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QUALITY CONTROL SUMMARY REPORT/ ANALYTICAL RESULT REPORT CONFIRMATORY STUDIES FORT STORY VA

3/1/1995

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Quality Control Summary Report/ Analytical Results Report

Confirmatory Studies
Fort Story, Virginia

March 1995

U.S. Army Corps
Of Engineers
Omaha District

MONTGOMERY
WATSON

ARCHITECT ENGINEER
QUALITY CONTROL SUMMARY REPORT/ANALYTICAL RESULTS REPORT
CONFIRMATORY STUDIES
FORT STORY, VIRGINIA

Contract No. DACW45-92-D-0007
Delivery Order 0030

Prepared for:

U.S. Army Corps of Engineers
Missouri River Division
Omaha District
Omaha, Nebraska

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LIST OF ACRONYMS AND ABBREVIATIONS

A-E	Architect-Engineer
ARR	Analytical Results Report
ASTM	American Society for Testing Materials
BNA	Base-neutral and acid extractable compound
CDAP	Chemical Data Acquisition Plan
CFR	Code of Federal Regulations
COC	Chain Of Custody Record
CS	Confirmatory Studies
DO	Delivery Order
DOT	U.S. Department of Transportation
DQCR	Daily Quality Control Report
DQO	Data quality objective
EPA	U.S. Environmental Protection Agency
ENRD	Environmental and Natural Resources Division
ESE	Environmental Science and Engineering, Inc.
eV	electron volt
FIT	Field investigation team
FTL	Field team leader
HDPE	High Density Polythelyene
IDW	Investigation-derived waste
J	Associated value is an estimated quantity; yet qualitatively acceptable
JMM	James M. Montgomery Consulting Engineers, Inc.
LCS	Laboratory control samples
MRD	Missouri River Division
MRL	Method reporting level
MS	Matrix spike
MSA	MSA Tri-Gas Indicator
MSD	Matrix spike duplicate
OSHA	U.S. Occupational Safety and Health Administration
OSO	Onsite Safety Officer
PA/SI	Preliminary Assessment/Site Investigation
PARCC	Precision, accuracy, representativeness, completeness and comparability
PCB	Polychlorinated biphenyl
Pest/PCB	Pesticide/polychlorinated biphenyl
PID	Photo ionization detector
PPE	Personal protective equipment
ppm	parts per million
QA	Quality Assurance
QA/QC	Quality Assurance/Quality Control
QC	Quality Control
QCSR	Quality Control Summary Report
RI	Remedial Investigation
RPD	Relative percent difference
SSHP	Site Safety and Health Plan
TAL	Target analyte list
TDS	Total dissolved solids
TFH-H	Total fuel hydrocarbon - heavy fraction

LIST OF ACRONYMS AND ABBREVIATIONS (cont.)

TFH-L	Total fuel hydrocarbon - light fraction
TM	Technical Manager
UJ	Associated non-detection is an estimated quantity; yet qualitatively acceptable
USACE	United States Army Corps of Engineers
VOC	Volatile organic compound
WQP	Water quality parameters

1.0 INTRODUCTION

Montgomery Watson is the prime Architect-Engineer (A-E) contracted by the U.S. Army Corps of Engineers (USACE) to conduct Confirmatory Studies (CS) at Site 2 - Landfill 2 at Fort Story, Virginia. The CS was performed for USACE under Delivery Order (DO) No. 0030 and Modification No. 1 to DO No. 0030, of Contract No. DACW45-92-D-0007. USACE contracted the work at Fort Story for the Fort Eustis Environmental and Natural Resources Division.

1.1 REPORT OBJECTIVES AND ORGANIZATION

This *Quality Control Summary Report/Analytical Results Report (QCSR/ARR)* evaluates the quality of both the Fort Story CS field investigation program and the analytical data generated during this project. The objectives of the sections comprising the QCSR (Sections 1 through 4) are to evaluate the effectiveness of the CS field investigation program and to assess whether the field procedures employed and the data gathered from this investigation is of sufficient quality to evaluate conditions at each of the project sites. This section of the report specifically addresses field-related quality control (QC) issues.

The evaluation of field QC issues helps to assess whether the procedures proposed in the *Final Chemical Data Acquisition Plan Confirmatory Studies, Fort Story, Virginia (CDAP)* (Montgomery Watson, 1995) were executed properly. To make this evaluation, nonconformances, field changes and potential problems with the associated data are documented. A determination of whether the project field data quality objectives (DQOs) specified in the *CDAP* were met also is presented. To document the Fort Story CS field investigation program, the *QCSR* sections of this document include the following:

- A concise summary of field activities
- A summary of Montgomery Watson's technical professionals who performed the field investigative tasks
- A synopsis of health and safety activities employed during the field activities
- A summary of the QC practices used to meet the DQOs for each field program
- An identification of nonconformances and corresponding corrective actions for each field program

This *QCSR/ARR* is organized into seven sections that contain the following information:

Section Number	Purpose
1	Introduces the report and outlines report objectives.
2	Summarizes Daily Quality Control Reports, provides a description of work activities and addresses Health and Safety issues.
3	Documents field investigation and QA/QC program.

4	Presents conclusions and recommendations regarding acceptability of field data.
5	Summarizes and presents results from chemical analyses of Fort Story samples.
6	Presents analytical quality control data for Fort Story chemical analyses.
7	Evaluates the acceptability of the analytical data to make project-related decisions.

1.2 SITE DESCRIPTION AND INVESTIGATIVE HISTORY

Fort Story is located within the Hampton Roads region of southeastern Virginia. Figure 1-1 presents a vicinity map of Fort Story in relation to the Hampton Roads region. Figure 1-2 presents a map of Fort Story.

Site 2 - Landfill 2 is located within the wetland area along the southern margin of Fort Story, and is immediately adjacent to the southern flank of a central sand ridge area near the junction of Coast Artillery Road and U.S. Route 60. Figure 1-3 presents a site map of Site 2 - Landfill 2. The landfill was in operation from 1956 to 1962 (ESE, 1988). During the 1960s, a group of wooden buildings were reported possibly to have been demolished and buried at this site, but no documentation is available to confirm this action (Fort Story Personnel, 1990). There was no evidence of surface debris or buried debris from field observations during the Preliminary Assessment/Site Investigation (PA/SI) conducted in 1990. Geographical and electromagnetic surveys were performed to determine the extent of the landfill. Five monitoring wells were installed and groundwater samples were collected and submitted for chemical analysis to assess whether the landfill may have released contaminants to the environment. Additionally, 10 soil samples were collected from the monitoring well borings and submitted for chemical analysis. The soil samples were collected at the surface and at the water table in each of the five monitoring well borings.

During the PA/SI, cadmium was detected in groundwater collected from MW109 at a concentration of 87 µg/L. Although MW109 is cross-gradient to the landfill, it is downgradient of a marshy area that contaminants from the landfill may have affected. Additionally, elevated concentrations of copper were detected in the soil samples collected from the boring for monitoring well MW107, located downgradient of the landfill.

1.3 CONFIRMATORY STUDIES PROJECT OBJECTIVES

The Fort Story CS site, Site 2 - Landfill 2, was recommended for further study in the *Final Preliminary Assessment/Site Investigation Report for Fort Story (PA/SI Report)* (JMM, 1992).

The goals of the Fort Story CS, as stated in the Scope of Services for DO 0030 dated December 1, 1992, were to complete confirmatory sampling at Site 2 - Landfill 2 and to assess whether further investigations would be required. Modification No. 1 to the Scope of Services for DO 0030, dated June 30, 1994, was executed to change the scope of the Site 2 - Landfill 2 investigation. Remedial Investigation (RI) field work activities for Fort Story originally were to be executed concurrently with this project (DO 0030) but were never funded. Also, certain DO 0030 activities were to be executed as part of the RI in order to save costs. Because RI work at Fort Story was never funded, Modification No. 1 was necessary to account for the items that had to be added to DO 0030 so that it could be fully and independently executed.

To meet the objectives outlined in the Scope of Services for DO 0030 and Modification No. 1 to DO 0030, Montgomery Watson collected surface water, sediment and groundwater samples. All groundwater samples were collected from previously constructed monitoring wells. Section 4.0 of this documents presents a summary of the CS field investigation program.

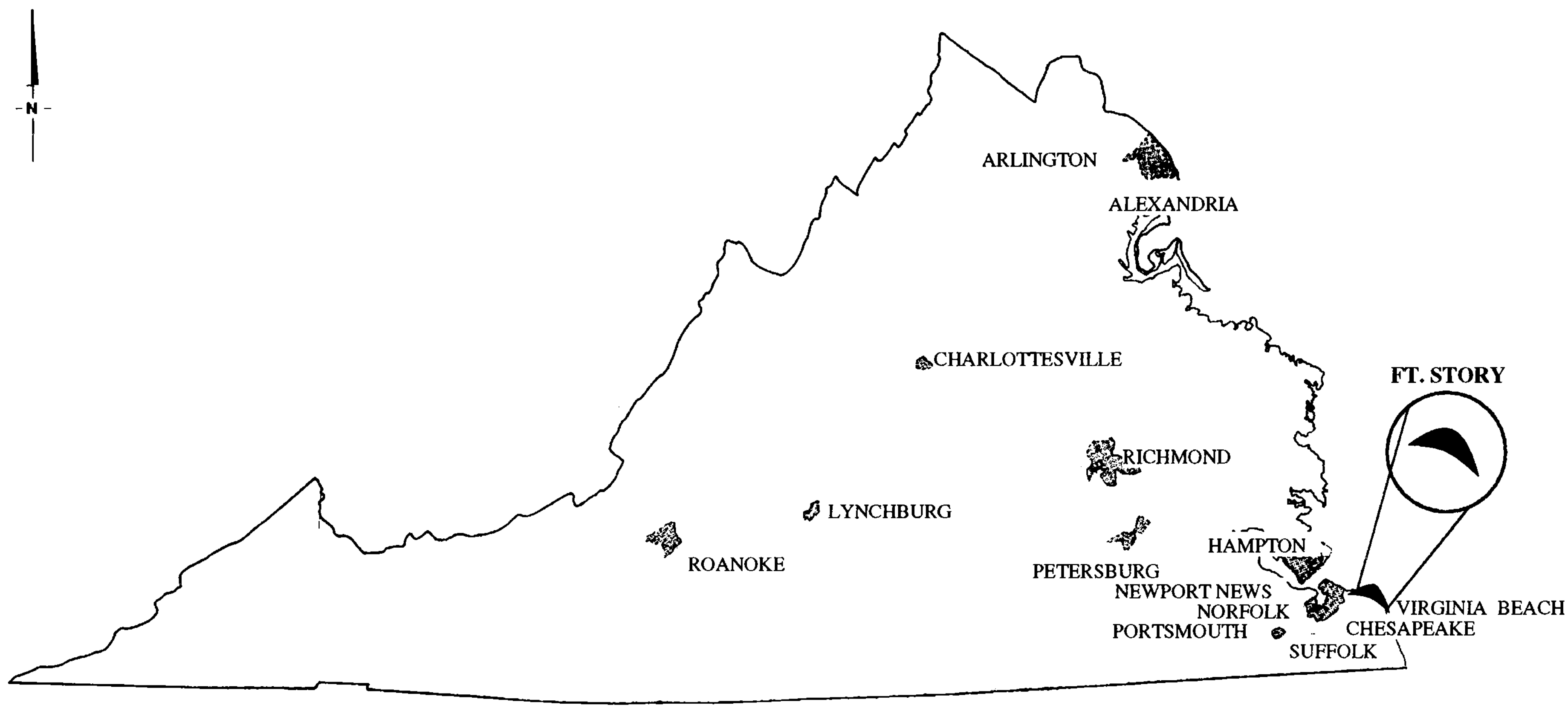
1.4 PROJECT TASKS COMPLETED

Montgomery Watson performed the following tasks prior to initiating the CS field investigation programs:

- The *CDAP* was prepared prior to the CS field investigation program. The *CDAP* defined site conditions and previous site investigations; planned field operations, sampling and analytical procedures; data quality objectives; calibration and preventive maintenance programs; data reduction, validation and reporting procedures; nonconformances and corrective action reporting requirements; performance audit procedures; and project organization, quality control responsibilities and work schedules.

- The *Final Site Safety and Health Plan Addendum, Fort Story, Virginia (SSHP)* (Montgomery Watson, 1995), was prepared as a companion document to the *CDAP* to provide the field team with guidelines for ensuring a safe working environment during field activities. The purpose of the SSHP was to stipulate procedures for preventing and minimizing personal injuries and illnesses and for minimizing physical damage to equipment, supplies and property. The document emphasizes management responsibilities, preplanning all activities, medical surveillance, training, periodic work site evaluations and audits, accident investigations, record keeping, designation of personal protective equipment (PPE), hazard assessment criteria, and site controls including exclusion zones, decontamination procedures, and general site safety requirements.

The CS field investigation program consisted of collecting five groundwater samples, five sediment samples and two surface water samples.



Vicinity Map
Confirmatory Studies
Fort Story, Virginia

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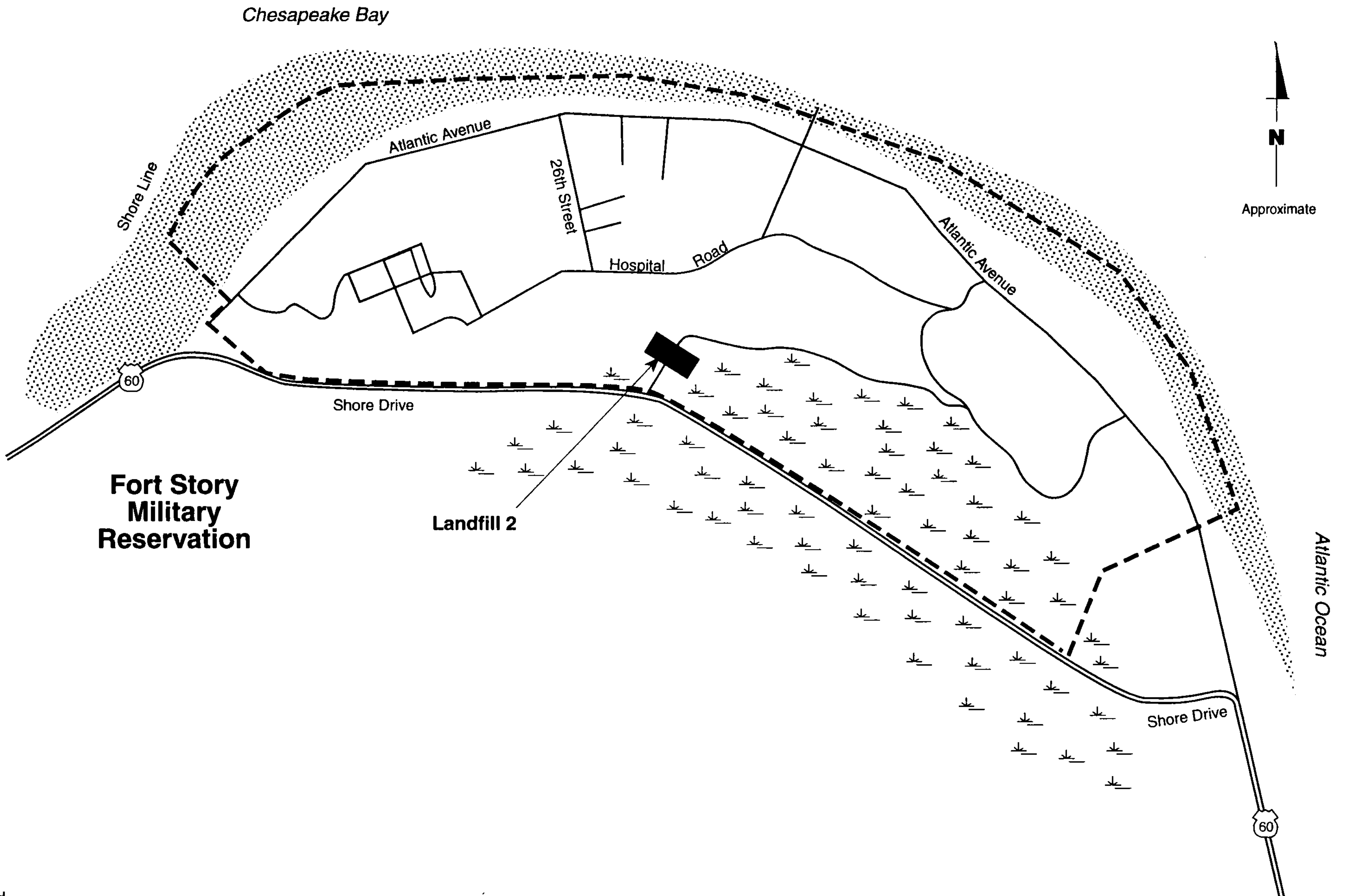
Figure 1-1



Legend

- Swamp land
- Shore line
- Fort Story Military Reservation Boundary

Approximate Scale in Feet

0 1000 2000 3000

Installation Map
Confirmatory Studies
Fort Story, Virginia

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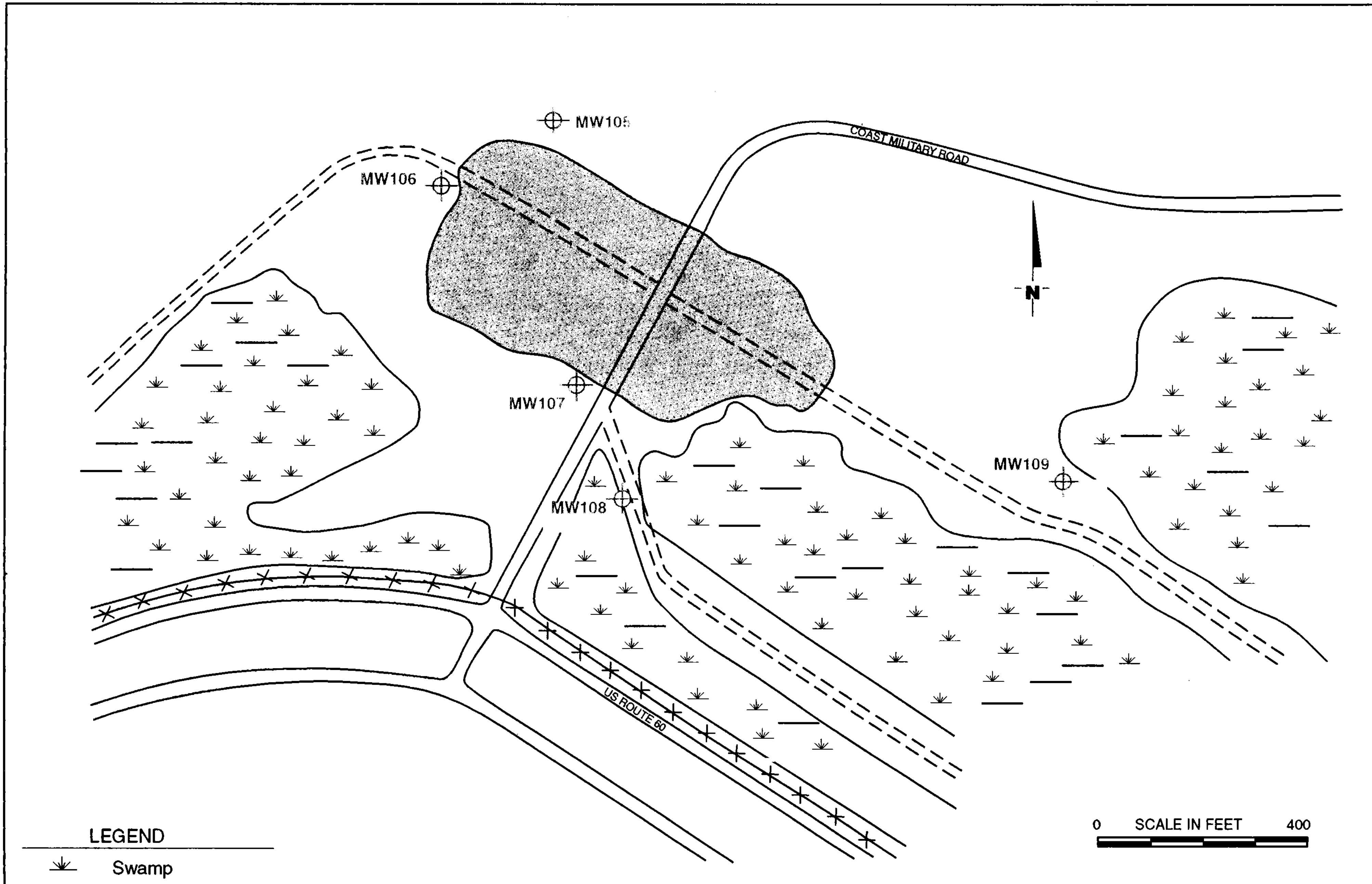
Figure 1-2



Location Map
Site 2 - Landfill 2
Confirmatory Studies
Fort Story, Virginia

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Figure 1-3

2.0 SUMMARY OF ARCHITECT-ENGINEER DAILY QUALITY CONTROL REPORTS

The field work for the Fort Story CS project was conducted from January 27, 1995, to January 29, 1995.

Daily Quality Control Reports (DQCRs) were prepared during each active day of the Fort Story CS field investigation program. These contractually required reports summarize daily activities such as work completed, personnel on site, weather conditions, sampling equipment used, health and safety issues, field parameters measured, field problems encountered and subsequent corrective actions, and scheduled activities for the following day. The *DQCRs* were submitted to the Environmental and Natural Resources Division (ENRD) at Fort Eustis. They also were compiled and submitted to the USACE Technical Manager (TM), Mr. John Palensky. Appendix B presents the *DQCRs* from the CS field effort. The following sections summarize some of the significant information contained in the *DQCRs* and expands on some of the issues discussed in the *DQCRs*.

Section 3 discusses the CS field investigation program in more detail. The field QC program and field procedures are explained and the deviations from the *CDAP* are documented.

2.1 PERSONNEL AND SUBCONTRACTORS

The field investigation task involved Montgomery Watson technical professionals. Subsequent analytical laboratory services were performed by contract laboratories. Sections 2.1.1 and 2.1.2 discuss personnel and subcontractors used during the CS field investigation program; Section 2.1.3 discusses the USACE quality assurance (QA) laboratory.

2.1.1 Montgomery Watson Field Personnel

Montgomery Watson personnel assigned to direct and perform tasks involved in this field effort included civil and environmental engineers and environmental scientists. The field team leader (FTL) directed field activities performed by the field investigation team (FIT). The FTL was responsible for ensuring that the field effort was executed in conformance with procedures described in the *CDAP* and for managing work schedules and control of field costs. Additional duties of the FTL included ensuring *DQCRs* were prepared properly, interfacing with environmental representatives at the Fort Eustis Environmental and Natural Resources Division (ENRD) and USACE, and managing investigation-derived wastes.

2.1.2 Laboratory Subcontractors

Chemical analyses of soil, sediment, groundwater and surface water samples were conducted by Savannah Laboratories & Environmental Services, Inc. of Tallahassee, Florida. Savannah Laboratories also analyzed all field samples and trip blanks collected for QC purposes.

2.1.3 Quality Assurance Laboratory

The USACE's Missouri River Division (MRD) Laboratory analyzed project quality assurance (QA) split samples. QA samples were collected at the same time and location as QC duplicate samples, but the QA samples were shipped to MRD rather than Savannah Laboratories. The MRD Laboratory will send the results of their analyses directly to the USACE TM for review and evaluation of interlaboratory precision.

2.2 HEALTH AND SAFETY ACTIVITIES

This section summarizes the health and safety procedures used to protect project personnel during the CS field investigation program. OSHA requires employers involved in hazardous waste activities to comply with Title 29 (OSHA) of the Code of Federal Regulations, Part 1910, Section 120, *Hazardous Waste Operations and Emergency Response* (29 CFR 1910.120). The *Site Safety and Health Plan (SSHP)* (Montgomery Watson, 1995) was prepared prior to the start of all field work to stipulate measures for compliance with federal, state, and local safety and health requirements.

2.2.1 Site Safety and Health Plan

As discussed in Section 1.4, the *SSHP,* which was approved by USACE - Omaha District, was designed to present and document measures for providing health and safety protection during the execution of field activities. The *SSHP* also detailed several emergency response plans to comply with the requirements outlined in COE 385-USACE-1-1, *Safety and Health Requirements Manual* (USACE, 1989). All plans and response actions met or exceeded state and federal OSHA requirements. All personnel involved in the field activities were required to read and understand the *SSHP* and to sign an acknowledgement of their understanding.

2.2.2 Safety Meetings

Montgomery Watson's Onsite Safety Officer (OSO) conducted a preliminary site health and safety kickoff meeting prior to commencement of the field investigation program. In addition to the project kickoff safety meetings, the OSO conducted daily health and safety briefings (Tailgate Safety Meetings) with the FIT to discuss pertinent site-specific safety topics, potential hazards or changes in site conditions that might affect hazard potential. Each Tailgate Safety Meeting was documented by the OSO before field work commenced.

2.2.3 Risk Prevention Plan

A risk prevention plan was included in the *SSHP* that provided guidelines for emergency responses and accident claims. Site-specific hazard assessments were detailed in the *SSHP* that outlined appropriate levels of personal protective equipment (PPE) or each field task. A copy of the *SSHP* was kept in each field vehicle or with the FTL when a vehicle was not available. The phone number and directions to the closest hospital were discussed during each Tailgate Safety Meeting and were included in the *SSHP*. No accidents occurred during the field investigation program.

2.2.4 Personal Protective Equipment

PPE used during the course of the field work were based primarily on real-time hazard assessment data and work task requirements, and included several types of air monitoring equipment. Prior to site entry, a photoionization detector (PID) and a tri-gas indicator were used continuously to monitor levels of volatile organic vapors and potentially combustible vapors in active work areas.

The PID was used continuously during groundwater, sediment and surface water sampling. Calibration and maintenance information for field monitoring and health and safety equipment is presented in Table 2-1.

2.2.4.1 Photoionization Detector. The PID was used during sampling to monitor the breathing space in the work zone for volatile organic compounds. The type of PID used was a Photovac Microtip equipped with a 10.2 electron volt (eV) probe. The PID was calibrated at least twice a day, using a calibration standard of 100 parts per million (ppm) isobutylene once prior to use and again at the end of the day. Operational checks were conducted on the instrument periodically throughout the day. These checks included PID response to an arbitrary organic vapor source, such as volatile fumes from a permanent marking pen, and measurement of background PID readings.

2.2.4.2 Tri-Gas Indicator. The MSA Portable/Alarm for Oxygen, Hydrogen Sulfide and Combustible Gas, Model 361 (MSA), was used continuously to monitor the breathing zone during all drilling activities. The instrument is designed to monitor for oxygen deficiency and for hydrogen sulfide and/or combustible gas. It was placed within 5 feet of the open monitoring well, and background readings were taken at periodic intervals. The MSA was calibrated periodically with methane.

2.2.4.3 Colorimetric Tubes. Dräger Colorimetric tubes, equipped with a bellows hand pump, were available to monitor levels of CS_2 if PID readings exceeded 4 ppm. These tubes would provide a gross indication of the presence or absence of CS_2. Because workspace PID readings never exceeded 4 ppm, the Dräger tubes were not used.

2.2.4.5 Personal Protective Clothing. All field activities for the Fort Story CS project were completed using modified Level D protection. Contingency for PPE upgrades were dictated by onsite monitoring equipment or by changes in site conditions, as evaluated by the OSO in conjunction with the FTL and in accordance with stipulations in the *SSHP*. Based on the on-site monitoring and site conditions, no upgrades were required.

2.2.5 Contamination Control Zones

Contamination control measures were established to minimize the transfer of potentially hazardous substances from the site during sampling. Upon completion of the Tailgate Safety Meeting, an exclusion zone and support zone were established. Exclusion zones were created at each site to restrict public access to sampling locations and to minimize transfer of potentially contaminated materials away from the sampling location. Each zone was regulated and maintained for the duration of activity at each location. In addition, disposable sampling equipment was used to prevent cross-contamination between locations.

2.2.6 Health and Safety Issues

Cold stress and frostbite were a major health and safety concern. During the field effort, the temperature was typically below freezing with winds up to 15 mph. Several precautions were taken, including extending workbreaks in heated areas; using proper clothing, working in warm or sheltered areas whenever possible; and keeping all field team members well-hydrated. As a result of these precautions, no serious incidents occurred.

Table 2-1

Health and Safety and Field Monitoring Equipment
Calibration and Maintenance
Site 2 - Landfill 2
Confirmatory Studies
Fort Story, Virginia
Page 1 of 1

Equipment	Model	Calibration Technique	Frequency of Calibration	Equipment Maintenance
Colorimetric Tubes	Dräger Multi Gas Detector	NAP	NAP	Check pump for leaks prior to use
Photoionization Detectors	Photovac Microtip	Calibrate against known concentration of isobutylene gas	Twice daily	Check/recharge battery as necessary Clean probe and lamp window for every 24 hours of operation Check to be sure UV lamp is operating
pH Meters	Cole Parmer 59002-00	Calibrate against 4.0, and 7.0 buffer solutions	Twice daily	Be sure electrode is surrounded by liquid Rinse and replace storage cap with every use Clean sensor bulb with liquid cleaner, such as Windex™, as necessary
SCT Meters	YSI-33	Calibrate against potassium chloride solution and perform "red line" calibration	Daily	Check/recharge battery as necessary Clean cell cup or electrode as necessary
Turbidity Meters	Hach 2100P	Calibrate against manufacturer's standards	Daily	Check/recharge battery as necessary Decontaminate testing tubes after each use
Tri-Gas Explosimeter	MSA 360	Use manufacturers check kit to calibrate	Daily	Check/recharge battery as necessary
Water Level Meters	Solonist 101	Check tape against measuring tape	Daily	Check/recharge battery as necessary Rinse probe and tape after each use

MSA = Mine Safety Appliances Company
NAP = Not Applicable

SCT = Salinity, Conductivity and Temperature
YSI = Yellow Springs Instruments

2.3 DECONTAMINATION PROCEDURES

All equipment used during monitoring well purging was decontaminated and cleaned to prevent cross-contamination between sampling locations. Groundwater and surface water sampling equipment was disposable and therefore did not require decontamination. Sediment sampling was performed using stainless-steel bowls, sampling spoons and hand augers. These items were decontaminated by washing with Alconox, followed by tap-water rinse, a 10 percent normal propanol (pesticide-grade) rinse, and a triple-deionized water rinse. The water-level sensor was decontaminated in the same fashion as sediment sampling equipment.

2.4 DOCUMENTATION AND FIELD MEASUREMENT

To keep permanent records of field activities, the following documents were maintained throughout the CS field investigation program: Field Logbooks, Groundwater Sampling Logs, Sample Registers, Chain of Custody Records (COCs), Cooler Receipt Forms and *DQCRs*. Section 2.0 presents a detailed description of *DQCRs*. All other documents are described in the following subsections.

2.4.1 Field Logbook

Daily field activities executed during the site investigation were documented in the Field Logbook. This is a hard-bound book that includes field instrument readings, date and time of sample collection, samples collected, and problems encountered with their resolution.

2.4.2 Groundwater Sampling Logs

Groundwater Sampling Logs were used to document the purging of all groundwater monitoring wells prior to sampling. The depth-to-water, total well depth and volume of groundwater to be purged prior to sampling were recorded on the log. Specific conductance, pH, temperature and turbidity readings were recorded approximately every 15 minutes. The time of sampling and relevant observations were also noted.

2.4.3 Sample Register

Samples were documented in the Sample Register, a hardbound notebook used to track all field samples. A Microsoft Excel spreadsheet also was created to aid in tracking field and QA/QC samples. The Sample Register contained the following information:

- Client name
- Project number
- Sample identification number
- Sample location
- Date and time of collection
- How the sample was collected (e.g., grab or composite)
- Number and size of bottles for each analysis

- Types of analyses requested
- Destination of sample

A sample label was affixed to all field samples. Each sample label was recorded in indelible ink and included the following information:

- Sample identification number
- Date and time of collection
- Project location
- Required analyses
- Presence and type of preservative
- Grab or composite sample designation
- Sampler's initials

2.4.4 Chain of Custody Record

Chain of Custodies (COCs) were used to track CS project samples. Each COC included the following information:

- Time and date of sample
- Sample number
- Designations as grab or composite sample
- Sampler's signature
- Required analysis
- Number and size of containers

A copy of the COC was retained by the sampler prior to shipment. Upon receipt of the samples by the laboratory, the samples were logged in and the COC was signed by the log-in clerk. The signed COC and a sample analysis acknowledgment form were returned to Montgomery Watson to verify receipt of the samples. Appendix C provides copies of all COC Forms.

2.4.5 Cooler Receipt Form

Cooler Receipt Forms were completed by Savannah Laboratories for all sample coolers received during the field investigation program. These forms, provided in Appendix D, documented the condition of the sample coolers and individual sample containers upon receipt by the laboratory. The forms also documented that custody seals were intact upon receipt and that all appropriate paperwork was present.

3.0 FIELD INVESTIGATION PROGRAMS

This section documents the conduct of the Fort Story CS field investigation program. Field investigation procedures, sampling locations, analytical requirements, numbers of samples to be collected and field documentation requirements are presented in the *CDAP*. The major purpose of this section is to assess the conformance of the CS field investigation program relative to those requirements proposed in the *CDAP*.

3.1 CONFIRMATORY STUDIES FIELD INVESTIGATION PROGRAM

Confirmatory studies field investigations were conducted at Landfill 2. Figure 3-1 presents the CS sampling locations.

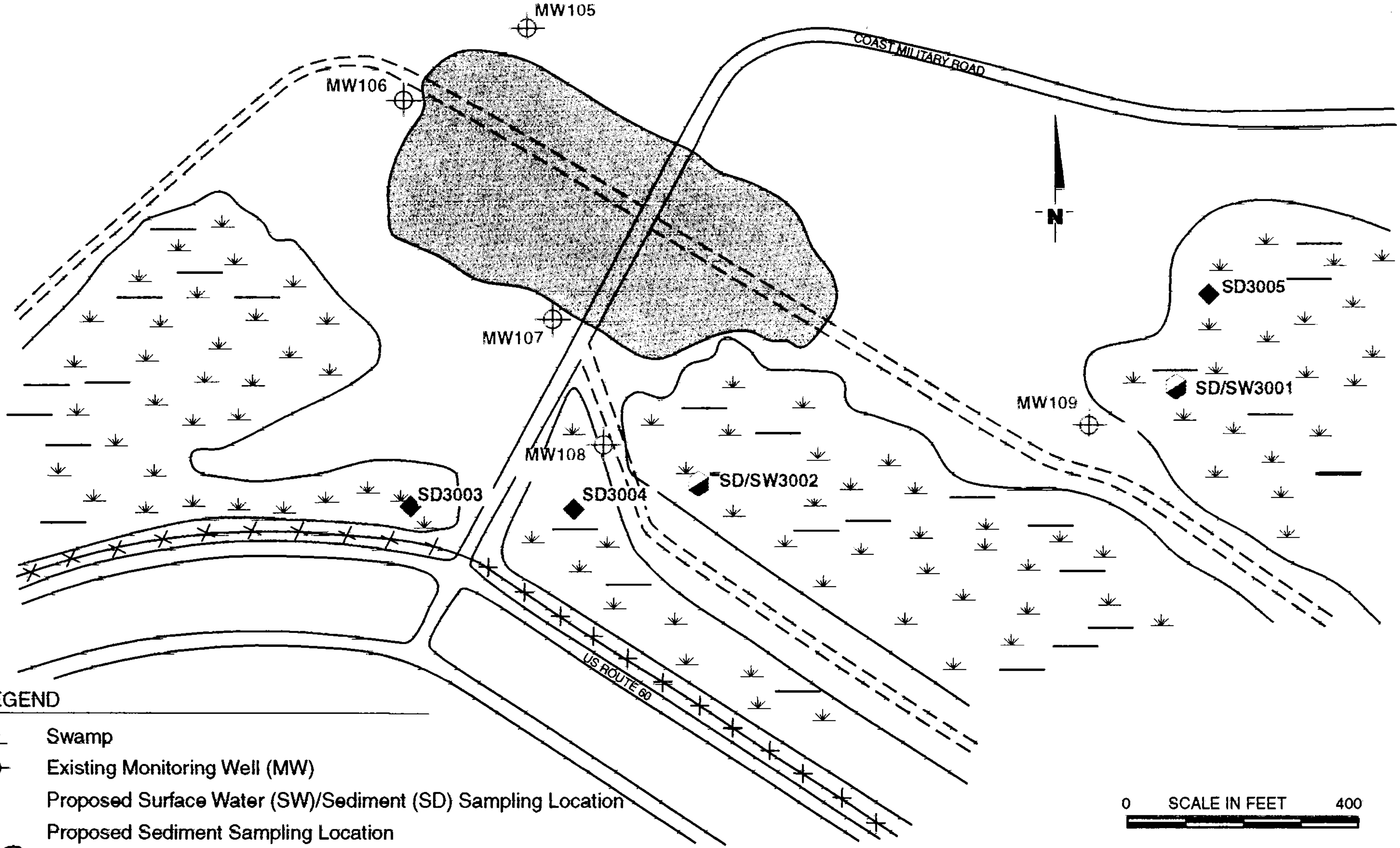
3.2 FIELD DATA QUALITY OBJECTIVES

The Fort Story CS field investigation program is evaluated based on the project field Data Quality Objectives (DQOs), which are presented in Section 2 of the *CDAP*. These are quantitative and qualitative statements used to assess the quality of the data required for use in future project phases. The DQOs for the CS project are restated in Section 4.2, which evaluates whether the project DQOs were met.

Field DQOs can be used to measure the performance of the CS field investigation program and their impact on the final results. The sampling and analytical activities may introduce potential sources of uncertainty or biases that may affect the overall confidence in the final analytical measurement. The data quality associated with environmental measurements can be considered a function of sampling variability. This includes the sampling plan rationale, sample collection procedures and field measurement procedures. When reviewing field DQOs, the evaluation is primarily qualitative and its purpose is to address the impact of field procedures and field nonconformances on the associated data. This section of the *QCSR/ARR* addresses precision, accuracy, representativeness, comparability and completeness (PARCC) criteria specifically associated with field sampling activities. Field DQOs are evaluated in qualitative terms for precision, accuracy, representativeness and comparability. Completeness is evaluated in quantitative terms.

