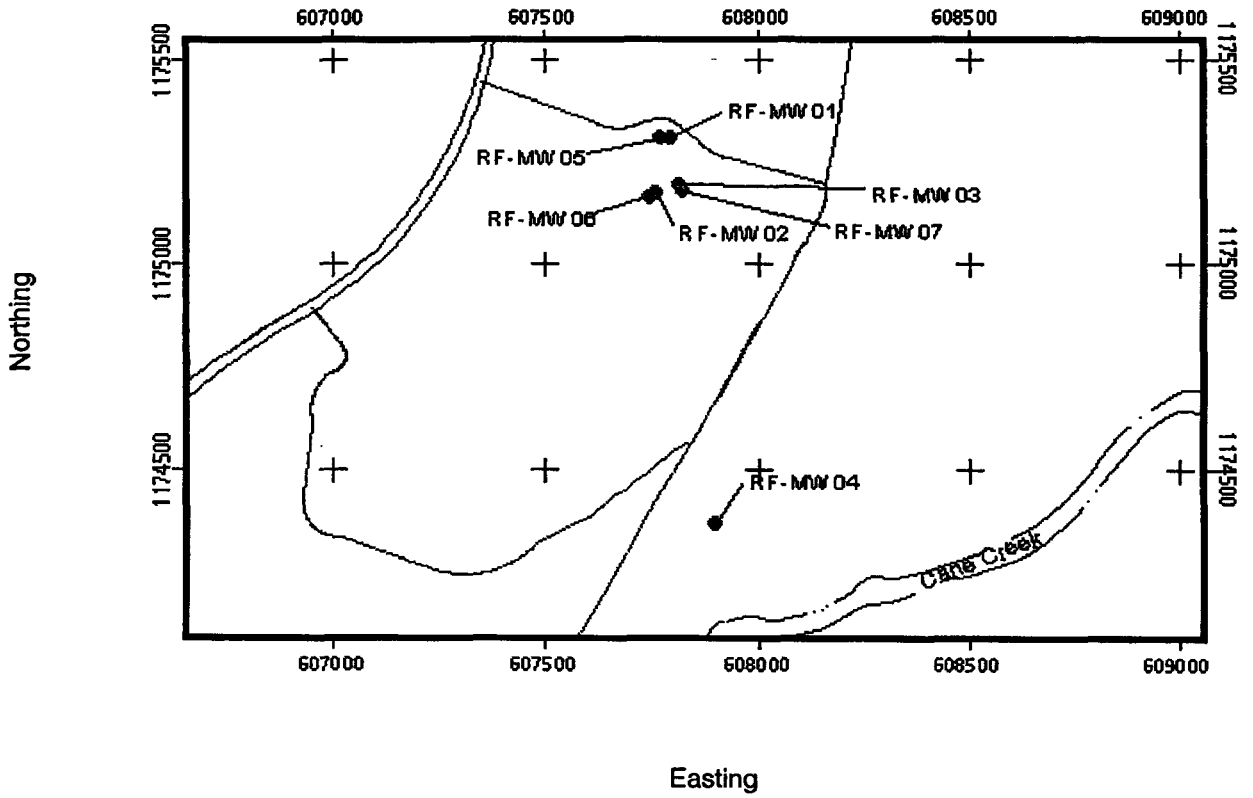
HTRW DRILLING LOG

	District: **Mobile USACE**	HOLE NUMBER RF-MW01
1. Company name: **IT Corporation**	2. Drill Subcontractor: Miller Drilling Company	Sheet 1 of 4 sheets

3. Project: Fort McClellan	4. Location: **Calhoun County, Alabama**
5. Name of driller: Paul Gibson	6. Mfr. designation of drill: Mobile B-59 HSA
7. Sizes and types of drilling and sampling equipment: Hollow Stem Auger HSA - 5'x8.25" OD Augers, 2'x2" Steel Split Spoons	8. Hole location: Rideout Field, Pelham Range
	9. Surface elevation (feet above mean sea level): 553.15
	10. Date started: 05/28/02 — 11. Date completed: 06/03/02
12. Overburden thickness (feet bgs): 23	15. Depth groundwater encountered (feet bgs): NA
13. Depth drilled into rock (feet bgs): .1	16. Depth to water and elapsed time after drilling completed (feet bgs): Dry after 24 hours
14. Total depth of hole (feet bgs): 23.1	17. Other water level measurements (specify): NA

18. Geotechnical samples:	Collected:	Disturbed:	Undisturbed:	19. Total no. of core boxes: N/A		
20. Samples for chemical analysis:	**VOC**	**Metals**	**Other (specify)**	**Other (specify)**	**Other (specify)**	**21. Total core recovery:**
						N/A
22. Disposition of hole:	Backfilled	Monitoring well	Other (specify)	Geologist:		
		2" Permanent		Cindy Levaas		

LOCATION SKETCH/COMMENTS:



HTRW DRILLING LOG (Continuation Sheet)

HOLE NUMBER: RF-MW01

Project: Fort McClellan | Geologist: Cindy Levaas | Sheet 2 of 4 sheets

Elev. (a)	Depth (b)	Description of Materials (c)	USCS / Lithology	Graphic	Field screening results (d)	Geotech sample or core box no. (e)	Analytical sample no. (f)	Blow counts (g)	Remarks (h)
	0	sc: Reddish brown, slightly moist, medium stiff to stiff CLAY and SAND, trace roots, trace subrounded, sandstone Gravel.	sc		Organic Vapor = 0ppm			4 4 3 5	Rec 1.7'/2.0' (0-2' bgs)
	1								
		NA: No recovery.	NA						
	2	sc: Reddish brown, slightly moist, medium stiff to stiff CLAY and SAND, trace roots, trace subrounded, sandstone Gravel.	sc		Organic Vapor = 0ppm			3 3 7 11	Rec 1.8'/2.0' (2-4' bgs)
550	3								
		NA: No recovery.	NA						
	4	sc: Reddish brown, slightly moist, medium stiff to stiff CLAY and SAND, trace roots, trace subrounded, sandstone Gravel.	sc		Organic Vapor = 0ppm			8 10 14 10	Rec 1.5'/2.0' (4-6' bgs)
	5								
		NA: No recovery.	NA						
	6	sc: Reddish brown to light brown, moist, very stiff CLAY and fine to medium SAND, little Silt, little subrounded, sandstone Gravel.	sc		Organic Vapor = 0ppm			7 9 11 17	Rec 2.0'/2.0' (6-8' bgs)
	7								
545	8	cl: Reddish brown to light gray, moist, stiff CLAY, some fine to medium Sand, little Silt, little subangular, siltstone Gravel (in layer).	cl		Organic Vapor = 0ppm			16 17 20 14	Rec 2.0'/2.0' (8-10' bgs)
	9								
	10								

HTRW DRILLING LOG (Continuation Sheet)

HOLE NUMBER: RF-MW01

Project: Fort McClellan | Geologist: Cindy Levaas | Sheet 3 of 4 sheets

Elev. (a)	Depth (b)	Description of Materials (c)	USCS / Lithology	Graphic	Field screening results (d)	Geotech sample or core box no. (e)	Analytical sample no. (f)	Blow counts (g)	Remarks (h)
		cl: Reddish brown, moist, stiff CLAY, some fine to medium Sand, little Silt.	cl		Organic Vapor = 0ppm			13 18 16 14	Rec 1.5'/2.0' (10-12' bgs)
	11								
		NA: No recovery.	NA						
	12	NA: No sample collected for lithologic description.							
548	13								
			NA						
	14								
	15	cl: Orangeish brown to olive gray, moist, medium stiff to stiff CLAY, some Silt, noted manganese nodules.			Organic Vapor = 0ppm			1 3 4 6	Rec 1.9'/2.0' (15-17' bgs)
	16		cl						
	17	NA: No recovery.	NA						
		NA: No sample collected for lithologic description.							
535	18								
			NA						
	19								
	20	sc: Light brown to dark brown, very moist, fine			Organic			3 3 4 6	Rec 2.0'/2.0' (20-22' bgs)

HTRW DRILLING LOG (Continuation Sheet)

HOLE NUMBER: RF-MW01

Project: Fort McClellan | Geologist: Cindy Levaas | Sheet 4 of 4 sheets

Elev. (a)	Depth (b)	Description of Materials (c)	USCS / Lithology	Graphic	Field screening results (d)	Geotech sample or core box no. (e)	Analytical sample no. (f)	Blow counts (g)	Remarks (h)
		to medium SAND, some Clay, little Silt.			Vapor = 0ppm				
	21		SC						21
	22	NA: No sample collected for lithologic description.	NA						22
	23	ls: Light gray, weathered LIMESTONE.						30/0.1' (23-	Auger and split spoon refusal at 23.1' bgs Bottom of borehole at 23.1' 23

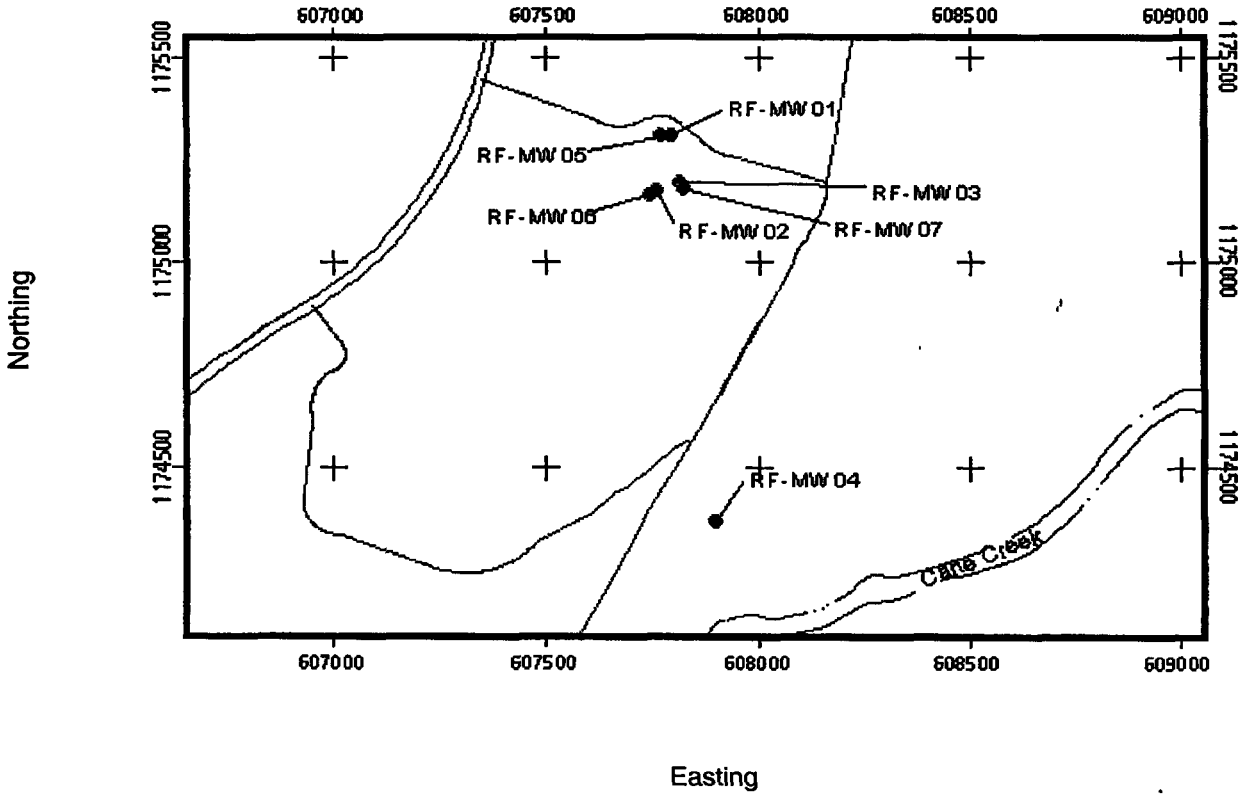
HTRW DRILLING LOG

	District: **Mobile USACE**	**HOLE NUMBER** RF-MW02
1. Company name: **IT Corporation**	2. Drill Subcontractor: Miller Drilling Company	Sheet 1 of 4 sheets

3. Project: Fort McClellan	4. Location: **Calhoun County, Alabama**
5. Name of driller: Paul Gibson	6. Mfr. designation of drill: Mobile B-59 HSA
7. Sizes and types of drilling and sampling equipment: Hollow Stem Auger HSA - 5'x8.25" OD Augers, 2'x2" Steel Split Spoons	8. Hole location: Rideout Field, Pelham Range
	9. Surface elevation (feet above mean sea level): 550.5
	10. Date started: 05/30/02 — 11. Date completed: 06/03/02
12. Overburden thickness (feet bgs): 23.5	15. Depth groundwater encountered (feet bgs): N/A
13. Depth drilled into rock (feet bgs): 0	16. Depth to water and elapsed time after drilling completed (feet bgs): Dry after 24 hours
14. Total depth of hole (feet bgs): 23.5	17. Other water level measurements (specify): N/A

18. Geotechnical samples:	Collected:	Disturbed:	Undisturbed:	19. Total no. of core boxes: N/A		
20. Samples for chemical analysis:	**VOC**	**Metals**	**Other (specify)**	**Other (specify)**	**Other (specify)**	**21. Total core recovery:**
						N/A
22. Disposition of hole:	Backfilled	Monitoring well	Other (specify)	Geologist:		
		2" Permanent		Cindy Levaas		

LOCATION SKETCH/COMMENTS:



Project: Fort McClellan	bgs= below ground surface NA = Not applicable	Hole no.: RF-MW02

HTRW DRILLING LOG (Continuation Sheet)

HOLE NUMBER: RF-MW02

Project: Fort McClellan | Geologist: Cindy Levaas | Sheet 2 of 4 sheets

Elev. (a)	Depth (b)	Description of Materials (c)	USCS / Lithology	Graphic	Field screening results (d)	Geotech sample or core box no. (e)	Analytical sample no. (f)	Blow counts (g)	Remarks (h)
550	0	sc: Reddish orange, dry to slightly moist, medium stiff CLAY and SAND, little subrounded, sandstone Gravel.	sc		Organic Vapor = 0ppm			3 2 4 5	Rec 1.8'/2.0' (0-2' bgs)
	1								
	2	NA: No recovery.	NA						
		sc: Reddish brown, dry to moist, medium stiff to stiff CLAY and SAND.	sc		Organic Vapor = 0ppm			6 4 11 9	Rec 1.0'/2.0' (2-4' bgs)
	3	NA: No recovery.	NA						
	4	sc: Reddish brown, moist, medium stiff CLAY and SAND, trace Silt.	sc		Organic Vapor = 0ppm			6 11 12 14	Rec 1.7'/2.0' (4-6' bgs)
545	5								
	6	NA: No recovery.	NA						
		cl: Orangeish brown, moist, stiff to very stiff CLAY, little fine to medium Sand.	cl		Organic Vapor = 0ppm			14 15 19 20	Rec 1.4'/2.0' (6-8' bgs)
	7								
	8	NA: No recovery.	NA						
		cl: Orangeish brown, moist, stiff to very stiff CLAY, little fine to medium Sand.	cl		Organic Vapor = 0ppm			11 17 20 29	Rec 1.2'/2.0' (8-10' bgs)
	9								
	10	NA: No recovery.	NA						

HTRW DRILLING LOG (Continuation Sheet)

HOLE NUMBER: RF-MW02

Project: Fort McClellan | Geologist: Cindy Levaas | Sheet 3 of 4 sheets

Elev. (a)	Depth (b)	Description of Materials (c)	USCS / Lithology	Graphic	Field screening results (d)	Geotech sample or core box no. (e)	Analytical sample no. (f)	Blow counts (g)	Remarks (h)
	11	NA: Shelby tube sample collected.	NA						
540	12	NA: No sample collected for lithologic description.							
	13		NA						
	14	cl: Orangeish brown to light brown, moist to very moist, medium stiff to stiff, partially laminated CLAY, some fine to coarse Sand, little Silt, noted manganese nodules.			Organic Vapor = 0ppm			3 5 5 8	Rec 2.0'/2.0' (14-16' bgs)
	15		cl						
535	16	NA: Shelby tube sample collected.							
	17		NA						
	18	NA: No sample collected for lithologic description.							
	19		NA						
	20	sc: Medium brown, wet, soft to medium stiff			Organic				Rec 0.8'/0.8' (20-20.8' bgs)

HTRW DRILLING LOG (Continuation Sheet)

HOLE NUMBER: RF-MW02

Project: Fort McClellan | Geologist: Cindy Levaas | Sheet 4 of 4 sheets

Elev. (a)	Depth (b)	Description of Materials (c)	USCS / Lithology	Graphic	Field screening results (d)	Geotech sample or core box no. (e)	Analytical sample no. (f)	Blow counts (g)	Remarks (h)
530		SAND and CLAY.	SC		Vapor = 0ppm				
	21	NA: No sample collected for lithologic description.							21
	22		NA						22
	23								23
									Auger refusal at 23.5' bgs

