CAFB 95

DEPARTMENT OF THE AIR FORCE

HEADQUARTERS 27th FIGHTER WING (ACC)
CANNON AIR FORCE BASE, NEW MEXICO

10/9/1995

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Commander, 27th Support Group
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OCT 11 1995

Mr. William Honker
Chief, RCRA Permits Branch
US EPA Region VI
1445 Ross Avenue Suite 1200
Dallas TX 75202-2733

Dear Mr. Honker

The Draft Construction Work Plan Appendix II and III Solid Waste Management Units is attached for your review and approval. This work plan addresses the Interim RCRA Corrective Actions for 19 oil-water separator sites previously investigated in the Phase I Appendix II RCRA Facility Investigation and the Phase I Appendix III RCRA Facility Investigation.

If you have any questions, please contact Mr. John S. Pike, of my environmental flight, at (505) 784-4348.

Sincerely

W. P. ARD, Colonel, USAF
Commander, 27th Support Group

Attachments:
1. Construction Work Plan Appendix II and III Solid Waste Management Units
2. Corrective Measure Completion Report Appendix II and III Solid Waste Management Units

cc:
NMED (B. Hoditschek)
NMED (D. Morgan)
HQ ACC CE/ESVW (M. Calvert) w/o Attachments

70, 92, 94

19 OWS - SWMUs: 1, 7, 8, 9, 11, 32, 33, 38, 39, 46, 47, 51, 57, 61, 62, 63

ESE

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CONSTRUCTION WORK PLAN
APPENDIX II AND III
SOLID WASTE MANAGEMENT UNITS
CANNON AIR FORCE BASE
CLOVIS, NEW MEXICO

Prepared for:

U.S. ARMY CORPS OF ENGINEERS - ALBUQUERQUE DISTRICT
Albuquerque, New Mexico

Prepared by:

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Project No. 8195129G

SEPTEMBER 1995

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TABLE OF CONTENTS

Section — Page

EXECUTIVE SUMMARY v

1.0 INTRODUCTION 1

1.1 GENERAL STATEMENT OF WORK 1
1.2 BACKGROUND INFORMATION 1
1.3 SITE LOCATION AND DESCRIPTION 3
1.4 REMEDIAL APPROACH 4
1.5 WORK PLAN OBJECTIVES 4

2.0 EXISTING SITE CONDITIONS 6

3.0 SCOPE OF CONSTRUCTION CONTRACTOR'S WORK 11

3.1 DOCUMENT REVIEW 11
3.2 REMOVAL UNITS AND UTILITIES RECONNAISSANCE 11
3.3 CONSTRUCTION EQUIPMENT AND SCHEDULE SUBMITTAL 12
3.4 SUBSURFACE EXPLORATION PLAN 12
3.5 LANDFARM CONSTRUCTION 13
3.6 APPROACH FOR REMOVAL OF DESIGNATED UNITS AND CONTAMINATED SOIL 16

3.6.1 GENERAL APPROACH FOR REMOVAL OF OWS, SAND TRAPS, DRAINS, USTS, PIPING AND CONTAMINATED SOIL 16
3.6.2 APPROACH TO SWMUs #32, #46, #47, #51, #70, AND #94 20
3.6.3 GENERAL APPROACH FOR REMOVAL OF LEACH WELLS, PIPING, AND CONTAMINATED SOIL 22

3.7 GENERAL APPROACH FOR RECONNECTION OF SANITARY SEWER LINE 23
3.8 GENERAL APPROACH FOR GROUTING SANITARY SEWER LINE LEADING TO A REMOVED UNIT 23
3.9 GENERAL APPROACH FOR INSTALLATION OF REPLACEMENT OWS OR DRAIN 24
3.10 SITE RESTORATION 26
3.11 LANDFARM OPERATIONS AND MAINTENANCE 27
3.12 WASTE MANAGEMENT 30

3.12.1 DISPOSAL OF HAZARDOUS WASTE FROM LANDFARM 30
3.12.2 DISPOSAL OF REMEDIATED SOIL FROM LANDFARM 31

4.0 SAMPLING AND ANALYSIS PLAN 33

4.1 INTRODUCTION 33
4.2 SOIL SAMPLING AND ANALYSIS 33
4.3 SURFACE WATER SAMPLING AND ANALYSIS 36
4.4 GROUNDWATER SAMPLING AND ANALYSIS 38
4.5 AIR SAMPLING AND ANALYSIS 38
4.6 REMOVAL UNITS FLUIDS AND SLUDGE SAMPLING AND ANALYSIS 39
4.7 EQUIPMENT AND DECONTAMINATION SAMPLES (BLANKS) 39

TABLE OF CONTENTS
(Continued)

Section — Page

5.0 QUALITY ASSURANCE/QUALITY CONTROL PLAN 41

5.1 GENERAL QA/QC POLICY GUIDELINES 41
5.2 QA/QC ORGANIZATION 41
5.3 FIELD QUALITY CONTROL PROCEDURES 44

5.3.1 ENVIRONMENTAL SAMPLING PROCEDURES TO ENSURE FIELD QC AND QA COMPLIANCE 44
5.3.2 SAMPLING METHODS 44
5.3.3 SAMPLE HANDLING 45

5.4 LABORATORY QUALITY CONTROL PROCEDURES 46
5.5 CONSTRUCTION QA/QC PROCEDURES 47

5.5.1 GEOTECHNICAL LABORATORY TESTING 47
5.5.2 FIELD MOISTURE AND DENSITY TESTING 47

5.5.2.1 Nuclear Densometer Method 48
5.5.2.2 Sand Cone Method 48

5.5.3 MISCELLANEOUS MATERIALS INSTALLATION 48
5.5.4 FML INSTALLATION 49
5.5.5 GEOTEXTILE AND GEOWEB INSTALLATION 53
5.5.6 DOCUMENTATION 55

5.6 QA/QC SUBMITTALS 56

6.0 LANDFARM INITIAL PERMITTING REQUIREMENTS 57

6.1 AIR 57
6.2 GROUNDWATER 57
6.3 SURFACE WATER 57
6.4 SOIL 57

7.0 CONSTRUCTION MANAGEMENT 59

8.0 CONSTRUCTION CONTINGENCY PROCEDURES 60

9.0 PROJECT SCHEDULE 61

10.0 COST ESTIMATE 62

11.0 REFERENCES 63

LIST OF APPENDICES

APPENDIX A SITE-SPECIFIC HEALTH AND SAFETY PLAN

APPENDIX B NMED UST REGULATIONS AND UST SOIL/WATER SAMPLING AND DISPOSAL GUIDELINES

APPENDIX C API-REMOVAL AND DISPOSAL OF USED UNDERGROUND PETROLEUM STORAGE TANKS

APPENDIX D REMOVAL OF UNDERGROUND STORAGE TANKS EM 1110-3-178

APPENDIX E CHEMICAL DATA QUALITY MANAGEMENT FOR PETROLEUM STORAGE TANK REMEDIATION PROJECTS

APPENDIX F CHEMICAL DATA QUALITY MANAGEMENT FOR HAZARDOUS WASTE REMEDIAL ACTIVITIES

APPENDIX G OSHA § 1926.650 SUBPART P-EXCAVATIONS

APPENDIX H FORMS

APPENDIX I NOTICE OF INTENT

LIST OF TABLES

Table | Page

1 Recommended Removal Action Levels and Cleanup Levels for Soil 5

2 Field QC and QA Sample Descriptions and Collection Frequencies 42

3 Project Schedule 61

LIST OF FIGURES

Figure | Page

1 Project Management Organization 43

LIST OF DRAWINGS

Drawing

1 SWMU Layout

2 Landfarm Plan and Details

3 Precast Concrete Barrier Details

4 Oil/Water Separator Installation Details

5 SWMU #7, #11, #38, #39, #46, #33B, #94 Piping Reconnection Details

6 Typical Details

7 Typical Details

8 Typical Details

EXECUTIVE SUMMARY

This Construction Work Plan (CWP) has been prepared for the United States Army Corps of Engineers (USACE) for the removal and disposal of selected oil/water separators (OWS), drains, sand traps, underground storage tanks (USTs), related appurtenances, and associated impacted soil removal; replacement of selected OWS and drains at selected locations; and the construction, operation, and maintenance of a landfarm to remediate impacted soils at Cannon Air Force Base (CAFB) in Clovis, New Mexico. The OWS, drains, sand traps, USTs, and associated appurtenances are part of designated solid waste management units (SWMUs) under the CAFB Resource Conservation and Recovery Act (RCRA) Part B Permit. The CWP describes the removal and disposal of the units and replacement of selected OWS and drains. The CWP describes the construction, operation, and maintenance of a landfarming facility for remediation of petroleum hydrocarbon impacted soils which will be excavated during the removal of the units. The CWP also describes the site history, remedial approach, CWP objectives, existing site conditions and the scope of the construction contractor's work. Other components of the Plan include a Sampling and Analysis Plan (SAP), a Quality Assurance and Quality Control (QA/QC) Plan, landfarm initial permitting requirements, construction management, construction contingency procedures, a project schedule, a cost estimate, and a Site-Specific Health and Safety Plan (HASP).

USACE will initiate the work outlined within this CWP based on information gathered during RCRA Facility Investigations (RFI). The information gathered included sampling and analysis data characterizing surface water, surface sediments, and soils around and beneath the subsurface SWMUs.

A construction contractor shall be responsible for the implementation of the activities presented in the CWP, specifications, and drawings. The contractor will be responsible for removal of units and related appurtenances, excavation of petroleum hydrocarbon and metals impacted soils, replacement of several OWS, transportation of contaminated soils to the landfarming facility, removal area site restoration, and waste disposal. The contractor will be responsible for construction and operation of the landfarm facility. The contractor shall accomplish these tasks using this plan, construction specifications, drawings, and with guidance from USACE.

1.0 INTRODUCTION

1.1 GENERAL STATEMENT OF WORK

This Construction Work Plan (CWP) was prepared by Environmental Science & Engineering, Inc. (ESE) for the United States Army Corps of Engineers (USACE) Albuquerque District for the removal and disposal of selected oil/water separators (OWS), drains, sand traps, underground storage tanks (USTs), related appurtenances, and associated impacted soil; replacement of removed OWS and drains at selected locations; and the construction, operation, and maintenance of a landfarm to remediate impacted soils at Cannon Air Force Base (CAFB) in Clovis, New Mexico. ESE was retained by USACE under contract DACA47-95-D-0002 to prepare a CWP for remediation of 19 Resource Conservation and Recovery Act (RCRA) Appendix II and III solid waste management units (SWMUs). The CWP was prepared in accordance with guidelines in the RCRA Corrective Action Plan, OSWER Directive 9902.3-2A, May 1994. This work has been performed in conjunction with the preparation of drawings and specifications for the activities discussed herein. This CWP, construction specification and drawings fulfill the requirements of the 100 percent design submittal as provided in the revised scopes of work dated May 16, 1995 and September 5, 1995.

This CWP has been prepared in conjunction with the previously prepared RCRA Facility Investigation (RFI) reports, and the construction specifications and drawings, for performance of all work outlined herein. The petroleum hydrocarbon impacted soils generated during the removal of OWS and USTs shall be recovered and remediated, using a landfarm facility to be constructed by the contractor.

1.2 BACKGROUND INFORMATION

CAFB has served as an active Air Force operations and support installation for more than 50 years. Throughout base history, numerous tasks have been performed as related to aircraft and equipment maintenance operations. These operations were performed in various buildings and aircraft hangars equipped with surface run-off collection drains connected to OWS and sand traps.

CAFB currently operates in compliance with the terms of a RCRA permit issued by the U.S. Environmental Protection Agency (EPA) and enforced by the State of New Mexico, New Mexico Environmental Department (NMED). A section of this permit governs the investigation and implementation of corrective measures to remediate environmental impacts associated with the release(s) of petroleum hydrocarbon-containing products and other chemicals potentially released from SWMUs.

Dozens of pre-treatment units are operated throughout CAFB, and are most heavily utilized in the aircraft hangar and associated maintenance areas. The units consist of OWS, drains, sand traps, USTs, leach wells, and associated appurtenances. The OWS are considered process tanks and are used to separate solids, sludges, and

petroleum products from washwater and storm water associated with indoor and outdoor drains. The settled sludges and separated petroleum hydrocarbon compounds are temporarily stored in the OWS and USTs and are periodically evacuated from the vessels for off-base disposal. The remaining water flows from the OWS to the CAFB sewage lagoons or, in the case of two of the SWMUs, to two leach wells.

In response to the requirements of the RCRA permit (under which the SWMUs are regulated) which require investigation of potential releases, USACE contracted Woodward-Clyde Consultants and LRL Sciences, Inc. to perform RFIs at SWMU locations and various other RCRA regulated areas throughout CAFB.

The RFIs performed for CAFB consisted of characterizing the physical setting and extent of potential hazardous wastes associated with each SWMU. The investigations included surficial and subsurface soil sampling, surface water and pond sediment sampling. These data combined with personnel interviews and historical records review were used to determine if releases occurred at SWMUs and if identified releases presented any potential risk to human health and/or the environment. The Woodward-Clyde RFI (1993) included screening level risk evaluations using risk-based concentrations (RBCs) calculated as action levels as outlined in RCRA Subpart S guidance. Potential exposure pathways were evaluated with respect to chemical sources at each SWMU, physical evidence of a material spill/release, available transport mechanisms (i.e., water), and available human receptor mechanisms (i.e., direct contact, ingestion, inhalation, etc.). The Woodward-Clyde RFI then recommended either no further action or a baseline risk assessment for each SWMU. Baseline risk assessments were recommended when concentrations exceeded RBCs. Feasible potential corrective measures or recommendations for further investigation were provided.

The LRL Sciences RFI (1993) included similar investigations and analyses, and a human health and ecological risk assessment. Both the Woodward-Clyde and LRL Sciences risk evaluations were performed for the scenario of leaving the soils in place.

Types of potential contaminants identified in the RFIs include the following parameters:

- JP-4 fuel
- Petroleum and synthetic lubricants
- Oils
- Ethylene glycol n-monobutyl ether
- PD-680
- Aircraft cleaning compound
- Turco stripping compound
- Mirachem 100 (stripping and degreasing)
- Greases

- Other solvents
- Metals (aluminum, antimony, arsenic, barium, beryllium, cadmium, calcium, chromium, cobalt, copper, iron, lead, manganese, mercury, nickel, selenium, silver, sodium, thallium, zinc)
- Fuels
- Dirt
- Synthetic oil
- Paint chips
- Volatile organic compounds (VOCs)
- Semi-volatile organic compounds (SVOCs)

The RFIs identified material releases at several of the SWMUs with contaminant concentrations exceeding the calculated risk-based action levels. In response to the results outlined in the RFIs, USACE is taking proactive remedial steps to remove several of the Appendix II and III units, consisting of OWS, USTs, drains, sand traps, associated piping, leach wells, and impacted soil.

1.3 SITE LOCATION AND DESCRIPTION

CAFB is located approximately 7 miles west of the City of Clovis, Curry County, New Mexico and is situated on approximately 4,320 acres of land. CAFB is surrounded by irrigated farmlands and grasslands. Drawing 1 presents a location map of CAFB and the location of each unit to be removed and replaced or removed and disposed. The landfarm described in this report is planned for construction near the north end of the decommissioned runway, which is located in the northeastern portion of CAFB.

CAFB is located in a semi-arid climate which is characterized by low annual precipitation (about 16 inches per year) and an average annual temperature of 57.4 degrees Fahrenheit (°F). The soil at CAFB consists of silty sand and clayey sand (LRL Sciences, 1993). Surface run-off in the general area of the base is to the east and southeast while surface run-off flows off the centerline of the decommissioned runway and proposed landfarm area to the southeast and southwest.

The geology and hydrogeology at the site have been characterized in previous reports by Lee Wan and Associates, Inc. (1990), Woodward-Clyde (1993) and LRL Sciences, Inc. (1993). The soils at the site consist of light tan to red dry sandy clays, fine sandy loams, and are typically classified SM to SC according to the Unified Soil Classification System (USCS). These soils range in depth from approximately 2 to 5 feet below ground surface (BGS). The soils are underlain by the tertiary-aged Ogallala sandstone formation which serves as the shallow aquifer. Groundwater is located in excess of 200 feet BGS.

1.4 REMEDIAL APPROACH

Based on information presented in the Woodward-Clyde and LRL Sciences, Inc. RFI reports and on information gathered during ESE site visits, approximately 2,400 cubic yards of impacted soil are estimated to require removal and remediation during the excavation, removal and disposal of the designated units. Table 1 presents the recommended removal action levels and landfarm cleanup levels for soil. The cleanup levels were derived as follows:

- Total recoverable petroleum hydrocarbons (TRPH), benzene, toluene, ethylbenzene, and xylene (BTEX), and benzene according to NMED UST Soil/Water Sampling and Disposal Guidelines (1995)
- VOCs and SVOCs according to the specific VOC and SVOC toxicity characteristic leaching procedure (TCLP) level
- RCRA metals (i.e., arsenic, barium, cadmium, chromium, lead, mercury, selenium, silver) according to each specific metal's TCLP level
- Other metals (i.e., aluminum, antimony, beryllium, calcium, cobalt, copper, iron, manganese, nickel, sodium, thallium, zinc) according to 95 percent upper tolerance limit of background concentrations, given in Table 2-2 of the Woodward Clyde RFI (1993)

The units and associated appurtenances will be properly disposed according to federal, state, and local regulations. The soils impacted above action levels will be removed from unit locations, and the excavations will be backfilled with clean material. The approach to remediating the petroleum hydrocarbon impacted soils includes transport to the landfarm facility followed by landfarming operations and maintenance (O&M) procedures. Replacement OWS will be installed at designated locations and the sanitary sewer lines will be reconnected or grout plugged in other specified locations where no new OWS will be installed.

1.5 WORK PLAN OBJECTIVES

The objective of this CWP is to provide the following information to the construction contractor:

- Background information and site history
- Existing site conditions
- Scope of the contractor's work
- Approaches for the removal, disposal, and, as designated, replacement of each unit
- Approaches for landfarm operations and maintenance
- Sampling and Analysis Plan (SAP)
- Quality Assurance/Quality Control (QA/QC) Plan
- Construction management organization
- Construction contingency procedures
- Construction schedule
- Site-Specific Health and Safety Plan (HASP)

Table 1. Recommended Removal Action Levels and Cleanup Levels for Soil

Matrix	Analyte	Removal Action Level[1]	Cleanup Level[2]	Test Method
Soil	TRPH[3]	≥ 500 mg/kg[4]	100 mg/kg	EPA Method 8015 Modified
Soil	BTEX[5]	≥ 100 mg/kg	50 mg/kg	EPA Method 8020
Soil	Benzene	≥ 30 mg/kg	10 mg/kg	EPA Method 8020
Soil	VOCs[6]	---[7]	< specific VOC TCLP level	EPA Methods 1311, 8240
Soil	SVOCs[8]	≥ specific SVOC TCLP level	< specific SVOC TCLP level	EPA Methods 1311, 8270
Soil	Arsenic	≥ 500 mg/kg	< 5.0 mg/L[9]	XRF[10]; EPA Methods 1311, 6010
Soil	Barium	≥ 10,000 mg/kg	< 100.0 mg/L	XRF; EPA Methods 1311, 6010
Soil	Cadmium	≥ 100 mg/kg	< 1.0 mg/L	XRF; EPA Methods 1311, 6010
Soil	Chromium	≥ 500 mg/kg	< 5.0 mg/L	XRF; EPA Methods 1311, 6010
Soil	Lead	≥ 500 mg/kg	< 5.0 mg/L	XRF; EPA Methods 1311, 6010
Soil	Mercury	≥ 20 mg/kg	< 0.2 mg/L	XRF; EPA Methods 1311, 6010
Soil	Selenium	≥ 100 mg/kg	< 1.0 mg/L	XRF; EPA Methods 1311, 6010
Soil	Silver	≥ 500 mg/kg	< 5.0 mg/L	XRF; EPA Methods 1311, 6010
Soil	Aluminum	---	< 10,540 mg/kg	EPA Method 6010
Soil	Antimony	---	< 6.75 mg/kg	EPA Method 6010
Soil	Beryllium	---	< 0.73 mg/kg	EPA Method 6010
Soil	Calcium	---	< 186,400 mg/kg	EPA Method 6010
Soil	Cobalt	---	< 4.5 mg/kg	EPA Method 6010
Soil	Copper	---	< 5.40 mg.kg	EPA Method 6010
Soil	Iron	---	< 8,720 mg/kg	EPA Method 6010
Soil	Manganese	---	< 164.0 mg/kg	EPA Method 6010
Soil	Nickel	---	< 9.0 mg/kg	EPA Method 6010
Soil	Sodium	---	< 514.0 mg/kg	EPA Method 6010
Soil	Thallium	---	< 0.50 mg/kg	EPA Method 6010
Soil	Zinc	---	< 21.9 mg/kg	EPA Method 6010

[1] for soil associated with underground storage tanks (USTs) and non-UST units
[2] for soil after remediation in landfarm
[3] total recoverable petroleum hydrocarbons
[4] milligrams per kilogram
[5] benzene, toluene, ethylbenzene, and xylene
[6] volatile organic compounds
[7] not an analyte used as a criteria for removal
[8] semi-volatile organic compounds
[9] milligrams per liter
[10] X-ray fluorescence

2.0 EXISTING SITE CONDITIONS

Existing site conditions are based on site visits to CAFB on May 23 through 25, 1995. During the site visit, initial conditions were documented through the collection of photographs and were evaluated by observing the aboveground indications of the OWS, utilities, and the landfarm location. The locations of the units to be removed and utilities were hand-marked on utility maps, and are presented on design plans and details. The contractor shall be responsible for all utility location and field verification of existing conditions prior to commencement of work activities. A brief summary of site-specific information for each unit is provided herein.

SWMU #1, Building #119 - Remove and Replace

- Top of OWS is exposed ≃8 inches above the ground surface and surrounded by steel guard rail and asphalt pavement
- No overhead utility lines above the OWS
- Area around the OWS is covered with asphalt pavement
- Electrical conduit running from large light pole (located south of the OWS) to Building #119

SWMU #7, Building #129 - Remove and Dispose, Reconnect Line

- Total depth of OWS is approximately 9 feet and located in an area covered with asphalt pavement
- Lid of OWS partially covered by asphalt pavement
- No overhead utility lines exist above the OWS
- Underground telephone and high voltage utility lines are located nearby
- High voltage electricity building for airfield lighting is located just to the north of OWS

SWMU #8, Building #165 - Remove and Dispose

- Total depth of OWS approximately 10 feet and located in an area of grass next to lawn sprinkler system on one side and concrete curb on other side
- OWS weighs approximately 40 U.S. tons
- No overhead utility lines above the OWS

SWMU #9, Building #165 - Remove and Replace

- Total depth of drain approximately 5 feet
- Drain located on concrete tarmac wash area; contractor is to sawcut along existing joints only
- No overhead utility lines above the drain
- Remove and replace drain and piping between drain and SWMU #8; investigate and remove impacted soil around drain and piping
- High strength tarmac concrete to be replaced

SWMU #11, Building #170 - Remove and Dispose, Reconnect Line

- Grease trap located at back of building in an area covered by asphalt pavement
- Total depth of approximately 9 feet
- No overhead utility lines above the grease trap
- Subsurface high voltage electrical and sanitary sewer lines are located very nearby
- Concrete pad adjacent to building with heating, ventilation, and air-conditioning (HVAC) unit and multiple antennae are located approximately 1½ feet from the grease trap and will require temporary relocation
- Lid of grease trap partially covered by asphalt pavement

SWMU #32, Building #186 - Remove and Replace

- Unit is an OWS, 6 feet by 6 feet, with an approximate total depth of 6 feet 9 inches, and is located in an area covered by asphalt pavement with tarmac concrete pavement 5 feet away
- High voltage manhole and subsurface electrical lines located approximately 10 feet from OWS lid and along fence
- Aboveground storage tanks located to east of OWS
- Electric line located north of pump island
- Other utilities located in subsurface to south of OWS
- Fuel pump island overhead canopy located approximately 10 feet from OWS
- Contractor may encounter petroleum hydrocarbon impacted soil associated with gas pump USTs (which were previously removed); contractor is to excavate impacted soil per USACE directive only

SWMU #33, Building #186 - Remove and Dispose, Reconnect Line

- Unit is an OWS, 6 feet by 6 feet, with an approximate total depth of 6 feet 9 inches
- OWS located approximately 12 feet from west corner of building and approximately 6 inches above the surrounding asphalt pavement (concrete pavement adjacent to south edge)
- Overhead utility lines located approximately 30 feet above OWS
- Abandoned gas line located directly beneath the OWS and nearby subsurface water, telephone, and sanitary sewer lines

SWMU #38, Building #194 - Remove and Dispose, Reconnect Line

- Unit is an OWS, 7 feet (w) by 9 feet (l) with an approximate total depth of 10 feet 6 inches in an area covered by asphalt pavement, although tarmac concrete 9 feet south
- Protected by bumper pole located approximately 4 feet from east corner of building
- General area used for drum storage, temporarily relocate these

- Overhead hot water line located approximately 15 feet above ground surface between the north ends of Buildings #194 and #195 appears to be over the only entrance for construction equipment to the OWS removal area
- Subsurface electrical line located directly beneath the OWS

SWMU #39, Building #195 - Remove and Dispose, Reconnect Line

- Unit is an OWS, 7 feet (w) by 9 feet (l), with an approximate total depth of 7 feet, and is located in an area covered by asphalt pavement, although tarmac concrete located 9 feet to south
- No overhead utility lines located above the OWS
- Nearby subsurface storm sewer, water and gas lines

SWMU #46, Building #196 - Remove and Dispose, Reconnect Line

- Unit is an OWS with an approximate total depth of 7.5 feet and is located in an area covered by asphalt pavement, although tarmac concrete located 9 feet to south
- No overhead utility lines above the OWS
- Tall light pole with circular concrete foundation located approximately 10 inches from north edge of OWS
- Light pole subsurface electrical line appears to be located 10 inches away from OWS, but this location is not confirmed
- Subsurface gas and water lines are located nearby

SWMU #47, Building #494 - Remove and Replace OWS and Remove and Dispose Sand Trap, Re-route Line

- Unit consists of an OWS and a sand trap
- No overhead utility lines located above either the OWS or sand trap
- Sand trap is 4 feet (w) by 5 feet (l) with an approximate total depth of 5 feet, located in an area covered by grass
- OWS is 3 feet by 3 feet with an approximate total depth of 3 feet, located in an area covered by asphalt pavement
- Multiple subsurface utility lines located very near the OWS
- Utility transformer box, trees and shrubs, and multiple subsurface utility lines located very near sand trap
- OWS designated for replacement and sand trap designated for disposal; sand trap influent line shall be re-routed through the replaced OWS

SWMU #51, Building #375 - Remove and Replace

- Unit is an OWS divided into two portions; one part is a vault built into the building foundation wall (inside the building) with an approximate total depth of 7 feet 4 inches, and another part is a unit 1 foot outside of the building with an approximate total depth of 5.5 feet, located in an area covered by asphalt pavement
- No overhead utility lines located above the OWS
- Multiple subsurface utility lines located very nearby
- Outside part of OWS nearby exit door of building; contractor shall verify that door of facility is locked during construction activities for safety reasons

SWMU #57, Building #379 - Remove and Replace

- Unit is an OWS or sand trap, 5 feet (w) by 6.5 feet (l), with an approximate total depth of 6 feet, and is located in an area covered by asphalt pavement
- No overhead utility lines located above the OWS
- OWS is very close to building and concrete access ramp to building, protected by bumper protection poles

SWMUs #61, #62, and #63, Pad 5077 - Remove and Dispose

- OWS are actually sand traps located beneath a concrete apron and beneath an area covered by grass
- OWS #61 and #62 are 3.5 feet (w) by 7 feet (l) with an approximate total depth of 4 feet, and OWS #63 is 5 feet (w) by 10 feet (l) with an approximate total depth of 4 feet 6 inches
- Overhead electrical line approximately 30 feet away from OWS area
- Subsurface water line appears to be beneath SWMU #62 and OWS nearby gas and sanitary sewer lines
- CAFB waived replacement and patching of concrete pad around SWMUs #61 and #62

SWMU #70, Building #326 - Remove and Dispose

- Unit consists of an OWS, UST, leach well, and piping located in an area covered by grass and dirt
- OWS is 18 inches (w) by 24 inches (l) and has an approximate total depth of 6 feet
- UST is 30 inches in diameter, 6 feet long, and has an approximate total depth of 9.5 feet
- No overhead utility lines located above the OWS and associated appurtenances
- OWS, UST, leach well, associated piping, 3 gas vents on wall of building, and impacted soil shall be removed
- CAFB may decide at a later date to remove bioventing unit

SWMU #92, Former Building #5120 - Remove and Dispose

- Unit consists of an OWS, UST, leach well, and associated piping
- OWS has a total depth of approximately 5 feet 9 inches and is located in an area covered by grass
- Depth and size of UST are unknown
- No overhead utility lines located above the OWS and associated appurtenances
- Multiple subsurface utility lines nearby
- OWS, UST, leach well, associated piping and impacted soil shall be removed

SWMU #94, Pad #5144 - Remove, Dispose, and Reconnect Line at OWS and Remove and Dispose Sand Traps

- Unit consists of an OWS to be removed, disposed, and the line reconnected, and two sand traps, and associated piping to be removed and disposed
- Sand traps are 3.5 feet (w) by 7 feet 3 inches (l) and have an approximate total depth of 4 feet (both are on concrete pad wash areas, and one is covered by a metal maintenance building)
- OWS is 6 feet (w) by 11 feet (l) with an approximate total depth of 5.5 feet and is located in a grassy area
- Multiple subsurface utility lines nearby
- Nearby locked storage unit will have to be removed prior to construction
- West wall of metal maintenance building could be removed to allow access for work
- Sand trap within metal building appears to be filled with concrete

3.0 SCOPE OF CONSTRUCTION CONTRACTOR'S WORK

The construction contractor shall be responsible for completion of all activities outlined in this CWP. The contractor shall observe and comply with methodologies and specifications described within this plan, although the contractor shall utilize experience, technical knowledge, and professional judgement in performance of these activities.