3.2.1 Precision

The evaluation of precision for the CS field investigation program is qualitative and serves to identify possible sampling problems that may induce variability in the analytical data. The evaluation considers sample collection, sample handling and sample transportation procedures. Detailed planning and field protocols were used to minimize variability in the sampling process. Changes or nonconformances in the planned collection, handling and transportation procedures may result in variability in the analytical data. To ensure that the impacts of these changes could be evaluated, any field change or nonconformance was fully documented. Field nonconformances are documented throughout this section and are summarized in Sections 3.5 - 3.8. Precision is evaluated also by determining whether sufficient field duplicate samples were collected during the field investigation programs. Duplicate samples are required so that the overall precision of the data can be evaluated after the analytical program is complete. The results from the field duplicate samples do not specifically address field variability alone, rather, they provide information on the overall precision of the combined sampling and analytical measurement.



LEGEND

Swamp

Existing Monitoring Well (MW)

Proposed Surface Water (SW)/Sediment (SD) Sampling Location

Proposed Sediment Sampling Location

Approximate Boundary of Landfill

Fence

Note: SD/SW3001 was originally designated SD/SW3002 in the *CDAP* but was labelled as SD/SW3001 in the field. As a result of this field change, samples from the location labelled SD/SW3001 in the *CDAP* were labelled as SD/SW3002 in the field. This map reflects the field change.

Sampling Locations
Site 2 - Landfill 2
Confirmatory Studies
Fort Story, VA

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Figure 3-1

Precision of field data developed during the CS field investigation program was ensured also by adhering to standards of precision established for each field measurement procedure.

Examples of this include the following:

- Measuring depth-to-water in monitoring wells to within one hundredth of a foot
- Making depth-to water measurements in monitoring wells from consistent measuring points
- Calibrating field measurement instruments to the manufacturer's recommendations using properly prepared standard solutions (Table 2-1)
- Entering precise measurements on all field documentation forms, including the use of consistent descriptive terminology for the logging of soil borings

The standards of precision required of the Fort Story CS field investigation program are presented in the *CDAP*.

3.2.2 Accuracy

The evaluation of accuracy in the CS field investigation program is limited partially to a qualitative evaluation of field performance. Satisfactory field performance is evaluated also based on the quantitative standards of accuracy required to conduct specific field measurements. In addition, field performance is evaluated based on acquiring the necessary samples to identify analytical problems that may be attributed to the field investigation program. The accuracy of the sampling program is evaluated by collecting and analyzing matrix spike (MS), matrix spike duplicate (MSD) and field blanks at a sufficient frequency during the field sampling program. The results from MS/MSD samples, along with laboratory control samples (LCS) and surrogate spike samples, are used to assess accuracy in the laboratory analytical program and are discussed in Section 6. Trip blanks, which are prepared by the laboratory, provide an indication of contamination that may have been introduced during sample handling, storage and transportation. Since the results of the blanks and MS/MSD samples are included in the assessment of analytical accuracy, the evaluation of accuracy of the field investigation program is considered a qualitative statement of field performance.

Accuracy of field measurements during the CS field investigation program was ensured by the following:

- Maintaining accurate Chain of Custody Records (COCs) and other field data forms
- Properly calibrating and maintaining field measurement instruments to ensure that accurate measurements are taken (Table 2-1)
- Properly implementing field measurement in a consistent manner to ensure accuracy
- Locating sampling locations vertically and horizontally

3.2.3 Representativeness

The representativeness of the CS field investigation program depends upon whether the resulting analytical data are characteristic of compound concentrations present at Site 2 - Landfill 2. To collect data that are representative of the site, field samples were collected from all media that potentially were exposed to contaminants. Samples were collected using procedures and methods that attempt to maintain the integrity of the sampling process. For example, volatile organic compounds (VOCs) and total fuel hydrocarbon-light fraction (TFH-L) samples are collected in an undisturbed state (grab samples), preserved using proper preservation techniques and transported with a proper COC. Therefore, representativeness is a qualitative statement on the design and implementation of the sampling program and represents the confidence that contaminant concentrations in all potentially exposed media were evaluated.

The representativeness criteria was met by performing the following:

- Collecting samples using approved procedures and at designated locations
- Collecting samples for all the proposed analytical methods in approved containers with proper preservation
- Properly decontaminating all sampling equipment
- Maintaining a strict COC and handling all samples to prevent outside sources of contamination

3.2.4 Completeness

The completeness of the CS field investigation programs is a quantitative statement that generally is expressed as a percentage of the total samples collected versus the total sample numbers planned for collection in the *CDAP*. To evaluate completeness, the project sampling plan is compared with the amount of data collected to determine whether any data deficiencies exist.

Thorough documentation allows for the impact of missing data to be evaluated. Missing data can result from a number of unforeseen circumstances, including sample collection problems, sample location accessibility problems and sample bottle breakage. Incomplete sample sets (i.e., field and QC samples) may affect sample representativeness and the degree of confidence that contamination may or may not exist within a given matrix in a specific location.

Field data completeness is evaluated to ensure that an appropriate quantity of field measurements is taken and recorded. Field data are used to develop a conceptual understanding of the site and to provide supporting information for resolving any sampling-related concerns generated by laboratory analytical results. Completeness was ensured in the field by conducting sampling and measuring activities in accordance with established procedures. This included the following activities:

- Collecting all of the samples specified in the *CDAP*
- Measuring all specified field parameters during sampling
- Completing all field data forms correctly

3.2.5 Comparability

The comparability of a sampling program considers the confidence in which one data set can be compared with another. Comparability assessment is concerned with whether the field sampling techniques and measurement units of the field equipment can be compared with data collected during previous sampling events at the same site.

This aspect of the CS field investigation program was very important because the information developed will be incorporated with information developed during previous field investigations at Fort Story.

The assessment of field DQOs through the evaluation of PARCC criteria for the field investigation is presented in the following sections. The extent to which the field DQOs for the CS project were met is presented in Section 4.2.

3.3 FIELD QUALITY CONTROL PROGRAM

To support an evaluation of the analytical data collected during the CS field investigation program, a field QC program was developed in accordance with ER-110-1-263, *Chemical Engineering and Design Quality Management for Hazardous Waste Remedial Activities* (USACE, 1990), and used during all field sampling activities. Project QC samples included field duplicates, trip blanks and MS/MSD samples. Field split samples were collected for QA purposes. The USACE Missouri River Division (MRD) Laboratory analyzed all QA samples. Field duplicate and split samples were collected concurrently at sampling locations. An objective of the field QC program was to collect the required number of field QA/QC samples for each sample matrix. With the exception of one surface water sample that did not have a corresponding split sample, these samples were collected at the frequency specified in the *CDAP*. Rinsate blanks were not required for either groundwater or surface water sampling because disposable bailers were used to collect groundwater samples and sample containers were used to collect surface water.

Table 3-1 presents a summary of all field samples collected during the Fort Story field investigation, and Table 3-2 summarizes the number of field and QC samples by media. These tables may be used to help evaluate the precision, accuracy, representativeness, completeness and comparability of the Fort Story field effort.

Savannah Laboratories provided all sample containers for groundwater, surface water and sediment sampling activities that occurred during the Fort Story CS field investigation program. Sample jars and bottles containing preservatives as required for a particular analysis were color-coded. A number of the containers used in sampling varied from those specified in the *CDAP* as a result of sample containers breaking in transit. Table 3-3 presents a summary of sample containers used during the CS field investigation programs.

3.4 FIELD INVESTIGATION PROGRAM TECHNICAL APPROACH

The following sections discuss the technical procedures used during the Fort Story CS field investigation program. Field DQOs were developed for each aspect of the CS field investigation program. Changes to this program were dictated largely by field conditions encountered.
Field nonconformances and planned interpretations of the *CDAP* are documented within the discussion of each aspect of the CS field investigation program. These sections document, where

Table 3-1

Summary of Field Samples Collected
Confirmatory Studies
Fort Story, Virginia

Sample Description	VOC 8240	BNA 8270	Pest/PCB 8080	TFH-H 8015	TFH-L 8015	TAL metals total	TAL metals dissolved	Hg total	Hg dissolved	WQP	% Solids
S2SW30010127	X	-	-	-	-	-	-	-	-	-	NAP
S2MW1090127 D	X	-	-	-	-	-	-	-	-	-	NAP
S2MW1090127	X	-	-	-	-	-	-	-	-	-	NAP
S2MW1050127	X	-	-	-	X	-	-	-	-	-	NAP
S2SW30020127	X	-	-	-	-	-	-	-	-	-	NAP
Trip Blank T510274*6	X	-	-	-	-	-	-	-	-	-	NAP
S2SW30010128 D	X	X	X	X	-	X	X	X	X	X	NAP
Trip Blank T510286*2	X	-	-	-	-	-	-	-	-	-	NAP
S2MW1090127	-	X	X	X	-	X	X	X	X	X	NAP
S2MW1090127 D	-	X	X	X	-	X	X	X	X	X	NAP
S2MW1090127 S	X	X	X	X	-	X	X	X	X	X	NAP
Trip Blank (S2MW1090127 S)	X	-	-	-	-	-	-	-	-	-	NAP
S2MW1050127	-	X	X	X	-	X	X	X	X	X	NAP
S2SW30010127	-	X	X	X	-	X	X	X	X	X	NAP
S2SW30020127	-	X	X	X	-	X	X	X	X	X	NAP
S2MW1060128	X	-	-	-	-	-	-	-	-	-	NAP
S2MW1060128 MS	X	-	-	-	-	-	-	-	-	-	NAP
S2MW1060128 MSD	X	-	-	-	-	-	-	-	-	-	NAP
S2MW1070128	X	-	-	-	-	-	-	-	-	-	NAP
S2MW1080128	X	-	-	-	-	-	-	-	-	-	NAP
Trip Blank T510298*4	X	-	-	-	-	-	-	-	-	-	NAP
S2MW1060128	-	X	X	X	-	X	X	X	X	-	NAP
S2MW1060128 MS	-	X	X	X	-	X	X	X	X	-	NAP
S2MW1060128 MSD	-	X	X	X	-	X	X	X	X	-	NAP
S2MW1070128	-	X	X	X	-	X	X	X	X	-	NAP
S2MW1080128	-	X	X	X	-	X	X	X	X	-	NAP
S2SD30010128	X	X	X	X	X	X	NAP	X	NAP	NAP	X

Table 3-1

Summary of Field Samples Collected
Confirmatory Studies
Fort Story, Virginia

Sample Description	VOC 8240	BNA 8270	Pest/PCB 8080	TFH-H 8015	TFH-L 8015	TAL metals total	TAL metals dissolved	Hg total	Hg dissolved	WQP	% Solids
S2SD30010128 MS	X	X	X	X	X	X	NAP	X	NAP	NAP	X
S2SD30010128 MSD	X	X	X	X	X	X	NAP	X	NAP	NAP	X
S2SD30020128	X	X	X	X	-	X	NAP	X	NAP	NAP	X
S2SD30030128	X	X	X	X	-	X	NAP	X	NAP	NAP	X
S2SD30040128	X	X	X	X	-	X	NAP	X	NAP	NAP	X
S2SD30050128	X	X	X	X	-	X	NAP	X	NAP	NAP	X
S2SD30050128 D	X	X	X	X	-	X	NAP	X	NAP	NAP	X
S2SD30050128 S	X	X	X	X	-	X	NAP	X	NAP	NAP	X
S2DI10131	X	X	X	X	X	X	-	X	-	-	NAP
Trip blank T510346*2	X	-	-	-	-	-	-	-	-	-	-

BNA = Base-Neutral and Acid Extractables
D = Duplicate sample
Hg = Mercury
MS = Matrix Spike
MSD = Matrix Spike Duplicate
NAP = Not applicable
Pest/PCBs = Polychlorinated biphenyls
S = Split sample
TAL = Target Analyte List for Metals
TFH-H = Total Fuel Hydrocarbons - Heavy Fraction
TFH-L = Total Fuel Hydrocarbons - Light Fraction
VOC = Volatile Organic Compounds
WQP = TDS, Alk, Nitrate-N, Nitrite-N, Ortho-P, SO4, Cl, Fl, Total P, Sulfide

Table 3-2

Summary of Field QA/QC Samples
Site 2 - Landfill 2
Confirmatory Studies
Fort Story, Virginia
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Media	Field Sample ID	Duplicate Sample ID	Split Sample ID	No. of Analytical Samples	No. of QC Samples
Sediment	S2SD30050128	S2SD30050128 D	S2SD30050128 S	5	4
Groundwater	S2MW1090127	S2MW1090127 D	S2MW1090127 S	5	4
Surface Water	S2SW30010127	S2SW30010128 D	NA	2	1

NA = Not Analyzed
QC = Quality Control

Table 3-3

Specifications for Groundwater, Surface Water and Sediment Samples
Site 2 - Landfill 2
Confirmatory Studies
Fort Story, Virginia

Parameter		Container [a]	Sample Preservation	Holding Time
Volatile Organic Compounds	Water	Three 40-ml glass vials	Cool to 4°C, pH<2 with HCl No Headspace	14 days
	Soil/Sediment	One 125-ml amber glass No headspace	Cool to 4°C	Analyze in 14 days
	Soil/Sediment	One 125-ml clear glass No headspace	Cool to 4°C	Analyze in 14 days
Total Fuel Hydrocarbons - Light Fraction	Water	Three 40-ml glass vials	Cool to 4°C,	14 days
	Soil/Sediment	One 125-ml amber glass No headspace	Cool to 4°C	Analyze in 14 days
Base-Neutral and Acid Extractables	Water	Two 1–liter amber glass bottles	Cool to 4°C	extraction–7 days analysis–40 days
	Soil/Sediment	One 500-ml glass	Cool to 4°C	14 days to extraction; 40 days from extraction to analysis
Total Fuel Hydrocarbons - Heavy Fraction (TFH–H)	Water	Two 1–liter amber glass bottles	Cool to 4°C	extraction–7 days analysis–40 days
	Soil/Sediment	One 500-ml glass	Cool to 4°C	Analyze in 14 days
Pesticide/Polychlorinated Biphenyls	Water	Two 1–liter amber glass bottles	Cool to 4°C	extraction–7 days analysis–40 days
	Soil/Sediment	One 500-ml glass	Cool to 4°C	14 days to extraction; 40 days from extraction to analysis
Target Analyte List Metals (Total)	Water	One 500–ml HDPE bottle	Cool to 4°C, pH<2 with 1:1 HNO_3	28 days for Hg; Others, 6 months
	Soil/Sediment	One 500-ml plastic	Cool to 4°C	28 days for Hg 6 months all other metals
Target Analyte List Metals (Dissolved)	Water	One 500–ml HDPE bottle	After filtration, Cool to 4°C, pH<2 with 1:1 HNO_3	28 days for Hg; Others, 6 months

Table 3-3

Specifications for Groundwater, Surface Water and Sediment Samples
Site 2 - Landfill 2
Confirmatory Studies
Fort Story, Virginia

Parameter		**Container** [a]	**Sample Preservation**	**Holding Time**
Silica	Water	One 500–ml plastic bottle	Cool to 4°C	28 days
Hardness	Water	One 500–ml plastic bottle	Cool to 4°C, pH<2 with HNO_3	6 months
Ammonia	Water	One 500–ml plastic bottle	Cool to 4°C, pH<2 with H_2SO_4	28 days
Nitrate	Water	One 500–ml plastic bottle	Cool to 4°C	48 hours
Nitrite	Water	One 500–ml plastic bottle	Cool to 4°C	48 hours
Total Phosporus	Water	One 500–ml plastic bottle	Cool to 4°C, pH<2 with H_2SO_4	28 days
Orthophosphate	Water	One 500–ml plastic bottle	After filtration, cool to 4°C	48 hours
Alkalinity	Water	One 500–ml plastic bottle	Cool to 4°C No Headspace	14 days
Total Dissolved Solids	Water	One 500–ml plastic bottle	Cool to 4°C	7 days
Chloride	Water	One 500–ml plastic bottle	Cool to 4°C	28 days
Sulfate	Water	One 100–ml plastic bottle	Cool to 4°C	28 days
Fluoride	Water	One 100–ml plastic bottle	Cool to 4°C	28 days
Sulfide	Water	One 125–ml plastic bottle	Cool to 4°C, Add zinc acetate, and pH>9 with NaOH	7 days

Source: Savannah Laboratories and Environmental Services, Inc., *Comprehensive Quality Assurance Plan,* 1992.

Note: Sample containers may be used for multiple analyses.

(a) All sample containers will have Teflon™–lined lids.
(b) These holding times are advisory because these methods were modified water methods; therefore, the holding times are not specific to the soil matrix.

°C = degrees Celcius

HDPE = High Density Polyethelyene
ml = milliliter

applicable, how the field investigation programs at each site deviated from the *CDAP*. Table 3-4 presents a summary of the field investigation program for the CS project. Field changes are documented and the effect of the field change is explained. This section presents a summary of the CS field investigation sampling program.

3.5 GROUNDWATER SAMPLING PROGRAM

Groundwater samples were collected from five groundwater monitoring wells constructed during previous CS field investigation programs. Table 3-5 summarizes the purging and sampling program used during the CS field investigation program. Groundwater sampling procedures were described in the *CDAP*.

3.5.1 Equipment Summary

Purging of groundwater monitoring wells was accomplished using disposable bailers or a submersible pump equipped with a bottom check valve. Groundwater samples were collected using disposable bailers. A water level indicator was used to measure depth-to-water and total depth of the well. Water quality was measured periodically (Section 3.5.2) A photoionization detector (PID) was used periodically to monitor the breathing space above the monitoring well. Full information on PPE including calibration, maintenance and documentation procedures is summarized in Section 2.2.4 of this report and discussed in detail in the *CDAP* and *Site Safety and Health Plan (SSHP).* Purge water was contained in 55-gallon drums at the well location and then transported to the Fort Story hazardous waste storage facility.

3.5.2 Purging and Sampling Procedures

At least three well volumes were purged from monitoring wells prior to sampling. The volume of groundwater to be purged was based on a field calculation of the standing water column within the well. Water quality parameters were monitored every 15 minutes during purging using the following equipment:

- COLE PARMER pH Meter
- YSI S-C-T Meter (Salinity, Conductivity and Temperature)
- HACH Turbidimeter
- SOLINST Water Level Indicator

Calibration and preventive maintenance procedures for all field equipment were described in the *CDAP*. These procedures were followed during the field investigation program and were documented in Field Logbooks. Additional equipment included a PID, which was used periodically to monitor breathing space during development. Full information on PPE, is presented in Section 2.2.4 and in the *CDAP* and *SSHP*. Table 2-1 summarizes calibration and maintenance procedures performed on all monitoring equipment used during the CS field investigation programs.

The well was sampled immediately after purging or after recharging, if it had gone dry, and sampling was conducted with a disposable bailer attached to a Teflon™-coated wire. The sample was transferred to properly labeled sample containers and was placed in a cooler with fresh ice.

Table 3-4

Field Investigation Program Descriptions,
Sampling Rationale, Field Changes and Effect of Field Changes
Site 2 - Landfill 2
Confirmatory Studies
Fort Story, Virginia
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Field Program	Field Program Description	Rationale	Field Change and Rationale	Effect of Field Change
Surface Water/Sediment Sampling	Collect two matched surface water/sediment samples.	Characterize the impact Landfill 2 may have had on the surrounding area.	Samples collected at location SW/SD3001 (from *CDAP*) were labelled as SW/SD3002 and samples collected at location SW/SD3002 (from *CDAP*) were labelled as SW/SD3001.	None
Surface Water Sampling	Collect one split sample.	Verify analytical performance.	One surface water split sample not collected.	Slight: analytical performance can also be verified through other split samples, LCSs, MS/MSDs, and duplicates.
Source Water Analysis	Collect sample of source water.	Confirm that source water does not contain target contaminants.	Source water analysis not required because field team used Fort Eustis water which had been analyzed during the fourth quarter of 1994.	None
Rinsate Blank Analysis	Collect rinsate blanks for groundwater samples.	Confirm that decontamination procedures were working correctly.	Disposable bailers were used so no decontamination was required for water samples.	None
Deionized Water Analysis	Collect deionized water.	Confirm that deionized water does not contain target contaminants.	Sample was collected at Herndon, VA office because bottle shipment broke in transit between Savannah Laboratories and the field.	None

Table 3-5

Groundwater Monitoring Well Purging and Sampling Summary
Site 2 - Landfill 2
Confirmatory Studies
Fort Story, Virginia
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Monitoring Well ID Numbers	Purging Method	Sampling Method	Notes
MW105	E.Pump	D. Bailer	Well pumped steadily
MW106	Hand-bailed	D. Bailer	Well pumped steadily
MW107	E.Pump	D. Bailer	Well pumped steadily
MW108	E.Pump	D. Bailer	Well pumped steadily
MW109	Hand-bailed/E.Pump	D. Bailer	Well pumped steadily

E.Pump = Two-stage Electrical Pump with Teflon™ check valve
D.Bailer = Disposable Bailer

Samples were delivered to the appropriate laboratory in accordance with all applicable U.S. Department of Transportation (DOT) shipping requirements, and precautions were taken to maintain the inegrity of each sample by providing sufficient ice and packing material with the project-required COC. QC groundwater samples were collected as duplicate samples and MS/MSD. A trip blank was placed in any cooler containing VOC samples to identify possible sample contamination originating from sample cross-contamination during transport and shipping. Groundwater sampling was documented in the Field Logbooks, Sample Register, COC, Cooler Receipt Form and *Daily Quality Control Reports (DQCR).*

3.5.3 Decontamination Procedures

Standard decontamination procedures, as detailed in Section 2.3 and the *CDAP,* were used during groundwater sampling. The water level indicator, purging systems and attached Teflon™-coated wire were decontaminated between monitoring wells.

3.5.4 Summary of Nonconformances and Corrective Action

Significant field nonconformances, field changes and field observations for the CS groundwater sampling program are explained below.

Because dedicated sampling equipment was used during groundwater sampling, no rinsate blank samples were collected. It was not possible to achieve a low turbidity in selected groundwater monitoring wells prior to sampling. Although the turbidity is higher than desired, this in an unavoidable field-induced condition and should have minimal affect on data quality.

3.6 SURFACE WATER SAMPLING PROGRAM

Surface water samples were collected from two locations near Landfill 2. Sample locations and procedures were documented in the *CDAP* and are presented in the relevant site figures. Figure 3-1 presents the CS surface water sampling locations.

3.6.1 Sampling Procedures

Surface water samples were collected by lowering an open, preserved sample bottle horizontally into the water at the designated sample collection point, taking care not to spill preservative into the water. As water entered the bottle, the bottle gradually was turned upright, keeping the lip just under the surface so that only surface water was collected. The sample bottles were filled to just below the lip to avoid any loss of preservative. If the water was not deep enough to turn the bottle upright, the bottle was held at an angle as steep as possible with the lip remaining just under the surface.

Sample bottles provided by the laboratory were used to collect the surface water sample directly to prevent any cross-contamination that might be associated with using a glass sample collection vessel, as originally proposed in the *CDAP*. The samples were stored on ice until they were packed and shipped to the appropriate laboratory. Relevant packing and shipping procedures are described in Section 3.5.2. No decontamination procedures were required during this aspect of the sampling program because sample bottles were used as collection vessels.

Surface water QC samples, comprised of duplicate samples, were collected and sent to Savannah Laboratories for analysis. Surface water sampling during the Fort Story CS was documented in the Field Logbooks, Sample Register, COC, Cooler Receipt Form and *DQCR*.

3.6.2 Summary of Nonconformances and Corrective Action

QA split samples were not collected for surface water samples, due to an oversight in field sampling procedures. Also, the orginal sample for S2SW3001 was collected on January 27 while its duplicate was collected on January 28. The duplicate for S2SW3001 was collected on January 28 because it was too dark to collect samples from that area. To ensure that the duplicate was collected from the same location under the same conditions as the original samples, the exact location of the surface water sample was marked with surveyor's tape and the duplicate was collected the next day prior to the onset of precipitation. Split samples were collected for groundwater and sediment samples and submitted to MRD for analysis.

There was a minor nonconformance in the documentation of the CS field investigation program: the samples from location SD3002/SW3002 were labelled as SD3001/SW3001 prior to the collection of the second sediment/surface water sample pair (originally designated as SD3001/SW3001 in the *CDAP*). Because of this labelling problem, the second sediment/surface water sample pair (originally designated as SD3001/SW3001 in the *CDAP*) was changed to SD3002/SW3002.

3.7 SEDIMENT SAMPLING PROGRAM

Sediment samples were collected at five locations near Site 2 - Landfill 2. The *CDAP* details the number and location of sediment samples collected. Figure 3-1 presents the CS sediment sampling locations.

3.7.1 Equipment Summary

A stainless-steel trowel or hand auger, and stainless-steel bowls and mixing spoons were used for collecting sediment samples.

3.7.2 Sampling Procedures

Grab samples were collected at a depth of 1-1.5 ft. Sampling personnel were forced to collect the sediment samples at this depth rather than the proposed depth of 6 inches because there was a thick layer of decaying plant matter covering the sediment. Any VOC and TFH-L samples were taken as a grab samples and the rest of the sample was homogenized in a stainless-steel bowl using a stainless-steel spoon that was decontaminated prior to each sampling procedure. QC samples for sediment included field duplicates and MS/MSD samples. A QA sediment sample (split) was submitted to MRD Laboratories.

After the sample was transferred to the appropriate sample container, the sample was placed in a cooler containing fresh ice. At the end of each day of sample collection, all samples requiring transportation offsite were repackaged with fresh ice and packing material. Relevant packing and shipping procedures are described in Section 3.5.2. Sediment sampling during the Fort Eustis CS was documented in the Field Logbooks, Sample Register, COC, Cooler Receipt Form and *DQCR*.

The stainless-steel trowel, bowls and spoons were decontaminated between sampling locations using standard decontamination procedures outlined in the *CDAP*.

3.7.3 Summary of Nonconformances and Corrective Actions

There was a minor nonconformance in the documentation of the CS field investigation program: the samples from location SD3002/SW3002 were labelled as SD3001/SW3001 prior to the collection of the second sediment/surface water sample pair (originally designated as SD3001/SW3001 in the *CDAP*). Because of this labelling problem, the second sediment/surface water sample pair (originally designated as SD3001/SW3001 in the *CDAP*) were changed to SD3002/SW3002.

3.8 SOURCE WATER SAMPLING PROGRAM

The field effort for Fort Story immediately followed the quarterly sampling for Fort Eustis' Landfill 7 and 15 program. The field team obtained water from Fort Eustis to perform equipment decontamination for both the Fort Eustis and Fort Story field efforts. The water obtained from Fort Eustis had been sampled and analyzed during the 1994 Remedial Investigation field effort to assess levels of background chemicals in the Fort Eustis potable water. Chemical analyses performed on Fort Eustis potable water included volatile organic compounds (VOCs), total fuel hydrocarbons - light fraction (TFH-L), total fuel hydrocarbons - heavy fraction (TFH-H), base-neutral and acid extractable compounds (BNAs), pesticide/polychlorinated biphenyls (Pest/PCBs), total TAL metals, dissolved TAL Metals and residual chlorine content. Because the source water used for decontamination had been previously characterized, re-sampling and analysis was not performed at this time.

Deionized water was sampled directly from the supplied containers. Because sample bottles broke in transit from Savanah Laboratories to the field, the deionized water sample could not be collected in the field. The laboratory sent additional bottles to Montgomery Watson's Herndon, Virginia, office and the samples of deionized water were collected there.

The water samples were transferred to appropriately labeled bottles, packed and shipped using procedures described in Section 3.5.2. The sampling program was documented in the Field Logbook, Sample Register, COC, Cooler Receipt Form and *DQCR*. Results from this sampling will help to evaluate whether source water used during the CS field investigation program had an impact on the analytical results.

4.0 SUMMARY AND CONCLUSIONS OF FIELD INVESTIGATION

A summary of the CS field investigation program is presented in this *QCSR/ARR*. The objectives of this document are to ensure that the sample protocol outlined in the *CDAP* were adhered to and that all field problems were documented and addressed without affecting the analytical data. This was achieved by evaluating the effectiveness of the sediment, groundwater and surface water sampling programs with respect to the CS field DQOs (Section 3.2).

4.1 SUMMARY OF FIELD INVESTIGATION PROGRAMS

Given field constraints, all field procedures conducted during the CS field investigation program adhered to the *CDAP*. Environmental samples were collected from sediment, groundwater and surface water during the CS field investigation program. Any field changes, nonconformances, or corrective actions from the planned activities were documented in Section 3.0. To ensure the integrity of the samples collected during the CS field investigation programs, the following aspects were documented:

- Equipment used during all sampling events
- Procedures for handling samples from the time the sample was collected until it reached the laboratory
- Calibration and measurement records
- Identification of field nonconformances and the resulting effect on the data generated.

In summary, the CS field investigation program was in substantial conformance with the proposed procedures from the *CDAP*. All field nonconformances were fully documented in the field. Field changes and nonconformances are summarized in Table 3-4. These actions result in a high level of confidence associated with the CS data set.

The *SSHP* stipulates measures for compliance with federal, state and local safety and health requirements pertaining to site investigation activities. All field activities complied with the requirements of the *SSHP*.

4.2 EVALUATION OF FIELD DATA QUALITY OBJECTIVES

As discussed in Section 3-2, the CS project field DQOs are quantitative and qualitative statements used to assess the quality of the data required for use in future project phases. The evaluation of field DQOs with respect to precision, accuracy, representativeness, completeness and comparability (PARCC) criteria is presented in the following sections.

4.2.1 Precision

In terms of the precision DQO, the consistent use of standard sample collection, documentation, handling and transportation procedures during all sampling activities should provide data of acceptable quality. Field measurements were made to the required levels of precision. Field measurement equipment was properly calibrated and the field investigation programs were documented. In addition, sufficient field MS/MSD and duplicate samples were collected from the sediment, groundwater and surface water media to evaluate precision after the analytical program was completed.

4.2.2 Accuracy

In terms of the accuracy DQO, a sufficient number of field blank samples (i.e., deionized blank and trip blank samples) were collected to determine whether contamination was introduced from outside the sample matrix. In addition, Field Logbooks were completed accurately. Samples were located to project-required levels of accuracy and field monitoring equipment was calibrated properly to ensure accurate measurements were taken.

4.2.3 Representativeness

The representativeness DQO was met by collecting data that were representative of site conditions. Samples were collected from all media potentially exposed to contamination and from designated sample locations.This field DQO was achieved by using procedures that maintain the sample, as close as possible, in its original condition when contained. Careful preservation and handling of field samples contributed to acceptable field representativeness.

4.2.4 Completeness

Although a QA split sample for surface water was not collected, duplicate and LCS results provided additional data that will allow CS project objectives to be met. All other QA/QC samples were collected as per the *CDAP*. All field samples planned for collection were sampled and submitted for analysis or testing.

During the CS field investigation program, all field documentation required, such as Groundwater Sampling Logs and Field Logbooks, were completed. In addition, a *DQCR* was completed for every day that field work was conducted. Based upon this information it can be concluded that the CS field completeness goal was met.

4.2.5 Comparability

The comparability DQO was achieved by using sampling techniques and equipment that were based on EPA-accepted methods and that produced consistent data and measurement. The same field techniques were used during all CS field investigations. In addition, the field investigation techniques also were consistent with techniques used during previous Montgomery Watson field investigation programs at Fort Story. It can be concluded that the comparability DQO was met, allowing for data generated during all Montgomery Watson field investigations to be used confidently to evaluate project sites.

4.3 CONFIRMATORY STUDIES PROJECT CONCLUSIONS

Montgomery Watson concludes that the overall field DQOs were attained for the CS project. Table 4-1 summarizes the field DQOs for the CS project.

By meeting the CS project field DQOs, the field investigation programs and associated QA/QC program implemented was successful in confirming that the data collected in the field are of known quality and are useful for the purposes of assessing Site 2 - Landfill 2.

Table 4-1

Summary of Data Uses and Field Data Quality Objectives
Site 2 - Landfill 2
Confirmatory Studies
Fort Story, Virginia

Field Programs	Project Data Quality Objectives (DQOs)	Data Type [a]	Data Uses [b]	Analytical Level [c]	Field DQO Met?
Groundwater Sampling	Evaluate contaminant levels in site groundwater.	VOCs + TICs TFH-L BNAs + TICs Pest/PCBs TFH-H Total Metals Dissolved Metals Water Quality Parameters	SC	III	Yes
Surface Water Sampling	Evaluate contamination in surface water.	VOCs + TICs BNAs + TICs Pest/PCBs TFH-H Total Metals Dissolved Metals Water Quality Parameters	SC	III	Yes
Sediment Sampling	Evaluate contamination in shallow sediment.	VOCs + TICs TFH-L BNAs + TICs Pest/PCBs TFH-H Total Metals Dissolved Metals	SC	III	Yes

(a) BNAs + TICs = Base-neutral and acid extractable compounds + tentatively identified compounds
(b) SC = Site Characterization
(c) = Analytical Levels I and III (EPA, 1987) or screening and definative (EPA, 1994)
Level III = Quantitative Laboratory Analysis (Not CLP)

DQO = Data Quality Objectives
Metals = Target Analyte List metals
Pest/PCBs = Pesticides/polychlorinated biphenyls
TFH-H = Total fuel hydrocarbons - heavy fraction
TFH-L = Total fuel hydrocarbons - light fraction
VOCs + TICs = Volatile organic compounds + tentatively identified compounds

5.0 ANALYTICAL SAMPLE RESULTS

Laboratory chemical analyses were performed on sediment, groundwater and surface water samples collected during the Fort Story CS field investigation program. As discussed in Section 3.8, the water supply used for decontamination procedures were sampled from Fort Eustis during a field effort immediately preceding the Fort Story CS field investigation. Samples from the Fort Eustis municipal water supply were collected and analyzed in 1994, so re-sampling and analysis were not required at this time. Purchased deionized water was submitted for chemical analysis. Table 5-1 lists the analytical methods employed for the chemical analysis of Fort Story CS project samples. Except for the total fuel hydrocarbons - light fraction (TFH-L) and total fuel hydrocarbons - heavy fraction (TFH-H) analyses, the analytical methods employed are described in *Test Methods for Evaluating Solid Waste, EPA SW-846* (EPA, 3rd ed, update 1, 1992). The TFH-L and TFH-H analyses, modified versions of EPA Method 8015, are described in *Leaking Underground Fuel Tank Manual - Guidelines for Site Assessment, Cleanup, and Underground Storage Tank Closure* (State of California, 1989) and standard procedures in SW-846.

5.1 SITE SUMMARIES

Figure 3-1 presents the sampling locations for Landfill 2. Five sediment samples, five groundwater samples and two surface water samples were collected and submitted for volatile organic compounds, base-neutral and acid extractable compounds, TFH-H, pesticides/polychlorinated biphenyls, Target Analyte List (TAL) metals, dissolved TAL metals (water only), and percent solids (sediment only). One sediment and one groundwater sample were submitted for TFH-L, and two surface water and two groundwater samples were submitted for water quality parameters. Analytical results for these samples are separated by media and analytical method.

Tables 5-2 through 5-14 present analytical results for all CS samples. The tables do not reflect results for QA split samples submitted for analysis to the USACE Missouri River Division Laboratory. Results presented in the tables are reported in boldface if the compound was detected at a concentration greater than the compound detection limit. Otherwise, analytical results are presented as less than the detection limit. All results for soil and sediment samples were reported on a dry-weight basis. Analytical results reported as Miscellaneous Analytes include percent solids for sediment (Table 5-7) and inorganic water quality parameters for groundwater and surface water samples (Table 5-14).

Table 5-1

Analytical Method References
Site 2 - Landfill 2
Confirmatory Studies
Fort Story, Virginia

Analyte	Soil Matrix Method Number	Water Matrix Method Number	Reference	Holding Times
Volatile Organic Compounds (VOCs)	8240	8240	SW-846, 3rd ed.	14 days
Base-Neutral and Acid Extractables (BNAs)	3550/8270	3510/8270	SW-846, 3rd ed.	7 days (water)/ 40 days 14 days (soil)/40 days
Organochlorine Pesticides/PCBs	3550/8080	3510/8080	SW-846, 3rd ed.	7 days (water)/ 40 days 14 days (soil)/40 days
Total Fuel Hydrocarbons (TFH-H)	8015 (modified)	8015 (modified)	CA-LUFT	7 days (water)/ 40 days 14 days (soil)/ 40 days
Total Fuel Hydrocarbons (TFH-L)	8015 (modified)	8015 (modified)	CA-LUFT	14 days
Total and Dissolved Metals				
Aluminum	3050/6010	3010/6010	SW-846, 3rd ed.	6 months
Antimony	3050/6010	3010/6010	SW-846, 3rd ed.	6 months
Arsenic	3050/6010	3010/7060	SW-846, 3rd ed.	6 months
Barium	3050/6010	3010/6010	SW-846, 3rd ed.	6 months
Beryllium	3050/6010	3010/6010	SW-846, 3rd ed.	6 months
Cadmium	3050/6010	3010/6010	SW-846, 3rd ed.	6 months
Calcium	3050/6010	3010/6010	SW-846, 3rd ed.	6 months
Chromium, Total	3050/6010	3010/6010	SW-846, 3rd ed.	6 months
Cobalt	3050/6010	3010/6010	SW-846, 3rd ed.	6 months
Copper	3050/6010	3010/6010	SW-846, 3rd ed.	6 months
Iron	3050/6010	3010/6010	SW-846, 3rd ed.	6 months
Lead	3050/6010	3010/7421	SW-846, 3rd ed.	6 months
Magnesium	3050/6010	3010/6010	SW-846, 3rd ed.	6 months
Manganese	3050/6010	3010/6010	SW-846, 3rd ed.	6 months
Mercury	7471	7470	SW-846, 3rd ed.	28 days
Nickel	3050/6010	3010/6010	SW-846, 3rd ed.	6 months
Potassium	3050/6010	3010/6010	SW-846, 3rd ed.	6 months
Selenium	3050/6010	3010/7741	SW-846, 3rd ed.	6 months
Silver	3050/6010	3010/6010	SW-846, 3rd ed.	6 months
Sodium	3050/6010	3010/6010	SW-846, 3rd ed.	6 months
Thallium	3050/6010	3010/6010	SW-846, 3rd ed.	6 months

Table 5-1

Analytical Method References
Site 2 - Landfill 2
Confirmatory Studies
Fort Story, Virginia

Analyte	Soil Matrix Method Number	Water Matrix Method Number	Reference	Holding Times
Total and Dissolved Metals (*continued*)				
Vanadium	3050/6010	3010/6010	SW-846, 3rd ed.	6 months
Zinc	3050/6010	3005/6010	SW-846, 3rd ed.	6 months
Miscellaneous Analytes				
Chloride	—	325.3/9252	SW-846, 3rd. ed.	28 days
Total Dissolved Solids (TDS)	—	160.3	SW-846, 3rd. ed.	7 days
Total organic carbon (TOC)	9060 (modified)	9060	SW-846, 3rd. ed.	28 days
Ammonia	—	350.3	EPA, 1983	28 days
Nitrate (NO_3-N)/ Nitrite (NO_2-N)	—	353.2	EPA, 1983	28 days
Orthophosphate	—	365.1	EPA, 1983	2 days
Total Phosphorus	—	365.4	EPA, 1983	28 days
Sulfate	—	375.3	EPA, 1983	28 days
Sulfide	—	376.2/427	EPA, 1983	7 days
Alkalinity	—	310.1	EPA, 1983	14 days
Fluoride	—	300	EPA, 1983	28 days

Note: When two method numbers are given, the first method is the extraction or digestion method and the second is the analysis method.

