Final Work Plan
for Interim Removal Activities at
Underground Storage Tank 82
Facility ID #9-089029
Building 1281
Fort Stewart, Georgia

July 2006

Submitted to:
U.S. Army Corps of Engineers
Savannah District
Contract No. W912HN-04-D-0019
Delivery Order No. 0011

Prepared by:
Solutions To Environmental Problems, Inc.
1006 Floyd Culler Court
Oak Ridge, Tennessee 37830

TABLE OF CONTENTS

List of Figures

List of Tables

Acronyms and Abbreviations

BTEX	benzene, toluene, ethylbenzene, and xylene
CAP	corrective action plan
CLP	contract laboratory program
COC	chain-of-custody
DPW	Directorate of Public Works
DRO	diesel range organic
FID	flame ionization detector
ft	foot/feet
GRO	gasoline range organic
IDW	investigative derived waste
IRA	interim removal activity
MS	matrix spike
MSD	matrix spike duplicate
MTBE	methyl tertbutyl ether
PAH	polynuclear aromatic hydrocarbon
psi	pounds per square inch
QA	quality assurance
QC	quality control
ORC®	Oxygen Release Compound®
STEP	Solutions To Environmental Problems, Inc.
TPH	total petroleum hydrocarbons
µg/L	micrograms per liter
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
UST	underground storage tank

1. INTRODUCTION

Solutions To Environmental Problems, Inc. (STEP) has been contracted by the U.S. Army Corps of Engineers (USACE), Savannah District, to perform interim removal activities (IRAs) at a former underground storage tank (UST) location within Fort Stewart, Georgia. This work plan provides the details of the removal activities and field procedures that will be followed during the IRAs.

1.1 PURPOSE OF THIS WORK PLAN

The purpose of this work plan is to provide site-specific and background information related to IRAs at former UST site, UST 82. This work plan describes the removal activities; the numbers and types of samples to be taken; sampling rationale and criteria; field investigation techniques and procedures; analytical requirements and methods; quality assurance (QA)/quality control (QC) requirements to be applied; necessary reporting requirements; and any site-specific health and safety procedures.

1.2 SCOPE

The objectives of the scope of work for the former UST 82 site are to:

- remove monitoring well 32-08,
- excavate a 15 ft by 15 ft area surrounding well 32-08 to a depth of 15 ft or to groundwater (whichever is less),
- collect soil samples from the four walls of the excavation and the excavation floor,
- conduct chemical analysis of the soil samples for characterization of the excavation,
- apply Oxygen Release Compound® (ORC®) to the excavation floor and four side walls,
- install a new monitoring well with pre-pack screen in the well 32-08 pit, and
- characterize and properly dispose of the IDW.

1.3 PROJECT ORGANIZATION

Figure 1-1 depicts the project organization. A listing of project key personnel, which includes contact information, follows the organizational chart.