3.1 DOCUMENT REVIEW

The contractor shall review the CWP, construction specifications and drawings. The contractor shall meet with USACE at a preconstruction conference at CAFB and discuss the CWP, specifications, drawings, and information submitted by the contractor to USACE. Review of the referenced RFI reports will be beneficial to an understanding of the site history; however, a synopsis of the RFIs is presented in Section 1.0. The contractor shall review the HASP, presented in Appendix A, and select a Site Safety and Health Officer (SSHO) for the project. The contractor shall verify that USACE has filed a Notice of Intent with the NMED Groundwater Division in order to construct and operate a landfarm. The contractor shall consult with USACE to determine which piping systems will be reconnected and which will be grout plugged. The contractor shall also review all documents and regulations referenced herein, including but not limited to the following:

- NMED Underground Storage Tank Regulations and UST Soil/Water Sampling and Disposal Guidelines, revised April 1995 (Appendix B)
- Removal and Disposal of Used Underground Petroleum Storage Tanks, American Petroleum Institute (API) Recommended Practice 1604, Second Edition, December 1987 and Supplement, dated March 6, 1989 (Appendix C)
- Removal of Underground Storage Tanks (USTs), USACE, EM 1110-3-178, August 31, 1993 (Appendix D)
- Chemical Data Quality Management (CDQM) for Petroleum Storage Tank Remediation Projects, USACE, December 1990 (Appendix E)
- CDQM for Hazardous Waste Remedial Activities, USACE, October 1, 1990 (Appendix F)

3.2 REMOVAL UNITS AND UTILITIES RECONNAISSANCE

Prior to commencing field construction and removal operations, the contractor shall be responsible for reviewing and understanding USACE-provided design plans, details, and marked-up utility location maps. These plans and drawings shall be used by the contractor to aid in preparation of the bid and mobilization and demobilization approaches. The contractor shall be responsible for field verification and marking of utility lines and for field confirmation of existing site conditions at removal units and the landfarm. Any unexpected conditions encountered, such as unmapped utility lines, man-made subsurface structures or wastes, shall be reported immediately to USACE. Work shall be suspended until a decision has been made by USACE and the contractor

ensuring a suitable and safe course of action has been established. Work will not commence prior to locking out and tagging out of active utilities as per the site-specific HASP. The contractor shall not enter any buildings or cross the "red line" at any time or place without the direct approval of USACE.

3.3 CONSTRUCTION EQUIPMENT AND SCHEDULE SUBMITTAL

The contractor shall prepare and submit a list of construction equipment and a firm schedule to perform the construction to USACE. The contractor shall provide for safe conduct of the work, including the provision of necessary supports, lateral bracing and shoring when required, careful removal and disposition of materials specified for salvage, protection of property which is to remain undisturbed, coordination with other work in progress, and timely reconnection of utility services. The contractor shall provide all electricity, water, telephone, sanitary facilities, onsite trailer, and any other utilities or facilities necessary for completion of the work. USACE will provide a hookup for trailers. The contractor shall provide a detailed description of the selected equipment to be used for each removal operation, location of work areas, the sequence of operations, illustration of haul roads, demolition procedures, and the safety precautions to be implemented to protect personnel and property. The equipment list, work schedule, required submittals, dates of interpreted utility services, and other information shall be submitted to USACE four weeks prior to commencement of work.

3.4 SUBSURFACE EXPLORATION PLAN

The RFI reports provide limited subsurface contaminant characterizations for each unit location. The subsurface has not been fully characterized, and assumptions have been made based on data contained in the RFIs regarding the amounts of impacted soil requiring removal and treatment. During actual unit removal and excavation operations, the contractor may encounter contamination beyond the vertical and lateral extent as approximately delineated by the RFI reports. If removal operations result in excavating near buildings, roads, or other structures, the contractor shall discuss their approach in protecting such structures and obtain USACE approval prior to proceeding with excavation activities next to the structures.

If contractor reaches the maximum vertical excavation depths of standard excavation equipment and impacted soils above the selected action levels remain, the contractor shall discuss options with USACE. The contractor shall use methods described in EM 1110-3-178, Chapter 5, provided in Appendix D; CDQM for Petroleum Storage Tank Remediation Projects (USACE, 1990), provided in Appendix E; and Monitor Well Design, Installation and Documentation at Hazardous and/or Toxic Waste Sites, EM 1110-1-4000 (USACE, August 31, 1994), as appropriate. The contractor shall be prepared, upon request by USACE, to drill soil borings and sample and test soil to further characterize and delineate impacted soils. The contractor shall not utilize trenching or test pits for this purpose due to the highly intrusive nature of these methods unless authorized in writing by USACE. A minimum of four borings shall be drilled around the excavation to delineate the vertical extent of contamination above action levels. Borings drilled to locate the vertical extent of contamination shall

be located at least a distance equal to the drill rig's width away from the excavation for the safety of drilling and sampling personnel with the provision that excavation slopes are sloped in accordance with Occupational Safety and Health Administration (OSHA) § 1926.650 Subpart P-Excavations. Appendix G provides a copy of the excavation standard.

Borings shall be drilled with hollow-stem or solid-stem augers. Augers and drill rods shall be steam cleaned between holes. Soil samples shall be obtained with a 2-inch inner diameter (ID) California sampler or with a 2-inch outer diameter (OD) split-spoon sampler advanced by driving with a 140-pound hammer falling 30 inches. Penetration resistance of the samplers shall be recorded in blows per inch. Soil shall be sampled at 5-foot intervals or at intervals requested by USACE. Soil samples shall be collected and field screened, and QA/QC procedures shall be employed as provided in the SAP and QA/QC Plan portions of this CWP. Borings shall be advanced to 15 feet below the depth where the soil headspace measurement equals 0 parts per million (ppm). Soil samples shall be submitted to the approved analytical laboratory as described in the SAP.

If the lateral extent of the contamination appears to extend more than 5 feet horizontally from any portion of the unit to be removed (e.g., 5 feet laterally from a leach well, UST, piping, etc.), USACE shall be notified by the contractor. Borings to delineate the lateral extent of the contamination shall then be drilled, with the approval of USACE. Borings shall be located at least a distance equal to the drill rig's width away from the excavation with the provision that excavation slopes are sloped in accordance with OSHA § 1926.650 Subpart P-Excavations. Drilling and sampling activities shall be performed as described above for borings drilled to delineate the vertical extent of contamination.

Borings shall be drilled and sampled prior to excavation and removal of the OWS at SWMU #51. Four borings shall be drilled at equally spaced locations in a circular arc around the outside portion of the OWS. The two borings at the ends of the arc shall be as close as possible to the wall of Building 375. Drilling and sampling activities shall be performed as described above. Excavation and removal of the outside portion of the OWS shall not be performed until soil sample test results are evaluated by USACE. USACE will make the decision on whether to proceed with the excavation and removal or to perform additional soil sampling.

3.5 LANDFARM CONSTRUCTION

The landfarm design was prepared with construction operations evaluated to minimize the disruption to routine facility operations and mitigate the potential for structural damage to the decommissioned runway and to a nearby 16-inch sewer line. Materials identified in this design for use in construction of this landfarm were evaluated for cost effectiveness, availability, containment characteristics, and durability. This landfarm is designed to operate as a temporary structure, at the request of USACE.

Impacted soils shall be placed and contained within lined and bermed cells on the decommissioned runway located south of the intersection of the runway with Munitions Road. The landfarm shall be built south of a 16-inch sewer line located south of the Munitions Road crossing. The approximate location of the proposed landfarm is shown in Drawing 1. The landfarm plan and details are provided in Drawings 2 and 3. Key design elements of the cell include the following:

- The landfarm facility shall consist of two adjacent cells with overall dimensions of 80 feet wide and 610 feet in length. The perimeter shall be constructed using pre-cast concrete highway barriers, according to Drawings 2 and 3 and according to Specifications 00004 and 03100. The precast barriers shall be 32 and 60 inches high, for Cells 1 and 2, respectively. A 60-inch-high barrier shall separate the facility into two cells; Cell 1 shall be 270 feet long and Cell 2 shall be 340 feet long.

- Cell 1 shall be used to landfarm soils associated with UST removal operations. State of New Mexico UST Regulations require that UST-related soils be treated by spreading in a single lift of 6 inches or less. This lift thickness allows for a maximum capacity of 400 cubic yards of impacted soil. Cell 1 may also be used for remediating other heavily contaminated soils.

- Cell 2 shall be used to landfarm soils associated with OWS, sand trap, leach well, drain and associated piping removal operations. Lift thickness shall be a maximum of 24 inches, and the cell shall have a maximum capacity of 2,015 cubic yards of soil.

- A storage cell to provide for storage of soil prior to remediation shall be constructed adjacent to the landfarm cells. Soil stored for landfarming can be placed to a thickness of at least 8 feet. A flexible membrane liner (FML) cover shall be placed over the soil and shall be anchored by sandbags at the edges sufficient in number to resist wind uplift. A compacted soil ramp will provide access between the storage cell and the landfarm cells.

- Cells 1 and 2 have a combined soil capacity of 2,415 cubic yards, utilizing 6-inch and 24-inch soil lifts, respectively. The amount of precipitation associated with the 25-year, 24-hour storm event is estimated to be about 4.7 inches, based on meteorological data. If the design storm occurred during the anticipated operating conditions, 10.8 and 20.8 inches of freeboard would exist for Cells 1 and 2, respectively. This value of freeboard is conservative since infiltration into the soil during the design storm was not assumed for this calculation of freeboard.

- The existing concrete runway shall be stripped of any deleterious materials that could potentially puncture or tear the FML system (see below). Some minor clearing of brush and small tree removal

will be required around the runway prior to construction. Operations shall be performed in accordance with construction Specification 02110.

- A tack coat and then 2 inches of asphalt shall be placed on the decommissioned runway over the entire area of the proposed landfarm facility and shall extend to a 5-foot distance outside of all structures to be constructed, including the decontamination pads. The tack coat and asphalt shall be placed according to Drawing 2 and Specifications 02558 and 02551, respectively. Following hardening of this asphalt layer, the contractor shall commence landfarm wall construction and then liner deployment.

- By State of New Mexico UST Regulations, CAFB landfarming facilities are not required to have an impervious liner because groundwater is greater than 100 feet in depth. However, to ensure that no discharges occur (due to cracks in the asphalt pavement, precipitation events, etc.) and to prepare for unforeseen changes in New Mexico regulations, a liner has been incorporated into the design for both the landfarm cells and storage cells. The liner shall consist of a 30- to 35-mil reinforced FML. The liner shall be provided and installed in accordance with Drawings 2 and 3 and Specification 00001. This liner shall be anchored by a batten bar on the inside top of the barrier.

- Following deployment of the reinforced flexible membrane liner, a 10-ounce, needle-punched, non-woven geotextile shall be deployed on top of the liner. This geotextile shall cushion the liner and provide protection for the liner from the overlying layer. The geotextile shall be anchored with the FML by the batten bar. An 8-inch-thick geoweb structural support material shall then be deployed on top of the geotextile. The geoweb shall be filled with crushed limestone or equivalent aggregate and shall provide the working base for the landfarming and storage cell activities. The geoweb and aggregate infill shall consist of a thickness of about 10 inches total. The geotextile, geoweb, and aggregate infill shall be supplied and deployed according to Drawings 2 and 3 and Specifications 00002 and 00003, respectively.

- Cells 1 and 2 shall be equipped with compacted soil access ramps for transporting soil into the cells and as access points for equipment ingress and egress, as shown in Drawing 2. Compacted soil access ramps shall be constructed according to Drawing 2 and Specification 02225. Decontamination pads and hoses shall be installed as shown on Drawing 2. The decontamination pads shall also be lined with the 30- to 35-mil reinforced flexible liner, 10-ounce geotextile, and 10 inches of geoweb and aggregate infill for structural support to prevent run-off of decontamination water. The inner dimensions of the decontamination pad shall be selected by the contractor to accommodate the

contractor's longest piece of anticipated construction and transportation equipment. Decontamination water shall be allowed to evaporate from within the decontamination area.

- A single diversion ditch shall be required on the west side of the runway to direct surface water run-off around the landfarm cells in accordance with Drawing 2. Drainage on the runway generally flows off the runway centerline to the southeast and southwest. However, regional drainage is to the southeast. To direct run-off away from the cells, a shallow drainage ditch (approximately 1 foot) shall be constructed along the western edge of the runway from 50 feet north of the northern extent of the storage cell to the south end of the Cell 1 decontamination pad. The drainage ditch can be installed using the angled blade of a road grader or dozer.

- An automatic sprinkler system shall be supplied and installed on top of the concrete barriers as shown on Drawings 2 and 3 and according to Specification 02811. Polyvinyl chloride (PVC) piping shall be installed along the top perimeter of the barricades to each of the sprinklers.

- Water for landfarming operations shall be required. A 3-inch water line is located near the south end of the proposed landfarm. Feeder pipe shall connect the landfarm sprinkler network and the decontamination hose stations to the 3-inch main. The feeder pipe shall be installed along the west side of the runway in a trench approximately 2 feet in depth. The pipe shall connect to the sprinkler piping at the southwest corner of Cell 1.

3.6 APPROACH FOR REMOVAL OF DESIGNATED UNITS AND CONTAMINATED SOIL

Unit removal procedures shall be performed according to the CWP, specifications and drawings. The work shall be accomplished to allow for the removal of each unit and replacement and/or sewer service reconnection within three days. Locations which have been designated for OWS replacement can exceed this three-day limit. The procedures for removal of OWS and USTs shall meet the requirements of the NMED UST Regulations; API Publication 1604, Removal and Disposal of Used Underground Petroleum Storage Tanks; and USACE Removal of Underground Storage Tanks (USTs) EM 1110-3-178, provided in Appendices B, C, and D, respectively. Existing utilities shall be protected during the work. The contractor shall verify the locations of utilities prior to the work and coordinate the work with the utility companies affected. The contractor shall not commence work next to adjacent utilities until energized and pressurized utilities are locked and tagged out.

3.6.1 GENERAL APPROACH FOR REMOVAL OF OWS, SAND TRAPS, DRAINS, USTS, PIPING AND CONTAMINATED SOIL

The following general approaches shall be used by the contractor for the removal of OWS, sand traps, drains, USTs, piping and associated contaminated soil, with the exception of the units listed separately.

Review of HASP and other regulatory requirements:

The contractor shall review the HASP, provided in Appendix A, immediately prior to the removal operations. All other requirements of the HASP prior to and during the work shall be performed by the contractor.

The contractor shall comply with NMED Underground Storage Tank Regulations presented in Appendix B. According to the regulations, discovered releases from a UST and actions taken to mitigate immediate damage from the spill must be reported to the NMED UST Division by telephone within 24 hours of discovery. The contractor shall notify USACE immediately upon discovery of a release, and USACE will contact the NMED UST Division within the time limit specified. USACE will be responsible for orally reporting remedial action to NMED within 72 hours of discovery. This oral summary will be followed by a written report to be submitted within 7 days of discovery.

The contractor shall review OSHA 1926.650 Subpart P-Excavations and perform work according to the requirements of the standard, which is presented in Appendix G.

The contractor shall review and comply with the API Removal and Disposal of Used Underground Petroleum Storage Tanks, Second Edition, December 1987 and Supplement, dated March 6, 1989, pages 1 through 9, presented in Appendix C. These standard procedures shall be used to remove not only USTs, but also OWS, sand traps, leach wells, piping and associated appurtenances, where the procedures are appropriate.

The contractor shall review and comply with the USACE Removal of Underground Storage Tanks (USTs), EM 1110-3-178, August 31, 1993, presented in Appendix D. If any of the procedures in EM 1110-3-178 or any other guidance document conflict with the procedures provided by the NMED UST regulations, the procedures in the NMED UST regulations shall be used. These standard procedures shall be used to remove not only USTs, but also OWS, sand traps, leach wells, piping and associated appurtenances, where the procedures are appropriate.

The contractor shall notify the local and/or CAFB fire departments to allow them to be present during the unit excavation according to the requirements of EM 1110-3-178 and API guidelines. The contractor shall obtain a tank removal permit from the local and/or CAFB fire departments prior to removal activities.

Check for flammability and combustibility:

The contractor shall eliminate all potential sources of ignition from the area, prevent the discharge of static electricity during venting of flammable vapors and prevent the accumulation of vapors at ground level. A combustible gas indicator (CGI) shall be used to check for hazardous vapor concentrations. Explosion proof electrical equipment shall be used in the area by the contractor. The contractor shall follow the API procedures

for Removal and Disposal of Used Underground Petroleum Storage Tanks, pages 2 and 7. The contractor shall follow procedures for CGI monitoring presented in EM 1110-3-178, Chapter 10.

Pump out fluids from the unit:
The contractor shall drain piping into the unit, being careful to avoid any spillage. The residues and liquids shall be pumped from the unit using explosion-proof or air-driven pumps. The vacuum truck operation area shall be vapor-free, upwind from the tank and outside of the path of probable vapor travel. All liquids and residues removed from the unit should be handled in accordance with the product and sludge removal procedures in EM 1110-3-178, Chapters 12 and 14, respectively. The contractor shall follow the API procedures for Removal and Disposal of Used Underground Petroleum Storage Tanks, pages 3 through 5.

Purge the unit:
The contractor shall use a CGI to assess vapor concentrations in the unit and around the work area. The contractor shall vent all vapors from the unit at a minimum height of 12 feet above grade and 3 feet above any adjacent roof lines until the unit is purged of flammable vapors. The work area shall be free from sources of ignition. Flammable and combustible vapors may be purged with an inert gas such as carbon dioxide or nitrogen or with dry ice. The contractor shall follow the API procedures for Removal and Disposal of Used Underground Petroleum Storage Tanks, pages 5 through 7.

Remove asphalt or concrete pavement:
The contractor shall employ a method of removing asphalt or concrete pavement above or around the unit which produces the least damage to surrounding pavement and results in the least disturbance to nearby base personnel. Jackhammering out or sawcutting asphalt and concrete pavements is recommended, based on general conditions. The contractor shall comply with removal requirements presented in Specifications 02050 and 02575.

Decontaminate and dispose of pavement:
The contractor shall decontaminate the concrete or asphalt pavement by brushing off or otherwise cleaning off any attached soil. The broken pavement shall be loaded into haul trucks and disposed of in a licensed municipal landfill which receives such construction waste materials. The contractor shall be responsible for any documentation necessary to dispose of the pavement.

Excavate soil surrounding the designated unit:
The contractor shall use a combination of procedures to excavate soil surrounding the unit to allow the removal of the unit. A backhoe and hand tools are recommended to excavate soil surrounding the unit. The edge of any excavation shall not be closer than 10 feet from a structure foundation without the use of shoring. Drawing 4 and Specification 02150 shall be followed by the contractor. General procedures presented in EM 1110-3-178,

Chapter 15 shall be followed by the contractor. Compacted soil berms shall be constructed by the contractor around all excavations to divert site run-on and potential contamination. Compacted soil berms shall be constructed according to Specification 02225.

Field screening of soil around unit:
The contractor shall use visual observation of soil staining and observation of petroleum hydrocarbon odors at all times to help identify the presence of petroleum hydrocarbon contamination. The contractor shall use field screening methods according to NMED UST Soil/Water Sampling and Disposal Guidelines, page 4, presented in Appendix B, and as described in the SAP. Soil with headspace levels corresponding to an analytical laboratory concentration of 500 ppm or above shall be excavated and transported to the landfarm.

Loading soil:
The contractor shall load soil with concentrations above the action level, as defined in Section 3.12, into end-dump haul trucks. The contractor shall weigh the loaded end-dump haul trucks enroute to the landfarm for payment purposes. The soil shall be stockpiled nearby the unit removal location prior to getting soil sample test results, if necessary. The stockpile area shall be lined with and covered by an FML meeting the product requirements of Specification 00001. The FML shall be anchored with sufficient sand bags to resist wind uplift. The lined area shall have a surrounding compacted soil berm to divert site run-on and to restrict the run-off of any precipitation. Compacted soil berms shall be constructed according to Specification 02225.

Stockpiling of clean soil:
The contractor shall stockpile, in another area, soil with concentrations below action levels for backfill use elsewhere on CAFB. The stockpile shall be constructed on the surrounding pavement with a sand bag-anchored FML cover to avoid the production of muddy run-off from the stockpile until the soil can be loaded into haul trucks for transportation elsewhere.

Disconnect piping from unit:
The contractor shall disconnect the piping from the unit by using a blind cut, by disconnecting the companion flange, if present, or by other means based on the type of pipe encountered, which connects to the unit to be removed.

Remove unit from the ground and disposal of unit:
The contractor shall lift the unit out of the ground. The contractor shall use a chain with a spreader bar through the unit pipe holes, or excavate below the unit and place a chain around the middle, or use another safe practical method to remove the unit. The unit can then be lifted onto a haul truck with a crane, front-end loader, or other appropriate piece of heavy equipment. The piping shall also be lifted out of the ground using a similar method.

The contractor shall remove soil from the exterior of the unit to eliminate the possibility of deposition of soil on roadways during transportation and to simplify tank cutting and labelling. Soil shall be removed with non-sparking tools. Soil adhering to the unit shall be removed from the unit exterior on a paved area, if the soil is not impacted above action levels, and on an FML-lined surface, if the soil is impacted above action levels. The interior of the units shall be cleaned prior to transport and disposal. The contractor shall label and then transport the unit to an approved disposal facility according to federal, state, and local regulations. The contractor shall follow the API procedures for Removal and Disposal of Used Underground Petroleum Storage Tanks, pages 7 through 8. The contractor shall follow procedures for removal and disposal provided in EM 1110-3-178, Chapter 13. The contractor shall comply with Specification 02050. The contractor shall submit a Tank Closure Report to USACE within 14 days of the completion of the site restoration at each unit removal location. The Tank Closure Report shall comply with the requirements of EM 1110-3-178, Chapter 1.

Excavate remaining contaminated soil:
The contractor shall excavate soil contaminated above action levels and load the contaminated soil into end-dump haul trucks for transportation to the landfarm. The contractor shall secure open excavations and stockpile areas during the work. The contractor shall construct a compacted soil berm around the excavation if precipitation may occur during removal and/or replacement activities in order to divert site run-on.

Collection of confirmatory soil samples:
The contractor shall collect soil samples to verify that the soil remaining in the excavation is below removal action levels. Removal action levels are provided in Table 1. The samples shall be collected as described in Section 4.2 of the SAP. The contractor shall not backfill the excavation without approval from USACE.

Significant lateral or vertical extent of contamination:
The contractor shall confer with USACE and follow the Subsurface Exploration Plan, provided herein, if the lateral or vertical extent of contamination is significant.

Collection of surface water samples:
The contractor shall collect surface water samples, if precipitation occurs which produces run-off from contaminated stockpiled soil or from the excavation. Water samples shall be collected as described in Section 4.3 of the SAP.

3.6.2 APPROACH TO SWMUs #32, #46, #47, #51, #70, AND #94

The general approaches given above shall be used by the contractor with the substitution of the following approaches for specific unit removal locations.

SWMU #32

The contractor shall excavate impacted soil associated with gas pump USTs according to USACE directive only.

SWMU #46

The contractor shall protect the excavation walls by providing shoring during excavation and backfill because of the close proximity of a large light pole foundation. The contractor shall comply with excavation protection requirements according to Drawing 4 and Specification 02150.

SWMU #47

The contractor shall remove and dispose of the sand trap. The contractor shall re-route the sand trap influent line around the building to the replacement OWS.

SWMU #51

The contractor shall pump out any liquids and remove any residues from both portions of the OWS and follow the other general approaches described above. The contractor shall then remove the portion of the OWS and piping which lies outside of Building 375.

The portion of the OWS which is inside of the building consists of a vault and piping which extend through the building foundation wall. The inside portion of the OWS shall be thoroughly cleaned. A sump pump with surrounding housing shall be placed in the vault according to Specification 00005. The sump pump shall be connected to the original piping which enters the vault from the bottom from the floor drains of Building 375, in accordance with the detail on Drawing 4. Piping from the sump pump shall be routed up within the vault and then out through the foundation wall to the grade of the replacement OWS. The OWS effluent will flow by gravity to the sanitary sewer. A form shall be constructed and concrete shall be placed on one side of the vault to take up space along the length of the vault which could otherwise be a potential receptacle for liquid. The rest of the vault shall be kept open to allow for servicing of the sump pump.

If soil impacted above the removal action level appears to be located underneath Building 375 during the removal of the outside portion of the OWS, the contractor shall implement procedures according to the Subsurface Exploration Plan, provided herein, with USACE approval, to further delineate the vertical and horizontal extent of contamination. If soil impacted above the removal action level is present beneath the building, based on the additional subsurface investigation, USACE will select an *in situ* remediation system for the cleanup of impacted soil. Based on the soil types and other factors encountered during the additional subsurface exploration, remediation systems such as soil vapor extraction or bioventing may be appropriate.

SWMU #70

The contractor shall remove and dispose of the OWS/UST vent pipes from the location of the OWS and UST to the end of the pipes along the side of Building 326. The contractor shall confer with USACE on the potential removal of the bioventing unit during the other removal activities.

SWMU #94

The contractor shall remove the west wall of the metal maintenance building around one of the sand traps to perform removal activities at this unit. The contractor shall reassemble the wall of the metal building in accordance with Specification 13120.

3.6.3 GENERAL APPROACH FOR REMOVAL OF LEACH WELLS, PIPING, AND CONTAMINATED SOIL

The following general approaches shall be used by the contractor for the removal of leach wells, piping and contaminated soil for SWMUs #70 and #92.

The following approaches shall be as described above for the removal of OWS, sand traps, drains, USTs, piping and contaminated soils. The contractor shall comply with the requirements of the same Drawings and Specifications referenced above.

- Review of HASP and other regulatory requirements
- Check for flammability and combustibility
- Pump out fluids from the leach well

Purge the leach well:

The contractor shall allow the well to aerate or purge the gases within the well, if appropriate, given the results of well vapor monitoring.

The following approaches shall be as described above for the removal of OWS, sand traps, drains, USTs, piping and contaminated soil:

- Remove asphalt and concrete pavement
- Decontaminate and dispose of pavement
- Excavate the leach well and surrounding impacted soil
- Field screening of soil around leach well
- Loading soil
- Stockpiling of clean soil
- Remove piping
- Excavate remaining contaminated soil

- Collection of confirmatory soil samples
- Significant lateral or vertical extent of contamination
- Collection of surface water samples

3.7 GENERAL APPROACH FOR RECONNECTION OF SANITARY SEWER LINE

The contractor shall reconnect the sanitary sewer lines at the following locations unless otherwise directed by USACE: SWMUs #7, #11, #33, #38, #39, #46, #47, and #94. The following general approaches shall be followed by the contractor to reconnect sanitary sewer lines.

Backfill excavation:

The contractor shall backfill the excavation to the grade of the pipe bedding layer. Backfill shall be performed according to Specification 02225. The contractor shall use excavated soil, which is suitable for use as backfill according to specification requirements, which is not impacted above action levels for backfilling excavations, except where specific backfill is specified.

Excavate soil laterally:

The contractor shall excavate soil in the lateral direction to enable removal of the pipe to an appropriate location for reconnection.

Prepare bedding material:

The contractor shall prepare the subgrade of the pipe bedding material according to Specification 02225. The contractor shall then place and compact the bedding material according to the locations and depths shown in Drawing 4 and according to Specification 02222.

Install and connect pipe:

The contractor shall install the double-lined pipe and connect to the existing pipe on each side according to Drawing 5 and Specification 02730. Backfill shall then be placed around the pipe to the subgrade of the site restoration layer. The contractor shall use clean excavated soil, which is suitable for use as backfill according to specification requirements, which is not impacted above action levels for backfilling excavations, except where specific backfill is specified.

3.8 GENERAL APPROACH FOR GROUTING SANITARY SEWER LINE LEADING TO A REMOVED UNIT

The contractor shall grout plug the following sanitary sewer lines and influent drains at the following locations unless otherwise directed by USACE: SWMUs #8, #61, #62, #63, #70, and #92. The sanitary sewer line leading to the unit to be removed at SWMU #8 shall not be reconnected or plugged with grout. The contractor

shall place a removable cap on the end of the sanitary sewer line at the location of the removed unit at SWMU #8. A cover shall be placed over the influent drain at the replaced drain at SWMU #9.

The sanitary sewer line leading to the removed unit shall have a plug of grout placed at the drain or other point of entry into the line and at the end of the pipe immediately before the location of the removed unit. The following general approaches shall be followed by the contractor to grout the sanitary sewer line leading to a removed unit.

Backfill excavation:
The contractor shall backfill the excavation to the grade of the pipe according to Specification 02225. The contractor shall use clean excavated soil, which is suitable for use as backfill according to specification requirements, which is not impacted above action levels for backfilling excavations, except where specific backfill is specified.