When two holding times are given, the first number is time from sample collection to extraction/preparation, and the second number is the time from extraction to analysis.

Table 5-2

Volatile Organic Compounds Results for Sediment Samples
Site 2 - Landfill 2
Confirmatory Studies
Fort Story, Virginia
Page 1 of 2

Parameter/Analyte	SD3001	SD3002	SD3003	SD3004	SD3005	SD3005D
Volatile Organic Compounds (µg/kg)						
1,1,1-Trichloroethane	<29	<45[UJ,a]	<46[UJ,a]	<45	<45	<42
1,1,2,2-Tetrachloroethane	<29	<45[UJ,a]	<46[UJ,a]	<45	<45	<42
1,1,2-Trichloroethane	<29	<45[UJ,a]	<46[UJ,a]	<45	<45	<42
1,1-Dichloroethane	<29	<45[UJ,a]	<46[UJ,a]	<45	<45	<42
1,1-Dichloroethene	<29	<45[UJ,a]	<46[UJ,a]	<45	<45	<42
1,2-Dichloroethane	<29	<45[UJ,a]	<46[UJ,a]	<45	<45	<42
1,2-Dichloropropane	<29	<45[UJ,a]	<46[UJ,a]	<45	<45	<42
2-Butanone (MEK)	<150	<230[UJ,a]	<230[UJ,a]	<230	<230	<210
2-Chloroethylvinyl Ether	<290	<460[UJ,a]	<460[UJ,a]	<450	<450	<420
2-Hexanone	<150	<230[UJ,a]	<230[UJ,a]	<230	<230	<210
4-Methyl-2-pentanone (MIBK)	<150	<230[UJ,a]	<230[UJ,a]	<230	<230	<210
Acetone	**1,300**	**960[J,a]**	**1,200[J,a]**	**630**	**750**	**700**
Benzene	<29	<45[UJ,a]	<46[UJ,a]	<45	<45	<42
Bromodichloromethane	<29	<45[UJ,a]	<46[UJ,a]	<45	<45	<42
Bromoform	<29	<45[UJ,a]	<46[UJ,a]	<45	<45	<42
Bromomethane	<58	<90,[UJ,a]	<91[UJ,a]	<91	<91	<84
Carbon Disulfide	<29	<45[UJ,a]	<46[UJ,a]	<45	<45	<42
Carbon tetrachloride	<29	<45[UJ,a]	<46[UJ,a]	<45	<45	<42
Chlorobenzene	<29	<45[UJ,a]	<46[UJ,a]	<45	<45	<42
Chloroethane	<58	<90,[UJ,a]	<91[UJ,a]	<91	<91	<84
Chloroform	<29	<45[UJ,a]	<46[UJ,a]	<45	<45	<42
Chloromethane	<58	<90,[UJ,a]	<91[UJ,a]	<91	<91	<84
cis-1,2-Dichloroethylene	<29	<45[UJ,a]	<46[UJ,a]	<45	<45	<42
cis-1,3-Dichloropropene	<29	<45[UJ,a]	<46[UJ,a]	<45	<45	<42
Dibromochloromethane	<29	<45[UJ,a]	<46[UJ,a]	<45	<45	<42
Ethylbenzene	<29	<45[UJ,a]	<46[UJ,a]	<45	<45	<42

Table 5-2

Volatile Organic Compounds Results for Sediment Samples
Site 2 - Landfill 2
Confirmatory Studies
Fort Story, Virginia
Page 2 of 2

Parameter/Analyte	SD3001	SD3002	SD3003	SD3004	SD3005	SD3005D
Volatile Organic Compounds (μg/kg) (cont.)						
m&p-Xylene	<29	<45[UJ,a]	<46[UJ,a]	<45	<45	<42
Methylene Chloride (Dichloromethane)	<29	<45[UJ,a]	<46[UJ,a]	<45	<45	<42
o-Xylene	<29	<45[UJ,a]	<46[UJ,a]	<45	<45	<42
Styrene	<29	<45[UJ,a]	<46[UJ,a]	<45	<45	<42
Tetrachloroethene	<29	<45[UJ,a]	<46[UJ,a]	<45	<45	<42
Toluene	<29	<45[UJ,a]	<46[UJ,a]	<45	**90**	<42
trans-1,2-Dichloroethylene	<29	<45[UJ,a]	<46[UJ,a]	<45	<45	<42
trans-1,3-Dichloropropene	<29	<45[UJ,a]	<46[UJ,a]	<45	<45	<42
Trichloroethene	<29	<45[UJ,a]	<46[UJ,a]	<45	<45	<42
Vinyl acetate	<58	<90[UJ,a]	<91[UJ,a]	<91	<91	<84
Vinyl Chloride	<58	<90[UJ,a]	<91[UJ,a]	<91	<91	<84

a = Concentration qualified due to low surrogate spike recovery
J = Associated value is an estimated quantity. Results are qualitatively acceptable.
UJ = Associated value is an estimated quantity. Results are qualitatively acceptable.

Table 5-3

Base-Neutral and Acid Extractables Results for Sediment Samples
Site 2 - Landfill 2
Confirmatory Studies
Fort Story, Virginia
Page 1 of 3

Parameter/Analyte	SD3001	SD3002	SD3003	SD3004	SD3005	SD3005D
Base-Neutral and Acid Extractables (μg/kg)						
1,2,4-Trichlorobenzene	<2,100	<3,000	<2,800	<3,300	<2,600	<2,200
1,2-Dichlorobenzene	<2,100	<3,000	<2,800	<3,300	<2,600	<2,200
1,3-Dichlorobenzene	<2,100	<3,000	<2,800	<3,300	<2,600	<2,200
1,4-Dichlorobenzene	<2,100	<3,000	<2,800	<3,300	<2,600	<2,200
2,4,5-Trichlorophenol	<2,100	<3,000	<2,800	<3,300	<2,600	<2,200
2,4,6-Trichlorophenol	<2,100	<3,000	<2,800	<3,300	<2,600	<2,200
2,4-Dichlorophenol	<2,100	<3,000	<2,800	<3,300	<2,600	<2,200
2,4-Dimethylphenol	<2,100	<3,000	<2,800	<3,300	<2,600	<2,200
2,4-Dinitrophenol	<10,000	<15,000	<14,000	<17,000	<13,000	<11,000
2,4-Dinitrotoluene	<2,100	<3,000	<2,800	<3,300	<2,600	<2,200
2,6-Dinitrotoluene	<2,100	<3,000	<2,800	<3,300	<2,600	<2,200
2-Chloronaphthalene	<2,100	<3,000	<2,800	<3,300	<2,600	<2,200
2-Chlorophenol	<2,100	<3,000	<2,800	<3,300	<2,600	<2,200
2-Methylnaphthalene	<2,100	<3,000	<2,800	<3,300	<2,600	<2,200
2-Methylphenol (o-cresol)	<2,100	<3,000	<2,800	<3,300	<2,600	<2,200
2-Nitroaniline	<10,000	<15,000	<14,000	<17,000	<13,000	<11,000
2-Nitrophenol	<2,100	<3,000	<2,800	<3,300	<2,600	<2,200
3,3'-Dichlorobenzidine	<4,200	<6,100	<5,600	<6,700	<5,100	<4,400
3-Methylphenol/4-Methylphenol(m&p-cresol)	<2,100	<3,000	<2,800	<3,300	<2,600	<2,200
3-Nitroaniline	<10,000	<15,000	<14,000	<17,000	<13,000	<11,000
4,6-Dinitro-o-cresol (4,6-Dinitro-2-methylphenol)	<10,000	<15,000	<14,000	<17,000	<13,000	<11,000
4-Bromophenyl-phenyl-ether	<2,100	<3,000	<2,800	<300	<2,600	<2,200
4-Chloro-3-methylphenol	<2,100	<3,000	<2,800	<3,300	<2,600	<2,200
4-Chloroaniline	<4,200	<6,100	<5,600	<6,700	<5,100	<4,400
4-Chlorophenyl-phenyl ether	<2,100	<3,000	<2,800	<3,300	<2,600	<2,200
4-Nitroaniline	<10,000	<15,000	<14,000	<17,000	<13,000	<11,000
4-Nitrophenol	<10,000	<15,000	<14,000	<17,000	<13,000	<11,000

Table 5-3

Base-Neutral and Acid Extractables Results for Sediment Samples
Site 2 - Landfill 2
Confirmatory Studies
Fort Story, Virginia

Parameter/Analyte	SD3001	SD3002	SD3003	SD3004	SD3005	SD3005D
Base-Neutral and Acid Extractables (µg/kg) (cont.)						
Acenaphthene	<2,100	<3,000	<2,800	<3,300	<2,600	<2,200
Acenaphthylene	<2,100	<3,000	<2,800	<3,300	<2,600	<2,200
Anthracene	<2,100	<3,000	<2,800	<3,300	<2,600	<2,200
Benzidine	<17,000	<24,000	<22,000	<27,000	<2,1000	<18,000
Benzo(a)anthracene	<2,100	<3,000	<2,800	<300	<2,600	<2,200
Benzo(a)pyrene	<2,100	<3,000	<2,800	<300	<2,600	<2,200
Benzo(b)fluoranthene	<2,100	<3,000	<2,800	<300	<2,600	<2,200
Benzo(g,h,i)perylene	<2,100	<3,000	<2,800	<300	<2,600	<2,200
Benzo(k)fluoranthene	<2,100	<3,000	<2,800	<300	<2,600	<2,200
Benzoic acid	<10,000	<15,000	<14,000	<17,000	<13,000	<11,000
Benzyl alcohol	<2,100	<3,000	<2,800	<3,300	<2,600	<2,200
bis(2-Chloroethoxy)methane	<2,100	<3,000	<2,800	<300	<2,600	<2,200
bis(2-Chloroethyl)ether	<2,100	<3,000	<2,800	<300	<2,600	<2,200
Bis(2-chloroisopropyl)ether	<2,100	<3,000	<2,800	<300	<2,600	<2,200
bis(2-Ethylhexyl)phthalate	<2,100	<3,000	<2,800	<300	<2,600	<2,200
Butylbenzylphthalate	<2,100	<3,000	<2,800	<3,300	<2,600	<2,200
Chrysene	<2,100	<3,000	<2,800	<3,300	<2,600	<2,200
Di-n-butylphthalate	<2,100	<3,000	<2,800	<3,300	<2,600	<2,200
Di-n-octylphthalate	<2,100	<3,000	<2,800	<3,300	<2,600	<2,200
Dibenz(a,h)anthracene	<2,100	<3,000	<2,800	<3,300	<2,600	<2,200
Dibenzofuran	<2,100	<3,000	<2,800	<3,300	<2,600	<2,200
Diethylphthalate	<2,100	<3,000	<2,800	<3,300	<2,600	<2,200
Dimethylphthalate	<2,100	<3,000	<2,800	<3,300	<2,600	<2,200
Fluoranthene	<2,100	<3,000	<2,800	<3,300	<2,600	<2,200
Fluorene	<2,100	<3,000	<2,800	<3,300	<2,600	<2,200
Hexachlorobenzene	<2,100	<3,000	<2,800	<3,300	<2,600	<2,200
Hexachlorobutadiene	<2,100	<3,000	<2,800	<3,300	<2,600	<2,200

Table 5-3

Base-Neutral and Acid Extractables Results for Sediment Samples
Site 2 - Landfill 2
Confirmatory Studies
Fort Story, Virginia
Page 3 of 3

Parameter/Analyte	SD3001	SD3002	SD3003	SD3004	SD3005	SD3005D
Base-Neutral and Acid Extractables (µg/kg) (cont.)						
Hexachlorocyclopentadiene	<2,100	<3,000	<2,800	<3,300	<2,600	<2,200
Hexachloroethane	<2,100	<3,000	<2,800	<3,300	<2,600	<2,200
Indeno(1,2,3-c,d)pyrene	<2,100	<3,000	<2,800	<3,300	<2,600	<2,200
Isophorone	<2,100	<3,000	<2,800	<3,300	<2,600	<2,200
n-Nitrosodi-n-Propylamine	<2,100	<3,000	<2,800	<3,300	<2,600	<2,200
n-Nitrosodimethylamine	<2,100	<3,000	<2,800	<3,300	<2,600	<2,200
n-Nitrosodiphenylamine/Diphenylamine	<2,100	<3,000	<2,800	<3,300	<2,600	<2,200
Naphthalene	<2,100	<3,000	<2,800	<3,300	<2,600	<2,200
Nitrobenzene	<2,100	<3,000	<2,800	<3,300	<2,600	<2,200
Pentachlorophenol	<2,100	<3,000	<2,800	<3,300	<2,600	<2,200
Phenanthrene	<2,100	<3,000	<2,800	<3,300	<2,600	<2,200
Phenol	<2,100	<3,000	<2,800	<3,300	<2,600	<2,200
Pyrene	<2,100	<3,000	<2,800	<3,300	<2,600	<2,200

Table 5-4

Pesticides/Polychlorinated Biphenyls Results for Sediment Samples
Site 2 - Landfill 2
Fort Story, Virginia
Page 1 of 1

Parameter/Analyte	SD3001	SD3002	SD3003	SD3004	SD3005	SD3005D
Pest/Polychlorinated Byphenyls (µg/kg)						
4,4'-DDD	**79**	**63**	**390**	**170**	**390**	**110**
4,4'-DDE	<30	<21	**36**	**45**	**69**	**32**
4,4'-DDT	<30[UJ,b]	<21	<28	<33	<25	<22
Aldrin	<15	<11	<14	<17	<13	<11
alpha-BHC	<15	<11	<14	<17	<13	<11
Aroclor-1016	<300	<210	<280	<330	<250	<220
Aroclor-1221	<610	<420	<560	<670	<520	<450
Aroclor-1232	<300	<210	<280	<330	<250	<220
Aroclor-1242	<300	<210	<280	<330	<250	<220
Aroclor-1248	<300	<210	<280	<330	<250	<220
Aroclor-1254	<300	<210	<280	<330	<250	<220
Aroclor-1260	<300	<210	<280	<330	<250	<220
beta-BHC	<15	<11	<14	<17	<13	<11
Chlordane	<150	<110	<140	<170	<130	<110
delta-BHC	<15	<11	<14	<17	<13	<11
Dieldrin	<30[UJ,b]	<21	<28	<33	<25	<22
Endosulfan I	<15	<11	<14	<17	<13	<11
Endosulfan II	<30	<21	<28	<33	<25	<22
Endosulfan sulfate	<30	<21	<28	<33	<25	<22
Endrin	<30	<21	<28	<33	<25	<22
Endrin Aldehyde	<30	<21	<28	<33	<25	<22
gamma-BHC	<15[UJ,b]	<11	<14	<17	<13	<11
Heptachlor	<15	<11	<14	<17	<13	<11
Heptachlor epoxide	<15	<11	<14	<17	<13	<11
Methoxychlor	<150	<110	<140	<170	<130	<110
Toxaphene	<1,500	<1,100	<1,400	<1,700	<1,300	<1,100

UJ = Associated non-detection is an estimated quantity. Results are qualitatively acceptable.
b = Concentration qualified due to low MS/MSD recovery.

Table 5-5

Total Fuel Hydrocarbons Results
for Sediment Samples
Site 2 - Landfill 2
Confirmatory Studies
Fort Story, Virginia
Page 1 of 1

Parameter/Analyte	SD3001	SD3002	SD3003	SD3004	SD3005	SD3005D
Total Fuel Hydrocarbons (µg/kg)						
Hydrocarbons as Diesel Fuel	<62,000	<91,000	**460,000**	**850,000**	<77,000	<67,000
Hydrocarbons as Heavy Oils	<4,200,000	<6,100,000	<5,600,000	<6,700,000	<5,200,000	<4,500,000
Hydrocarbons as Gasoline	<2,300	NA	NA	NA	NA	NA

NA = Not Analyzed

Table 5-6

Metals Results for Sediment Samples
Site 2 - Landfill 2
Confirmatory Studies
Fort Story, Virginia
Page 1 of 1

Parameter/Analyte	SD3001	SD3002	SD3003	SD3004	SD3005	SD3006
Metals (mg/kg)						
Aluminum	**230**	**3,000**	**3,900**	**3,800**	**1,700**	**1,800**
Antimony	<5	<5	<5	<5	<5	<5
Arsenic	**5.0**	**4.6**	**9.9**	**7.3**	**3.4**	**4.3**
Barium	**36**	**84**	**72**	**55**	**28**	**26**
Beryllium	<0.40	<0.40	<0.4	<0.40	<0.40	<0.40
Cadmium	<0.50	**0.78**	**0.68**	**0.57**	<0.50	<0.50
Calcium	**4,100**	**7,700**	**4,900**	**6,500**	**2,300**	**2,100**
Chromium	**4.9**	**3.8**	**7.5**	**6.5**	**3.9**	**4.1**
Cobalt	**1.6**	**2.3**	**3.1**	**2.3**	**1.5**	**1.4**
Copper	**7.9**	**6.7**	**14**	**16**	**4.3**	**3.8**
Iron	**6,500**	**25,000**	**16,000**	**14,000**	**6,400**	**5,800**
Lead	**30**	**22**	**69**	**58**	**30**	**24**
Magnesium	**820**	**890**	**1,300**	**1,300**	**910**	**860**
Manganese	**59**	**190**	**140**	**130**	**68**	**64**
Mercury	**0.17**	<0.2	**0.28**	**0.28**	**0.14**	**0.10**
Nickel	<4	<4	**5.4**	**4.3**	<4	<4
Potassium	**180**	**190**	**320**	**270**	**230**	**240**
Selenium	<1	<1	<1	<1	<1	<1
Silver	<1	<1	<1	<1	<1	<1
Sodium	**260**	**260**	**530**	**390**	**250**	**210**
Thallium	<1	<1	<1	<1	<1	<1
Vanadium	**14**	**16**	**23**	**24**	**12**	**11**
Zinc	**49**	**65**	**380**	**90**	**30**	**30**

Table 5-7

Miscellaneous Analytes Results for Sediment Samples
Site 2 - Landfill 2
Confirmatory Studies
Fort Story, Virginia
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Parameter/Analyte	SD3001	SD3002	SD3003	SD3004	SD3005	SD3005D
Miscellaneous						
Percent Solids (%)	16	11	12	10	13	15

Table 5-8

Volatile Organic Compounds Results for Groundwater and Surface Water Samples
Site 2 - Landfill 2
Confirmatory Studies
Fort Story, Virginia
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Parameter/Analyte	SW3001	SW3001D	SW3002	MW105	MW106	MW107	MW108	MW109	MW109D
Volatile Organic Compounds (μg/L)									
1,1,1-Trichloroethane	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,1,2,2-Tetrachloroethane	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,1,2-Trichloroethane	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,1-Dichloroethane	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,1-Dichloroethene	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,2-Dichloroethane	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,2-Dichloropropane	<1	<1	<1	<1	<1	<1	<1	<1	<1
2-Butanone (MEK)	<10	<10	<10	<10	**23**	<10	<10	<10	<10
2-Chloroethylvinyl Ether	<10	<10	<10	<10	<10	<10	<10	<10	<10
2-Hexanone	<10	<10	<10	<10	<10	<10	<10	<10	<10
4-Methyl-2-pentanone (MIBK)	<10	<10	<10	<10	<10	<10	<10	**12**	<10
Acetone	<10	<10	<10	<10	<10	**12**	<10	<10	<10
Benzene	<1	<1	<1	<1	<1	<1	<1	<1	<1
Bromodichloromethane	<1	<1	<1	<1	<1	<1	<1	<1	<1
Bromoform	<1	<1	<1	<1	<1	<1	<1	<1	<1
Bromomethane	<2	<2	<2	<2	<2	<2	<2	<2	<2
Carbon Disulfide	<1	<1	<1	<1	<1	<1	<1	<1	<1
Carbon Tetrachloride	<1	<1	<1	<1	<1	<1	<1	<1	<1
Chlorobenzene	<1	<1	<1	<1	<1	<1	<1	<1	<1
Chloroethane	<1	<1	<1	<1	<1	<1	<1	<1	<1
Chloroform	<1	<1	<1	<1	<1	<1	<1	<1	<1
Chloromethane	<1	<1	<1	<1	<1	<1	<1	<1	<1
cis-1,2-Dichloroethylene	<1	<1	<1	<1	<1	<1	<1	<1	<1
cis-1,3-Dichloropropene	<1	<1	<1	<1	<1	<1	<1	<1	<1
Dibromochloromethane	<1	<1	<1	<1	<1	<1	<1	<1	<1
Ethylbenzene	<1	<1	<1	<1	<1	<1	<1	<1	<1
m&p-Xylene	<1	<1	<1	<1	<1	<1	<1	<1	<1
Methylene Chloride (Dichloromethane)	<1	<1	<1	<1	<1	<1	<1	<1	<1
o-Xylene	<1	<1	<1	<1	<1	<1	<1	<1	<1
Styrene	<1	<1	<1	<1	<1	<1	<1	<1	<1

Table 5-8

Volatile Organic Compounds Results for Groundwater and Surface Water Samples
Site 2 - Landfill 2
Confirmatory Studies
Fort Story, Virginia
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Parameter/Analyte	**SW3001**	**SW3001D**	**SW3002**	**MW105**	**MW106**	**MW107**	**MW108**	**MW109**	**MW109D**
Volatile Organic Compounds (µg/L) (cont.)									
Tetrachloroethene	<1	<1	<1	<1	<1	<1	<1	<1	<1
Toluene	**2.9**	**2.2**	**1.1**	<1	<1	<1	<1	<1	<1
trans-1,2-Dichloroethylene	<1	<1	<1	<1	<1	<1	<1	<1	<1
trans-1,3-Dichloropropene	<1	<1	<1	<1	<1	<1	<1	<1	<1
Trichloroethene	<1	<1	<1	<1	<1	<1	<1	<1	<1
Vinyl Acetate	<2	<2	<2	<2	<2	<2	<2	<2	<2
Vinyl Chloride	<1	<1	<1	<1	<1	<1	<1	<1	<1

Table 5-9

Base-Neutral and Acid Extractables Results for Groundwater and Surface Water Samples
Site 2 - Landfill 2
Confirmatory Studies
Fort Story, Virginia

Parameter/Analyte	SW3001	SW3001D	SW3002	MW105	MW106	MW107	MW108	MW109	MW109D
Base-Neutral and Acid Extractables (µg/L)									
1,2,4-Trichlorobenzene	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,2-Dichlorobenzene	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,3-Dichlorobenzene	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,4-Dichlorobenzene	<10	<10	<10	<10	<10	<10	<10	<10	<10
2,4,5-Trichlorophenol	<10	<10	<10	<10	<10	<10	<10	<10	<10
2,4,6-Trichlorophenol	<10	<10	<10	<10	<10	<10	<10	<10	<10
2,4-Dichlorophenol	<10	<10	<10	<10	<10	<10	<10	<10	<10
2,4-Dimethylphenol	<10	<10	<10	<10	<10	<10	<10	<10	<10
2,4-Dinitrophenol	<50	<50	<50	<50	<50	<50	<50	<50	<50
2,4-Dinitrotoluene	<10	<10	<10	<10	<10	<10	<10	<10	<10
2,6-Dinitrotoluene	<10	<10	<10	<10	<10	<10	<10	<10	<10
2-Chloronaphthalene	<10	<10	<10	<10	<10	<10	<10	<10	<10
2-Chlorophenol	<10	<10	<10	<10	<10	<10	<10	<10	<10
2-Methylnaphthalene	<10	<10	<10	<10	<10	<10	<10	<10	<10
2-Methylphenol (o-cresol)	<10	<10	<10	<10	<10	<10	<10	<10	<10
2-Nitroaniline	<50	<50	<50	<50	<50	<50	<50	<50	<50
2-Nitrophenol	<10	<10	<10	<10	<10	<10	<10	<10	<10
3,3'-Dichlorobenzidine	<20	<20	<20	<20	<20	<20	<20	<20	<20
3-Methylphenol/4-Methylphenol(m&p-cresol)	<10	<10	<10	<10	<10	<10	<10	<10	<10
3-Nitroaniline	<50	<50	<50	<50	<50	<50	<50	<50	<50
4,6-Dinitro-o-cresol (4,6-Dinitro-2-methylphenol)	<50	<50	<50	<50	<50	<50	<50	<50	<50
4-Bromophenyl-phenyl-ether	<10	<10	<10	<10	<10	<10	<10	<10	<10
4-Chloro-3-methylphenol	<10	<10	<10	<10	<10	<10	<10	<10	<10
4-Chloroaniline	<20	<20	<20	<20	<20	<20	<20	<20	<20
4-Chlorophenyl-phenyl ether	<10	<10	<10	<10	<10	<10	<10	<10	<10
4-Nitroaniline	<50	<50	<50	<50	<50	<50	<50	<50	<50
4-Nitrophenol	<50	<50	<50	<50	<50	<50	<50	<50	<50
Acenaphthene	<10	<10	<10	<10	<10	<10	<10	<10	<10
Acenaphthylene	<10	<10	<10	<10	<10	<10	<10	<10	<10
Anthracene	<10	<10	<10	<10	<10	<10	<10	<10	<10

Table 5-9

Base-Neutral and Acid Extractables Results for Groundwater and Surface Water Samples
Site 2 - Landfill 2
Confirmatory Studies
Fort Story, Virginia

Parameter/Analyte	SW3001	SW3001D	SW3002	MW105	MW106	MW107	MW108	MW109	MW109D
Base-Neutral and Acid Extractables (µg/L) (cont.)									
Benzidine	<80	<80	<80	<80	<80	<80	<80	<80	<80
Benzo(a)Anthracene	<10	<10	<10	<10	<10	<10	<10	<10	<10
Benzo(a)pyrene	<10	<10	<10	<10	<10	<10	<10	<10	<10
Benzo(b)fluoranthene	<10	<10	<10	<10	<10	<10	<10	<10	<10
Benzo(g,h,i)perylene	<10	<10	<10	<10	<10	<10	<10	<10	<10
Benzo(k)fluoranthene	<10	<10	<10	<10	<10	<10	<10	<10	<10
Benzoic acid	<50	<50	<50	<50	<50	<50	<50	<50	<50
Benzyl alcohol	<10	<10	<10	<10	<10	<10	<10	<10	<10
bis(2-Chloroethoxy)methane	<10	<10	<10	<10	<10	<10	<10	<10	<10
bis(2-Chloroethyl)ether	<10	<10	<10	<10	<10	<10	<10	<10	<10
Bis(2-chloroisopropyl)ether	<10	<10	<10	<10	<10	<10	<10	<10	<10
bis(2-Ethylhexyl)phthalate	<10	<10	<10	<10	<10	<10	<10	<10	<10
Butylbenzylphthalate	<10	<10	<10	<10	<10	<10	<10	<10	<10
Chrysene	<10	<10	<10	<10	<10	<10	<10	<10	<10
Di-n-butylphthalate	<10	<10	<10	<10	<10	<10	<10	<10	<10
Di-n-octylphthalate	<10	<10	<10	<10	<10	<10	<10	<10	<10
Dibenz(a,h)anthracene	<10	<10	<10	<10	<10	<10	<10	<10	<10
Dibenzofuran	<10	<10	<10	<10	<10	<10	<10	<10	<10
Diethylphthalate	<10	<10	<10	<10	<10	<10	<10	<10	<10
Dimethylphthalate	<10	<10	<10	<10	<10	<10	<10	<10	<10
Fluoranthene	<10	<10	<10	<10	<10	<10	<10	<10	<10
Fluorene	<10	<10	<10	<10	<10	<10	<10	<10	<10
Hexachlorobenzene	<10	<10	<10	<10	<10	<10	<10	<10	<10
Hexachlorobutadiene	<10	<10	<10	<10	<10	<10	<10	<10	<10
Hexachlorocyclopentadiene	<10	<10	<10	<10	<10	<10	<10	<10	<10
Hexachloroethane	<10	<10	<10	<10	<10	<10	<10	<10	<10
Indeno(1,2,3-c,d)pyrene	<10	<10	<10	<10	<10	<10	<10	<10	<10
Isophorone	<10	<10	<10	<10	<10	<10	<10	<10	<10
n-Nitrosodi-n-Propylamine	<10	<10	<10	<10	<10	<10	<10	<10	<10
n-Nitrosodimethylamine	<10	<10	<10	<10	<10	<10	<10	<10	<10

Table 5-9

Base-Neutral and Acid Extractables Results for Groundwater and Surface Water Samples
Site 2 - Landfill 2
Confirmatory Studies
Fort Story, Virginia

Parameter/Analyte	**SW3001**	**SW3001D**	**SW3002**	**MW105**	**MW106**	**MW107**	**MW108**	**MW109**	**MW109D**
Base-Neutral and Acid Extractables (µg/L) (cont.)									
n-Nitrosodiphenylamine/Diphenylamine	<10	<10	<10	<10	<10	<10	<10	<10	<10
Naphthalene	<10	<10	<10	<10	<10	<10	<10	<10	<10
Nitrobenzene	<10	<10	<10	<10	<10	<10	<10	<10	<10
Pentachlorophenol	<50	<50	<50	<50	<10	<10	<10	<50	<50
Phenanthrene	<10	<10	<10	<10	<10	<10	<10	<10	<10
Phenol	<10	<10	<10	<10	<10	<10	<10	<10	<10
Pyrene	<10	<10	<10	<10	<10	<10	<10	<10	<10

Table 5-10

Pesticides/Polychlorinated Biphenyls Results for Groundwater and Surface Water Samples
Site 2 - Landfill 2
Confirmatory Studies
Fort Story, Virginia

Parameter/Analyte	SW3001	SW3001D	SW3002	MW105	MW106	MW107	MW108	MW109	MW109D
Pesticides/Polychlorinated Biphenyls (µg/L)									
4,4'-DDD	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
4,4'-DDE	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
4,4'-DDT	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Aldrin	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
alpha-BHC	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Aroclor-1016	<1	<1	<1	<1	<1	<1	<1	<1	<1
Aroclor-1221	<2	<2	<2	<2	<2	<2	<2	<2	<2
Aroclor-1232	<1	<1	<1	<1	<1	<1	<1	<1	<1
Aroclor-1242	<1	<1	<1	<1	<1	<1	<1	<1	<1
Aroclor-1248	<1	<1	<1	<1	<1	<1	<1	<1	<1
Aroclor-1254	<1	<1	<1	<1	<1	<1	<1	<1	<1
Aroclor-1260	<1	<1	<1	<1	<1	<1	<1	<1	<1
beta-BHC	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Chlordane	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
delta-BHC	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Dieldrin	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan I	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Endosulfan II	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan sulfate	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin Aldehyde	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
gamma-BHC	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Heptachlor	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Heptachlor epoxide	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Methoxychlor	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Toxaphene	<5	<5	<5	<5	<5	<5	<5	<5	<5

Table 5-11

Total Fuel Hydrocarbon Results for
Groundwater and Surface Water Samples
Site 2 - Landfill 2
Confirmatory Studies
Fort Story, Virginia
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Compound	SW3001	SW3001D	SW3002	MW105	MW106	MW107	MW108	MW109	MW109D
Total Fuel Hydrocarbons (µg/L)									
Hydrocarbons as Diesel Fuel	<300	<300	<300	<300	<300	<300[UJ,a]	<300	<300	<300
Hydrocarbons as Gasoline	NA	NA	NA	<50	NA	NA	NA	NA	NA
Hydrocarbons as Heavy Oils	<2,000	<2,000	<2,000	<2,000	<2,000	<2,000[UJ,a]	<2,000	<2,000	<2,000

a = Concentration qualified due to low surrogate spike recovery.
UJ = Associated non-detection is an estimated quantity. Results are qualitatively acceptable.
NA = Not Analyzed

Table 5-12

Total Metals Results for Groundwater and Surface Water Samples
Site 2 - Landfill 2
Confirmatory Studies
Fort Story, Virginia
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Parameter/Analyte	SW3001	SW3001D	SW3002	MW105	MW106	MW107	MW108	MW109	MW109D
Metals (µg/L)									
Aluminum	**0.6**	**0.56**	<0.34	**1.1**	**1.1**	**3.4**	**2.3**	**8.6**	**9.4**
Antimony	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Arsenic	<0.01	<0.01	<0.1	<0.1	<0.01	**0.027**	**0.022**	**0.016**	**0.016**
Barium	**0.022**	**0.019**	**0.064**	<0.01	**0.024**	**0.073**	**0.027**	**0.047**	**0.053**
Beryllium	<0.004	<0.004	<0.004	<0.004	**0.004**	**0.004**	**0.004**	<0.004	<0.004
Cadmium	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Calcium	**5.8**	**6.1**	**21**	**16**	**3.1**	**69**	**15**	**8.5**	**9.2**
Chromium	<0.01	<0.01	<0.01	<0.01	<0.01[UJ]	<0.01[UJ]	<0.01[UJ]	0.014	**0.015**
Cobalt	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Copper	<0.025	<0.025	<0.025	<0.025	<0.025	**0.2**	<0.025	<0.025	<0.025
Iron	**12**	**11**	**33**	**4.1**	**1.5**	**31**	**31**	**14**	**15**
Lead	**0.0087**	**0.0061**	<0.005	<0.005	<0.005	**0.016**	**0.018**	**0.015**	**0.016**
Magnesium	**4.1**	**4.3**	**6.9**	**1.3**	**0.56**	**3.4**	**6.4**	**3.9**	**4.1**
Manganese	**0.17**	**0.17**	**0.55**	**0.04**	**0.051**	**0.56**	**0.44**	**0.28**	**0.29**
Mercury	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Nickel	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
Potassium	<1	<1	**3.2**	<1	<1	**1.6**	**4.2**	**3.2**	**3.3**
Selenium	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Silver	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Sodium	**14**	**15**	**22**	**8.3**	**3.1**	**6.3**	**15**	**11**	**12**
Thallium	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Vanadium	<0.01	<0.01	<0.01	<0.01	<0.01	**0.012**	<0.01	**0.02**	**0.022**
Zinc	**0.049**	**0.053**	**0.023**	<0.02	**0.038**	**0.28**	**0.46**	**0.06**	**0.084**

Table 5-13

Dissolved Metals Results for Groundwater and Surface Water Samples
Site 2 - Landfill 2
Confirmatory Studies
Fort Story, Virginia
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Parameter/Analyte	SW3001	SW3001D	SW3002	MW105	MW106	MW107	MW108	MW109	MW109D
Metals (µg/L)									
Aluminum	**0.38**	**0.38**	<0.20	<0.20	**0.25**	<0.20	**1.2**	**1.5**	**1.5**
Antimony	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Arsenic	<0.01	<0.01	<0.01	<0.1	<0.01	0.027	0.022	<0.010	<0.010
Barium	0.016	0.016	0.041	<0.01	0.024	0.055	0.021	0.022	0.021
Beryllium	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Cadmium	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Calcium	**4.9**	**5**	**19**	**12**	**1.7**	**69**	**15**	**7.2**	**7.2**
Chromium	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.010	<0.010
Cobalt	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Copper	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Iron	**8.5**	**8.7**	**11**	**1.6**	**0.7**	**21**	**28**	**9.8**	**9.9**
Lead	<0.0050	<0.0050	<0.005	<0.005	<0.005	<0.005	<0.005	<0.0050	<0.0050
Magnesium	**3.9**	**3.9**	**6.7**	**1.1**	**0.53**	**3.4**	**6.3**	**3.1**	**3.2**
Manganese	**0.15**	**0.16**	**0.48**	**0.025**	**0.044**	**0.56**	**0.43**	**0.23**	**0.22**
Mercury	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Nickel	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.004
Potassium	<1	<1	**3**	<1	<1	**1.6**	**4.3**	**2.6**	**2.8**
Selenium	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Silver	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Sodium	**15**	**15**	**6.7**	**9.9**	**3.1**	**7**	**16**	**11**	**12**
Thallium	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Vanadium	<0.01	<0.01	<0.01	<0.01	<0.01	<0.010	<0.01	<0.010	<0.010
Zinc	**0.039**	**0.06**	**0.13**	<0.02	0.037	0.049	0.025	0.021	<0.020

Table 5-14

Miscellaneous Analytes Results for Groundwater and Surface Water Samples
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Parameter/Analyte	SW3001	SW3001D	SW3002	MW105	MW106	MW107	MW108	MW109	MW109D
Miscellaneous (µg/L)									
Alkalinity (to pH 4.5) as CaCO3	<1	**2.2**	**27**	**15**	NA	NA	NA	**33**	**37**
Ammonia-N	**0.13**	**0.12**	**0.21**	**0.074**	NA	NA	NA	**3**	**3.5**
Chloride	**32**	**34**	**50**	**14**	NA	NA	NA	**20**	**25**
Fluoride	<0.2	<0.2	<0.2	<0.2	NA	NA	NA	<0.2	<0.2
Nitrate-N	<0.05	**0.13**	**0.17**	<0.05	NA	NA	NA	<0.05	<0.05
Nitrite-N	<0.05	<0.05	<0.05	<0.05	NA	NA	NA	<0.05	<0.05
Orthophosphate-P	<0.05	<0.5	<0.05	0.08	NA	NA	NA	**0.096**	**0.08**
Sulfate as SO4	<5	**7.2**	<5	**13**	NA	NA	NA	**8.9**	**8.9**
Sulfide	<0.4	<0.4	<0.4	<0.4	NA	NA	NA	<0.4	<0.4
Total Dissolved Solids	**180**	**170**	**150**	**44**	NA	NA	NA	**200**	**160**
Total Phosphorus (365.4)	**0.45**	**0.32**	**0.49**	**0.13**	NA	NA	NA	**0.82**	**0.76**

NA = Not analyzed

6.0 ANALYTICAL DATA QUALITY CONTROL RESULTS

The following is a summary of the analytical quality control (QC) results for the sediment, surface water and groundwater samples collected for the Fort Story CS project. The field program was conducted in accordance with the quality assurance (QA) program requirements presented in the *CDAP* as described in Section 4. This section defines the data quality objectives (DQOs) for laboratory measurement systems. The DQOs are quantitative and qualitative statements that specify the quality of data required to meet the project objectives. The data produced for the CS project must meet the DQOs in order to support decision making on the project sites. The DQOs and QC program described in the *CDAP* provided the structure for review of the chemical data results.