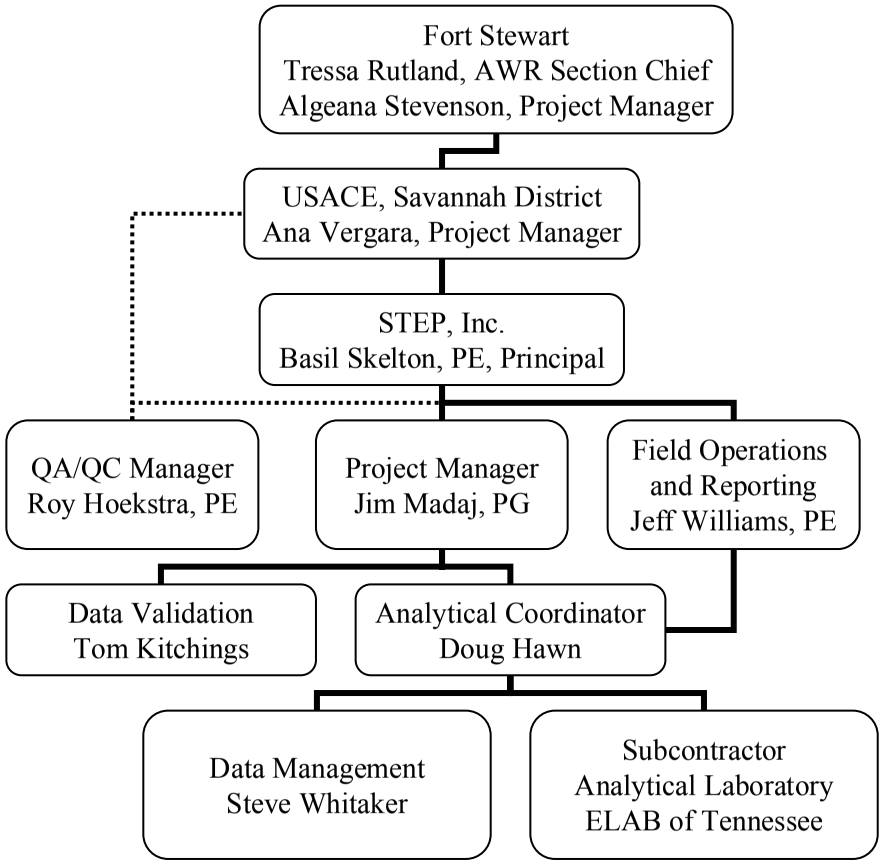


Figure 1-1 Organizational Chart for IRA at UST 82

Contact Information – Key Personnel

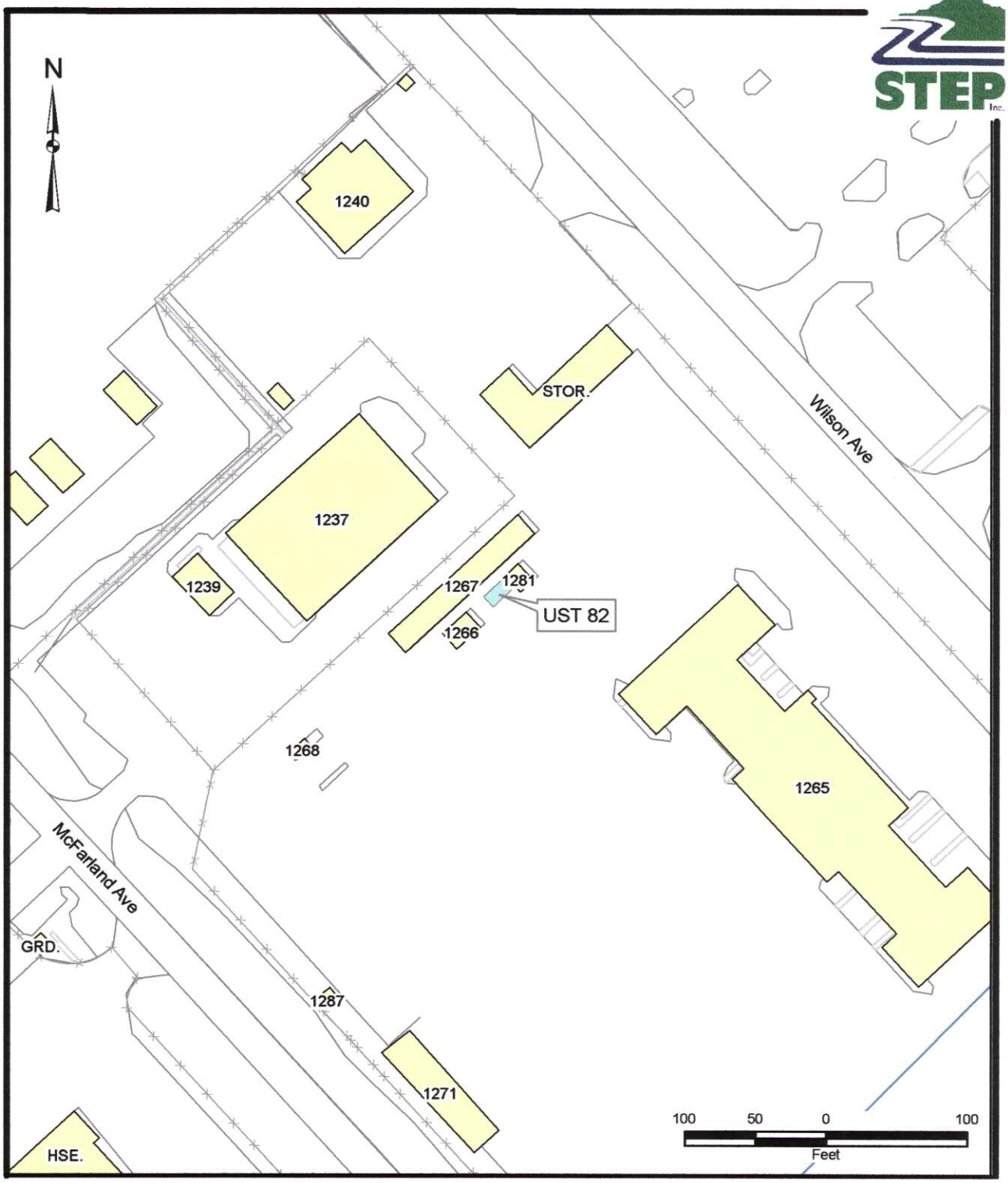
Tressa Rutland, Fort Stewart AWR, Section Chief Environmental Branch, Directorate of Public Works HQs 3d Infantry Division (Mechanized and Fort Stewart) 1557 Frank Cochran Drive Fort Stewart, GA 31314-4928	(912) 767-7919
Algeana Stevenson, Fort Stewart Project Manager Environmental Branch, Directorate of Public Works HQs 3d Infantry Division (Mechanized and Fort Stewart) 1557 Frank Cochran Drive Fort Stewart, GA 31314-4928	(912) 767-2281
Ana Vergara, Savannah COE, Project Manager Box 889 Savannah, GA 31402-0889	(912) 652-5835
Zsolt Haverland, Savannah COE, Technical Manager Box 889 Savannah, GA 31402-0889	(912) 652-5815
Jim Madaj, PG, Project Manager STEP Inc. 1006 Floyd Culler Court Oak Ridge, TN 37830	(865) 481-7837 ext. 266