Grouting:
The contractor shall place a 2-foot-long plug of grout in the pipe leading to the removed unit according to Specification 03602. The contractor shall place a 2-foot-long plug of grout in the pipe at the entry point or drain into the sanitary sewer line and grout flush with the surface of the drain or point of entry.

Backfill to subgrade:
The contractor shall backfill around the pipe to the subgrade of the site restoration layer. The contractor shall use clean excavated soil, which is suitable for use as backfill according to specification requirements, which is not impacted above action levels for backfilling excavations, except where specific backfill is specified.

3.9 GENERAL APPROACH FOR INSTALLATION OF REPLACEMENT OWS OR DRAIN

If a replacement OWS or drain is planned for a given location, the following general approaches shall be followed by the contractor to install a replacement OWS or drain. The contractor shall be certified by the NMED as a UST installer in order to install the replacement OWS described herein. The contractor shall provide as-built plans and details of all replacement OWS, drains and piping. The contractor shall survey the replacement OWS and drains relative to USACE-approved benchmarks.

Check pipe grade:
The contractor shall check the pipe grade with respect to the replacement OWS requirements in order to place the effluent piping at the proper grade to maintain gravity flow through the OWS required for proper OWS operation. The effluent piping shall have a minimum slope of ¼ inch per foot. The contractor shall make necessary adjustments of the OWS or of the influent or effluent piping to attain the correct grade for the proper

operation of the OWS. The contractor shall confer with the OWS manufacturer and USACE to ensure that the OWS is installed properly. The contractor shall comply with Specification 00006.

Backfill and preparation of bedding layer:
The contractor shall place and compact the backfill and the bedding layer to the OWS or drain installation grade. Backfill shall be placed and compacted and the bedding layer shall be placed and compacted for the OWS and drain according to Drawing 4, and according to Specifications 00006 and 00004, respectively. The contractor shall use clean excavated soil, which is suitable for use as backfill according to specification requirements, which is not impacted above action levels for backfilling excavations, except where specific backfill is specified.

OWS or drain installation:
The contractor shall install the OWS or drain on the compacted bedding layer according to Drawing 4 and Specifications 00006 and 00004, respectively.

Backfill around OWS or drain:
The contractor shall backfill the excavation around OWS or drain to the grade of the pipe bedding layer according to the drawings and specifications referenced above.

Pipe excavation:
The contractor shall excavate the soil laterally along the pipe in each direction to enable removal of the pipe to an appropriate location for reconnection. The contractor shall remove the pipe to the best place for pipe reconnection.

Preparation of pipe bedding layer:
The contractor shall prepare the subgrade of the pipe bedding material and then place and compact the pipe bedding material according to Drawing 4 and Specification 02222.

Pipe installation:
The contractor shall install the double-lined pipe to the OWS or drain and connect it to the existing pipe on each side to the existing sanitary sewer line according to Drawing 4 and Specification 02730.

OWS or drain startup:
The contractor shall perform startup of the OWS or drain system according to OWS manufacturer recommendations. The contractor shall trouble-shoot any problems and ensure that the OWS or drain is functioning properly to meet regular operating conditions as intended by USACE. The contractor shall confer

with USACE and the OWS or drain manufacturer if any problems with OWS or drain operation cannot be solved by the contractor.

The following approaches shall then be followed by the contractor for the OWS installation only:

OWS access:
The contractor shall place a corrugated galvanized steel pipe vertically around the OWS manhole between the OWS and the grade of the concrete pad to be placed above the OWS at the pavement grade. The contractor shall follow the requirements of Specification 00006.

Backfill around the OWS to grade:
The contractor shall backfill around the double-lined pipe and corrugated steel pipe to the subgrade of the concrete pad according to Drawing 4 and Specification 00006.

Construct concrete pad:
The contractor shall construct a concrete pad for the steel access cover according to Drawing 4 and Specification 00006.

Site restoration:
The contractor shall restore the area surrounding the concrete pad and steel access cover as in the site restoration section below.

Train CAFB personnel:
The contractor shall train CAFB building representative(s) on OWS operation, alarm systems and maintenance.

The following approaches shall then be followed by the contractor for the drain installation only:

Backfill around the pipe and drain to grade:
The contractor shall backfill around the double-lined pipe and drain to grade according to Specification 02222.

3.10 SITE RESTORATION

The concrete, asphalt, tarmac concrete, lawn sprinkler systems, concrete curbs, and other materials shall be placed according to Drawings 6, 7, and 8 and Specifications 02210, 02511, 02515, 02551, 02576, 02579, 02592, 02811, 02935, 02950, 03200, and 03250. The sites shall be restored to existing conditions or as directed herein or by USACE. The contractor shall verify with USACE on not replacing concrete during site restoration at SWMUs #61 and #62.

3.11 LANDFARM OPERATIONS AND MAINTENANCE

All excavated soils impacted above the removal action level shall be transported to the landfarming facility for remediation of petroleum hydrocarbon contaminants. The general approaches for operating and maintaining the landfarm facility are provided herein.

The initial soil excavated from unit removal operations shall be transported to the landfarm cell with end-dump haul trucks. The end-dump haul trucks shall access the landfarm cell through the decontamination pad and shall place the excavated soil in the appropriate landfarm cell. UST-related soil shall be spread in Cell 1 and other UST-related soils shall be spread in Cell 2. The soil shall be spread in Cells 1 and 2 in one lift with a maximum thickness of 6 inches and 24 inches, respectively. The earthmoving equipment recommended for spreading and loading soil in the landfarm cell is a rubber-tired, front-end loader. The earthmoving equipment shall be operated by an equipment operator with an excellent history of experience in the operation of that specific piece of equipment. Extreme care shall be exercised by the equipment operator so that the geotextile and FML lining of the landfarm and storage cells are not touched by the earthmoving equipment.

Soil shall be stored in the storage cell after one 6-inch and 24-inch lift is placed in each of the landfarm cells for remediation. Soil shall be transported into the storage cell through the decontamination pad by an end-dump haul truck. The end-dump trucks shall place the soil in piles in the center of the storage cell so that at least a 10-foot-wide buffer zone remains between the concrete barrier and the stored soil piles. The FML storage cell soil cover shall be placed over the soil pile after unloading the soil and shall be anchored by sufficient sand bags to resist uplift by the wind. The soil shall not remain uncovered for a period of more than 30 minutes after being unloaded. The soil shall be covered immediately if health and safety conditions warrant that action according to the HASP.

In exceedance of the State of New Mexico UST Regulations requirements, provided in Appendix B, soils contained in both cells shall be aerated by turning every week. Ripping and discing of the soils will aerate the soils, enhancing biodegradation and volatilization of the petroleum hydrocarbon compounds. A farm tractor equipped with a farming disc and/or ripper is recommended. The tractor shall complete two sets of the following passes: parallel to the length of the landfarm cell until the whole width of the cell is tilled; followed by passes parallel to the width of the landfarm cell, until the whole length of the cell is tilled. If this method does not appear to turn all of the 6-inch or 24-inch lift, additional passes or use of rippers shall be performed until the whole lift appears to be totally remixed.

Following placement and daily thereafter, the soils shall be moisture conditioned using the permanent automatic sprinkler system. Moistening the soils at this frequency shall enhance natural microbial activity and biodegradation of petroleum hydrocarbon contaminants, as well as reduce the generation of dust from exposed

soils. The sprinkler system shall be set on a timer to apply a water spray across the landfarm cells on a daily basis at about 6:00 AM or at the time of day which typically is the least windy, based on CAFB personnel observations and meteorological records.

The optimum moisture content for landfarm remediation of soil is approximately equal to or slightly more moist than the optimum moisture content for the maximum compaction of soils according to ASTM D-698. If the soil to be remediated is silty sand or clayey sand, as described in the RFIs, the optimum moisture content for remediation will be approximately 15 to 18 percent by weight. The contractor shall collect a sample of clean soil similar to the contaminated soil and perform a standard compaction test, according to ASTM D-698 to determine the optimum moisture content. The contractor shall test the moisture content of the soil being remediated according to ASTM D-2216, D-4643, or D-4959 at a rate of once per month. The contractor shall use the "feel" of the soil (using gloves specified in the HASP) at the optimum moisture content during the above tests to calibrate him or herself so that the contractor can gauge whether the soil in the landfarm is at the optimum moisture content by "feel" alone. The contractor shall then shorten or lengthen the standard amount of time that the sprinkler operates each day.

The automatic sprinkler system shall be turned off by the contractor before and during periods of frost or freezing temperatures. The sprinkler system shall be constructed according to Specification 02811. The system will automatically drain at drainoff valves in the manifold box and at each sprinkler head so that water does not freeze in the pipes or valves and damage the system.

Maintenance of the landfarm facility shall include the following items:

- Periodic inspection of the spray system for faulty sprinkler heads, misaligned sprayheads, correct length and radius of spray coverage, leaking sprinkler system pipes, leaking valves or pipes in the manifold box or connections, correct timer programming

- Visual inspection of landfarm and storage cell integrity including observation of the inside and outside surfaces of the concrete barriers for spalling or damage from earthmoving equipment and haul trucks; observation of the geotextile and FML along the inside of the concrete barrier for signs of damage by earthmoving equipment or degradation; observation of the batten bar anchoring the geotextile and FML for signs of deterioration of the geosynthetics; observation of the geoweb and aggregate infill when it is exposed during the period between removing the remediated soil and spreading the next lift of soil to be remediated; observation of leakage from the perimeter of the cells along the junction of the concrete barrier and the asphalt pavement

- Observation of discing and tilling operations to verify that the soil is being totally turned over by the number and method of equipment passes

- Observation of the storage cell FML cover and sandbag anchoring system including observation to verify that soil is properly covered and is not eroded by the wind; observation of the integrity of the FML cover and sandbags

- Visual inspection of the decontamination pads including observation of the integrity and wear of the geoweb and aggregate infill; observation of piping of any of the compacted soil through the FML, geotextile and geoweb

- Shoveling of any soil or residue in the decontamination pad to the landfarm cell for remediation with the other soil

- Siphoning of decontamination pad water to the adjacent landfarm cell through a hose if decontamination pad water collects to a maximum depth of 1 foot deep

- Visual inspection of the access ramps between the decontamination pads and the cells for settling of the compacted soil under the layer of FML, geotextile and geoweb

- Visual inspection of the decontamination pad hose stations for signs of degradation and contamination by soil or decontamination rinsewater

- Soil sampling and testing to evaluate remediation efforts, performed according to the SAP

If any of the inspections described above or other observations indicate partial, total or impending failure of a component or an operational method of the landfarm facility, the contractor shall notify USACE immediately and confer on a possible solution to the problem.

After the 6 inches and 24 inches, respectively, of soil in the landfarm cells is remediated, according to the soil sample tests (described in the SAP, Section 4.0) and the action levels (described in Section 3.12), the remediated soil will be loaded within the landfarm cells into end-dump haul trucks by the rubber-tired front-end loader. The soil will then be transported to a USACE-designated location on CAFB to be used as clean fill. Soil will then be transported by the earthmoving equipment from the storage cell into the emptied landfarm cells and spread out into a maximum 6-inch and 24-inch lift, respectively, for remediation. This process will be repeated until no more soil is present in the storage cell. If soil does not meet cleanup levels for analytes which cannot be

remediated in the landfarm, such as heavy metals, the contractor shall follow the procedures described in Section 3.12.

3.12 WASTE MANAGEMENT

OWS, USTs, and related appurtenances shall be removed, cleaned of all solids, liquids, and sludges, and purged of remaining vapors. The contractor shall be responsible for this decontamination procedure and for the transportation and off-base disposal of all OWS, sand traps, drains, USTs, leach wells, piping, and other scrap materials. The contractor shall also be responsible for the off-base disposal of purged solids, sludges, and liquids, according to federal, state, and local regulations. Federal regulations including, but not limited to the following, shall be complied with: CFR 40, Parts 261 through 266, and Part 280. The contractor shall comply with NMED regulations, including but not limited to, the UST regulations.

All potentially impacted soil excavated during unit removal operations shall be transported to the landfarm facility for remediation. Soil sampling shall be performed in accordance with the SAP to evaluate the remedial efforts of landfarming. The contractor shall be responsible for determining, based on soil analytical results, when soil has been remediated to NMED UST Regulations guidelines for TRPH and BTEX, and can be removed from the landfarming facility. The NMED UST regulations require remediation until petroleum hydrocarbon concentrations are below the following cleanup levels:

Analyte	Concentration (mg/kg or ppm)
TRPH	100
BTEX	50
Benzene	10

Although the soils shall be remediated to NMED guidelines for petroleum hydrocarbons, the potential exists for the soils to contain SVOCs and metals. Prior to removal and unrestricted disposal of the soil from the landfarm facility, a TCLP analytical test shall be performed for the analytes presented in Table 1 and described in Section 4.2.

While a total RCRA analysis for metals will be performed at the bottom of each unit excavation location as described in the SAP, the TCLP performed at the landfarm shall characterize the total bulk mixtures of soils from multiple unit locations. The results of this test shall be used by the contractor to determine the appropriate and final waste management practices for soil disposal as described below.

3.12.1 DISPOSAL OF HAZARDOUS WASTE FROM LANDFARM

If the TCLP analysis for RCRA metals indicates that metals concentrations in the soil are above EPA and NMED disposal guidelines and risk-based criteria from a future USACE risk assessment on landfarm-remediated

soil, the soil may classify as hazardous waste under 40 CFR 261.3 and 49 CFR 171.8. The methods for treatment and disposal of soils classified as hazardous wastes due to elevated metals concentrations are limited. Hazardous waste landfilling is one disposal method alternative. Disposing of the soil in a hazardous waste landfill does not remediate the soil, reduce metal toxicity within the soil, or decrease the volume of waste. Disposal in a landfill greatly reduces the potential for human exposure to the waste while virtually eliminating the potential for future impact to the environment. However, there are no hazardous waste disposal facilities in New Mexico, so the hazardous waste would have to be transported to another state for disposal.

Another disposal method for metals-impacted soil utilizes soil fixation/stabilization techniques. The purpose of soil fixation/stabilization is to produce chemically stable solids with improved contaminant containment and handling characteristics. The soils are mixed with cement grout, chemical grout compound, or other soil stabilizing product to produce a slurry. This slurry is poured into forms and allowed to harden. Typically, the pH of the soil is raised by adding lime {$Ca(OH)_2$}. Portions of the added calcium hydroxide break down and bond with various metals to produce insoluble metal carbonates and hydroxides, greatly reducing the leaching potential of the metals.

The forms in which the slurry is poured are typically made to a size and shape to form blocks easily handled and usable as construction materials or various other purposes. This disposal method increases the total waste volume but effectively reduces the handling and exposure hazards while basically rendering the material non-hazardous. The contractor shall not be responsible for implementing an alternate disposal method for soil designated as hazardous waste, unless that contract is modified with USACE.

The possibility also exists that some of the soil will be impacted with heavy distillate petroleum hydrocarbons such as oils, greases, and other SVOCs. In such instances, landfarming techniques may not remediate the soils to NMED cleanup levels and the soils shall be treated in accordance with NMED solid waste disposal requirements. Other treatment alternatives such as hazardous waste landfilling, thermal oxidation, or incineration will be considered by USACE. The contractor's contract will be modified to implement other disposal methods if other disposal methods are deemed necessary by USACE.

3.12.2 DISPOSAL OF REMEDIATED SOIL FROM LANDFARM

If the TCLP analysis for metals indicates that metals concentrations in the soil are below EPA and NMED disposal guidelines and risk-based criteria from a future USACE risk assessment on landfarm-remediated soil, the soil can be used for virtually any application. The contractor shall coordinate with USACE to determine an appropriate disposal methodology for the soil. The contractor, unless relieved of this responsibility by USACE, shall be responsible for the on-base disposal of all remediated soils. USACE may designate uses for the

remediated soil on base property. The contractor shall be responsible for removal of the soil from the landfarm facility and for transportation of the soil to the base location(s) designated by USACE.

4.0 SAMPLING AND ANALYSIS PLAN

4.1 INTRODUCTION

Sampling and analysis of various media shall be performed as part of the unit removal and impacted soil excavation operations. Sampling activities shall predominantly involve impacted soils, but shall also include surface water, groundwater, and air. The objectives of sampling and analysis of the soils are to delineate the horizontal and vertical extent of impacted soils (if present) and the area requiring removal, to document adequate removal, and to establish baseline concentrations of contaminants transported to the CAFB landfarm facility. An accurate baseline of possible contaminants in impacted soils will allow the treatability of the soils (excavated and placed in the landfarm facility) to be evaluated as remediation efforts progress. Sampling and analysis activities shall be performed according to NMED UST Soil/Water Sampling and Disposal Guidelines, presented in Appendix B. General procedures and guidance provided in CDQM for Petroleum Storage Tank Remediation Projects (Appendix E) and CDQM for Hazardous Waste Remedial Activities (Appendix F) shall be followed except when these guidance manuals contradict NMED regulations.

4.2 SOIL SAMPLING AND ANALYSIS

Unit Removal and Disposal

Sampling and testing of soils shall be performed in three phases. Phase 1 shall consist of field screening by utilizing a flame ionization detector (FID) or a photoionization detector (PID) to evaluate the concentrations of petroleum hydrocarbons and associated VOCs in the soil during impacted soil removal operations. Soil headspace screening shall be performed in the following manner according to NMED UST Soil/Water Sampling and Disposal Guidelines (Appendix B):

- Soil samples shall be collected from various points (bottom and sides) of the excavation
- Fill 16-ounce or larger glass jar one-half full of soil
- Cover top of jar with a piece of clean aluminum foil, seal using a ring lid, and label
- Place in an area where the jars will be in direct sunlight or otherwise ensure that the sample is at 60 to 80°F for 10 minutes. A warm water bath can be used if necessary. The sample should be shaken for one minute during the 10-minute interval.
- Immediately puncture the aluminum foil cover with the tip of the PID or FID probe and record the peak measurement from the meter. Appropriate PIDs and FIDs are a Foxboro 128 GC/FID, HNu DL-101 PID, or equivalent.

This field screening method shall be used to delineate the extent of petroleum hydrocarbons within the soils beneath and around the units prior to confirmatory sampling. Guidance for field screening procedures is provided in EM 1110-3-178, Chapters 6 and 11, provided in Appendix D.

As petroleum hydrocarbon impacted soils are initially encountered at the first unit removal site, as indicated by soil headspace screening, four or more samples shall be collected and sent for analysis on a 24-hour turnaround time to establish a correlation between TRPH concentrations from analytical laboratory testing and from soil headspace screening results. At each unit removal location, two or more soil samples will be submitted to verify the correlation obtained at the first removal site between soil headspace readings and analytical laboratory test results. The number of samples to be collected and tested shall be increased until a correlation is developed at each unit removal location. The soil headspace action level for soil removal can be adjusted based on this correlating effort (i.e., lower soil petroleum hydrocarbon concentrations from analytical laboratory testing compared with soil headspace screening shall be indicative of the potential to lower the soil headspace screening action level and vice versa). The contractor shall confer with USACE regarding the soil headspace versus analytical laboratory TRPH test results correlation.

An analytical laboratory test-based action level of 500 ppm shall be used to determine if additional soils need to be removed. Soils exhibiting soil headspace readings above the soil headspace-based action level, determined from the correlation developed above, shall be removed to greater extent or depth and another soil headspace reading taken from the newly exposed soils. If soils exhibit staining or strong hydrocarbon odors, excavation operations shall be continued until soils are free of observed contaminants and soil headspace screening indicates that remaining soil concentrations are below the selected action level. Field screening will not be performed for heavy metals contaminants as it can be assumed that petroleum hydrocarbons generally have a greater leaching and dispersion capability in soils compared to heavy metals. By excavating petroleum hydrocarbon impacted soils as identified by field headspace screening techniques, soils impacted by heavy metals will also be removed. Confirmatory sampling, as described in Phase 3 sampling, shall ensure that impacted material will be excavated to meet removal criteria.

Contaminants may be found at depths greater than the excavation capabilities of standard construction equipment. The contractor shall confer with USACE regarding this situation, and a decision will be made by USACE to resolve this issue. If subsurface sampling and testing is selected to define the vertical and lateral extent of impacted soil, the Soil Subsurface Exploration Plan, described herein, shall be used as a guide to the subsurface investigation. This sampling and testing shall comprise Phase 2. The contractor shall follow soil sampling and analysis procedures provided in EM 1110-3-178, Chapter 6, and CDQM for Petroleum Storage Tank Remediation Projects, pages 3-28 through 3-35. These references are provided in Appendices D and E, respectively.

Phase 3 sampling shall consist of confirmatory sampling to be performed following removal of all soil identified by soil headspace screening techniques as having concentrations greater than the soil headspace-based action level. Soil samples from the bottom surface of the excavation shall be collected according to NMED UST

Soil/Water Sampling and Disposal Guidelines, provided in Appendix B, to confirm that concentrations in the remaining soil are below the selected action level. Although OWS are process tanks and are not regulated by NMED UST guidelines, the Sampling and Disposal guidelines shall be used and followed as minimum requirements. One sample shall be collected from beneath the center of the OWS for all units with a capacity of less than 2,000 gallons. Two samples shall be collected, one beneath each end of the unit, for all units with a capacity of greater than 2,000 gallons. Soil shall be sampled where holes or releases have occurred in units or piping. Soil shall also be sampled according to the area of highest contamination and the system configuration. Samples shall be taken as soon as possible after the tank removal and shall be taken a minimum of 1 foot below the tank bottom or pit, whichever is deeper.

All soil samples shall be removed from the unit excavation using the bucket of an excavator, and a sample shall be collected by gloved hand. The confirmatory soil samples shall be taken according to the NMED UST guidelines (Appendix B), shall be placed in the appropriate laboratory containers, and returned to the laboratory for analyses under proper chain-of-custody seal. The sampling and analysis procedures presented in EM 1110-3-178, Chapter 6, and the CDQM for Petroleum Storage Tank Remediation Projects, pages 3-28 through 3-35, provided in Appendices D and E, respectively, shall be followed by the contractor. Soil samples shall be analyzed by the following test methods:

- TRPH by EPA Method 8015 Modified
- BTEX by EPA Method 8020
- Total RCRA metals for a sample collected from the center of the excavation by X-ray fluorescence (XRF) device
- SVOCs by EPA Method 8270 for soil above the removal action level at SWMUs #51, #63, #70, #92, and #94

Landfarm

Upon reception of the impacted soil at the landfarming facility and prior to initiating landfarming, representative samples of the soil shall be obtained for TRPH and BTEX testing to provide a baseline for monitoring remediation efforts performance. Representative sampling shall consist of at least one sample per 100 cubic yards of soil. Analytical data acquired during unit removal operations can also be used for baseline characterization of contaminant levels within soils transported to the landfarming facility. The during-unit-removal and representative-sampling-at-the-landfarm test results shall be summarized in a table format. One table shall summarize baseline data for the UST-related soil and one table shall summarize baseline data for all other excavated soil. The tables of baseline data shall be used as a reference to compare to later soil sample test results from the landfarmed soil. The amount of decrease of TRPH and BTEX concentrations from later landfarm soil sample test results can be gauged by comparing to the original or baseline concentrations.

Following this initial sampling, additional sampling shall be conducted every two weeks for the first two months of operation to establish remediation performance. After two months, sampling shall be performed on a monthly basis if a decrease of at least 100 ppm TRPH has occurred each month. If a decrease of at least 100 ppm TRPH has not occurred each month, soil sampling shall be conducted every two months and the frequency of tilling/ discing shall be increased to twice per week.

Landfarm facility sampling will be conducted using standard household gardening equipment. Soil samples shall be collected from the following depths and analyzed for TRPH to evaluate remedial efforts:

- Cell 1 - 3 inches and 1 foot
- Cell 2 - 3 inches, 1 and 2 feet

Personnel collecting samples shall wear appropriate personal protective equipment (PPE) as outlined in the HASP (i.e., latex surgical gloves, etc.) and sample soils at depth using shovels or picks. In order to pack soil into sample jars, gloved hands shall be used. One discrete sample shall be collected at each depth. Sampler(s) shall change gloves between each sample. If a spade or other gardening instrument is used to collect the sample, the sample collection device will be decontaminated as outlined in the HASP before sampling and between each consecutive sample. The contractor shall follow the referenced guideline documents for soil sampling at unit removal locations.

Treatment of the impacted soils shall be continued until the contaminant concentrations in one soil sample tested per 100 cubic yards of treated soil are below 100 ppm for TRPH, 50 ppm for BTEX, and 10 ppm for benzene. After petroleum hydrocarbon soil cleanup levels have been reached, one sample shall be collected per 400 cubic yards of soil for TCLP tests for the following:

- Metals listed in Table 1
- VOCs by EPA Method 8240
- SVOCs by EPA Method 8270

The results of these tests shall be used by the contractor and USACE to determine appropriate disposal methods for the soil as described in Section 3.12.

4.3 SURFACE WATER SAMPLING AND ANALYSIS

Unit Removal and Disposal

Surface water sampling will reveal any impacts on the surface water quality should a precipitation event occur and precipitation-induced run-on flows into excavations or contaminated stockpiles, despite the presence of compacted soil berms. As described in Section 3.0 of the CWP, the contractor shall be responsible for constructing temporary surface water control and diversion structures of compacted soil or other appropriate

materials around removal operations situated within run-off and drainage pathways. Implementation of proper vehicle and personal decontamination and rinseate collection procedures shall aid in the containment of excavated soils, surface water, and associated contaminants, thereby reducing the potential for contaminant migration. Decontamination waste, rinseate and potentially contaminated soils shall be transported to and deposited in the landfarming facility. Although CAFB is located in an arid area (typically less than 16 inches precipitation per year), implementation of a surface water sampling plan shall be required should a rainstorm occur during removal operations.

In the event that a quantity of surface water which can be physically sampled occurs, samples of surface water shall be collected from the surface water stream flowing into and out of the work area. The sample shall be collected by lowering the sample container into the flow. The sampling locations shall be approached from the downstream side to avoid disturbing surficial sediments and shall progress to the upgradient sampling point. Water samples shall be collected according to NMED UST Soil/Water Sampling and Disposal Guidelines, presented in Appendix B. The contractor shall follow sampling and analysis procedures in CDQM for Petroleum Storage Tank Remediation Projects, pages 3-42 through 3-47 (Appendix E).

Surface water sampling shall consist of collecting two samples, one upgradient and one downgradient, of all ongoing removal operations. The upgradient sample shall provide baseline concentrations for which contaminant identification and respective concentrations (if present) can be evaluated compared to the downgradient sample. Samples shall be analyzed for BTEX using EPA Method 8020, volatile organics using EPA Method 8240, TRPH using EPA Method 8015 Modified, total suspended solids, and total RCRA metals.

Landfarm

The landfarming facility shall be constructed to contain all solids and surface water using a bermed impervious lined facility. The facility is designed to retain the volume of water produced by a 24-hour, 25-year precipitation event for the Clovis, New Mexico region. Surface water sampling of the landfarm shall not be required unless overflow from the landfarm facility occurs or the potential for an overflow event exists. The potential for an overflow condition will be when less than 6 inches of freeboard exists in a landfarm or storage cell. If winds create waves in a landfarm or storage cell, the 6 inches of freeboard will be measured from the crest of the wave to the top of the barrier.

Should the potential for an overflow event exist, water samples shall be collected and analyzed according to the same sampling and analysis procedures and for the same analytes as given above for the unit removal locations. Analytical results shall then be used by the contractor and USACE to determine an appropriate disposal method for the collected surface water. The water can be pumped off the cells and stored in a temporary tank until analytical results are obtained if an immediate overflow condition exists.

4.4 GROUNDWATER SAMPLING AND ANALYSIS

Unit Removal and Disposal

Groundwater at the site is located approximately 280 feet BGS. Activities associated with unit removal and operations are not expected to impact groundwater. The contractor will not be required to perform groundwater monitoring.

Landfarm

Groundwater at the site is located approximately 280 feet BGS. Landfarming operations are not expected to impact groundwater as the landfarm facility is completely lined and all materials contained. Regular inspection of the landfarm facility shall identify damage to the liner and/or containment structures should such an event occur. The contractor will not be required to perform groundwater monitoring.

4.5 AIR SAMPLING AND ANALYSIS

USACE and CAFB have not previously performed ambient air quality monitoring for total VOCs or dusts potentially containing heavy metals at unit locations. The potential exists for airborne exposure to soils impacted with petroleum hydrocarbons and heavy metals during performance of the activities outlined in the CWP; therefore, air monitoring shall be required to characterize airborne contaminants and evaluate potential exposure hazards to the contractor and base personnel during unit removal, disposal and landfarm operations.

Unit Removal and Disposal

Personal Air Monitoring

Personal air monitoring shall be performed for worker protection according to the recommendations outlined in the site-specific HASP. Personal sampling, utilizing personal sampling pumps and filter cassettes, shall be performed for each task exhibiting the potential for exposure to dusts originating from unit and impacted soil removal and replacement operations. The HASP describes the activities where there may be a potential for exposure to dusts. Sampling shall be conducted for a one-week period for each task to establish a baseline of data characterizing each task's exposure potential. Following sampling of all tasks, the task with the highest potential for continued exposure shall be monitored daily with another task selected randomly by the SSHO and sampled once per week.

Personal sampling shall be performed during unit removal and disposal activities using MSA Escort personal sampling pumps or equivalent. These pumps shall be calibrated daily before and after sampling according to a secondary standard, such as a rotameter. This secondary flow calibration device shall be calibrated using a primary standard every six months, and the contractor shall retain calibration records for the rotameter and personal sampling pumps onsite.