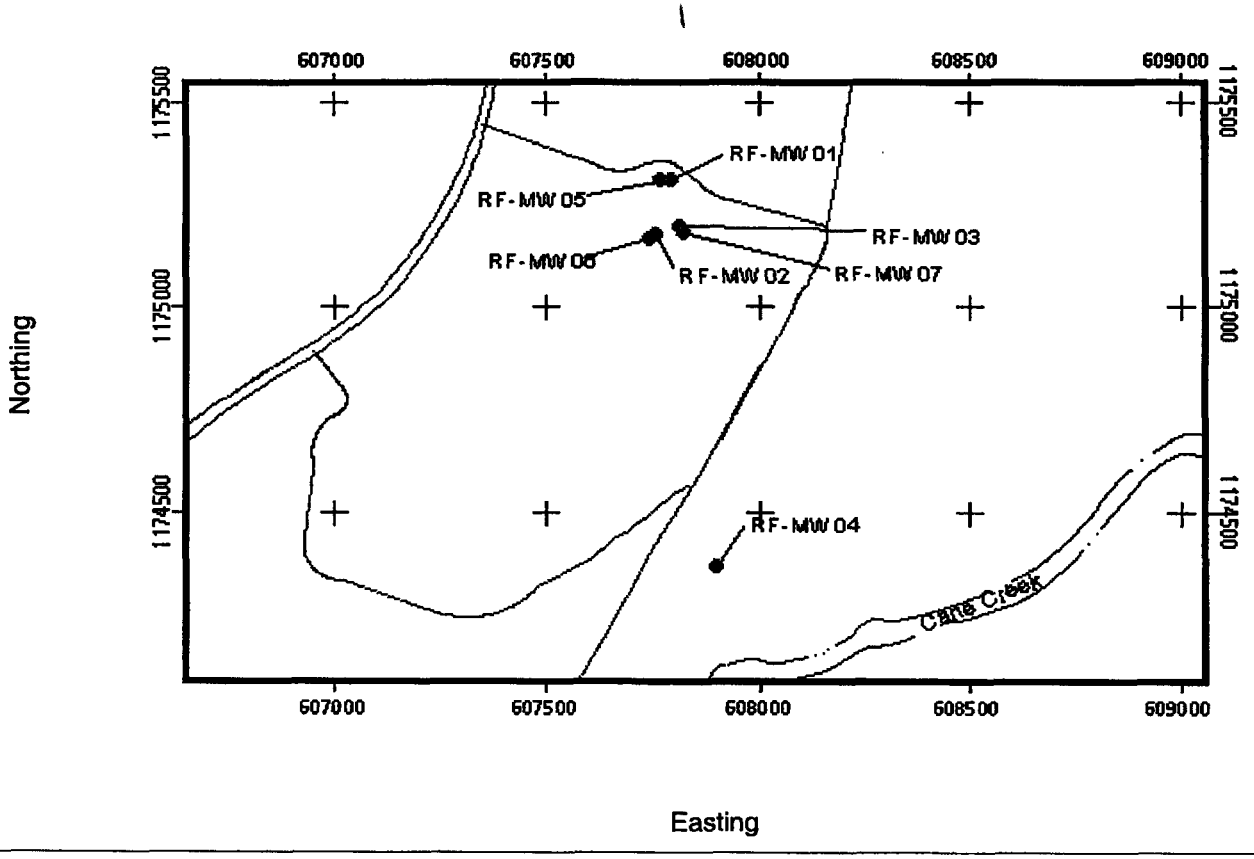
HTRW DRILLING LOG

District: **Mobile USACE**		HOLE NUMBER RF-MW03
1. Company name: **IT Corporation**	2. Drill Subcontractor: Miller Drilling Company	Sheet 1 of 4 sheets

3. Project: Fort McClellan	4. Location: **Calhoun County, Alabama**
5. Name of driller: Paul Gibson	6. Mfr. designation of drill: Mobile B-59 HSA
7. Sizes and types of drilling and sampling equipment: Hollow Stem Auger HSA - 5'x8.25" OD Augers, 2'x2" Steel Split Spoons	8. Hole location: Rideout Field, Pelham Range 9. Surface elevation (feet above mean sea level): 552.01 10. Date started: 05/29/02 — 11. Date completed: 06/03/02
12. Overburden thickness (feet bgs): 20	15. Depth groundwater encountered (feet bgs): N/A
13. Depth drilled into rock (feet bgs): .1	16. Depth to water and elapsed time after drilling completed (feet bgs): Dry after 24 hours
14. Total depth of hole (feet bgs): 20.1	17. Other water level measurements (specify): N/A

18. Geotechnical samples:	Collected:	Disturbed:	Undisturbed:	19. Total no. of core boxes: N/A		
20. Samples for chemical analysis:	VOC	Metals	Other (specify)	Other (specify)	Other (specify)	21. Total core recovery:
						N/A
22. Disposition of hole:	Backfilled	Monitoring well	Other (specify)	Geologist:		
		2" Permanent		Cindy Levaas		

LOCATION SKETCH/COMMENTS:



HTRW DRILLING LOG (Continuation Sheet)

HOLE NUMBER: RF-MW03

Project: Fort McClellan | Geologist: Cindy Levaas | Sheet 2 of 4 sheets

Elev. (a)	Depth (b)	Description of Materials (c)	USCS / Lithology	Graphic	Field screening results (d)	Geotech sample or core box no. (e)	Analytical sample no. (f)	Blow counts (g)	Remarks (h)
	0	sc: Reddish orange, dry to slightly moist, medium stiff CLAY and SAND, trace subrounded, sandstone Gravel.	sc		Organic Vapor = 0ppm			2 2 2 3	Rec 1.3'/2.0' (0-2' bgs)
	1								
		NA: No recovery.	NA						
550	2	sc: Reddish orange, dry to slightly moist, medium stiff CLAY and SAND, trace subrounded, sandstone Gravel.	sc		Organic Vapor = 0ppm			4 5 7 8	Rec 1.9'/2.0' (2-4' bgs)
	3								
	4	NA: No recovery.	NA		Organic Vapor = 0ppm			5 7 6 8	Rec 0.8'/2.0' (4-6' bgs)
		cl: Reddish brown, moist, medium stiff CLAY, little fine to medium Sand, little subangular, siltstone Gravel.	cl						
	5	NA: No recovery.	NA						
	6	cl: Reddish brown, moist, medium stiff CLAY, some fine to medium Sand.	cl		Organic Vapor = 0ppm			5 6 8 7	Rec 1.3'/2.0' (6-8' bgs)
545	7								
		NA: No recovery.	NA						
	8	cl: Reddish brown, moist, medium stiff CLAY, some fine to medium Sand.	cl		Organic Vapor = 0ppm			4 4 6 6	Rec 0.7'/2.0' (8-10' bgs)
		NA: No recovery.	NA						
	9								
	10								

HTRW DRILLING LOG (Continuation Sheet)

HOLE NUMBER: RF-MW03

Project: Fort McClellan | Geologist: Cindy Levaas | Sheet 3 of 4 sheets

Elev. (a)	Depth (b)	Description of Materials (c)	USCS / Lithology	Graphic	Field screening results (d)	Geotech sample or core box no. (e)	Analytical sample no. (f)	Blow counts (g)	Remarks (h)
		cl: Reddish brown, moist, medium stiff CLAY, some fine to medium Sand.	cl		Organic Vapor = 0ppm			2 5 4 3	Rec 1.2'/2.0' (10-12' bgs)
	11								
		NA: No recovery.	NA						
540	12	NA: Shelby tube sample collected.							
	13		NA						
	14	NA: No sample collected for lithologic description.	NA						
	15	cl: Reddish brown, moist, medium stiff to very stiff CLAY, trace fine to medium Sand, noted manganese nodules, some Silt.	cl		Organic Vapor = 0ppm			6 7 9 7	Rec 2.0'/2.0' (15-17' bgs)
	16								
535	17	NA: No sample collected for lithologic description.	NA						
	18								
	19								
	20	ls: Light gray to medium gray, subangular, fine						48/0.1'	Rec 0.1'/0.1' (20-20.1' bgs) Auger and split spoon refusal at 20.1' bgs Bottom of borehole at 20.1'

HTRW DRILLING LOG (Continuation Sheet)									HOLE NUMBER: RF-MW03
Project: Fort McClellan			Geologist: Cindy Levaas						Sheet 4 of 4 sheets
Elev. (a)	Depth (b)	Description of Materials (c)	USCS / Lithology	Graphic	Field screening results (d)	Geotech sample or core box no. (e)	Analytical sample no. (f)	Blow counts (g)	Remarks (h)

grained LIMESTONE.

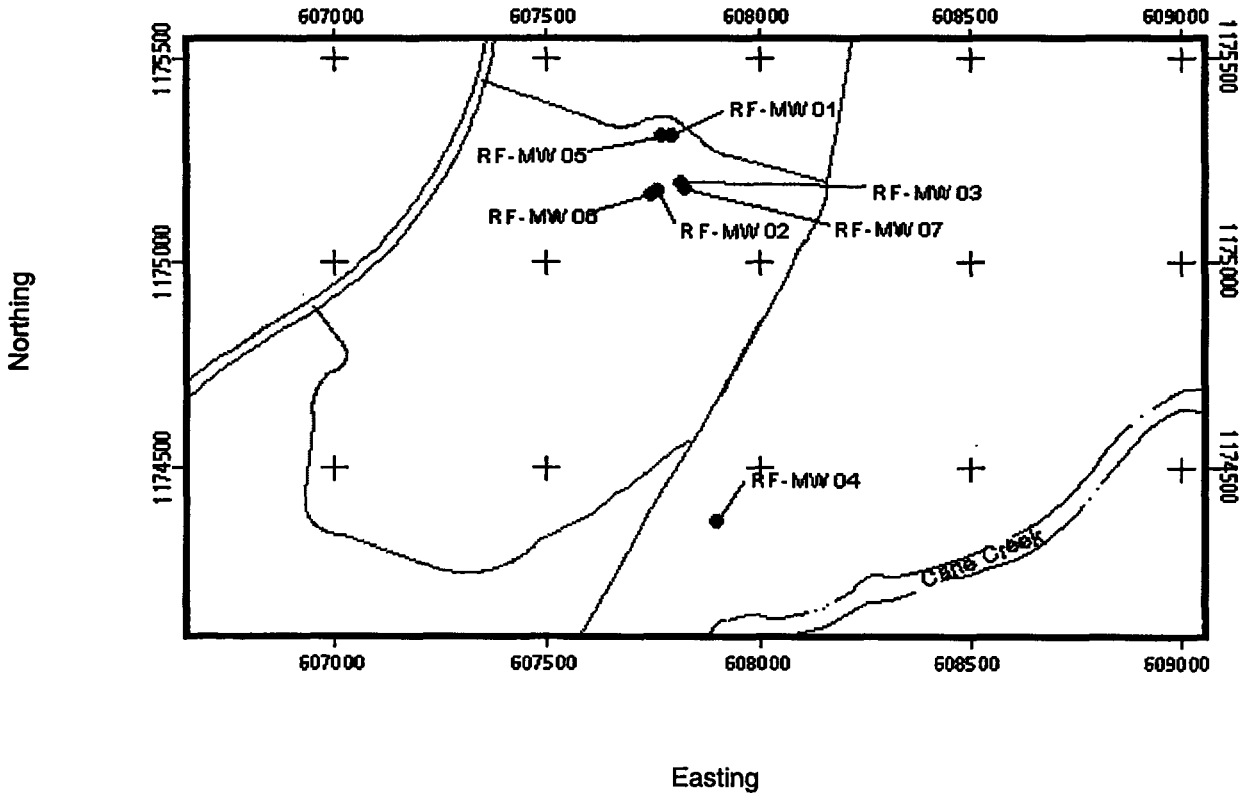
HTRW DRILLING LOG

District: **Mobile USACE**		HOLE NUMBER RF-MW04
1. Company name: **IT Corporation**	2. Drill Subcontractor: Miller Drilling Company	Sheet 1 of 3 sheets

3. Project: Fort McClellan	4. Location: **Calhoun County, Alabama**
5. Name of driller: Paul Gibson	6. Mfr. designation of drill: Mobile B-59, Pelham Range
7. Sizes and types of drilling and sampling equipment: Hollow Stem Auger HSA - 5'x8.25" OD Augers, 2'x2" Steel Split Spoons	8. Hole location: Rideout Field, Pelham Range
	9. Surface elevation (feet above mean sea level): 518.7
	10. Date started: 05/30/02 — 11. Date completed: 06/03/02
12. Overburden thickness (feet bgs): 20	15. Depth groundwater encountered (feet bgs): Dry
13. Depth drilled into rock (feet bgs): 0	16. Depth to water and elapsed time after drilling completed (feet bgs): 10.25' bgs ~72 hrs
14. Total depth of hole (feet bgs): 20	17. Other water level measurements (specify): N/A

18. Geotechnical samples:	Collected:	Disturbed:	Undisturbed:	19. Total no. of core boxes: N/A		
20. Samples for chemical analysis:	**VOC**	**Metals**	**Other (specify)**	**Other (specify)**	**Other (specify)**	**21. Total core recovery:**
						N/A
22. Disposition of hole:	Backfilled	Monitoring well	Other (specify)	Geologist:		
		2" Permanent		Cindy Levaas		

LOCATION SKETCH/COMMENTS:



HTRW DRILLING LOG (Continuation Sheet)

HOLE NUMBER: RF-MW04

Project: Fort McClellan | Geologist: Cindy Levaas | Sheet 2 of 3 sheets

Elev. (a)	Depth (b)	Description of Materials (c)	USCS / Lithology	Graphic	Field screening results (d)	Geotech sample or core box no. (e)	Analytical sample no. (f)	Blow counts (g)	Remarks (h)
	0	cl: Light brown, dry to slightly moist, medium stiff, laminated CLAY, some Silt.	cl		Organic Vapor = 0ppm			6 7 7 11	Rec 2.0'/2.0' (0-2' bgs)
	2	cl: Dark brown to olive gray, dry to slightly moist, very stiff, laminated CLAY, some Silt.	cl		Organic Vapor = 0ppm			22 26 46 50/0.3'	Rec 1.6'/1.8' (2-3.8' bgs)
515	4	NA: No recovery.	NA						
		NA: No sample collected for lithologic description.	NA						
	8	cl: Dark gray, dry to slightly moist, stiff, laminated CLAY, some Silt.	cl		Organic Vapor = 0ppm			27 50	Rec 1.0'/1.0' (8-9' bgs)
510	10								

HTRW DRILLING LOG (Continuation Sheet)

HOLE NUMBER: RF-MW04

Project: Fort McClellan | Geologist: Cindy Levaas | Sheet 3 of 3 sheets

Elev. (a)	Depth (b)	Description of Materials (c)	USCS / Lithology	Graphic	Field screening results (d)	Geotech sample or core box no. (e)	Analytical sample no. (f)	Blow counts (g)	Remarks (h)
		NA: No sample collected for lithologic description.			Organic Vapor = 3.1ppm				
	11		NA						
	12								
	13	sh: Dark gray to black, carbonaceous SHALE, little black, medium stiff Clay.	sh		Organic Vapor = 0.3ppm			50/0.4'	Rec 0.4'/0.4' (13-13.4' bgs)
505		NA: No sample collected for lithologic description.							
	14								
	15								
	16		NA						
	17								
	18	sh: Dark gray to black, carbonaceous SHALE, little black, medium stiff Clay.	sh		Organic Vapor = 0ppm			50/0.3'	Rec 0.3'/0.3' (18-18.3' bgs)
500		NA: No recovery.							
	19		NA						
	20								Auger refusal at 20' bgs Bottom of borehole at 20' bgs

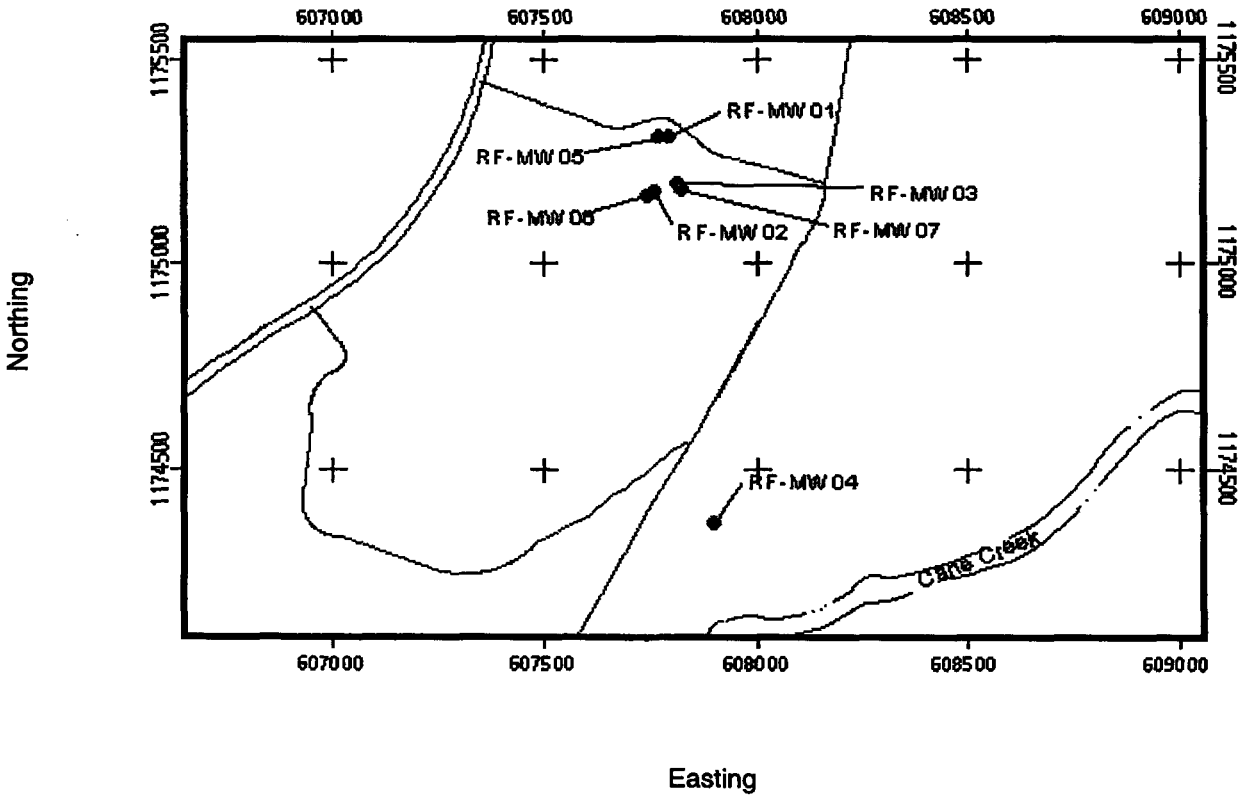
HTRW DRILLING LOG

District: **Mobile USACE**		**HOLE NUMBER** RF-MW05
1. Company name: **IT Corporation**	2. Drill Subcontractor: Miller Drilling Company	Sheet 1 of 11 sheets

3. Project: Fort McClellan	4. Location: **Calhoun County, Alabama**
5. Name of driller: Al Davis	6. Mfr. designation of drill: Schramm T450W Air Rotary
7. Sizes and types of drilling and sampling equipment: Air Rotary 12" Roller bit 8" Hammer bit	8. Hole location: Rideout Field, Pelham Range 9. Surface elevation (feet above mean sea level): 552.75 10. Date started: 06/28/02 — 11. Date completed: 07/11/02
12. Overburden thickness (feet bgs): 22.5	15. Depth groundwater encountered (feet bgs): 90 Ft
13. Depth drilled into rock (feet bgs): 69.4	16. Depth to water and elapsed time after drilling completed (feet bgs): 28.0' after 24 hours
14. Total depth of hole (feet bgs): 91.9	17. Other water level measurements (specify): N/A

18. Geotechnical samples:	Collected:	Disturbed:	Undisturbed:	19. Total no. of core boxes: N/A		
20. Samples for chemical analysis:	**VOC**	**Metals**	**Other (specify)**	**Other (specify)**	**Other (specify)**	**21. Total core recovery:**
						N/A
22. Disposition of hole:	Backfilled	Monitoring well	Other (specify)	Geologist:		
		4" Permanent		Adam Day		

LOCATION SKETCH/COMMENTS:



HTRW DRILLING LOG (Continuation Sheet)

HOLE NUMBER: RF-MW05

Project: Fort McClellan | Geologist: Adam Day | Sheet 2 of 11 sheets

Elev. (a)	Depth (b)	Description of Materials (c)	USCS / Lithology	Graphic	Field screening results (d)	Geotech sample or core box no. (e)	Analytical sample no. (f)	Blow counts (g)	Remarks (h)
	0	sc: Reddish brown, slightly moist, medium stiff to stiff CLAY and SAND, trace roots, trace subrounded, sandstone Gravel.	sc						Lithologic description from RF-MW01 (0-22.5' bgs)
	1								
		NA: No recovery.	NA						
	2	sc: Reddish brown, slightly moist, medium stiff to stiff CLAY and SAND, trace roots, trace subrounded, sandstone Gravel.							
550	3		sc						
		NA: No recovery.	NA						
	4	sc: Reddish brown, slightly moist, medium stiff to stiff CLAY and SAND, trace roots, trace subrounded, sandstone Gravel.							
	5		sc						
		NA: No recovery.	NA						
	6	sc: Reddish brown to light brown, moist, very stiff CLAY and fine to medium SAND, little Silt, little subrounded, sandstone Gravel.							
	7		sc						
545	8	cl: Reddish brown to light gray, moist, stiff CLAY, some fine to medium Sand, little Silt, little subangular, siltstone Gravel (in layer).							
	9		cl						
	10								

HTRW DRILLING LOG (Continuation Sheet)

HOLE NUMBER: RF-MW05

Project: Fort McClellan | Geologist: Adam Day | Sheet 3 of 11 sheets

Elev. (a)	Depth (b)	Description of Materials (c)	USCS / Lithology	Graphic	Field screening results (d)	Geotech sample or core box no. (e)	Analytical sample no. (f)	Blow counts (g)	Remarks (h)
	11	cl: Reddish brown, moist, stiff CLAY, some fine to medium Sand, little Silt.	cl						
		NA: No recovery.	NA						
	12	NA: No sample collected for lithologic description.							
540	13		NA						
	14								
	15	cl: Orangeish brown to olive gray, moist, medium stiff to stiff CLAY, some Silt, noted manganese nodules.							
	16		cl						
	17	NA: No recovery.	NA						
		NA: No sample collected for lithologic description.							
535	18								
	19		NA						
	20	sc: Light brown to dark brown, very moist, fine							

HTRW DRILLING LOG (Continuation Sheet)

HOLE NUMBER: RF-MW05

Project: Fort McClellan | Geologist: Adam Day | Sheet 4 of 11 sheets

Elev. (a)	Depth (b)	Description of Materials (c)	USCS / Lithology	Graphic	Field screening results (d)	Geotech sample or core box no. (e)	Analytical sample no. (f)	Blow counts (g)	Remarks (h)
		to medium SAND, some Clay, little Silt.							
	21		sc						
	22								
530	23	ls: LIMESTONE, hard, unweathered, undetermined fraturing, undetermined bedding, microcrystalline, medium Gray, reacts with HCl.							Description from Air Rotary drill cuttings (22.5-91.9' bgs)
	24				Organic Vapor = 0ppm				
	25								
	26		ls						
	27								
525	28								
	29	ls: Dolomitic LIMESTONE, hard, unweathered, undetermined fraturing, undetermined bedding, microcrystalline, medium Gray, slightly reacts with HCl.			Organic Vapor = 0ppm				
	30								

HTRW DRILLING LOG (Continuation Sheet)

HOLE NUMBER: RF-MW05

Project: Fort McClellan | Geologist: Adam Day | Sheet 5 of 11 sheets

Elev. (a)	Depth (b)	Description of Materials (c)	USCS / Lithology	Graphic	Field screening results (d)	Geotech sample or core box no. (e)	Analytical sample no. (f)	Blow counts (g)	Remarks (h)
	31				Organic Vapor = 0ppm				
	32								
520	33								
	34								
	35		ls						
	36								
	37								
515	38								
	39								
	40								

HTRW DRILLING LOG (Continuation Sheet)

HOLE NUMBER: RF-MW05

Project: Fort McClellan | Geologist: Adam Day | Sheet 6 of 11 sheets

Elev. (a)	Depth (b)	Description of Materials (c)	USCS / Lithology	Graphic	Field screening results (d)	Geotech sample or core box no. (e)	Analytical sample no. (f)	Blow counts (g)	Remarks (h)
	41				Organic Vapor = 0ppm				
	42	ls: Dolomitic LIMESTONE, hard, fine grained, undetermined fraturing, undetermined bedding, light gray, reacts slightly with HCl, (unweathered).							
510	43								
	44				Organic Vapor = 0ppm				
	45								
	46								
	47								
505	48								
	49								
	50				Organic Vapor = 0ppm				

HTRW DRILLING LOG (Continuation Sheet)

HOLE NUMBER: RF-MW05

Project: Fort McClellan | Geologist: Adam Day | Sheet 7 of 11 sheets

Elev. (a)	Depth (b)	Description of Materials (c)	USCS / Lithology	Graphic	Field screening results (d)	Geotech sample or core box no. (e)	Analytical sample no. (f)	Blow counts (g)	Remarks (h)
	51								
	52		ls						
500	53								
	54								
	55								
	56								
	57								
495	58								
	59								
	60				Organic Vapor = 0ppm				

HTRW DRILLING LOG (Continuation Sheet)

HOLE NUMBER: RF-MW05

Project: Fort McClellan | Geologist: Adam Day | Sheet 8 of 11 sheets

Elev. (a)	Depth (b)	Description of Materials (c)	USCS / Lithology	Graphic	Field screening results (d)	Geotech sample or core box no. (e)	Analytical sample no. (f)	Blow counts (g)	Remarks (h)
	61				Organic Vapor = 0ppm				61
	62	ls: LIMESTONE, hard, fine grained, undetermined fraturing, undetermined bedding, unweathered, light gray, reacts with HCl.							62
490	63				Organic Vapor = 0ppm				63
	64								64
	65								65
	66								66
	67								67
485	68								68
	69								69
	70				Organic Vapor = 0ppm				70
	71								71

HTRW DRILLING LOG (Continuation Sheet)

HOLE NUMBER: RF-MW05

Project: Fort McClellan | Geologist: Adam Day | Sheet 9 of 11 sheets

Elev. (a)	Depth (b)	Description of Materials (c)	USCS / Lithology	Graphic	Field screening results (d)	Geotech sample or core box no. (e)	Analytical sample no. (f)	Blow counts (g)	Remarks (h)
	72		ls						
480	73								
	74								
	75								
	76								
	77								
475	78								
	79								
	80								
	81								

HTRW DRILLING LOG (Continuation Sheet)

HOLE NUMBER: RF-MW05

Project: Fort McClellan | Geologist: Adam Day | Sheet 10 of 11 sheets

Elev. (a)	Depth (b)	Description of Materials (c)	USCS / Lithology	Graphic	Field screening results (d)	Geotech sample or core box no. (e)	Analytical sample no. (f)	Blow counts (g)	Remarks (h)
	82	ls: Dolomitic LIMESTONE, hard, unweathered, undetermined fraturing, undetermined bedding, microcrystalline, medium gray, reacts slightly with HCl, some medium gray, soft Clay in cuttings. (Possible weathered shaley LIMESTONE?)	ls		Organic Vapor = 0ppm				
470	83								
	84				Organic Vapor = 0ppm				
	85								
	86								
	87								
465	88								
	89								
	90								Groundwater encountered at 90' bgs
	91				Organic Vapor				

HTRW DRILLING LOG (Continuation Sheet)

HOLE NUMBER: RF-MW05

Project: Fort McClellan | Geologist: Adam Day | Sheet 11 of 11 sheets

Elev. (a)	Depth (b)	Description of Materials (c)	USCS / Lithology	Graphic	Field screening results (d)	Geotech sample or core box no. (e)	Analytical sample no. (f)	Blow counts (g)	Remarks (h)
					= 0ppm				Bottom of borehole at 91.9' bgs

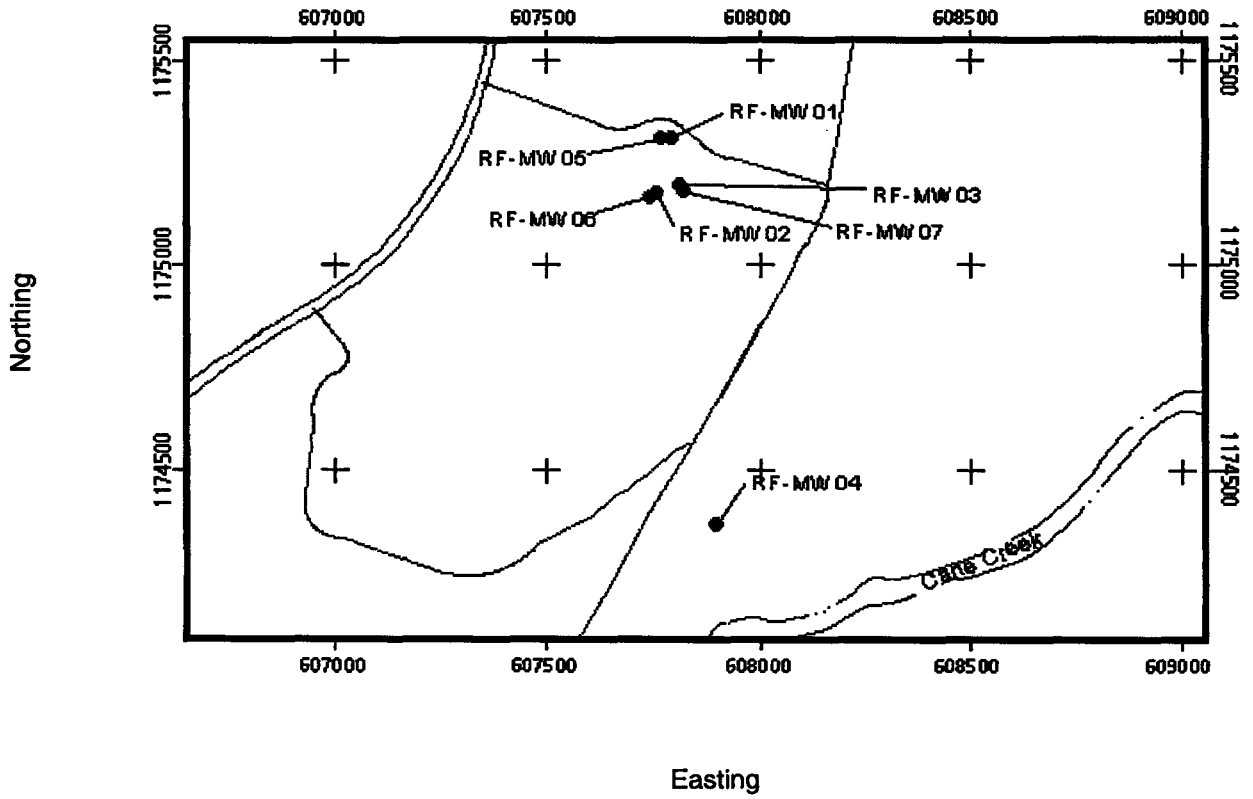
HTRW DRILLING LOG

District: Mobile USACE		HOLE NUMBER RF-MW06
1. Company name: IT Corporation	2. Drill Subcontractor: Miller Drilling Company	Sheet 1 of 10 sheets

3. Project: Fort McClellan	4. Location: Calhoun County, Alabama
5. Name of driller: Al Davis	6. Mfr. designation of drill: Schramm T450 Rotadrill
7. Sizes and types of drilling and sampling equipment: Air Rotary 14", 10", 8" Roller bit 8" Hammer bit	8. Hole location: Rideout Field 9. Surface elevation (feet above mean sea level): 550.01 10. Date started: 06/26/02 — 11. Date completed: 07/02/02
12. Overburden thickness (feet bgs): 19.5	15. Depth groundwater encountered (feet bgs): 61 Ft
13. Depth drilled into rock (feet bgs): 62.4	16. Depth to water and elapsed time after drilling completed (feet bgs): 25.25 after 24 hours
14. Total depth of hole (feet bgs): 81.9	17. Other water level measurements (specify): N/A

18. Geotechnical samples:	Collected:	Disturbed:	Undisturbed:	19. Total no. of core boxes: N/A		
20. Samples for chemical analysis:	**VOC**	**Metals**	**Other (specify)**	**Other (specify)**	**Other (specify)**	**21. Total core recovery:**
						N/A
22. Disposition of hole:	**Backfilled**	**Monitoring well**	**Other (specify)**	**Geologist:**		
		4" Permanent		Adam Day		

LOCATION SKETCH/COMMENTS:



HTRW DRILLING LOG (Continuation Sheet)

HOLE NUMBER: RF-MW06

Project: Fort McClellan | Geologist: Adam Day | Sheet 2 of 10 sheets

Elev. (a)	Depth (b)	Description of Materials (c)	USCS / Lithology	Graphic	Field screening results (d)	Geotech sample or core box no. (e)	Analytical sample no. (f)	Blow counts (g)	Remarks (h)
550	0	sc: Reddish orange, dry to slightly moist, medium stiff CLAY and SAND, little subrounded, sandstone Gravel.	sc		Organic Vapor = 0ppm				Lithologic description from RF-MW02 (0-19.5' bgs)
	1								
	2	NA: No recovery.	NA						
		sc: Reddish brown, dry to moist, medium stiff to stiff CLAY and SAND.	sc						
	3	NA: No recovery.	NA						
	4	sc: Reddish brown, moist, medium stiff CLAY and SAND, trace Silt.	sc						
545	5								
		NA: No recovery.	NA						
	6	cl: Orangeish brown, moist, stiff to very stiff CLAY, little fine to medium Sand.	cl						
	7								
		NA: No recovery.	NA						
	8	cl: Orangeish brown, moist, stiff to very stiff CLAY, little fine to medium Sand.	cl						
	9								
		NA: No recovery.	NA						
540	10								

HTRW DRILLING LOG (Continuation Sheet)

HOLE NUMBER: RF-MW06

Project: Fort McClellan | Geologist: Adam Day | Sheet 3 of 10 sheets

Elev. (a)	Depth (b)	Description of Materials (c)	USCS / Lithology	Graphic	Field screening results (d)	Geotech sample or core box no. (e)	Analytical sample no. (f)	Blow counts (g)	Remarks (h)
		NA: Shelby tube sample collected.			Organic Vapor = 0ppm				
	11		NA						
	12	NA: No sample collected for lithologic description.							
	13		NA						
	14	cl: Orangeish brown to light brown, moist to very moist, medium stiff to stiff, partially laminated CLAY, some fine to coarse Sand, little Silt, noted manganese nodules.							
535	15		cl						
	16	NA: Shelby tube sample collected.							
	17		NA						
	18	NA: No sample collected for lithologic description.							
	19		NA						
		ls: LIMESTONE, hard, unweathered, undetermined fracturing, undetermined bedding, fine grained to microcrystalline, medium gray, reacts with HCl.							Description from Air Rotary drill cuttings (19.5-81.9' bgs)
530	20				Organic				

HTRW DRILLING LOG (Continuation Sheet)

HOLE NUMBER: RF-MW06

Project: Fort McClellan | Geologist: Adam Day | Sheet 4 of 10 sheets

Elev. (a)	Depth (b)	Description of Materials (c)	USCS / Lithology	Graphic	Field screening results (d)	Geotech sample or core box no. (e)	Analytical sample no. (f)	Blow counts (g)	Remarks (h)
	21				Vapor = 0ppm				
	22		ls		Organic Vapor = 0ppm				
	23								
	24								
525	25	ls: LIMESTONE, hard, undetermined fracturing, undetermined bedding, microcrystalline, dark gray to medium gray, contorted calcite veins throughout, reacts with HCl.							
	26								
	27				Organic Vapor = 0ppm				
	28								
	29								
520	30				Organic Vapor				

HTRW DRILLING LOG (Continuation Sheet)

HOLE NUMBER: RF-MW06

Project: Fort McClellan | Geologist: Adam Day | Sheet 5 of 10 sheets

Elev. (a)	Depth (b)	Description of Materials (c)	USCS / Lithology	Graphic	Field screening results (d)	Geotech sample or core box no. (e)	Analytical sample no. (f)	Blow counts (g)	Remarks (h)
	31				= 0ppm				
	32								
	33		ls						
	34								
515	35								
	36								
	37								
	38								
	39								
510	40				Organic Vapor = 0ppm				

HTRW DRILLING LOG (Continuation Sheet)

HOLE NUMBER: RF-MW06

Project: Fort McClellan | Geologist: Adam Day | Sheet 6 of 10 sheets

Elev. (a)	Depth (b)	Description of Materials (c)	USCS / Lithology	Graphic	Field screening results (d)	Geotech sample or core box no. (e)	Analytical sample no. (f)	Blow counts (g)	Remarks (h)
	41	ls: LIMESTONE, hard, unweathered, undetermined fracturing, undetermined bedding, microcrystalline, medium gray, reacts with HCl.							
	42				Organic Vapor = 0ppm				
	43								
	44								
505	45								
	46								
	47								
	48								
	49								
500	50				Organic Vapor = 0ppm				

HTRW DRILLING LOG (Continuation Sheet)

HOLE NUMBER: RF-MW06

Project: Fort McClellan | Geologist: Adam Day | Sheet 7 of 10 sheets

Elev. (a)	Depth (b)	Description of Materials (c)	USCS / Lithology	Graphic	Field screening results (d)	Geotech sample or core box no. (e)	Analytical sample no. (f)	Blow counts (g)	Remarks (h)
	51		ls						
	52								
	53								
	54								
495	55								
	56								
	57								
	58								
	59								
490	60				Organic Vapor = 0ppm				

HTRW DRILLING LOG (Continuation Sheet)

HOLE NUMBER: RF-MW06

Project: Fort McClellan | Geologist: Adam Day | Sheet 8 of 10 sheets

Elev. (a)	Depth (b)	Description of Materials (c)	USCS / Lithology	Graphic	Field screening results (d)	Geotech sample or core box no. (e)	Analytical sample no. (f)	Blow counts (g)	Remarks (h)
	61	ls: LIMESTONE, hard, unweathered, undetermined fracturing, undetermined bedding, microcrystalline, dark gray to medium gray, contorted calcite veins throughout, reacts with HCl.							Groundwater encountered at 61' bgs
	62				Organic Vapor = 0ppm				
	63								
	64								
485	65								
	66								
	67								
	68								
	69								
480	70				Organic Vapor = 0ppm				
	71								

HTRW DRILLING LOG (Continuation Sheet)