2. SITE BACKGROUND

Fort Stewart is located in Liberty County, Georgia, approximately 40 miles southwest of Savannah, Georgia. The nearest city is Hinesville, approximately 1½ miles to the south. Former UST 82 (Georgia UST Facility I.D. #9-089029) was near Building 1281 at Fort Stewart, Georgia. The UST has been removed; however, subsequent groundwater monitoring of wells at the site has indicated that free-phased product is present on the groundwater. This free product requires remediation.

3. SITE DESCRIPTION

UST 82, a 1,000-gallon waste oil UST, was located near Building 1281 as shown on Figure 3-1. UST 82 was excavated and removed from the site in February 1995. A CAP Part A investigation (1996) and a CAP Part B investigation (1997-1998, and 2000) were conducted to determine the extent of petroleum



LEGEND

Building
Fence
Railroad
Sidewalk
Road
Underground Storage Tank

Source: FT Stewart GIS
Job Title: UST 82
Fort Stewart, Liberty County
Georgia

R:/113/113-131-012/Graphics/ust82.mxd 5/3/2006

Figure 3-1 Site Location Map UST 82

contamination at the site. Seven monitoring wells and five soil borings were installed and sampled during these investigations. The CAP-Part B in 2000 recommended semiannual monitoring at all seven groundwater wells well [*Scope of Work, Interim Removal Activities at Underground Storage Tank 61, Facility ID #9-089104, Building 1161 and Underground Storage Tank 82, Facility ID #9-089029, Building 1281, and SWMU 39, Underground Storage Tanks 59 & 60 at Fort Stewart Georgia* (USACE Savannah District, January 2006)]. Fort Stewart has continued monitoring the water level and free product measurements and has found free product thickness in well 32-08 has ranged from a sheen to over 5 feet from 1999 to 2004.