Collected samples shall be analyzed for, at a minimum, lead, arsenic, cadmium, and total dust. The contractor's SSHO shall modify the testing analytes as deemed necessary based on the contaminants identified in the RFIs. These contaminants are listed in Section 1.3. The contractor's SSHO shall be responsible for reviewing the RFI reports and data if additional information is deemed necessary.

Unit Removal and Disposal, and Landfarm

Ambient Air Quality Monitoring

Site-specific air quality shall be monitored during unit removal, site restoration, and landfarm activities. All air monitoring shall be in accordance with the HASP. In general, peripheral ambient air sampling shall be conducted periodically to reaffirm the ambient air quality. As a minimum, the following air monitoring tests shall be required during excavation and removal of the units and landfarm activities:

- Total VOCs, using PID/FID monitoring every 15 minutes
- Total dust, using a miniram portable monitor continuously

If total VOC and/or dust concentrations exceed the permissible exposure limit (PEL) set forth in the HASP, the construction shall immediately stop, and the SSHO shall be notified to evaluate the site conditions and determine engineering controls, PPE, and additional air monitoring requirements.

4.6 REMOVAL UNITS FLUIDS AND SLUDGE SAMPLING AND ANALYSIS

Fluids and sludges from USTs and other units to be removed shall be sampled and tested prior to the removal of fluids and sludges from the units. Fluids and sludges shall be sampled, placed in bottles, preserved, and tested according to CDQM for Petroleum Storage Tank Remediation Projects, pages 3-10 through 3-24.

4.7 EQUIPMENT AND DECONTAMINATION SAMPLES (BLANKS)

The majority of the samples collected during the unit and impacted soil removal operations shall be solid samples. Soil samples shall be collected from a point within the excavator bucket, at least 4 inches below the surface of the soil in the bucket, to minimize exposure of the soil to the atmosphere and sunlight. The sample shall not come in contact with the sides of the bucket. No soil sample equipment blanks shall be collected.

Surface water samples, if collected, shall be obtained directly from the surface water flow into the sample bottle. No other surface water sampling equipment shall be utilized; therefore, no equipment blank shall be needed.

The PIDs/FIDs used within the exclusion zone shall be kept clean at all times. If the equipment is soiled, the unit shall be decontaminated with the appropriate wash solution. The tip of the influent line must be kept clean and free from particulate matter at all times.

Personal sampling pumps shall be wiped clean of gross contamination at the end of every working shift in which the pumps are used. A minimum of 10 percent of the filters analyzed for metals should be sent with a field blank filter. No field blanks will be required for the total dust analyses as those filters are pre-weighed.

5.0 QUALITY ASSURANCE/QUALITY CONTROL PLAN

5.1 GENERAL QA/QC POLICY GUIDELINES

The contractor shall maintain an active QA/QC program that provides analytical and engineering data of known and supportable quality and ensures high professional standards in analytical data generated. In support of this policy, this section describes the minimum QC procedures for sample collection and analysis related to unit removal operations. The contractor shall ensure that this quality policy, work standards, and requirements outlined in construction Specification 01440 - Contractor Quality Control, are observed by all subcontractors used on this project. The contractor shall comply with EM 1110-3-178, Chapter 8, CDQM for Petroleum Storage Tank Remediation Projects, and CDQM for Hazardous Waste Remedial Activities, provided in Appendices D, E, and F, respectively.

The precision and accuracy of data generated during field sampling and laboratory analyses shall be ensured by the performance of field and laboratory QC checks. The designated frequency of QC checks represents a minimum number that may be adjusted upward if the Field Team Leader or Laboratory Coordinator identifies additional uncertainty during sample collection or analysis.

5.2 QA/QC ORGANIZATION

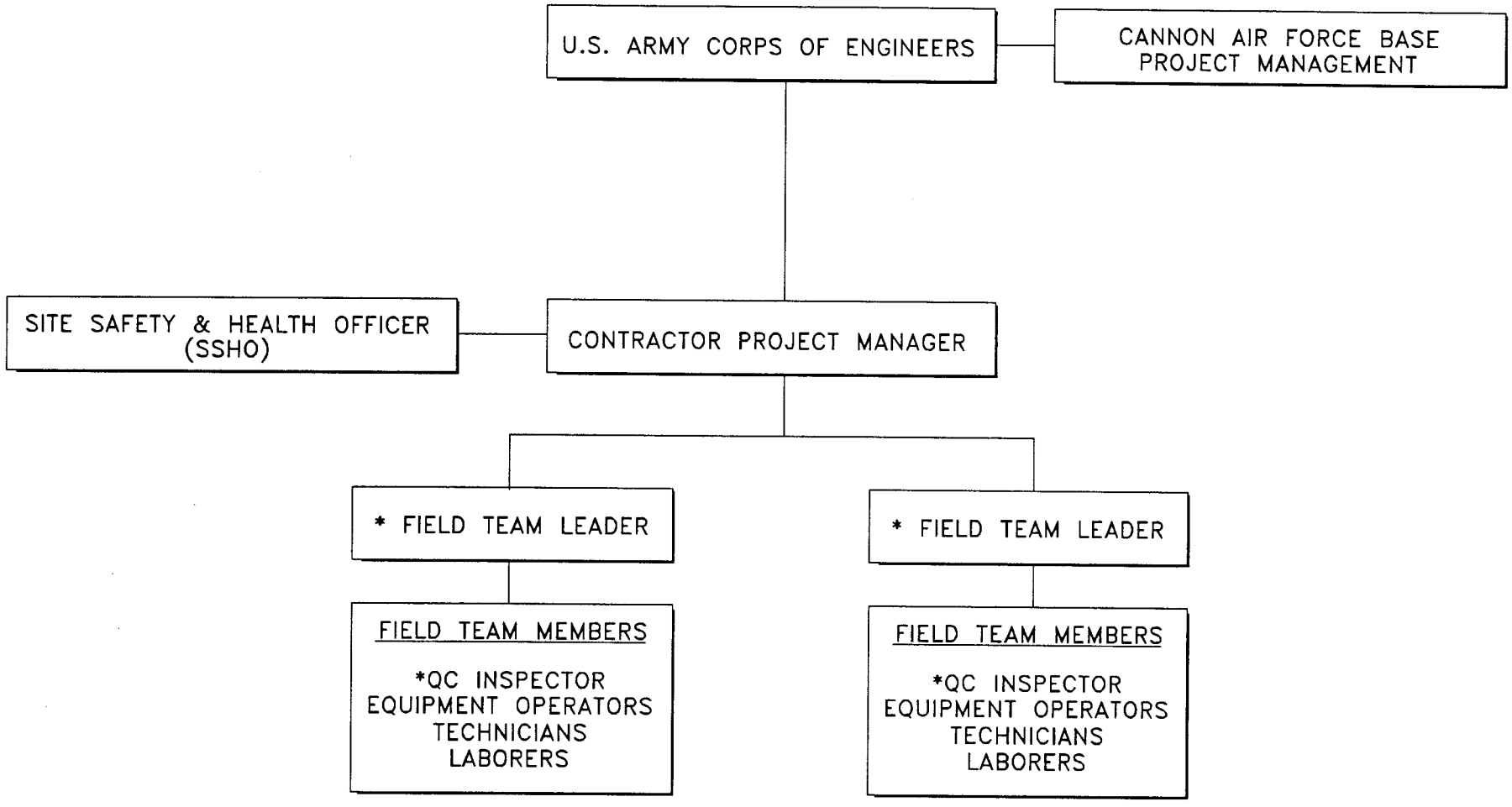
The QA/QC organization shall consist of three key personnel: the Contractor Project Manager, Field Team Leader(s), and one Field Team Member from each team. The designated Field Team Member(s) shall be responsible for performing the outlined components of the QC Plan (Table 2) according to the frequency specified. The purpose of the Field Team Members is to verify that the construction proceeds in accordance with the CWP and specifications.

The Field Team Leader shall be responsible for performing QA checks which include oversight of QC operations, ensuring appropriate types and quantities of samples are collected, documentation completeness, and performing QA sampling and testing. The Field Team Leader shall perform geotechnical testing at a rate of 10 percent of the QC test requirements as outlined in the construction specifications. The Contractor Project Manager shall be held responsible for the quality of work on the job and is subject to removal by USACE for non-compliance with quality requirements specified in the Contract.

Figure 1 presents the organizational structure for the project and key QA and QC personnel. The contractor shall appoint personnel to the required positions and shall establish the appropriate number of field teams as needed to complete the project according to USACE scheduling.

Table 2. Field QC and QA Sample Descriptions and Collection Frequencies

Field Samples	Sample Description	Minimum Frequency of Collection of QC Samples	Minimum Frequency of Collection of QA Samples
Blind Decontamination Rinsate Blank	All matrices except air: Water collected by rinsing sampling equipment after equipment decontamination	Once per sampling event and whenever changes take place in the sample collection procedures, sample decontamination procedures, sampling equipment, or sample collection personnel	10 percent of QC Samples
Blind Field Duplicates	Aqueous matrices: Co-located samples collected identically and consecutively over a minimum period of time	10 percent of total number of samples collected per sampling event or at least one sample per sampling event	10 percent of total number of samples collected per sampling event or at least one sample per sampling event
	Soil matrices: Co-located samples collected identically and consecutively over a minimum period of time	10 percent of total number of samples collected per sampling event or at least one sample per sampling event	10 percent of total number of samples collected per sampling event or at least one sample per sampling event
	Air matrices (personal sampling): Co-located samples collected identically and consecutively over the same period of time. Also, one blank filter sample will be submitted	One duplicate and one blank per 15 sampling events	One duplicate and one blank per 15 sampling events
Trip Blank	Aqueous matrices: One of each type of sample bottle will be filled with Type II reagent grade water by the analytical laboratory, transported to the site, handled using the same procedures as a sample, and returned unopened to the laboratory for analysis	One per sampling event, or one per shipment from the field	One per sampling event, or one per shipment from the field



NOTES:

* KEY QA & QC PERSONNEL

EXACT NUMBER OF FIELD TEAMS TO BE DETERMINED BY CONTRACTOR

ESE Environmental Science & Engineering, Inc. A CILCORP Company DENVER, COLORADO 80112	Figure 1 PROJECT MANAGEMENT ORGANIZATION CANNON AIR FORCE BASE CLOVIS, NEW MEXICO	Prepared for: USACE
		Drawn By: GWT — Date: AUG. 1995
		Checked by: — File: ORGCHT

5.3 FIELD QUALITY CONTROL PROCEDURES

Field QC is a qualitative process that is dependent on the decisions made by personnel while performing individual tasks. Because EPA does not have statistical control limits on field QC, the field personnel's professional opinion shall be required to estimate the influence of field QC on the quality and usability of the sample data. Specific field QC procedures that shall be implemented by the contractor include:

- Maintenance and calibration of instruments
- Decontamination of sampling equipment
- Collection of duplicate and blank samples
- Performance of duplicate geotechnical tests
- Appropriate sample custody, documentation, and document control procedures

Table 2 describes the QC and QA sampling requirements and frequencies for ensuring the validity of environmental soil sampling, surface water sampling, and air monitoring results. The contractor shall follow the guidelines in the CDQM for Hazardous Waste Remedial Activities, Appendix D, presented in Appendix F of the CWP. The following subsections describe specific sample handling procedures.

5.3.1 ENVIRONMENTAL SAMPLING PROCEDURES TO ENSURE FIELD QC AND QA COMPLIANCE

The analytical data validity is dependent on the integrity of field procedures employed in obtaining a sample. The nature of environmental sampling includes several variables that may affect analytical results. Proper sampling techniques are required to ensure that the small aliquot sample from a bulk material is representative. For a sample to be representative, the sample must be collected and handled in a manner that maintains its original physical form and chemical composition to as great an extent as possible. Sample integrity must be ensured and QA standards must be followed throughout the field sampling effort.

5.3.2 SAMPLING METHODS

The methods to be employed for representative sampling of soil, surface water, and air are described in the SAP. Calibration for field instrumentation used by the contractor must be performed according to those procedures outlined by the respective equipment manufacturer. Calibration of these instruments shall be performed at the frequency recommended by the manufacturer, at minimum.

Field sampling equipment shall be decontaminated prior to use. Decontamination procedures include the following:

- Wash contact areas of the sample equipment with fresh water and Liquinox (or equivalent) soap
- Rinse the contact areas with potable water
- Rinse with 0.1 N nitric acid when sampling for metals
- Rinse the contact areas with de-ionized water

- Rinse with methanol (pesticide grade) when sampling for organics
- Air dry
- Rinse with hexane (pesticide grade) when sampling for organics
- Air dry equipment and wrap in aluminum foil (shiny side out) when not in use

The contractor shall follow decontamination procedures in EM 1110-3-178, Chapter 9, and CDQM for Petroleum Storage Tank Remediation Projects, page 2-20.

5.3.3 SAMPLE HANDLING

The contractor shall comply with sample handling procedures in CDQM for Hazardous Waste Remedial Activities Appendix F, presented in Appendix F of the CWP. Field procedures shall be designed to minimize sample handling and transfers. During sampling activity, a Field Team Member shall record the following information in the field notebook using indelible ink:

- The unique sample number as obtained from the sample label
- Source of sample (including name, location, and sample type)
- Date and time of sample collection
- Preservatives used (if applicable)
- Name(s) of sample collector(s)
- Relevant associated field data such as pH, temperature, or specific conductance as applicable

Each sample shall be identified by affixing a gummed label. Each label shall have a unique combination of field group name and sequence number, a standardized sample preservation code (if required), and station identification (ID) according to the reference given above. Each label shall have spaces for the field team to write in the date, time of sample collection, sampler's signature, and new station ID (if necessary). A new station ID may be necessary due to changes in field and/or sampling conditions that require substitution of sampling stations. All changes in station ID shall be clearly noted in permanent ink on the sample label and on the field logsheet/logbook. Changes must be approved by the Field Team Leader.

Once the label is attached, the sample container shall then be placed in a transportation case along with the chain-of-custody. The chain-of-custody contains all relevant information (sample types, requested analyses, sample locations and time collected, etc.) for each sample transported within that container.

Sample bottles/jars shall be pre-preserved by the analytical laboratory or according to the laboratory standard operating procedures for sample preservation. The contractor shall comply with the sample containers, preservatives and holding times given in Appendix F, Table F-1.

The method of shipment shall be entered on the bottom of the chain-of-custody, and the sampler shall sign and date the form. The chain-of-custody shall be placed in a waterproof container (typically a freezer-grade Ziploc™ baggie) and sealed (using a chain-of-custody seal) in the transportation case along with the samples to which the chain-of-custody applies. The transportation seal shall not be opened until the samples arrive in the laboratory and are checked in by the Laboratory Coordinator or designate. The Field Team Leader shall alert the Laboratory Coordinator to pertinent shipping information as needed at the end of each sampling day.

5.4 LABORATORY QUALITY CONTROL PROCEDURES

Laboratory work to be performed associated with the activities described in this CWP shall follow the QC protocols outlined in the QA/QC Control Guidance for Removal Activities, Sampling QA/QC Plan and Data Validation Procedures (EPA, 1990). The target for precision is 20 percent relative difference (PRD) and for accuracy is ± 20 percent recovery. Corrective action shall be implemented if the QC sample analytical results do not meet the Contract Laboratory Program (CLP) targets for precision and accuracy.

The corrective action for a blank detection above the contract-required limit is re-analysis of all samples occurring in that blank's sample digestion group that have concentrations less than 10 times the concentration detected in the blank. Duplicates, spikes, and the inductively coupled plasma (ICP) serial dilution check samples shall also be checked against the control limits, and results outside these limits shall require flagging the affected data.

Upon arrival in the laboratory, samples shall be checked by the Laboratory Coordinator, Laboratory Sample Custodian, or a designated alternate. All samples contained in the shipment shall be compared to the chain-of-custody forms to ensure that all samples designated on the logsheet have been received. Any changes in the station ID from the originally established station ID are noted. A sample receipt form, which contains all pertinent information relating to the shipment and receipt of samples, shall be filled out by laboratory personnel.

Checking for proper field sample preservation is normally done at the beginning of the extraction/digestion/analysis process by the analysts/technicians who are processing the samples. Results of this checking of preservation are entered on the sample preparation sheets that are contained in the analysis lot folders for that analysis batch. If it is discovered that the samples have been improperly preserved, the Laboratory Coordinator shall be notified immediately and will contact USACE to inform them of the situation. It shall be the responsibility of USACE to determine whether or not the analysis should proceed under these circumstances.

If USACE specifies that checking for sample preservation is to be performed at the time of receipt, the Sample Custodian shall audit a portion of all fractions requiring field preservation and will record his findings on a sample receipt form. If all tested samples are found to have been properly preserved, no further action is

necessary. If any of the audited sample fractions are found to have not been preserved (or improperly preserved), the Custodian shall check all sample fractions in the shipment that use the same preservation technique as the fraction that failed the audit check. For example, if it was found that one of the sulfuric acid fractions was found to have a neutral pH for a sample, all other sulfuric acid fractions in that shipment shall be tested for proper preservation.

If any sample fractions are found to be improperly preserved, the Sample Custodian shall note this fact on a sample receipt form and notify the Laboratory Coordinator of the situation. The Laboratory Coordinator shall immediately contact USACE to determine what action will be taken. If subsequently instructed to do so by USACE, the Sample Custodian shall preserve all unpreserved fractions upon receipt. Samples are placed in appropriate storage areas and Chemistry Group Leaders are then notified. Access to samples is limited to authorized personnel (the Sample Custodian or their designate). Internal chain-of-custody records are started for samples at the time they are removed from storage for processing and/or analysis. All internal transfers of samples/subsamples are recorded on appropriate forms. These internal chain-of-custody records shall be kept with other laboratory records. Samples shall remain in storage until it becomes necessary to retain them, at which time their disposition is noted.

5.5 CONSTRUCTION QA/QC PROCEDURES

This section describes QA/QC procedures to be performed during construction activities associated with unit removal, replacement, site restoration, and landfarm construction. All contractor and subcontractor personnel shall use information supplied in this section as guidelines for construction, although the contractor shall utilize experience, technical knowledge and professional judgement in performance of these and other QC activities. Construction QC refers to QC of physical construction operations, but not to site characterization or design. The procedures described in this section shall be performed in accordance with the ASTM standard procedures as specified in applicable construction specifications.

5.5.1 GEOTECHNICAL LABORATORY TESTING

The primary construction QA/QC activities include soil sampling and geotechnical laboratory testing for particle size analysis, compaction testing, and field density and moisture testing.

5.5.2 FIELD MOISTURE AND DENSITY TESTING

Density and moisture measurements shall be performed during backfilling, landfarm construction operations, and as referenced in the specifications. If a test is desired below the test equipments standard operating depth for data validation or other verification purposes, a small test pit may be excavated. Typically, all testing shall be performed as backfilling and grading operations proceed.

Any geotechnical testing results which do not meet the specification requirements will require retesting. Retesting will be performed according to the directive of the Field Team Leader, but at a minimum will consist of testing two (2) points around the non-passing test point. Upon delineation of a non-passing test area, the material will be reconditioned (i.e., compacted, moisture conditioned, etc.) and confirmatory testing performed. All testing and remedial actions taken to correct construction deficiencies will be documented by the Field Team Leader, reviewed by the contractor, and submitted with other data and reports to USACE.

5.5.2.1 Nuclear Densometer Method

Test methods shall be used as outlined in the specifications. All results shall be recorded on appropriate forms approved by USACE for data documentation. This equipment shall be used only by personnel authorized, trained, and knowledgeable in its use, calibration, and maintenance procedures. Personnel using this equipment shall have been trained on radiation safety and the use of nuclear soil gauges. Personnel shall be monitored through the use of radiation dosimeter badges.

5.5.2.2 Sand Cone Method

This method shall be performed according to the specifications. This test method shall be performed to verify the test results of the nuclear densometer tests at a frequency of once per 10 nuclear densometer tests. If these sand cone test frequencies are not sufficient to adequately verify nuclear densometer test results, the sand cone tests shall be increased in frequency at the discretion of the Field Team Leader in order to establish a good correlation between the two test methods. The sand cone method is not generally suitable for soft, friable, or seeping materials.

5.5.3 MISCELLANEOUS MATERIALS INSTALLATION

Observe and test, as designated in the specifications, the installation of the following items:

- Precast concrete barriers
- Cast-in-place concrete corners (of the landfarm cells)
- Asphaltic pavement
- Piping
- Wastewater sump
- OWS and alarm system
- Drain
- Shoring and bracing
- Concrete pavement, curbs, and gutters
- Sprinkler system
- Revegetation

- Metal building
- Grout

5.5.4 FML INSTALLATION

Subgrade Acceptance:

- Obtain written acceptance for subgrade on the Certificate of Acceptance of Soil Subgrade Surface form prior to FML installation from the FML installer. If any damage has occurred since acceptance, the QC Team shall obtain re-acceptance of the damaged and repaired area prior to liner installation. The liner installer is responsible for maintaining the condition of accepted areas until liner installation is complete.

FML Delivery:

- Review the statement of production date or dates
- Review the manufacturer's certification that the FML meets specifications requirements
- Review the certification that all FML rolls are from the same FML supplier
- Review the quality control certificates issued by the supplier
- Review test reports from the supplier
- Review shop drawings showing FML panel numbers, seam numbers, and proposed seaming equipment. The identification shall contain the panel layout number, roll number, and deployment date. The data shall be marked on each panel by the installer immediately after deployment. The QC Team will record this data on the Geosynthetic Panel Deployment Log
- Observe delivered rolls to identify any damage that may have resulted from shipping, storage, and handling
- Observe delivered rolls to verify proper storage of rolls
- Document the geosynthetic rolls received and any discrepancies on the Log of Geosynthetics Received form
- Document any and all damage sustained while in storage

FML Deployment:

- Observe the unrolled FML for visual holes, pinholes, blisters, gels, striations, roughness, bubbles, undisposed resin, or the presence of foreign matter. Defective areas will be circled by the QC Team. Excessively damaged panels shall be removed.

- Review the installation contractor's methods to prevent uplift by wind.

- Observe FML surfaces to be welded for the presence of grease, moisture, dust, dirt, debris, or other foreign matter.

- Observe that the panels are deployed in a systematic fashion and record the following, as necessary, on the Geosynthetic Panel Deployment Log:
  - Correct deployment directions
  - Correct overlapping
  - Prevention of "trampolining"
  - Prevention of water entering between panels
  - Temporary anchorage
  - No open holes or seams at the end of the day

- Verify the thickness on the leading edge of the FML with a micrometer.

- Verify that the installer submits progress reports on panels deployed that day to USACE. Reports should contain at least a panel number, roll number, location, and date for each panel deployed.

- Observe panel overlap prior to seaming to check for the minimum overlap required and proper shingling to avoid water seepage beneath FML.

FML Field Seaming:

- Review the installation contractor's field seaming method

- Inspect field seaming equipment

- Review qualifications and experience of field seaming personnel

- Inspect FML welding temperature, speed, contact pressure, and related items

- Verify that no horizontal seams are welded on slopes and that no horizontal seams shall be within 5 feet of the toe of slopes. In corners or odd shapes, seaming shall be minimized

- Verify that all seaming equipment is equipped with gauges to monitor the temperature and welding speed, if applicable

- Verify that, prior to seaming, the liner installer cleans the immediate area of seaming of all grease, moisture, dust, dirt, debris, or other foreign materials. Welding shall be stopped if the liner installer fails to properly clean areas of welding. Seams are to be aligned with the fewest possible wrinkles. All "fish mouths" are to be prepared for seaming.

- Observe that seaming does not take place during inclement weather. The QC Team will have final authority over the contractor to halt seaming operations. These conditions include, but are not limited to, the following:
  - Precipitation of any kind
  - Ponding water
  - Excessive heat or cold
  - Excessive wind

- Observe for the following items:
  - Correct centering of the weld
  - Water or air blisters of the weld
  - Proper adhesion of extruded bead in extrusion welding
  - Overgrinding of the panel adjacent to the extrusion seam. If overgrinding is 4 mils or greater, an extrusion bead is to be placed over the overgrind
  - Insufficient overlap
  - Lack of extrudate in extrusion seam bead
  - Poor workmanship

- Record the following next to each seam: the seamer's initials, date of seaming, time, machine number, welding temperatures and, if applicable, preheat and machine speeds, and arrows to show seaming direction. All information shall also be recorded on the Geosynthetic Field Seaming Log.

FML Trial Welds:

- Observe the creation of trial welds seamed by the installer's technicians to verify if seaming conditions and techniques are acceptable to meet the specifications. Trial welds shall be made at the following times:
  - At the beginning of each seaming period
  - At least once for each four hours of seaming
  - After a piece of equipment has cooled down after use
  - For each seaming apparatus used

- At least once per shift for each welding person performing seaming
- At the discretion of the QC Team

- Record all trial welds data on the Geosynthetic Trial Weld Log.

- Observe that trial welds meet the following conditions:
  - Clearly marked with sample identification number
  - Five-feet long by 1-foot wide sample for fusion welds, 3-feet long by 1-foot wide sample for extrusion welds
  - Same field overlap
  - Seam centered along long axis of sample
  - Sample allowed to cool

- Perform the required tests with a calibrated tensiometer and record test results on the Geosynthetic Trial Weld Log.

FML Seam Continuity (Leak) Testing:

- Observe installation contractor's seam continuity testing (e.g., vacuum box testing)

- Record any deficiencies found on seams or panels on the appropriate form and on the panel by describing the method of correction with the following terms:
  - circle - bead
  - circle with P - Patch
  - L - Leak
  - Bridge - Bridge
  - DS - Destructive sample
  - IO - Insufficient Overlap

  Further markings shall be used to identify the repair or destructive sample number. Bead repairs need not be recorded.

- Observe that insufficient overlaps are patched, and bridges are cut and patched. All holes, leaks, and destructive samples shall be patched. Patching material shall be the same type and thickness as material being repaired. All patches shall be a minimum of 6 inches larger in all directions than an area to be patched, and will have rounded corners.

- Record all repairs on the Geosynthetic Repair Log

- Observe that capping is used to repair fusion welds or excessive overgrinding

- Verify that all repairs are tested for seam continuity. The QC Team will observe all repairs and tests on seams and panels prior to acceptance of both seams and panels. If the repair passes the seam continuity test, an OK mark and the QC Team personnel initials will be placed next to the repair. All seam continuity test results will be recorded on the Geosynthetic Seam Continuity Test Log.

5.5.5 GEOTEXTILE AND GEOWEB INSTALLATION

Geosynthetic Delivery:

- Review the statement of production date or dates

- Review manufacturer's certification that the geosynthetic meets specifications outlined in the construction specifications

- Review the quality control certificates issued by the supplier

- Review test reports from the supplier

- Observe delivered rolls to identify damage that may have resulted from shipping, storage, and handling

- Observe delivered rolls to verify protection of rolls from weather and UV radiation, if necessary

- Document the geosynthetic rolls received and any discrepancies on the Log of Geosynthetics Received form

- Document any and all damage sustained while in storage

- Verify that all geosynthetic material is stored in a place free of hazard and that the following conditions are avoided:
  - UV light exposure
  - Precipitation
  - Dirt or dust
  - Cutting or puncture
  - Any other hazardous conditions

Geosynthetic Deployment:

- Observe that the subgrade surface is ready for geosynthetic deployment

- Observe the unrolled geosynthetic for defects, holes, and tears. Defective areas will be circled by the QC Team. Excessively damaged panels shall be removed.

- Review the installation contractor's methods to prevent uplift by wind

- Observe geosynthetic overlap

- Verify that the panels are deployed in a systematic fashion and record the following, as necessary, on the Geosynthetic Panel Deployment Log:
  - Properly anchored
  - Clean
  - No damage to subgrade or FML
  - Correct deployment directions
  - Correct overlapping
  - No open holes or seams at the end of day

- Verify that the installer submits progress reports to USACE on panels deployed that day. Reports should contain square footage and number of rolls used.

Geosynthetic Field Seaming:

- Observe joining or heat tacking methods

- Review the installation contractor's field seaming method

- Observe field seaming equipment

- Review qualifications and experience of field seaming personnel

- Verify that no horizontal seams are welded on slopes and that no horizontal seams are within 5 feet of the toe of slopes. In corners or odd shapes, seaming shall be minimized.

- Verify that all seaming equipment is equipped with gauges to monitor the temperature and welding speed, if applicable

- Verify that prior to seaming, the liner installer cleans the immediate area of seaming of all grease, moisture, dust, dirt, debris, or other foreign materials. Seams are to be aligned with the fewest possible wrinkles. All "fish mouths" are to be prepared for seaming.

- Observe that seaming does not take place during inclement weather. The QC Team will have final authority over the contractor to halt seaming operations. These conditions include, but are not limited to, the following:
  - Precipitation of any kind
  - Ponding water
  - Excessive heat or cold
  - Excessive wind

Geosynthetic Trial Seams:

- Observe trial seaming prior to the beginning of work, including the following:
  - Burn-through (thermal bonding)
  - Poor sealing (sewing)
  - Poor shingling and overlap

Geosynthetic Seam Testing:

- Observe that repairs are completed using the same material being repaired. The patch shall be 24 inches larger in all directions than the area being repaired. All repairs will be observed by the QC Team prior to commencement of work. Results will be recorded on the Geosynthetic Repair Log.