Savannah Laboratories, a USACE approved laboratory, performed chemical analyses for project samples. Samples analyzed by Savannah Laboratories, according to the methods specified in Table 5-1 included field samples from sediment, groundwater and surface water media and associated QC samples. The methods include volatile organic compounds (VOCs), base-neutral and acid extractable compounds (BNAs), pesticides/polychlorinated biphenyls (Pest/PCBs), total fuel hydrocarbons-light fraction (TFH-L), total fuel hydrocarbons-heavy fraction (TFH-H), metals and water quality parameters. Table 3-1 presents a cross-reference of the field and laboratory identification numbers. This table also shows the sample matrix and the date collected.

As an additional means to support the quality of field sample results, QA split samples were analyzed by the USACE's Missouri River Division (MRD) Laboratory. QA split samples were collected from the same location and at the same time as the corresponding field duplicate samples. Because Savannah Laboratories and MRD use standard analytical methods and units of measurement for all analyses, the results of the QA split samples may be used to evaluate the performance of Savannah Laboratories during this analytical period. The QA split sample results were not available at the time this report was generated. These data will be submitted to the USACE by the MRD Laboratory under separate cover.

Montgomery Watson reviewed the analytical data results according to the guidelines specified in the *CDAP* (Montgomery Watson, 1995), EPA SW-846, and the EPA guidance documents, including *National Functional Guidelines for Organic Data Review* (EPA, 1991), *Laboratory Data Validation Functional Guidelines for Evaluation of Inorganic Analyses* (EPA, 1988), and Savannah Laboratories' *Comprehensive Quality Assurance Plan* (*CQAP*). The data review was based on the sample and QC result summaries discussed in this section. Data quality was evaluated in terms of the following data quality criteria: precision, accuracy, representativeness, completeness and comparability (PARCC). These criteria are described in Section 6.1 The QC results for each type of analysis are through Section 6.2 through 6.7. QC results summary tables are presented in Appendices E, F and G.

The quality of environmental data is a function of both field and laboratory procedures, including the sampling design and sample collection in the field, as well as the analytical methods and instrumentation employed by the laboratories. The sampling and analytical components both contain potential sources of uncertainty, error and biases that may affect the overall quality of measurement.

The field component was evaluated and presented in Sections 2 through 4. These sections describe potential sources of uncertainty associated with the field sampling program, including sampling measurement error or inappropriate application of procedures and protocols during sample handling, packaging and transportation. All deviations from the planned sampling activities are documented in Sections 2 through 4.

Based on a review of the field program, Montgomery Watson concluded that an adequate number of sediment, groundwater and surface water field samples were collected during the field sampling effort and the integrity of the field samples was maintained. Therefore, the samples collected and submitted for analysis are of known quality and can be considered useful for the purposes for which they were collected.

6.1 DATA QUALITY OBJECTIVES

This section describes the PARCC DQOs and describes the procedures used to evaluate each objective or parameter. The analytical data were evaluated in terms of the PARCC criteria. The PARCC criteria present an indication of data quality and the confidence that a particular compound may be present or absent in an associated field sample. The types of QC data used to evaluate each PARCC objective are described in Table 6-1. The QC data generated for each type of analysis are presented, with one section for each of the five PARCC objectives or parameters in the following section. A brief description of each objective is presented below. In Section 7, this information is used to evaluate whether the DQOs have been met.

Analytical QC samples were used to document the quality of the associated field sample results and to evaluate the performance of the laboratory during the period in which the project samples were analyzed. QC samples include: laboratory control samples (LCSs) and laboratory control sample duplicates (LCSDs), matrix spike/matrix spike duplicates (MS/MSDs), field duplicates, surrogate spikes, method blanks, trip blanks, and rinsate blanks. These samples were used to evaluate the different PARCC criteria, as shown in Table 6-1.

6.1.1 Precision

Precision refers to the reproducibility of measurements of the same characteristics under a given set of prescribed conditions. Precision is expressed as the relative percent difference (RPD) between duplicate measurements. The precision of chemical analyses was assessed by the MS/MSD sample pairs, LCS pairs, field duplicate samples, and QA split samples. As stated previously, the QA split sample results will be submitted to the USACE by the MRD Laboratory under separate cover from this report.

The results of duplicate samples are used to calculate a RPD value:

$$RPD = \frac{\left| (D_1 - D_2) \right|}{\frac{(D_1 + D_2)}{2}} \times 100$$

where D_1 and D_2 are the reported concentrations for sample and duplicate analyses. The RPD value is the measure of precision.

Table 6-1

PARCC Quality Control Samples And Criteria
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Analysis	Parameter	Quality Control Sample/Criteria	Measurement
Volatile Organic Compounds	Precision	MS/MSD, LCS/LCSD and field duplicate samples	RPD
	Accuracy	MS, MSD, LCS and surrogate standards	% Recovery
	Representativeness	Method blank, field blank, rinsate blank and trip blank	Detectable quantities
	Comparability	Standard methods	Deviations
	Completeness	QC control limits and corrective action, criteria, and holding times	Deficiencies and nonconformances
Base, Neutral, Acid Extractable Compounds	Precision	MS/MSD, LCS/LCSD and field duplicate samples	RPD
	Accuracy	MS, MSD, LCS and surrogate standards	% Recovery
	Representativeness	Method blank, field blank and rinsate blank	Detectable quantities
	Comparability	Standard methods	Deviations
	Completeness	QC control limits and corrective action, criteria, and holding times	Deficiencies and nonconformances
Organochlorine Pesticides and PCBs	Precision	MS/MSD, LCS/LCSD and field duplicate samples	RPD
	Accuracy	MS, MSD, LCS and surrogate standards	% Recovery
	Representativeness	Method blank, field blank, and rinsate blank	Detectable quantities
	Comparability	Standard methods	Deviations
	Completeness	QC control limits and corrective action, criteria, and holding times	Deficiencies and nonconformances
Total Fuel Hydrocarbons	Precision	MS/MSD, LCS/LCSD and field duplicate samples	RPD
	Accuracy	MS, MSD, LCS and surrogate standards	% Recovery
	Representativeness	Method blank, field blank, and rinsate blank	Detectable quantities
	Comparability	Standard methods	Deviations
	Completeness	QC control limits and corrective action, criteria, and holding times	Deficiencies and nonconformances
Metals	Precision	MS/MSD, LCS/LCSD and field duplicate samples	RPD
	Accuracy	MS, MSD and LCS	% Recovery
	Representativeness	Method blank, field blank and rinsate blank	Detectable quantities
	Comparability	Standard methods	Deviations
	Completeness	QC control limits and corrective action, criteria, and holding times	Deficiencies and nonconformances
Inorganic Parameters	Precision	MS/MSD, LCS/LCSD and field duplicate samples	RPD
	Accuracy	MS, MSD and LCS	% Recovery
	Representativeness	Method blank, field blank and rinsate blank	Detectable quantities
	Comparability	Standard methods	Deviations
	Completeness	QC control limits and corrective action, criteria, and holding times	Deficiencies and nonconformances

LCS = Laboratory Control Sample
LCSD = Laboratory Control Sample Duplicate
MS = Matrix Spike
MSD = Matrix Spike Duplicate
RPD = Relative Percent Difference
QC = Quality Control
PCB = Polychlorinated biphenyls
PARCC = Precision, Accuracy, Representativeness, Comparability and Completeness

RPD values are calculated for all duplicate samples: field duplicates, MS/MSD samples, and LCS duplicates. MS/MSD samples were used by the laboratory as the primary means of assessing matrix-specific and possible site-specific precision. The RPD for each sample pair was calculated from percent recovery of spiked compounds. In the absence of an MS/MSD pair, two LCSs were analyzed in each analytical batch as an alternate means for assessing batch-specific precision. Field duplicate sample results are assessed for possible sample heterogeneity and indicate a combination of laboratory and field sampling precision. They are evaluated qualitatively by calculating RPD.

6.1.1.1 Laboratory Control Samples. An LCS consists of a controlled, interference-free matrix that is spiked with a representative number of the target analytes prior to sample preparation and analyses. Laboratory reagent-grade water was used to prepare an aqueous LCS. The nonaqueous LCS was prepared with standard sand, approved by the American Society for Testing and Materials (ASTM) for its homogeneity. The LCS was then prepared and extracted using all steps of the analytical method. Thus the LCS measured the efficiency of the complete analytical method in recovering target analytes from either a solid or aqueous matrix in the absence of matrix interferences. Because a known amount of analyte was added to the sample, the detected concentration could be compared with the known concentration. LCSs were often run in pairs to measure precision. At a minimum, a single LCS was prepared and analyzed with every batch of samples (up to a maximum of 20 field samples) for each matrix.

6.1.1.2 Matrix Spike and Matrix Spike Duplicate Samples. MS and MSD samples were part of a single field sample collected in separate containers. Like the LCS, the MS/MSD samples were spiked in the laboratory with a representative number of target analytes prior to preparation and analyses. However, the MS/MSD sample may include matrix interferences, unlike the interference-free matrix of the LCS. The MS/MSD samples were used to measure the efficiency of the laboratory and the analytical method used in recovering target analytes from the actual sample itself. The MS/MSD provides more information than the LCS about the potential interference or matrix suppression of a compound in a site-specific matrix. Site-specific MS/MSD samples were collected at a frequency of one MS/MSD pair per every 20 field samples collected. The MS/MSD samples were prepared and analyzed by the laboratory at a rate of one set per batch of samples (up to a maximum of 20 field samples) for each matrix.

The acceptance criteria used for LCS and MS/MSD samples are specified in the *CDAP*, and are listed in the Appendix E and Appendix F QC results summary tables. The acceptance criteria are specific for each type of analysis and matrix.

6.1.1.3 Field Duplicate Sample. Field duplicate samples were collected from a composited and homogenized sample of an environmental matrix. However, VOC and TFH-L field duplicate sample pairs were collected as discrete (or grab) samples only. These samples are not composited or homogenized in order to reduce the potential loss of volatile target compounds. Field duplicate samples were collected at a rate of one duplicate sample for every 10 field samples collected for each matrix. These duplicate sample identifications were submitted blind to the laboratory. The data were evaluated qualitatively to assess precision and possible matrix heterogeneity.

In the absence of field duplicate sample results, it is often not possible to identify the specific source of imprecision (i.e., field or analytical imprecision). Possible sources of poor precision include sample heterogeneity, improper handling of samples, or imprecise preparation or analysis of the samples. To limit these types of nonconformances, procedures were implemented in the field and the laboratory to collected and analyzed representative samples, and standard operating procedures were also implemented as specified in the *CDAP*.

Unlike other types of QC samples that include a spike, target analytes or non-target analytes, substantially fewer positive results were obtained for field duplicate samples, particularly for organic compounds. Since RPDs were calculated only when a compound was detected, fewer RPD data pairs were generated. However, the information obtained from field duplicates were of substantial value for several reasons.

First, results do not include measurement of potential bias occurring in the analytical system due to problems associated with spiking analytes into a sample matrix (particularly soil or product matrices). Although the number of positive duplicate sample results are small, generally they are considered representative of the larger data set in terms of analytes and concentration levels. This assumes that the field duplicates collected at a rate of approximately 10 percent of the total number of samples were relatively well distributed. Table 6-2 shows the field duplicate QC acceptance criteria for each sample matrix and chemical parameter analyzed for the Fort Story CS project.

6.1.2 Accuracy

Accuracy refers to the degree of a measurement agrees with the true value. This DQO was evaluated based on the results from the MS/MSD, surrogate standard, internal standards, and LCS recovery results. The accuracy of the data collected in support of this project was assessed by calculating the percent recovery of analytes in the QC sample results.

Accuracy was assessed by adding a known concentration of an analyte (or analytes) to a sample and then analyzing the sample for the added analyte(s). The accuracy was evaluated by comparing the true value with the concentration recovered. Percent recovery was calculated using the equation:

$$\text{Percent Recovery} = \frac{(A\text{-}B)}{C} \times 100$$

where: A = measured analyte concentration in the spiked sample

B = measured concentration of the spiked analyte in the unspiked sample

C = actual concentration of the spiked analyte

As stated previously, accuracy was assessed by analyzing MS/MSD samples, LCS samples, internal standards, and surrogate spike samples. The percent recovery was calculated for each analyte or compound spiked in a sample and compared against the acceptance criteria. Acceptance criteria for surrogate spikes were specified by the analytical method. LCS and MS/MSD spike recoveries were compared to limits derived from a statistical performance of the laboratory over a specific period of time. These criteria are specific to each analytical method. They are discussed in this section and listed in the Appendix E and Appendix F QC results summary tables.

Table 6-2

Acceptance Limits For Field Duplicate QC Samples
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	Relative Percent Difference			
	Water		Soil/Sediment	
Parameter	**High[(a)]**	**Low**	**High**	**Low**
Metals	10	25	20	30
VOCs	20	40	30	50
Base/Neutral/Acids	20	40	30	50
Pesticides/PCB	20	40	30	50
TFH-H	20	40	30	50
TFH-L	20	40	30	50
Inorganic parameters	10	25	20	30

All results shown in percent.

(a) Duplicate precision is calculated as the relative percent difference (RPD) between the sample and duplicate. Low level refers to concentrations less than 10 times the detection limit. High level refers to concentrations greater than 10 times the detection limit.

PCB = Polychlorinated biphenyls
TFH-H = Total fuel hydrocarbons - heavy fraction
TFH-L = Total fuel hydrocarbons - light fraction
VOCs = Volatile Organic Compounds

Spike recoveries outside the acceptable QC accuracy limits indicate bias in the analytical results. The reported data may overestimate or underestimate the actual concentration of compounds detected and quantitation limits reported in field samples. The recoveries outside acceptable QC limits may be caused by factors such as matrix interference as well as the factors attributed to poor field and analytical precision. In the case of MS/MSD samples, the presence of the analyte in the sample can also affect recovery. Dilutions made to quantitate target analytes or reduce matrix interference can also affect recovery.

Surrogate standard compounds were added to all samples analyzed for VOCs, BNAs, Pest/PCBs, and TFH prior to sample preparation. Surrogate spikes were added to every blank, field sample, MS/MSD, LCS, QC sample, and standard, for these analyses. These compounds mimic the target analytes and should not have a potential for interference from any target analytes. Surrogate results indicated the effectiveness of the extraction and analysis steps on individual samples; therefore, surrogate results are sample-specific QC indicators. Because a known amount of surrogate was added to each sample, the detected concentration was compared with the known concentration. Surrogate limits are specified by each analytical method for each matrix. They are discussed in this section, and listed in the Appendix G QC results summary tables.

6.1.3 Representativeness

Representativeness is a qualitative parameter, unlike precision or accuracy. In terms of overall data quality, representativeness may be one of the most important DQO criteria. This objective expresses how the data represent the characteristics of a population, parameter variation at a sampling point, or environmental conditions. It was evaluated by reviewing the results of the various QC blank samples. Positive detection of compounds in a blank sample indicates the possible contamination may have been introduced to the associated field samples during sample collection, transport, or analysis, thus providing an estimate of potential bias due to contamination. Method blanks, rinsate blanks, trip blanks, field blank samples and source water samples were analyzed to determine if contamination sources not associated with the environmental conditions may have entered the sampling and/or analysis process.

6.1.3.1 Method Blank Samples. A method blank is a laboratory-grade water or a solid matrix that contains all of the method reagents and is processed through all steps of sample preparation and analysis. A method blank sample was prepared and analyzed with every analytical batch of samples and was used to measure the combined contamination emanating from the laboratory source water, instruments, reagents and sample preparation steps. As specified in the *CDAP,* method blank samples were required to have no detectable concentrations of the target analytes above the method reporting level (MRL). If an analyst noticed an increase in the method blank concentration beginning to approach the MRL, the source of contamination had to be investigated before further analyses were performed. After receipt from the laboratory, reported data were qualified as "not detected" if the compound detected in the blank sample was also detected in the field sample at a concentration within five times that which was detected in the blank sample (EPA, 1991). If the compound detected in a blank sample is one of five common laboratory contaminants [methylene chloride, acetone, methyl ethyl ketone (2-butanone), or common phthalate esters], the results of the associated samples were qualified as not detected when the sample concentration was less than 10 times the blank concentration (EPA, 1991). Method blanks were prepared for each sample analytical batch for all project scheduled analyses.

6.1.3.2 Trip Blank Samples. Trip blank samples were used to identify possible contamination originating from sample transport, shipping, storage and site conditions. A trip blank was prepared in the laboratory by filling a VOC vial with reagent grade water preserved to a pH of less than two with hydrochloric acid. Each trip blank VOC vial was filled with water (with no air bubbles). The trip blanks were transported to the site with the sample containers, stored with the field samples, and returned to the laboratory for analysis. They were not opened until they were ready for analysis in the laboratory. Trip blanks were shipped with each set of samples to be analyzed for VOCs.

6.1.3.3 Field Blank Samples. Field blank samples were collected from the de-ionized water source used for the final decontamination rinse of the sampling equipment and for the rinsate blank sample water. These samples assess the level of background chemicals present in the water used for decontamination. The source for the field blank sample was analyte-free deionized water. Field blank samples were analyzed for all the project-required analyses with the exception of dissolved metals.

6.1.3.4 Source Water Samples. Fort Eustis potable water (source water) was used as part of the equipment decontamination procedure. As part of the Landfill 7 and 15 monitoring program, a water sample was collected from the wastewater treatment plant in 1994 and analyzed to assess levels of background chemicals in the Fort Eustis potable water.

6.1.4 Completeness

Completeness measures whether all of the information necessary to meet the objectives of the project were collected and were usable for the intended purposes of the project. Completeness of analytical results was defined in the *CDAP* as the percentage of acceptable data relative to the number of tests conducted. The quality of the field data was compromised if there was unacceptable QC data related to precision, accuracy or representativeness. If data quality was not acceptable, associated field data could not be used. Completeness was evaluated to determine if the level of data obtained was sufficient to complete a valid scientific assessment.

The completeness of the QC data was evaluated by comparing the number of QC samples collected to the number of QC samples required. Completeness of the analytical data was evaluated in terms of the number of samples with acceptable analytical results as compared to the total number of analyses conducted. Data completeness would be affected if, for instance, a sample was lost because of container breakage during transit, or if the sample was not logged correctly. As specified in the *CDAP,* the goal for completeness for all QC parameters, except holding times, was 90 percent. The goal for holding times was 95 percent.

6.1.5 Comparability

Comparability is the expression of the confidence with which one set of data can be qualitatively compared to another. Comparability was a prime concern given that data produced from the CS project field effort will be integrated with historical data. Special consideration was given to the comparability of historical data used to support this project.

Comparability of the analytical process was a qualitative assessment to determine if the analytical results reported were equivalent to data obtained from similar analyses. When evaluating analytical comparability, it was important to ensure that correct analytical methods were used throughout the analytical period and that samples requiring dilution were identified. When samples were diluted, the analytical results for the samples were reported as having higher reporting limits. Sample dilutions usually were caused by high concentrations of target analytes or contaminant matrix interferences.

The primary level of concern regarding comparability was whether the field sampling techniques, analytical procedures and concentration units of one set of data can be compared with another. To achieve comparability, field procedures were standardized by adhering to standard operating procedures; laboratory procedures follow EPA analytical methodologies that utilize standard units of measure and techniques. The primary analytical comparability concerns between data sets were analytical procedures and concentration units. Standard analytical methods and consistent concentration units were used for all project samples. The following sections present a review of QC data for each analytical method.

6.2 VOLATILE ORGANIC COMPOUNDS

Five sediment, five groundwater, and two surface water samples and the associated QC samples were collected at Site 2 - Landfill 2 and analyzed for VOCs by EPA Method 8240. The following is a brief summary of the analytical nonconformances associated with the QC data for the VOCs analyses.

6.2.1 Precision and Accuracy

Precision and accuracy were assessed through the results from LCSs, MS/MSD samples, surrogate recoveries, and field duplicate samples. The LCS, MS/MSD and surrogate results are summarized in Appendices E, F and G, respectively. Duplicate sample results are summarized in this section and also are presented next to the corresponding sample results in the analytical results tables in Section 5. The following is a brief description of the QC nonconformances associated with VOC analysis.

The VOCs analysis samples were spiked with three surrogate standards: 1, 2-dichloroethane, 4-bromofluorobenzene and toluene-d8. Surrogate recoveries were within acceptance criteria for all matrices, except for those presented in Table 6-3 and discussed below.

Sediment samples S2SD3003 and S2SD3002 had low surrogate recoveries of 67 and 67 percent, which are below the 68 percent control limit for 4-bromofluorobenzene. The results for these samples were qualified with a "J" for detected compounds and "UJ" for non-detects.

All VOC MS/MSD and LCS recoveries were within acceptance limits.

During the CS field investigation program, one duplicate sample each for sediment, groundwater and surface water was collected. Each media sample and their corresponding field duplicate sample had at least one detectable concentration of VOCs. Table 6-4 presents the field sample and field duplicate sample results and their corresponding RPDs. All precision results for field duplicate samples were within acceptance criteria.

Table 6-4

Field Duplicate Sample Results Summary
Volatile Organic Compounds
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Sample Identification*	Matrix	Analyte	Field Sample Result (µg/kg)	Field Duplicate Sample Result (µg/kg)	Relative Percent Difference (%)	Control Limit (%)	Relative Percent Difference Acceptable
SD3005	Sediment	Acetone	750	700	7	30	Yes
	Sediment	Toluene	90	<42	NC	50	NAP
MW109	Groundwater	2-Butanone	12	<10	NC	40	NAP
SW3001	Surface Water	Toluene	2.9	2.2	27	40	Yes

* = Only analytes detected in the field and/or duplicate samples are presented.
NC = Not Calculated
NAP = Not Applicable

Table 6-3

Volatile Organic Compounds
Surrogate Recovery Nonconformances
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Sample ID	Matrix	Surrogate	Recovery (%)	Surrogate Control Limits	Percent Recovery Acceptable?
S2SD30030128	Soil	1,2-Dichloroethane-d4	93	64-126	Yes
		Toluene-d8	131	84-138	Yes
		4-Bromofluorobenzene	67	68-123	No
S2SD30020128	Soil	1,2-Dichloroethane-d4	94	64-126	Yes
		Toluene-d8	130	84-138	Yes
		4-Bromofluorobenzene	67	68-123	No

6.2.2 Representativeness

Representativeness for VOCs analysis was assessed using the results of the method blank, rinsate blank, trip blank, and field blank sample results. Table 6-5 presents the field water VOC results. Table 6-6 presents the trip blank VOC results. There were no detectable concentrations of VOCs in method blank samples, trip blank samples, or field blank samples.

6.2.3 Comparability

The laboratory utilized the protocols specified in the *CDAP,* Savannah Laboratories *CQAP,* and *EPA SW-846*; therefore, these data were considered comparable to previous data and future data collected according to the specified protocol.

6.2.4 Completeness

Completeness was evaluated as a measure of whether all the necessary information to meet the objectives of the project was generated based on the planned samples stated in the *CDAP.*

All coolers were received within the required temperature of 4°C (+/- 2°C). All samples received by the laboratory contained the correct preservatives.

All samples were analyzed within the specified method holding times for VOC analysis. Therefore, the completeness goal of 95 percent for holding times was met.

For all media, the actual number of field samples and associated QC samples collected and analyzed met the number planned. Therefore, the analytical QC completeness goal of 90 percent was met for VOC analysis.

6.3 BASE-NEUTRAL AND ACID EXTRACTABLE COMPOUNDS

Five sediment, five groundwater, and two surface water samples, and the associated QC samples, were collected from Site 2 - Landfill 2 and analyzed for BNAs by EPA Method 8270. The following is a brief summary of the analytical nonconformances associated with the QC data reported for the BNAs analyses.

6.3.1 Precision and Accuracy

Precision and accuracy were assessed through the results from surrogate recoveries, MS/MSD samples, LCS, and field duplicate samples. The LCS, MS/MSD and surrogate results are summarized in Appendices E, F and G, respectively. Duplicate sample results are summarized in this section and also presented next to the corresponding sample results in the analytical results tables in Section 5. The following is a brief description of the QC nonconformances associated with these parameters.

The BNA samples were spiked with six surrogate standards: 2,4,6-tribromophenol, 2-fluorobiphenyl, 2-fluorophenol, nitrobenzene-d5, phenol-d5, and terphenyl-d14. All surrogate recoveries were within the acceptance criteria for all matrices with the exceptions presented in Table 6-7. The laboratory implemented corrective action procedures according to the *CDAP* specifications. Data were not qualified with respect to surrogate recovery outliers unless two or more BNA surrogates, within the same fraction (base-neutral or acid fraction), were outside the acceptance limits (EPA, 1991).

The following samples had percent recoveries for 4-terphenyl-d14 that were below the control limit of 46 percent: S2MW107 (28%), S2MW108 (21%), S2MW109 (27%), S2MW109D (30%), S2SW3002 (38%), S23001 (30%), and S2SW3001D (33%). Per EPA guidance, these sample results were not qualified based on one surrogate within a sample fraction whose results fell outside the acceptance criteria.

The BNAs analysis utilizes six representative matrix spike compounds for LCSs, which are listed in Appendix F. All of the LCS precision and accuracy results were within acceptance limits with one exception. The LCS/LCSD RPD for 4-chloro-3-methylphenol was calculated to be 19 percent, which was outside the precision control limit of 17 percent for Batch 0207G. Because the percent recoveries for this compound were within acceptance criteria, the sample results associated with this batch (Sample S2DI1) were not qualified.

During the CS field program, one duplicate sample each for sediment groundwater and surface water were collected. BNAs were not detected in either the field and corresponding duplicate samples; therefore, precision could not be assessed for this parameter.

6.3.2 Representativeness

Representativeness for BNAs analysis was assessed using the results of the method blank and field blank sample results. Table 6-8 presents the field water sample results. There were no detectable concentrations of BNAs in method blanks, or field blank samples.

6.3.3 Comparability

The laboratory utilized the protocols specified in the *CDAP, CQAP* and EPA SW-846; therefore, these data were considered comparable to previous data and future data collected and analyzed according to the specified protocol.

6.3.4 Completeness

Completeness was evaluated as a measure of whether all the necessary information to meet the objectives of the project had been generated based on the planned samples stated in the *CDAP*.

All coolers were received within the specified temperature of 4°C (+/- 2°C). All samples received by the laboratory contained the correct preservatives.

The holding times criteria was met for all other samples collected for analysis of BNAs. Therefore, the completeness goal of 95 percent for holding times was met.

For all media, the planned number of samples were collected and analyzed. Therefore, the analytical QC completeness of 90 percent was met for the BNA analysis.

Table 6-5

Field Water Volatile Organic Compounds Results
Site 2 - Landfill 2
Confirmatory Studies
Fort Story, Virginia
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Parameter/Analyte	S2DI1	DI2903*
VOCs (µg/L)		
1,1,1-Trichloroethane	<1.0	<5.0
1,1,2,2-Tetrachloroethane	<1.0	<5.0
1,1,2-Trichloroethane	<1.0	<5.0
1,1-Dichloroethane	<1.0	<5.0
1,1-Dichloroethene	<1.0	<5.0
1,2-Dichloroethane	<1.0	<5.0
1,2-Dichloropropane	<1.0	<5.0
2-Butanone (MEK)	<1.00	<50
2-Hexanone	<1.00	<50
4-Methyl-2-pentanone (MIBK)	<1.00	<50
Acetone	<1.00	<50
Benzene	<1.0	<1.0
Bromodichloromethane	<1.0	<5.0
Bromoform	<1.0	<5.0
Bromomethane	<2.0	<10
Carbon Disulfide	<1.0	<5.0
Carbon Tetrachloride	<1.0	<5.0
Chlorobenzene	<1.0	<5.0
Chloroethane	<1.0	<10
Chloroform	<1.0	<5.0
Chloromethane	<1.0	<10
cis-1,2-Dichloroethylene	<1.0	<5.0
cis-1,3-Dichloropropene	<1.0	<5.0
Dibromochloromethane	<1.0	<5.0
Ethylbenzene	<1.0	<5.0
m&p-Xylene	<1.0	<5.0
Methylene Chloride (Dichloromethane)	<1.0	<5.0
o-Xylene	<1.0	<5.0
Styrene	<1.0	<5.0
Tetrachloroethene	<1.0	<5.0
Toluene	<1.0	<5.0
trans-1,2-Dichloroethylene	<1.0	<5.0
trans-1,3-Dichloropropene	<1.0	<5.0
Trichloroethene	<1.0	<5.0
Vinyl Acetate	<2.0	<10
Vinyl Chloride	<1.0	<10

* = The results for this field water sample were taken from the 1994 Fort Eustis RI data. Water used for decontamination at Fort Story was obtained from Fort Eustis.

Table 6-6

Trip Blank Results
Site 2 - Landfill 2
Confirmatory Studies
Fort Story, Virginia

Parameter/Analyte	Trip Blank T510274*6	Trip Blank T510286*2	Trip Blank T510298*4	Trip Blank T510346*2
Volatile Organic Compounds (µg/L)				
1,1,1-Trichloroethane	< 1.0	< 1.0	< 1.0	< 1.0
1,1,2,2-Tetrachloroethane	< 1.0	< 1.0	< 1.0	< 1.0
1,1,2-Trichloroethane	< 1.0	< 1.0	< 1.0	< 1.0
1,1-Dichloroethane	< 1.0	< 1.0	< 1.0	< 1.0
1,1-Dichloroethene	< 1.0	< 1.0	< 1.0	< 1.0
1,2-Dichloroethane	< 1.0	< 1.0	< 1.0	< 1.0
1,2-Dichloropropane	< 1.0	< 1.0	< 1.0	< 1.0
2-Butanone (MEK)	< 10	< 10	< 10	< 10
2-Chloroethylvinyl Ether	< 10	< 10	< 10	< 10
2-Hexanone	< 10	< 10	< 10	< 10
4-Methyl-2-pentanone (MIBK)	< 10	< 10	< 10	< 10
Acetone	< 10	< 10	< 10	< 10
Benzene	< 1.0	< 1.0	< 1.0	< 1.0
Bromodichloromethane	< 1.0	< 1.0	< 1.0	< 1.0
Bromoform	< 1.0	< 1.0	< 1.0	< 1.0
Bromomethane	< 2.0	< 2.0	< 2.0	< 2.0
Carbon Disulfide	< 1.0	< 1.0	< 1.0	< 1.0
Carbon tetrachloride	< 1.0	< 1.0	< 1.0	< 1.0
Chlorobenzene	< 1.0	< 1.0	< 1.0	< 1.0
Chloroethane	< 1.0	< 1.0	< 1.0	< 1.0
Chloroform	< 1.0	< 1.0	< 1.0	< 1.0
Chloromethane	< 1.0	< 1.0	< 1.0	< 1.0
cis-1,2-Dichloroethylene	< 1.0	< 1.0	< 1.0	< 1.0
cis-1,3-Dichloropropene	< 1.0	< 1.0	< 1.0	< 1.0
Dibromochloromethane	< 1.0	< 1.0	< 1.0	< 1.0
Ethylbenzene	< 1.0	< 1.0	< 1.0	< 1.0
m&p-Xylene	< 1.0	< 1.0	< 1.0	< 1.0
Methylene Chloride (Dichloromethane)	< 1.0	< 1.0	< 1.0	< 1.0
o-Xylene	< 1.0	< 1.0	< 1.0	< 1.0
Styrene	< 1.0	< 1.0	< 1.0	< 1.0
Tetrachloroethene	< 1.0	< 1.0	< 1.0	< 1.0
Toluene	< 1.0	< 1.0	< 1.0	< 1.0
trans-1,2-Dichloroethylene	< 1.0	< 1.0	< 1.0	< 1.0
trans-1,3-Dichloropropene	< 1.0	< 1.0	< 1.0	< 1.0
Trichloroethene	< 1.0	< 1.0	< 1.0	< 1.0
Vinyl Acetate	< 2.0	< 2.0	< 2.0	< 2.0
Vinyl Chloride	< 1.0	< 1.0	< 1.0	< 1.0

Table 6-7

Base-Neutral and Acid Extractables Surrogate Recovery Nonconformances
Site 2 - Landfill 2
Confirmatory Studies
Fort Story, Virginia
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Sample ID	Matrix	Surrogate	Recovery (%)	Surrogate Control Limits	Percent Recovery Acceptable?
S2MW1070128	Water	2-Fluorophenol	64	10-104	Yes
		Phenol-d5	72	10-106	Yes
		Nitrobenzene-d5	70	61-115	Yes
		2-Fluorobiphenyl	66	59-119	Yes
		2,4,6-Tribromophenol	76	41-143	Yes
		4-Terphenyl-d14	28	46-136	No
S2MW1080128	Water	2-Fluorophenol	67	10-104	Yes
		Phenol-d5	72	10-106	Yes
		Nitrobenzene-d5	72	61-115	Yes
		2-Fluorobiphenyl	69	59-119	Yes
		2,4,6-Tribromophenol	74	41-143	Yes
		4-Terphenyl-d14	21	46-136	No
S2MW1070128	Water	2-Fluorophenol	64	10-104	Yes
		Phenol-d5	72	10-106	Yes
		Nitrobenzene-d5	70	61-115	Yes
		2-Fluorobiphenyl	66	59-119	Yes
		2,4,6-Tribromophenol	76	41-143	Yes
		4-Terphenyl-d14	28	46-136	No
S2MW1080128	Water	2-Fluorophenol	67	10-104	Yes
		Phenol-d5	72	10-106	Yes
		Nitrobenzene-d5	72	61-115	Yes
		2-Fluorobiphenyl	69	59-119	Yes
		2,4,6-Tribromophenol	74	41-143	Yes
		4-Terphenyl-d14	21	46-136	No
S2SW30010127	Water	2-Fluorophenol	71	10-104	Yes
		Phenol-d5	77	10-106	Yes
		Nitrobenzene-d5	81	61-115	Yes
		2-Fluorobiphenyl	75	59-119	Yes
		2,4,6-Tribromophenol	78	41-143	Yes
		4-Terphenyl-d14	30	46-136	No
S2MW1090127	Water	2-Fluorophenol	69	10-104	Yes
		Phenol-d5	77	10-106	Yes
		Nitrobenzene-d5	79	61-115	Yes
		2-Fluorobiphenyl	78	59-119	Yes
		2,4,6-Tribromophenol	78	41-143	Yes
		4-Terphenyl-d14	27	46-136	No

Table 6-7

Base-Neutral and Acid Extractables Surrogate Recovery Nonconformances
Site 2 - Landfill 2
Confirmatory Studies
Fort Story, Virginia
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Sample ID	Matrix	Surrogate	Recovery (%)	Surrogate Control Limits	Percent Recovery Acceptable?
S2MW1090127D	Water	2-Fluorophenol	70	10-104	Yes
		Phenol-d5	78	10-106	Yes
		Nitrobenzene-d5	80	61-115	Yes
		2-Fluorobiphenyl	80	59-119	Yes
		2,4,6-Tribromophenol	79	41-143	Yes
		4-Terphenyl-d14	30	46-136	No
S2SW30020127	Water	2-Fluorophenol	70	10-104	Yes
		Phenol-d5	76	10-106	Yes
		Nitrobenzene-d5	80	61-115	Yes
		2-Fluorobiphenyl	79	59-119	Yes
		2,4,6-Tribromophenol	77	41-143	Yes
		4-Terphenyl-d14	38	46-136	No
S2SW30010128D	Water	2-Fluorophenol	80	10-104	Yes
		Phenol-d5	90	10-106	Yes
		Nitrobenzene-d5	93	61-115	Yes
		2-Fluorobiphenyl	81	59-119	Yes
		2,4,6-Tribromophenol	75	41-143	Yes
		4-Terphenyl-d14	33	46-136	No

Table 6-8

Field Water Base-Neutral and Acid Extractable Results
Site 2 - Landfill 2
Confirmatory Studies
Fort Story, Virginia
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Parameter/Analyte	S2DI1	DI2903*
BNAs (μg/L)		
1,2,4-Trichlorobenzene	<10	<10
1,2-Dichlorobenzene	<10	<10
1,3-Dichlorobenzene	<10	<10
1,4-Dichlorobenzene	<10	<10
2,4,5-Trichlorophenol	<10	<10
2,4,6-Trichlorophenol	<10	<10
2,4-Dichlorophenol	<10	<10
2,4-Dimethylphenol	<10	<10
2,4-Dinitrophenol	<50	<50
2,4-Dinitrotoluene	<10	<10
2,6-Dinitrotoluene	<10	<10
2-Chloroethylvinyl Ether	<10	<10
2-Chloronaphthalene	<10	<10
2-Chlorophenol	<10	<10
2-Methylnaphthalene	<10	<10
2-Methylphenol (o-cresol)	<10	<10
2-Nitroaniline	<50	<50
2-Nitrophenol	<10	<10
3,3'-Dichlorobenzidine	<20	<20
3-Methylphenol/4-Methylphenol (m&p-cresol)	<10	<10
3-Nitroaniline	<50	<50
4,6-Dinitro-o-cresol (4,6-Dinitro-2-methylphenol)	<50	<50
4-Bromophenyl-phenyl-ether	<10	<10
4-Chloro-3-methylphenol	<10	<10
4-Chloroaniline	<20	<20
4-Chlorophenyl-phenyl ether	<10	<10
4-Nitroaniline	<50	<50
4-Nitrophenol	<50	<10
Acenaphthene	<10	<10
Acenaphthylene	<10	<10
Anthracene	<10	<10
Benzidine	<80	<80
Benzo(a)anthracene	<10	<10
Benzo(a)pyrene	<10	<10
Benzo(b)fluoranthene	<10	<10
Benzo(g,h,i)perylene	<10	<10
Benzo(k)fluoranthene	<10	<10
Benzoic acid	<50	<50
Benzyl alcohol	<10	<10
bis(2-Chloroethoxy)methane	<10	<10
bis(2-Chloroethyl)ether	<10	<10
bis(2-chloroisopropyl)ether	<10	<10
bis(2-Ethylhexyl)phthalate	<10	<10
Butylbenzylphthalate	<10	<10
Chrysene	<10	<10

Table 6-8

Field Water Base-Neutral and Acid Extractable Results
Site 2 - Landfill 2
Confirmatory Studies
Fort Story, Virginia
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Parameter/Analyte	S2DI1	DI2903*
BNAs (µg/L) (con't)		
Di-n-butylphthalate	<10	<10
Di-n-octylphthalate	<10	<10
Dibenz(a,h)anthracene	<10	<10
Dibenzofuran	<10	<10
Diethylphthalate	<10	<10
Dimethylphthalate	<10	<10
Fluoranthene	<10	<10
Fluorene	<10	<10
Hexachlorobenzene	<10	<10
Hexachlorobutadiene	<10	<10
Hexachlorocyclopentadiene	<10	<10
Hexachloroethane	<10	<10
Indeno(1,2,3-cd)pyrene	<10	<10
Isophorone	<10	<10
n-Nitrosodi-n-Propylamine	<10	<10
n-Nitrosodimethylamine	<10	<10
n-Nitrosodiphenylamine/Diphenylamine	<10	<10
Naphthalene	<10	<10
Nitrobenzene	<10	<10
Pentachlorophenol	<50	<50
Phenanthrene	<10	<10
Phenol	<10	<10
Pyrene	<10	<10

* = The results for this field water sample were taken from the 1994 Fort Eustis Remedial Investigation data. Water used for decontamination at Fort Story was obtained from Fort Eustis.