4. INTERIM REMOVAL ACTIVITIES

STEP will perform IRAs at the former UST 82 site. Tasks to be performed include

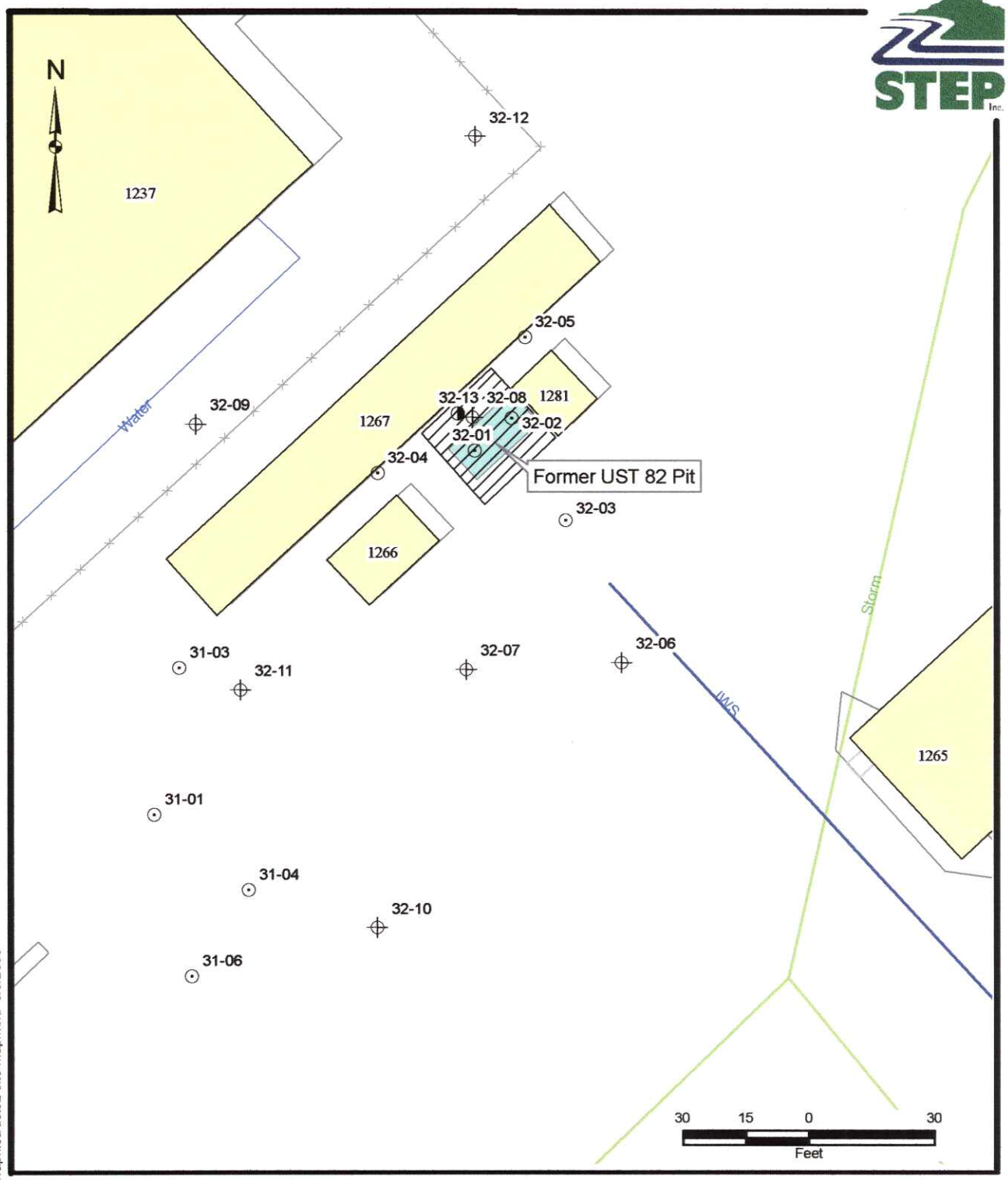
- removal of one monitoring well and surrounding soil at the former UST site,
- installation of a new pre-packed groundwater monitoring well at the location of the removed well,
- collecting environmental samples from the excavation for chemical analyses,
- applying ORC® to the excavation side walls and excavation floor, and
- backfilling the excavation surrounding the well with rock.

4.1 SITE RECONNAISSANCE, PREPARATION, AND RESTORATION PROCEDURES

Before field activities begin, all excavation permits and utility clearances for the UST 82 site will be obtained in coordination with the USACE project manager and DPW Environmental personnel. The well installation/excavation locations will be marked on the ground before field activities begin. The STEP project manager will coordinate with the Fort Stewart project manager, Ms. Algeana Stevenson of the Directorate of Public Works (DPW) Environmental Branch, to locate utilities in the vicinity of field activities. The proposed excavation area is shown on Figure 4-1.

4.2 MONITORING WELL REMOVAL, SOIL REMOVAL, ORC® APPLICATION AND WELL INSTALLATION

The well to be removed is in a developed area that is covered with concrete. A 25 ft x 25-ft area centered on the well will be saw-cut and the concrete will be removed to provide access to the well and the excavation area. The concrete will be broken into pieces, and the resulting concrete debris will be loaded



R:/113/113-131-012/Graphics/ust82 site map.mxd 5/3/2006

LEGEND

Building	Road	UST Monitoring Well	Source: FT Stewart GIS
Fence	Underground Storage Tank	UST Temp Piezometer	Job Title: UST 82
Railroad	Proposed Excavation 25' x 25'	UST Bore Hole	Fort Stewart, Liberty County Georgia
Sidewalk			

Figure 4-1 Site Map UST 82

onto trucks and disposed at Fort Stewart's construction debris landfill. The size of the concrete removal area is larger than the planned excavation area in order to allow for minimal sidewall collapse and to prevent undermining of the surrounding concrete.

After the concrete has been removed, STEP personnel will use a rubber tire backhoe to excavate and remove the monitoring well. The surface components of the well (concrete pad, protective casing, and bollards) will be disposed with the concrete debris. Well materials removed during the excavation will be disposed with the excavated soil identified as IDW. Excavated material will be field-screened using visual observation and instruments [i.e. a flame ionization detector (FID)] to detect petroleum contamination. STEP will be prepared to absorb, bail, pump, and otherwise remove and contain any free product and water exhibiting a sheen encountered in the excavation. Materials containing free product will be appropriately disposed as IDW.

After the monitoring well is removed, excavation activities will continue, expanding the pit to an area 15 ft by 15 ft by 15-ft deep or until groundwater is encountered (whichever is shallower). Excavated soil material will be placed in plastic lined construction debris roll-off containers for disposal at a permitted disposal facility. Soil samples will be collected from the excavated material as it is placed in the roll-off containers and will be sent to a laboratory for analyses required to characterize the waste in order to determine disposal requirements.