5.5.6 DOCUMENTATION

Field Team Members shall record geotechnical test (or analytical sample) type, date and time of tests, location and depth of test (or sample collection point), and all field testing results or screening data in the project field logbooks. Observations made during construction and site restoration earthwork shall also be recorded in field logbooks. Examples of such information include noting completion of project milestones, difficulties encountered and how problems were addressed, encountering of unexpected structures or conditions, deviations to the work scope, etc. All documentation shall be completed in indelible ink. Mistakes shall be crossed out with a single line and initialled by the recorder, and new data shall be added so as not to delete previous information. No documentation shall be discarded or destroyed.

Additionally, all analytical and geotechnical laboratory results shall be reviewed by contractor personnel and maintained in project files. All laboratory results shall be submitted by the contractor to USACE for their review and records.

5.6 QA/QC SUBMITTALS

The construction contractor shall prepare daily activity reports which include all QA/QC testing information, analytical and geotechnical sampling and testing results, field screening, health and safety monitoring results, as applicable, for the day, and a summary of the daily activities. The contractor shall also prepare a weekly report summarizing the week's activities. Much of the soil and air sampling to be performed shall have a laboratory turnaround time of one week or more. Therefore, these results shall be included in the weekly reports as received by the contractor. All submittals, including those from subcontractors and vendors, shall be supplied to USACE in accordance with Specifications 01300 and 01305. Forms to be used by the contractor are presented in Appendix H.

6.0 LANDFARM INITIAL PERMITTING REQUIREMENTS

Federal, state, and local regulatory agencies were contacted to establish initial permitting requirements for operation of a landfarming facility on CAFB. The City of Clovis and Curry County do not require permits and deferred their authority regarding this issue to NMED. NMED has RCRA authority and therefore makes decisions regarding appropriate action and cleanup levels for soil remediation operations, and enforces associated permitting requirements. The following sections outline the permitting requirements of various NMED divisions for performance of landfarming operations.

6.1 AIR

The NMED Air Quality and Air Pollution Control Divisions attempted to locate regulations applicable to the situation at CAFB. Conversations with various NMED personnel revealed that no regulations exist regarding the permitting of a landfarming facility. Air Pollution Control Division personnel recommended, based on the size of the landfarm and location away from residential areas, that USACE check with NMED on a quarterly basis to inquire about new regulations applicable to landfarming. Currently, landfarming at this location is a non-issue for NMED and no action, permitting or otherwise, is required.

6.2 GROUNDWATER

Based on the size of the landfarm facility and the depth to groundwater, the NMED Groundwater Division requires a Notice of Intent to discharge be filed. Division personnel stated that a Notice of Intent will be adequate (as compared to a detailed Discharge Permit) providing that it clearly describes the landfarming operations and procedures, the estimated contaminant concentrations, amount of impacted soil, sampling procedures, and cleanup levels. The Notice of Intent should specify what landfarming design factors, operational procedures, and cleanup levels will correspond with the UST Soil/Water Sampling and Disposal Guidelines. Site conditions (i.e., depth to groundwater, size of landfarm, etc.) should also be presented. The Notice of Intent is included in Appendix I.

6.3 SURFACE WATER

The NMED Surface Water Quality Division requires permits for construction activities affecting five or more acres of land. No surface water permit is required based on the assumption that less than five acres of land will be disturbed during construction. Also, CAFB landfarm facilities will be lined to prevent surface run-off, the surrounding area will be graded and diversion ditches installed to divert surface water run-off around the cells.

6.4 SOIL

The NMED Solid Waste Management Division does not require a permit for landfarming operations unless operations will be conducted on a commercial landfill property. The NMED Hazardous Waste and Radiation

Control Division does not require a permit for landfarming facilities. The Division does review permit applications and Notices of Intent to discharge through the NMED Groundwater Division. Similarly, the NMED UST Division suggested filing a Notice of Intent with the Groundwater Division as they do not regulate landfarming facilities. The UST Division did note that, under the requirements of the UST Soil/Water Sampling and Disposal Guidelines, CAFB must obtain prior approval from the Division if excavated soils associated with UST remediation operations exceed 1,000 cubic yards per location. Discovered releases associated with USTs must be reported to NMED UST Division within 24 hours of discovery. The contractor shall be responsible for reporting such conditions to USACE immediately upon discovery of a release, and USACE will contact the NMED UST Division within the time limit specified. USACE will be responsible for orally reporting remedial action being taken within 72 hours of discovery. This oral summary will be followed by a written report to be submitted within seven days of discovery.

7.0 CONSTRUCTION MANAGEMENT

USACE will provide the construction management text to conform with the RCRA Corrective Action Plan, OSWER Directive 9902.3-2A, May 1994, page 82.

8.0 CONSTRUCTION CONTINGENCY PROCEDURES

Changes to the design and/or specifications may be needed during construction to address unforeseen problems encountered in the field. Procedures to address such circumstances include notification by the contractor to USACE and possibly regulatory agencies such as NMED and EPA. In the event of a construction emergency (i.e., fire, earthwork failure, etc.), the contractor will orally notify USACE immediately, and notify the implementing regulatory agencies within 24 hours of the event and in writing within 72 hours of the event. This written notification must, at a minimum, specify what happened, what response action was taken and/or is planned, and any potential impacts on human health and/or the environment. If the event prevents completion of the planned corrective measures for the site (i.e., unit removal), secondary corrective measures will be planned by the contractor and USACE. These secondary corrective measures shall be reviewed and approved by implementing regulatory agencies.

9.0 PROJECT SCHEDULE

The project schedule, presented in Table 3, shows the timing for key elements of the bidding process, timing for initiation and completion of all major corrective measure construction tasks, and the timing of the submittal of the Construction Completion Report.

Table 3. Project Schedule

Event or Task	Duration (weeks)	Completion Date
Advertisement	0	
Bid Meeting	0	
Bids Due	0	
Contract Awarded	0	
Notice-to-Proceed	0	
Pre-Construction Conference	0	
Mobilization	2	
Construction Equipment and Schedule Submittal	0	
Landfarm Construction	8	
Removal, Disposal, and Replacement of Units	29	
Site Restoration	19	
Landfarm O&M	Ongoing	
Corrective Measure Completion Report	0	
Construction Completion Report	0	

10.0 COST ESTIMATE

USACE will provide the cost estimate herein to conform with the RCRA Corrective Action Plan, OSWER Directive 9902.3-2A, May 1994, page 83.

11.0 REFERENCES

American Petroleum Institute (API). December 1987 and March 6, 1989. API Publication 1604 and Supplement. "Removal and Disposal of Used Underground Petroleum Storage Tanks."

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APPENDIX A

SITE-SPECIFIC HEALTH AND SAFETY PLAN

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SITE-SPECIFIC HEALTH AND SAFETY PLAN

This site-specific Health and Safety Plan (HASP), in conjunction with other portions of the CWP, specifications, and drawings, has been developed for USACE. The HASP identifies, evaluates, and recommends control measures for potential safety and health hazards, as well as provides emergency response procedures during the removal and disposal of units, replacement of OWS and drains, and construction of a landfarm at CAFB, Clovis, New Mexico.

This HASP has been prepared in conformance with the Safety Program for Hazardous Waste Sites, Occupational Safety and Health Administration (OSHA) standards, and USACE standards (i.e., Fire Protection for Facilities). This HASP presents health, safety, and emergency response activities involved with unit removal (and related appurtenances) operations at CAFB. Compliance with this HASP and CAFB regulations is required of all contractor personnel involved with removal operations.

The purpose of this HASP is to:

- Detail the safety, accident prevention, decontamination, construction, and fire protection standards and procedures to be used during the course of site work
- Outline procedures to ensure the safety and health of all personnel performing activities associated with the CWP
- Outline emergency and contingency plans for protection of personnel and for any contingencies that may affect personnel during unit removal and related activities
- Designate the responsibilities and authorities for implementing this HASP

Health and safety reporting procedures are also outlined in this HASP. All employees working on this project (including temporary employees) must be familiar with the information, instructions, and emergency response actions contained in this HASP. All employees directly involved with site field activities must read and sign the HASP acknowledgement page prior to participating in field activities. Signature of the HASP serves as documentation that listed personnel have read and understand the contents of the HASP, and that listed personnel have received a site-specific pre-entry safety briefing by the Site Safety and Health Officer (SSHO).

Site visitors will be required to attend a site pre-entry safety briefing which covers all elements of this HASP. This pre-entry briefing will be performed by the SSHO. Visitors will be accompanied by the SSHO or other contractor representative while onsite at all times. Following review of the HASP and performance of the site pre-entry briefing, temporary workers will be required to work under the direct supervision of a contractor-designated supervisor for a minimum of one 8-hour shift.

Any modifications to this HASP shall be approved and documented by the SSHO prior to implementation. Following approval of the modifications, said modifications will be presented to all involved employees during periodic health and safety tailgate meetings. Tailgate safety meetings will be presented by the SSHO and documented on Tailgate Safety Meeting Forms.

The HASP shall be made available for inspection and review by all employees participating in field activities, including OSHA and military personnel, and other temporary employees or visitors. A copy of the HASP shall be readily available during field activities (i.e., stored at the site, job trailer, or in vehicles used to transport employees about the site).

1.1 SUMMARY

Site Name: Cannon Air Force Base (multiple unit locations)

Approximate Size of Area where Work Activities are to be Conducted:

The work area consists of multiple unit locations near the following base buildings or pads: #119, #129, #165, #170, #186, #194, #195, #196, #326, #375, #379, #494, #5077, #5120, and #5144. The operational area required for removal of the units and associated appurtenances consists of approximately 0.5 acre per unit totaling approximately 8.5 acres. The above listed buildings and associated units are located in the aircraft hangar area. The landfarm facility, also covered under this HASP, is located at the north end of the decommissioned runway.

Summary of Project Objectives:

Removal of the above referenced units, associated appurtenances, and related petroleum hydrocarbon and metals impacted soils from the vicinity surrounding the units. Limited replacement of several units, restoration of each site, transportation of impacted soils, and landfarming operations associated with treatment of recovered petroleum hydrocarbon impacted soils.

Summary of Project Tasks and Responsibilities:

Task	Description
Task 1	Construction of temporary landfarm facility for treatment of petroleum hydrocarbon impacted soils. This task will require placement of asphalt pavement, installation of precast concrete or other berm materials, geosynthetic materials deployment, pipework, and implementation of heavy construction equipment. Task will utilize construction laborers, equipment operators, engineers, and health and safety personnel. Multiple subcontractors may be used for the various duties required for construction of the landfarm (i.e., concrete, asphalt, geosynthetic materials installers, technical support staff from material vendors, etc.).

Task 2 Removal of OWS, associated piping, USTs, sand traps, drains, and leach wells. Excavation of petroleum hydrocarbon (and possibly metals) impacted soils. This task will require temporary sealing of product lines, purging of units and related appurtenances, cutting and removal of piping, use of cranes for removal of units and heavy construction and excavation equipment. Task will utilize construction laborers, equipment operators, engineers, soil sampling technicians, and health and safety personnel. Ambient air monitoring will be required above and within the limits of any excavations. Units will be considered confined spaces and will not be entered until they have been purged in accordance with API publication 1604 and appropriate monitoring has been performed to ensure a safe environment. Access to the units will be strictly controlled, and entry will not be performed unless absolutely necessary for removal of the units.

Task 3 Limited replacement of designated OWS and drains, piping reconnects, and site restoration including backfilling/compaction, grading, and placement of concrete, asphalt, or other surficial materials. This task will require pipework to reconnect product lines and replaced units, cranes for placement of OWS and drains, and heavy construction equipment for backfilling, compacting, grading, and resurfacing. Task will utilize construction laborers, equipment operators, engineers, and health and safety personnel. Ambient air monitoring will be required above and within the limits of any excavations subsequent to the removal of impacted soils.

Task 4 Transportation of impacted soils to landfarm facility and subsequent landfarming operations for treatment of the impacted soils. This task will require implementation of farming or construction equipment for placement, tilling, and removal of excavated soils. Task will utilize heavy equipment operators, truckers, soil sampling technicians, engineers, operations and maintenance personnel, and health and safety personnel.

No welding, torch and open flame are allowed within the work zone.

Tasks 1 and 2 may require the implementation of shoring (i.e., trench boxes, etc.) during removal of units, and replacement of OWS and drains.

Air monitoring will be performed according to the procedures described in the following sections and in accordance with the procedures outlined in referenced publications.

Duration of Planned Activities:

1. Estimated time for project completion:

   Landfarm construction, unit removal and unit replacement operations - 37 weeks

   Landfarm O&M - ongoing basis

2. Anticipated Shift Schedule:

9 to 12 hours per day, 45 to 70 hours per week

Project Representatives, Emergency Contacts and Phone Numbers:

USACE Project Manager:	Ms. Susan Gant	(505) 766-1363
CAFB Project Manager:	Mr. John Pike	(505) 784-4348
Contractor Project Manager:		
Contractor Project SSHO:		
Subcontractor Project Manager(s):		

All questions regarding health and safety for this project should be directed to Mr. Dave Willett, CIH, USACE, Albuquerque District at (505) 766-1791.

Medical Facilities:

The CAFB Hospital is located at 208 West Casablanca Avenue, and can be reached at 784-4033. Drawing 1 shows the location of the base hospital. The nearest off-base hospital is the Plains Regional Medical Center (formerly Clovis High Plains Hospital) located at 2100 North Thomas Street, (505) 769-2141. To get to the hospital, exit CAFB and travel east on Route 60/84 into Clovis. Make a left (north) on Thomas Street. The hospital is on the left (west) side of the street near the intersection of Thomas Street and 21st Street.

1.2 HAZARD ANALYSIS

Chemical Hazard Analysis:

Project Task	Chemical Hazard
Tasks 2 through 4	Units and associated piping, etc. may contain residual petroleum hydrocarbon related sludges, liquids, and vapors. Soils excavated from around the units and treated in the landfarm may contain varying degrees of petroleum hydrocarbon and heavy metals contamination. Section 1.3 and Table 1 provide a list of contaminants identified in the RFIs as being above the upper threshold limits. Petroleum hydrocarbon contamination includes a wide range of compounds with varying chemical characteristics and volatilization rates (from benzene to diesel, heavy oils and greases). Metals contamination includes but is not limited to lead, cadmium, chromium, arsenic, mercury, and beryllium. Several other metals are present, although many of these elements (and their detected concentrations) are indigenous to the soils of this area. The RFI reports shall be reviewed by the contractor for specific compounds detected at each individual unit location and unit-specific modifications made to this HASP to address appropriate personal protective equipment (PPE) and monitoring requirements

as deemed necessary by the SSHO. The contractor shall also review the RFIs for risk assessment and hazard evaluation information.

Types of materials expected to be encountered at the site while performing Tasks 2 through 4:

- Soils containing lead, arsenic, mercury, cadmium, beryllium, chromium, solvents, gasoline, jet fuel, diesel, oil, and grease

Available Material Safety Data Sheets (MSDSs) and/or chemical fact sheets for these and any other chemicals brought to the site will be included with this HASP. These sheets shall be updated onsite as needed to cover all materials used during construction and those recovered hazardous materials associated with the units and impacted soil. The MSDSs contain exposure limits, hazards, symptoms of overexposure, first aid procedures, and other pertinent information about each chemical. This attachment shall be updated in the field by the SSHO. If MSDSs cannot be acquired for certain naturally occurring minerals, health data sheets shall be provided by the contractor. The contractor is responsible for providing all MSDS/chemical fact sheets.

Possible routes of exposure for these chemicals (all applicable routes listed):

- Dermal (skin) contact and absorption
- Inhalation
- Ingestion

As previously stated, attached MSDSs provide chemical-specific information related to exposure hazards and bodily entry pathways. In general, the entry route with the most potential for chemical exposure involves inhalation of petroleum hydrocarbon vapors and metals-containing dusts present in the soil. Tasks 2 through 4 will involve the potential exposure of personnel to these vapors and dusts. Similarly, although personnel may not be directly handling impacted soils, the potential for contact with contaminants is moderate as personnel will be involved in removing units and associated appurtenances from the subsurface. The potential for dermal absorption exists with many of the compounds found in petroleum hydrocarbon products. Standard hygiene practices including proper decontamination prior to leaving the site and prohibition of eating, drinking, or smoking near site activities combined with proper selection and usage of PPE should eliminate the potential for ingestion of contaminants.

Physical Hazard Analysis:

Project Task	Physical Hazard
Task 1	Temperature extremes, manual material handling, heavy equipment and truck traffic, excessive noise exposure (jet aircraft).

Task 2	Temperature extremes, manual material handling, heavy equipment operation and truck traffic, open trenches, excavations, confined space, fire hazards, energized/pressurized line hazards, overhead utilities and obstacles, hazards associated with operating cranes, uneven ground and trips/slips/falls, excessive noise exposure (jet aircraft).
Task 3	See Task 2.
Task 4	Temperature extremes, manual material handling, heavy equipment operation and truck traffic, trips/slips/falls, and excessive noise exposure (jet aircraft).

Training Requirements:

Each site worker shall have completed a 40-hour hazardous materials training class and be authorized by a licensed physician to perform site work according to the requirements set forth in OSHA Standard 29 CFR 1910.120. Personnel shall also be qualified by the physician to use a respirator in accordance with 29 CFR 1910.134. Personnel shall also be trained and current in first aid and CPR. All of the certificates for the above training and medical surveillance shall be provided by the contractor in Attachment A. In addition to these requirements, site-specific training shall be conducted and shall consist at a minimum of the following:

- A health and safety orientation prior to start of onsite work using this HASP as an instructional guideline, consisting of a minimum of two hours of instruction.

- The orientation shall also be used to review standard operating procedures and safe work practices; this instruction will be performed by the SSHO and the construction manager/superintendent. The CWP can be used as an instructional guideline in combination with the Contractor's Standard Operating Procedures (SOPs) as related to the requirements of each of the four outlined tasks.

- Tailgate health and safety meetings, minimum one per week, and additional meetings as deemed necessary by the SSHO.

Other planned training activities related to this project include:

- Fit testing of all field personnel should the decision be made that respiratory protection will be required. Personnel shall also review cleaning and maintenance procedures for their respective respiratory protective gear, if respiratory protection is required.

- Inform all subcontractors that OSHA standard 29 CFR 1910.120 applies to their site field activities, and provide them with training regarding the hazards associated with the site in accordance with 29 CFR 1910.1200, Hazard Communication.

Tasks 2 and 3 of the project involve the use of heavy construction equipment and the excavation of the units and impacted soils. At least one of the contractor's supervisors will be authorized as a competent person for the purposes of inspecting open excavation and slope stability and will be accessible onsite during all Task 2 and 3 operations. The competent person will have the training and experience to evaluate the excavations and the authority to correct deficiencies (possibly suspending work) within the excavation. The appointed competent person's credentials shall be approved by USACE prior to commencement of site activities. The SSHO's credentials shall also be provided and approved by USACE prior to commencement of site activities.

Medical Surveillance:

Contractor personnel that are involved with onsite work should participate in a medical surveillance program which includes baseline and routine annual follow-up physical examinations. The program should be specifically designed for personnel working on hazardous waste sites. Contractor's onsite workers shall also receive a medical examination at the termination of their employment, unless their annual exam has occurred within six months of termination.

1.3 ENGINEERING CONTROLS AND WORK PRACTICES

The following engineering controls, work practices, and PPE shall be employed during site operations in order to minimize the potential for exposure to petroleum hydrocarbon vapors and impacted soils and metals impacted soils:

Project Task	Engineering Controls/Work Practices
Task 1	Follow all related construction safety standards as outlined in 29 CFR 1926, Construction Industry Safety and Heath Standards.
Tasks 2 and 3	Use water spray to lightly moisten subsurface working area materials to reduce dust hazard. Utilize respirators as per air monitoring section. Inspect crane on a daily basis according to manufacturer's specifications and 29 CFR 1926 Subpart N standards. Inspect open trenches and excavations on a daily basis according to 29 CFR 1926 Subpart P Standards. Ensure all manual and mechanically powered hand tools are inspected and meet the requirements set forth in 29 CFR 1926 Subpart I. Ensure all subsurface utility lines are located and marked. De-energize all sources of electrical, mechanical, chemical, or otherwise powered utility and product lines prior to commencing operations involving said lines. Use the distance method or line blanketing as per power company standards for protecting heavy equipment from

electrical shock. The OWS and USTs associated with the units are considered confined spaces. Entry to these process and storage tanks will be strictly controlled, minimized, and performed only after the proper steps have been performed to clean and purge the tanks from all residual liquids and vapors in accordance with API 1604, New Mexico Environmental Department Underground Storage Tank Regulations, and 29 CFR 1910.146 Standards. All trenching and excavation shall meet OSHA excavation requirements 29 CFR 1926, Subpart P, 20 CFR Part 1926 and 29 CFR Part 1910; and confined space requirements 29 CFR 1910.146.

Task 4 Air monitoring will be performed as per the air monitoring section and PPE used as specified therein. Safe work practices involving heavy equipment operation will be observed during spreading, tilling, and removal of treated soils. Proper decontamination as per the decon section (below) will prevent the transport of contaminants away from the landfarm facility.

Excavation Operations:

Health and safety protocols and procedures that will be implemented during all excavation operations at the site include the following:

- During the excavation operations the contractor will visually assess excavation sideslope stability and subgrade strength. Personnel will not be allowed to enter unsupported excavations or work next to unsupported excavation sideslopes unless the contractor's registered professional engineer determines that excavation stability conditions are safe to do so. If required, excavations will be supported in accordance with the specifications.

- All personnel participating in the site operations will be made aware and will be required to stay clear of transportation routes for heavy equipment operation. Personnel will maintain visual contact with heavy equipment operators at all times. Personnel will not work directly behind heavy equipment and will be aware of counterweight swing radius and movement.

- Use of any electrical equipment within the excavation will require the use of ground fault circuit interrupters. No personnel will be allowed to operate electrical equipment in standing water.

- Egress from open excavations (e.g., ladders, ramps) will be maintained around the excavation. Ladders will be secured and appropriately tied off.

- A lay down area will be established for storage of materials (e.g., casing, shoring materials). No stacking or leaning of unsupported or unsecured casings, lumber, or other heavy materials or equipment will be allowed along excavation sideslopes or against buildings.

- Good housekeeping will be maintained at the site at all times. Electrical cords, compressor lines and pump lines will be set away from walkways and ladders to prevent tripping hazards.

- Fire protection equipment will be maintained at the site at all times. Fire extinguishers and a spotter will be utilized and be on hand during any hot work at the site.

If requirements for a confined space are identified as indicated in 29 CFR 1910.146, then specific health and safety procedures shall be established before proceeding. These procedures shall comply with all applicable and relevant requirements of 29 CFR 1910.146.

1.4 AIR MONITORING AND PERSONAL PROTECTIVE EQUIPMENT

Vapor Monitoring:

Based on the site characterization, the level of protection (LOP) required for operations at the site will be determined by breathing space monitoring. Level C protection will be required for the site activities for this HASP until adequate site characterization and monitoring has been performed and analyzed indicating Level D PPE as adequate. Background total organic vapor (TOV) readings will be established using a flame ionization detector (FID). The FID will be calibrated according to the manufacturer's instructions before and after measuring background levels with the manufacturer recommended gas, or 100 parts per million (ppm) isobutylene. If sustained readings of 5 ppm or greater above background are measured in the breathing zone, don full-face air purifying respirators (APR) with combination particulate/organic vapor cartridges and sample specific to benzene using Draeger tubes, or evacuate the work area, evaluate site conditions, and implement available engineering controls. The following action levels shall be implemented for this project:

PID/FID readings of background to 1 ppm:	Level D
PID/FID readings greater than 1 ppm to 5 ppm above background:	Level C
PID/FID readings greater than 5 ppm:	EVACUATE THE SITE, provide engineering controls to lower vapors, or upgrade to Level B

Readings will be taken prior to commencement of site activities, when the job location changes, every 20 minutes during unit removal and unit replacement operations, and other times deemed necessary by the SSHO.

Note that Level D protection applies only after adequate site characterization has been performed indicating that Level C protection is not required to protect workers from metal dust/fume exposures.

Sustained readings mean readings taken and concentrations maintained for 30 seconds or longer.

Smoking and the use of other open flame sources such as cutting torches and welding equipment will be prohibited within 50 feet of the excavation perimeter or any associated removed unit appurtenances. Prior to cutting or burning piping (if required), the air will be monitored as above and additionally, the lower explosive limit (LEL) will be monitored. Readings of 20 percent or less of the LEL must be obtained before the OWS/UST/piping/drain is considered safe for removal or cutting. The apparatus being cut/burned must also be purged of combustible vapors prior to commencement of cutting operations. A fire watch will be posted during and 30 minutes following completion of cutting operations. Observe the safety standards outlined in 29 CFR 1926, Subpart J.

Dust/Fume Monitoring:

Personal monitoring using personal sampling pumps and minirams for ambient air quality shall be used at unit removal locations. Landfarm area ambient air monitoring using miniram should be performed. All air monitoring shall be performed in accordance with all applicable OSHA, National Institute for Occupational Safety and Health (NIOSH), state, and U.S. Environmental Protection Agency (EPA) guidelines. It is recommended that Level C PPE be worn until an adequate database of personal sampling information confirms that metal dusts and fumes are below appropriate OSHA PELs. Each job activity in each task should be characterized using personal sampling air monitoring pumps for at minimum lead, arsenic, and cadmium, to evaluate potential metals dust/fumes exposures prior to downgrading to Level D. Should this sampling information indicate that Level C PPE is adequate, personal sampling should be continued at a minimum of one person per day. The job activity indicating the highest potential for metals exposure as noted from the initial characterization data should be monitored daily with another task randomly chosen and monitored on a weekly basis. This sampling routine will provide adequate data to ensure that chemical exposures to metal dusts and fumes are being adequately controlled during unit removal and replacement operations.

In order to fully characterize and evaluate the chemical hazards at the site, a Certified Industrial Hygienist should review sampling analyses data to determine if additional monitoring is required and to determine if Level D PPE will be adequate. ESE cannot assume liability for hazard assessment, monitoring, or for the overall health and safety of site workers unless allowed to perform the monitoring and sampling analyses evaluations during site operations.

Primary (Level C) PPE Requirements:

Level C PPE will consist of the following equipment:

Steel-toed safety shoes, hard hat, ear plugs, rubber booties or boots, poly Tyvek or Saranex protective suits, full-face respirators with combination particulate/organic vapor cartridges, surgical inner gloves with teflon or viton outer gloves.

Level D PPE will consist of the following equipment:
Steel-toed safety shoes, hard hat, ear plugs, safety glasses, and surgical gloves.

Additional Controls, PPE, and Safety Equipment:
Where possible, enclosed cab construction equipment should be utilized to minimize exposure to hazardous vapors and metal dusts and fumes.

Noise levels above 85 dbA require implementation of a hearing conservation program while noise levels above 90 dbA require implementation of hearing protection. Historical data indicate that construction operations utilizing heavy equipment exceed 90 dbA; therefore, hearing protection will be required as directed by 29 CFR 1910.95. Hearing protection should be available at all times while on base due to the excessive noise produced by jet airplane activity.

Additional safety equipment required at each removal site includes a fire extinguisher, first aid kit, eyewash kit, explosimeter, FID, scrub brushes and decon wash buckets, brooms and long-handled brushes for vehicle decon, decontamination wash solutions (Liquinox), plastic trash bags for used PPE collection, and 6-mil liner material for use as vehicle decon pads.

Site Control Methods and Procedures:
The site SSHO will establish overhead clearance areas, exclusion zones, contamination reduction zones, decontamination areas, and support zones for each unit removal area. These areas will be marked with safety cones and/or tape, and open excavations shall be secured using barricades or security fencing if left open overnight or unattended for more than one day. All potentially contaminated equipment and personnel shall remain within the limits of the exclusion zone until properly decontaminated. A decontamination station will be established within the contaminant reduction zone surrounding the exclusion zone. The support zone will serve as equipment storage area and provide an area for workers to eat, drink, and rest.

Heat Stress:
Heat stress could potentially affect personnel conducting excavation and soil removal activities. The potential for heat stress depends on the type of protective gear being worn, the ambient temperature, and the amount of activity. Work cycle lengths will be based initially on subjective input from personnel. Employees will report any cases of dizziness, excessive sweating, increased respiratory rate, or pulse and are to leave the work area immediately if these conditions are noted. Work cycle lengths will be reduced and a monitoring program will be initiated if the above symptoms are noted. Work cycles will be reduced if a pulse rate of greater than 110 is noticed at the beginning of the break. Personnel with elevated rates will not return to work until the pulse has lowered to their resting rate. First aid procedures will be used for heat related conditions, as necessary.

Cold Stress:

During remedial activities, workers may also become exposed to cold temperatures when onsite. Although frostbite is not a likely hazard during expected operation periods (summer), hypothermia can occur any month of the year in northern climates. Factors leading to hypothermia include ambient temperature, wind velocity, precipitation, exposure time, and type of protective gear being worn.

Signs of excess cold exposure include uncontrollable fits of shivering, slurred speech, memory lapses, immobile hands, stumbling, drowsiness, and exhaustion. Treatment for these symptoms are to remove the victim from the wind and cold, remove wet clothing, supply a warm drink, and keep the victim warm with blankets or clothing.

1.5 DECONTAMINATION PROCEDURES

A decontamination plan shall be developed by the contractor and set up before any worker or equipment may enter areas where the potential for exposure to hazardous substances exists. The decontamination plan shall accomplish the following:

- Determine the number and layout of decontamination stations
- Determine the decontamination equipment needed
- Determine appropriate decontamination methods
- Establish procedures to prevent contamination of clean areas
- Establish methods and procedures to minimize worker contact with contaminants during removal of personal protective clothing and PPE
- Establish methods for disposing of clothing and equipment that are not completely decontaminated

The plan shall be revised whenever the type of personal protective clothing or equipment changes, the site conditions change, or the site hazards are reassessed based on new information.