6.4 PESTICIDES AND POLYCHLORINATED BIPHENYLS

Five sediment, five groundwater, two surface water samples, and associated QC samples were collected from the Site 2 - Landfill 2 and analyzed for Pest/PCBs by EPA Method 8080. The following is a brief summary of the analytical nonconformances associated with the QC data reported for the Pest/PCBs analyses.

6.4.1 Precision and Accuracy

Precision and accuracy were assessed through the results from surrogate recoveries, MS/MSD samples, LCSs, and field duplicate samples. LCS, MS/MSD and surrogate results are summarized in Appendices E, F and G, respectively. Field duplicate sample nonconformances are listed in this section and the complete set of duplicate results are presented next to the corresponding sample results in the analytical results tables in Section 5. The following is a brief description of the QC nonconformances associated with these parameters.

The Pest/PCBs analysis samples were spliked with two surrogate standards: dibutylchlorendate and tetrachloro-m-xylene. The data were evaluated based on the primary surrogate (dibutylchlorendate) results. If these results did not meet the criteria, the secondary (tetrachloro-m-xylene) was reviewed for compliance. The sample results were not qualified as estimated if either the primary or secondary surrogates were acceptable. All surrogate recoveries were within the acceptance criteria for all matrices with the exceptions presented in Table 6-9 and discussed below.

The following samples had percent recoveries for dibutyl chlorendate that were below the lower control limit of 28 percent for water or 45 percent for sediment: water samples S2MW107 (26%), S2MW108 (23%), S2MW109 (26%), S2MW109D (25%), S2SW3001 (25%), S2SW3002 (27%), S2DI (13%) and sediment samples S2SD3002 (28%), S2SD3003 (33%), S2SD3004 (33%), and S2SD3005D (26%). However, as stated above, the results for these samples were not qualified because the secondary surrogate spike recoveries were within the acceptance criteria.

Sediment Sample S2SD3001 had low MSD recoveries for DDT at 52 percent, dieldrin at 45 percent and gamma- BHC at 48 percent. The MS/MSD RPD for DDT also was calculated as 49 percent, which was outside the precision control limit of 28 percent. These outliers indicate a low bias in the sample results. The sample results for these compounds were nondetect; and therefore, were qualified as estimated (UJ).

The RPD for gamma-BHC for sample S2MW106 was outside the precision control limit of 18 percent. However, the recoveries for both the MS and MSD samples were within the acceptance criteria. Therefore, the gamma-BHC results for this sample was not qualified.

The Pest/PCBs laboratory control sample (LCS) contains known amounts of eight representative spike compounds: aldrin, Aroclor 1016, Aroclor 1260, DDT, dieldrin, endrin, gamma-BHC, and heptachlor. All of the LCSs precision and accuracy results were within acceptance limits with the following exception. The RPD for gamma-BHC for sample S2MW106 was outside the precision control limit of 25 percent. However, the recoveries for both the LCS and LCSD were within the acceptance criteria. Therefore, the aldrin result for this sample was not qualified.

Table 6-9

Pesticides/Polychlorinated Biphenyls Surrogate Recovery Nonconformances
Site 2 - Landfill 2
Confirmatory Studies
Fort Story, Virginia
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Sample ID	Matrix	Surrogate	Recovery (%)	Surrogate Control Limits	Percent Recovery Acceptable?
S2MW1070128	Water	Tetrachloro-m-xylene	29	22-126	Yes
		Dibutyl Chlorendate	26	28-151	No
S2MW1080128	Water	Tetrachloro-m-xylene	33	22-126	Yes
		Dibutyl Chlorendate	23	28-151	No
S2SD30030128	Soil	Tetrachloro-m-xylene	35	19-132	Yes
		Dibutyl Chlorendate	33	45-131	No
S2SD30040128	Soil	Tetrachloro-m-xylene	35	19-132	Yes
		Dibutyl Chlorendate	33	45-131	No
S2SD30050128D	Soil	Tetrachloro-m-xylene	35	19-132	Yes
		Dibutyl Chlorendate	26	45-131	No
S2SD30020128	Soil	Tetrachloro-m-xylene	35	19-132	Yes
		Dibutyl Chlorendate	28	45-131	No
S2SW30010127	Water	Tetrachloro-m-xylene	29	22-126	Yes
		Dibutyl Chlorendate	25	28-151	No
S2MW1090127	Water	Tetrachloro-m-xylene	36	22-126	Yes
		Dibutyl Chlorendate	26	28-151	No
S2MW1090127D	Water	Tetrachloro-m-xylene	24	22-126	Yes
		Dibutyl Chlorendate	25	28-151	No
S2SW30020127	Water	Tetrachloro-m-xylene	25	22-126	Yes
		Dibutyl Chlorendate	27	28-151	No
S2DI0131	Water	Tetrachloro-m-xylene	72	22-126	Yes
		Dibutyl Chlorendate	13	28-151	No

During the CS field investigation program, one duplicate sediment sample each for groundwater and surface water were collected for Pest/PCB analysis. Table 6-10 presents sample and duplicate results and corresponding RPDs. All field duplicate sample precision results were within acceptance criteria except for sediment sample S2SD3005, which exceeded the control limits of 30 percent for DDD and DDE, with RPDs of 110 and 32 percent, respectively. The variance between the sample and field duplicate sample results were attributed to matrix heterogencity: and therefore, the sample results were not qualified.

6.4.2 Representativeness

Representativeness for Pest/PCBs analysis was assessed using the results of the method blank and field blank sample results. Table 6-11 presents the field water sample results. There were no detectable concentrations of Pest/PCBs in method blanks or field blank samples.

6.4.3 Comparability

The laboratory utilized the protocols specified in the *CDAP, CQAP*, and *EPA SW-846*; therefore, these data were considered comparable to previous data and future data collected according to the specified protocol.

6.4.4 Completeness

Completeness was evaluated as a measure of whether all the necessary information to meet the objectives of the project had been collected based on the planned samples stated in the *CDAP*.

All coolers were received within the specified temperature of 4°C (+/- 2°C). All samples received by the laboratory contained the correct preservatives.

All samples were analyzed within the specified method holding times for Pest/PCBs analysis. Therefore, the completeness goal of 95 percent for holding times was met.

For all media, the actual number of field samples and associated QC samples collected and analyzed met the number planned. Therefore, the analytical QC completeness goal of 90 percent was met for Pest/PCBs analysis.

6.5 TOTAL FUEL HYDROCARBONS

Five sediment, five groundwater and two surface water samples along with associated QC samples were collected from Site 2 - Landfill 2 and analyzed for TFH-H as Fuel and TFH-H as Oil. One sediment and one groundwater sample also were collected and analyzed for total fuel hydrocarbons for gasoline (TFH-L). The following is a brief summary of the analytical nonconformances associated with the QC data reported for the TFH-H and TFH-L analyses.

6.5.1 Precision and Accuracy

Precision and accuracy were assessed through the results from surrogate recoveries, MS/MSD samples, LCSs, and field duplicate samples. The LCS, MS/MSD and surrogate results are summarized in Appendices E, F and G, respectively. Duplicate results are summarized in this section and also presented next to the corresponding sample results in the analytical results tables

Table 6-10

Field Duplicate Sample Results Summary
Pesticides/Polychlorinated Biphenyls
Site 2 - Landfill 2
Confirmatory Studies
Fort Story, Virginia
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Sample Identification*	Matrix	Analyte	Field Sample Result (µg/kg)	Field Duplicate Sample Result (µg/kg)	Relative Percent Difference (%)	Control Limit (%)	Relative Percent Difference Acceptable?
SD3005	Sediment	4,4'-DDD	390	110	112	30	No
		4,4'-DDE	69	32	73	30	No

* = Only analytes detected in the field and/or duplicate samples are presented

Table 6-11

Field Water Pesticides/Polychlorinated Biphenyls Results
Site 2 - Landfill 2
Confirmatory Studies
Fort Story, Virginia
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Parameter/Analyte	S2DI1	DI2903*
Pesticides/PCBs (µg/L)		
4,4'-DDD	<0.10	<0.10
4,4'-DDE	<0.10	<0.10
4,4'-DDT	<0.10	<0.10
Aldrin	<0.050	<0.050
alpha-BHC	<0.050	<0.050
Aroclor-1016	<1.0	<1.0
Aroclor-1221	<2.0	<2.0
Aroclor-1232	<1.0	<1.0
Aroclor-1242	<1.0	<1.0
Aroclor-1248	<1.0	<1.0
Aroclor-1254	<1.0	<1.0
Aroclor-1260	<1.0	<1.0
beta-BHC	<0.050	<0.050
Chlordane	<0.50	<0.50
delta-BHC	<0.050	<0.050
Dieldrin	<0.10	<0.10
Endosulfan I	<0.050	<0.050
Endosulfan II	<0.10	<0.10
Endosulfan sulfate	<0.10	<0.10
Endrin	<0.10	<0.10
Endrin Aldehyde	<0.10	<0.10
gamma-BHC	<0.050	<0.050
Heptachlor	<0.050	<0.050
Heptachlor epoxide	<0.050	<0.050
Methoxychlor	<0.50	<0.50
Toxaphene	<5.0	<5.0

* = The results for this field water sample were taken from the 1994 Fort Eustis Remedial Investigation data. Water used for decontamination at Fort Story was obtained from Fort Eustis.

in Section 5. The following is a brief description of the QC nonconformances associated with these parameters.

The TFH-H and TFH-L analysis samples were spiked with one surrogate standard for each analysis: decafluorobiphenyl or terphenyl-d14 and a,a,a-trifluorotoluene, respectively. All of the surrogate recoveries were within the acceptance criteria for all matrices with the exeptions presented in Table 6-12 and discussed below.

TFH-H results for the following samples had percent recoveries outside of control limits: S2MW107 (decafluorobiphenyl, 37%; o-terphenyl, 32%), S2SD3004 (o-terphenyll, 143%), S2MW105 (decafluorobiphenyl, 35%). The TFH-H results for sample S2MW107 were qualified because both surrogates had low recoveries. These outliers indicated a low bias in the sample results. TFH-H as Fuel and TFH-H as Oil results for this sample were nondetect, and therefore, qualified as estimated (UJ).

All LCS and MS/MSD results for TFH-H and TFH-L analyses were within acceptance criteria.

During the CS field program, one TFH-H and TFH-L sediment duplicate sample, one TFH-H and TFH-L groundwater, and two TFH-H duplicate samples were collected. The field sample and corresponding duplicate results were below detection limits.

6.5.2 Representativeness

Representativeness for TFH-H and TFH-L analysis was assessed using the results of the method blank and field blank sample results. Table 6-13 presents the field water rinsate blank sample results. There were no detectable concentrations of TFH-H and TFH-L in method blanks, and field blank samples.

6.5.3 Comparability

The laboratory utilized the protocols specified in the *CDAP, CQAP*, and *EPA SW-846*; therefore, these data were considered acceptable for comparing previous data and future data collected according to the specified protocol.

6.5.4 Completeness

Completeness was evaluated as a measure of whether all the necessary information to meet the objectives of the project had been generated based on the planned samples stated in the *CDAP*.

All coolers were received within the required temperature of 4°C (+/- 2°C). All samples received by the laboratory contained the correct preservatives.

All samples were analyzed within the specified method holding times for TFH-H and TFH-L analysis. Therefore, the completeness goal of 95 percent for holding times was met.

For all media, the actual number of field samples and associated QC samples collected and analyzed met the number planned. Therefore, the analytical QC completeness goal of 90 percent was met for TFH-H and TFH-L analysis.

Table 6-12

Total Fuel Hydrocarbons Surrogate Recovery Nonconformances
Site 2 - Landfill 2
Confirmatory Studies
Fort Story, Virginia
Page 1 of 1

Sample ID	Matrix	Surrogate	Recovery (%)	Surrogate Control Limits	Percent Recovery Acceptable?
S2MW1070128	Water	Decafluorobiphenyl	37	40-140	No
		o-Terphenyl	32	40-140	No
S2SD30040128	Soil	Decafluorobiphenyl	68	20-150	Yes
		o-Terphenyl	143	40-140	No
S2MW1050127	Water	Decafluorobiphenyl	35	40-140	No
		o-Terphenyl	67	40-140	Yes

Table 6-13

Field Water Total Fuel Hydrocarbon Results
Site 2 - Landfill 2
Confirmatory Studies
Fort Story, Virginia
Page 1 of 1

Parameter/Analyte	S2DI1	DI2903*
Total Fuel Hydrocarbons (µg/L)		
Hydrocarbons as Diesel Fuel	<300	<300
Hydrocarbons as Gasoline	<50	<50
Hydrocarbons as Heavy Oils	<2,000	<2,000

* = The results for this field water sample were taken from the 1994 Fort Eustis Remedial Investigation data. Water used for decontamination at Fort Story was obtained from Fort Eustis.

6.6 METALS ANALYSIS

Five sediment, five groundwater, and two surface water samples were collected from Site 2 - Landfill 2 and analyzed for total metals and dissolved metals (water samples only) by EPA Methods 6010 and 7000 series. The specific methods for soils and waters analyses are presented in Table 5-1. The following is a brief summary of the analytical nonconformances associated with the QC data reported for the metals analyses.

6.6.1 Precision and Accuracy

Precision and accuracy were assessed through the results from MS/MSD samples, LCSs, and field duplicate samples. The LCS and MS/MSD results are summarized in Appendices E and F, respectively. Field duplicate sample results are summarized in this section and also presented next to the corresponding sample results in the analytical results tables in Section 5. The following is a brief description of the QC nonconformances associated with these parameters.

EPA SW-846 QC requires a laboratory duplicate analysis at a frequency of one duplicate sample for every batch of samples (up to a maximum of 20 samples). However, an MSD was analyzed in place of the laboratory duplicate. All MSD samples met the precision criteria for both water and soil matrices with the exceptions described below.

The spiking solution used to prepare MS/MSD samples included all target analytes for metals analyses. All MS/MSD precision and accuracy results were within acceptance limits.

- S2MW106 - the MS recovery for chromium was 9 percent. MSD recovery for chromium was 99 percent indicating there was no matrix effect. Therefore, chromium results for this sample were qualified as estimated (UJ).

- S2SD3001 - MS/MSD recoveries were outside of the upper control limit for the following analytes: aluminum, calcium and iron. As per EPA guidance, sample results were not qualified because the levels of these analytes were greater than four times the spike amount.

- The MS/MSD sample analyzed for Batch 0203J did not have percent recoveries within criteria for the following analytes: calcium, iron and sodium. Data associated with this analysis were not qualified because the MS/MSD sample was not collected from Fort Story and the analytes in question were those metals typically present at very high concentrations in environmental samples. Additionally, the LCS results for this batch were within control limits.

All RPDs for MS/MSD samples were within the advisory limits of 20 percent (water) or 30 percent (sediment) with the exception of the following samples:

- S2MW1060128 - the RPD for chromium was 167 percent. Chromium results for this and associated samples were not qualified because the RPD is calculated from MS and MSD results. If the RPD were calculated from sample and duplicate results, EPA criteria would apply. (For metals, Savannah Laboratories performs MS/MSD analysis in lieu of MS/Duplicate analysis.)

- S2SD30010128 - the RPD for iron was 67 percent. No data were qualified for the reasons listed above.

- The MS/MSD sample analyzed for batch 0203J had RPDs that were outside of advisory limits for the following target analytes: calcium, iron, and sodium. No data were qualified because the sample was not representative of Fort Story samples.

The spiking solution used to prepare LCSs included all target analytes for metals analyses. All LCSs precision and accuracy results were within acceptance limits.

During the RI/CS field investigation program, one duplicate sample each for sediment groundwater and surface water were collected. All field samples and their corresponding duplicate samples had detectable quantities. Tables 6-14 and 6-15 present the field and duplicate samples metals results and corresponding RPDs for sediment samples and water samples, respectively. All of the field duplicate samples were within acceptance criteria with some exceptions.

For sediment sample S2SD3005, the RPDs of 22 and 33 percent for lead and mercury exceeded the control limits of 20 and 30 percent. The variances between these samples and their duplicates were attributed to either matrix heterogeneity and/or sample dilution and did not have an impact on data quality. Therefore, these samples results were not qualified.

For groundwater sample S2MW109, the RPD of 33 percent for total zinc exceeded the control limit of 25 percent. For surface water S2SW3001, the RPDs of 38, 22, 26, 35, 13 and 30 percent for total aluminum, calcium, iron, lead, manganese and zinc, respectively, exceeded their respective control limits. For dissolved zinc, the RPD of 42 percent exceeded the control limit of 25 percent. The variances between the results of these water samples and their duplicates were attributed to matrix interference, sample dilution, and/or mixing prior to sample preparation, and did not have an impact or data quality. Therefore, these sample results were not qualified as estimated.

6.6.2 Representativeness

Representativeness for metals analysis was assessed using the results of the method blank and field blank sample results. The field blank results are summarized in Table 6-16. There were no detectable concentrations of metals in method blank samples or field blank samples which required qualification of the data.

6.6.3 Comparability

The laboratory utilized the protocols specified in the *CDAP, CQAP*, and *EPA SW-846*; therefore, these data were considered acceptable for comparing previous data and future data collected and analyzed according to the specified protocol.

Table 6-14

Field Duplicate Metals in Sediment Results Summary
Site 2 - Landfill 2
Confirmatory Studies
Fort Story, Virginia

Sample Identification*	Analyte	Field Sample Result (mg/kg)	Field Duplicate Sample Result (mg/kg)	Relative Percent Difference (%)	Control Limit (%)	Relative Percent Difference Acceptable?
SD3005	Aluminum	1700	1800	6	20	Yes
	Arsenic	3.4	4.3	23	30	Yes
	Barium	28	26	7	20	Yes
	Calcium	2300	2100	9	20	Yes
	Chromium, Total	3.9	4.1	5	30	Yes
	Cobalt	1.5	1.4	7	30	Yes
	Copper	4.3	3.8	12	30	Yes
	Iron	6400	5800	10	20	Yes
	Lead	30	24	22	20	No
	Magnesium	910	860	6	20	Yes
	Manganese	68	64	6	20	Yes
	Mercury	0.14	0.10	33	30	No
	Potassium	230	240	4	30	Yes
	Sodium	250	210	17	30	Yes
	Vanadium	12	11	9	20	Yes
	Zinc	30	30	0	20	Yes

* = Only analytes detected in the field and/or duplicate samples are presented

Table 6-15

Field Duplicate Sample Metals in Water Results Summary
Site 2 - Landfill 2
Confirmatory Studies
Fort Story, Virginia
Page 1 of 2

Sample Identification*	Analyte	Field Sample Result (mg/L)	Field Duplicate Sample Result (mg/L)	Relative Percent Difference (%)	Control Limit (%)	Relative Percent Difference Acceptable?
MW109	Aluminum	8.6	9.4	9	10	Yes
	Arsenic	0.016	0.016	0	25	Yes
	Barium	0.047	0.053	12	25	Yes
	Calcium	8.5	9.2	8	10	Yes
	Chromium, Total	0.014	0.015	7	25	Yes
	Iron	14	15	7	10	Yes
	Lead	0.015	0.016	6	25	Yes
	Magnesium	3.9	4.1	5	25	Yes
	Manganese	0.28	0.29	4	10	Yes
	Potassium	3.2	3.3	3	25	Yes
	Sodium	11	12	9	10	Yes
	Vanadium	0.020	0.022	10	25	Yes
	Zinc	0.060	0.084	33	25	No
	Aluminum, dissolved	1.5	1.5	0	25	Yes
	Barium, dissolved	0.022	0.021	5	25	Yes
	Calcium, dissolved	7.2	7.2	0	10	Yes
	Iron, dissolved	9.8	9.9	1	10	Yes
	Magnesium, dissolved	3.1	3.2	3	25	Yes
	Manganese, dissolved	0.23	0.22	4	10	Yes
	Potassium, dissolved	2.6	2.8	7	25	Yes
	Sodium, dissolved	11	11	0	10	Yes
	Zinc, dissolved	0.021	<0.020	NC	25	NAP

Table 6-15

Field Duplicate Sample Metals in Water Results Summary
Site 2 - Landfill 2
Confirmatory Studies
Fort Story, Virginia

Sample Identification*	Analyte	Field Sample Result (mg/L)	Field Duplicate Sample Result (mg/L)	Relative Percent Difference (%)	Control Limit (%)	Relative Percent Difference Acceptable?
SW3001	Aluminum	0.38	0.56	38	25	No
	Barium	0.016	0.019	17	25	Yes
	Calcium	4.9	6.1	22	10	No
	Iron	8.5	11	26	25	No
	Lead	0.0087	0.0061	35	25	No
	Magnesium	3.9	4.3	10	25	Yes
	Manganese	0.15	0.17	13	10	No
	Sodium	15	15	0	10	Yes
	Zinc	0.039	0.053	30	25	No
	Aluminum, dissolved	0.38	0.38	0	25	Yes
	Barium, dissolved	0.016	0.016	0	25	Yes
	Calcium, dissolved	4.9	5	2	25	Yes
	Iron, dissolved	8.5	8.7	2	10	Yes
	Magnesium, dissolved	3.9	3.9	0	25	Yes
	Manganese, dissolved	0.15	0.16	6	10	Yes
	Sodium, dissolved	15	15	0	10	Yes
	Zinc, dissolved	0.039	0.060	42	25	No

* = Only analytes detected in the field and/or duplicate samples are presented.
NC = Not Calculated
NAP = Not Applicable

Table 6-16

Field Water Metals Results
Site 2 - Landfill 2
Confirmatory Studies
Fort Story, Virginia

Parameter/Analyte	S2DI1	DI2903 *
Total Metals (mg/L)		
Aluminum	<0.2	<0.20
Antimony	<0.05	<0.050
Arsenic	<0.01	<0.010
Barium	<0.01	<0.010
Beryllium	<0.004	<0.0050
Cadmium	<0.005	<0.0050
Calcium	<0.5	<0.50
Chromium	<0.01	<0.010
Cobalt	<0.01	<0.010
Copper	<0.025	<0.025
Iron	<0.05	<0.050
Lead	<0.005	<0.00020
Magnesium	<0.5	<0.50
Manganese	<0.01	<0.010
Mercury	<0.0002	<0.00020
Nickel	<<0.04	<0.040
Potassium	<1.0	<1.0
Selenium	<0.01	<0.010
Silver	<0.01	<0.010
Sodium	0.64	<0.50
Thallium	<0.01	<0.010
Vanadium	<0.01	<0.010
Zinc	<0.02	0.064
Dissolved Metals (mg/L)		
Aluminum	NA	<0.20
Antimony	NA	<0.050
Arsenic	NA	<0.010
Barium	NA	<0.010
Beryllium	NA	<0.0050
Cadmium	NA	<0.0050
Calcium	NA	<0.50
Chromium	NA	<0.010
Cobalt	NA	<0.010
Copper	NA	<0.025
Iron	NA	<0.050
Lead	NA	<0.0050
Magnesium	NA	<0.50
Manganese	NA	<0.010
Mercury	NA	<0.00020
Nickel	NA	<0.040
Potassium	NA	<1.0
Selenium	NA	<0.010

Table 6-16

Field Water Metals Results
Site 2 - Landfill 2
Confirmatory Studies
Fort Story, Virginia
Page 2 of 2

Parameter/Analyte	S2DI1	DI2903 *
Dissolved Metals (mg/L) (cont.)		
Silver	NA	<0.010
Sodium	NA	<0.50
Thallium	NA	<0.010
Vanadium	NA	<0.010
Zinc	NA	<0.020

* = The results for this field water sample were taken from the 1994 Fort Eustis Remedial Investigation data. Water used for decontamination at Fort Story was obtained from Fort Eustis.

NA = Not analyzed

6.6.4 Completeness

Completeness was evaluated as a measure of whether all the necessary information to meet the objectives of the project had been generated based on the planned samples stated in the *CDAP*.

All coolers were received within the specified temperature of 4°C (+/- 2°C). All samples received by the laboratory contained the correct preservatives.

The holding times criteria were met for all samples collected for metals. Therefore, the completeness goal of 95 percent for holding time was met for total and dissolved metals analyses.

For all media, the actual number of samples collected and analyzed met the number planned. Therefore, the analytical QC completeness goal of 90 percent was met for metals analyses.

6.7 MISCELLANEOUS ANALYTES

Miscellaneous Analytes (water quality parameters) in water included: nitrate, nitrite, ammonia, total phosphorous, orthophosphate, sulfate, chloride, fluoride, sulfide, alkalinity, and total dissolved solids. Five groundwater samples and two surface water samples collected from Site 2 - Landfill 2 were analyzed for water quality parameters.

6.7.1 Precision and Accuracy

Precision and accuracy were assessed through the results from laboratory duplicates, MS/MSDs, LCSs, and field duplicate samples. The LCS and MS/MSD results are summarized in Appendices E and F, respectively. Duplicate results are summarized in Table 6-17 and also presented next to the corresponding sample results in the analytical results tables in Section 5. The following is a brief description of the QC nonconformances associated with these parameters.

MSD samples were substituted for laboratory duplicate samples and were analyzed at a frequency of one duplicate sample for every batch of samples (up to a maximum of 20 samples). The spiking solutions used to prepare MS/MSD samples included all target analytes for the Miscellaneous Analytes compounds. All of the MS/MSD precision and accuracy results were within acceptance limits with the exception of the following.

- Batch 0209D (Sulfate) - MSD recoveries were below the lower control limit.
- Batch 0210C (Chloride) - MSD recoveries were below the lower control limit.
- Batch 0207B (Ammonia) - MS and MSD recoveries were below the lower control limit (87 and 88 percent, respectively)
- Batch 0130W (Nitrite) - MS and MSD recoveries were below the lower control limit (72 and 70 percent, respectively)

No data were qualified because these samples were not representative of Fort Story samples.

Table 6-17

Miscellaneous Analytes Field Duplicate Results Summary
Site 2 - Landfill 2
Confirmatory Studies
Fort Story, Virginia
Page 1 of 1

Sample Identification*	Matrix	Analyte	Field Sample Result (mg/L)	Field Duplicate Sample Result (mg/L)	Relative Percent Difference (%)	Control Limit (%)	Relative Percent Difference Acceptable?
MW109	Groundwater	Alkalinity, Total (As $CaCO^3$)	33	37	11	25	Yes
		Ammonia (As N)	3	3.5	15		
		Chloride	20	25	22	25	Yes
		Orthophosphate	0.096	0.08	18		
		Phosphorus, Total (As P)	0.82	0.76	8	25	Yes
		Sulfate	8.9	8.9	0	25	Yes
		Total Dissolved Solids (Residue, Filterable)	200	160	22	25	Yes
SW3001	Surface Water	Alkalinity, Total (As $CaCO^3$)	<1.0	2.2	NC	25	NAP
		Ammonia (As N)	0.13	0.12	8	25	Yes
		Chloride	32	34	6	25	Yes
		Nitrogen, Nitrate (As N)	<0.050	0.13	NC	25	NAP
		Phosphorus, Total (As P)	0.45	0.32	34	25	No
		Sulfate	<5.0	7.2	NC	25	NAP
		Total Dissolved Solids (Residue, Filterable)	180	170	6	25	Yes

* = Only analytes detected in the field and/or duplicate samples are presented.

NAP = Not Applicable
NC = Not Calculated

- Batch 0210A (Sulfate) - MS and MSD recoveries were above the upper control limit (150 and 144 percent, respectively)
- Batch 0210C (Chloride) - MSD recoveries were below the lower control limit.

The spiking solutions used to prepare LCSs included all target analytes for the Miscellaneous Analytes compounds. All of the LCSs precision and accuracy results were within acceptance limits.

6.7.2 Representativeness

Representativeness for analysis of the Miscellaneous Analytes compounds was assessed using the results of method blanks. Field blank samples were not collected for Miscellaneous Analytes compounds. There were no detectable concentrations of the Miscellaneous Analytes compounds in method blanks; therefore, the data required no qualification.

6.7.3 Comparability

The laboratory utilized the protocols specified in the *CDAP, CQAP,* and *EPA SW-846*; therefore, these data were considered acceptable for comparison with previous data and were collected and analyzed according to the specified protocol.

6.7.4 Completeness

Completeness was evaluated as a measure of whether all the necessary information to meet the objectives of the project had been generated based on the planned samples stated in the *CDAP.*

All coolers were received within the specified temperature of 4°C (+/- 2°C). All samples received by the laboratory contained the correct preservatives.

The holding times criteria were met for all samples collected for Miscellaneous Analytes. Therefore, the completeness goal of 95 percent for holding time was met for Miscellaneous Analytes analyses.

For all media, the actual number of samples collected and analyzed met the number planned. Therefore, the analytical QC completeness goal of 90 percent was met for Miscellaneous Analytes analyses.

7.0 SUMMARY OF ANALYTICAL DATA

Analytical data for the Fort Story CS project was evaluated in Section 6 on the basis of the precision, accuracy, representativeness, comparability and completeness (PARCC) criteria. Sediment, groundwater and surface water samples were submitted for one or more of the following analyses: volatile organic compounds (VOCs), base-neutral and acid extractables (BNAs), pesticides/polychlorinated biphenyls (Pest/PCBs), total fuel hydrocarbons-light fraction (TFH-L), total fuel hydrocarbons-heavy fraction (TFH-H), total metals, dissolved metals (for water), and Miscellaneous Analytes, which include percent solids (for sediment) and water quality parameters. For each analytical method, the associated quality control (QC) data were used to provide an indication of the acceptability of the associated project data.

Precision was evaluated using the results of matrix spike/matrix spike duplicate (MS/MSD) sample pairs, laboratory control sample (LCS) pairs, and field duplicate sample pairs. Accuracy was assessed using the percent recoveries of spiked analytes for MS/MSD, LCS, and surrogate samples. Representativeness was evaluated using the results of method blank, trip blank, field blank samples and Fort Eustis source water results. Completeness was assessed by both the success rate in meeting holding time criteria and the number of analytical results considered acceptable after review of QC parameters. Comparability was assessed by using standard analytical methods and reporting analytical results in standard units of measurement. A detailed discussion for each PARCC criterion is presented in Section 6 of this report.

Based on the results of the QC samples for the VOC analyses, analytical precision and accuracy were considered acceptable. All MS/MSD and LCS precision and accuracy results were within acceptance limits. There were no detectable concentrations in the associated method blanks, trip blanks, and field blank samples that impacted the data quality or required data to be qualified. The 95 percent completeness goal for holding times and the 90 percent completeness goal for analytical QC were met for VOC analyses. Use of EPA Method 8240 ensured that the data were comparable to past analytical results and would be comparable to future data collected according to the specified protocol.

BNA QC results met the PARCC criteria. There were no detectable concentrations in the associated method blanks and field blank samples that impacted the data quality or required data to be qualified. The holding time completeness goal of 95 percent for BNA analysis was met. The completeness goal of 90 percent for the analytical data also was met. The use of EPA Method 8270 ensured that the data were comparable to past analytical results and would be comparable to future data collected according to the specified protocol.

The evaluation of Pest/PCB results based on PARCC criteria indicated that data quality was acceptable. There were no Pest/PCB compounds detected in the method blanks and field blanks; therefore, the representativeness of the analytical results was considered acceptable. The goal of 95 percent for holding times was achieved for the project samples. The completeness goal of 90 percent for the analytical data also was met. The use of EPA Method 8080 to analyze all Pest/PCB samples was selected to ensure that the data were comparable with past results and would be comparable to future data collected according to the specified protocol.

Based on the QC results associated with the samples analyzed for TFH, the data quality was considered acceptable. TFH compounds were not detected in method blanks, trip blanks, or field blank samples, so the representativeness of the data was considered acceptable. All samples were extracted and analyzed within holding times; therefore, the goal of 95 percent for holding times was met for TFH analyses. The completeness goal of 90 percent for the analytical data also was met. The use of the modified EPA Method 8015 procedures ensured that the data were comparable with past analytical results and would be comparable to future data collected according to the specified protocol.

Overall the metal QC results met the PARCC criteria. QC results showed conformance with project precision and accuracy goals for MS/MSD and LCS samples. All MS/MSD results were within acceptance limits. All LCS precision and accuracy results were within acceptance limits. The method blank and field blank samples did not have detectable metals at concentrations that required qualification of the data. The representativeness of the metal results were considered acceptable. The holding times completeness goal of 95 percent was met. The 90 percent completeness goal for analytical QC was met for metals analyses. The use of standard EPA analytical methods with data reported in consistent units of measurement should ensure that the data set is comparable with past analytical results and would be comparable to future data collected according to the specified protocol.

Miscellaneous Analytes results for CS project samples met the PARCC criteria. All samples were analyzed within holding times; therefore, the holding times completeness goal of 95 percent was met. The 90 percent completeness goal for analytical QC was met for the Miscellaneous Analytes. The use of EPA standard analytical methods with consistent units of measurement ensured that the of the data set is comparable with past analytical results and would be comparable to future data collected according to the specified protocol.

In summary, the data generated in support of the Fort Story CS project were considered acceptable and can be used with a high degree of confidence to evaluate environmental conditions at the project site. There were a limited number of samples that were qualified based on QC deficiencies, but overall, the QC criteria outlined in the *CDAP* were achieved for the project samples.

APPENDIX A

REFERENCES

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MONTGOMERY WATSON

A-E DAILY QUALITY CONTROL REPORT

DATE January 27, 1995
DAY Friday
WEATHER sunny
TEMPERATURE mid 30s
WIND moderate
HUMIDITY
REPORT NO. 1

USACE TECHNICAL MANAGER John Palensky

PROJECT Fort Story, Confirmatory Studies, Site 2 - Landfill 2

JOB NO. 1868.1122

CONTRACT NO. DAC W45-92-D-007

PERSONNEL AND SUBCONTRACTORS ON SITE:

Alex Tracy, Paige Igoe, Reid Dennis

VISITORS ON SITE:

none

EQUIPMENT ON SITE: Rental GMC Ryder truck, Rental F150 Uhaul truck, Isuzu Trooper, Rental GMC Ryder truck, Photovac PID, water quality meters, flow meter, electric stage pump, new battery

WORK PERFORMED (INCLUDING SAMPLING):

Water level measurements on MW105, MW106, MW107, MW108 and MW10
Purge and sample MW105 and MW109 (S/Dup)
Collected surface water samples SW3001 and SW3002.
Begin bailing MW106.

QUALITY CONTROL ACTIVITIES (INCLUDING CALIBRATIONS):

Calibrated all instruments/meters before work.

HEALTH AND SAFETY LEVELS AND ACTIVITIES:

Conducted tailgate safety meeting when we arrived on site.
All work conducted in Level D.

PROBLEMS ENCOUNTERED/CORRECTIVE ACTION:

SPECIAL NOTES:

TOMORROW'S EXPECTATIONS:
Sample MW106 (S/Dup), MW107, MW108.
Collect Sediment samples.

DISTRIBUTION:

SUBMITTED BY: Paige S. Igoe **TITLE:** Associate Engineer

Paige S Igoe

MONTGOMERY WATSON

A-E DAILY QUALITY CONTROL REPORT

DATE January 28, 1995
DAY Saturday
WEATHER rain
TEMPERATURE 30s
WIND fair
HUMIDITY
REPORT NO. 2

USACE TECHNICAL MANAGER John Palensky

PROJECT Fort Story, Confirmatory Studies, Site 2 Landfill 2

JOB NO. 1868.1122

CONTRACT NO. DACW45-92-D-007

PERSONNEL AND SUBCONTRACTORS ON SITE:

Alex Tracy, Reid Dennis, Paige Igoe

VISITORS ON SITE:

none

EQUIPMENT ON SITE:

Isuzu Trooper, Rental GMC Ryder truck, Rental F150 Uhaul truck, PhotoVac PID, water quality meters, flow meter, electric stage pump, battery

WORK PERFORMED (INCLUDING SAMPLING):

Finish purging MW106; collect samples for MW106 (MS/MSD).
Collect duplicate for SW3001.
Sampled MW107 and MW108.
Collect sediment samples SD3001 (MS/MSD), SD3002, SD3003, SD3004 and SD3005 (S/Dup)
Transport and pump purge water into a poly storage tank located in the hazardous waste facility

QUALITY CONTROL ACTIVITIES (INCLUDING CALIBRATIONS):

Calibrated PID and all instruments/meters before use.

HEALTH AND SAFETY LEVELS AND ACTIVITIES:

Conducted tailgate safety meeting at beginning of workday.
All work conducted in Level D.