HOLE NUMBER: RF-MW06

Project: Fort McClellan | Geologist: Adam Day | Sheet 9 of 10 sheets

Elev. (a)	Depth (b)	Description of Materials (c)	USCS / Lithology	Graphic	Field screening results (d)	Geotech sample or core box no. (e)	Analytical sample no. (f)	Blow counts (g)	Remarks (h)
	71		ls						
	72								
	73								
	74								
475	75								
	76								
	77								
	78								
	79								
470	80				Organic Vapor = 0ppm				
	81								

HTRW DRILLING LOG (Continuation Sheet)

HOLE NUMBER: RF-MW06

Project: Fort McClellan | Geologist: Adam Day | Sheet 10 of 10 sheets

Elev. (a)	Depth (b)	Description of Materials (c)	USCS / Lithology	Graphic	Field screening results (d)	Geotech *sample or* core box no. (e)	Analytical sample no. (f)	Blow counts (g)	Remarks (h)
									Bottom of borehole at 81.9'

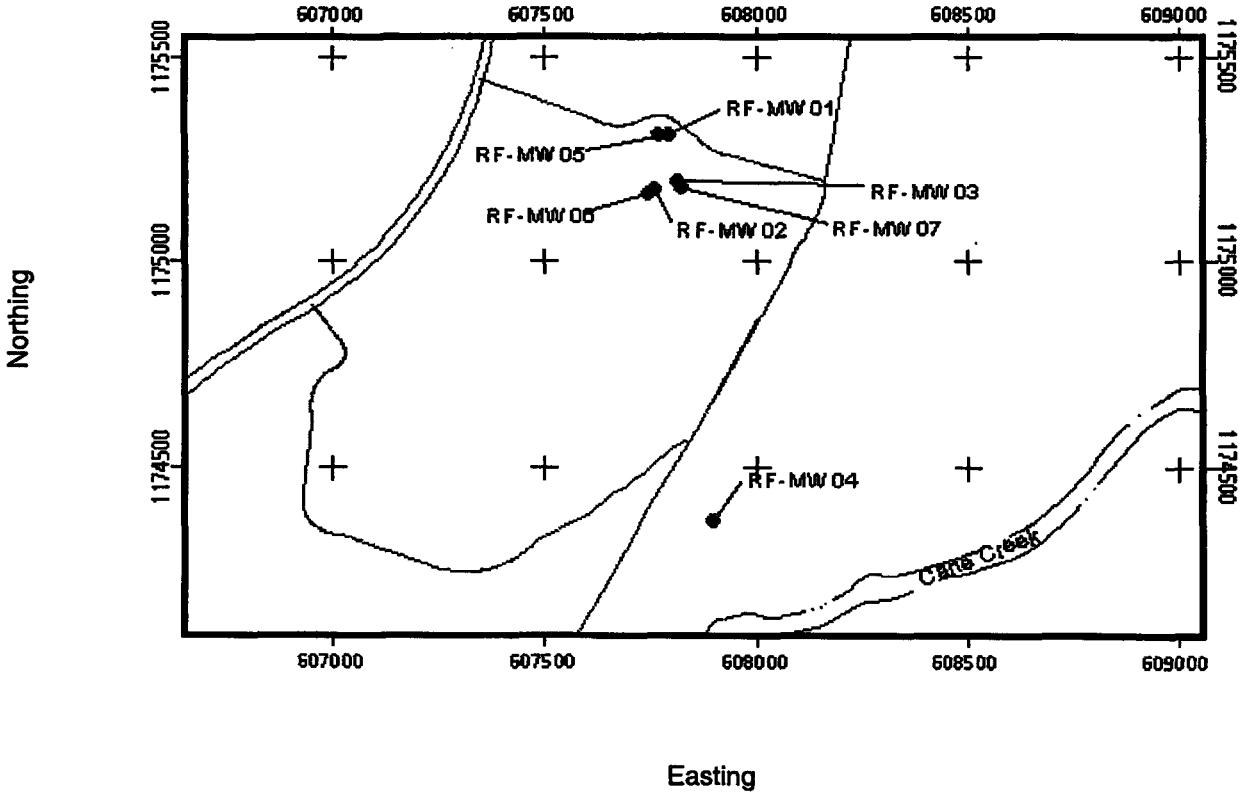
HTRW DRILLING LOG

District: Mobile USACE		HOLE NUMBER RF-MW07
1. Company name: IT Corporation	2. Drill Subcontractor: Miller Drilling Company	Sheet 1 of 10 sheets

3. Project: Fort McClellan	4. Location: Calhoun County, Alabama
5. Name of driller: Al Davis/Glen Bilbrey	6. Mfr. designation of drill: CME 850/CME 250/Schramm T450 Rotadrill
7. Sizes and types of drilling and sampling equipment: CME 850, Triple PQ Core Barrel 14", 10", 8" Roller Bit 8" Hammer bit	8. Hole location: Rideout Field, Pelham Range 9. Surface elevation (feet above mean sea level): 549.79 10. Date started: 06/24/02 / 11. Date completed: 07/02/02
12. Overburden thickness (feet bgs): 23	15. Depth groundwater encountered (feet bgs): unknown
13. Depth drilled into rock (feet bgs): 62.5	16. Depth to water and elapsed time after drilling completed (feet bgs): 40.93 after 2 hours
14. Total depth of hole (feet bgs): 85.5	17. Other water level measurements (specify): N/A

18. Geotechnical samples:	Collected:	Disturbed:	Undisturbed:	19. Total no. of core boxes: 7		
20. Samples for chemical analysis:	**VOC**	**Metals**	**Other (specify)**	**Other (specify)**	**Other (specify)**	**21. Total core recovery:**
						~ 58.5
22. Disposition of hole:	**Backfilled**	**Monitoring well**	**Other (specify)**	**Geologist:**		
		4" Permanent		Adam Day/Kyle Wilson		

LOCATION SKETCH/COMMENTS:



Project: Fort McClellan

bgs= below ground surface
NA = Not applicable

Hole no.: RF-MW07

HTRW DRILLING LOG (Continuation Sheet)

HOLE NUMBER: RF-MW07

Project: Fort McClellan | Geologist: Adam Day/Kyle Wilson | Sheet 2 of 10 sheets

Elev. (a)	Depth (b)	Description of Materials (c)	USCS / Lithology	Graphic	Field screening results (d)	Geotech sample or core box no. (e)	Analytical sample no. (f)	Blow counts (g)	Remarks (h)
	0	sc: Reddish orange, dry to slightly moist, medium stiff CLAY and SAND, traace subrounded, sandstone Gravel.	sc		Organic Vapor = 0ppm				Lithologic description from RF-MW03 (0-23' bgs)
	1	NA: No recovery.	NA						
	2	sc: Reddish orange, dry to slightly moist, medium stiff CLAY and SAND, trace subrounded, sandstone Gravel.	sc						
	3								
	4	NA: No recovery.	NA						
545		cl: Reddish brown, moist, medium stiff CLAY, little fine to medium Sand, little subangular, siltstone Gravel.	cl						
	5	NA: No recovery.	NA						
	6	cl: Reddish brown, moist, medium stiff CLAY, some fine to medium Sand.	cl						
	7								
	8	NA: No recovery.	NA						
	9	cl: Reddish brown, moist, medium stiff CLAY, some fine to medium Sand.	cl						
540		NA: No recovery.	NA						
	10								

HTRW DRILLING LOG (Continuation Sheet)

HOLE NUMBER: RF-MW07

Project: Fort McClellan | Geologist: Adam Day/Kyle Wilson | Sheet 3 of 10 sheets

Elev. (a)	Depth (b)	Description of Materials (c)	USCS / Lithology	Graphic	Field screening results (d)	Geotech sample or core box no. (e)	Analytical sample no. (f)	Blow counts (g)	Remarks (h)
	11	cl: Reddish brown, moist, medium stiff CLAY, some fine to medium Sand.	cl		Organic Vapor = 0ppm				
	12	NA: No recovery.	NA						
	13	NA: No sample collected for lithologic description.	NA						
	14	NA: No sample collected for lithologic description.	NA						
535	15	cl: Reddish brown, moist, medium stiff to very stiff CLAY, trace fine to medium Sand, noted manganese nodules, some Silt.	cl						
	16								
	17	NA: No sample collected for lithologic description.	NA						
	18								
	19								
530	20	ls: Light gray to medium gray, subangular, fine							

HTRW DRILLING LOG (Continuation Sheet)

HOLE NUMBER: RF-MW07

Project: Fort McClellan | Geologist: Adam Day/Kyle Wilson | Sheet 4 of 10 sheets

Elev. (a)	Depth (b)	Description of Materials (c)	USCS / Lithology	Graphic	Field screening results (d)	Geotech sample or core box no. (e)	Analytical sample no. (f)	Blow counts (g)	Remarks (h)
		grained LIMESTONE.							
	21				Organic Vapor = 0ppm				21
			ls						
	22								22
	23	ls: Dolomitic LIMESTONE, hard, unweathered, fracturing undetermined, bedding undetermined, microcrystalline, light bluish gray, reacts very slightly with HCl, reacts vigorously when powdered.							Description from Air Rotary drill cuttings (23-25.3' bgs) 23
	24		ls		Organic Vapor = 0ppm				24
525	25								25
		NA: GROUT from setting casing.						CD 25.3	Run 1 (25.3-30.3' bgs) Ran 5.0' Rec 4.76' (3.3' of rock) Loss 0.24 UL 0.19
	26		NA						Water used 525 gallons, rec 95%, gray to white 26 HP 500 psi WP 50 psi Time10 mins RQD 31.8%
	27	ls: LIMESTONE, moderately hard, slightly weathered, microcrystalline, massive bedding. Intensely to highly jointed, possible slickensides at 28.5' and 29.8'. Interbedded layers of Shale and Clay along fractures. Contorted calcite veins throughout. Some veins are filled with Clay, color light gray to light bluish gray, Shale and Clay, medium gray.			Organic Vapor = 0ppm				27
	28					Box 1 of 7 (27.0 to 40.3' bgs)			28
	29		ls						29
520	30								30

HTRW DRILLING LOG (Continuation Sheet)

HOLE NUMBER: RF-MW07

Project: Fort McClellan | Geologist: Adam Day/Kyle Wilson | Sheet 5 of 10 sheets

Elev. (a)	Depth (b)	Description of Materials (c)	USCS / Lithology	Graphic	Field screening results (d)	Geotech sample or core box no. (e)	Analytical sample no. (f)	Blow counts (g)	Remarks (h)
	31	ls: LIMESTONE, moderately hard, slightly weathered to unweathered, microcrystalline, massive bedding, highly fractured (fractures embedded with Shale at 30.5', 32.3', 33.8', 34' and 35'), contorted calcite veins throughout, color light bluish gray to light gray. Shale is medium gray, contorted veins of Shale and Clay throughout, color medium bluish gray.			Organic Vapor = 0ppm			CD 30.25	Run 2 (30.3-35.3' bgs) Ran 5.0', Rec 4.88' Loss .12' UL .01' Water used 450 gallons, rec 95%, light gray to tan to white HP 500 psi WP 50 psi Time 18 min RQD 50%
	32								
	33		ls						
	34								
515	35				Organic Vapor = 0ppm			CD 35.14	Run 3 (35.3-40.3' bgs) Ran 5.0', Rec 4.93' Loss .07' UL 0.0 Water used 450 gallons, rec 98%, gray to white HP 500 psi WP 50 psi Time 20 mins RQD 91.8%
	36	ls: LIMESTONE, moderately hard, unweathered, microcrystalline, massive bedding, moderately jointed at 35.14-35.67', 36.06', 37.85' and 38.03'. Joints are filled with gray Shale and Clay along edges at 35.14-35.67'. Contorted calcite veins throughout, some veins are filled with Clay, color is light bluish gray to light gray, Clay and Shale is medium to medium bluish gray.							
	37								
	38		ls						
	39								
510	40				Organic Vapor = 0ppm			CD 40.07	Run 4 (40.3-45.3' bgs)
		ls: LIMESTONE, moderately hard, unweathered, microcrystalline, massive bedding, moderately jointed at 41.5', 41.8',							

HTRW DRILLING LOG (Continuation Sheet)

HOLE NUMBER: RF-MW07

Project: Fort McClellan | Geologist: Adam Day/Kyle Wilson | Sheet 6 of 10 sheets

Elev. (a)	Depth (b)	Description of Materials (c)	USCS / Lithology	Graphic	Field screening results (d)	Geotech sample or core box no. (e)	Analytical sample no. (f)	Blow counts (g)	Remarks (h)
		42.7', 43.7', 43.95', broken zone from 44.65' to 44.81'. Embedded Shale at 41.5', 41.8', 42.7. Contorted calcite veins throughout, some veins are filled with Shale and Clay, color is light bluish gray to light gray, Clay and Shale is medium to medium bluish gray.							Ran 5.0', Rec 5.18' Gain 0.18 UL 0.0 Water used 300 gallons, rec 95% HP 500 psi WP 50 psi Time 15 mins RQD 86%
	41								41
	42								42
	43		ls						43
	44					Box 2 of 7 (40.3 to 45.3' bgs)			44
505	45				Organic Vapor = 0ppm				45
		ls: LIMESTONE, moderately hard, unweathered, microcrystalline, massive bedding, moderately jointed at 46.5', 47.5', 48.45' and 48.82'. Joints are filled with Shale, contorted veins throughout, some veins are filled with calcite, some filled with Clay, color is light bluish gray to light gray, Clay and Shale is medium to medium bluish gray.						CD 45.25	Run 5 (45.3-50.3' bgs) Ran 5.0', Rec 4.45' Loss 0.55' UL 0.0 Water used 410 gallons, rec 95%, gray to white HP 500 psi WP 50 psi Time 20 mins
	46								46
	47								47
	48		ls			Box 3 of 7 (45.3 to 55.3' bgs)			48
	49								49
500	50	ls: LIMESTONE, moderately hard, unweathered, microcrystalline, massive bedding, lightly jointed at 52.85' (90 degrees). Joints are not filled with Shale and Clay. Contorted calcite veins throughout, color is light bluish gray to medium light gray.			Organic Vapor = 0ppm			CD 49.7	50 Run 6 (50.3-55.3' bgs) Ran 5.0', Rec 4.35'

HTRW DRILLING LOG (Continuation Sheet)

HOLE NUMBER: RF-MW07

Project: Fort McClellan | Geologist: Adam Day/Kyle Wilson | Sheet 7 of 10 sheets

Elev. (a)	Depth (b)	Description of Materials (c)	USCS / Lithology	Graphic	Field screening results (d)	Geotech sample or core box no. (e)	Analytical sample no. (f)	Blow counts (g)	Remarks (h)
	51								Loss 0.65' UL 0.02' Water used 320 gallons, rec 80%, gray HP 500 psi WP 50 psi Time 25 mins RQD 100%
	52								
	53		ls						
	54							CD 54.07	
495	55	ls: LIMESTONE, moderately hard, unweathered, microcrystalline, massive bedding, moderately jointed at 55' (60 degrees), 55.53' (80 degrees), 57.83' (90 degrees). Contorted calcite veins throughout. Calcite vein offset at 58.4', color is light bluish gray to medium light gray.			Organic Vapor = 0ppm				Run 7 (55.3-59.3' bgs) Ran 4.0', Rec 5.0' Gain 1.0' UL 0.03' Water used 450 gallons, rec 95%, gray to white HP 500 psi WP 50 psi Time 28 mins RQD 100%
	56								
	57		ls						
	58								
	59							CD 59.1	
490	60	ls: LIMESTONE, moderately hard to hard, unweathered, microcrystalline, massive bedding, lightly jointed at 59.36', 60', 61.54' all 90 degrees. Contorted calcite veins throughout, color is medium bluish gray to medium light gray.			Organic Vapor = 0ppm				Run 8 (59.3-64.3' bgs) Ran 5.0', Rec 4.94' Loss 0.06' UL 0 Water used 700 gallons, rec 80%, gray to white HP 500 psi WP 50 psi Time 43 mins RQD 100%

HTRW DRILLING LOG (Continuation Sheet)

HOLE NUMBER: RF-MW07

Project: Fort McClellan | Geologist: Adam Day/Kyle Wilson | Sheet 8 of 10 sheets

Elev. (a)	Depth (b)	Description of Materials (c)	USCS / Lithology	Graphic	Field screening results (d)	Geotech sample or core box no. (e)	Analytical sample no. (f)	Blow counts (g)	Remarks (h)
	61		ls			Box 4 of 7 (55.3 to 64.3' bgs)			
	62								
	63								
	64	ls: LIMESTONE, moderately hard to hard, unweathered, microcrystalline, massive bedding, lightly jointed at 66.61', 67.53', 67.94', recemented joint at 64.9', color is medium bluish gray to medium light gray. All joints are 90 degrees.			Organic Vapor = 0ppm			CD 64.04	Run 9 (64.3-69.3' bgs) Ran 5.0', Rec 5.02' Gain 0.2' UG 0.04' Water used 750 gallons, rec 85%, white to gray HP 500 psi WP 50 psi Time 45 mins RQD 100%
485	65								
	66								
	67		ls			Box 5 of 7 (64.3 to 74.3' bgs)			
	68								
	69	ls: LIMESTONE, moderately hard to hard, unweathered, microcrystalline, massive bedding, lightly jointed at 70.3', 71.57' and 73.4'. All joints are 90 degrees. Color is medium bluish gray to medium light gray.						CD 69.1	Run 10 (69.3-74.3' bgs) Ran 5.0', Rec 4.98' Loss .02' UL .02' Water used 750 gallons, rec 85%, gray to white HP 500 psi WP 50 psi Time 47 mins RQD 100%
480	70				Organic Vapor = 0ppm				
	71								

HTRW DRILLING LOG (Continuation Sheet)