The first step in decontamination is to establish the Standard Operating Procedures that minimize contact with waste and thus the potential for contamination. The following situations are provided as examples.

- Implement work practices that minimize contact with hazardous substances (e.g., do not walk through areas of obvious contamination, do not directly touch potentially hazardous substances if not absolutely required; use tools).

- Use remote sampling, handling, and container-opening techniques.

- Protect monitoring and sampling instruments by bagging. Make openings in the bags for sample ports and sensors that must contact or monitor site materials.

- Wear disposable outer garments and use disposable equipment where appropriate.

- Encase the source of contaminants with plastic sheeting or overpacks.

Procedures for dressing prior to entering the Exclusion Zone will minimize the potential for contaminants to bypass the protective clothing and escape decontamination. In general, all fasteners shall be used (i.e., zippers fully closed, all buttons used, all snaps closed, etc.). Gloves and boots shall be tucked under the sleeves and legs of outer clothing, and hoods (if not attached) shall be worn outside the collar. Another pair of tough outer gloves is often worn over the sleeves. All junctures shall be taped to prevent contaminants from running inside the gloves, boots, and jackets (or suits, if one-piece construction).

Prior to each use, the PPE shall be checked to ensure that it contains no cuts or punctures that could expose workers to wastes. Similarly, any injuries to the skin surface, such as cuts and scratches, may enhance the potential for chemicals or infectious agents that directly contact the worker's skin to penetrate into the body. Particular care shall be taken to protect these areas. Workers with large areas of damaged skin shall be kept from working onsite until the skin heals.

Contaminants can be located either on the surface of PPE or may permeate into the PPE material. Surface contaminants may be easy to detect and remove; however, contaminants that have permeated a material are difficult or impossible to detect and remove. If contaminants that have permeated a material are not removed by decontamination, they may continue to permeate to the skin surface where they may cause additional exposure.

Five major factors affect the extent of permeation.

- Contact time - The longer a contaminant is in contact with an object, the greater the probability and extent of permeation. For this reason, minimizing contact time is one of the most important objectives of a decontamination program.

- Concentration - Molecules flow from areas of high concentration in areas of low concentration. As concentrations of wastes increase, the potential for permeation of personal protective clothing increases.

- Temperature - An increase in temperature generally increases the permeation rate of contaminants.

- Size of contaminant molecules and pore space - Permeation increases as the contaminant molecule becomes smaller and as the pore space of the material to be permeated increases.

- Physical state of wastes - As a rule, gases, vapors, and low-viscosity liquids tend to permeate more readily than high-viscosity liquids or solids.

All personnel, clothing, equipment, and samples leaving the contaminated area of a site (generally referred to as the Exclusion Zone) shall be decontaminated to remove any harmful chemicals that may have adhered to them. Decontamination methods either (1) physically remove contaminants, (2) inactivate contaminants by chemical detoxification or disinfection/sterilization, or (3) remove contaminants by a combination of both physical and chemical means.

In many cases, gross contamination can be removed by physical means involving dislodging/displacement, rinsing, wiping off, and evaporation. Physical methods involving high pressure and/or heat should be used only as necessary and with caution since they can spread contamination and cause burns. Contaminants that can be removed by physical means can be categorized as follows:

- Loose contaminants - Dusts and vapors that cling to equipment and workers or become trapped in small openings, such as the weave of the clothing fabrics, can be removed with water or a liquid rinse. Removal of electrostatically attached materials can be enhanced by coating the clothing or equipment with anti-static solutions. These are available commercially as wash additives or anti-static sprays.

- Adhering contaminants - Some contaminants adhere by forces other than electrostatic attraction. Adhesive qualities vary greatly with the specific contaminants and the temperature. For example, contaminants such as glues, cements, resins, and muds have much greater adhesive properties than elemental mercury and, consequently, are difficult to remove by physical means. Physical removal methods for gross contaminants include scraping, brushing, and wiping. Removal of adhesive contaminants can be enhanced through certain methods such as solidifying, freezing (e.g., using dry ice or ice water), adsorption or absorption (e.g., with powdered lime or kitty litter), or melting.

- Volatile liquids - Volatile liquid contaminants can be removed from protective clothing or equipment by evaporation followed by a water rinse. Evaporation of volatile liquids can be enhanced by using steam jets. With any evaporation or vaporization process, care must be taken to prevent worker inhalation of the vaporized chemicals.

Physical removal of gross contamination should be followed by a wash/rinse process using cleaning solutions. These cleaning solutions normally utilize one or more of the following methods.

- Dissolving contaminants - Chemical removal of surface contaminants can be accomplished by dissolving them in a solvent. The solvent must be chemically compatible with the equipment being cleaned. This is particularly important when decontaminating personal protective clothing constructed of organic materials that could be damaged or dissolved by organic solvents. In addition, care must be taken in selecting, using, and disposing of any organic solvents that may be flammable or potentially toxic. Organic solvents include alcohols, ethers, ketones, aromatics, straight-chain alkanes, and common petroleum products. Halogenated solvents generally are incompatible with PPE and are toxic. They should only be used for decontamination in extreme cases where other cleaning agents will not remove the contaminant.

- Surfactants - Surfactants augment physical cleaning methods by reducing adhesion forces between contaminants and the surface being cleaned and by preventing redeposit of the contaminants. Household detergents are among the most common surfactants. Some detergents can be used with organic solvents to improve the dissolving and dispersal of contaminants into the solvent.

- Solidification - Solidifying liquid or gel contaminants can enhance their physical removal. The mechanisms of solidification are (1) moisture removal through the use of adsorbents such as grounded clay or powdered lime; (2) chemical reactions via polymerization catalysts and chemical reagents; and (3) freezing using ice water.

- Rinsing - Rinsing removes contaminants through dilution, physical attraction, and solubilization. Multiple rinses with clean solutions remove more contaminants than a single rinse with the same volume of solution. Continuous rinsing with large volumes will remove even more contaminants than multiple rinsing with a lesser total volume.

At a hazardous waste site, decontamination facilities should be located in the Contamination Reduction Zone (CRZ) in the area between the Exclusion Zone (the contaminated area) and the Support Zone (the clean area).

The level and types of decontamination procedures required depend on several site-specific factors including the following:

- The chemical, physical, and toxicological properties of the wastes
- The pathogenicity of infectious wastes
- The amount, location, and containment of contaminants
- The potential for, and location of, exposure based on assigned worker duties, activities, and functions
- The potential for wastes to permeate, degrade, or penetrate materials used for personal protective clothing and PPE, vehicles, tools, buildings, and structures
- The proximity of incompatible wastes

- The movement of personnel and/or equipment among different zones
- Potential emergencies
- The methods available for protecting workers during decontamination
- The impact of the decontamination process and compounds on worker safety and health

Decontamination procedures must provide an organized process by which levels of contamination are reduced. The decontamination process should consist of a series of procedures performed in a specific sequence. For example, outer, more heavily contaminated items (e.g., outer boots and gloves) should be decontaminated and removed first, followed by decontamination and removal of inner, less contaminated items (e.g., jackets and pants). Each procedure should be performed at a separate station in order to prevent cross-contamination. The sequence of stations is called the decontamination line.

Stations should be separated physically to prevent cross-contamination and should be arranged in order of decreasing contamination, preferably in a straight line. Separate flow patterns and stations should be provided to isolate workers from different contamination zones containing incompatible wastes. Entry and exit points should be conspicuously marked, and the entry to the Contamination Reduction Zone (CRZ) from the Exclusion Zone should be separate from changing areas for exit from the CRZ. Personnel who wish to enter clean areas of the decontamination facility should be completely decontaminated.

Table 1 lists recommended equipment for decontamination of personnel, personal protective clothing, and equipment. In selecting decontamination equipment, consider whether the equipment itself can be decontaminated for reuse or can be easily disposed of. Table 2 lists recommended equipment for decontamination of large equipment and vehicles. Note that other types of equipment not listed in Tables 1 and 2 may be appropriate in certain situations.

All equipment used for decontamination must be decontaminated and/or disposed of properly. Buckets, brushes, clothing, tools, and other contaminated equipment should be collected, placed in containers, and labeled. Also, all spent solutions and wash water should be collected and disposed of properly. Clothing that is not completely decontaminated should be placed in plastic bags pending further decontamination and/or disposal. Water, soil, rinse solutions, and other natural media collected during decon will be taken to the landfarm facility and treated with the excavated soils.

Decontamination workers who initially come in contact with personnel and equipment leaving the Exclusion Zone will require more protection from contaminants than decontamination workers who are assigned to the last station in the decontamination line. In some cases, decontamination personnel should wear the same levels of PPE as workers in the Exclusion Zone. In other cases, decontamination personnel may be sufficiently protected

by wearing one level lower protection (e.g., wearing Level C protection while decontaminating workers who are wearing Level B).

The level of protection required will vary with the type of decontamination equipment used. For example, workers using a steam jet may need a different type of respiratory protection than other decontamination personnel because of the high moisture levels produced by steam jets. In some situations, the cleaning solutions used and wastes removed during decontamination may generate harmful vapors. Appropriate equipment and clothing for protecting decontamination personnel should be selected by a qualified health and safety expert.

TABLE 1. SOME RECOMMENDED EQUIPMENT FOR DECONTAMINATION OF PERSONNEL AND PERSONAL PROTECTIVE CLOTHING AND EQUIPMENT

- Drop cloths of plastic or other suitable materials on which heavily contaminated equipment and outer protective clothing may be deposited.
- Collection containers, such as drums or suitably lined trash cans, for storing disposable clothing and heavily contaminated personal protective clothing or equipment which must be discarded.
- Lined box with adsorbents for wiping or rinsing off gross contaminants and liquid contaminants.
- Large, galvanized tubs, stock tanks, or children's wading pools to hold wash and rinse solutions - these should be at least large enough for a worker to place a booted foot in, and should have either no drain or a drain connected to a collection tank or appropriate treatment system.
- Wash solutions selected to wash off and reduce the hazards associated with the contaminants.
- Rinse solutions selected to remove contaminants and contaminated wash solutions.
- Long-handled, soft-bristled brushes to help wash and rinse off contaminants.
- Paper or cloth towels for drying protective clothing and equipment.
- Lockers and cabinets for storage of decontaminated clothing and equipment.
- Metal or plastic cans or drums for contaminated wash and rinse solutions.
- Plastic sheeting, sealed pads with drains, or other appropriate methods for containing and collecting contaminated wash and rinse solutions spilled during decontamination.
- Shower facilities for full body wash or, at a minimum, personal wash sinks (with drains connected to a collection tank or appropriate treatment system).
- Soap or wash solution, wash cloths, and towels for personnel.
- Lockers or closets for clean clothing and personal item storage.

TABLE 2. SOME RECOMMENDED EQUIPMENT FOR HEAVY EQUIPMENT AND VEHICLE DECONTAMINATION

- Six-mil plastic drop cloths beneath entire decon area with surrounding berms for containment of spilled soils and for collection of rinseate liquids.
- Storage tanks of appropriate treatment systems for temporary storage and/or treatment of contaminated wash and rinse solutions.
- Drains or pumps for collection of contaminated wash and rinse solutions.
- Long-handled brushes for general exterior cleaning.
- Wash solutions selected to remove and reduce the hazards associated with the contamination.
- Rinse solutions selected to remove contaminants and contaminated wash solutions.
- Pressurized sprayers for washing and rinsing, particularly hard-to-reach areas.
- Curtains, enclosures, or spray booths to contain splashes from pressurized sprays.
- Long-handled brushes, rods, and shovels for dislodging contaminants and contaminated soil caught in tires and the underside of vehicles and equipment.
- Wash and rinse buckets for use in the decontamination of operator areas inside vehicles and equipment.
- Brooms and brushes for cleaning operator areas inside vehicles and equipment.
- Containers for storage and disposal of contaminated wash and rinse solutions, damaged or heavily contaminated parts, and equipment to be discarded.
- Vehicles will be visually inspected (following loading and decon) prior to leaving the decon area.
- Loading of trucks should be performed carefully to minimize spillage and decon time.
- A dry (physical) decon method should be used to decon vehicles as much as possible to minimize rinseates.
- Truck beds should be covered prior to leaving the loading/decon area to minimize dust during transport of soil to the landfarm facility.

All decontamination workers are in a contaminated area and must themselves be decontaminated before entering the clean Support Zone. The extent of their decontamination should be determined by the types of contaminants they may have contacted and the type of work they performed. All decontamination procedures shall be implemented by the SSHO and modified as needed according to location-specific information (i.e., containment characterization from RFIs, etc.).

Emergency Decontamination:

In addition to routine decontamination procedures, emergency decontamination procedures must be established. In an emergency, the primary concern is to prevent the loss of life or severe injury to site personnel. If immediate medical treatment is required to save a life, decontamination should be delayed until the victim is stabilized. If decontamination can be performed without interfering with essential life-saving techniques or first aid, or if a worker has been contaminated with an extremely toxic or corrosive material that could cause severe injury or loss of life, decontamination must be performed immediately. If an emergency due to a heat-related illness develops, protective clothing should be removed from the victim as soon as possible to reduce the heat stress. During an emergency, provisions must also be made for protecting medical personnel and disposing of contaminated clothing and equipment.

1.6 EMERGENCY RESPONSE AND SPILL CONTAINMENT PLAN

Prior to the commencement of the site activities, all personnel must be familiar with this HASP. Contractor personnel will notify local emergency services and personnel of the work location. A route map showing access roads to the work area is one method of notification. A listing of phone numbers and contacts for reporting emergencies is provided below. Names of the project representatives and contractor project representatives and other relevant personnel are also listed below.

Personnel should always be alert for signs and symptoms of illnesses related to chemical, physical and disease factors. Severe injuries resulting from accidents must be recognized as emergencies and treated as such. Table 3 provides an overview of signs and symptoms indicating a medical emergency.

1.6.1 MEDICAL EMERGENCIES

If a medical emergency occurs at the site, the local Emergency Medical Services (EMS) will be notified immediately. The CAFB project manager must be notified by phone and an accident report will be filed. In accordance with EMS instruction, victims that are contaminated with toxic or dangerous materials may be decontaminated before being transported from the site, as instructed by medical emergency personnel. First aid assistance must be initiated immediately when a medical emergency occurs.

1.6.2 FIRES, EXPLOSIONS, AND SPILLS

Events of this nature must be recognized as an emergency. Personnel will be evacuated to the refuge area and the local fire and/or EMS personnel notified. Only persons properly trained in fire suppression, spill control, and other emergency response procedures should attempt to deal with these occurrences. Other than small incipient fires or spills, local emergency response agencies will be relied upon to provide containment and control functions. Cleanup after such events may require the services of specialized contractors. The CAFB project manager and contractor project representatives, along with appropriate regulatory personnel, will decide proper cleanup procedures.

1.6.3 REFUGE AREAS

For each project, a refuge area away from any active work area must be established. In many cases, this can be the parking area or job trailer area. In any case, the preferred location is an upwind point, relative to prevailing winds, from site activity.

1.6.4 EMERGENCY ALERTING AND RESPONSE PROCEDURES

An air horn or other similar device must be available for alerting personnel to an emergency. Should a need to evacuate the site arise, the alerting device should be used in the manner described in Table 4.

Table 3. Medical Emergency Signs and Symptoms

CONDITION	SYMPTOMS	TREATMENT
Heat Stroke	Hot, dry, red skin	Remove from heat source. Cool immediately. Transport immediately to hospital.
Heat Exhaustion	Sweating, nausea, skin is pale, cool	Remove from heat; administer liquids. Monitor vital signs.
Hypothermia	Shivering, disoriented, slurred speech	Warm patient; remove any wet clothing.
Frost Bite	White or grayish yellow skin - part feels very cold and numb	Do not rub or massage affected part; place in warm water.
Chemical Burns	Skin redness, pain	Remove any contaminated clothing; flush 15 to 30 minutes with water.
Thermal Burns (no open blisters)	Skin redness, pain	Flush with lots of cool water; apply moist dressing.
Thermal Burns (open blisters and third degree)	Skin may be red to charred	Do not use water; apply dry dressings.
Bleeding	Obvious blood loss	Apply direct pressure on the wound or at pressure points, if necessary.

Table 3. Medical Emergency Signs and Symptoms (continued)

CONDITION	SYMPTOMS	TREATMENT
Amputations	Body part severed	Place part in moist wrap on ice, control bleeding.
Shock	Pale or bluish skin, lips and fingernails, very fast or slow pulse and/or breathing; confusion; enlarged pupils	Maintain body temperature; elevate feet if no back or neck injury; call Emergency Medical Services (EMS).
Chemical Inhalations and Exposures	Varied	Determine chemical identity; remove from exposure; maintain airway, breathing and circulation (ABCs).
Fractures, Sprains and Strains	Pain, swelling, inability to move the affected part	Immobilize part or area; apply cold packs to reduce swelling.
Heart Attack	Chest pain, nausea, shortness of breath, denial	Keep victim from moving; call EMS, administer CPR if necessary.
Unconscious (general)	Look for abnormalities, observe conditions around victim before assisting	Remove from any hazardous conditions; maintain ABCs.
Stings	Be alert for allergic reactions, redness, swelling, difficulty breathing	Remove stinger with forceps; apply cold pack.

Table 4. Emergency Alerting and Response Signals

BLASTS	MEANING
1 LONG (L)	Evacuate entire work zone by nearest exit route.
2 SHORT (S)	Localized problem (not dangerous to workers). Workers move to contamination reduction zone for further instructions.
L/S/L/S	Need help at work location.
2 L	All clear. Resume work.

1.6.5 SITE EVACUATION

Two types of evacuation have been considered:

- Withdrawal from the immediate work area onsite
- Evacuation of the entire work site

Withdrawal to a safe upwind location will be required under the following circumstances:

- Occurrence of a minor accident--field operations will resume after first-aid and decontamination procedures have been administered
- Malfunction or failure of protective equipment, clothing, or respirator

The CAFB project manager or contractor project representatives and/or their designee, must initiate such an evacuation. An emergency alert will be sounded in accordance with Table 4. Personnel must proceed to the refuge area after passing through the decontamination area, if possible and when appropriate.

1.6.6 EMERGENCY EQUIPMENT

Medical:

The following equipment/supplies shall be made available onsite:

- 5 gallons of potable water per each 5 persons
- Eyewash kit
- First aid kit
- 1 field stretcher per job site

Fire:

Each piece of motorized equipment at the job site (excluding worker personal vehicles) must be equipped with an ABC rated fire extinguisher (minimum 10-lb. size).

Communication:

Normally, where the work site is within one road mile of an accessible telephone and the project duration is one week or less, no additional outside communication equipment is required. In situations where extremely hazardous materials are being handled, telephones or radios must be available at the site. Also, for any projects lasting longer than one week (seven days), telephone or radio communications should be available at the site.

1.6.7 EMERGENCY NOTIFICATION PROCEDURES

If an emergency occurs, the proper notifications must take place in a timely manner. The contractor SSHO shall be responsible for ensuring such notifications take place, and that the following information is given when reporting an emergency:

- Name and location of person reporting
- Location of accident/incident
- Name and affiliation of injured party
- Description of injuries
- Status of medical aid effort
- Details of any chemicals involved

- Summary of the accident, including the suspected cause and the time it occurred
- Temporary control measures taken to minimize further risk

This information is not to be released under any circumstances to parties other than those listed in this section and bona fide emergency response team members. Once emergency response agencies have been notified, the CAFB and USACE project representatives must be notified immediately. They will assist the contractor SSHO in notifying additional persons or agencies, as necessary.

Medical Emergency Phone Numbers:

The chain-of-command will be used for notifying personnel in case of emergencies. The chain-of-command is as follows:

- The SSHO will notify the emergency response team, fire department, police departments, etc. In addition, the SSHO will notify the CAFB project manager. The CAFB project manager will notify the USACE representatives and other applicable agencies.

Fire and Explosion Emergency Phone Numbers:

USACE Project Manager:	Ms. Susan Gant	(505) 766-1363
USACE CIH:	Mr. Dave Willett	(505) 766-1791
CAFB Project Manager:	Mr. John Pike	(505) 784-4348
Contractor Project Manager:		
Contractor Project SSHO:		
Subcontractor Project Manager(s):		

Local:

CAFB Hospital	(505) 784-4033
Plains Regional Medical Center	(505) 769-2141
Ambulance	911
Police and Fire Departments	911

<u>Federal Emergency Response Contact</u>

Region VI Response Center
U.S. Environmental Protection Agency
Response and Prevention Branch
1445 Ross Avenue
Dallas, TX 75202 (214) 665-2222 (Hotline)

New Mexico Environment Department Emergency Reporting Hotline	(505) 827-9329
New Mexico Environment Department	
Air Quality	(505) 827-0070
Air Pollution Control	(505) 827-1468
Groundwater Protection and Remediation	(505) 827-0158
USTs	(505) 827-2914
Surface Water	(505) 827-2827
Hazardous and Radioactive Materials	(505) 827-4308
Solid Waste	(505) 827-2950
New Mexico Department of Energy, Minerals and Natural Resources	(505) 827-7811
Department of Interior	
Bureau of Land Management (New Mexico State Office)	(505) 438-7400
Bureau of Mines	(505) 835-5420
Bureau of Reclamation	(505) 835-1202
Department of Agriculture	
U.S. Forest Service (See listing for local National Forests)	
Department of Transportation	
Federal Highway Administration	(505) 820-2021
OSHA	(505) 827-4230

The following organizations may be contacted for information regarding spill of hazardous materials:

- Chemtrec, **(800) 424-9300**--This service is operated by the Chemical Manufacturers' Association. An expert on chemicals and spill response is available twenty-four (24) hours a day via this toll free number.
- Poison Control Center, Rocky Mountain Poison Control Center, Denver, CO, **(800) 525-5042**--This center provides information on the chemical composition, appearance, and toxicity of common poisonous materials, as well as information on the symptoms of exposure and on emergency procedures recommended in the event of exposure. (Note: This service deals mainly with household chemicals.)

1.6.8 PROCEDURES FOR HANDLING EMERGENCY INCIDENTS

As stated previously, the local emergency services agencies will be relied upon to respond to emergencies. Initial action by site workers should an emergency incident occur, are described below:

- **Personal Injury in the Exclusion Zone**--Upon notification of an injury in the Exclusion Zone, the designated emergency signal shall be sounded. All site personnel shall assemble at the decontamination line. The rescue team will enter the Exclusion Zone (if required) to remove the injured person to the hotline. The SSHO and Field Team Leader should evaluate the nature of the injury, and the affected

person should be decontaminated to the extent possible prior to movement to the Support Zone. Onsite personnel shall administer the appropriate first aid, and contact should be made for an ambulance and with the designated medical facility (if required). In case of a life-threatening injury, provide rapid gross decontamination, if necessary, and move immediately to medical attention. If victim is contaminated, wrap the person to contain contaminants and ensure that medical providers have information on the nature of the site contaminants. No persons shall re-enter the Exclusion Zone until the cause of the injury or symptoms is determined.

- **Personal Injury in the Support Zone**--Upon notification of an injury in the Support Zone, the SSHO will assess the nature of the injury. If the cause of the injury or loss of the injured person does not affect the performance of site personnel, operations may continue, with onsite personnel initiating the appropriate first aid and necessary follow-up as stated above. If the injury increases the risk to others, the designated emergency signal shall be sounded and all site personnel shall move to the decontamination line for further instructions. Onsite activities will stop until the added risk is removed or minimized.

- **Fire/Explosion**--Upon notification of a fire or explosion onsite, the designated emergency signal shall be sounded and all site personnel assembled at the decontamination line. The fire department shall be alerted and all personnel moved to the refuge area.

- **Other Equipment Failure**--If any other equipment onsite fails to operate properly, the SSHO shall be notified and then determine the effect of this failure on continuing operations onsite. If the failure affects the safety of personnel or prevents completion of the Work Plan tasks, all personnel shall leave the Exclusion Zone until the situation is evaluated and appropriate actions taken.

Procedures for reporting incidents to local, state, and federal government agencies are contained in this section. The emergency response plan outlined in this HASP is intended to be compatible and complimentary to other government agency response plans.

Project:	Cannon Air Force Base Appendix II and III Solid Waste Management Units Removal/Disposal/Unit Replacement Operations	Project Number:	
Project Manager:		Site:	Cannon Air Force Base, Multiple Locations
Site Team Leader:		Site Location:	Clovis, New Mexico
Site Health & Safety Officer:			

HASP ACKNOWLEDGEMENT

I acknowledge that I understand the requirements of the HASP, and agree to abide by the procedures and limitations specified. I also acknowledge that I have been given an opportunity to have my questions concerning the HASP and its requirements answered prior to performing field activities. Health and safety training, and medical surveillance requirements applicable to my field activities at this site are current and will not expire during onsite activities.

SIGNATURE	EMPLOYEE NUMBER	DATE

SUBCONTRACTORS

I have provided subcontractors who will be performing field activities on this site with a copy of this HASP. I have also informed the subcontractors that OSHA Standard 29 CFR 1910.120 applies to their site field activities.

Project Manager Signature _____ Date _____

ATTACHMENT A

CERTIFICATES

APPENDIX B

NMED UST REGULATIONS AND UST SOIL/WATER SAMPLING AND DISPOSAL GUIDELINES

UST Soil/Water Sampling & Disposal Guidelines

The New Mexico Environment Department

Revised April 1995

This guidance document supersedes all previous documents.

PURPOSE: This document is provided to clarify lead program responsibilities at leaking Underground Storage Tank (UST) sites, tank removal methodologies, soil and groundwater sampling protocols, analyses, and procedures for investigating and remediating soil and groundwater contaminated with petroleum hydrocarbons, hazardous substances, and wastes from UST systems.

DEFINITIONS: For purposes of clarification, the following definitions are provided.

A. Hazardous Substance UST - As defined in the UST Regulations, is a UST system that contains an accumulation of hazardous substances defined in Section 101(14) of CERCLA, other than any substance regulated as a hazardous waste under Subtitle C of RCRA, or a mixture of such substances and petroleum in which the hazardous substance(s) comprise greater than 50% of the weight or volume of the mixture.

B. Regulated Substance - As defined in the UST Regulations, is any substance defined in Section 101(14) of CERCLA, but not including any substance regulated as a hazardous waste under Subtitle C of RCRA; and petroleum, including crude oil or any fraction thereof which is liquid at standard conditions of temperature and pressure of 60 degrees Fahrenheit and 14.7 lbs/square inch Absolute.

C. Highly Contaminated Soil - As defined in the UST Regulations, Section 1201(G), are soils which are saturated with any type of petroleum product. Two methods to determine this are:

1) Filter paper method: Place a sample of the soil on filter paper. Observe the paper under the soil. If hydrocarbons are able to saturate the paper, the soil is highly contaminated.

2) Observation of physical properties: Study a sample of the soil for observable free petroleum product, moisture content, gross staining, and evidence of very strong odor. These physical properties are criteria which may be used to determine if the soil is high contaminated.

D. Release - As defined in the UST Regulations, is the spilling, emitting, discharging, escaping, leaching or disposing from an underground storage tank system into ground water, surface water or subsurface soil. Included in these are overfills and spills, as well as pipe and tank leaks. **Note: Releases must be reported to the UST Bureau pursuant to the UST Regulations, Section 204 and Part VII.**

E. Ground Water Discharge Permit - means the approved methods and conditions, including any monitoring and sampling requirements, for the discharge of effluent or leachate which may move directly or indirectly into ground water. Ground water discharge permits are processed by the Ground Water Protection & Remediation Bureau of NMED, and generally require 120 days to approve after receipt of a complete permit application.

F. Landfarming - means the remediation of petroleum contaminated soils on or at ground surface using natural aeration and volatilization, disking, and natural and enhanced bioremediation to reduce the concentrations of petroleum hydrocarbons to regulatory levels. Landfarming facilities require ground water discharge permits.

I. Lead Program at UST Sites v. Non-UST Sites

A. The UST Bureau has jurisdiction at all sites where a petroleum hydrocarbon release has occurred and the source of that release is a "UST" as defined in the UST Regulations, Section 102 (CCC), or a "UST system" as defined in Section 102 (EEE).

B. The Hazardous Waste and Radioactive Materials (HWRM) Bureau has jurisdiction over any UST used to store hazardous waste not commingled with petroleum hydrocarbons. Call (505) 827-4308.

C. The HWRM Bureau has jurisdiction over releases where the UST system that leaked contained a mixture of hazardous waste and other regulated substances, including petroleum products.

D. The Ground Water Protection and Remediation (GWPR) Bureau has jurisdiction over any petroleum release from a non-UST source including an aboveground storage tank (AST) and associated piping. Call (505) 827-2886. This includes surface spills from a UST dispenser if the release was caused by overfilling of a vehicle and the UST system did not sustain physical damage which caused the release.

E. Where the facility has both ASTs and USTs and at least one of the release sources is a UST, a decision will be made jointly by the UST and GWPR bureaus regarding which bureau will take the lead in case management. Both UST regulations and New Mexico Water Quality Control Commission Regulations will apply in these cases.

F. When the source of a release is on Indian lands, the US Environmental Protection Agency has jurisdiction. Sites on Navajo lands are referred to Region IX in San Francisco, California. Sites on other Indian lands within the boundaries of New Mexico are referred to Region VI in Dallas, Texas.