PROBLEMS ENCOUNTERED/CORRECTIVE ACTION:
Due to several bottles that were broken during shipment, we ran out of bottles to send the DI water samples for analyses. We have called Savannah Labs and asked for bottles to be shipped to Montgomery Watson's Herndon, VA office. We will prepare the DI water samples at the office and send them from there upon our return.

SPECIAL NOTES:

TOMORROW'S EXPECTATIONS:
Drop off poly tank and empty drums at Fort Eustis hazardous waste facility.

DISTRIBUTION:

SUBMITTED BY: Paige S. Igoe **TITLE:** Associate Engineer

Paige S. Igoe

MONTGOMERY WATSON

A-E DAILY QUALITY CONTROL REPORT

DATE January 29, 1995
DAY Sunday
WEATHER cloudy
TEMPERATURE ~30s
WIND fair
HUMIDITY
REPORT NO. 3

USACE TECHNICAL MANAGER John Palensky

PROJECT Fort Eustis, Confirmatory Studies, Site 2 Landfill 2

JOB NO. 1868.1122

CONTRACT NO. DACW45-92-D-007

PERSONNEL AND SUBCONTRACTORS ON SITE:

Alex Tracy, Reid Dennis, Paige Igoe

VISITORS ON SITE:

none

EQUIPMENT ON SITE:

WORK PERFORMED (INCLUDING SAMPLING):

Return empty drums and poly tank to Fort Eustis hazardous waste facility.
Return Uhaul F150 to Newport News, VA.
Drive back to Herndon, VA.

QUALITY CONTROL ACTIVITIES (INCLUDING CALIBRATIONS):

HEALTH AND SAFETY LEVELS AND ACTIVITIES:

PROBLEMS ENCOUNTERED/CORRECTIVE ACTION:

SPECIAL NOTES:

TOMORROW'S EXPECTATIONS:

DISTRIBUTION:

SUBMITTED BY: Paige S Tgoe **TITLE:** Associate Engineer

Paige Sleger

MONTGOMERY WATSON

DATE February 1, 1995
DAY Wednesday
WEATHER cloudy
TEMPERATURE low 40s
WIND [illegible]
HUMIDITY
REPORT NO. 4

A-E DAILY QUALITY CONTROL REPORT

USACE TECHNICAL MANAGER John Palensky

PROJECT Fort Story, Confirmatory Studies, Site 2 Landfill 2

JOB NO. 1868.1122

CONTRACT NO. DACW 45-92-D-007

PERSONNEL AND SUBCONTRACTORS ON SITE:

Tom Haynes, Paige Igoe

VISITORS ON SITE:

none

EQUIPMENT ON SITE:

WORK PERFORMED (INCLUDING SAMPLING):

Put together DI water samples to be analyzed.

QUALITY CONTROL ACTIVITIES (INCLUDING CALIBRATIONS):

HEALTH AND SAFETY LEVELS AND ACTIVITIES:

PROBLEMS ENCOUNTERED/CORRECTIVE ACTION:

SPECIAL NOTES:

The DI water used at Fort Story for decontamination procedures was placed in the sample containers at the Montgomery Watson Herndon, VA equipment warehouse. This was necessary because of a bottle shortage in the field. Additional bottles were shipped from Savannah Labs to Montgomery Watson's Herndon, VA office.

TOMORROW'S EXPECTATIONS:

DISTRIBUTION:

SUBMITTED BY: Paige Solgve **TITLE:** Associate Engineer

SL SAVANNAH LABORATORIES & ENVIRONMENTAL SERVICES, INC.

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ANALYSIS REQUEST AND CHAIN OF CUSTODY RECORD

P.O. NUMBER	PROJECT NUMBER	PROJECT NAME	PAGE	OF
	1862.1122	FISIny & LF2		

CLIENT NAME	TELEPHONE/FAX NO.
Mont Walsm	703/478 3160/3375

CLIENT ADDRESS	CITY, STATE, ZIP CODE
500 Herndon Pkwy	Herndon VA 22070

SAMPLER(S) NAME(S)	CLIENT PROJECT MANAGER
Paige Tyoe Alex Tracy	Tom Haynes

MATRIX TYPE: AQUEOUS MATRIX / NONAQUEOUS MATRIX / OIL MATRIX / AIR MATRIX

REQUIRED ANALYSES: 8240 + TICS; 8015 - Light *

☐ STANDARD TAT
☐ EXPEDITED TAT *

REPORT DUE DATE ______

* SUBJECT TO RUSH FEES

NUMBER OF CONTAINERS SUBMITTED

SAMPLING DATE	SAMPLING TIME	SAMPLE IDENTIFICATION	AQUEOUS	NONAQUEOUS	OIL	AIR	8240 + TICS	8015 - Light
1/27/95	14 00	S2SW30010127	X				3	
1/27/95	13 30	S2MW1090127 D	X				~~3~~ 6 PSI	
1/27/95	13 30	S2MW1090127	X				6	
1/27/95	13 00	S2MW1050127	X				3	3
1/27/95	13 60	S2SW30020127	X				~~3~~ 6 PSI	
		Trip Blank						
		[illegible] bottle						

RELINQUISHED BY: (SIGNATURE)	DATE	TIME	RECEIVED BY: (SIGNATURE)	DATE	TIME	RELINQUISHED BY: (SIGNATURE)	DATE	TIME
Elijah Knight	0123-95	1600				[signature]	1/27/95	1700

RECEIVED BY: (SIGNATURE)	DATE	TIME	RELINQUISHED BY: (SIGNATURE)	DATE	TIME	RECEIVED BY: (SIGNATURE)	DATE	TIME

CLIENT'S FIELD COPY

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ANALYSIS REQUEST AND CHAIN OF CUSTODY RECORD

P.O. NUMBER	PROJECT NUMBER	PROJECT NAME	PAGE	OF
	1566-1177	Ft Story LF2	1	1

CLIENT NAME: Mont Watson
TELEPHONE/FAX NO.: 703 478 3400
CLIENT ADDRESS: 560 Herndon Pkwy
CITY, STATE, ZIP CODE: Herndon VA 22070
SAMPLER(S) NAME(S): Reid Dennis
CLIENT PROJECT MANAGER: Tom Haynes

MATRIX TYPE: AQUEOUS MATRIX / NONAQUEOUS MATRIX / OIL MATRIX / AIR MATRIX

REQUIRED ANALYSES — NUMBER OF CONTAINERS SUBMITTED

SAMPLING DATE	SAMPLING TIME	SAMPLE IDENTIFICATION	AQUEOUS	NONAQUEOUS	OIL	AIR	8080	8270+TICs	8015 Heavy	TAL Metals total /Hg	TAL Metals Diss /Hg	WQP	temp
1/27/95	1100	SQSW30010137	X				2	2	2	2	2	4	1

☐ STANDARD TAT
☐ EXPEDITED TAT *
REPORT DUE DATE ______
* SUBJECT TO RUSH FEES

RELINQUISHED BY: (SIGNATURE)	DATE	TIME	RECEIVED BY: (SIGNATURE)	DATE	TIME	RELINQUISHED BY: (SIGNATURE)	DATE	TIME
EMPTY BOTTLES [signature] Knight	01-16-95	1600	EMPTY BOTTLES			[signature]	1/27/95	1700
RECEIVED BY: (SIGNATURE)	DATE	TIME	RELINQUISHED BY: (SIGNATURE)	DATE	TIME	RECEIVED BY: (SIGNATURE)	DATE	TIME

FOR SAVANNAH LABORATORY USE ONLY

RECEIVED FOR LABORATORY BY: (SIGNATURE)	DATE	TIME	CUSTODY INTACT	CUSTODY SEAL NO.	S.L. LOG NO.	LABORATORY REMARKS
[signature]	1/28/95	1000	☒ YES ☐ NO		T5/1[illegible]	

WQP = 1 bottle → TDS, Alk, NO3/NO2, PO4 ; 1 bottle → SO4, Cl, F ; 1 bottle → NH3, P total ; 1 bottle → sulfide

ORIGINAL

WATER ANALYSIS ... 106

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ANALYSIS REQUEST AND CHAIN OF CUSTODY RECORD

Package 1 of 1

P.O. NUMBER	PROJECT NUMBER	PROJECT NAME	PAGE	OF
	1568.1122	F1 Sling LF 2	1	1

CLIENT NAME	TELEPHONE/FAX NO.
M. Nelson	7034783100/3375

CLIENT ADDRESS	CITY, STATE, ZIP CODE
[redacted] ndin Pkwy	Herndon, VA 22070

SAMPLER NAME(S)	CLIENT PROJECT MANAGER
[redacted] Tracy	Tom Haynos

MATRIX TYPE: AQUEOUS MATRIX / NONAQUEOUS MATRIX / OIL MATRIX / AIR MATRIX

REQUIRED ANALYSES — NUMBER OF CONTAINERS SUBMITTED

SAMPLING DATE	SAMPLING TIME	SAMPLE IDENTIFICATION	AQUEOUS MATRIX	NONAQUEOUS MATRIX	OIL MATRIX	AIR MATRIX	8240, TICs	8270, TICs	8080	8015 Heavy	TAL Metals total / Hg	TAL Metals diss / Hg	WQP	temp		
1/28/95	1300	S2 SW 3001 0128 D	X				3	2	2	2	2	2	4	1		
		Trip Blank					3									

☐ STANDARD TAT
☐ EXPEDITED TAT *

REPORT DUE DATE ____________

* SUBJECT TO RUSH FEES

RELINQUISHED BY: (SIGNATURE)	DATE	TIME	RECEIVED BY: (SIGNATURE)	DATE	TIME	RELINQUISHED BY: (SIGNATURE)	DATE	TIME
Elijah Knight	01-16-95	1600				Paige Sayre	1/28/95	14:00
RECEIVED BY: (SIGNATURE)	**DATE**	**TIME**	**RELINQUISHED BY: (SIGNATURE)**	**DATE**	**TIME**	**RECEIVED BY: (SIGNATURE)**	**DATE**	**TIME**

RECEIVED FOR LABORATORY BY: [illegible]

WQP = 1 bottle → SO_4, Cl, F; 1 bottle → TDS, Alk, NO_3/NO_2 [illegible] bottle [illegible] sulfides; [illegible] total

CLIENT'S FIELD COPY

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ANALYSIS REQUEST AND CHAIN OF CUSTODY RECORD

P.O. NUMBER	PROJECT NUMBER	PROJECT NAME
	1508.1122	Fisley LF2

CLIENT NAME	TELEPHONE/FAX NO.
Montgomery Walson	703 478 3446/3375

CLIENT ADDRESS	CITY, STATE, ZIP CODE
560 Herndon Pkwy	Herndon, VA 22070

SAMPLER(S) NAME(S)	CLIENT PROJECT MANAGER
Paige Ique Alex Tracy	Tom Haynes

PAGE ____ OF ____

MATRIX TYPE: AQUEOUS MATRIX / NONAQUEOUS MATRIX / OIL MATRIX / AIR MATRIX

REQUIRED ANALYSES: 8080 / 8270+TICs / 8015 Heavy / TAL Metals/Hg Total / TAL Metals/Hg Diss / WQP

☐ STANDARD TAT

☐ EXPEDITED TAT *

REPORT DUE DATE ________

* SUBJECT TO RUSH FEES

NUMBER OF CONTAINERS SUBMITTED

SAMPLING DATE	SAMPLING TIME	SAMPLE IDENTIFICATION	AQUEOUS	NONAQUEOUS	OIL	AIR	8080	8270+TICs	8015 Heavy	TAL Metals/Hg Total	TAL Metals/Hg Diss	WQP				
1/27/95	13:30	S2MW1090127 D	X				2	2	2	2	2	4	1			

RELINQUISHED BY: (SIGNATURE)	DATE	TIME	RECEIVED BY: (SIGNATURE)	DATE	TIME	RELINQUISHED BY: (SIGNATURE)	DATE	TIME
Elijah Knight	01-23-95	1600						
RECEIVED BY: (SIGNATURE)	**DATE**	**TIME**	**RELINQUISHED BY: (SIGNATURE)**	**DATE**	**TIME**	**RECEIVED BY: (SIGNATURE)**	**DATE**	**TIME**

FOR SAVANNAH LABORATORIES USE ONLY

RECEIVED FOR LABORATORY BY: (SIGNATURE)	DATE	TIME	CUSTODY INTACT	CUSTODY SEAL NO.	S.L. LOG NO.
			☐ YES ☐ NO		

WQP = 1 bottle → TDS, Alk, NO_3/NO_2, PO_4 ; 1 bottle → SO_4, Cl, F ; 1 bottle → NH_3, P, [illegible] ; 1 bottle → Sulfide

CLIENT'S FIELD COPY

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ANALYSIS REQUEST AND CHAIN OF CUSTODY RECORD

1 MW

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P.O. NUMBER	PROJECT NUMBER	PROJECT NAME
	1568.1122	FtStory LF 2

CLIENT NAME	TELEPHONE/FAX NO.
Montgomery Watson	7034783400/3375

CLIENT ADDRESS	CITY, STATE, ZIP CODE
560 Herndon Pkwy Ste 300	Herndon VA 22070

SAMPLER(S) NAME(S)	CLIENT PROJECT MANAGER
Paige Ique, Alex Tracy	Tom Haynes

MATRIX TYPE: AQUEOUS MATRIX, NONAQUEOUS MATRIX, OIL MATRIX, AIR MATRIX

REQUIRED ANALYSES: 8270+TICs; 8080; 6015-Heavy; TAL Total (1/15); TAL Diss (1/15); WQP

PAGE ___ OF ___

☐ STANDARD TAT
☐ EXPEDITED TAT *

REPORT DUE DATE ______

* SUBJECT TO RUSH FEES

NUMBER OF CONTAINERS SUBMITTED

SAMPLING DATE	SAMPLING TIME	SAMPLE IDENTIFICATION	AQUEOUS	NONAQUEOUS	OIL	AIR	8270+TICs	8080	6015-Heavy	TAL Total	TAL Diss	WQP				
1/7/15	13[30]	S2MW109 0127	X				2	2	2	2	2	4	1			

RELINQUISHED BY: (SIGNATURE)	DATE	TIME	RECEIVED BY: (SIGNATURE)	DATE	TIME	RELINQUISHED BY: (SIGNATURE)	DATE	TIME
Deyoh Knight	1/23/95	1600			1700	Paige Ique	1/27/95	1700

RECEIVED BY: (SIGNATURE)	DATE	TIME	RELINQUISHED BY: (SIGNATURE)	DATE	TIME	RECEIVED BY: (SIGNATURE)	DATE	TIME

RECEIVED FOR LABORATORY BY: [illegible]

WQP = 1 bottle → TDS, Alk, NO_3/NO_2, PO_4; 1 bottle → SO_4, [illegible]; 1 bottle → NH_3, P-Total; 1 bottle → Sulfide

CLIENT'S FIELD COPY

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ANALYSIS REQUEST AND CHAIN OF CUSTODY RECORD

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P.O. NUMBER	PROJECT NUMBER	PROJECT NAME
	1-69 1122	F-1 Slury

CLIENT NAME	TELEPHONE/FAX NO.
Montgomery Watson	703 478 3400/3375

CLIENT ADDRESS	CITY, STATE, ZIP CODE
300 Herndon Pkwy Suite 300	Herndon VA 22070

SAMPLER(S) NAME(S)	CLIENT PROJECT MANAGER
Reid Dennis	Tom Haynes

PAGE 1 OF

- [ ] STANDARD TAT
- [ ] EXPEDITED TAT *

REPORT DUE DATE ______

* SUBJECT TO RUSH FEES

MATRIX TYPE / REQUIRED ANALYSES / NUMBER OF CONTAINERS SUBMITTED

SAMPLING DATE	SAMPLING TIME	SAMPLE IDENTIFICATION	AQUEOUS MATRIX	NONAQUEOUS MATRIX	OIL MATRIX	AIR MATRIX	~~VOC 8240 + TICs~~	~~8015-Light~~	8080	8015-Heavy	8270 + TICs	TAL Metals total/Hg	TAL metals diss/Hg	WQP *	temp	
1/27/95	1300	SJMW1050127	X				3	3	2	2	2	2	2	4	1	

RELINQUISHED BY: (SIGNATURE)	DATE	TIME	RECEIVED BY: (SIGNATURE)	DATE	TIME	RELINQUISHED BY: (SIGNATURE)	DATE	TIME
~~Elijah Knight~~	~~012395~~	~~1600~~	[signature]	1/27/95	1700	Paige S[illegible]	1/27/95	1700

RECEIVED BY: (SIGNATURE)	DATE	TIME	RELINQUISHED BY: (SIGNATURE)	DATE	TIME	RECEIVED BY: (SIGNATURE)	DATE	TIME

RECEIVED FOR LABORATORY BY: [illegible]

*WQP = 1 bottle → TDS, Alk, NO3/NO2, PO4; 1 bottle → SO4, Cl, F; 1 bottle → NH3, [illegible]; 1 bottle → Sulfide

CLIENT'S FIELD COPY

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ANALYSIS REQUEST AND CHAIN OF CUSTODY RECORD

P.O. NUMBER	PROJECT NUMBER	PROJECT NAME
	15002.1122	Flsley LF 2

CLIENT NAME	TELEPHONE/FAX NO.
Mont Walsen	703 8478 3400

CLIENT ADDRESS	CITY, STATE, ZIP CODE
500 Herndon Pkwy	Herndon VA 22070

[redacted] NAME(S)	CLIENT PROJECT MANAGER
[redacted] Alex Tracy	Tom Haynes

PAGE ___ OF ___

☐ STANDARD TAT
☐ EXPEDITED TAT *

REPORT DUE DATE ________

* SUBJECT TO RUSH FEES

REQUIRED ANALYSES / NUMBER OF CONTAINERS SUBMITTED

SAMPLING DATE	SAMPLING TIME	SAMPLE IDENTIFICATION	AQUEOUS MATRIX	NONAQUEOUS MATRIX	OIL MATRIX	AIR MATRIX	8080	8270 +TICs	8015-Heavy	TAL metals/Hg	TAL metals/Hg Diss	WQP	Temp			
1/27/95	1350	S2SW30020127	X				2	2	2	2	2	4	1			

RELINQUISHED BY: (SIGNATURE)	DATE	TIME	RECEIVED BY: (SIGNATURE)	DATE	TIME	RELINQUISHED BY: (SIGNATURE)	DATE	TIME
Elijah Knight	01-16-95	1600				[illegible]	1/27/95	1700
RECEIVED BY: (SIGNATURE)	**DATE**	**TIME**	**RELINQUISHED BY: (SIGNATURE)**	**DATE**	**TIME**	**RECEIVED BY: (SIGNATURE)**	**DATE**	**TIME**

LABORATORY USE ONLY

RECEIVED FOR LABORATORY BY: (SIGNATURE) | DATE | TIME | CUSTODY INTACT ☐ YES ☐ NO | [illegible] | S.L. LOG NO. [illegible]

* WQP = 1 bottle → TDS, Alk, NO_3/NO_2, PO_4; 1 bottle → SO4, Cl, F; 1 bottle → NH3, P total; 1 bottle → sulfide

CLIENT'S FIELD COPY

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ANALYSIS REQUEST AND CHAIN OF CUSTODY RECORD

1+1
2 MW

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- ☒ MRD

P.O. NUMBER	
PROJECT NUMBER	1565.1122
PROJECT NAME	FL Slay LF 2
CLIENT NAME	Montgomery Watson
TELEPHONE/FAX NO.	703/478-3446 / 3375
CLIENT ADDRESS	560 Herndon Pkwy Ste 300
CITY, STATE, ZIP CODE	Herndon, VA 22070
SAMPLER(S) NAME(S)	Inge Igoe Alex Tracy
CLIENT PROJECT MANAGER	Tom Haynes
PAGE	
OF	

MATRIX TYPE: AQUEOUS MATRIX / NONAQUEOUS MATRIX / OIL MATRIX / AIR MATRIX

REQUIRED ANALYSES: 8080 | 8270 + TICs | 8015 - Heavy | TAL Metals Total/Hg | TAL Metals Diss/Hg | WQP | WQP | 8240

☐ STANDARD TAT
☐ EXPEDITED TAT *

REPORT DUE DATE ____________

* SUBJECT TO RUSH FEES

NUMBER OF CONTAINERS SUBMITTED

SAMPLING DATE	SAMPLING TIME	SAMPLE IDENTIFICATION	AQUEOUS	NONAQUEOUS	OIL	AIR	8080	8270 + TICs	8015 - Heavy	TAL Metals Total/Hg	TAL Metals Diss/Hg	WQP	WQP	8240		
1/27/95	17:00	SSMW1090127 S	X				2	2	2	2	2	4	1	3		
		Trip Blank												3		

8240? why have trip blank

RELINQUISHED BY: (SIGNATURE)	DATE	TIME	RECEIVED BY: (SIGNATURE)	DATE	TIME	RELINQUISHED BY: (SIGNATURE)	DATE	TIME
Delah Knight	01-23-95	1600				Inge Igoe	1/27/95	19:00
RECEIVED BY: (SIGNATURE)	**DATE**	**TIME**	**RELINQUISHED BY: (SIGNATURE)**	**DATE**	**TIME**	**RECEIVED BY: (SIGNATURE)**	**DATE**	**TIME**

RECEIVED FOR LABORATORY BY: (SIGNATURE) | DATE | TIME

WQP = 1 bottle → TDS, Alk, NO3/NO2, Cl; 1 bottle → SO4, NP; 1 bottle → NH3, PO4; 1 bottle → sulfide

CLIENT'S FIELD COPY

3 MW

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ANALYSIS REQUEST AND CHAIN OF CUSTODY RECORD

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P.O. NUMBER:
PROJECT NUMBER: 1868.1122
PROJECT NAME: F1 Story LF2
CLIENT NAME: Montgomery Watson
TELEPHONE/FAX NO.: 703 478 3400/3375
CLIENT ADDRESS: 560 Herndon Pkwy
CITY, STATE, ZIP CODE: Herndon VA 22070
SAMPLER(S) NAME(S): Alex Tracy, Paige Iqoe
CLIENT PROJECT MANAGER: Tom Haynes

PAGE 1 OF 1

- [ ] STANDARD TAT
- [ ] EXPEDITED TAT *

REPORT DUE DATE ______

* SUBJECT TO RUSH FEES

MATRIX TYPE: AQUEOUS MATRIX / NONAQUEOUS MATRIX / OIL MATRIX / AIR MATRIX

REQUIRED ANALYSES: 8240; temp

NUMBER OF CONTAINERS SUBMITTED

SAMPLING DATE	SAMPLING TIME	SAMPLE IDENTIFICATION	AQUEOUS MATRIX	NONAQUEOUS MATRIX	OIL MATRIX	AIR MATRIX	8240	temp
1/28/95	1000	S2MW1060128	X				3	1
1/28/95	1000	S2MW1060128 MS	X				3	–
1/28/95	1000	S2MW1060128 MSD	X				3	–
1/28/95	1200	S2MW1070128	X				3	–
1/28/95	1030	S2MW1080128	X				3	–
		trip blank	X				3	–

RELINQUISHED BY: (SIGNATURE)	DATE	TIME	RECEIVED BY: (SIGNATURE)	DATE	TIME	RELINQUISHED BY: (SIGNATURE)	DATE	TIME
[signature]	1/24/95	1600	[signature]			Paige S Iqoe	1/30/95	1300
RECEIVED BY: (SIGNATURE)	**DATE**	**TIME**	**RELINQUISHED BY: (SIGNATURE)**	**DATE**	**TIME**	**RECEIVED BY: (SIGNATURE)**	**DATE**	**TIME**
						[signature]		

RECEIVED FOR LABORATORY BY: (SIGNATURE) — DATE — TIME — [illegible] YES NO

CLIENT'S FIELD COPY

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- [ ] 900 Lakeside Drive, Mobile, AL 36693 — Phone: (205) 666-6633 — Fax (205) 666-6696
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ANALYSIS REQUEST AND CHAIN OF CUSTODY RECORD

P.O. NUMBER	PROJECT NUMBER	PROJECT NAME	PAGE	OF
	1868.1122	Ft Story LF2	1	1

CLIENT NAME	TELEPHONE/FAX NO.
Montgomery Watson	7034783400

CLIENT ADDRESS	CITY, STATE, ZIP CODE
560 Herndon Pkwy	Herndon VA 22070

SAMPLER(S) NAME(S)	CLIENT PROJECT MANAGER
Alex Tracy	Tom Haynes

- [ ] STANDARD TAT
- [ ] EXPEDITED TAT *

REPORT DUE DATE ____________

* SUBJECT TO RUSH FEES

MATRIX TYPE / REQUIRED ANALYSES — NUMBER OF CONTAINERS SUBMITTED

SAMPLING DATE	SAMPLING TIME	SAMPLE IDENTIFICATION	AQUEOUS MATRIX	NONAQUEOUS MATRIX	OIL MATRIX	AIR MATRIX	8080	8270+TICS	8015 Heavy	TAL Metals/Hg total	TAL Metals/Hg diss.	temp					
1/28/95	10:00	S2MW1060128	X				2	2	2	2	2	1					

RELINQUISHED BY: (SIGNATURE)	DATE	TIME	RECEIVED BY: (SIGNATURE)	DATE	TIME	RELINQUISHED BY: (SIGNATURE)	DATE	TIME
[signature]	01-29-95	1600	[signature]			Paige Sloop	1/30/95	1200

RECEIVED BY: (SIGNATURE)	DATE	TIME	RELINQUISHED BY: (SIGNATURE)	DATE	TIME	RECEIVED BY: (SIGNATURE)	DATE	TIME

RECEIVED FOR LABORATORY BY: [illegible]

CLIENT'S FIELD COPY

SL SAVANNAH LABORATORIES & ENVIRONMENTAL SERVICES, INC. 12878

☐ 5102 LaRoche Avenue, Savannah, GA 31404	Phone: (912) 354-7858	Fax (912) 352-0165
☒ 2846 Industrial Plaza Drive, Tallahassee, FL 32301	Phone: (904) 878-3994	Fax (904) 878-9504
☐ 414 Southwest 12th Avenue, Deerfield Beach, FL 33442	Phone: (305) 421-7400	Fax (305) 421-2584
☐ 900 Lakeside Drive, Mobile, AL 36693	Phone: (205) 666-6633	Fax (205) 666-6696
☐ 6712 Benjamin Road, Suite 100, Tampa, FL 33634	Phone: (813) 885-7427	Fax (813) 885-7049

ANALYSIS REQUEST AND CHAIN OF CUSTODY RECORD

P.O. NUMBER:
PROJECT NUMBER: 1863.1122
PROJECT NAME: Ft Story LF2
PAGE 1 OF 1

CLIENT NAME: Montgomery Watson
TELEPHONE/FAX NO.:
CLIENT ADDRESS: 560 Herndon Pkwy
CITY, STATE, ZIP CODE: Herndon VA 22070
SAMPLER(S) NAME(S): Alex Tracy
CLIENT PROJECT MANAGER: Tom Haynes

MATRIX TYPE: AQUEOUS MATRIX / NONAQUEOUS MATRIX / OIL MATRIX / AIR MATRIX

REQUIRED ANALYSES: 8080 / 8270+TICS / 8015 Heavy / TAL Metals/Hg total / TAL Metals/Hg diss / temp

☐ STANDARD TAT
☐ EXPEDITED TAT *
REPORT DUE DATE ______
* SUBJECT TO RUSH FEES

SAMPLING DATE	SAMPLING TIME	SAMPLE IDENTIFICATION	AQUEOUS	NONAQUEOUS	OIL	AIR	8080	8270+TICS	8015 Heavy	TAL Metals/Hg total	TAL Metals/Hg diss	temp					
1/28/95	1000	S2MW1060128 MS	X				2	2	2	2	2	1					

NUMBER OF CONTAINERS SUBMITTED

RELINQUISHED BY: (SIGNATURE)	DATE	TIME	RECEIVED BY: (SIGNATURE)	DATE	TIME	RELINQUISHED BY: (SIGNATURE)	DATE	TIME
Elijah Knight	01-28-95	1600	[signature]			Paige S Doyle	1/30/95	1200
RECEIVED BY: (SIGNATURE)	DATE	TIME	RELINQUISHED BY: (SIGNATURE)	DATE	TIME	RECEIVED BY: (SIGNATURE)	DATE	TIME
						[signature]		

RECEIVED FOR LABORATORY BY: ... DATE ... TIME ... CUSTODY INTACT ☐ YES ☐ NO

CLIENT'S FIELD COPY

SL SAVANNAH LABORATORIES & ENVIRONMENTAL SERVICES, INC.

12747

- ☐ 5102 LaRoche Avenue, Savannah, GA 31404 — Phone: (912) 354-7858 — Fax (912) 352-0165
- ☒ 2846 Industrial Plaza Drive, Tallahassee, FL 32301 — Phone: (904) 878-3994 — Fax (904) 878-9504
- ☐ 414 Southwest 12th Avenue, Deerfield Beach, FL 33442 — Phone: (305) 421-7400 — Fax (305) 421-2584
- ☐ 900 Lakeside Drive, Mobile, AL 36693 — Phone: (205) 666-6633 — Fax (205) 666-6696
- ☐ 6712 Benjamin Road, Suite 100, Tampa, FL 33634 — Phone: (813) 885-7427 — Fax (813) 885-7049

ANALYSIS REQUEST AND CHAIN OF CUSTODY RECORD

P.O. NUMBER	PROJECT NUMBER	PROJECT NAME	PAGE	OF
	1868.1122	Ft Story LF 2		

- **CLIENT NAME:** Montgomery Walson
- **TELEPHONE/FAX NO.:** 703 478 3400/3375
- **CLIENT ADDRESS:** 560 Herndon Pkwy
- **CITY, STATE, ZIP CODE:** Herndon, VA 22070
- **SAMPLER(S) NAME(S):** Alex tracy
- **CLIENT PROJECT MANAGER:** Tom Haynos

☐ STANDARD TAT
☐ EXPEDITED TAT *

REPORT DUE DATE ______

* SUBJECT TO RUSH FEES

MATRIX TYPE: AQUEOUS MATRIX / NONAQUEOUS MATRIX / OIL MATRIX / AIR MATRIX

REQUIRED ANALYSES — NUMBER OF CONTAINERS SUBMITTED

SAMPLING DATE	SAMPLING TIME	SAMPLE IDENTIFICATION	AQUEOUS MATRIX	NONAQUEOUS MATRIX	OIL MATRIX	AIR MATRIX	8080	8015 Heavy	8270 + TICs	TAL metals total/Hg	TAL metals diss/Hg	temp				
1/28/95	1000	S2MW1060128MSD	X				2	2	2	2	2	1				

RELINQUISHED BY: (SIGNATURE)	DATE	TIME	RECEIVED BY: (SIGNATURE)	DATE	TIME	RELINQUISHED BY: (SIGNATURE)	DATE	TIME
[signature]	1/29/95	1220	[signature]			Paige S[signature]	1/30/95	1200

RECEIVED BY: (SIGNATURE)	DATE	TIME	RELINQUISHED BY: (SIGNATURE)	DATE	TIME	RECEIVED BY: (SIGNATURE)	DATE	TIME

RECEIVED FOR LABORATORY BY: [illegible] DATE TIME CUSTODY INTACT ☐ YES ☐ NO [illegible]

CLIENT'S FIELD COPY

1-1-1-154 115 4105 ... 24

SL SAVANNAH LABORATORIES & ENVIRONMENTAL SERVICES, INC.

4MW

- [ ] 5102 LaRoche Avenue, Savannah, GA 31404 Phone: (912) 354-7858 Fax (912) 352-0165
- [x] 2846 Industrial Plaza Drive, Tallahassee, FL 32301 Phone: (904) 878-3994 Fax (904) 878-9504
- [ ] 414 Southwest 12th Avenue, Deerfield Beach, FL 33442 Phone: (305) 421-7400 Fax (305) 421-2584
- [ ] 900 Lakeside Drive, Mobile, AL 36693 Phone: (205) 666-6633 Fax (205) 666-6696
- [ ] 6712 Benjamin Road, Suite 100, Tampa, FL 33634 Phone: (813) 885-7427 Fax (813) 885-7049

ANALYSIS REQUEST AND CHAIN OF CUSTODY RECORD

P.O. NUMBER	PROJECT NUMBER	PROJECT NAME	PAGE	OF
	1368.1122	Ft Story LF 3	1	1

CLIENT NAME	TELEPHONE/FAX NO.
Mont. Watson	703 478 3400/3375

CLIENT ADDRESS	CITY, STATE, ZIP CODE
Scotlandon Pkwy	Herndon, VA 22070

SAMPLER(S) NAME(S)	CLIENT PROJECT MANAGER
Paige Igoe	Tom Haynes

MATRIX TYPE: AQUEOUS MATRIX, NONAQUEOUS MATRIX, OIL MATRIX, AIR MATRIX

REQUIRED ANALYSES: 8080; 8270+TICs; 8015 Heavy; TAL metals/Hg total; TAL metals/Hg Diss; temp

- [ ] STANDARD TAT
- [ ] EXPEDITED TAT *

REPORT DUE DATE ______

* SUBJECT TO RUSH FEES

NUMBER OF CONTAINERS SUBMITTED

SAMPLING DATE	SAMPLING TIME	SAMPLE IDENTIFICATION	AQUEOUS	NONAQUEOUS	OIL	AIR	8080	8270+TICs	8015 Heavy	TAL metals/Hg total	TAL metals/Hg Diss	temp
1/25/95	1200	SAMW107 0128	X				2	2	2	2	1	1

RELINQUISHED BY: (SIGNATURE)	DATE	TIME	RECEIVED BY: (SIGNATURE)	DATE	TIME	RELINQUISHED BY: (SIGNATURE)	DATE	TIME
Dana A. Stasick	1/24/95	1600				Paige S. Igoe		
RECEIVED BY: (SIGNATURE)	DATE	TIME	RELINQUISHED BY: (SIGNATURE)	DATE	TIME	RECEIVED BY: (SIGNATURE)	DATE	TIME

RECEIVED FOR LABORATORY BY: (SIGNATURE) DATE TIME CUSTODY INTACT [ ] YES [ ] NO

CLIENT'S FIELD COPY

12972

SL SAVANNAH LABORATORIES & ENVIRONMENTAL SERVICES, INC.

ANALYSIS REQUEST AND CHAIN OF CUSTODY RECORD

- [ ] 5102 LaRoche Avenue, Savannah, GA 31404 — Phone: (912) 354-7858 — Fax (912) 352-0165
- [X] 2846 Industrial Plaza Drive, Tallahassee, FL 32301 — Phone: (904) 878-3994 — Fax (904) 878-9504
- [ ] 414 Southwest 12th Avenue, Deerfield Beach, FL 33442 — Phone: (305) 421-7400 — Fax (305) 421-2584
- [ ] 900 Lakeside Drive, Mobile, AL 36693 — Phone: (205) 666-6633 — Fax (205) 666-6696
- [ ] 6712 Benjamin Road, Suite 100, Tampa, FL 33634 — Phone: (813) 885-7427 — Fax (813) 885-7049

P.O. NUMBER	PROJECT NUMBER	PROJECT NAME	MATRIX TYPE	REQUIRED ANALYSES	PAGE	OF
	1566.1129	Ft. Stay LF2			1	1

CLIENT NAME: Mont. Watson
TELEPHONE/FAX NO.: 703 478 3400/3375
CLIENT ADDRESS: [redacted] Pkwy
CITY, STATE, ZIP CODE: Herndon, VA 22070
SAMPLER NAME(S): [redacted]
CLIENT PROJECT MANAGER: Tom Haynes

- [ ] STANDARD TAT
- [ ] EXPEDITED TAT *

REPORT DUE DATE ______

* SUBJECT TO RUSH FEES

NUMBER OF CONTAINERS SUBMITTED

SAMPLING DATE	SAMPLING TIME	SAMPLE IDENTIFICATION	AQUEOUS MATRIX	NONAQUEOUS MATRIX	OIL MATRIX	AIR MATRIX	8080	8270+TICs	8015 Heavy	TAL Metals/Hg total	TAL Metals/Hg Diss.	temp				
1/25/96	10:30	S2MW1080128	X				2	2	2	2	2	1				

RELINQUISHED BY: (SIGNATURE)	DATE	TIME	RECEIVED BY: (SIGNATURE)	DATE	TIME	RELINQUISHED BY: (SIGNATURE)	DATE	TIME
Elijah Knight	01/16/95	1600	[signature]			[signature]		
RECEIVED BY: (SIGNATURE)	**DATE**	**TIME**	**RELINQUISHED BY: (SIGNATURE)**	**DATE**	**TIME**	**RECEIVED BY: (SIGNATURE)**	**DATE**	**TIME**

RECEIVED FOR LABORATORY BY: [illegible]

CLIENT'S FIELD COPY

SL SAVANNAH LABORATORIES & ENVIRONMENTAL SERVICES, INC. 12971

☐	5102 LaRoche Avenue, Savannah, GA 31404	Phone: (912) 354-7858	Fax (912) 352-0165
☒	2846 Industrial Plaza Drive, Tallahassee, FL 32301	Phone: (904) 878-3994	Fax (904) 878-9504
☐	414 Southwest 12th Avenue, Deerfield Beach, FL 33442	Phone: (305) 421-7400	Fax (305) 421-2584
☐	900 Lakeside Drive, Mobile, AL 36693	Phone: (205) 666-6633	Fax (205) 666-6696
☐	6712 Benjamin Road, Suite 100, Tampa, FL 33634	Phone: (813) 885-7427	Fax (813) 885-7049

ANALYSIS REQUEST AND CHAIN OF CUSTODY RECORD

P.O. NUMBER:
PROJECT NUMBER: 1868.1122
PROJECT NAME: Ft. Story LF 2
PAGE 1 OF 1

CLIENT NAME: Montgomery Watson
TELEPHONE/FAX NO.: 703 478 3400/3375
CLIENT ADDRESS: [redacted]don Pkwy
CITY, STATE, ZIP CODE: Herndon VA 22070
SAMPLER NAME(S): [redacted] Dennis
CLIENT PROJECT MANAGER: Tom Haynos

MATRIX TYPE: AQUEOUS MATRIX / NONAQUEOUS MATRIX / OIL MATRIX / AIR MATRIX

REQUIRED ANALYSES: % solids; 8240; TFH-L; TAL metals; 8270/8080; TFH-H; temp

☐ STANDARD TAT
☐ EXPEDITED TAT *
REPORT DUE DATE ______
* SUBJECT TO RUSH FEES

NUMBER OF CONTAINERS SUBMITTED

SAMPLING DATE	SAMPLING TIME	SAMPLE IDENTIFICATION	AQUEOUS MATRIX	NONAQUEOUS MATRIX	OIL MATRIX	AIR MATRIX	% solids	8240	TFH-L	TAL metals	8270/8080	TFH-H	temp			
1/28/95	430	S2SD30010128		X			1	1	1	1	2	1				
1/28/95	430	S2SD30010128 MS		X			1	1	1	1	2	—				
1/28/95	430	S2SD30010128 MSD		X			1	1	1	1	2	—				
1/28/95	400	S2SD30020128		X			1	2	—	1	2	—				

RELINQUISHED BY: (SIGNATURE)	DATE	TIME	RECEIVED BY: (SIGNATURE)	DATE	TIME	RELINQUISHED BY: (SIGNATURE)	DATE	TIME
Dylan Knight	01/16/95	1600	[signature]			[signature]	1/30/95	1200
RECEIVED BY: (SIGNATURE)	DATE	TIME	RELINQUISHED BY: (SIGNATURE)	DATE	TIME	RECEIVED BY: (SIGNATURE)	DATE	TIME

RECEIVED FOR LABORATORY BY: [illegible]

CLIENT'S FIELD COPY

[illegible]

SL SAVANNAH LABORATORIES & ENVIRONMENTAL SERVICES, INC.