HOLE NUMBER: RF-MW07

Project: Fort McClellan | Geologist: Adam Day/Kyle Wilson | Sheet 9 of 10 sheets

Elev. (a)	Depth (b)	Description of Materials (c)	USCS / Lithology	Graphic	Field screening results (d)	Geotech sample or core box no. (e)	Analytical sample no. (f)	Blow counts (g)	Remarks (h)
	72		ls						
	73								
	74				Organic Vapor = 0ppm			CD 74.1	Run 11 (74.3-75.3' bgs) Ran 1.0' Rec 1.05' Gain 0.05' UL 0.1'
475	75	ls: LIMESTONE, moderately hard to hard, unweathered, microcrystalline, massive bedding, all one piece. Color is medium light gray to light bluish gray.	ls						Water used 250 gallons, rec 95% HP 500 psi WP 50 psi Time 8 mins RQD 100%
	76	ls: LIMESTONE, moderately hard to hard, unweathered, microcrystalline, massive bedding, lightly jointed at 76.74', 78.02', 79.55'. Joints filled with Clay and Shale at 79.55'-80.05'. Contorted calcite veins throughout, veins filled with Clay and Shale at 75.6'-75.8'. Color is medium light gray to light bluish gray. Clay and Shale is medium bluish gray.			Organic Vapor = 0ppm			CD 75.45	Run 12 (75.3-80.3' bgs) Ran 5.0' Rec 4.66' Loss 0.34' UL 0.0' Water used 550 gallons, rec 95%, white to gray HP 500 psi WP 50 psi Time 32 mins RQD 100%
	77								
	78		ls			Box 6 of 7 (74.3 to 80.3' bgs)			
	79								
470	80				Organic Vapor = 0ppm			CD 80.11	Run 13 (80.3-85.3' bgs) Ran 5.0' Rec 4.27' Loss 0.73' UL 0.02'
	81	ls: LIMESTONE, moderately hard to hard, unweathered, microcrystalline, massive bedding, lightly jointed at 81.48', 74.17', both at 90 degrees. Contorted calcite veins throughout, some veins filled with Clay and Shale. Color is medium light gray to light bluish gray. Clay and Shale is medium bluish							Water used 750 gallons, rec

HTRW DRILLING LOG (Continuation Sheet)

HOLE NUMBER: RF-MW07

Project: Fort McClellan | Geologist: Adam Day/Kyle Wilson | Sheet 10 of 10 sheets

Elev. (a)	Depth (b)	Description of Materials (c)	USCS / Lithology	Graphic	Field screening results (d)	Geotech sample or core box no. (e)	Analytical sample no. (f)	Blow counts (g)	Remarks (h)
		gray.							95%, gray to white HP 500 psi WP 50 psi Time 34 mins RQD 100%
	82								82
	83		ls			Box 7 of 7 (80.3 to 85.5' bgs)			83
	84								84
465		ls: LIMESTONE, moderately hard to hard, unweathered, microcrystalline, medium light gray to light bluish gray.							
	85				Organic Vapor = 0ppm				85 Description from Air Rotary drill cuttings (85.3-85.5' bgs) Bottom of borehole at 85.5'

WELL CONSTRUCTION LOGS

MONITORING WELL INSTALLATION DETAIL

PROJECT: Fort McClellan
LOCATION: Anniston, AL
CLIENT: USACE Mobile District
CONTRACTOR: Miller Drilling Company
DRILLER: Paul Gibson
IT FIELD REPRESENTATIVE: Cindy Levaas

WELL NO: RF-MW01
DRILLING METHOD: Hollow Stem Auger
INSTALLATION DATE: 03-JUN-02
NORTHING: 1175307.4
EASTING: 607793.63
HORIZONTAL SURVEY DATUM: NAD83
VERTICAL SURVEY DATUM: NAVD88
JOB NO: 796887

GROUND SURFACE ELEVATION* 553.15

TOP of WELL CASING or RISER PIPE
EL* 555.41 STICKUP 2.26

SURFACE SEAL
TYPE of SURFACE SEAL: Concrete
MINIMUM THICKNESS: 4 inches

ANNULAR SPACE SEAL TYPE
Grout

APPROXIMATE DIAMETER of BOREHOLE (inches) 8

TOP OF SEAL

SEAL MATERIAL	SEAL START DEPTH
Bentonite	7

FILTER PACK

TYPE of SAND PACK AROUND SCREEN	TOP OF SAND PACK
Sand No 1	10

CASING

TYPE of RISER MATERIAL (Flush Threaded)	INSIDE DIAMETER of RISER (inches)
PVC SCH 40	2

SCREEN

TYPE of SCREEN MATERIAL	SLOT SIZE (inches)	INSIDE DIAMETER (inches)
PVC SCH 40	0.010	2

TOP OF SCREENED INTERVAL
EL* 540.15 DEPTH 13

BOTTOM of SCREENED INTERVAL
EL* 530.15 DEPTH 23

BOTTOM of SUMP and WELL
EL* 530.15 DEPTH 23

BOTTOM of BOREHOLE
EL* 530.05 DEPTH 23.1

NEAT CEMENT
GROUT
BENTONITE SEAL
FILTER PACK
BOREHOLE COLLAPSE

*All elevations (EL) are referenced to MSL.
All depths and heights are given in feet and are referenced to the ground surface.

MONITORING WELL INSTALLATION DETAIL

PROJECT: Fort McClellan
LOCATION: Anniston, AL
CLIENT: USACE Mobile District
CONTRACTOR: Miller Drilling Company
DRILLER: Paul Gibson
IT FIELD REPRESENTATIVE: Cindy Levaas

WELL NO: RF-MW02
DRILLING METHOD: Hollow Stem Auger
INSTALLATION DATE: 03-JUN-02
NORTHING: 1175169.35
EASTING: 607761.15
HORIZONTAL SURVEY DATUM: NAD83
VERTICAL SURVEY DATUM: NAVD88
JOB NO: 796887

GROUND SURFACE ELEVATION* 550.5

TOP of WELL CASING or RISER PIPE
EL* 552.63 STICKUP 2.13

SURFACE SEAL
TYPE of SURFACE SEAL: Concrete
MINIMUM THICKNESS: 4 inches

ANNULAR SPACE SEAL TYPE
Grout

APPROXIMATE DIAMETER of BOREHOLE (inches) 8

TOP OF SEAL

SEAL MATERIAL	SEAL START DEPTH
Bentonite	6.5

FILTER PACK

TYPE of SAND PACK AROUND SCREEN	TOP OF SAND PACK
Sand No 1	10

CASING

TYPE of RISER MATERIAL (Flush Threaded)	INSIDE DIAMETER of RISER (inches)
PVC SCH 40	2

SCREEN

TYPE of SCREEN MATERIAL	SLOT SIZE (inches)	INSIDE DIAMETER (inches)
PVC SCH 40	0.010	2

TOP OF SCREENED INTERVAL
EL* 537 DEPTH 13.5

BOTTOM of SCREENED INTERVAL
EL* 527 DEPTH 23.5

BOTTOM of SUMP and WELL
EL* 527 DEPTH 23.5

BOTTOM of BOREHOLE
EL* 527 DEPTH 23.5

NEAT CEMENT
GROUT
BENTONITE SEAL
FILTER PACK
BOREHOLE COLLAPSE

*All elevations (EL) are referenced to MSL.
All depths and heights are given in feet and are referenced to the ground surface.

MONITORING WELL INSTALLATION DETAIL

PROJECT: Fort McClellan
LOCATION: Anniston, AL
CLIENT: USACE Mobile District
CONTRACTOR: Miller Drilling Company
DRILLER: Paul Gibson
IT FIELD REPRESENTATIVE: Cindy Levaas

WELL NO: RF-MW03
DRILLING METHOD: Hollow Stem Auger
INSTALLATION DATE: 03-JUN-02
NORTHING: 1175190.89
EASTING: 607815.86
HORIZONTAL SURVEY DATUM: NAD83
VERTICAL SURVEY DATUM: NAVD88
JOB NO: 796887

GROUND SURFACE ELEVATION* 552.01

TOP of WELL CASING or RISER PIPE
EL* 554.24 STICKUP 2.23

SURFACE SEAL
TYPE of SURFACE SEAL: Concrete
MINIMUM THICKNESS: 4 inches

ANNULAR SPACE SEAL TYPE
Grout

APPROXIMATE DIAMETER of BOREHOLE (inches) 8

TOP OF SEAL

SEAL MATERIAL	SEAL START DEPTH
Bentonite	4

FILTER PACK

TYPE of SAND PACK AROUND SCREEN	TOP OF SAND PACK
Sand No 1	7

CASING

TYPE of RISER MATERIAL (Flush Threaded)	INSIDE DIAMETER of RISER (inches)
PVC SCH 40	2

SCREEN

TYPE of SCREEN MATERIAL	SLOT SIZE (inches)	INSIDE DIAMETER (inches)
PVC SCH 40	0.010	2

TOP OF SCREENED INTERVAL
EL* 542.01 DEPTH 10

BOTTOM of SCREENED INTERVAL
EL* 532.01 DEPTH 20

BOTTOM of SUMP and WELL
EL* 532.01 DEPTH 20

BOTTOM of BOREHOLE
EL* 531.91 DEPTH 20.1

NEAT CEMENT
GROUT
BENTONITE SEAL
FILTER PACK
BOREHOLE COLLAPSE

*All elevations (EL) are referenced to MSL.
All depths and heights are given in feet and are referenced to the ground surface.

MONITORING WELL INSTALLATION DETAIL

PROJECT: Fort McClellan
LOCATION: Anniston, AL
CLIENT: USACE Mobile District
CONTRACTOR: Miller Drilling Company
DRILLER: Paul Gibson
IT FIELD REPRESENTATIVE: Cindy Levaas

WELL NO: RF-MW04
DRILLING METHOD: Hollow Stem Auger
INSTALLATION DATE: 03-JUN-02
NORTHING: 1174360.65
EASTING: 607894.02
HORIZONTAL SURVEY DATUM: NAD83
VERTICAL SURVEY DATUM: NAVD88
JOB NO: 796887

GROUND SURFACE ELEVATION* 518.7

TOP of WELL CASING or RISER PIPE
EL* 520.96 STICKUP 2.26

SURFACE SEAL
TYPE of SURFACE SEAL: Concrete
MINIMUM THICKNESS: 4 inches

ANNULAR SPACE SEAL TYPE
Grout

APPROXIMATE DIAMETER of BOREHOLE (inches) 8

TOP OF SEAL

SEAL MATERIAL	SEAL START DEPTH
Bentonite	2

FILTER PACK

TYPE of SAND PACK AROUND SCREEN	TOP OF SAND PACK
Sand No 1	5

CASING

TYPE of RISER MATERIAL (Flush Threaded)	INSIDE DIAMETER of RISER (inches)
PVC SCH 40	2

SCREEN

TYPE of SCREEN MATERIAL	SLOT SIZE (inches)	INSIDE DIAMETER (inches)
PVC SCH 40	0.010	2

TOP OF SCREENED INTERVAL
EL* 508.7 DEPTH 10

BOTTOM of SCREENED INTERVAL
EL* 498.7 DEPTH 20

BOTTOM of SUMP and WELL
EL* 498.7 DEPTH 20

BOTTOM of BOREHOLE
EL* 498.7 DEPTH 20

NEAT CEMENT
GROUT
BENTONITE SEAL
FILTER PACK
BOREHOLE COLLAPSE

*All elevations (EL) are referenced to MSL.
All depths and heights are given in feet and are referenced to the ground surface.

MONITORING WELL INSTALLATION DETAIL

PROJECT: Fort McClellan
LOCATION: Anniston, AL
CLIENT: USACE Mobile District
CONTRACTOR: Miller Drilling Company
DRILLER: Al Davis
IT FIELD REPRESENTATIVE: Adam Day

WELL NO: RF-MW05
DRILLING METHOD: Air Rotary
INSTALLATION DATE: 11-JUL-02
NORTHING: 1175304.31
EASTING: 607769.39
HORIZONTAL SURVEY DATUM: NAD83
VERTICAL SURVEY DATUM: NAVD88
JOB NO: 796887

GROUND SURFACE ELEVATION*: 552.75

TOP of WELL CASING or RISER PIPE
EL* 554.85 STICKUP 2.1

SURFACE SEAL
TYPE of SURFACE SEAL: Concrete
MINIMUM THICKNESS: 4 inches

APPROXIMATE DIAMETER of BOREHOLE (inches): 12

ANNULAR SPACE SEAL TYPE
Grout
Grout

SURFACE CASING
BOTTOM of SURFACE CASING

MATERIAL	INSIDE DIAMETER	EL*	DEPTH
Steel	8	523.75	29

CASING

TYPE of RISER MATERIAL (Flush Threaded)	INSIDE DIAMETER of RISER (inches)
PVC SCH 80	4

APPROXIMATE DIAMETER of BOREHOLE (inches): 8

TOP OF SEAL

SEAL MATERIAL	SEAL START DEPTH
Bentonite	19
Sand No 0	59

SCREEN

TYPE of SCREEN MATERIAL	SLOT SIZE (inches)	INSIDE DIAMETER (inches)
PVC SCH 80	0.010	4

FILTER PACK

TYPE of SAND PACK AROUND SCREEN	TOP OF SAND PACK
Sand No 1	64

TOP OF SCREENED INTERVAL
EL* 486.2 DEPTH 66.55

BOTTOM of SCREENED INTERVAL
EL* 461.2 DEPTH 91.55

BOTTOM of SUMP and WELL
EL* 460.85 DEPTH 91.9

BOTTOM of BOREHOLE
EL* 460.85 DEPTH 91.9

NEAT CEMENT
GROUT
BENTONITE SEAL
FILTER PACK
BOREHOLE COLLAPSE

*All elevations (EL) are referenced to MSL.
All depths and heights are given in feet and are referenced to the ground surface.

MONITORING WELL INSTALLATION DETAIL

PROJECT: Fort McClellan
LOCATION: Anniston, AL
CLIENT: USACE Mobile District
CONTRACTOR: Miller Drilling Company
DRILLER: Al Davis
IT FIELD REPRESENTATIVE: Adam Day

WELL NO: RF-MW06
DRILLING METHOD: Air Rotary
INSTALLATION DATE: 02-JUL-02
NORTHING: 1175161.46
EASTING: 607745.86
HORIZONTAL SURVEY DATUM: NAD83
VERTICAL SURVEY DATUM: NAVD88
JOB NO: 796887

GROUND SURFACE ELEVATION* 550.01

TOP of WELL CASING or RISER PIPE
EL* 552.16 STICKUP 2.15

SURFACE SEAL
TYPE of SURFACE SEAL: Concrete
MINIMUM THICKNESS: 4 inches

APPROXIMATE DIAMETER of BOREHOLE (inches) 14

ANNULAR SPACE SEAL TYPE
Grout
Grout

SURFACE CASING
BOTTOM of SURFACE CASING

MATERIAL	INSIDE DIAMETER	EL*	DEPTH
Steel	8	525.51	24.5

CASING

TYPE of RISER MATERIAL (Flush Threaded)	INSIDE DIAMETER of RISER (inches)
PVC SCH 80	4

APPROXIMATE DIAMETER of BOREHOLE (inches) 8

TOP OF SEAL

SEAL MATERIAL	SEAL START DEPTH
Bentonite	14.5
Sand No 0	51

SCREEN

TYPE of SCREEN MATERIAL	SLOT SIZE (inches)	INSIDE DIAMETER (inches)
PVC SCH 80	0.010	4

FILTER PACK

TYPE of SAND PACK AROUND SCREEN	TOP OF SAND PACK
Sand No 1	56

TOP OF SCREENED INTERVAL
EL* 488.11 DEPTH 61.9

BOTTOM of SCREENED INTERVAL
EL* 468.11 DEPTH 81.9

BOTTOM of SUMP and WELL
EL* 468.11 DEPTH 81.9

BOTTOM of BOREHOLE
EL* 468.11 DEPTH 81.9

NEAT CEMENT
GROUT
BENTONITE SEAL
FILTER PACK
BOREHOLE COLLAPSE

*All elevations (EL) are referenced to MSL.
All depths and heights are given in feet and are referenced to the ground surface.

MONITORING WELL INSTALLATION DETAIL

PROJECT: Fort McClellan
LOCATION: Anniston, AL
CLIENT: USACE Mobile District
CONTRACTOR: Miller Drilling Company
DRILLER: Al Davis
IT FIELD REPRESENTATIVE: Adam Day

WELL NO: RF-MW07
DRILLING METHOD: Air Rotary
INSTALLATION DATE: 02-JUL-02
NORTHING: 1175173.97
EASTING: 607824.7
HORIZONTAL SURVEY DATUM: NAD83
VERTICAL SURVEY DATUM: NAVD88
JOB NO: 796887

GROUND SURFACE ELEVATION* 549.79

TOP of WELL CASING or RISER PIPE
EL* 551.92 STICKUP 2.13

SURFACE SEAL
TYPE of SURFACE SEAL: Concrete
MINIMUM THICKNESS: 4 inches

APPROXIMATE DIAMETER of BOREHOLE (inches) 14

ANNULAR SPACE SEAL TYPE
Grout
Grout

SURFACE CASING
BOTTOM of SURFACE CASING

MATERIAL	INSIDE DIAMETER	EL*	DEPTH
Steel	8	520.79	29

CASING

TYPE of RISER MATERIAL (Flush Threaded)	INSIDE DIAMETER of RISER (inches)
PVC SCH 80	4

APPROXIMATE DIAMETER of BOREHOLE (inches) 8

TOP OF SEAL

SEAL MATERIAL	SEAL START DEPTH
Bentonite	19
Sand No 0	54

FILTER PACK

TYPE of SAND PACK AROUND SCREEN	TOP OF SAND PACK
Sand No 1	59

SCREEN

TYPE of SCREEN MATERIAL	SLOT SIZE (inches)	INSIDE DIAMETER (inches)
PVC SCH 80	0.010	4

TOP OF SCREENED INTERVAL
EL* 489.64 DEPTH 60.15

BOTTOM of SCREENED INTERVAL
EL* 464.64 DEPTH 85.15

BOTTOM of SUMP and WELL
EL* 464.29 DEPTH 85.5

BOTTOM of BOREHOLE
EL* 464.29 DEPTH 85.5

NEAT CEMENT
GROUT
BENTONITE SEAL
FILTER PACK
BOREHOLE COLLAPSE

*All elevations (EL) are referenced to MSL.
All depths and heights are given in feet and are referenced to the ground surface.