II. Soil Sample Collection Methodology at Tank Removals

A. Pursuant to the UST Regulations, Section 802, "Before permanent closure or a change in service is completed, owners and operators must measure for the presence of a release where contamination is most likely to be present at a UST site." Additionally, Section 802 specifies that the ONLY exception to this is if vapor monitoring or ground water monitoring as defined in Section 603 is operating AT THE TIME OF CLOSURE and these indicate no release occurred.

NOTE: This does not mean that soil sampling should not be conducted if a release is either suspected or confirmed.

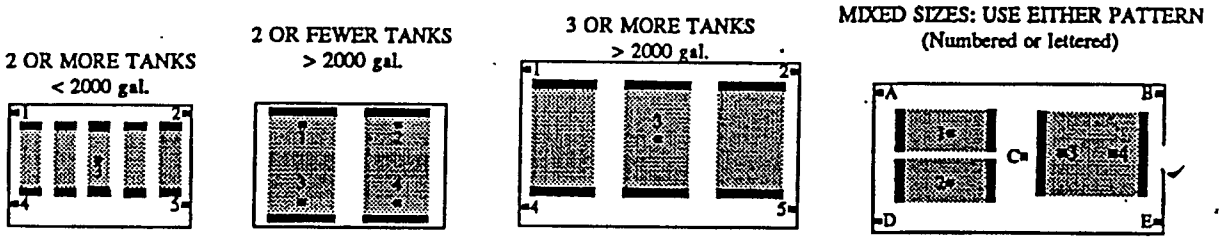
Starting immediately, if the results of soil samples analyzed by heated headspace using a photo-ionization detector (PID) are disputed by tank owners, operators, or their contractor(s), soil samples must be collected for laboratory analysis and must be extracted in the field using the **Methanol Extraction Method.** The procedure for this sampling methodology is described in Part E of this section.

B. The location and number of samples required should be based on the following:

1) For tanks 2,000 gallons or less in capacity:
   a. One sample under the center of each tank.
   b. If there are two or more of these tanks in a single pit, samples must be taken at the bottom of the pit in each corner (or each wall midpoint) and in the pit center.

2) For tanks greater than 2,000 gallon capacity:
   a. One sample under each end of the tank.
   b. If there are three or more of these tanks in a single pit, samples must be taken at the bottom of the pit in each corner (or each wall midpoint) and in the pit center.

Diagrams of proper sampling locations:



3) In addition to the sampling scheme above, sampling locations should be based on these considerations:
   a. Area(s) of highest contamination;
   b. Type of closure;
   c. Soil types;
   d. Backfill material;
   e. System configuration.

   Sample soils where holes or releases have occurred in tanks and piping runs or where overfill/spill has occurred.

4) If ground water is encountered, water samples should be collected in a **clean** container and then decanted into 40 ml VOA/VOC vials for lab analysis. Refer to the water sampling procedures discussed later in this document.

Samples should be taken **as soon as possible** after the removal of the tank(s) and before any backfilling or other disturbance of the pit bottom. Samples must be taken a minimum of one (1) foot below the bottom of the tank(s) or pit, whichever is deeper.

C. For purposes of clarifying the responsibilities of UST Bureau staff, the following applies:

As part of their inspection at a UST removal site, UST field inspectors will utilize an appropriate field testing instrument to detect the presence or absence of petroleum hydrocarbon contamination and report confirmed releases to the Remedial Action Section of the UST Bureau. Upon completion of this task, inspectors will not remain on-site and act as the RP's consultant. Inspectors may, however, remain on-site to ensure that the RP has collected soil/water samples from the excavation pit in an approved manner as specified below. RP's are responsible for collecting and analyzing soil/water samples and submitting the analyses to the UST Bureau.

Further, RP's are responsible for conducting investigations and corrective actions, and must utilize an environmental consultant or other qualified person(s) to assist and advise the RP as to the actions needed. In no case will UST Bureau staff act as the RP's consultant. **Results of all lab analyses must be submitted to the field inspector to determine if a release has occurred. All samples above or below acceptable limits must be reported to the Remedial Action Section in accordance with Part XII, Section 1202 of the UST Regulations.**

NOTE: A quick reference chart indicating contaminant types and appropriate EPA methodologies to use is in Appendix I of this document.

D. Heated Headspace Methodology

1. Fill a 0.5 liter/16 ounce or larger glass jar half full of soil sample. **Plastic bags or other non-glass containers are not acceptable.**

2. Seal top of jar with clean aluminum foil.

3. Ensure sample is at 15 to 25 degrees Celsius or approximately 60 to 80 degrees Fahrenheit. A warm water bath should be used if necessary to raise sample temperature to the acceptable range.

4. Aromatic hydrocarbon vapor concentrations must be allowed to develop in the headspace of the sample jar for 5 to 10 minutes. During this headspace development, the sample should be shaken vigorously for one minute.

5. Immediately pierce the foil seal with the probe of either a Flame Ionization Detector (FID) or a Photo-Ionization Detector (PID), and read the highest (peak) measurement. The instrument must be able to accurately detect total aromatic hydrocarbons (TAH) between 0-1000 parts per million (ppm). Detection of contaminant levels (TAH) of 100 ppm or greater indicates that the soils tested exceed the soil cleanup standards in Section 1209 of the UST Regulations.

NOTE: Never use a PID, FID or any other accepted field test instrument unless the instrument is calibrated in the field and in good working order. Only calibrant gases having a standard of 100 ppm or greater should be used to calibrate field instruments.

NOTE: RP's and/or their consultants should use their best judgement in determining the appropriate field instrument to use (PID vs. FID). Factors to consider include, but should be limited to, age of the UST system, soil characteristics, and extent of contaminant degradation.

E. Laboratory Methodology-Methanol Extraction Procedure

The extraction procedure is simple, but these step by step instructions should be followed without deviation:

1. Contact the analytical laboratory that you normally send soil samples to and let them know you need the supplies required to perform methanol extraction. Let them know how many samples you are extracting if known, or take enough supplies with you to cover any contingencies. The laboratory should have the sample bottles ready and pre-weighed with purge and trap grade methanol in them. The laboratory should also supply enough disposable or non disposable syringes in which to collect the soil sample, and the paperwork required to log and ship the samples to their lab. At least two New Mexico analytical laboratories are now ready to provide this service.

2. Soil samples can be collected from a backhoe bucket (for tank removals) or from a split-spoon sampler for soil borings or monitor wells. Avoid placing pebbles or other particles larger than soil in the sample.

   If soil samples are collected from a backhoe bucket, scrape off the top six or so inches of soil in the bucket and fill the syringe supplied by the lab with 10-15 cc's of soil. The syringe should be marked to indicate when the right amount of soil has been collected.

   If soil samples are collected from soil borings or monitor well installations, brass tube samplers should be used. Place the brass tube samplers in the split spoon and collect the sample. Seal the ends of one tube with aluminum foil and duct tape, label it and place on ice. Use the soil in the other tubes to conduct heated headspace analysis. Once the headspace analysis is complete and you have determined which samples need lab analysis, remove the aluminum foil from one end of the brass tube(s) you placed on ice and collect the soil sample for extraction. **Note: Do not send brass tube samples to the lab. Perform soil collection with a syringe then methanol extraction on the soil from the brass tube being held on ice. Brass tubes can be reused after decontaminating them.**

3. Two procedures can be used to extract the soil sample: 1) Unscrew the cap on the sample bottle and quickly push the sample into the bottle with the syringe plunger being careful not to get soil particles on the rim of the bottle. Quickly replace the cap and tighten securely; or 2) If the methanol is provided in a separate vial from the sample bottle, Unscrew the cap on the sample bottle and quickly push the sample into the bottle with the syringe plunger being careful not to get soil particles on the rim of the bottle. Open the vial containing the methanol and pour it in to the sample bottle being careful not to spill any methanol. Quickly replace the cap and tighten securely. Gently agitate the sample so the soil is immersed in the methanol. **Excessive agitation may cause undue volatilization** In both procedures you must work quickly to avoid VOC losses from the sample. Write the sample information on the bottle, fill out the paperwork and place the bottle on ice for transport to the lab. **Note: Two samples should be collected and extracted for each analysis requested.**

4. Collect a dry-weight sample in a VOA vial supplied by the lab for each sampling location at the site. Insure that you have collected at least 20 grams (the bottle should be at least half full of soil). Label the sample to correspond with the labeling on the matching field preserved sample. This is to measure the soil moisture content of the soil

only and the sample does not need any special preservation. Fill out the necessary paperwork indicating that the sample is for soil moisture analysis only.

5. Be sure to tell the analytical laboratory to conduct EPA Method 8020 and EPA Method 8015 modified analyses on the samples.

6. Do not use methanol extraction on diesel, fuel oil, jet fuel, kerosene or other heavy petroleum contaminated soils. Collect these samples as usual with no headspace in jars supplied by the lab.

NOTE: If heated headspace and lab analyses are conducted on samples from the same site/location the highest value obtained will be used to determine compliance with soil cleanup standards.

F. Diesel/Heavier-Than-Gasoline Contaminated Soils

For these soils, collect samples in 4 ounce or larger jars. Fill jars completely full, leaving no headspace in the jar. Place jars on ice and ship to laboratory for analysis. Note: Mason jars or other similar jars are not acceptable for these samples. Obtain proper jars from the analytical laboratory or lab equipment supplier.

III. Soil/water sampling protocols

A. Soil Sampling Protocols

For soils contaminated with gasoline, headspace with detector tubes or field FID, PID as specified in Section II(D), or analysis with Hanby Kit or EPA approved Lab-In-A-Bag may be used to screen samples to determine which ones to perform the methanol extraction procedure on and send to the laboratory. To receive a "No Further Action" determination at a confirmed release site, owners or operators must comply with USTR Part XII, Section 1209. If laboratory analysis is used instead of heated headspace/PID readings to verify if a site is cleaned up below state action levels, UST Bureau staff must be in receipt of data generated by laboratory analysis after using one of the following appropriate soil collection procedures: 1) gasoline or AVGAS contaminated soil samples, or soils where heated headspace/PID readings indicated the presence of aromatic hydrocarbons, are extracted at the time of collection using the methanol extraction procedure specified in Section II(E); or 2) diesel or other heavier than gasoline petroleum hydrocarbon contaminated soils collected without headspace in 4 ounce or larger jars (not Mason jars), placed on ice and shipped to the analytical laboratory as specified in Section II(F).

Acceptable lab analysis methodologies and suggested EPA methods are:

-- Analyze for aromatic volatile organics by gas chromatograph and a photo-ionization detector. (EPA Method 8020)
-- Analyze for volatile organics by gas chromatograph and mass spectrophotometry. (EPA Method 8240)
-- Analyze for non-halogenated volatile organics by gas chromatograph and a flame-ionization detector. (EPA Method 8015 Modified by purge-and-trap sample preparation)

Detection limits: Benzene-0.50 ppm; Toluene-0.50 ppm; Ethylbenzene-050 ppm;

Xylenes(total)-0.50 ppm; Non-halogenated volatile organics-0.50 ppm

For soils contaminated with petroleum hydrocarbons heavier than gasoline (e.g., diesel, kerosene, used oil), samples must be collected with no headspace in the sample jar and, only data generated by laboratory analysis will be accepted by the UST Bureau. Acceptable laboratory analyses are:

Analyze for total recoverable petroleum hydrocarbons by infrared spectrophotometry; freon extraction **(for waste oil or diesel)** (EPA Method 418.1 Modified or EPA Method 8015 Modified by methylene chloride extraction). Additionally, analyze for purgeables/halogenated volatiles by gas chromatograph (waste oil only) using EPA Method 8010.

Analyze for non-halogenated semi-volatile organics by gas chromatograph and a flame-ionization detector, or mass spectrometry. (EPA Method 8015 Modified or EPA Method 8270)

Detection limits: Total Recoverable Petroleum Hydrocarbons (TRPH)-25.0 ppm Non-halogenated semi-volatile organics-1.0 ppm Purgeables/Halogenated volatiles-1.0 ppm

At sites where soils are contaminated with used oil above the state cleanup standards of 100 parts per million Total Petroleum Hydrocarbons (TPH) (confirmed by lab analysis specified above), and the vertical extent of contamination is < 50 feet above the seasonal high static water table, EPA Methods 8240/8270 must be conducted. If results of these analyses reveal compounds in concentrations above the maximum contaminant level (MCL), a determination will be made by the Department whether TCLP analysis must be conducted on a sample collected from the area of greatest contamination. If TCLP is required the analysis must include volatile organics, semi-volatile organics,metals, and PCB's. If the TCLP analyses indicates the presence of hazardous waste the contaminated soil is remediated and disposed of as a hazardous waste.

Detection limit: The detection limit for PCB's in soil is 50 parts per million (ppm). (In ground water the detection limit is 0.001 ppm.)

All samples obtained during a drilling program must be collected and analyzed in accordance with USTR Part XII, Section 1205(C). Not all samples, however, must be submitted to a lab or analyzed by heated headspace. For example, it is acceptable for an RP or their consultant to use detector tubes, Hanby Kit, or Lab-In-A Bag for every sample, but send only the bottom two samples from each borehole (one higher sample "hot" (>50 ppm total BTEX and > 10 ppm benzene by lab analysis, > 100 ppm total aromatic hydrocarbons by heated headspace), the lower one "clean" (<50 ppm total BTEX and < 10 ppm benzene by lab analysis, < 100 ppm total aromatic hydrocarbons by heated headspace) to the lab. Remember all gasoline and AVGAS contaminated soil samples and all soil samples where heated headspace PID readings, or detector tubes indicated the presence of aromatic hydrocarbons above action levels that are submitted for laboratory analysis must be extracted at the time of collection using the methanol extraction procedure.

Action levels listed above are for sites where soils are to be remediated in place or removed for treatment on the surface. Additionally, in the situation where a site has or is suspected of having been contaminated with more than one type of petroleum product, i.e., gasoline and

diesel, clean-up action levels for both products apply and analysis for both products will be conducted.

B. Water Sampling Protocols

1. **Well Construction/Abandonment** - Guidelines for well construction and abandonment are outlined in the UST Regulations, Part XII, Appendices D and E.

NOTE: Section 1205(C) of the UST Regulations outlines the requirements for monitoring ground water.

2. **Monitoring Well Development** - Where ground water is collected and analyzed from monitoring wells, the wells should be developed prior to sampling. Development has two broad objectives: (1) repair damage done to the formation by the drilling operation so that natural hydraulic properties are restored; and (2) remove any fluids introduced into the formation that might interfere with ground water sample analysis.

All monitoring wells, regardless of the drilling technique used, must be developed until pH and conductivity have stabilized and turbidity has been reduced to the greatest extent possible. Development must include some technique for agitation and purging to accomplish this. Documentation should be submitted that explains the steps taken to develop the wells.

3. **Sampling Protocols** - Proper glassware is required when sampling ground water. Use only 40 ml VOA/VOC vials for volatile and semi-volatile organics and amber bottles for Poly-nuclear Aromatics (PNAs). As with soils, use only those containers supplied by the lab.

Preservatives must be used in all water samples to reduce degradation effects. While the use of hydrochloric acid (HCl) is acceptable, the UST Bureau recommends and uses mercuric chloride ($HgCl_2$) for all water samples. $HgCl_2$ is an effective preservative which inhibits bio-degradation effects and does not affect the pH of the sample. **Changes in the pH of a soil sample may create an environment suitable for microbial growth that flourish on petroleum hydrocarbons and can interfere with the integrity of the sample.**

Placing samples on ice only is not an acceptable preservation technique.

Chain-of-custody documentation is required for all samples shipped to a lab for analysis.

Quality Assurance/Quality Control (QA/QC) of samples should include surrogate and spike recovery, and trip blanks whenever possible. The lab QA/QC must be included in the analysis report.

When collecting water samples:

1) Use a clean bailer and bail the well as directed above. If collecting samples from an excavation pit, use a clean container and decant the sample into 40 ml VOA/VOC vials.

2) Using the appropriate glassware, place the preservative in the sample bottle and pour the water into the bottle making sure there are no bubbles or headspace. For VOA/VOC bottles, ensure that you have developed a meniscus before capping.

3) Label the bottle carefully and seal it with evidence (custody) tape.

4) Place sample(s) under ice in a cooler and transport to the lab. Use chain-of-custody documentation when transferring samples from one person to another.

Acceptable lab analysis methodologies and suggested EPA methods for gasoline are:

– Analyze for non-halogenated purgeable aromatics by gas chromatograph and a photo-ionization detector. (EPA Method 8020 preferred, but EPA Methods 601 or 602 can be used)
– Analyze for volatile organics by gas chromatograph and mass spectrometry. (EPA Method 8240 preferred but EPA Methods 624 or 625 can be used)
– Analyze for non-halogenated volatile organics by gas chromatograph and a flame-ionization detector. (EPA Method 8015 Modified)

Detection limits:
Non-halogenated purgeable aromatics-1.0 ppb;
Volatile organics: benzene-10.0 ppb, toluene-75.0 ppb, ethylbenzene-75.0 ppb, xylenes(total)-62.0 ppb, methyl tert butyl ether(MTBE)-100.0 ppb, EDB-0.01 ppb, EDC-1.0 ppb;
Non-halogenated volatile organics-1.0 ppb.

MTBE and EDB/EDC must be analyzed for at least once early in the sampling chronology by mass spectrometry, or gas chromatography for MTBE, and by EPA Method 504 using the Electron Capture Detector for EDB only, and EPA Method 8010 preferred for EDC, but EPA Methods 601 or 602 can be used. Constituents exclusive of BTEX ruled out twice in consecutive analyses may be dropped from future analysis.

For ground water contaminated with heavier-than-gasoline petroleum products, acceptable laboratory analysis methodologies and suggested EPA Methods are:

– Analyze for polynuclear aromatics by high performance liquid chromatograph-ultraviolet/fluorescence (HPLC UV/Fluor)(EPA Method 8310), or GC/FID only if waste oil has been characterized (diesel spills or releases are not considered as waste oil).

Detection limit: napthalenes- <30 ppb; benzo-a-pyrene <0.7 ppb

IF SAMPLE IS HIGHLY CONTAMINATED:

– Analyze for semivolatile organics by gas chromatograph and mass spectrophotometry (EPA Method 8270 preferred or EPA Methods 624 or 625 can be used), or in the case of diesel contaminated ground water only if the GC/MS instrument can attain an MCL of .7 ppb for benzo-a-pyrenes, otherwise use High Performance Liquid Chromatography (EPA Method 8310)

Detection limit: 0.01 ppm, except as specified above for diesel-contaminated groundwater where benzo-a-pyrenes and naphthalenes are required in the analysis.

Note: UST Bureau staff must verify that proper detection levels were utilized, and that QA/QC and chain-of custody documentation was employed for all methods used.

Analytical laboratories that cannot reach detection limits for certain constituents must explain the reasons why detection limits were unattainable. UST Bureau staff will then determine if the explanation and lab analyses are acceptable.

IV. Handling, disposal, and remediation of contaminated soil/water

Note: Part XII, Section 1209, of the UST Regulations provides the guidelines for handling and remediating both contaminated soils and highly contaminated soils.

A. Permits

Responsible parties (RP's) are advised that one or more permits may be required before handling, disposing, and remediating petroleum hydrocarbon contaminated soils and water. RP's must contact the Ground Water Protection and Remediation Bureau for ground water discharge permits, the Surface Water Quality Bureau for surface water discharge permits, the Air Quality Bureau for air quality permits, and the Solid Waste Bureau for waste disposal permits prior to implementing any handling, disposal, or remediation actions. In addition, landfill/landfarm and asphalt plant owners and operators must contact the respective bureaus indicated above to determine if a permit or modification of an existing permit is required prior to accepting petroleum hydrocarbon contaminated soils and water.

B. Disposal and remediation of contaminated soils:

1. If remediating soils on the ground surface or in-situ (in place) at the UST facility responsible parties (RP's) must comply with Section 1209 of the UST Regulations.

2. If remediating soils off-site, (except at landfills or landfarms), RP's may request permission from the UST Bureau to dispose on a one-time basis at an off-site location in which the RP must comply with the treatment and clean-up standards specified in Section 1209 of the UST Regulations. Disposing or remediating soils on more than a one-time basis at the same off-site location (contiguous property) requires a ground water discharge permit.

NOTE: Requirements for protecting private and public wells at sites where soil disposal and remediation is to occur are outlined in the Water Supply Regulations Part I, Section 110 (C), and must be adhered to.

3. If disposing contaminated soils at a landfill or landfarm, RP's should submit copies of the manifest report signed by the facility operator, and provide the name of the facility and the ground water discharge permit number to the UST Bureau. **Note: Some city, county, or other local jurisdictions may have stricter requirements or prohibitions on landfarming of contaminated soils. It is advisable to check this out before disposing soils.**

4. Drilling cuttings and other contaminated soils which are drummed prior to disposal should not be labeled using the "Hazardous Waste" DOT label. Instead, the drum should be clearly labeled using the following format:

"Non-Regulated Waste"

Origin: Drill cuttings-Petroleum Hydrocarbon

Contaminated Soils-Gasoline, Diesel, Aviation Fuel (whichever applies)

Concentration: _____ Parts Per Million Total Petroleum Hydrocarbons

5. If remediating soils by incineration, RP's should insure that the temperature of the incinerator unit is greater than 500 degrees Fahrenheit in order to fully break down and/or volatize all petroleum hydrocarbons present in the soil. After incineration is completed if the soils are to be re used, they should be tested to insure contaminant concentrations are below state cleanup levels as specified In Section 1209(D) of the UST Regulations.

Note: Disposal of soils at asphalt plants will not meet the criteria above. Temperatures for asphalt processing typically range between 300-350 degrees Fahrenheit. This is not hot enough to insure combustibility and breakdown of petroleum hydrocarbons. This requirement may be waived if the disposition of the soils after processing is material for paving or asphalt, and the asphalt plant owner has obtained an air quality permit from the Air Quality Bureau, or, where asphalt plants are located in Bernalillo County, from the City of Albuquerque. Documentation of the disposition of the soil, the facility name and air quality permit number should be submitted to the UST Bureau as a condition for granting any waiver.

6. Disposing or remediating contaminated soils by mixing with clean soils is not allowed. Dilution is not considered to be an appropriate remediation method.

C. Soil Remediation Methodology

When a contaminated soil requires remediation according to the standards set forth in Section 1209 of the UST Regulations, it must be treated according to the following:

1. Highly Contaminated Soil

a) Removal- Highly contaminated soils must be excavated from the ground to the maximum depth and horizontal extent practicable within 96 hours of discovery.

b) Treatment-

1) Thin spreading- The soils must be spread in a single layer no greater than six inches thick in a bermed area. If the depth to the seasonal high static water level is less than 100 feet below ground surface the soil must be placed in a level, bermed area on an impermeable barrier such as plastic sheeting or a concrete pad. All necessary precautions must be taken to prevent runoff of contaminants or the infiltration of contaminants below ground surface. The soil should be turned or disked to enhance aeration approximately once every two weeks.

2) Other methods- The UST Bureau encourages other methods of soil remediation, including active soil aeration, bioremediation, and incineration (at the proper temperatures). **Alternatives to thin spreading must fall within the guidelines specified in the UST Regulations, Section 1215(C).** Soils which are temporarily stored prior to treatment must be kept on an impermeable barrier in a bermed area to prevent runoff or infiltration of contaminants.

c) Where highly contaminated soils remain beyond the horizontal and vertical extent of practicable excavation, they must be treated in place. The soil treatment system must be installed and operating within forty-five days of discovery of the contamination. An active vapor venting system or other treatment system must be utilized. The method to be used must be capable of reducing contaminant levels in a timely manner. Venting systems are generally appropriate for volatile contaminants, such as gasoline, only. Heavier petroleum products generally require an alternative technique.
Note: Notifying the Air Quality Bureau, or the Albuquerque Environmental Health Department (AEHD) for Bernalillo County sites, prior to implementing any vapor venting systems is required to determine if an air quality permit is needed.

The soil treatment system must be evaluated for effectiveness within thirty days of system start up, and all necessary modifications must be completed within 15 days of the evaluation. The system output or another gauge of system effectiveness must be monitored monthly to track the reduction in contaminant levels. System operation and monthly monitoring may cease when the soil meets the standards outlined in Section 1209 of the UST Regulations.

d) Section 1209 (E) of the UST Regulations requires a report describing in detail the treatment of highly contaminated soils be submitted to the UST Bureau within seventy-five days of the discovery of the contamination.

2. Other Contaminated Soils (not saturated)

a) All soils with contaminant levels in excess of the cleanup action levels specified in Section 1209 of the UST Regulations must be remediated if:

1) contaminated soils are located within 50 feet of the seasonal high static water table;

2) contaminated soils are located where the underlying ground water contains 10,000 milligrams per liter or less total dissolved solids.

NOTE: Soils which are not highly contaminated (saturated) and are located greater than fifty feet above the seasonal high static water table do not need to be remediated. However, if the contaminated soil poses a threat of contamination to groundwater due to percolation or seasonal fluctuations of the water table, or a threat to public health or the environment exists, the soil must be remediated.

b) Removal and Treatment- **The UST Bureau will not reimburse the costs of excavation and ex-situ treatment methods of remediating soils unless it can be demonstrated to be more cost effective than other remedial technologies.** If excavation and *ex situ* treatment is approved, the following must be adhered to:

1) Prior approval must be obtained from the Bureau if excavation of soils exceeds 1000 cubic yards.

2) Contaminated soil must be removed until samples from the walls and bottom of the excavation exhibit contaminant levels below the cleanup action levels.
3) Treatment of removed soil

a) Thin spreading - Follow the guidelines specified under "Highly Contaminated Soils" above.

b) Other treatment methods- The UST Bureau encourages the use of other treatment methods for excavated soil, such as enhanced soil aeration, bioremediation, etc. The specific method must be proposed to the UST Bureau for approval or disapproval prior to commencing the remediation work.

3) Treatment in place (*in situ*)- Contaminated soils may be treated in place by vapor venting systems or other means approved by the UST Bureau. Volatile contaminants only are effectively remediated with venting systems. Non-volatile contaminants such as diesel, motor oil, kerosene, etc. must be remediated by a method(s) other than soil venting. Note: The UST Bureau encourages treatment in place, or at least on site, rather than moving the soil from one place to another. System installation deadlines, evaluation periods, and monitoring requirements specified under "highly contaminated soils" are also applicable here.

D. Water Remediation Methodology- Remediation and treatment of contaminated ground water can be accomplished in a number of ways. Various technologies including air sparging, carbon filtration, and pump and treat systems have been utilized. RP's are advised to solicit the expertise of an environmental consultant or firm to assist in the planning and implementation of remediation system technology. The following guidelines should be followed when disposing of hydrocarbon contaminated water produced during sampling or well development:

1. As outlined in the EPA/540/G-91/009 document titled "Management of Investigation-Derived Wastes During Site Inspections", water containing petroleum contaminants, but not **free product**, may be disposed onto the ground provided that the contaminated water is contained on the property where the site is located and, that the discharge does not endanger public health or safety, and the discharge does not enter any surface water or tributary, such as an arroyo. If the site is in the City of Albuquerque, contact the Albuquerque Environmental Health Department for approval prior to disposal.

2. Discharge of hydrocarbon contaminated water produced during well development procedures or small-volume aquifer tests must be handled the same as those discharges specified in #1.

NOTE: DISPOSAL ON THE GROUND SHOULD OCCUR ONLY WITHIN THE AREA OF EXISTING GROUNDWATER CONTAMINATION.

3. Disposal of large volumes of contaminated water such as are produced during remediation of a site should be done as follows:

a) Disposal by recharge or percolation- Such disposal is allowed only after

obtaining a ground water discharge permit pursuant to Part 3 of the Water Quality Control Commission (WQCC) Ground Water Regulations which is issued by the Ground Water Section of the Ground Water Protection & Remediation Bureau of the New Mexico Environment Department.

b) Disposal to a surface water body or tributary such as an arroyo is allowed only after obtaining a permit to discharge from the U.S. Environmental Protection Agency, Region 6, Dallas, Texas, under the National Pollutant Discharge Elimination System (NPDES) permit program. Application must be made at least 180 days before the date on which the discharge is to commence. Persons proposing a new discharge are encouraged to submit their applications well in advance of the 180 day requirement to avoid delay.

c) Disposal to a sewage treatment plant requires permission from the owner of the sewage treatment system prior to any discharge into the sewage treatment system or the collection system. Pretreatment of the wastewater prior to discharge into the system may be required to meet local requirements.

NOTE: OTHER PERMITS MAY BE REQUIRED BY CITY, COUNTY, MUNICIPAL OR OTHER LOCAL AGENCIES. RESPONSIBLE PARTIES ARE URGED TO ENSURE ALL PERMITTING IS COMPLETED PRIOR TO ANY DISCHARGE ACTIVITY.

E. Recovered Petroleum Product Disposal- All petroleum products must be removed from the site and taken to an approved recycling facility.

The guidelines in this document encompass the majority of situations which may be encountered when dealing with underground storage tanks. If a situation arises that is not outlined in this document, it is advisable to contact the UST Bureau at (505) 827-0188 for guidance.