12970

☐ 5102 LaRoche Avenue, Savannah, GA 31404 Phone: (912) 354-7858 Fax (912) 352-0165
☒ 2846 Industrial Plaza Drive, Tallahassee, FL 32301 Phone: (904) 878-3994 Fax (904) 878-9504
☐ 414 Southwest 12th Avenue, Deerfield Beach, FL 33442 Phone: (305) 421-7400 Fax (305) 421-2584
☐ 900 Lakeside Drive, Mobile, AL 36693 Phone: (205) 666-6633 Fax (205) 666-6696
☐ 6712 Benjamin Road, Suite 100, Tampa, FL 33634 Phone: (813) 885-7427 Fax (813) 885-7049

ANALYSIS REQUEST AND CHAIN OF CUSTODY RECORD

P.O. NUMBER	PROJECT NUMBER	PROJECT NAME	PAGE	OF
	1268.1122	A. Story	1	1

CLIENT NAME: Montgomery Watson
TELEPHONE/FAX NO.: 703-478-3400 / 3375
CLIENT ADDRESS: [redacted] Herndon Parkway
CITY, STATE, ZIP CODE: Herndon VA 22070
[redacted] Dennis
CLIENT PROJECT MANAGER: Tom Haynes

MATRIX TYPE: AQUEOUS MATRIX / NONAQUEOUS MATRIX / OIL MATRIX / AIR MATRIX

REQUIRED ANALYSES: 8240 + TICs; 8270 + TICs, Pest; 8015-Heavy; TAL Metals; % Solids

☒ STANDARD TAT
☐ EXPEDITED TAT *
REPORT DUE DATE ________
* SUBJECT TO RUSH FEES

NUMBER OF CONTAINERS SUBMITTED

SAMPLING DATE	SAMPLING TIME	SAMPLE IDENTIFICATION	AQUEOUS	NONAQUEOUS	OIL	AIR	8240 + TICs	8270 + TICs, Pest	8015-Heavy	TAL Metals / % Solids						
1/28	12:00	S2SD30030128		X			2	1	1	1						
1/28	13:00	S2SD30040128		X			2	1	1	1						
1/28	16:45	S2SD30050128		X			2	1	1	1						
1/28	16:45	S2SD30050128D		X			2	2	1	1						

RELINQUISHED BY: (SIGNATURE)	DATE	TIME	RECEIVED BY: (SIGNATURE)	DATE	TIME	RELINQUISHED BY: (SIGNATURE)	DATE	TIME
Elijah Knight	01/28/95	1600		1/30/95	13:30	[illegible signature]		
RECEIVED BY: (SIGNATURE)	DATE	TIME	RELINQUISHED BY: (SIGNATURE)	DATE	TIME	RECEIVED BY: (SIGNATURE)	DATE	TIME

RECEIVED FOR LABORATORY BY: (SIGNATURE) [illegible]

CLIENT'S FIELD COPY

'0E'' 'a''' 'FO'' '15'

SL SAVANNAH LABORATORIES & ENVIRONMENTAL SERVICES, INC.

12880

☐ 5102 LaRoche Avenue, Savannah, GA 31404 — Phone: (912) 354-7858 — Fax (912) 352-0165
☐ 2846 Industrial Plaza Drive, Tallahassee, FL 32301 — Phone: (904) 878-3994 — Fax (904) 878-9504
☐ 414 Southwest 12th Avenue, Deerfield Beach, FL 33442 — Phone: (305) 421-7400 — Fax (305) 421-2584
☐ 900 Lakeside Drive, Mobile, AL 36693 — Phone: (205) 666-6633 — Fax (205) 666-6696
☐ 6712 Benjamin Road, Suite 100, Tampa, FL 33634 — Phone: (813) 885-7427 — Fax (813) 885-7049
☒ MRD

ANALYSIS REQUEST AND CHAIN OF CUSTODY RECORD

P.O. NUMBER	PROJECT NUMBER	PROJECT NAME
	1808.1122	Ft. Story LF2

PAGE 1 OF 1

CLIENT NAME	TELEPHONE/FAX NO.
Montgomery Watson	703 478 3400

CLIENT ADDRESS	CITY, STATE, ZIP CODE
560 Herndon Pkwy	Herndon VA 22070

SAMPLER(S) NAME(S)	CLIENT PROJECT MANAGER
Reid Dennis	Tom Haynes

☐ STANDARD TAT
☐ EXPEDITED TAT *

REPORT DUE DATE ______

* SUBJECT TO RUSH FEES

MATRIX TYPE / REQUIRED ANALYSES / NUMBER OF CONTAINERS SUBMITTED

SAMPLING DATE	SAMPLING TIME	SAMPLE IDENTIFICATION	AQUEOUS MATRIX	NONAQUEOUS MATRIX	OIL MATRIX	AIR MATRIX	Percent Solids	TAL metals	8240+TICS	TPH-H, 8080 8270	temp					
1/28/95	1645	S2SD30050128 S	X				1	1	2	2	1					

RELINQUISHED BY: (SIGNATURE)	DATE	TIME	RECEIVED BY: (SIGNATURE)	DATE	TIME	RELINQUISHED BY: (SIGNATURE)	DATE	TIME
[illegible signature]	1-23-95	1600	[illegible signature]			[illegible signature]	1/30/95	12:00
RECEIVED BY: (SIGNATURE)	DATE	TIME	RELINQUISHED BY: (SIGNATURE)	DATE	TIME	RECEIVED BY: (SIGNATURE)	DATE	TIME

CLIENT'S FIELD COPY

SL SAVANNAH LABORATORIES & ENVIRONMENTAL SERVICES, INC. 12985

Fed Ex 2417011940

ANALYSIS REQUEST AND CHAIN OF CUSTODY RECORD

☐ 5102 LaRoche Avenue, Savannah, GA 31404 — Phone: (912) 354-7858 — Fax (912) 352-0165
☒ 2846 Industrial Plaza Drive, Tallahassee, FL 32301 — Phone: (904) 878-3994 — Fax (904) 878-9504
☐ 414 Southwest 12th Avenue, Deerfield Beach, FL 33442 — Phone: (305) 421-7400 — Fax (305) 421-2584
☐ 900 Lakeside Drive, Mobile, AL 36693 — Phone: (205) 666-6633 — Fax (205) 666-6696
☐ 6712 Benjamin Road, Suite 100, Tampa, FL 33634 — Phone: (813) 885-7427 — Fax (813) 885-7049

P.O. NUMBER:
PROJECT NUMBER: 1868.1122
PROJECT NAME: Ft Story LF 2
PAGE 1 OF 1

[redacted] omary Watson
TELEPHONE/FAX NO.: 703478 3400/3375
[redacted]RESS: 500 Herndon Pkwy
CITY, STATE, ZIP CODE: Herndon VA 22070
SAMPLER(S) NAME(S): [redacted]aynos, Paige Igoe
CLIENT PROJECT MANAGER: Tom Haynos

[redacted]

MATRIX TYPE: AQUEOUS MATRIX / NONAQUEOUS MATRIX / OIL MATRIX / AIR MATRIX

REQUIRED ANALYSES — NUMBER OF CONTAINERS SUBMITTED

DATE	TIME	SAMPLE IDENTIFICATION	AQUEOUS MATRIX	NONAQUEOUS MATRIX	OIL MATRIX	AIR MATRIX	8080	8270	8015 Heavy	8015 light	8240	TAL metals total	Hg	temp		
2/1/95	130	S2DI10131	X				2	2	2	3	3	2	1			
		tripblank	✓				–	–	–	–	–	–	–	3		

Fed Ex 2417011940

☐ STANDARD TAT
☐ EXPEDITED TAT *
REPORT DUE DATE ____________
* SUBJECT TO RUSH FEES

RELINQUISHED BY: (SIGNATURE)	DATE	TIME	RECEIVED BY: (SIGNATURE)	DATE	TIME	RELINQUISHED BY: (SIGNATURE)	DATE	TIME
[signature]	2-2-95	1100	[signature]			Paige Igoe	2/1/95	1400
RECEIVED BY: (SIGNATURE)	DATE	TIME	RELINQUISHED BY: (SIGNATURE)	DATE	TIME	RECEIVED BY: (SIGNATURE)	DATE	TIME

[redacted]

No TICs for 8240 and 8270

CLIENT'S FIELD COPY

& ENVIRONMENTAL SERVICES, INC.
Industrial Plaza Drive (32301) • P.O. Box 13056 • Tallahassee, FL 32317-3056 • (904) 878-3994 • Fax (904) 878-9504

Project Receipt Checklist

Project: ______

SL Log #: T5-10274

Client Name: Montgomery Watson

Date & Time Received: 1/28/95 1000

Arrived Via:

Fed Ex X Econ ______
UPS ______ Pri X
Bus ______ Other Sat
CL ______

Shipping container custody seals status:
Intact: X Broken: ______ None: ______

Shipping container:
SL Ice chest X
Client ice chest ______
Other ______

Sample condition upon receipt:
Frozen: ______ Thawed: ______
Cold: X Other: ______

Measured temperature: 2°C

Standard TAT: ______
Expedited TAT: ______

Comments: Received two 1-liter amb glass containers (empties) broken in shipment for sample S2MW1090127

All items checked by: [signature]
Date: 1/28/95

JMM-FORM.DRW

SL & ENVIRONMENTAL SERVICES, INC.
2846 Industrial Plaza Drive (32301) • P.O. Box 13056 • Tallahassee, FL 32317-3056 • (904) 878-3994 • Fax (904) 878-9504

Project Receipt Checklist

Project: ______

SL Log #: T5-10286

Client Name: Montgomery Watson

Date & Time Received: 1/30/95 0900

Arrived Via:

Fed Ex X Econ ____
UPS ____ Prt X
Bus ____ Other ____
CL ____

Shipping container custody seals status:

Intact: X Broken: ____ None: ____

Shipping container:

SL ice chest X
Client ice chest ____
Other ____

Sample condition upon receipt:

Frozen: ____ Thawed: ____
Cold: X Other: ____

Measured temperature: 2°C

Standard TAT: X
Expedited TAT: ____

Comments: ______

All items checked by: [signature]

Date: 1/30/95

JMM-FORM.DRW

& ENVIRONMENTAL SERVICES, INC.

2846 Industrial Plaza Drive (32301) • P.O. Box 13056 • Tallahassee, FL 32317-3056 • (904) 878-3994 • Fax (904) 878-9504

Project Receipt Checklist

Project: ______

SL Log #: TS- 10298

Client Name: Montgomery Watson

Date & Time Received: 1-31-95 0950

Arrived Via:

Fed Ex ✓ Econ ______

UPS ______ Prt ______

Bus ______ Other ______

CL ______

Shipping container custody seals status:

Intact: ✓ Broken: ______ None: ______

Shipping container:

SL ice chest ✓

Client ice chest ______

Other ______

Sample condition upon receipt:

Frozen: ______ Thawed: ______

Cold: ✓ Other: ______

Measured temperature: 2°

Standard TAT: ✓

Expedited TAT: ______

Comments: ______

All items checked by: Thomas [signature]

Date: 1-31-95

JMM-FORM.DRW

SAVANNAH LABORATORIES
& ENVIRONMENTAL SERVICES, INC.

2846 Industrial Plaza Drive (32301) • P.O. Box 13056 • Tallahassee, FL 32317-3056 • (904) 878-3994 • Fax (904) 878-9504

Project Receipt Checklist

Project: ______________________

SL Log #: TS-10376

Client Name: Montgomery Watson

Date & Time Received: 2/2/95 0900

Arrived Via:

Fed Ex X Econ ____
UPS ____ Pri X
Bus ____ Other ____
CL ____

Shipping container custody seals status:
Intact: X Broken: ____ None: ____

Shipping container:
SL ice chest X
Client ice chest ____
Other ____

Sample condition upon receipt:
Frozen: ____ Thawed: ____
Cold: X Other: ____

Measured temperature: 2°C

Standard TAT: X
Expedited TAT: ____

Comments: ______________________

All items checked by: [signature]
Date: 2/2/95

JMM-FORM.DRW

Table E-1

Laboratory Control Sample Results Summary
Volatile Organic Compounds (VOC)
Site 2 - Landfill 2
Confirmatory Studies
Page 1 of 1

Sample Batch ID	Sample Identification	Parameter Analyte	Laboratory Control Sample Recovery (%)	Laboratory Control Sample Duplicate Recovery (%)	RPD (%)	LCS Accuracy Control Limits (%)	Accuracy Acceptable?	Precision Control Limits (%)	Precision Acceptable?
		VOC							
0202A	S2MW106	1,1-Dichloroethene	115	102	12	60-136	Yes	19	Yes
	S2MW107	Benzene	104	101	3	73-144	Yes	22	Yes
	S2MW108	Chlorobenzene	90	90	0	68-136	Yes	17	Yes
	Trip Blank (T510298-4)	Toluene	89	88	1	68-138	Yes	17	Yes
		Trichloroethylene (TCE)	105	102	3	66-136	Yes	20	Yes
		VOC							
0202B	S2SD3003	1,1-Dichloroethene	83	90	8	59-155	Yes	40	Yes
	S2SD3004	Benzene	89	90	1	48-150	Yes	27	Yes
	S2SD3005	Chlorobenzene	91	95	4	54-138	Yes	33	Yes
	S2SD3005D	Toluene	83	86	4	51-141	Yes	27	Yes
	S2SD3002	Trichloroethylene (TCE)	92	96	4	43-140	Yes	27	Yes
	S2SD3001								
		VOC							
0130C	S2SW3001D	1,1-Dichloroethene	85	82	4	60-136	Yes	19	Yes
	Trip Blank (T510286-2)	Benzene	104	108	4	73-144	Yes	22	Yes
	S2SW3001	Chlorobenzene	96	92	4	68-136	Yes	17	Yes
	S2MW109	Toluene	88	83	6	68-138	Yes	17	Yes
	S2MW109D	Trichloroethylene (TCE)	96	98	2	66-136	Yes	20	Yes
	S2SW3002								
	Trip Blank (T510274-6)								
		VOC							
0131D	S2MW105	1,1-Dichloroethene	85	82	4	60-136	Yes	19	Yes
		Benzene	104	108	4	73-144	Yes	22	Yes
		Chlorobenzene	96	92	4	68-136	Yes	17	Yes
		Toluene	88	83	6	68-138	Yes	17	Yes
		Trichloroethylene (TCE)	96	98	2	66-136	Yes	20	Yes
		VOC							
0207F	S2DI1	1,1-Dichloroethene	84	88	5	60-136	Yes	19	Yes
	Trip Blank (T510346-2)	Benzene	95	96	1	73-144	Yes	22	Yes
		Chlorobenzene	89	91	2	68-136	Yes	17	Yes
		Toluene	85	82	4	68-138	Yes	17	Yes
		Trichloroethylene (TCE)	98	98	0	66-136	Yes	20	Yes

Table E-2

Laboratory Control Sample Results Summary
Base-Neutral and Acid Extractables (BNAs)
Site 2 - Landfill 2
Confirmatory Studies
Page 1 of 2

Sample Batch ID	Sample Identification	Parameter Analyte	Laboratory Control Sample Recovery (%)	Laboratory Control Sample Duplicate Recovery (%)	RPD (%)	LCS Accuracy Control Limits (%)	Accuracy Acceptable?	Precision Control Limits (%)	Precision Acceptable?
		BNA							
0202D	S2MW106	1,2,4-Trichlorobenzene	58	62	7	49-105	Yes	24	Yes
	S2MW107	1,4-Dichlorobenzene	55	58	5	46-110	Yes	18	Yes
	S2MW108	2,4-Dinitrotoluene	80	80	0	39-133	Yes	25	Yes
		2-Chlorophenol	60	62	3	54-99	Yes	18	Yes
		4-Chloro-3-Methylphenol	70	71	1	53-104	Yes	17	Yes
		4-Nitrophenol	71	70	1	10-112	Yes	108	Yes
		Acenaphthene	70	71	1	65-116	Yes	20	Yes
		N-Nitroso-di-n-Propylamine	88	86	2	39-142	Yes	60	Yes
		Pentachlorophenol	81	83	2	15-139	Yes	39	Yes
		Phenol	56	60	7	10-96	Yes	21	Yes
		Pyrene	89	94	5	36-153	Yes	21	Yes
		BNA							
0202K	S2SD3003	1,2,4-Trichlorobenzene	63	67	6	48-107	Yes	28	Yes
	S2SD3004	1,4-Dichlorobenzene	59	64	8	46-112	Yes	28	Yes
	S2SD3005	2,4-Dinitrotoluene	64	69	8	35-111	Yes	29	Yes
	S2SD3005D	2-Chlorophenol	51	56	9	45-105	Yes	31	Yes
	S2SD3002	4-Chloro-3-Methylphenol	57	61	7	38-112	Yes	23	Yes
	S2SD3001	4-Nitrophenol	52	57	9	10-130	Yes	34	Yes
		Acenaphthene	61	64	5	58-106	Yes	26	Yes
		N-Nitroso-di-n-Propylamine	67	75	11	27-140	Yes	35	Yes
		Pentachlorophenol	59	64	8	10-107	Yes	89	Yes
		Phenol	49	54	10	37-112	Yes	36	Yes
		Pyrene	72	78	8	33-139	Yes	25	Yes
		BNA							
0131D	S2SW3001D	1,2,4-Trichlorobenzene	71	69	3	49-105	Yes	24	Yes
		1,4-Dichlorobenzene	73	72	1	46-110	Yes	18	Yes
		2,4-Dinitrotoluene	77	76	1	39-133	Yes	25	Yes
		2-Chlorophenol	82	80	2	54-99	Yes	18	Yes
		4-Chloro-3-Methylphenol	80	78	3	53-104	Yes	17	Yes
		4-Nitrophenol	88	92	4	10-112	Yes	108	Yes
		Acenaphthene	78	78	0	65-116	Yes	20	Yes
		N-Nitroso-di-n-Propylamine	102	102	0	39-142	Yes	60	Yes
		Pentachlorophenol	89	87	2	15-139	Yes	39	Yes
		Phenol	76	78	3	10-96	Yes	21	Yes
		Pyrene	79	83	5	36-153	Yes	21	Yes

Table E-2

Laboratory Control Sample Results Summary
Base-Neutral and Acid Extractables (BNAs)
Site 2 - Landfill 2
Confirmatory Studies
Page 2 of 2

Sample Batch ID	Sample Identification	Parameter Analyte	Laboratory Control Sample Recovery (%)	Laboratory Control Sample Duplicate Recovery (%)	RPD (%)	LCS Accuracy Control Limits (%)	Accuracy Acceptable?	Precision Control Limits (%)	Precision Acceptable?
		BNA							
0130B	S2SW3001	1,2,4-Trichlorobenzene	76	76	0	49-105	Yes	24	Yes
	S2MW109	1,4-Dichlorobenzene (p-DCB)	76	76	0	46-110	Yes	18	Yes
	S2MW109D	2,4-Dinitrotoluene	84	98	15	39-133	Yes	25	Yes
	S2SW3002	2-Chlorophenol	91	90	1	54-99	Yes	18	Yes
	S2MW105	4-Chloro-3-methylphenol	81	81	0	53-104	Yes	17	Yes
		4-Nitrophenol	67	63	6	10-112	Yes	108	Yes
		Acenaphthene	92	104	12	65-116	Yes	20	Yes
		N-Nitrosodi-N-propylamine	100	92	8	39-142	Yes	60	Yes
		Pentachlorophenol	72	78	8	15-139	Yes	39	Yes
		Phenol	79	76	4	10-96	Yes	21	Yes
		Pyrene	113	111	2	36-153	Yes	21	Yes
		BNA							
0207G	S2DI1	1,2,4-Trichlorobenzene	70	67	4	49-105	Yes	24	Yes
		1,4-Dichlorobenzene (p-DCB)	68	62	9	46-110	Yes	18	Yes
		2,4-Dinitrotoluene	85	83	2	39-133	Yes	25	Yes
		2-Chlorophenol	76	76	0	54-99	Yes	18	Yes
		4-Chloro-3-methylphenol	86	71	19	53-104	Yes	17	No
		4-Nitrophenol	92	90	2	10-112	Yes	108	Yes
		Acenaphthene	82	83	1	65-116	Yes	20	Yes
		N-Nitrosodi-N-propylamine	72	74	3	39-142	Yes	60	Yes
		Pentachlorophenol	98	95	3	15-139	Yes	39	Yes
		Phenol	74	75	1	10-96	Yes	21	Yes
		Pyrene	86	92	7	36-153	Yes	21	Yes

Table E-3

Laboratory Control Sample Results Summary
Pesticides/Polycholrinated Biphenyls (P/PCB)
Site 2 - Landfill 2
Confirmatory Studies
Page 1 of 1

Sample Batch ID	Sample Identification	Parameter Analyte	Laboratory Control Sample Recovery (%)	Laboratory Control Sample Duplicate Recovery (%)	RPD (%)	LCS Accuracy Control Limits (%)	Accuracy Acceptable?	Precision Control Limits (%)	Precision Acceptable?
		P/PCB							
0202C	S2MW106	Aldrin	94	84	11	42-116	Yes	25	Yes
	S2MW107	Gamma BHC (Gamma Hexachlorocyclohexane)	108	92	16	52-136	Yes	18	Yes
	S2MW108	Dieldrin	105	91	14	51-143	Yes	46	Yes
		Endrin	103	91	12	57-142	Yes	23	Yes
		Heptachlor	97	84	14	42-129	Yes	22	Yes
		p,p'-DDT	106	94	12	67-137	Yes	28	Yes
		P/PCB							
0203H	S2SD3003	Aldrin	87	81	7	42-116	Yes	25	Yes
	S2SD3004	Gamma BHC (Gamma Hexachlorocyclohexane)	87	80	8	52-136	Yes	18	Yes
	S2SD3005	Dieldrin	87	81	7	51-142	Yes	46	Yes
	S2SD3005D	Endrin	96	86	11	57-142	Yes	23	Yes
	S2SD3002	Heptachlor	88	80	10	42-129	Yes	22	Yes
	S2SD3001	p,p'-DDT	95	88	8	67-137	Yes	28	Yes
		P/PCB							
0201B	S2SW3001D	Aldrin	45	41	9	42-116	No	25	Yes
	S2SW3001	Gamma BHC (Gamma Hexachlorocyclohexane)	46	41	11	52-136	No	18	Yes
	S2MW109	Dieldrin	73	70	4	51-142	Yes	46	Yes
	S2MW109D	Endrin	48	48	0	57-142	No	23	Yes
	S2SW3002	Heptachlor	51	45	13	42-129	Yes	22	Yes
	S2MW105	p,p'-DDT	52	54	4	67-137	No	28	Yes
		P/PCB							
0208B	S2DI1	Aldrin	59	79	29	42-116	Yes	25	No
		Gamma-BHC (gamma Hexachlorocyclohexane)	87	84	4	52-136	Yes	18	Yes
		Dieldrin	83	80	4	51-142	Yes	46	Yes
		Endrin	94	89	5	57-142	Yes	23	Yes
		Heptachlor	78	89	13	42-129	Yes	22	Yes
		p,p'-DDT	83	84	1	67-137	Yes	28	Yes

Table E-4

Laboratory Control Samples Results Summary
Volatile Organic Compounds (VOC)
Site 2 - Landfill 2
Confirmatory Studies
Page 1 of 1

Sample Batch ID	Sample Identification	Parameter	Laboratory Control Sample Recovery (%)	Laboratory Control Sample Duplicate Recovery (%)	RPD (%)	LCS Accuracy Control Limits (%)	Accuracy Acceptable?	Precision Control Limits (%)	Precision Acceptable?
0202A	S2MW106	Hydrocarbons as Diesel/Fuel (TFH-H)	95	101	6	40-140	Yes	40	Yes
0202C	S2MW107 S2MW108 S2SW3001 S2MW109 S2MW109D S2SW3002 S2MW105	Hydrocarbons as Diesel/Fuel (TFH-H)	75	90	18	40-140	Yes	40	Yes
0202D	S2SD3001	Hydrocarbons as Gasoline (TFH-L)	93	106	13	40-140	Yes	40	Yes
0203I	S2SD3003 S2SD3004 S2SD3005 S2SD3005D S2SD3002 S2SD3001	Hydrocarbons as Gasoline (TFH-H)	95	101	6	40-140	Yes	40	Yes
0201A	S2SW3001D	Hydrocarbons as Gasoline (TFH-H)	95	101	6	40-140	Yes	40	Yes
0131D	S2DI1	Hydrocarbons as Gasoline (TFH-L)	101	97	4	40-140	Yes	40	Yes
0203D	S2DI1	Hydrocarbons as Diesel/Fuel (TFH-H)	100	87	14	40-140	Yes	40	Yes

Table E-5

Laboratory Control Sample Results Summary
Metals Analytes
Site 2 - Landfill 2
Confirmatory Studies

Batch Sample ID	Sample Identification	Parameter Analyte	Laboratory Control Sample Recovery (%)	Laboratory Control Sample Duplicate Recovery (%)	RPD (%)	LCS Accuracy Control Limits (%)	Accuracy Acceptable?	Precision Control Limits (%)	Precision Acceptable?
		METALS							
02081	S2MW106	Aluminum	100	99	1	75-125	Yes	20	Yes
	S2MW107	Antimony	98	97	1	75-125	Yes	20	Yes
	S2MW108	Barium	95	97	2	75-125	Yes	20	Yes
		Beryllium	96	94	2	75-125	Yes	20	Yes
		Cadmium	96	93	3	75-125	Yes	20	Yes
		Calcium	96	95	1	75-125	Yes	20	Yes
		Chromium	97	95	2	75-125	Yes	20	Yes
		Cobalt	95	92	3	75-125	Yes	20	Yes
		Copper	95	95	0	75-125	Yes	20	Yes
		Iron	96	95	1	75-125	Yes	20	Yes
		Magnesium	93	90	3	75-125	Yes	20	Yes
		Manganese	98	97	1	75-125	Yes	20	Yes
		Nickel	95	93	2	75-125	Yes	20	Yes
		Potassium	83	84	1	75-125	Yes	20	Yes
		Silver	97	97	0	75-125	Yes	20	Yes
		Sodium	94	91	3	75-125	Yes	20	Yes
		Vanadium	100	99	1	75-125	Yes	20	Yes
		Zinc	91	87	4	75-125	Yes	20	Yes

Table E-5

Laboratory Control Sample Results Summary
Metals Analytes
Site 2 - Landfill 2
Confirmatory Studies

Batch Sample ID	Sample Identification	Parameter Analyte	Laboratory Control Sample Recovery (%)	Laboratory Control Sample Duplicate Recovery (%)	RPD (%)	LCS Accuracy Control Limits (%)	Accuracy Acceptable?	Precision Control Limits (%)	Precision Acceptable?
		METALS							
0207I	S2MW106	Aluminum	107	108	1	75-125	Yes	20	Yes
	S2MW107	Antimony	105	104	1	75-125	Yes	20	Yes
	S2MW108	Barium	108	108	0	75-125	Yes	20	Yes
		Beryllium	104	103	1	75-125	Yes	20	Yes
		Cadmium	103	103	0	75-125	Yes	20	Yes
		Calcium	112	114	2	75-125	Yes	20	Yes
		Chromium	105	104	1	75-125	Yes	20	Yes
		Cobalt	101	100	1	75-125	Yes	20	Yes
		Copper	104	102	2	75-125	Yes	20	Yes
		Iron	105	104	1	75-125	Yes	20	Yes
		Magnesium	102	102	0	75-125	Yes	20	Yes
		Manganese	107	106	1	75-125	Yes	20	Yes
		Nickel	104	104	0	75-125	Yes	20	Yes
		Potassium	92	92	0	75-125	Yes	20	Yes
		Silver	105	104	1	75-125	Yes	20	Yes
		Sodium	97	106	9	75-125	Yes	20	Yes
		Vanadium	108	107	1	75-125	Yes	20	Yes
		Zinc	95	94	1	75-125	Yes	20	Yes
		METALS							
0208E	S2MW106	Arsenic	112	108	4	75-125	Yes	20	Yes
	S2MW107	Lead	93	94	1	75-125	Yes	20	Yes
	S2MW108	Selenium	94	97	3	75-125	Yes	20	Yes
		Thallium	94	102	8	75-125	Yes	20	Yes
		METAL							
0209U	S2MW106	Mercury	98	99	1	75-125	Yes	20	Yes
	S2MW107								
	S2MW108								

Table E-5

Laboratory Control Sample Results Summary
Metals Analytes
Site 2 - Landfill 2
Confirmatory Studies
Page 3 of 7

Batch Sample ID	Sample Identification	Parameter Analyte	Laboratory Control Sample Recovery (%)	Laboratory Control Sample Duplicate Recovery (%)	RPD (%)	LCS Accuracy Control Limits (%)	Accuracy Acceptable?	Precision Control Limits (%)	Precision Acceptable?
		METALS							
0210C	S2SDSD3003	Aluminum	110	103	7	70-130	Yes	30	Yes
	S2SD3004	Antimony	94	94	0	70-130	Yes	30	Yes
	S2SD3005	Barium	90	101	12	70-130	Yes	30	Yes
	S2SD3005D	Beryllium	81	93	14	70-130	Yes	30	Yes
	S2SD3002	Cadmium	77	90	16	70-130	Yes	30	Yes
	S2SD3001	Calcium	77	85	10	70-130	Yes	30	Yes
		Chromium	80	94	16	70-130	Yes	30	Yes
		Cobalt	79	90	13	70-130	Yes	30	Yes
		Copper	84	94	11	70-130	Yes	30	Yes
		Iron	97	87	11	70-130	Yes	30	Yes
		Magnesium	89	97	9	70-130	Yes	30	Yes
		Manganese	81	91	12	70-130	Yes	30	Yes
		Nickel	80	92	14	70-130	Yes	30	Yes
		Potassium	113	112	1	70-130	Yes	30	Yes
		Silver	79	93	16	70-130	Yes	30	Yes
		Sodium	87	96	10	70-130	Yes	30	Yes
		Vanadium	85	96	12	70-130	Yes	30	Yes
		Zinc	83	95	13	70-130	Yes	30	Yes
		METALS							
0210A	S2SD3003	Arsenic	103	95	8	70-130	Yes	30	Yes
	S2SD3004	Lead	89	78	13	70-130	Yes	30	Yes
	S2S2SD3005	Selenium	95	90	5	70-130	Yes	30	Yes
	S2S2SD3005D	Thallium	116	103	12	70-130	Yes	30	Yes
	S2SD3002								
	S2SD3001								

Table E-5

Laboratory Control Sample Results Summary
Metals Analytes
Site 2 - Landfill 2
Confirmatory Studies

Batch Sample ID	Sample Identification	Parameter Analyte	Laboratory Control Sample Recovery (%)	Laboratory Control Sample Duplicate Recovery (%)	RPD (%)	LCS Accuracy Control Limits (%)	Accuracy Acceptable?	Precision Control Limits (%)	Precision Acceptable?
		METAL							
0210R	S2SD3003	Mercury	108	113	5	70-130	Yes	30	Yes
	S2SD3004							30	
	S2SD3005							30	
	S2SD3005D							30	
	S2SD3002							30	
	S2SD3001							30	
		METALS							
0202I	S2SW3001D	Aluminum	91	97	6	75-125	Yes	20	Yes
	S2SW3001	Antimony	92	99	7	75-125	Yes	20	Yes
	S2MW109	Barium	91	97	6	75-125	Yes	20	Yes
	S2MW109D	Beryllium	96	103	7	75-125	Yes	20	Yes
	S2SW3002	Cadmium	97	104	7	75-125	Yes	20	Yes
	S2MW105	Calcium	98	107	9	75-125	Yes	20	Yes
		Chromium	98	105	7	75-125	Yes	20	Yes
		Cobalt	99	106	7	75-125	Yes	20	Yes
		Copper	93	100	7	75-125	Yes	20	Yes
		Iron	96	103	7	75-125	Yes	20	Yes
		Magnesium	99	106	7	75-125	Yes	20	Yes
		Manganese	96	103	7	75-125	Yes	20	Yes
		Nickel	93	100	7	75-125	Yes	20	Yes
		Potassium	112	105	6	75-125	Yes	20	Yes
		Silver	94	99	5	75-125	Yes	20	Yes
		Sodium	95	92	3	75-125	Yes	20	Yes
		Vanadium	100	107	7	75-125	Yes	20	Yes
		Zinc	101	108	7	75-125	Yes	20	Yes
		METALS							
0202E	S2SW3001D	Arsenic	107	112	5	75-125	Yes	20	Yes
		Lead	91	99	8	75-125	Yes	20	Yes
		Selenium	99	108	9	75-125	Yes	20	Yes
		Thallium	102	111	8	75-125	Yes	20	Yes

Table E-5

Laboratory Control Sample Results Summary
Metals Analytes
Site 2 - Landfill 2
Confirmatory Studies

Batch Sample ID	Sample Identification	Parameter Analyte	Laboratory Control Sample Recovery (%)	Laboratory Control Sample Duplicate Recovery (%)	RPD (%)	LCS Accuracy Control Limits (%)	Accuracy Acceptable?	Precision Control Limits (%)	Precision Acceptable?
		METAL							
0207T	S2SW3001D	Mercury	97	99	2	75-125	Yes	20	Yes
	S2SW3001								
	S2MW109								
	S2MW109D								
	S2SD3002								
	S2MW105								
		METALS							
0203J	S2SW3001	Aluminum	102	103	1	75-125	Yes	20	Yes
	S2MW109	Antimony	104	105	1	75-125	Yes	20	Yes
	S2MW109D	Barium	103	106	3	75-125	Yes	20	Yes
	S2SW3002	Beryllium	101	103	2	75-125	Yes	20	Yes
	S2MW105	Cadmium	102	104	2	75-125	Yes	20	Yes
		Calcium	108	113	5	75-125	Yes	20	Yes
		Chromium, Total	103	104	1	75-125	Yes	20	Yes
		Cobalt	102	104	2	75-125	Yes	20	Yes
		Copper	100	102	2	75-125	Yes	20	Yes
		Iron	101	103	2	75-125	Yes	20	Yes
		Magnesium	100	102	2	75-125	Yes	20	Yes
		Manganese	102	104	2	75-125	Yes	20	Yes
		Nickel	101	103	2	75-125	Yes	20	Yes
		Potassium	90	91	1	75-125	Yes	20	Yes
		Silver	101	102	1	75-125	Yes	20	Yes
		Sodium	90	94	4	75-125	Yes	20	Yes
		Vanadium	106	107	1	75-125	Yes	20	Yes
		Zinc	101	103	2	75-125	Yes	20	Yes

Table E-5

Laboratory Control Sample Results Summary
Metals Analytes
Site 2 - Landfill 2
Confirmatory Studies

Batch Sample ID	Sample Identification	Parameter Analyte	Laboratory Control Sample Recovery (%)	Laboratory Control Sample Duplicate Recovery (%)	RPD (%)	LCS Accuracy Control Limits (%)	Accuracy Acceptable?	Precision Control Limits (%)	Precision Acceptable?
		METALS (TOTAL)							
0203F	S2SW3001	Arsenic	96	102	6	75-125	Yes	20	Yes
	S2MW109	Lead	96	109	13	75-125	Yes	20	Yes
	S2MWW109D	Selenium	92	97	5	75-125	Yes	20	Yes
	S2SW3002	Thallium	104	108	4	75-125	Yes	20	Yes
	S2MW105								
		METALS (DISSOLVED)							
0202E	S2SW3001	Arsenic	107	112	5	75-125	Yes	20	Yes
	S2MW109	Lead	91	99	8	75-125	Yes	20	Yes
	S2MWW109D	Selenium	99	108	9	75-125	Yes	20	Yes
	S2SW3002	Thallium	102	106	4	75-125	Yes	20	Yes
	S2MW105								
		METALS							
0209I	S2DI1	Aluminum	96	100	4	75-125	Yes	20	Yes
		Antimony	93	97	4	75-125	Yes	20	Yes
		Barium	90	94	4	75-125	Yes	20	Yes
		Beryllium	95	90	5	75-125	Yes	20	Yes
		Cadmium	93	97	4	75-125	Yes	20	Yes
		Calcium	96	99	3	75-125	Yes	20	Yes
		Chromium, Total	96	99	3	75-125	Yes	20	Yes
		Cobalt	93	97	4	75-125	Yes	20	Yes
		Copper	94	97	3	75-125	Yes	20	Yes
		Iron	94	90	4	75-125	Yes	20	Yes
		Magnesium	91	96	5	75-125	Yes	20	Yes
		Manganese	97	100	3	75-125	Yes	20	Yes
		Nickel	92	96	4	75-125	Yes	20	Yes
		Potassium	79	82	4	75-125	Yes	20	Yes
		Silver	98	101	3	75-125	Yes	20	Yes
		Sodium	91	101	10	75-125	Yes	20	Yes
		Vanadium	98	101	3	75-125	Yes	20	Yes
		Zinc	90	93	3	75-125	Yes	20	Yes