APPENDIX B

SAMPLE COLLECTION LOGS AND ANALYSIS REQUEST/CHAIN OF CUSTODY FORMS

SAMPLE COLLECTION LOGS

INTERNATIONAL TECHNOLOGY CORPORATION

Sample Collection Log

Project: 796887 Fort McClellan

Manager: Jeanne Yacoub

RFA / COC Number: RF-073102-EMAX

Location Code: **RF-MW04**
Collection Date: 07/30/02

Sample Number: **HV3005**
Collection Time: 1050

Sample Name: **RF-MW04-GW-HV3005-REG**
Start Depth: 10'

Sampling Method: ~~SP~~ PP
End Depth: 20'

Sample Type: **GW** *Sample Purpose:* **REG**
Sample Matrix: **WATER**

QC Partners:
(TB) NA (ER) 080202-ER (FB) NA
Sample Team: JA - JC

ERPIMS Values:
Sacode:
Lot Control#:

Containers

Analytical Suite	Flt	Frtn	Qty	Size	Units	Type
GAMMA SCAN	N	A	1	1	L	HDPE
STRONTIUM-90	N	A	1	1	L	HDPE

Comments: FD has been moved from RF-MW03 to RF-MW04

Sketch Location:

Logged BY / Date: 07/30/02 *Reviewed BY / Date:* 7/30/02

INTERNATIONAL TECHNOLOGY CORPORATION

Sample Collection Log

Project: 796887 Fort McClellan

Manager: Jeanne Yacoub

Location Code: **RF-MW04**

Sample Number: **HV3005**

.1g/L

PURGE RECORD:

Initial	Time(24hr)	DepthtoWater (ft)	Eh (mV)	pH (SU)	Conductivity (mS/cm)	Turbidity (NTU)	DissOxygen ~~(ppm)~~ MOLE	Temperature (C)	Purge Volume (gal)
SHC	0915	3.94	-65	6.44	.433	78.3	3.20	21.35	~~.1g/L~~
	0945	6.19	-150	7.00	.431	14.4	0.47	21.23	3
	1015	6.40	-160	7.04	.434	6.2	0.39	21.21	6
	1035	6.44	-159	6.96	.433	5.5	0.85	21.32	8
	1040	6.42	-160	6.96	.433	5.1	0.73	21.26	8.5
	1045	6.41	-160	6.95	.435	5.0	0.69	21.31	9
Sample:	1050	6.42	-160	6.96	.435	5.3	0.67	21.40	9.5

TD 22.28
DTW - 3.94
18.34 x .163 = 2.99
2.99 x 3 = 9
2.99 x 5 = 15

Gamma - Strontium-90 pH < 2
P.D - 0.0 Well head 3.1

Logged BY / Date: 07/30/02 *Reviewed BY / Date:* 7/30/02

INTERNATIONAL TECHNOLOGY CORPORATION

Sample Collection Log

Project: 796887 Fort McClellan

Manager: Jeanne Yacoub

RFA / COC Number: RF-073102-EMAK

Location Code: ~~RF-MW03~~ MW04

Collection Date: 07/30/02

Sample Number: HV3004

Collection Time: 1050

Sample Name: ~~RF-MW03-GW-HV3004-FD~~ RF-MW04-GW-HV3004-FD

Start Depth: 10'

Sampling Method: ~~SP~~ PP SAC

End Depth: 20'

Sample Type: GW

Sample Purpose: FD

Sample Matrix: WATER

QC Partners:

(TB) NA (ER) 080202-ER2 (FB) NA

Sample Team: JA - JC

ERPIMS Values:

Sacode:

Lot Control#:

Containers

Analytical Suite	Flt	Frtn	Qty	Size	Units	Type
GAMMA SCAN	N	A	1	1	L	HDPE
STRONTIUM-90	N	A	1	1	L	HDPE

Comments: FD. has been moved from RF-MW03 to RF-MW04

Sketch Location:

Logged BY / Date: [signature] 07/30/02

Reviewed BY / Date: [signature] 7/30/02

INTERNATIONAL TECHNOLOGY CORPORATION

Sample Collection Log

Project: 796887 **Fort McClellan**

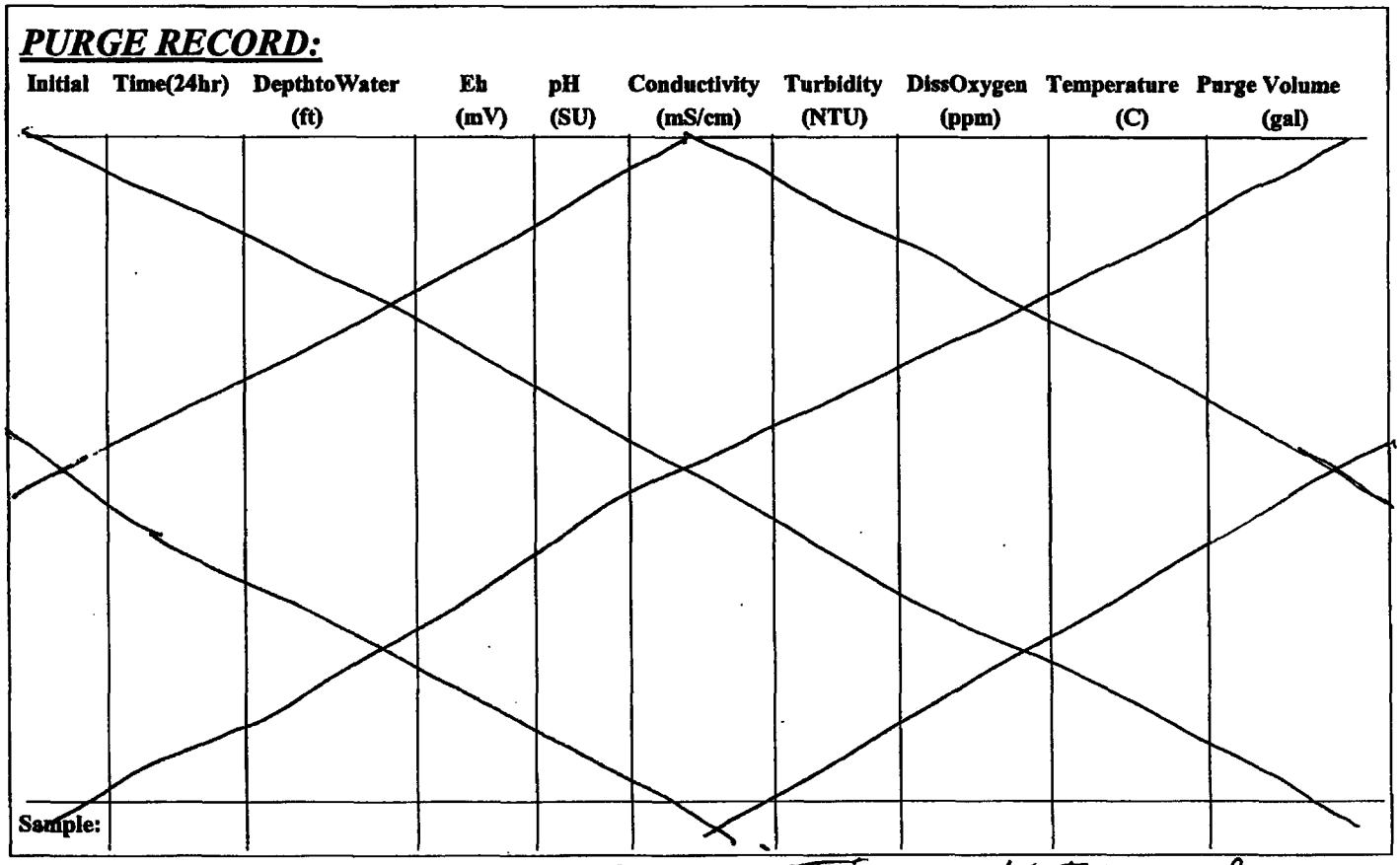
Manager: Jeanne Yacoub

Location Code: ~~RF-MW03~~ MW04

Sample Number: **HV3004**

FD

PURGE RECORD:



Parameter measurements and Calculations are listed of Log Sample Number - HV3005

Logged BY / Date: 07/30/02

Reviewed BY / Date: 7/30/02

INTERNATIONAL TECHNOLOGY CORPORATION

Sample Collection Log

Project: 796887 Fort McClellan

Manager: Jeanne Yacoub

KM 7/30/02 KM 7/30/02

RFA / COC Number: ~~RF02-~~ 0730~~02~~-SMW4

Location Code: **RF-MW05**

Sample Number: **HV3006**

Sample Name: **RF-MW05-GW-HV3006-REG**

Sampling Method: ~~SP~~ BP

Sample Type: **GW** *Sample Purpose:* **REG**

Collection Date: 07/30/02

Collection Time: 1255

Start Depth: ~~60.15~~ 66.55

End Depth: ~~85.15~~ 91.55

Sample Matrix: **WATER**

Sample Team: J.A. - J.C.

QC Partners:

(TB) NP (ER) 080202-ER (FB) NA

ERPIMS Values:

Sacode: _____

Lot Control#: _____

Containers

Analytical Suite	Flt	Frtn	Qty	Size	Units	Type
GAMMA SCAN	N	A	1	1	L	HDPE
STRONTIUM-90	N	A	1	1	L	HDPE

Comments:

Sketch Location:

07/30/02

Logged BY / Date: _____ *Reviewed BY / Date:* _____ 7/30/02

INTERNATIONAL TECHNOLOGY CORPORATION

Sample Collection Log

Project: 796887 Fort McClellan

Manager: Jeanne Yacoub

Location Code: **RF-MW05**

Sample Number: **HV3006**

PURGE RECORD:

Initial	Time(24hr) 07/29-02	DepthtoWater (ft)	Eh (mV)	pH (SU)	Conductivity (mS/cm)	Turbidity (NTU)	DissOxygen ~~(ppm)~~ NO LE	Temperature (C)	Purge Volume (gal)
JH(2	1120	31.06	196	6.53	.401	4.0	8.38	22.28	— .35gl
	1220	32.47	193	6.97	.424	4.2	7.53	20.72	21 gal - .5gl
	1320	32.46	188	7.02	.421	4.5	7.77	21.09	51
	1420	32.55	192	7.05	.415	4.3	7.78	21.0	81
	1520	32.61	190	6.99	.419	4.3	7.80	21.62	111
07/30/02	1210	31.08	117	7.23	.462	4.7	9.53	22.61	111g — .35gl
	1225	32.31	123	7.07	.427	4.4	7.23	20.55	116.25
	1240	32.42	121	7.02	.427	3.8	6.14	21.13	121.5
	1245	32.42	124	7.02	.429	3.6	6.33	20.91	123.25
	1250	32.42	122	7.02	.429	4.1	6.24	21.20	125
Sample:	1255	32.42	122	7.01	.429	3.7	6.19	21.32	126.75

TD - 94.13

DTW - 31.06

63.07 x .653 = 41.2

41.2 x 3 = 123.6

41.2 x 5 = 206

PID - 0.0

GAMMA - Stronair - 90 - PH < 2

Logged BY / Date: Jennifer Cunningham 07/30/02

Reviewed BY / Date: Kathleen Hogan 7/30/02

INTERNATIONAL TECHNOLOGY CORPORATION

Sample Collection Log

Project: 796887 Fort McClellan

Manager: Jeanne Yacoub

RFA / COC Number: RF-080502-96NC

Location Code: **RF-MW06**
Collection Date: 08/02/02

Sample Number: **HV3007**
Collection Time: 1205

Sample Name: **RF-MW06-GW-HV3007-REG**
Start Depth: 61.55

Sampling Method: ~~SP~~ BP
End Depth: 81.55

Sample Type: **GW** *Sample Purpose:* **REG**
Sample Matrix: **WATER**

QC Partners:
(TB) NH (ER) 080202-ER (FB) NH
Sample Team: RG - JC

ERPIMS Values:
Sacode:
Lot Control#:

Containers

Analytical Suite	Flt	Frtn	Qty	Size	Units	Type
GAMMA SCAN	N	A	1	1	L	HDPE
STRONTIUM-90	N	A	1	1	L	HDPE

Comments:

Sketch Location:

Logged BY / Date: [signature] 08-01-02/08-02-02

Reviewed BY / Date: [signature] 8/15/02

INTERNATIONAL TECHNOLOGY CORPORATION

Sample Collection Log

Project: 796887 **Fort McClellan**

Manager: Jeanne Yacoub

Location Code: **RF-MW06**

Sample Number: **HV3007**

PURGE RECORD:

Initial	Time(24hr)	DepthtoWater (ft)	Eh (mV)	pH (SU)	Conductivity (mS/cm)	Turbidity (NTU)	DissOxygen (mg/L)	Temperature (C)	Purge Volume (gal)
08/01/02									
SM	1540	27.70	108	7.04	~~7.00~~ .456	11.2	9.06	24.86	——.5ml
	1640	44.21	110	7.08	.469	13.9	8.31	24.19	30
08/02/02	0940	27.78	90	6.48	.468	6.2	9.73	21.42	30g — .5gl
	1040	32.25	86	7.18	.490	~~8.1~~ 6.3	7.23	~~22.56~~	60 — .6gl
	1145	37.09	95	7.29	.481	9.8	8.49	21.96	~~96~~ 99gal
	1150	37.16	90	7.27	.485	7.1	8.21	21.71	102
	1155	37.21	89	7.27	.487	6.9	8.16	22.0	105
	1200	37.36	90	7.26	.489	7.5	8.24	22.13	108
Sample:	1205	37.51	88	7.28	.486	8.1	8.21	21.99	111

TD - 83.91

DTW - 27.70

56.21 x .653 = 36.71

36.71 x 3 = 110.12

36.71 x 5 = 183.53

PID - 0.0

Gamma — Strontium 90 — PH < 2

Logged BY / Date: [signature] 08-01-02 / 08-02-02

Reviewed BY / Date: [signature] 8/6/02

INTERNATIONAL TECHNOLOGY CORPORATION

Sample Collection Log

Project: 796887 Fort McClellan

Manager: Jeanne Yacoub

RFA / COC Number: RF-080502-EMAX

Location Code: **RF-MW07**
Sample Number: **HV3008**
Sample Name: **RF-MW07-GW-HV3008-REG**
Sampling Method: ~~SP~~ BP purge Bailed Well
Sample Type: **GW** *Sample Purpose:* **REG**

Collection Date: 08-02-02
Collection Time: 1230
Start Depth: 60.15
End Depth: 85.15
Sample Matrix: **WATER**
Sample Team: RG - JC

QC Partners:
(TB) NA (ER) 080202-ER (FB) NA

ERPIMS Values:
Sacode:
Lot Control#:

Containers

Analytical Suite	Flt	Frtn	Qty	Size	Units	Type
GAMMA SCAN	N	A	1	1	L	HDPE
STRONTIUM-90	N	A	1	1	L	HDPE

Comments:

Sketch Location:

Logged BY / Date: [signature] 08-01-02 / 08-02-02

Reviewed BY / Date: [signature] 8/5/02

INTERNATIONAL TECHNOLOGY CORPORATION

Sample Collection Log

Project: 796887 Fort McClellan

Manager: Jeanne Yacoub

Location Code: **RF-MW07**

Sample Number: **HV3008**

PURGE RECORD:

Initial	Time(24hr) 08/01/02	Depth to Water (ft)	Eh (mV)	pH (SU)	Conductivity (mS/cm)	Turbidity (NTU)	Diss Oxygen (mg/L) (~~ppm~~)	Temperature (C)	Purge Volume (gal)
JHC	1200	66.06	151	6.88	.466	415	8.31	25.36	— .18 gl
	1300	70.54	152	6.99	.466	25.8	6.48	22.57	10.8
	1400	76.82	150	6.94	.499	122.0	8.52	29.62	21.6
	1500	80.98	147	6.98	.483	69.1	5.96	26.15	33.4
	1530	Well went Dry!	—	—	—	—	—	—	38.8
08/02/02	~~0910~~ 0910	82.09	Bailing sample						
JHC	1230	82.09	139	7.23	.505	111	9.06	21.70	
Sample:	1230	82.09	139	7.23	.505	111	9.06	21.70	

TD 84.08

DW - 66.06

18.02 x .653 = 11.8

11.8 x 3 = 35.3

11.8 x 5 = 59

PID - 0.0

GAMMA - Strontium 90 - PH < 2

Logged BY / Date: [signature] 08-01-02/08/02-02

Reviewed BY / Date: [signature] 8/5/02

ANALYSIS REQUEST/CHAIN OF CUSTODY FORMS

IT CORPORATION
A Member of The IT Group

ANALYSIS REQUEST AND CHAIN OF CUSTODY RECORD

I11 0214008

Reference Document No: RF-073102-EMAX

Page 1 of 1

Project Number: 796887
Project Name: Fort McClellan
Sample Coordinator: Oliver Allen
Turnaround Time: Normal

Samples Shipment Date: 31 JUL 2002
Lab Destination: EMAX Laboratories, Inc.
Lab Contact: Elizabeth McIntyre
Project Contact: Tim Roth
Carrier/Waybill No.: UPS/

Bill To: Duane Nielsen
312 Directors Drive
Knoxville TN 37923

Report To: Duane Nielsen
312 Directors Drive
Knoxville TN 37923

Special Instructions: None

Possible Hazard Indentification:
Non-hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown ☒

Sample Disposal:
Return to Client ☐ Disposal by Lab ☒ Archive (mos.)

1. Relinquished By (Signature/Affiliation) Scott Hogue	Date: 7/31/02 Time: 1400
1. Received By (Signature/Affiliation)	Date: 8-01-02 Time: 10:00
2. Relinquished By (Signature/Affiliation)	Date: Time:
2. Received By (Signature/Affiliation)	Date: Time:
3. Relinquished By (Signature/Affiliation)	Date: Time:
3. Received By (Signature/Affiliation)	Date: Time:

Comments: None

T=3.5°C

	Sample No	Sample Name	Sample Date	Sample Time	Container	Ctr Qty	Preservative	Requested Testing Program	Fil	CID	Condition On Receipt
1	HV3004	RF-MW04-GW-HV3004-FD	30 JUL 2002	10:50	1 L HDPE	1	HNO3<pH 2	Full Gamma Scan including Co-60 and Cs-137 by EPA 901.1, Strontium-90 by EPA 905.0	N		
2	HV3005	RF-MW04-GW-HV3005-REG	30 JUL 2002	10:50	1 L HDPE	1	HNO3<pH 2	Full Gamma Scan including Co-60 and Cs-137 by EPA 901.1, Strontium-90 by EPA 905.0	N		
3	HV3006	RF-MW05-GW-HV3006-REG	30 JUL 2002	12:55	1 L HDPE	1	HNO3<pH 2	Full Gamma Scan including Co-60 and Cs-137 by EPA 901.1, Strontium-90 by EPA 905.0	N		

31001

0208030

IT CORPORATION
A Member of The IT Group

ANALYSIS REQUEST AND CHAIN OF CUSTODY RECORD

Reference Document No: RF-080502-PGNC

Page 1 of 1

Project Number: 796887
Project Name: Fort McClellan
Sample Coordinator: Oliver Allen
Turnaround Time: Normal

Samples Shipment Date: 05 AUG 2002
Lab Destination: Paragon Analytics, Inc
Lab Contact: Debbie Fazio
Project Contact: Tim Roth
Carrier/Waybill No.: UPS/

Bill To: Duane Nielsen
312 Directors Drive
Knoxville TN 37923

Report To: Duane Nielsen
312 Directors Drive
Knoxville TN 37923

Special Instructions: None

Possible Hazard Indentification:
Non-hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown ☒

Sample Disposal:
Return to Client ☐ Disposal by Lab ☒ Archive (mos.)