Following completion of excavation activities, STEP personnel will collect a soil sample from the sidewalls and floor of the excavation. A total of five (5) primary samples and appropriate QA samples will be collected and analyzed for benzene, toluene, ethylbenzene, xylene (BTEX), methyl tertbutyl ether (MTBE), polynuclear aromatic hydrocarbons, total petroleum hydrocarbons (TPH) diesel range organics (DRO), and TPH gasoline range organics (GRO). BTEX, MTBE, and TPH GRO samples will be collected using an Encore Sampler. Table 4-1 lists the soil samples for UST 82.

After sampling is complete, STEP will apply approximately 400 pounds of ORC® to the excavation sidewalls and floor and will then proceed with installation of the new monitoring well. The ORC will be applied in accordance with the manufacture's recommendations. Components used for construction of the well will consist of 4-inch diameter well materials with a 10-foot pre-packed well screen and riser pipe. The well screen will be installed so that the well screen within the pit will be placed at an interval intersecting the water table as measured prior to excavation. The well will be positioned inside the excavation using suitable supports, and gravel backfill consisting of #57 stone will be used inside the

excavation. The gravel backfill will be placed loosely and will extend to approximately 1 foot above the well screen. The remaining backfill, which will also be #57 stone, will be placed using excavation equipment. The backfill will be placed in 8 to 10 inch lifts and compacted using the bucket of the available equipment. Backfilling will proceed in lifts until the backfill is 12 inches below the surface.

Table 4-1 Soil Samples for UST 82 (Facility ID #9-089029)

Sample Type	BTEX Method (8260B)	MTBE Method (8260B)	PAHs Method (8270C)	TPH-DRO Method (8015B)	TPH-GRO Method (8015B)
Primary Samples	5	5	5	5	5
Field Duplicates	1	1	1	1	1
Equipment Rinsates	1	1	1	1	1
Field Blanks	1	1	1	1	1
Trip Blanks	1	1			1
MS/MSD	1	1	1	1	1
Total Number of Samples	10	10	9	9	10

Notes:
1) Equipment rinsates and field duplicates will be taken at a rate of 10 percent of the total number of samples for each parameter by matrix and event.
2) One field blank sample per event for all analyses.
3) Matrix spike and matrix spike duplicates will be analyzed on representative matrix at a rate of a minimum of one sample per batch or 1 in 20 samples.

BTEX = benzene, toluene ethylbenzene, xylene
DRO = diesel range organic
GRO = gasoline range organic
MS = matrix spike
MSD = matrix spike duplicate
MTBE = methyl tertbutyl ether
PAH = polynuclear aromatic hydrocarbon
TPH = total petroleum hydrocarbon
UST = underground storage tank

The top 12 inches of the excavation will be filled with 4,000 psi strength concrete reinforced with #5 reinforcing steel placed typically 24 inches on center each way. The concrete will be secured to the surrounding (existing) concrete by doweling an epoxying #5 rebar into the surrounding concrete surface to a minimum depth of 6 inches. The concrete will be 12 inches thick and vibrated to remove air and to achieve full placement around the reinforcing steel. The concrete will then be finished with a broom to provide a relatively rougher surface than a smooth finish to blend with the surrounding concrete. After installation of the excavation pit well is complete, STEP will use an interface probe to check the well for free product. Upon completion of the interim removal actions, STEP will prepare a letter report for the UST 82 site documenting the interim removal activities.

5. INVESTIGATIVE DERIVED WASTE

All IDW will be properly disposed in accordance state and federal regulations. Concrete waste will be transported and disposed at the on-site landfill. All soil IDW will be stored in a lined roll-off container and liquid (free-product and/or water) IDW will be stored in drums at a nearby area designated by USACE or Fort Stewart representatives pending receipt of characterization results required to determine appropriate off-site disposal.

Each IDW container will be labeled in accordance with applicable state and federal requirements. IDW shall be labeled "UNCLASSIFIED WASTE, ANALYSIS PENDING." In addition, the following information shall be included on the waste label:

- the well number,
- STEP's point of contact and telephone number,
- the USACE point of contact and telephone number, and
- a description of the contents.

The area(s) in which the IDW is stored will be flagged with surveying tape and stakes. All other wastes (e.g., trash, tyvek suits, gloves, respirator cartridges, etc.) will be disposed off site in accordance with all applicable regulations.

IDW will be characterized for disposal within 60 days of the date of generation and properly disposed (on site and/or off site) within 90 days of generation. All IDW will be disposed at an approved permitted facility. All emptied drums, pallets, etc. will be removed from the site by STEP.

All required manifests for waste disposal will be completed by STEP, and a 72-hour notice will be provided to DPW personnel (Note: a DPW representative will sign each manifest). STEP will be on site during all waste removal activities.