Table E-5

Laboratory Control Sample Results Summary
Metals Analytes
Site 2 - Landfill 2
Confirmatory Studies

Batch Sample ID	Sample Identification	Parameter Analyte	Laboratory Control Sample Recovery (%)	Laboratory Control Sample Duplicate Recovery (%)	RPD (%)	LCS Accuracy Control Limits (%)	Accuracy Acceptable?	Precision Control Limits (%)	Precision Acceptable?
		METALS							
0209E	S2DI1	Arsenic	95	97	2	75-125	Yes	20	Yes
		Lead	94	94	0	75-125	Yes	20	Yes
		Selenium	100	104	4	75-125	Yes	20	Yes
		Thallium	105	106	1	75-125	Yes	20	Yes
		METALS							
0209E	S2DI1	Mercury	105	107	2	75-125	Yes	20	Yes

Table E-6

Laboratory Control Sample Results Summary
Miscellaneous Analytes
Site 2 - Landfill 2
Confirmatory Studies

Batch Sample ID	Sample Identification	Analyte	Laboratory Control Sample Recovery (%)	Laboratory Control Sample Duplicate Recovery (%)	RPD (%)	LCS Accuracy Control Limits (%)	Accuracy Acceptable?	Precision Control Limits (%)	Precision Acceptable?
0210C	S2SW3001 S2SW3001D S2MW109 S2MWW109D S2SW3002 S2MW105	Chloride	107	109	2	85-115	Yes	30	Yes
0207B	S2SW3001 S2SW3001D S2MW109 S2MWW109D S2SW3002 S2MW105	Ammonia (as N)	99	99	0	90-110	Yes	30	Yes
0201A	S2SW3001 S2SW3001D S2MW109 S2MWW109D S2SW3002 S2MW105	Total Phosphorus (as P)	96	97	1	60-140	Yes	40	Yes
0209D	S2SW3001 S2MW109 S2MWW109D S2SW3002 S2MW105	Sulfate	93	93	0	75-125	Yes	30	Yes

Table E-6

Laboratory Control Sample Results Summary
Miscellaneous Analytes
Site 2 - Landfill 2
Confirmatory Studies

Batch Sample ID	Sample Identification	Analyte	Laboratory Control Sample Recovery (%)	Laboratory Control Sample Duplicate Recovery (%)	RPD (%)	LCS Accuracy Control Limits (%)	Accuracy Acceptable?	Precision Control Limits (%)	Precision Acceptable?
0940	S2SW3001 S2SW3001D S2MW109 S2MWW109D S2SW3002 S2MW105	Orthophosphate	100	104	4	75-125	Yes	30	Yes
0201A	S2SW3001 S2SW3001D S2MW109 S2MWW109D S2SW3002 S2MW105	Sulfide	85	85	0	60-140	Yes	40	Yes
0201A	S2SW3001 S2SW3001D S2MW109 S2MWW109D S2SW3002 S2MW105	Fluoride	103	99	4	75-125	Yes	30	Yes
0209F	S2SW3001 S2MW109 S2MWW109D S2SW3002 S2MW105	Nitrate (as N)	101	100	1	85-115	Yes	30	Yes

Table E-6

Laboratory Control Sample Results Summary
Miscellaneous Analytes
Site 2 - Landfill 2
Confirmatory Studies
Page 3 of 3

Batch Sample ID	Sample Identification	Analyte	Laboratory Control Sample Recovery (%)	Laboratory Control Sample Duplicate Recovery (%)	RPD (%)	LCS Accuracy Control Limits (%)	Accuracy Acceptable?	Precision Control Limits (%)	Precision Acceptable?
0128N	S2SW3001 S2MW109 S2MWW109D S2SW3002 S2MW105	Nitrite (as N)	101	111	9	85-115	Yes	30	Yes
0130W	S2SW3001D	Nitrite (as N)	97	102	5	85-115	Yes	30	Yes
0209J	S2SW3001D	Nitrate (as N)	97	104	7	85-115	Yes	30	Yes
1140	S2SW3001D	Orthophosphate	103	97	6	75-125	Yes	30	Yes
0210A	S2SW3001D	Sulfate	107	109	2	75-125	Yes	30	Yes
0210B	S2SW3001D	Fluoride	99	99	0	75-125	Yes	30	Yes

Table F-1

Matrix Spike and Matrix Spike Duplicate Results Summary
Volatile Organic Compounds (VOC)
Site 2 - Landfill 2
Confirmatory Studies
Fort Story, Virginia
Page 1 of 1

Sample Batch ID	Sample Identification	Parameter Analyte	Matrix Spike Recovery (%)	Matrix Spike Duplicate Recovery (%)	RPD (%)	MS/MSD Accuracy Control Limits (%)	Accuracy Acceptable?	Precision Control Limits (%)	Precision Acceptable?
0202A	**S2MW106**	**VOC**							
		1,1-Dichloroethene	117	102	14	60-136	Yes	40	Yes
		Benzene	105	106	1	73-144	Yes	22	Yes
		Chlorobenzene	91	92	1	68-136	Yes	17	Yes
		Toluene	95	94	1	68-138	Yes	17	Yes
		Trichloroethylene (TCE)	93	92	1	66-136	Yes	20	Yes
0202D	**S2SD3001**	**VOC**							
		1,1-Dichloroethene	110	103	7	59-155	Yes	40	Yes
		Benzene	98	96	2	48-150	Yes	27	Yes
		Chlorobenzene	94	96	2	54-138	Yes	33	Yes
		Toluene	118	119	1	51-141	Yes	27	Yes
		Trichloroethylene (TCE)	96	95	1	43-140	Yes	27	Yes
0130C (H_20)	**Batch Sample**	**VOC**							
		1,1-Dichloroethene	92	95	3	60-136	Yes	40	Yes
		Benzene	91	97	6	73-144	Yes	22	Yes
		Chlorobenzene	91	98	7	68-136	Yes	17	Yes
		Toluene	78	80	3	68-138	Yes	17	Yes
		Trichloroethylene (TCE)	99	104	5	66-136	Yes	20	Yes

Table F-2

Matrix Spike and Matrix Spike Duplicate Results Summary
Base-Neutral-Acid Compounds (BNA)
Site 2 - Landfill 2
Confirmatory Studies
Fort Story, Virginia

Sample Batch ID	Sample Identification	Parameter Analyte	Matrix Spike Recovery (%)	Matrix Spike Duplicate Recovery (%)	RPD (%)	MS/MSD Accuracy Control Limits (%)	Accuracy Acceptable?	Precision Control Limits (%)	Precision Acceptable?
0202D	S2MW106	BNA							
		1,2,4-Trichlorobenzene	62	64	3	49-105	Yes	26	Yes
		1,4-Dichlorobenzene	56	60	7	46-116	Yes	18	Yes
		2,4-Dinitrotoluene	79	79	0	39-133	Yes	25	Yes
		2-Chlorophenol	62	62	0	54-99	Yes	18	Yes
		4-Chloro-3-Methylphenol	74	72	3	53-104	Yes	17	Yes
		4-Nitrophenol	64	62	3	10-112	Yes	168	Yes
		Acenaphthene	71	71	0	65-116	Yes	20	Yes
		N-Nitroso-di-n-Propylamine	85	84	1	39-142	Yes	60	Yes
		Pentachlorophenol	82	79	4	15-139	Yes	39	Yes
		Phenol	58	58	0	10-96	Yes	21	Yes
		Pyrene	85	86	1	36-153	Yes	21	Yes
0202K	S2SD3001	BNA							
		1,2,4-Trichlorobenzene	62	61	2	48-107	Yes	28	Yes
		1,4-Dichlorobenzene	58	59	2	46-112	Yes	28	Yes
		2,4-Dinitrotoluene	60	60	0	35-111	Yes	29	Yes
		2-Chlorophenol	61	62	2	45-105	Yes	31	Yes
		4-Chloro-3-Methylphenol	62	60	3	38-112	Yes	23	Yes
		4-Nitrophenol	54	57	5	10-130	Yes	34	Yes
		Acenaphthene	66	65	2	58-106	Yes	26	Yes
		N-Nitroso-di-n-Propylamine	56	55	2	27-140	Yes	35	Yes
		Pentachlorophenol	70	67	4	10-107	Yes	89	Yes
		Phenol	56	56	0	37-112	Yes	36	Yes
		Pyrene	114	120	5	33-139	Yes	25	Yes
0130B	Batch Sample (H_20)	BNA							
		1,2,4-Trichlorobenzene	72	67	7	49-105	Yes	26	Yes
		1,4-Dichlorobenzene	71	64	10	46-116	Yes	18	Yes
		2,4-Dinitrotoluene	87	87	0	39-133	Yes	25	Yes
		2-Chlorophenol	69	67	3	54-99	Yes	18	Yes
		4-Chloro-3-Methylphenol	76	76	6	53-104	Yes	17	Yes
		4-Nitrophenol	71	72	1	10-112	Yes	168	Yes
		Acenaphthene	79	78	1	65-116	Yes	20	Yes
		N-Nitroso-di-n-Propylamine	86	83	4	39-142	Yes	60	Yes
		Pentachlorophenol	85	85	0	15-139	Yes	39	Yes
		Phenol	64	62	3	10-96	Yes	21	Yes
		Pyrene	92	91	1	36-153	Yes	21	Yes

Table F-3

Matrix Spike and Matrix Spike Duplicate Results Summary
Pesticides/PCBs
Site 2 - Landfill 2
Confirmatory Studies
Fort Story, Virginia
Page 1 of 1

Sample Batch ID	Sample Identification	Parameter Analyte	Matrix Spike Recovery (%)	Matrix Spike Duplicate Recovery (%)	RPD (%)	MS/MSD Accuracy Control Limits (%)	Accuracy Acceptable?	Precision Control Limits (%)	Precision Acceptable?
0208F	**S2MW106**	**P/PCB (%)**							
		Aldrin	82	91	10	42-116	Yes	25	Yes
		DDT (1,1-Bis(Chlorophenyl)-2,2,2-Trichloroethane)	83	104	22	67-137	Yes	28	Yes
		Dieldrin	89	104	16	51-143	Yes	46	Yes
		Endrin	98	114	15	57-142	Yes	23	Yes
		Gamma-BHC	89	109	20	52-136	Yes	18	No
		Heptachlor	84	95	12	42-129	Yes	22	Yes
0203I	**S2SD3001**	**P/PCB (%)**							
		Aldrin	63	56	12	42-116	Yes	25	Yes
		DDT (1,1-Bis(Chlorophenyl)-2,2,2-Trichloroethane)	86	52	49	67-137	No	28	No
		Dieldrin	54	45	18	51-143	No	46	Yes
		Endrin	64	58	10	57-142	Yes	23	Yes
		Gamma-BHC	56	48	15	52-136	No	18	Yes
		Heptachlor	60	54	11	42-129	Yes	22	Yes

Table F-4

Matrix Spike and Matrix Spike Duplicate Results Summary
Total Fuel Hydrocarbons
Site 2 - Landfill 2
Confirmatory Studies
Fort Story, Virginia
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Sample Batch ID	Sample Identification	Parameter Analyte	Matrix Spike Recovery (%)	Matrix Spike Duplicate Recovery (%)	RPD (%)	MS/MSD Accuracy Control Limits (%)	Accuracy Acceptable?	Precision Control Limits (%)	Precision Acceptable?
0208F	**S2MW106**	**Fuels**							
		TFH-H as Fuel	50	54	8	40-140	Yes	40	Yes
0131D	**Batch Sample**	**Fuels**							
		TFH-L	76	81	6	40-140	Yes	40	Yes
0208F	**Batch Sample**	**Fuels**							
		TFH-H as Fuel	50	54	8	40-140	Yes	40	Yes

Table F-5

Matrix Spike and Matrix Spike Duplicate Results Summary - Metals
Site 2 - Landfill 2
Confirmatory Studies
Fort Story, Virginia
Page 1 of 5

Sample Batch ID	Sample Identification	Parameter Analyte	Matrix Spike Recovery (%)	Matrix Spike Duplicate Recovery (%)	RPD (%)	MS/MSD Accuracy Control Limits (%)	Accuracy Acceptable?	Precision Control Limits (%)	Precision Acceptable?
0208I	S2MW106	**Total Metals**							
		Aluminum	111	101	9	75-125	Yes	20	Yes
		Antimony	98	99	1	75-125	Yes	20	Yes
		Arsenic	117	117	0	75-125	Yes	20	Yes
		Barium	95	96	1	75-125	Yes	20	Yes
		Beryllium	98	98	0	75-125	Yes	20	Yes
		Cadmium	97	97	0	75-125	Yes	20	Yes
		Calcium	99	88	12	75-125	Yes	20	Yes
		Chromium, Total	9	99	167	75-125	No	20	No
		Cobalt	96	95	1	75-125	Yes	20	Yes
		Copper	96	97	1	75-125	Yes	20	Yes
		Iron	101	99	2	75-125	Yes	20	Yes
		Lead	95	98	3	75-125	Yes	20	Yes
		Magnesium	96	94	2	75-125	Yes	20	Yes
		Manganese	100	100	0	75-125	Yes	20	Yes
		Mercury	95	95	0	75-125	Yes	20	Yes
		Nickel	97	97	0	75-125	Yes	20	Yes
		Potassium	101	94	7	75-125	Yes	20	Yes
		Selenium	95	102	7	75-125	Yes	20	Yes
		Silver	81	98	19	75-125	Yes	20	Yes
		Sodium	118	111	6	75-125	Yes	20	Yes
		Thallium	87	89	2	75-125	Yes	20	Yes
		Vanadium	101	102	1	75-125	Yes	20	Yes
		Zinc	91	90	1	75-125	Yes	20	Yes

* = The recoveries of the matrix spikes are outside advisory limits due to the abundance of the target analyte in the sample.

Table F-5

Matrix Spike and Matrix Spike Duplicate Results Summary - Metals
Site 2 - Landfill 2
Confirmatory Studies
Fort Story, Virginia

Sample Batch ID	Sample Identification	Parameter Analyte	Matrix Spike Recovery (%)	Matrix Spike Duplicate Recovery (%)	RPD (%)	MS/MSD Accuracy Control Limits (%)	Accuracy Acceptable?	Precision Control Limits (%)	Precision Acceptable?
0210C	**S2SD3001**	**Total Metals**							
		Aluminum	336	298	12	70-130	No	30	Yes
		Antimony	80	81	1	70-130	Yes	30	Yes
		Arsenic	94	82	14	70-130	Yes	30	Yes
		Barium	89	81	9	70-130	Yes	30	Yes
		Beryllium	91	93	2	70-130	Yes	30	Yes
		Cadmium	89	90	1	70-130	Yes	30	Yes
		Calcium	143	147	3	70-130	No	30	Yes
		Chromium, Total	91	93	2	70-130	Yes	30	Yes
		Cobalt	91	93	2	70-130	Yes	30	Yes
		Copper	90	87	3	70-130	Yes	30	Yes
		Iron	228	113	67	70-130	No	30	No
		Lead	104	96	8	70-130	Yes	30	Yes
		Magnesium	104	107	3	70-130	Yes	30	Yes
		Manganese	88	90	2	70-130	Yes	30	Yes
		Mercury	90	85	6	70-130	Yes	30	Yes
		Nickel	86	87	1	70-130	Yes	30	Yes
		Potassium	91	93	2	70-130	Yes	30	Yes
		Selenium	77	82	6	70-130	Yes	30	Yes
		Silver	88	89	1	70-130	Yes	30	Yes
		Sodium	77	94	20	70-130	Yes	30	Yes
		Thallium	94	98	4	70-130	Yes	30	Yes
		Vanadium	94	96	2	70-130	Yes	30	Yes
		Zinc	92	92	0	70-130	Yes	30	Yes

* = The recoveries of the matrix spikes are outside advisory limits due to the abundance of the target analyte in the sample.

Table F-5

Matrix Spike and Matrix Spike Duplicate Results Summary - Metals
Site 2 - Landfill 2
Confirmatory Studies
Fort Story, Virginia

Sample Batch ID	Sample Identification	Parameter Analyte	Matrix Spike Recovery (%)	Matrix Spike Duplicate Recovery (%)	RPD (%)	MS/MSD Accuracy Control Limits (%)	Accuracy Acceptable?	Precision Control Limits (%)	Precision Acceptable?
0203J	Batch Sample	TOTAL METALS							
		Aluminum	105	109	4	75-125	Yes	20	Yes
		Antimony	97	101	4	75-125	Yes	20	Yes
		Arsenic	108	111	3	75-125	Yes	20	Yes
		Barium	94	97	3	75-125	Yes	20	Yes
		Beryllium	98	101	3	75-125	Yes	20	Yes
		Cadmium	94	98	4	75-125	Yes	20	Yes
		Calcium	92	130	34	75-125	No	20	No
		Chromium, Total	98	101	3	75-125	Yes	20	Yes
		Cobalt	95	98	3	75-125	Yes	20	Yes
		Copper	97	100	3	75-125	Yes	20	Yes
		Iron	79	91	14	75-125	Yes	20	Yes
		Lead	91	91	0	75-125	Yes	20	Yes
		Magnesium	91	97	6	75-125	Yes	20	Yes
		Manganese	98	101	3	75-125	Yes	20	Yes
		Mercury	93	90	3	75-125	Yes	20	Yes
		Nickel	91	95	4	75-125	Yes	20	Yes
		Potassium	103	106	3	75-125	Yes	20	Yes
		Selenium	101	95	6	75-125	Yes	20	Yes
		Silver	96	99	3	75-125	Yes	20	Yes
		Sodium	129	153	17	75-125	No	20	Yes
		Thallium	91	95	4	75-125	Yes	20	Yes
		Vanadium	102	105	3	75-125	Yes	20	Yes
		Zinc	91	94	3	75-125	Yes	20	Yes

* = The recoveries of the matrix spikes are outside advisory limits due to the abundance of the target analyte in the sample.

Table F-5

Matrix Spike and Matrix Spike Duplicate Results Summary - Metals
Site 2 - Landfill 2
Confirmatory Studies
Fort Story, Virginia

Sample Batch ID	Sample Identification	Parameter Analyte	Matrix Spike Recovery (%)	Matrix Spike Duplicate Recovery (%)	RPD (%)	MS/MSD Accuracy Control Limits (%)	Accuracy Acceptable?	Precision Control Limits (%)	Precision Acceptable?
02071	**S2MW106**	**Dissolved Metals**							
		Aluminum	113	107	5	75-125	Yes	20	Yes
		Antimony	106	107	1	75-125	Yes	20	Yes
		Arsenic	106	108	2	75-125	Yes	20	Yes
		Barium	110	110	0	75-125	Yes	20	Yes
		Beryllium	106	106	0	75-125	Yes	20	Yes
		Cadmium	104	105	1	75-125	Yes	20	Yes
		Calcium	105	96	9	75-125	Yes	20	Yes
		Chromium, Total	106	106	0	75-125	Yes	20	Yes
		Cobalt	102	102	0	75-125	Yes	20	Yes
		Copper	105	105	0	75-125	Yes	20	Yes
		Iron	108	108	0	75-125	Yes	20	Yes
		Lead	88	87	1	75-125	Yes	20	Yes
		Magnesium	101	107	6	75-125	Yes	20	Yes
		Manganese	108	109	1	75-125	Yes	20	Yes
		Mercury	100	103	3	75-125	Yes	20	Yes
		Nickel	105	106	1	75-125	Yes	20	Yes
		Potassium	103	104	1	75-125	Yes	20	Yes
		Selenium	94	97	3	75-125	Yes	20	Yes
		Silver	106	106	0	75-125	Yes	20	Yes
		Sodium	116	116	0	75-125	Yes	20	Yes
		Thallium	80	86	7	75-125	Yes	20	Yes
		Vanadium	109	110	1	75-125	Yes	20	Yes
		Zinc	95	96	1	75-125	Yes	20	Yes

* = The recoveries of the matrix spikes are outside advisory limits due to the abundance of the target analyte in the sample.

Table F-5

Matrix Spike and Matrix Spike Duplicate Results Summary - Metals
Site 2 - Landfill 2
Confirmatory Studies
Fort Story, Virginia

Sample Batch ID	Sample Identification	Parameter Analyte	Matrix Spike Recovery (%)	Matrix Spike Duplicate Recovery (%)	RPD (%)	MS/MSD Accuracy Control Limits (%)	Accuracy Acceptable?	Precision Control Limits (%)	Precision Acceptable?
0203J	Batch Sample	**Dissolved Metals**							
		Aluminum	91	94	3	75-125	Yes	20	Yes
		Antimony	96	95	1	75-125	Yes	20	Yes
		Arsenic	110	121	10	75-125	Yes	20	Yes
		Barium	97	95	2	75-125	Yes	20	Yes
		Beryllium	101	100	1	75-125	Yes	20	Yes
		Cadmium	98	96	2	75-125	Yes	20	Yes
		Calcium	67	86	25	75-125	No	20	No
		Chromium, Total	101	99	2	75-125	Yes	20	Yes
		Cobalt	101	99	2	75-125	Yes	20	Yes
		Copper	99	98	1	75-125	Yes	20	Yes
		Iron	60	87	37	75-125	No	20	No
		Lead	90	93	3	75-125	Yes	20	Yes
		Magnesium	85	91	7	75-125	Yes	20	Yes
		Manganese	97	96	1	75-125	Yes	20	Yes
		Mercury	93	90	3	75-125	Yes	20	Yes
		Nickel	95	93	2	75-125	Yes	20	Yes
		Potassium	97	97	0	75-125	Yes	20	Yes
		Selenium	101	104	3	75-125	Yes	20	Yes
		Silver	98	96	2	75-125	Yes	20	Yes
		Sodium	59	101	53	75-125	No	20	No
		Thallium	99	100	1	75-125	Yes	20	Yes
		Vanadium	100	98	2	75-125	Yes	20	Yes
		Zinc	101	100	1	75-125	Yes	20	Yes

* = The recoveries of the matrix spikes are outside advisory limits due to the abundance of the target analyte in the sample.

Table F-6

Matrix Spike and Matrix Spike Duplicate Results Summary - Miscellaneous Analytes
Site 2 - Landfill 2
Confirmatory Studies
Fort Story, Virginia

Sample Batch ID	Sample Identification	Parameter Analyte	Matrix Spike Recovery (%)	Matrix Spike Duplicate Recovery (%)	RPD (%)	MS/MSD Accuracy Control Limits (%)	Accuracy Acceptable?	Precision Control Limits (%)	Precision Acceptable?
0128N	**Batch Sample**	Nitrite	93	97	4	85-115	Yes	30	Yes
0209D	**Batch Sample**	Nitrate	100	103	3	85-115	Yes	30	Yes
	Batch Sample	Orthophosphate	96	93	3	75-125	Yes	30	Yes
0209D	**Batch Sample**	Sulfate	76	32	81	75-125	No	30	No
0210C	**Batch Sample**	Chloride	91	67	30	85-115	No	30	No
0210A	**Batch Sample**	Fluoride	98	94	4	75-125	Yes	30	Yes
0207B	**Batch Sample**	Ammonia	87	88	1	90-110	No	30	Yes
0210A	**Batch Sample**	Total Phosphorous	89	88	1	60-140	Yes	40	Yes
0130W	**Batch Sample**	Nitrite	72	70	3	85-115	No	30	Yes
0209J	**Batch Sample**	Nitrate	100	103	3	85-115	Yes	30	Yes
	Batch Sample	Orthophosphate	89	92	3	75-125	Yes	30	Yes
0210A	**Batch Sample**	Sulfate	150	144	4	75-125	No	30	Yes
0210C	**Batch Sample**	Chloride	91	67	30	85-115	No	30	No
0210B	**Batch Sample**	Fluoride	98	94	4	75-125	Yes	30	Yes
0207B	**Batch Sample**	Ammonia	87	88	1	90-110	No	30	Yes
0201A	**Batch Sample**	Total Phosphorous	89	88	1	60-140	Yes	40	Yes

Table G-1

Volatile Organic Compounds
Surrogate Recovery Results
Site 2 - Landfill 2
Confirmatory Studies
Fort Story, Virginia

Sample ID	Surrogate	Recovery	Recovery Limits	Recovery Acceptable?
S2SD3001	1,2-Dichloroethane-d4	98	64-126	Yes
	Toluene-d8	109	84-138	Yes
	4-Bromofluorobenzene	81	68-123	Yes
S2SD3002	1,2-Dichloroethane-d4	94	64-126	Yes
	Toluene-d8	130	84-138	Yes
	4-Bromofluorobenzene	67	68-123	No
S2SD3003	1,2-Dichloroethane-d4	93	64-126	Yes
	Toluene-d8	131	84-138	Yes
	4-Bromofluorobenzene	67	68-123	No
S2SD3004	1,2-Dichloroethane-d4	97	64-126	Yes
	Toluene-d8	119	84-138	Yes
	4-Bromofluorobenzene	82	68-123	Yes
S2SD3005	1,2-Dichloroethane-d4	89	64-126	Yes
	Toluene-d8	108	84-138	Yes
	4-Bromofluorobenzene	72	68-123	Yes
S2SD3005D	1,2-Dichloroethane-d4	97	64-126	Yes
	Toluene-d8	114	84-138	Yes
	4-Bromofluorobenzene	81	68-123	Yes
S2MW105	1,2-Dichloroethane-d4	91	80-125	Yes
	Toluene-d8	86	77-120	Yes
	4-Bromofluorobenzene	86	80-125	Yes
S2MW109	1,2-Dichloroethane-d4	99	80-125	Yes
	Toluene-d8	91	77-120	Yes
	4-Bromofluorobenzene	92	80-125	Yes
S2MW109D	1,2-Dichloroethane-d4	92	80-125	Yes
	Toluene-d8	96	77-120	Yes
	4-Bromofluorobenzene	94	80-125	Yes

Table G-1

Volatile Organic Compounds
Surrogate Recovery Results
Site 2 - Landfill 2
Confirmatory Studies
Fort Story, Virginia

Sample ID	Surrogate	Recovery	Recovery Limits	Recovery Acceptable?
S2SW3001	1,2-Dichloroethane-d4	96	80-125	Yes
	Toluene-d8	90	77-120	Yes
	4-Bromofluorobenzene	90	80-125	Yes
S2SW3001D	1,2-Dichloroethane-d4	96	80-125	Yes
	Toluene-d8	90	77-120	Yes
	4-Bromofluorobenzene	90	80-125	Yes
S2SW3002	1,2-Dichloroethane-d4	96	80-125	Yes
	Toluene-d8	90	77-120	Yes
	4-Bromofluorobenzene	88	80-125	Yes
Trip Blank	1,2-Dichloroethane-d4	102	80-125	Yes
(T510298-4)	Toluene-d8	91	77-120	Yes
	4-Bromofluorobenzene	95	80-125	Yes
Trip Blank	1,2-Dichloroethane-d4	86	80-125	Yes
(T510274-6)	Toluene-d8	91	77-120	Yes
	4-Bromofluorobenzene	92	80-125	Yes
Trip Blank	1,2-Dichloroethane-d4	102	80-125	Yes
(T510346-2)	Toluene-d8	95	77-120	Yes
	4-Bromofluorobenzene	99	80-125	Yes
Trip Blank	1,2-Dichloroethane-d4	96	80-125	Yes
(T510286-2)	Toluene-d8	90	77-120	Yes
	4-Bromofluorobenzene	93	80-125	Yes
S2DI1	1,2-Dichloroethane-d4	107	80-125	Yes
	Toluene-d8	89	77-120	Yes
	4-Bromofluorobenzene	94	80-125	Yes

Table G-2

Base-Neutral and Acid Extractables
Surrogate Recovery Results
Site 2 - Landfill 2
Confirmatory Studies
Fort Story, Virginia
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Sample ID	Surrogate	Recovery	Recovery Limits	Recovery Acceptable?
S2SD3001	2-Fluorophenol	62	27-120	Yes
	Phenol-d5	65	32-123	Yes
	Nitrobenzene-d5	60	22-124	Yes
	2-Fluorobiphenyl	68	35-116	Yes
	2,4,6-Tribromophenol	68	17-123	Yes
	4-Terphenyl-d14	131	29-137	Yes
S2SD3002	2-Fluorophenol	55	27-120	Yes
	Phenol-d5	56	32-123	Yes
	Nitrobenzene-d5	53	22-124	Yes
	2-Fluorobiphenyl	62	35-116	Yes
	2,4,6-Tribromophenol	59	17-123	Yes
	4-Terphenyl-d14	109	29-137	Yes
S2SD3003	2-Fluorophenol	55	27-120	Yes
	Phenol-d5	56	32-123	Yes
	Nitrobenzene-d5	53	22-124	Yes
	2-Fluorobiphenyl	62	35-116	Yes
	2,4,6-Tribromophenol	61	17-123	Yes
	4-Terphenyl-d14	101	29-137	Yes
S2SD3004	2-Fluorophenol	63	27-120	Yes
	Phenol-d5	66	32-123	Yes
	Nitrobenzene-d5	59	22-124	Yes
	2-Fluorobiphenyl	68	35-116	Yes
	2,4,6-Tribromophenol	70	17-123	Yes
	4-Terphenyl-d14	105	29-137	Yes
S2SD3005	2-Fluorophenol	61	27-120	Yes
	Phenol-d5	63	32-123	Yes
	Nitrobenzene-d5	60	22-124	Yes
	2-Fluorobiphenyl	70	35-116	Yes
	2,4,6-Tribromophenol	64	17-123	Yes
	4-Terphenyl-d14	91	29-137	Yes
S2SD3005D	2-Fluorophenol	54	27-120	Yes
	Phenol-d5	60	32-123	Yes
	Nitrobenzene-d5	55	22-124	Yes
	2-Fluorobiphenyl	64	35-116	Yes
	2,4,6-Tribromophenol	66	17-123	Yes
	4-Terphenyl-d14	94	29-137	Yes

Table G-2

Base-Neutral and Acid Extractables
Surrogate Recovery Results
Site 2 - Landfill 2
Confirmatory Studies
Fort Story, Virginia

Sample ID	Surrogate	Recovery	Recovery Limits	Recovery Acceptable?
S2MW105	2-Fluorophenol	53	10-104	Yes
	Phenol-d5	59	10-106	Yes
	Nitrobenzene-d5	62	61-115	Yes
	2-Fluorobiphenyl	61	59-119	Yes
	2,4,6-Tribromophenol	66	41-143	Yes
	4-Terphenyl-d14	73	46-136	Yes
S2MW106	2-Fluorophenol	62	10-104	Yes
	Phenol-d5	74	10-106	Yes
	Nitrobenzene-d5	66	61-115	Yes
	2-Fluorobiphenyl	71	59-119	Yes
	2,4,6-Tribromophenol	66	41-143	Yes
	4-Terphenyl-d14	64	46-136	Yes
S2MW107	2-Fluorophenol	64	10-104	Yes
	Phenol-d5	72	10-106	Yes
	Nitrobenzene-d5	70	61-115	Yes
	2-Fluorobiphenyl	66	59-119	Yes
	2,4,6-Tribromophenol	76	41-143	Yes
	4-Terphenyl-d14	28	46-136	No
S2MW108	2-Fluorophenol	67	10-104	Yes
	Phenol-d5	72	10-106	Yes
	Nitrobenzene-d5	72	61-115	Yes
	2-Fluorobiphenyl	69	59-119	Yes
	2,4,6-Tribromophenol	74	41-143	Yes
	4-Terphenyl-d14	21	46-136	No
S2MW109	2-Fluorophenol	69	10-104	Yes
	Phenol-d5	77	10-106	Yes
	Nitrobenzene-d5	79	61-115	Yes
	2-Fluorobiphenyl	78	59-119	Yes
	2,4,6-Tribromophenol	78	41-143	Yes
	4-Terphenyl-d14	27	46-136	No
S2MW109D	2-Fluorophenol	70	10-104	Yes
	Phenol-d5	78	10-106	Yes
	Nitrobenzene-d5	80	61-115	Yes
	2-Fluorobiphenyl	80	59-119	Yes
	2,4,6-Tribromophenol	79	41-143	Yes
	4-Terphenyl-d14	30	46-136	No

Table G-2

Base-Neutral and Acid Extractables
Surrogate Recovery Results
Site 2 - Landfill 2
Confirmatory Studies
Fort Story, Virginia

Sample ID	Surrogate	Recovery	Recovery Limits	Recovery Acceptable?
S2SW3001	2-Fluorophenol	71	10-104	Yes
	Phenol-d5	77	10-106	Yes
	Nitrobenzene-d5	81	61-115	Yes
	2-Fluorobiphenyl	75	59-119	Yes
	2,4,6-Tribromophenol	78	41-143	Yes
	4-Terphenyl-d14	30	46-136	No
S2SW3001D	2-Fluorophenol	80	10-104	Yes
	Phenol-d5	90	10-106	Yes
	Nitrobenzene-d5	93	61-115	Yes
	2-Fluorobiphenyl	81	59-119	Yes
	2,4,6-Tribromophenol	75	41-143	Yes
	4-Terphenyl-d14	33	46-136	No
S2SW3002	2-Fluorophenol	70	10-104	Yes
	Phenol-d5	76	10-106	Yes
	Nitrobenzene-d5	80	61-115	Yes
	2-Fluorobiphenyl	79	59-119	Yes
	2,4,6-Tribromophenol	77	41-143	Yes
	4-Terphenyl-d14	38	46-136	No
S2DI1	2-Fluorophenol	74	10-104	Yes
	Phenol-d5	77	10-106	Yes
	Nitrobenzene-d5	78	61-115	Yes
	2-Fluorobiphenyl	81	59-119	Yes
	2,4,6-Tribromophenol	97	41-143	Yes
	4-Terphenyl-d14	82	46-136	Yes

Table G-3

Pesticides/Polychlorinated Biphenyls
Surrogate Recovery Results
Site 2 - Landfill 2
Confirmatory Studies
Fort Story, Virginia

Sample ID	Surrogate	Recovery	Recovery Limits	Recovery Acceptable?
S2SD3001	Tetrachloro-m-xylene	40	19-132	Yes
	Dibutyl Chlorendate	79	45-131	Yes
S2SD3002	Tetrachloro-m-xylene	35	19-132	Yes
	Dibutyl Chlorendate	28	45-131	No
S2SD3003	Tetrachloro-m-xylene	35	19-132	Yes
	Dibutyl Chlorendate	33	45-131	No
S2SD3004	Tetrachloro-m-xylene	35	19-132	Yes
	Dibutyl Chlorendate	33	45-131	No
S2SD3005	Tetrachloro-m-xylene	52	19-132	Yes
	Dibutyl Chlorendate	57	45-131	Yes
S2SD3005D	Tetrachloro-m-xylene	35	19-132	Yes
	Dibutyl Chlorendate	26	45-131	No
S2MW105	Tetrachloro-m-xylene	27	22-126	Yes
	Dibutyl Chlorendate	39	28-151	Yes
S2MW106	Tetrachloro-m-xylene	74	22-126	Yes
	Dibutyl Chlorendate	91	28-151	Yes
S2MW107	Tetrachloro-m-xylene	29	22-126	Yes
	Dibutyl Chlorendate	26	28-151	No
S2MW108	Tetrachloro-m-xylene	33	22-126	Yes
	Dibutyl Chlorendate	23	28-151	No
S2MW109	Tetrachloro-m-xylene	36	22-126	Yes
	Dibutyl Chlorendate	26	28-151	No
S2MW109D	Tetrachloro-m-xylene	24	22-126	Yes
	Dibutyl Chlorendate	25	28-151	No
S2SW3001	Tetrachloro-m-xylene	29	22-126	Yes
	Dibutyl Chlorendate	25	28-151	No

Table G-3

Pesticides/Polychlorinated Biphenyls
Surrogate Recovery Results
Site 2 - Landfill 2
Confirmatory Studies
Fort Story, Virginia
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Sample ID	Surrogate	Recovery	Recovery Limits	Recovery Acceptable?
S2SW3001D	Tetrachloro-m-xylene	35	22-126	Yes
	Dibutyl Chlorendate	31	28-151	Yes
	Decachlorobiphenyl	61	25-126	Yes
S2SW3002	Tetrachloro-m-xylene	25	22-126	Yes
	Dibutyl Chlorendate	27	28-151	No
S2DI1	Tetrachloro-m-xylene	72	22-126	Yes
	Dibutyl Chlorendate	13	28-151	No

Table G-4

Total Fuel Hydrocarbons - Heavy Fraction
Surrogate Recovery Results
Site 2 - Landfill 2
Confirmatory Studies
Fort Story, Virginia
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Sample ID	Surrogate	Recovery	Recovery Limits	Recovery Acceptable?
S2SD3001	Decafluorobiphenyl	66	20-150	Yes
	o-Terphenyl	83	40-140	Yes
S2SD3002	Decafluorobiphenyl	67	20-150	Yes
	o-Terphenyl	77	40-140	Yes
S2SD3003	Decafluorobiphenyl	65	20-150	Yes
	o-Terphenyl	99	40-140	Yes
S2SD3004	Decafluorobiphenyl	68	20-150	Yes
	o-Terphenyl	143	40-140	No
S2SD3005	Decafluorobiphenyl	75	20-150	Yes
	o-Terphenyl	92	40-140	Yes
S2SD3005D	Decafluorobiphenyl	73	20-150	Yes
	o-Terphenyl	88	40-140	Yes
S2MW105	Decafluorobiphenyl	35	40-140	No
	o-Terphenyl	67	40-140	Yes
S2MW106	Decafluorobiphenyl	74	40-140	Yes
	o-Terphenyl	91	40-140	Yes
S2MW107	Decafluorobiphenyl	37	40-140	No
	o-Terphenyl	32	40-140	No
S2MW108	Decafluorobiphenyl	50	40-140	Yes
	o-Terphenyl	48	40-140	Yes
S2SW3001D	Decafluorobiphenyl	56	40-140	Yes
	o-Terphenyl	55	40-140	Yes
S2DI1	Decafluorobiphenyl	42	40-140	Yes
	o-Terphenyl	80	40-140	Yes

Table G-5

Total Fuel Hydrocarbon - Light Fraction
Surrogate Recovery Results
Site 2 - Landfill 2
Confirmatory Studies
Fort Story, Virginia
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Sample ID	Surrogate	Recovery	Recovery Limits	Recovery Acceptable?
S2MW105	a,a,a-Trifluorotoluene	102	77-140	Yes
S2DI1	a,a,a-Trifluorotoluene	106	77-140	Yes