1. Relinquished By (Signature/Affiliation)	IT Corp.	Date: 8/5/02 Time: 1500	1. Received By (Signature/Affiliation) Amy Wolf (Paragon)	Date: 8/6/02 Time: 0930
2. Relinquished By (Signature/Affiliation)		Date: Time:	2. Received By (Signature/Affiliation)	Date: Time:
3. Relinquished By (Signature/Affiliation)		Date: Time:	3. Received By (Signature/Affiliation)	Date: Time:

Comments: None

	Sample No	Sample Name	Sample Date	Sample Time	Container	Ctr Qty	Preservative	Requested Testing Program	Fil	CID	Condition On Receipt
(1)	080202-ER	FIELDQC-BW-080202-ER-ER	02 AUG 2002	08:00	1 L HDPE	1	HNO3<pH 2	Full Gamma Scan including Co-60 and Cs-137 by EPA 901.1, Strontium-90 by EPA 905.0	N		
(2)	HV3007	RF-MW06-GW-HV3007-REG	02 AUG 2002	12:05	1 L HDPE	1	HNO3<pH 2	Full Gamma Scan including Co-60 and Cs-137 by EPA 901.1, Strontium-90 by EPA 905.0	N		
(3)	HV3008	RF-MW07-GW-HV3008-REG	02 AUG 2002	12:30	1 L HDPE	1	HNO3<pH 2	Full Gamma Scan including Co-60 and Cs-137 by EPA 901.1, Strontium-90 by EPA 905.0	N		

1002

APPENDIX C

WELL DEVELOPMENT LOGS

Groundwater Well Development Log

Fort McClellan, Alabama

Project Number: 796887
Form Completed by: Lee FLIPPEN
Well Developed by (person/firm): Lee FLIPPEN / The Shaw

Parcel No.: RF202
Well No.: MW04
Date started: 7-11-02

Monitoring Well Information

Development Method: Surge + purge
Development Equipment: whale pumps, Horiba U-22, Aquafast II, Heron water indicator
Casing Diameter: 2" .163

Beginning Measurements
Depth to Water (ft): 3.74' TOC
Total depth of Well (ft): 21.25 TOC

7-11-02 PID MALFUNCTION, screen 10'-20'

Time 24hr	Purge Volume (gal)	Water Level (ft) (TOC)	pH (std units)	Conductivity (mS/cm)	Turbidity (NTU)	Dissolved oxygen (mg/L)	Temperature (°C)	Clarity (color)	Comments (Date if different from start date) (Purge Rate, Pump Position, Misc.)
			7-11-02						– Surged well screen –
11:30	0	~~21.25~~	7.26	.437	999+	9.97	22.29	BLACK	Depth 21 ft, Purge Rate 1.0 gpm
11:45	15.0	20.11	7.39	.410	999+	6.69	22.05	BLACK	Depth 21 ft., PR .25 gpm
12:00	18.75	9.50	7.42	.410	999+	4.98	21.70	GRAY	Depth 21 ft., PR .25 gpm
12:15	22.5	9.87	7.39	.406	999+	5.32	21.01	GRAY	Depth 21 ft., PR .25 gpm
12:30	26.25	9.89	7.51	.406	999+	5.36	21.29	GRAY	DEPTH 21 ft, PR .25 gpm
12:45	30.0	9.81	7.34	.406	999+	3.78	21.86	GRAY	Depth 21 ft., PR .25 gpm
13:00	33.75	8.62	7.37	.403	999+	5.20	22.31	GRAY	DEPTH 21 ft. PR .25 gpm

1 hr

TD – DTW = WC x 2'/4' well = One PV x 5 = Min PV + H20 to install well = Minimum H20 to remove

21.25 – 3.74 = 17.51 x .163 = 2.85 x 5 = 14.25 + 10 g = 24.25 g

Parcel No.: RF202
Well ID: MW04
Date: 7-11-02

7-11-02 PID = MALFUNCTION. ADAM DAY /Lee FLIPPEN

Time 24hr	Purge Volume (gal)	Water Level (ft) (TOC)	pH (std units)	Conductivity (mS/cm)	Turbidity (NTU)	Dissolved oxygen (mg/L)	Temperature (°C)	Clarity (color)	Comments (Date if different from start date)
13:15	37.5	8.58	7.38	.411	654	5.02	22.28	Gray	Depth 21', Purge Rate .25 gpm
13:30	41.25	8.54	7.32	.412	394	4.01	21.22	Gray	Depth 21', P.R. .25 gpm
13:45	45.0	8.51	7.52	.406	445	7.01	20.54	Gray	Depth 21', PR .25 gpm
14:00	48.75	11.25	7.36	.408	441	3.78	20.16	Grayish	Depth 21' PR .25 gpm
14:15	52.5	11.64	7.35	.411	402	3.71	19.80	Grayish	Depth 21' PR .25 gpm
14:30	56.25	11.78	7.35	.407	268	3.74	19.84	Grayish	Depth 21', PR .25 gpm
14:45	60.0	11.98	7.39	.416	72.4	4.01	19.64	cloudy	Depth 21', PR .25 gpm
15:00	63.75	10.68	7.35	.399	112	6.35	19.93	Cloudy	Depth 21', PR .25 gpm
15:15	67.5	10.03	7.36	.409	131	6.02	20.01	cloudy	Depth 21', PR .25 gpm
15:30	71.25	9.89	7.36	.406	132	6.36	20.20	cloudy	Depth 21', PR .25 gpm
15:45	75.0	9.81	7.39	.404	102	7.73	20.60	cloudy	Depth 21, PR .25 gpm
16:00	78.75	9.48	7.31	.408	41.5	4.93	20.82	cloudy	—stopped parameters— Lee Flippen 7-11-02
09:25	78.75	3.78	6.71	.415	999+	4.24	19.47	gray	7-12-02 Depth 10'+12', PR .25 gpm
09:40	82.5	10.38	7.25	.406	999+	4.44	19.40	gray	Depth 14'+16', PR .25 gpm

3 hrs

4 hrs

7-12-02

Parcel No.: RF202
Well ID: MW04
Date: 7-12-02

7-12-02 PID 0.0 DTW 3.78 Lee FLIPPEN

Time 24hr	Purge Volume (gal)	Water Level (ft) (TOC)	pH (std units)	Conductivity (mS/cm)	Turbidity (NTU)	Dissolved oxygen (mg/L)	Temperature (°C)	Clarity (color)	Comments (Date if different from start date)
09:55	86.25	9.08	7.27	.408	672	5.01	20.48	grayish	Depth 18', 20' PR .25 gpm
10:10	90.0	9.93	7.35	.410	694	6.95	20.51	"	Depth 20', PR .25 gpm
10:25	93.75	9.78	7.39	.413	315	8.89	20.04	"	" "
10:40	97.5	9.87	7.37	.412	400	8.15	20.48	"	" "
10:55	101.25	9.68	7.37	.414	201	8.47	20.67	Cloudy	Depth 20', PR .2 gpm
11:10	104.25	9.65	7.37	.407	129	8.45	20.52	cloudy	" "
11:25	107.25	10.38	7.39	.418	51.8	4.12	20.75	cloudy	" "
11:40	110.25	10.27	7.37	.412	27	4.38	20.80	cloudy	" "
11:55	113.25	9.31	7.39	.417	43	5.04	21.29	cloudy	" "
12:10	116.25	9.48	7.38	.418	40	3.12	20.87	cloudy	" "
12:25	119.25	9.13	7.50	.415	28	5.12	21.53	cloudy	" "
12:40	122.25	9.91	7.50	.415	13.5	5.05	21.74	clear	" "
12:55	125.25	8.88	7.40	.410	7.0	5.17	21.74	clear	completed 8 hours of well Development Time. Took 12.420 Photo Sample @ 12:55 7-12-02

5 hrs
6 hrs
7 hrs

Groundwater Well Development Log

Fort McClellan, Alabama

Project Number: 796887
Form Completed by: Lee FLIPPEN
Well Developed by (person/firm): Lee FLIPPEN / The Shaw E+I
Parcel No.: RF202
Well No.: MW05
Date started: 7-15-02

Monitoring Well Information

Development Method: surge + purge
Development Equipment: Grundfos pump, Horiba U-22, AquaFAST II, Herby water indicator
Casing Diameter: 4" (.653)

Beginning Measurments
Depth to Water (ft): 31.31' TOC UNCUT
Total depth of Well (ft): 94.5' TOC UNCUT

PID 0.0 screen 66.5'-91.5'

Time 24hr	Purge Volume (gal)	Water Level (ft) (TOC)	pH (std units)	Conductivity (mS/cm)	Turbidity (NTU)	Dissolved oxygen (mg/L)	Temperature (°C)	Clarity (color)	Comments (Date if different from start date) (Purge Rate, Pump Position, Misc.)
									-surged well screen-
10:45	0	31.31	6.61	.482	624	5.94	19.74	Brownish	Depth 94', Purge Rate 1.25 gpm
11:00	18.75	41.60	6.99	.423	365	4.97	18.97	"	" "
11:15	37.5	44.72	7.18	.387	214	5.93	19.37	"	" PR 1.0 gpm
11:30	52.5	45.90	7.42	.381	47	6.93	19.57	cloudy	Depth 94', PR 1.0 gpm
11:45	67.5	46.20	7.39	.374	42	6.80	19.35	cloudy	" "
12:00	82.5	46.55	7.38	.371	36	7.02	19.36	clear	" "
12:15	97.5	46.73	7.48	.373	28	6.82	19.74	clear	Depth 94', PR 1.1 gpm

TD - DTW = WC x 2'/4' well = One PV x 5 = Min PV + H20 to install well = Minimum H20 to remove
94.5 - 31.31 = 63.19 x .653 = 41.26 x 5 = 206.3 + 270g = 476.3g

QC'd 7/18/02

Parcel No.: RF202
Well ID: MW05
Date: 7-15-02

Lee FLIPPEN

Time 24hr	Purge Volume (gal)	Water Level (ft) (TOC)	pH (std units)	Conductivity (mS/cm)	Turbidity (NTU)	Dissolved oxygen (mg/L)	Temperature (°C)	Clarity (color)	Comments (Date if different from start date)
12:30	113.5	39.48	7.42	.376	171	6.50	20.72	cloudy	-Generator ran out of GAS- Restarted, Depth 94', PR 1.1 gpm
12:45	130.0	46.40	7.50	.379	11.8	7.66	19.67	clear	Depth 94', PR 1.1 gpm
2hrs 13:00	146.5	46.62	7.50	.368	9.5	7.13	19.65	clear	" "
13:15	163.0	46.71	7.52	.376	6.3	7.82	19.66	clear	" "
13:30	179.5	46.83	7.52	.371	1.3	7.99	19.34	clear	-stopped parameters to drain Tank ~~Left tapper~~ 7-15-02
14:55	179.5	31.53	7.59	.383	5.3	7.36	21.60	clear	-Restarted Parameters- Depth 94', PR 1.2 gpm
15:10	197.5	42.53	7.58	.378	8.3	7.27	19.47	clear	" "
3hrs 15:25	215.5	47.08	7.64	.378	8.5	7.91	19.90	clear	" "
15:40	233.5	47.27	7.55	.369	6.4	7.03	19.77	clear	" "
15:55	251.5	47.25	7.47	.370	6.2	6.84	19.48	clear	" "
4hrs 16:10	269.5	47.29	7.53	.378	11.0	7.37	19.39	clear	-stopped parameters- ~~Left tapper~~ 7-15-02
7-16-02 09:00	269.5	31.41	6.67	.460	116	7.86	19.30	cloudy	7-16-02 Depth 94', PR 1.25 gpm
09:15	288.25	47.5	7.31	.403	14.0	7.86	19.46	clear	Depth 92', PR 1.2 gpm
09:30	306.25	48.13	7.27	.400	103	6.54	19.68	cloudy	Depth 92', PR 1.2 gpm

Parcel No.: RF202
Well ID: MW05
Date: 7-16-02

Lee FLIPPEN

Time 24hr	Purge Volume (gal)	Water Level (ft) (TOC)	pH (std units)	Conductivity (mS/cm)	Turbidity (NTU)	Dissolved oxygen (mg/L)	Temperature (°C)	Clarity (color)	Comments (Date if different from start date)
09:45	324.25	48.78	7.43	.407	233	8.18	19.84	cloudy	Depth 90', P.Rate 1.2 gpm
10:00	342.25	48.81	7.46	.405	85.1	7.21	19.38	cloudy	Depth 88', PR 1.2 gpm
10:15	360.25	48.99	7.41	.401	25.1	6.81	19.34	clear	Depth 86', PR 1.2 gpm
10:30	378.25	49.11	7.52	.401	21.6	7.48	19.29	clear	Depth 84', PR 1.2 gpm
10:45	396.25	49.19	7.47	.407	22.3	7.91	19.90	clear	Depth 82', PR 1.2 gpm
11:00	414.25	49.28	7.46	.417	29.8	7.28	19.70	clear	Depth 80', PR 1.2 gpm
11:15	432.25	49.02	7.63	.398	23.3	8.72	22.28	clear	* -Stopped parameters to drain tank- ~~Lee Flippen~~ 7-16-02
12:35	432.25	31.68	7.75	.415	55	9.13	20.04	cloudy	-Restarted parameters- Depth 78', PR 1.0 gpm
12:50	447.25	44.22	7.45	.400	3.3	7.52	19.63	~~clear~~ cloudy	Depth 76', 74', PR 1.0 gpm
13:05	462.25	45.95	7.47	.400	2.0	7.29	19.98	clear	Depth 72', 70', PR 1.0 gpm -Reached Target Purge Volume
13:20	477.25	46.28	7.43	.398	2.5	7.02	19.93	clear	Depth 68, 66', PR 1.0 gpm
13:35	492.25	46.35	7.45	.401	2.7	7.01	20.01	clear	Depth 60', PR 1.0 gpm
:									-stabilization accomplished- Stopped parameters and collected 1@ H20 Photo Sample. -well Development Completed- ~~Lee Flippen~~ 7-16-02
:									

Reached Target RV.

7 hrs

Groundwater Well Development Log

Fort McClellan, Alabama

Project Number: 796887
Form Completed by: MARK SHOEMAKER
Well Developed by (person/firm): MARK SHOEMAKER / REGGIE COINS (SNAW EHI)

Parcel No.: RF202
Well No.: RF[redacted]-MW96
Date started: 7/16/02

7-17-02 Lee FLIPPEN - Took over work on well From Mark S. + Reggie G.

Monitoring Well Information

Development Method: Surge + Purge
Development Equipment: Grundfos pump, control Box, Horiba U-22, AquaFast II, Heron water indicator
Casing Diameter: 4"

Beginning Measurments
Depth to Water (ft): 27.74
Total depth of Well (ft): 83.90

PID 0.0 Screen 61.5' - 81.5'

Time 24hr	Purge Volume (gal)	Water Level (ft) (TOC)	pH (std units)	Conductivity (mS/cm)	Turbidity (NTU)	Dissolved oxygen (mg/L)	Temperature (°C)	Clarity (color)	Comments (Date if different from start date) (Purge Rate, Pump Position, Misc.)
08:05	0	27.74	6.75	0.456	999	9.51	21.1	DARK GRAY MUDDY	INITIAL READINGS PUMP @ 83.0' FLOW 0.68 GPM
08:20	10.2	34.60	7.01	0.396	134	9.44	21.4	GRAY CLOUDY	PUMP @ 83.0' FLOW @ 0.68 GPM
08:35	20.4	38.70	7.22	0.420	90	9.48	21.5	SLIGHTLY CLOUDY	PUMP @ 83.0' FLOW @ 0.68 GPM
08:50	30.6	44.60	7.49	0.435	33	9.52	21.6	CLEAR	PUMP ADJUSTED @ 81.0' FLOW @ 0.68 GPM
09:05	40.8	46.40	7.44	0.446	22	9.64	21.6	CLEAR	PUMP ADJUSTED @ 75.0' FLOW @ 0.68 GPM
09:20	51.0	46.74	7.70	0.450	19	9.46	22.3	clear	PUMP ADJUSTED @ 75.0' FLOW @ 0.68 GPM
09:35	61.2	47.90	7.44	0.451	11	9.71	22.5	CLEAR	PUMP ADJUSTED @ 72' FLOW @ 0.68 GPM

TD - DTW = WC x 2' (4") well = One PV x 5 = Min PV + H2O to install well = Minimum H2O to remove

83.90-27.74 = 56.16 * 0.653 = 36.67 x 5 = 183.36 + 270 = 454 gal

QC'd Kurt Hagen 7/18/02

Parcel No.: RF 202
Well ID: MW06
Date: 7-16-02

Time 24hr	Purge Volume (gal)	Water Level (ft) (TOC)	pH (std units)	Conductivity (mS/cm)	Turbidity (NTU)	Dissolved oxygen (mg/L)	Temperature (°C)	Clarity (color)	Comments (Date if different from start date)
09:50	71.4	49.70	7.47	0.463	9	10.93	21.6	clear	PUMP ADJUSTED TO 70' FLOW @ 0.68 gpm
10:05	81.6	51.00	7.40	0.447	5.8	10.52	22.2	CLEAR	PUMP ADJUSTED TO 67' FLOW @ 0.68 GPM
10:20	91.8	51.46	7.41	0.453	7.6	10.13	21.6	clear	PUMP ADJUSTED TO 63' FLOW @ 0.5 gpm
10:35	99.3	49.35	7.51	0.462	65	10.39	23.1	CLEAR	PUMP ADJUSTED TO 83' FLOW @ 0.5 gpm
10:50	~~109.5~~ 106.8	47.60	7.57	0.464	50	10.25	22.7	clear	PUMP ADJUSTED TO 83' FLOW @ 0.5 gpm
11:05	114.3	48.20	7.44	0.459	32	10.29	22.9	CLEAR	PUMP @ 83' FLOW @ 0.5 GPM
11:20	121.8	46.70	7.86	0.461	28	6.55	22.3	clear	PUMP @ 83' FLOW @ 0.5 gpm
11:35	129.3	47.10	7.42	0.458	4.9	10.17	22.3	CLEAR	PUMP @ 83' FLOW @ 0.5 GPM
11:50	~~139.5~~ 136.8	46.80	7.42	0.459	6.7	6.42	21.7	clear	PUMP @ 83' FLOW @ 0.5 gpm
12:05	144.3	46.20	7.39	0.458	8.3	6.03	22.9	CLEAR	PUMP @ 83' FLOW @ 0.5 GPM
12:20	151.8	46.60	7.56	0.458	7.9	6.16	21.7	clear	PUMP @ 83' FLOW @ 0.5 gpm
12:35	159.3	46.10	7.39	0.461	5.7	5.71	22.3	CLEAR	PUMP @ 83' FLOW @ 0.5 GPM