6. QUALITY ASSURANCE/QUALITY CONTROL PROCEDURES AND REQUIREMENTS

6.1 SAMPLE COLLECTION, PRESERVATION, AND HOLDING TIMES

Procedures for collecting the IDW samples will follow U.S. Environmental Protection Agency (USEPA) protocols. Samples will be collected with properly decontaminated equipment and contained in properly cleaned sample containers. The steps required for sample control and identification, data recording, and chain-of-custody (COC) documentation are discussed in Section 6.2. All field sampling equipment will be decontaminated before use and after each sample location.

Sample containers and preservatives used to collect and contain samples designated for chemical analysis will be provided by the laboratory performing the analysis. The bottles must be pre-cleaned and traceable to the laboratory that performed the cleaning, and lot numbers of containers and reagents used for preservatives must be traceable to the laboratory that performed the initial assay. Certificates of cleanliness must be provided by the laboratory and kept in the project file.

All samples for chemical analysis will be placed on ice as soon as possible following collection. Samples will be chilled to 4 +/-2 degrees centigrade and maintained at that temperature through transport and subsequent storage at the analytical laboratory. In no case will samples be retained over 48 hours on site.

6.2 SAMPLE IDENTIFICATION AND CHAIN-OF-CUSTODY PROCEDURES

Sample COC procedures require that the possession and handling of the sample from the moment of its collection through analysis be documented by written record. The record must clearly reflect the movement of the sample through the COC to ensure the sample has been positively controlled and has not been tampered with in any way. A sample is judged to be in one's custody when one of the following criteria has been met.

- The sample is in one's actual physical possession.
- The sample is in one's clear field of view after being in one's physical possession.
- The sample is in one's physical possession and is then locked up in a secure container so that no one can tamper with it.
- The sample is kept in a secured area that is restricted to authorized personnel only.

6.2.1 Sample Identification

A standardized system will be used to uniquely identify all samples collected during IRA activities. The field sample number is a unique number assigned to each individual sample collected and relates a specific result set to the IDW container or containers from which it was collected. The numbering system provides a tracking procedure to ensure accurate data retrieval of all samples taken.

6.2.2 Sample Labels

All samples will be identified with a label attached directly to the container. Sample label information will be completed using waterproof black ink and will, at a minimum, contain the following information:

- company name and site,
- sample identification number,
- date and time of sample collection,
- parameters to be analyzed,
- preservative (if any), and
- initials of person collecting the sample.

6.2.3 Chain-of-Custody Record

To maintain a record of sample collection, a COC record will be filled out documenting the collection and shipment of samples and receipt by the laboratory. Each time samples are transferred, the signatures of the person relinquishing and receiving the samples, as well as the date and time of transfer, will be documented.

6.2.4 Transfer of Custody and Shipment

Before samples are shipped, the COC record will be signed and dated by a member of the field team who has verified that those samples indicated on the COC record are indeed being shipped. After packaging has been completed, the samples will be locked within the cooler, and custody seals, signed and dated by a member of the field team, will be placed over the lid edge.

All samples will be shipped by courier (e.g., Federal Express or United Parcel Service) to the analytical laboratory. Upon receipt of samples at the laboratory, the receiver will complete the transfer by dating

and signing the COC record. If shipped by commercial courier, the air bill number and shipping data will be transcribed to the COC in the appropriate signature/date block. A copy of the air bill is to be kept with the field copy of the COC form to reflect specific shipping information.

6.3 DOCUMENTATION PROCEDURES

All documentation must be legible and completed in indelible ink. Corrections must be marked with a single line, dated, and initialed. Serialized documents are not to be destroyed or discarded, even if illegible or inaccurate. Voided entries must be maintained within project files. Every line in the logbook should contain text or have notations that the line is intentionally not being used. Text should be continuous, with no breaks between topics. Empty lines should have a diagonal line drawn across them and be signed and dated.

Field documentation shall consist of a master site logbook, one or more job- or area-specific field logbooks, field forms, and sample logs/labels. This format of documentation allows for detailed recording of information in various field logbooks and forms that are referenced in the site logbook.

Site and field logbooks provide a daily handwritten record of all field activities at an investigation site. All logbooks will be permanently bound and have a hard cover. Field logbooks must be waterproof. Logbooks will be ruled, or ruled and gridded, with sequentially numbered pages. The site logbook is a master record of all site activities, and entries are usually made at the end of each workday. Field logbooks are detailed daily records that are kept in real time and are assigned to specific activities, positions, or areas within the site. Separate logbooks shall be used for each sampling and field (drilling) team.

6.4 QUALITY CONTROL FOR FIELD MEASUREMENTS

Most data will be developed in the analytical laboratory from the samples collected; however, field measurements for health and safety monitoring and sample collection locations may be performed and recorded in the field. The primary QA objectives of field activities where measurements will be taken are to verify that QC checks are performed, verify that measurements were obtained to the degree of accuracy consistent with their intended use, and provide documentation of adherence to the measurement procedures.

Measurement data may be generated during field activities (1) to make qualitative organic vapor screening measurements from samples before disposal segregation or health and safety monitoring using a photo ionization detector or FID; and (2) to determine gross levels of contaminant concentrations

Field measurement instruments will be calibrated according to manufacturers' specifications before and after each field use, or as otherwise required. Where necessary, instruments will be calibrated each day during field use, and calibration information will be documented on calibration log sheets or in logbooks. Information to be recorded includes date, operator, and calibration standards (concentration, manufacturer, lot number, and expiration date). Field measurements are considered valid provided that:

- calibration records for field measurement equipment are properly maintained;
- training records exist that document field personnel are familiar with standard procedures for taking measurements; and
- verification that calculations and observations are accurately recorded and transcribed.

Chemical data will be generated using USEPA SW-846 analytical methods. For SW-846 methods, forms that include similar information to that on the referenced contract laboratory program (CLP) forms must be included in the data package. Forms do not need to be presented in the format specified by the CLP but must include similar laboratory information as required by the CLP forms, including specifications for any QC acceptance limits or criteria required by the method performed. The laboratory identified in Figure 1-1, Organizational Chart, holds a current USACE laboratory certification and holds accreditation for environmental laboratories in the State of Georgia.

6.5 PERFORMANCE AND SYSTEM AUDITS

If deemed appropriate by Fort Stewart DPW personnel or the USACE Project Manager, surveillance of project field and/or laboratory operations may be conducted. The QA adequacy of these operations will be assessed against the requirements outlined in this document.

7. REPORTING REQUIREMENTS

In addition to this work plan, required project submittals for the IRA at UST 82 include a project schedule, monthly progress reports, and a letter completion report. Each of these deliverables is more fully described in the following sections..

7.1 SCHEDULE

A detailed schedule for preparation and submittal of this project work plan, conducting fieldwork, and preparation and submittal of the draft and final completion letter report is provided in Figure 7-1.

7.2 MONTHLY PROGRESS REPORTS

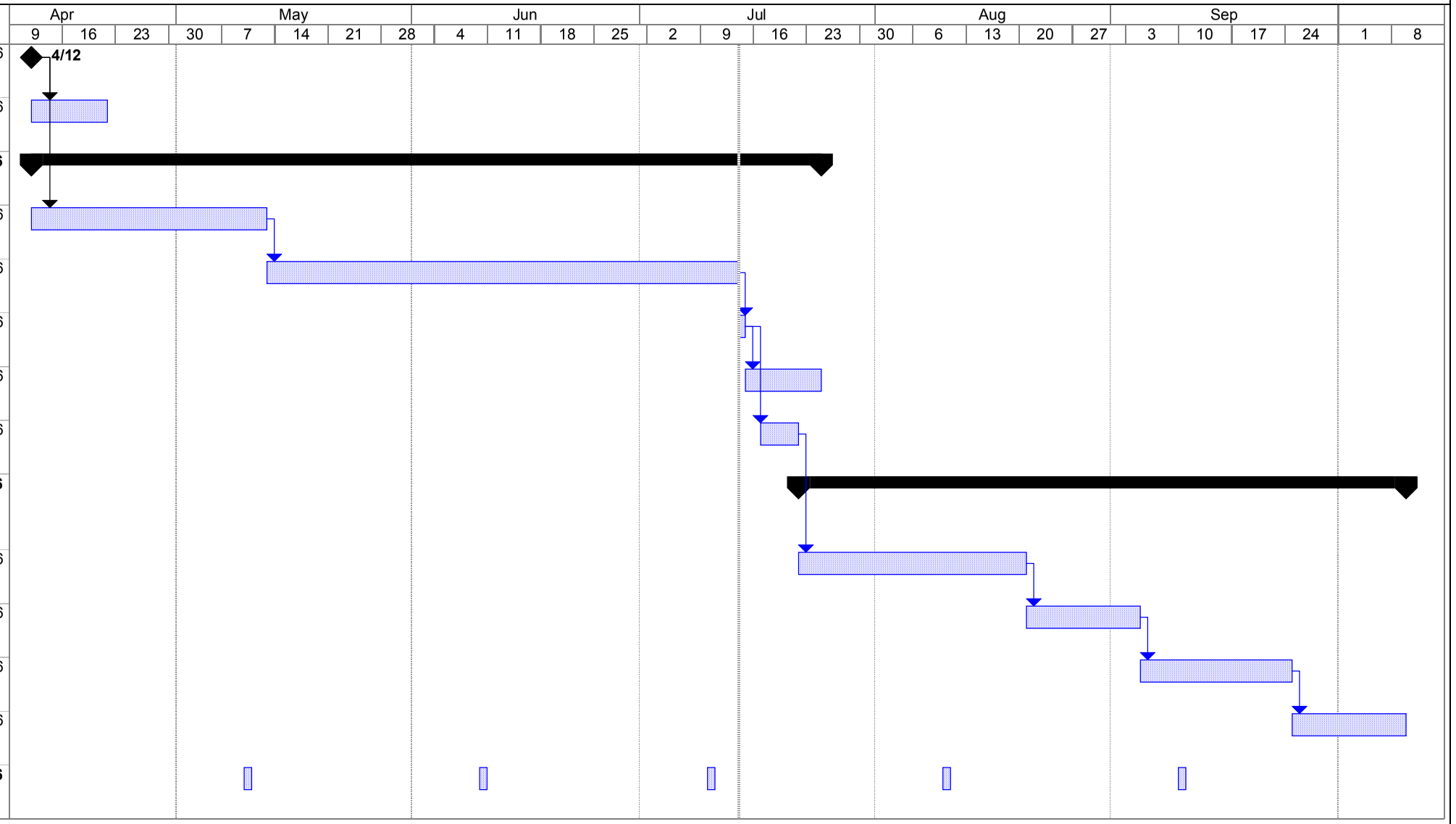
STEP will prepare and submit a monthly progress report to the USACE project manager. Each monthly report will describe the work completed during the current reporting period, indicate the work planned for the next reporting period, and discuss any problems, issues or concerns encountered on the project. Progress reports will be submitted on the 10th of each month.