Parcel No.: RF 202
Well ID: MW 06
Date: 7-17-02

Lee FLIPPEN

Time 24hr	Purge Volume (gal)	Water Level (ft) (TOC)	pH (std units)	Conductivity (mS/cm)	Turbidity (NTU)	Dissolved oxygen (mg/L)	Temperature (°C)	Clarity (color)	Comments (Date if different from start date)
12:50	166.8	46.25	7.42	0.464	6.8	6.50	22.1	clear	pump @ 83' FLOW @ 0.5 gpm
13:05	174.3	45.90	7.38	0.464	4.2	6.26	24.1	CLOUR	PUMP @ 83' FLOW @ 0.5 GPM
13:20	181.8	45.95	7.43	0464	5.1	6.43	23.0	clear	PUMP @ 83' FLOW @ 0.5 gpm
13:35	189.3	45.85	7.39	0.464	2.8	6.32	24.2	CLOUR	PUMP @ 83' FLOW @ 0.5 GPM
13:50	199.5	47.77	7.44	0.462	3.5	6.31	22.5	clear	PUMP @ 83' FLOW @ 0.68 GPM
14:05	209.7	49.10	7.39	0.463	0.1	6.14	22.9	CLOUR	PUMP @ 83' FLOW @ 0.68 GPM
14:20	219.9	49.55	7.49	0.462	1.1	6.46	23.0	clear	PUMP @ 83' FLOW @ 0.68 gpm
14:35	230.1	49.60	7.40	0.464	1.3	6.33	23.3	CLOUR	PUMP @ 83' FLOW @ 0.68 GPM
14:50	240.3	49.60	7.49	0.463	1.0	6.90	22.8	clear	PUMP @ 83' FLOW @ 1.0 gpm
15:05	255.3	50.30	7.34	0.459	1.1	5.76	22.3	CLOUR	PUMP @ 83' FLOW @ 1.0 GPM
15:20	270.3	56.40	7.47	0.458	1.3	6.25	22.8	clear	PUMP @ 83' FLOW @ 1.0 gpm
7-17-02 09:15	270.3	27.77	6.61	.499	999+	5.52	21.00	GRAY	7-17-02 Depth 83', PR 0.6 gpm

Parcel No.: RF 202
Well ID: MW06
Date: 7-17-02

Screen 61.5'-81.5' 7-17-02 PID 0.0, DTW 27.77' Lee FLIPPEN

Time 24hr	Purge Volume (gal)	Water Level (ft) (TOC)	pH (std units)	Conductivity (mS/cm)	Turbidity (NTU)	Dissolved oxygen (mg/L)	Temperature (°C)	Clarity (color)	Comments (Date if different from start date)
09:30	279.3	37.20	7.28	.441	100	7.14	21.90	cloudy	Depth 83', Purge Rate 1.2 gpm
09:45	297.3	41.73	7.31	.442	265	7.05	20.72	cloudy	Depth 65', P.R 1.0 gpm
10:00	312.3	47.03	7.39	.442	29	7.62	20.94	clear	Depth 83', PR 1.0 gpm
8hrs 10:15	327.3	48.44	7.41	.442	122	6.78	21.18	cloudy	Depth 83', PR 1.0 gpm
10:30	342.3	52.78	7.47	.452	19	6.87	21.07	clear	Depth 83', PR 1.0 gpm
10:45	357.3	58.64	7.46	.448	15	7.45	21.13	clear	Depth 83', PR 1.0 gpm
9hrs 11:00	372.3	60.98	7.47	.450	12	7.09	21.26	clear	Depth 83', PR .8 gpm
11:15	384.3	54.18	7.43	.445	15	6.68	21.19	clear	Depth 83', PR .8 gpm
11:30	396.3	54.20	7.41	.451	10	6.87	21.24	clear	Depth 83', PR .8 gpm
11:45	408.3	54.27	7.47	.446	11.5	6.89	21.28	clear	Depth 83', PR .8 gpm
12:00	420.3	54.42	7.47	.455	7.3	7.43	22.15	clear	Depth 83', PR .8 gpm
12:15	432.3	54.36	7.46	.451	2.8	7.38	21.43	clear	Depth 83', PR .8 gpm
12:30	444.3	54.33	7.47	.454	3.4	7.22	21.61	clear	Depth 83', PR .8 gpm
12:45	456.3	54.37	7.45	.454	2.3	7.11	21.62	clear	-well Development completed- -Reached Target Purge Volume- -collected L.C. H2O Photo Sample- Lee Flippen 7-17-02

Groundwater Well Development Log

Fort McClellan, Alabama

Project Number: 796987
Form Completed by: ADAM DAY
Well Developed by (person/firm): ADAM DAY, SHAW E&E

Parcel No.: 202
Well No.: RF-MW07
Date started: 7/14/02

Monitoring Well Information

Development Method: SURGE & PURGE
Development Equipment: GRUNDFOS PUMP # 84391
Controller # 13944, H-10 # 004014
Casing Diameter: 4"

Beginning Measurments
Depth to Water (ft): 33.83 'BGS
Total depth of Well (ft): 84.08' BGS

Time 24hr	Purge Volume (gal)	Water Level (ft) (TOC)	pH (std units)	Conductivity (mS/cm)	Turbidity (NTU)	Dissolved oxygen (mg/L)	Temperature (°C)	Clarity (color)	Comments (Date if different from start date) (Purge Rate, Pump Position, Misc.)
11:00	2 gallons	33.83	6.76	.378	214	1.42	~~+.3~~ 21.7	brownish	2 gpm, 74' BGS
11:15	0.30	59.23	7.89	.399	33	3.37	21.6	brownish	0.75 gpm, 74' BGS
11:30	41.25	64.45	6.77	.404	26	1.23	22.2	brownish	0.5 gpm, 74' BGS
11:45	48.75	68.55	6.46	.370	21	1.30	22.7	brownish	0.25 gpm, 74' BGS
12:00	52.5	70.00	7.30	.384	667	1.32	24.5	brown	0.25 gpm, 82' BGS
12:15	56.25	71.33	7.26	.382	524	0.55	25.3	brown	0.25 gpm, 82' BGS
12:30	60.00	72.50	7.08	.374	211	1.14	26.3	brownish	0.25 gpm, 82' BGS

TD - DTW = WC x 2'/4' well = One PV x 5 = Min PV + H20 to install well = Minimum H20 to remove
84.08 - 33.83 = 50.25 x 0.653 = 32.81325 x 5 = 164.06625 + 850 gal = 1014.066 gal

PID @ WH/BZ = 0.0 ppm

acc'd [signature] 7/18/02

Parcel No.: 202
Well ID: RF-MW07
Date: 7/15/02

Time 24hr	Purge Volume (gal)	Water Level (ft) (TOC)	pH (std units)	Conductivity (mS/cm)	Turbidity (NTU)	Dissolved oxygen (mg/L)	Temperature (°C)	Clarity (color)	Comments
12 :45	63.75	76.55	6.96	.379	534	0.72	22.4	BROWN	0.25 gpm, 82' BGS
13 :00	67.5	82.11	DRY						WAITING 20 MIN.
13 :20	67.5	79.86	STOPPED PURGING, WAITING 24 HOURS.						
13 :42	~~67.5~~ 76.75	76.75	7.15	.297	593	7.21	21.84	BROWN	0.125 gpm, 82' BGS
7 :00	69.75	78.39	7.13	.297	583	7.38	21.83	BROWN	0.125 gpm, 82' BGS
7 :15	71.625	78.98	7.22	.293	422	6.82	22.39	BROWNISH	0.125 gpm, 82' BGS
7 :30	73.5	79.35	7.24	.295	462	6.59	23.69	BROWN	0.125 gpm, 82' BGS
7 :45	75.375	80.00	7.26	.304	477	5.94	26.80	BROWN	0.0666 gpm, 82' BGS
8 :00	75.44	80.12	7.29	.312	549	5.86	26.42	BROWN	0.0666 gpm, 82' BGS
8 :15	76.43	80.51	7.32	.318	821	4.49	26.55	BROWN	0.0666 gpm, 82' BGS.
8 :30	77.42	DRY							
9 :00	~79.00	78.92	7.35	.351	>999	11.83	22.42	BROWN	BAILED DRY
:	COMPLETED	7/17/02	0900	PHOTO	SAMPLE	TAKEN	- FINAL	TURBIDITY	>999NTU

APPENDIX D

SURVEY DATA

Appendix D

Survey Data
Burial Mound at Rideout Field, Parcel 202Q-RD
Fort McClellan, Calhoun County, Alabama

Sample Location	Northing	Easting	Ground Elevation (ft amsl)	Top of Casing Elevation (ft amsl)
RF-MW01	1175307.40	607793.63	553.15	555.41
RF-MW02	1175169.35	607761.15	550.50	552.63
RF-MW03	1175190.89	607815.86	552.01	554.24
RF-MW04	1174360.65	607894.02	518.70	520.96
RF-MW05	1175304.31	607769.39	552.75	554.85
RF-MW06	1175161.46	607745.86	550.01	552.16
RF-MW07	1175173.97	607824.70	549.79	551.92

Horizontal coordinates referenced to the U.S. State Plane Coordinate System, Alabama East Zone, North American Datum of 1983 (NAD83).

Elevations referenced to the North American Vertical Datum of 1988 (NAVD88).

ft amsl - Feet above mean sea level
NA - Not applicable.

APPENDIX E

SUMMARY OF ANALYTICAL DATA

Summary of Groundwater Analytical Data
Burial Mound at Rideout Field, Parcel 202Q-RD
Fort McClellan, Alabama

Report Date: 10/25/02

	Location Code:	RF-MW04			RF-MW04			RF-MW05			RF-MW06		
	Associated Site:	PARCEL 202Q			PARCEL 202Q			PARCEL 202Q			PARCEL 202Q		
	Sample No:	HV3004			HV3005			HV3006			HV3007		
	Sample Date:	30-JUL-02			30-JUL-02			30-JUL-02			02-AUG-02		
User Test Group / Lab Method / Parameter	Flt / Units	Result	Qual	VQual	Result	Qual	VQual	Result	Qual	VQual	Result	Qual	VQual
GAMMA SCAN													
713R6													
Actinium-228	pCi/L	-2	U	nv	-5	U	nv	0	U	nv	-6	U	nv
Aluminum-26	pCi/L	1.8	U	nv	2.2	U	nv	-1.9	U	nv	-0.2	U	nv
Americium-241	pCi/L	-6	U	nv	-5	U	nv	0.5	U	nv	1.6	U	nv
Antimony-124	pCi/L	0.4	U	nv	4.8	U	nv	0.7	U	nv	-1.1	U	nv
Antimony-125	pCi/L	-2.6	U	nv	-1.6	U	nv	5	U	nv	-7.1	U	nv
Beryllium-7	pCi/L	-18	U	nv	25	U	nv	7	U	nv	1	U	nv
Bismuth-212	pCi/L	-12	U	nv	42	U	nv	59	U	nv	40	U	nv
Bismuth-214	pCi/L	7.1	U	nv	7	U	nv	10	U	nv	21		nv
Cadmium-109	pCi/L	7	U	nv	-37	U	nv	3	U	nv	-20	U	nv
Cerium-139	pCi/L	0.3	U	nv	-2.5	U	nv	-0.2	U	nv	-0.6	U	nv
Cerium-144	pCi/L	4	U	nv	4	U	nv	-7	U	nv	10	U	nv
Cesium-134	pCi/L	-1.6	U	nv	-3.7	U	nv	-0.6	U	nv	1.1	U	nv
Cesium-137	pCi/L	-3.5	U	nv	-0.7	U	nv	-1	U	nv	-3.2	U	nv
Chromium-51	pCi/L	-11	U	nv	17	U	nv	1	U	nv	2	U	nv
Cobalt-56	pCi/L	-0.7	U	nv	5.6	U	nv	5.2	U	nv	7.7	U	nv
Cobalt-57	pCi/L	-1.4	U	nv	0	U	nv	-0.2	U	nv	1	U	nv
Cobalt-58	pCi/L	-0.6	U	nv	1.5	U	nv	-2.9	U	nv	2.8	U	nv
Cobalt-60	pCi/L	-1.4	U	nv	-1.1	U	nv	-0.5	U	nv	-1.5	U	nv
Europium-152	pCi/L	2	U	nv	0	U	nv	23	U	nv	7	U	nv
Europium-154	pCi/L	-9	U	nv	16	U	nv	-11	U	nv	-7	U	nv
Europium-155	pCi/L	-7.6	U	nv	3.8	U	nv	0.9	U	nv	3.7	U	nv
Iodine-131	pCi/L	4	U	nv	-4.6	U	nv	1.7	U	nv	-1.3	U	nv
Iron-59	pCi/L	5.6	U	nv	0.7	U	nv	6.6	U	nv	4.6	U	nv
Lead-212	pCi/L	0.7	U	nv	2.4	U	nv	5.3	U	nv	2.6	U	nv
Lead-214	pCi/L	4.1	U	nv	7.5	U	nv	5	U	nv	21.6		nv
Manganese-54	pCi/L	-0.6	U	nv	0.9	U	nv	0.9	U	nv	0.1	U	nv
Niobium-94	pCi/L	-2.3	U	nv	0	U	nv	-0.4	U	nv	-0.5	U	nv
Niobium-95	pCi/L	0.7	U	nv	-4	U	nv	2.3	U	nv	0.3	U	nv
Potassium-40	pCi/L	-37	U	nv	-5	U	nv	-55	U	nv	3	U	nv
Protactinium-234m	pCi/L	80	U	nv	-200	U	nv	340	U	nv	530	U	nv
Ruthenium-106	pCi/L	-20	U	nv	11	U	nv	-10	U	nv	-2	U	nv

Summary of Groundwater Analytical Data
Burial Mound at Rideout Field, Parcel 202Q-RD
Fort McClellan, Alabama

Report Date: 10/25/02

Location Code:	RF-MW07	
Associated Site:	PARCEL 202Q	
Sample No:	HV3008	
Sample Date:	02-AUG-02	

User Test Group / Lab Method / Parameter	*Flt*	*Units*	*Result*	*Qual*	*VQual*
GAMMA SCAN					
713R6					
Actinium-228		pCi/L	6	U	nv
Aluminum-26		pCi/L	0.1	U	nv
Americium-241		pCi/L	15	U	nv
Antimony-124		pCi/L	-0.7	U	nv
Antimony-125		pCi/L	5.6	U	nv
Beryllium-7		pCi/L	-16	U	nv
Bismuth-212		pCi/L	25	U	nv
Bismuth-214		pCi/L	-3	U	nv
Cadmium-109		pCi/L	-41	U	nv
Cerium-139		pCi/L	-0.8	U	nv
Cerium-144		pCi/L	3	U	nv
Cesium-134		pCi/L	-5.1	U	nv
Cesium-137		pCi/L	-2.9	U	nv
Chromium-51		pCi/L	-16	U	nv
Cobalt-56		pCi/L	6.7	U	nv
Cobalt-57		pCi/L	-0.6	U	nv
Cobalt-58		pCi/L	-4.2	U	nv
Cobalt-60		pCi/L	-2.8	U	nv
Europium-152		pCi/L	-13	U	nv
Europium-154		pCi/L	0	U	nv
Europium-155		pCi/L	-1.7	U	nv
Iodine-131		pCi/L	3.3	U	nv
Iron-59		pCi/L	3.9	U	nv
Lead-212		pCi/L	1.7	U	nv
Lead-214		pCi/L	-10	U	nv
Manganese-54		pCi/L	-1.5	U	nv
Niobium-94		pCi/L	2.4	U	nv
Niobium-95		pCi/L	0.9	U	nv
Potassium-40		pCi/L	4	U	nv
Protactinium-234m		pCi/L	100	U	nv
Ruthenium-106		pCi/L	-18	U	nv

Summary of Groundwater Analytical Data
Burial Mound at Rideout Field, Parcel 202Q-RD
Fort McClellan, Alabama

Report Date: 10/25/02

	Location Code:	RF-MW04			RF-MW04			RF-MW05			RF-MW06		
	Associated Site:	PARCEL 202Q			PARCEL 202Q			PARCEL 202Q			PARCEL 202Q		
	Sample No:	HV3004			HV3005			HV3006			HV3007		
	Sample Date:	30-JUL-02			30-JUL-02			30-JUL-02			02-AUG-02		
User Test Group / Lab Method / Parameter	Flt / Units	Result	Qual	VQual	Result	Qual	VQual	Result	Qual	VQual	Result	Qual	VQual
GAMMA SCAN													
713R6													
Scandium-46	pCi/L	-1.5	U	nv	-0.5	U	nv	0.6	U	nv	2.1	U	nv
Silver-110m	pCi/L	0.5	U	nv	0.1	U	nv	0.3	U	nv	0.5	U	nv
Sodium-22	pCi/L	3.5	U	nv	0	U	nv	-0.3	U	nv	1.7	U	nv
Thallium-208	pCi/L	3.1	U	nv	1.9	U	nv	0.1	U	nv	0.2	U	nv
Thorium-227	pCi/L	22	U	nv	9	U	nv	13	U	nv	-12	U	nv
Thorium-234	pCi/L	5	U	nv	3	U	nv	-31	U	nv	-11	U	nv
Uranium-235	pCi/L	-4	U	nv	12	U	nv	-2	U	nv	-21	U	nv
Zinc-65	pCi/L	3.7	U	nv	-4.2	U	nv	3.3	U	nv	-2.6	U	nv
STRONTIUM-90													
724R7													
Strontium-90	pCi/L	-0.05	U	nv	0	U	nv	0.08	U	nv	-0.03	U	nv

Summary of Groundwater Analytical Data
Burial Mound at Rideout Field, Parcel 202Q-RD
Fort McClellan, Alabama

Report Date: 10/25/02

		Location Code:	RF-MW07		
		Associated Site:	PARCEL 202Q		
		Sample No:	HV3008		
		Sample Date:	02-AUG-02		
User Test Group / *Lab Method*	*Parameter*	*Flt* / *Units*	*Result*	*Qual*	*VQual*
GAMMA SCAN					
713R6					
	Scandium-46	pCi/L	-1.7	U	nv
	Silver-110m	pCi/L	0.1	U	nv
	Sodium-22	pCi/L	2.8	U	nv
	Thallium-208	pCi/L	1.8	U	nv
	Thorium-227	pCi/L	-4	U	nv
	Thorium-234	pCi/L	42	U	nv
	Uranium-235	pCi/L	18	U	nv
	Zinc-65	pCi/L	-1.5	U	nv
STRONTIUM-90					
724R7					
	Strontium-90	pCi/L	-0.17	U	nv