7.3 LETTER COMPLETION REPORT

STEP will prepare a letter completion report documenting the monitoring well removal and replacement, the soil removal action, and the ORC® application at the UST 82 site. This letter report will be prepared and signed by a Professional Engineer or a Professional Geologist, duly registered with the state of Georgia. The report will summarize the activities conducted during the IRA, include a detailed site map, and will also include all manifests for the disposal of the IDW generated by the project. The letter completion report will be submitted first in draft form that will be reviewed by USACE and DPW personnel. After comments are incorporated, a final letter completion report will be prepared and submitted. Upon acceptance of the final letter completion report, copies will be submitted to USACE Savannah District and Fort Stewart DPW in both electronic and written format.

Interim Removal Activities
at Underground Storage Tank 82
Facility ID #9-089029, Building 1281
Fort Stewart, Georgia

ID	Task Name	Duration	Start	Finish
1	Notice to Proceed	0 days	4/12/06	4/12/06
2	Issue Project Schedule	10 days	4/12/06	4/21/06
3	**Task 1 - Project Work Plan**	**104 days**	**4/12/06**	**7/24/06**
4	Issue Draft Work Plan	31 days	4/12/06	5/12/06
5	USACE/Fort Stewart Review	62 days	5/13/06	7/13/06
6	Issue Final Work Plan	1 day	7/14/06	7/14/06
7	USACE/Fort Stewart Review	10 days	7/15/06	7/24/06
8	Task 2 - Field Work	5 days	7/17/06	7/21/06
9	**Task 3 - Completion Letter Report for Field Work**	**80 days**	**7/22/06**	**10/9/06**
10	Issue Draft Completion Letter Report	30 days	7/22/06	8/20/06
11	USACE/Fort Stewart Review	15 days	8/21/06	9/4/06
12	Issue Final Completion Letter Report	20 days	9/5/06	9/24/06
13	USACE/Fort Stewart Review	15 days	9/25/06	10/9/06
14	**Task 4 - Monthly Progress Report**	**124 days**	**5/10/06**	**9/10/06**



Contract No.: W912HN-04-D-0019
DO No.: 0011
Date: 7/14/06

Task | Progress | Summary | External Tasks | Deadline
Split | Milestone | Project Summary | External Milestone

Figure 7-1 Project Schedule

8. REFERENCES

SAIC (Science Applications International Corporation), May 1997. *Corrective Action Plan-Part A for Tank #82.*

SAIC, March 1999. *Corrective Action Plan-Part B for UST #82.*

SAIC, October 1999. *First Annual Monitoring Only Report for UST #82.*

SAIC, October 2000. *Second Annual Monitoring Only Report for UST #82.*

USACE (U.S. Army Corps of Engineers) Savannah District, January 2006. *Scope of Work, Interim Removal Activities at Underground Storage Tank 61, Facility ID #9-089104, Building 1161 and Underground Storage Tank 82, Facility ID #9-089029, Building 1281, and SWMU 39, Underground Storage Tanks 59 & 60 at Fort Stewart Georgia*.