APPENDIX I
CONTAMINANT TYPE/LABORATORY ANALYSIS QUICK REFERENCE CHART

SOILS		
Contaminant Type	**Analyze for**	**EPA Laboratory Method**
Gasoline/AVGAS	Volatile organics (BTEX)	8020 or 8240
	Non-Halogenated Volatiles	8015
Diesel/kerosene/jet fuels	Total Petroleum Hydrocarbons	418.1 or 8015 (C4-C22)
	Non-halogenated Semi-Volatiles	8015 (C4-C22)
Waste oil	Total Petroleum Hydrocarbons	418.1 or 8015 (C4-C22)
	Non-halogenated Semi-Volatiles	8015 (C4-C22)
	Purgeables/Halogenated Volatile Organics	8010
	Volatile/Semi-Volatiles	8240/8270

WATER		
Contaminant Type	**Analyze for**	**EPA Laboratory Method**
Gasoline/AVGAS	Volatile organics (BTEX)	8240 or 8270 or 624/625
	Non-halogenated purgeables	8020 or 602
	EDB	504 only
	EDC	8010 or 601
	MTBE	8020 or 8240
Diesel/kerosene	Benzo-a-pyrenes	8310 only
Waste oil	Napthalenes	8310 only
	Poly-nuclear aromatics	8310 only

ACTION LEVELS/DETECTION LIMITS		
WATER		
Contaminant	Action Level(ppb)	Detection limit(ppb)
Benzene	10	1.0
Ethylbenzene	750	75
Toluene	750	75
Xylenes	620	62
EDB	0.1	0.01
EDC	10	1.0
MTBE	100	10
Naphthalene	30	<30
1,1,2 TCE	100	50
PCE	20	10
Benzo-a-pyrene	0.7	<0.7
Lead	50	
Iron	1000	
Manganese	200	

SOIL		
Contaminant	Action Level(ppm)	Detection limit(ppm)
Benzene	10	0.5
Toluene		0.5
Ethylbenzene		0.5
Xylenes		0.5
Total BTEX	100(field) 50(lab)	
Non-halogenated volatile organics		0.5
Non-halogenated semi-volatiles		1.0
Total Recoverable Petroleum Hydrocarbons(TRPH)	100	25

Post-it® Fax Note 7671	Date	# of pages ▶
To DAVE HORVATH	From ROSINA LOPEZ	
Co./Dept.	Co. UST	
Phone #	Phone # (505) 827-0107	
Fax # (303) 790 4411	Fax # (505) 827-0310	

APPENDIX C

API-REMOVAL AND DISPOSAL OF USED UNDERGROUND PETROLEUM STORAGE TANKS

Removal and Disposal of Used Underground Petroleum Storage Tanks

API RECOMMENDED PRACTICE 1604
SECOND EDITION, DECEMBER 1987

American Petroleum Institute
1220 L Street, Northwest
Washington, D.C. 20005

March 6, 1989

SUPPLEMENT TO RECOMMENDED PRACTICE 1604 ON REMOVAL AND DISPOSAL OF USED UNDERGROUND PETROLEUM STORAGE TANKS (Second Edition, December 1987)

On September 23, 1988, the United States Environmental Protection Agency issued its Technical Standards and Corrective Action Requirements for Owners and Operators of Underground Storage Tanks (UST). These standards, which will be Part 280 of Volume 40 of the Code of Federal Regulations, were published in Volume 53 of the Federal Register at pages 37194-212.

The EPA Technical Standards deal with removal and disposal of used USTs, among other topics. Consequently, some changes in Recommended Practice 1604 are called for. This Supplement contains revisions that will be included in the next edition.

SPECIFIC REVISIONS TO RECOMMENDED PRACTICE 1604

Unnumbered Page -- Foreword

Delete the third paragraph in the Foreword and substitute the following material:

> On September 23, 1988, the United States Environmental Protection Agency issued its Technical Standards and Corrective Action Requirements for Owners and Operators of Underground Storage Tanks (UST). These standards, which will be Part 280 of Volume 40 of the Code of Federal Regulations, were published in Volume 53 of the Federal Register at pages 37194-212. Furthermore, legislation and regulations on all aspects of UST management are under active development at state and local levels. These levels may have requirements other than those specified in the EPA Technical Standards, and the appropriate government agencies should be consulted about regulations that apply in the geographic area of interest before any action suggested by this Recommended Practice is taken. When used in this document, the term "implementing agency" means EPA or the designated state or local agency responsible for carrying out an approved UST program.
>
> This Recommended Practice is based upon the experience of knowledgeable members of the petroleum industry. In some respects it may be more stringent than the requirements imposed by the Technical Standards. However, the Recommended Practice does not attempt to cover all of the subjects covered by the EPA Technical Standards. Furthermore, while substantial effort has been made to ensure that none of the recommendations contravene the requirements of the Technical Standards, API is not undertaking to interpret the Standards and cannot guarantee that its recommendations are completely in accord. Nor is any representation made that these recommendations conform with any requirements imposed by state and local agencies.
>
> This edition of API Recommended Practice 1604 supersedes API Recommended Practice 1604, Second Edition, December 1987. The EPA Technical Standards provide that Recommended Practice 1604 can be used as a guide to compliance with EPA's requirements governing closure of USTs. According to EPA, an owner or operator conforms with this provision of the Standards if it uses the 1987 edition, which was in force when the Standards became final. However, an owner or operator who uses this

amended version will also be meeting the requirements of the 1987 edition, and EPA encourages the use of the most recent version.

Table of Contents

Change SECTIONS 3 and 4 to read as follows:

SECTION 3 - PERMANENT CLOSURE AND CHANGE OF SERVICE
3.1 General Requirements
3.2 Disposal in Place
3.3 Removal of Underground Tanks
3.4 Change of Service

Renumber SECTIONS 5, 6, and 7 to SECTIONS 4, 5, and 6.

Page 2

In subsection 1.3.1.1 Benzene, delete all material starting with the fourth sentence in the paragraph ("The American Conference . . . ") to the end of the paragraph and substitute the following:

The Occupational Safety and Health Administration (OSHA) imposes limits on occupational exposure. See 29 C.F.R. 1910.1000, Table Z-2, and 1910.1028.

Page 3

Delete the material under Section 2.1 Applicability and substitute the following:

An UST is considered temporarily out of service if it is:
a. Idle but will be returned to service;
b. Awaiting abandonment in place; or
c. Awaiting removal.
An UST that meets EPA's standards for new tanks or that has been upgraded in accord with EPA requirements can remain in the status of "temporarily out of service" indefinitely. An UST that does not meet EPA standards must be permanently removed from service after 12 months unless the implementing agency grants an extension. A site assessment must be completed before an extension can be applied for.

Add the following sentence to Section 2.2 Securing Tank Systems, subsection b.2.:

(If more than 2.5 centimeters (1 inch) of residue or more than 0.3 percent of the capacity of the system remain in

the tank, then release detection measures must be continued.)

Add a new major title SECTION 3 -- PERMANENT CLOSURE AND CHANGE OF SERVICE, and insert the following sections:

3.1 General Requirements

3.1.1 Applicability

Permanent closure of an UST can take place through abandonment in place or removal from the ground. A change of service (that is, conversion of the UST to storage of a non-regulated substance) should also be subject to many of the safeguards that apply to permanent closure.

3.1.2 Notification

The implementing agency must be notified at least 30 days before permanent closure or change of service is begun.

3.1.3 Site Assessment

Following notification, but before closure or change of service is completed, a site assessment must measure for the presence of a release at those places where contamination is most likely to be found. If the UST has been subject to release detection in the form of vapor monitoring, ground water monitoring, interstitial monitoring (in the form of monitoring between the walls of double wall tanks or observation wells), and if no release is indicated, then further site assessment is not necessary.

3.1.4 Corrective Action

If the site assessment indicates that a release(s) has occurred, then appropriate further evaluation and corrective action must be undertaken. See API Publication 1628.

3.1.5 Recordkeeping

Records demonstrating compliance with closure requirements must be maintained. The results of any site assessment of the excavation must be maintained for at least three years. These records can be kept by the owners and operators who took the tank out of service, by the current owners of the site, or by mailing the records to the implementing agency.

Change "SECTION 3 -- DISPOSAL IN PLACE" to "Section 3.2 Disposal in Place," and renumber the subsections accordingly.

Page 4

Insert the following material after the first sentence of present subsection 3.2.4 [renumbered to be 3.2.2.4]:

> During removal of liquids or residues from a tank it is likely that air will enter the tank, and may bring the tank atmosphere into the flammable range. Extra care should be taken during removal operations. For a complete description of safety precautions, refer to API Publication 2015.

Page 5

Change "SECTION 4 -- REMOVAL OF UNDERGROUND TANKS" to "Section 3.3 Removal of Underground Tanks," and renumber the subsections accordingly.

Page 7

Delete the present section 4.4.3 [renumbered to be 3.3.4.3] and substitute the following:

> Present 4.4.3 [Renumbered to be 3.3.4.3] When an existing USTS is partially or totally removed, a small amount of contaminated backfill may be encountered. Backfill can be contaminated by minor spills and drips during previous operation of the facility or by minor spills and drips during removal of equipment, despite efforts to drain and pump product from the equipment before removal. If severe contamination has occurred, local environmental officials and/or fire officials should be notified. Local officials may require isolation and special handling and/or disposal of contaminated backfill materials (see API Publication 1628). The implementing agency should be consulted about any requirements concerning notification, site assessment, or corrective action.

Page 8

Insert a new "Section 3.4 Change of Service" and add the following material:

> 3.4.1 Before a change of service, the UST must be emptied and cleaned.

Removal and Disposal of Used Underground Petroleum Storage Tanks

Marketing Department

API RECOMMENDED PRACTICE 1604
SECOND EDITION, DECEMBER 1987

American
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3.4.2 Any new service should be compatible with the former service. The precautions described in sections [old numbers] 4.4.4 and 4.4.5, above, should be observed.

Pages 8-9

Renumber SECTIONS 5, 6, and 7 as SECTIONS 4, 5, and 6, and renumber subsections accordingly.

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FOREWORD

Underground storage tank systems that have held flammable or combustible liquids should be handled with extreme care during disposal in place, removal, storage, or disposal off site. This is particularly true of underground storage tanks at motor vehicle refueling facilities which are most frequently used for storage of motor fuel or other petroleum products.

The purpose of this recommended practice is to provide procedures for the disposal in place, removal, storage, and the off-site disposal or sale of used underground tanks that have contained flammable or combustible liquids. Although this guide specifically addresses underground storage tank systems at service station facilities, the principles outlined may be applied to similar systems used at other petroleum facilities.

At the time this recommended practice was written, legislation and regulations related to the operation, maintenance, disposal, and removal of underground petroleum storage systems were under development at the federal, state, and municipal levels. The appropriate government agencies should therefore be consulted about regulations that apply to the geographic area of interest before any action suggested in this recommended practice is taken. API will revise this recommended practice from time to time in an effort to ensure consistency with all applicable federal regulations. This edition of API Recommended Practice 1604 supersedes API Publication 1604, *Recommended Practice for the Abandonment and Removal of Used Underground Service Station Systems* (First Edition, 1981) in its entirety.

Suggested revisions are invited and should be submitted to the Director of the Marketing Department, American Petroleum Institute, 1220 L Street, N.W., Washington, D.C. 20005.

CONTENTS

Page

SECTION 1—GENERAL
1.1 Introduction 1
1.2 Scope and Purpose 1
1.3 Special Precautions 1
1.3.1 Toxicity Considerations: Petroleum Substances 1
1.3.2 Flammability and Combustibility Considerations 2
1.4 Referenced Publications 2

SECTION 2—TEMPORARILY OUT OF SERVICE
2.1 Applicability 3
2.2 Securing Tank Systems 3

SECTION 3—DISPOSAL IN PLACE
3.1 Criteria for Disposal in Place 3
3.2 Procedures for Disposal in Place 3
3.3 Recordkeeping 4

SECTION 4—REMOVAL OF UNDERGROUND TANKS
4.1 Preparation 5
4.2 Purging 5
4.3 Testing 7
4.4 Removal 7

SECTION 5—STORAGE OF USED TANKS
5.1 Storage Considerations 8
5.2 Storage Procedures 8

SECTION 6—SALE FOR REUSE
6.1 Considerations for Reuse 8
6.2 Conditions of Sale 9

SECTION 7—DISPOSAL
7.1 Disposal Criteria 9
7.2 Disposal Procedures 9

Figures
1—Eductor-Type Air Mover 6
2—Diffused Air Blower 6

Removal and Disposal of Used Underground Petroleum Storage Tanks

SECTION 1—GENERAL

1.1 Introduction

Underground petroleum storage systems that are no longer needed or suitable for product storage must be properly disposed in place or removed in order to avoid future safety or environmental hazards. Because of the nature of the flammable or combustible liquids that are stored in these tanks, hazardous conditions may arise in the work area during disposal in place or removal and subsequent handling of tanks. For this reason, all personnel involved in the procedures outlined in this recommended practice should be familiar with the potential hazards, and be knowledgeable in the appropriate health and safety measures needed to ensure a safe working environment.

1.2 Scope and Purpose

1.2.1 This publication recommends procedures for the disposal in place, removal, storage, and off-site disposal of underground storage tank systems that have contained flammable or combustible fluids. In general, it outlines requirements, procedures, and operating conditions to be followed by contractors, engineers, or other individuals who may be involved in these practices. While this recommended practice specifically addresses underground petroleum storage tank systems at service station facilities, the principles outlined may be applied to similar systems used at other petroleum storage facilities. All such work must be accomplished in accordance with federal, state, and local requirements as well as accepted safety standards. Before initiating work, the appropriate government agencies should be consulted concerning applicable regulatory and permit requirements.

1.2.2 All applicable permits must be obtained prior to beginning any work. Where required, contractors must be approved by local authorities. Contractors, subcontractors, and their employees responsible for tank abandonment or removal should be familiar with: (a) all applicable safety rules and regulations, (b) the use of equipment and procedures for testing and vapor-freeing tanks, (c) the handling and disposal of the types of wastes likely to be encountered, and (d) the applicable sections of the publications referenced in 1.4.

1.2.3 The procedures outlined in this recommended practice can be carried out without the need to enter the tank. Should tank entry be desired, the procedures outlined in API Publications 2015, 2015A, and 2217 and Recommended Practice 1631 should be followed.

1.3 Special Precautions

During the course of underground storage tank removal or in place disposal, workers may be exposed to petroleum hydrocarbon liquids, vapors, or wastes. The precautions in 1.3.1 and 1.3.2 should be observed by all individuals engaged in the procedures discussed in this recommended practice.

1.3.1 TOXICITY CONSIDERATIONS: PETROLEUM SUBSTANCES

Users should be aware of appropriate health precautions. When high concentrations of petroleum hydrocarbon vapors are inhaled, symptoms of intoxication may result. These symptoms, ranging from simple dizziness to excitement or unconsciousness, are similar to those produced by alcohol or anesthetic gases. If such effects occur, the individual should be removed to fresh air. For minor effects of exposure, breathing fresh air or oxygen results in rapid recovery. If breathing has stopped, artificial respiration should be applied promptly. Medical attention should be obtained as soon as possible. Paragraphs 1.3.1.1 and 1.3.1.2 contain special toxicity considerations for benzene and tetraethyl lead, which may be present in petroleum products or wastes found in underground storage tanks. Care should be exercised to minimize exposure to these substances when they are present during the handling of used underground petroleum storage tanks.

WARNING: Tests have shown that prolonged or repeated exposure to some petroleum substances, in liquid or vapor form, may cause serious illness, including cancer, in laboratory animals. Although the significance of these test results to human health is not fully understood, exposure to petroleum substances should be minimized. The following health precautions are suggested:

a. Avoid skin contact and inhaling vapors.

b. Keep petroleum liquids away from eyes, skin, and mouth; they can be harmful or fatal if inhaled, absorbed through the skin, or ingested.
c. Use soap and water or waterless hand cleaner to remove any petroleum product that contacts skin. Do not use gasoline or similar solvents to remove oil and grease from skin.
d. Promptly wash petroleum-soaked clothes and avoid using soaked leather goods. Properly dispose of rags.
e. Keep work areas clean and well ventilated.
f. Clean up spills promptly.

1.3.1.1 Benzene

High occupational exposures to benzene have been associated with various human blood disorders, including an increased risk of leukemia. Very high levels have also been known to affect the central nervous system. Benzene administered by mouth has induced cancer in laboratory animals in long-term tests. Benzene is rapidly absorbed through the skin. The American Conference of Governmental Industrial Hygienists (ACGIH) threshold limit value (TLV) for benzene is 1-part-per-million time-weighted average, with a short term exposure limit of 25 parts-per-million (the latter is designated for deletion in 1986 or 1987). The Occupational Safety and Health Administration (OSHA) 8-hour time-weighted average for benzene is 10 parts-per-million with an acceptable ceiling concentration of 25 parts-per-million and an acceptable peak of 50 parts-per-million for 10 minutes (29 CFR 1910.1000, Table Z-2). OSHA conducted a rulemaking in 1986 with the intent to revise this standard. The latest OSHA *Occupational Safety and Health Standards* should be consulted to determine the current TLV.

1.3.1.2 Tetraethyl Lead

This organic form of lead can cause diseases of the central and peripheral nervous system, the kidney and the blood. Skin absorption of this compound is a major route of entry into the body. The ACGIH time-weighted average is 0.1 milligrams per cubic meter for general room air. The TLV in OSHA's *Occupational Safety and Health Standards* (29 CFR 1910.1000, Table Z-1) is 0.075 milligrams per cubic meter.

1.3.2 FLAMMABILITY AND COMBUSTIBILITY CONSIDERATIONS

1.3.2.1 Flammable or combustible vapors are likely to be present in the work area. The concentration of vapors in the tank, the excavation, or the work area may reach the flammable (explosive) range before venting is completed and a safe atmosphere is reached. Therefore, precautions must be taken to: (a) eliminate all potential sources of ignition from the area (for example, smoking materials, nonexplosion-proof electrical and internal combustion equipment), (b) prevent the discharge of static electricity during venting of flammable vapors, and (c) prevent the accumulation of vapors at ground level. Refer to API Publication 2015 and Recommended Practice 2003 for general precautionary measures to follow during the vapor-freeing procedure.

1.3.2.2 A combustible gas indicator (CGI) should be used to check for hazardous vapor concentrations (see 4.3). All open flame and spark-producing equipment within the vapor hazard area should be shut down. Electrical equipment (for example, pumps and portable hand tools) used in the area must be explosion-proof in accordance with NFPA 70B Class I, Division I, Group D or otherwise approved for use in potentially explosive atmospheres.

1.4 Referenced Publications

Portions of the following documents contain information regarding various engineering and safety procedures that may be applicable to underground storage tank removal or disposal.

API

Bull 1628	*Underground Spill Cleanup Manual*
RP 1631	*Interior Lining of Underground Storage Tanks*
RP 2003	*Protection Against Ignitions Arising Out of Static, Lightning, and Stray Currents*
Publ 2015	*Cleaning Petroleum Storage Tanks*
Publ 2015A	*A Guide for Controlling the Lead Hazard Associated with Tank Entry and Cleaning* (Supplement to API Publ 2015)
Publ 2217	*Guidelines for Confined Space Work in the Petroleum Industry*
Publ 2219	*Safe Operating Guidelines for Vacuum Trucks in Petroleum Service*

NFPA[1]

327	*Standard Procedure for Cleaning or Safeguarding Small Tanks and Containers*
70B	*Electrical Equipment Maintenance*

[1]National Fire Protection Association, Batterymarch Park, Quincy, Massachusetts 02269.

OSHA[2]

Occupational Safety and Health Standards (29 CFR 1910.1000)

EPA[3]

General Regulations for Hazardous Waste Management (40 CFR 260)

Regulations for Identifying Hazardous Waste (40 CFR 261)

Regulations for Hazardous Waste Generators (40 CFR 262)

Underground Storage Tanks Regulations (40 CFR 280.11, 280.22)

SECTION 2—TEMPORARILY OUT OF SERVICE

2.1 Applicability

Underground petroleum storage tank systems are considered temporarily out of service if they are: (a) idle but will be returned to service within one year, (b) are awaiting abandonment in place, or (c) are awaiting removal.

2.2 Securing Tank Systems

Tanks temporarily out of service must be properly secured for the period they will be out of service. Tanks may be considered properly secured if processed as follows:

a. Observe all special precautions described in 1.3 through 1.3.2.2.

b. Remove stored product from the tank using one of the following methods:

1. Drain all product lines into the tank, then remove all liquids from the tank.
2. Remove all flammable or combustible liquids with the exception of a sufficient quantity (approximately four inches) to assure a saturated vapor space.
3. When high water table or flooding conditions exist, remove all stored liquid and ballast the tank by filling with water.

c. Cap the fill pipe, gauge pipe, tank truck vapor recovery fitting, and vapor return. Secure the tank against tampering.

d. Cap the product lines at the service station island, or elsewhere if the pumps are removed, or leave the pumps connected and locked. Disconnect electric power to the pumps.

e. Leave the vent line open.

f. Consult the appropriate local, state, or federal agencies concerning regulatory notification requirements.

SECTION 3—DISPOSAL IN PLACE

3.1 Criteria for Disposal in Place

3.1.1 This section describes a safe method for the in place disposal of underground tanks. Removal of the tank is preferred (see Section 4). Disposal of the tank in place should be considered in the following circumstances: (a) because of the tank location adjacent equipment or structures may be damaged or weakened if the tank is removed, (b) removal may be physically impossible, or (c) removal may incur excessive costs. A determination of whether to dispose of a tank in place or to remove it will depend upon: (a) local regulations which may prohibit abandonment in place, (b) the location of the facility and tank, (c) the availability of equipment, and (d) cost. Additional considerations include the length of service the equipment has provided and its reuse or salvage value.

3.1.2 The federal *Resource Conservation and Recovery Act* (RCRA) (40 CFR 260-265) places restrictions on disposal of certain residues that may be present in some underground storage tanks. Residues from tanks that have held leaded gasoline should be treated with extreme caution. Lead compounds and other residues in the tank may be classified as hazardous wastes. All liquids and residues removed from the tank should be handled in accordance with appropriate federal, state, and local regulations. Product removed from the tank can usually be reused or recycled.

3.2 Procedures for Disposal in Place

3.2.1 Tanks may be effectively and safely disposed in place by using the procedures in 3.2.2 through 3.2.11.

[2]Occupational Safety and Health Administration, U.S. Department of Labor, Washington, D.C. 20402.

[3]U.S. Environmental Protection Agency, 401 M Street, S.W., Washington, D.C. 20460.

3.2.2 Observe the special precautions described in 1.3 through 1.3.2.2.

3.2.3 Drain product piping into the tank, being careful to avoid any spillage to the excavation area. Disconnect product piping from the tank, and cap or remove the piping.

3.2.4 Remove liquids and residues from the tank by using explosion-proof or air-driven pumps. Pump motors and suction hoses must be bonded to the tank or otherwise grounded to prevent electrostatic ignition hazards. It may be necessary to use a hand pump to remove the last few inches of liquid from the bottom of the tank. If a vacuum truck is used for removal of liquids or residues, the area of operation for the vacuum truck must be vapor-free. The truck should be located upwind from the tank and outside the path of probable vapor travel. The vacuum pump exhaust gases should be discharged through a hose of adequate size and length downwind of the truck and tank area. See API Publication 2219 for vacuum truck operating and safety practices.

3.2.5 Excavate to the top of the tank.

3.2.6 Remove the drop tube, fill pipe, gauge pipe, vapor recovery truck connection, submersible pumps, and other tank fixtures. Cap or remove all non-product lines, such as vapor recovery lines, except for the vent line. The vent line should remain connected until the tank is purged (see 4.2.2 through 4.2.7). Temporarily plug all other tank openings.

3.2.7 Purge the tank of flammable vapors. This may be accomplished using methods outlined in 4.2.2 through 4.2.7. Vent all vapors a minimum of 12 feet above grade and 3 feet above any adjacent roof lines. Monitor the tank for flammable vapor with a combustible gas indicator until the tank atmosphere has been brought to less than 20 percent of the lower flammable limit (see 4.3).

3.2.8 One or more holes may be cut in the tank top if existing tank openings are not adequate for introduction of the inert material to be used to fill the tank.

3.2.9 Proceed to introduce a suitable solid inert material through openings in the top of the tank. It is important to fill the tank as full as possible with the sand or other inert material. The procedures in 3.2.9.1 through 3.2.9.3 are intended to minimize any surface settling subsequent to disposal of the tank in place.

3.2.9.1 Sand will flow readily and is generally available. Any kind of sand is suitable if it is free of rocks, which might limit leveling-out in the tank. The sand may be introduced dry as long as it flows in freely. When the sand cone nears the top of the tank, the sand can be washed into the tank with a nominal amount of water and puddled to cause it to flow to the ends. The use of larger amounts of water should be avoided since the tank might be filled with water before it is filled with sand.

3.2.9.2 Almost complete filling of the tank can be achieved by using a combination of sand and earth. Fill the tank with sand to approximately 80 percent of calculated capacity. Mix soil and water to make a free-flowing mud and pour the mixture into the tank opening. Puddle the mixture until the tank is full and overflows the fill opening.

3.2.9.3 Other types of inert materials, slurries, or expandable materials such as polyurethane-type foams may be used when approved by regulatory officials.

3.2.10 After the tank is filled with an inert material, all tank openings should be plugged or capped unless it was necessary to cut open the tank top (see 3.2.8).

3.2.11 Disconnect and cap or remove the vent line.

3.3 Recordkeeping

3.3.1 When underground tanks are disposed in place, the owner of the tank should keep a permanent record of the tank location, the date of disposal in place, and the method of conditioning the tank for disposal. All local, state, and federal regulatory requirements for tank disposal/closure and notification must be observed.

3.3.2 It is recommended that the tank owner inform a potential buyer of the presence of abandoned underground tanks when properties are sold. A property owner should also be informed at the termination of the property lease. In some areas this may be a regulatory requirement. It may be desirable to obtain an acknowledgement or a release from the property owner.

SECTION 4—REMOVAL OF UNDERGROUND TANKS

4.1 Preparation

4.1.1 Observe the special safety precautions in 1.3 through 1.3.2.2.

4.1.2 Drain product piping into the tank, being careful to avoid any spillage. Cap or remove product piping.

4.1.3 Remove residues and liquids from the tank as described in 3.2.4. Also observe the restrictions in 3.1.2.

4.1.4 Excavate to the top of tank.

4.1.5 Remove the fill pipe, gauge pipe, vapor recovery truck connection, submersible pumps, and other tank fixtures. Remove the drop tube, except when it is planned to vapor-free the tank by using an eductor as in 4.2.5. Cap or remove all non-product lines, such as vapor recovery lines, except the vent line. The vent line should remain connected until the tank is purged. Temporarily plug all other tank openings so that all vapors will exit through the vent line during the vapor-freeing process.

4.2 Purging

4.2.1 Remove flammable vapors by one of the methods described in 4.2.2 through 4.2.7, or as required by local codes. These methods provide a means for temporary vapor-freeing of the tank atmosphere. However, it is important to recognize that the tank may continue to be a source of flammable vapors even after following the vapor-freeing procedures described in 4.2.2 through 4.2.7. For this reason, caution must always be exercised when handling or working around tanks that have stored flammable or combustible liquids. Before initiating work in the tank area or on the tank, a combustible gas indicator should be used to assess vapor concentrations in the tank and work area.

4.2.2 Vent all vapors from the tank at a minimum height of 12 feet above grade and 3 feet above any adjacent roof lines until the tank is purged of flammable vapors. The work area should be free from sources of ignition (see 1.3.2).

4.2.3 Flammable and combustible vapors may be purged with an inert gas such as carbon dioxide (CO_2) or nitrogen (N_2). This method should not be utilized if the tank is to be entered for any reason, as the tank atmosphere will be oxygen deficient. The inert gas should be introduced through a single tank opening at a point near the bottom of the tank at the end of the tank opposite the vent. When inert gases are used, they should be introduced under low pressure to avoid the generation of static electricity. When using CO_2 or N_2, pressures in the tank should not exceed 5 pounds per square inch gauge.

CAUTION: The process of introducing compressed gases into the tank may create a potential ignition hazard as the result of the development of static electrical charges. The discharging device must therefore be grounded. Explosions have resulted from the discharging of CO_2 fire extinguishers into tanks containing a flammable vapor-air mixture. CO_2 extinguishers should not be used for inerting flammable atmospheres.

4.2.4 If the method described in 4.2.3 is not practical, the vapors in the tank may be displaced by adding solid carbon dioxide (dry ice) to the tank in the amount of at least 1.5 pounds per 100 gallons of tank capacity. The dry ice should be crushed and distributed evenly over the greatest possible area in the tank to promote rapid evaporation. As the dry ice vaporizes, flammable vapors will flow out of the tank and may surround the area. Therefore, where practical, plug all tank openings except the vent after introducing the solid CO_2 and continue to observe all normal safety precautions regarding flammable or combustible vapors. Make sure that all of the dry ice has evaporated before proceeding.

CAUTION: Skin contact with dry ice may produce burns.

4.2.5 Flammable vapors may be exhausted from the tank by one of two methods of tank ventilation listed below:

a. Ventilation using an eductor-type air mover usually driven by compressed air is illustrated in Figure 1. The eductor-type air mover must be properly bonded to prevent the generation and discharge of static electricity. When using this method, the fill (drop) tube should remain in place to ensure ventilation at the bottom of the tank. Tanks equipped with fill (drop) tubes that are not removable should be purged by this method. An eductor extension shall be used to discharge vapors a minimum of 12 feet above grade.

b. Ventilation with a diffused air blower is illustrated in Figure 2. When using this purging method, it is imperative that the air-diffusing pipe is properly bonded to prevent the discharge of a spark. Fill (drop) tubes must be removed to allow proper diffusion of the air in the tank. Air supply should be from a compressor that has been checked to ensure a clean air supply and is free

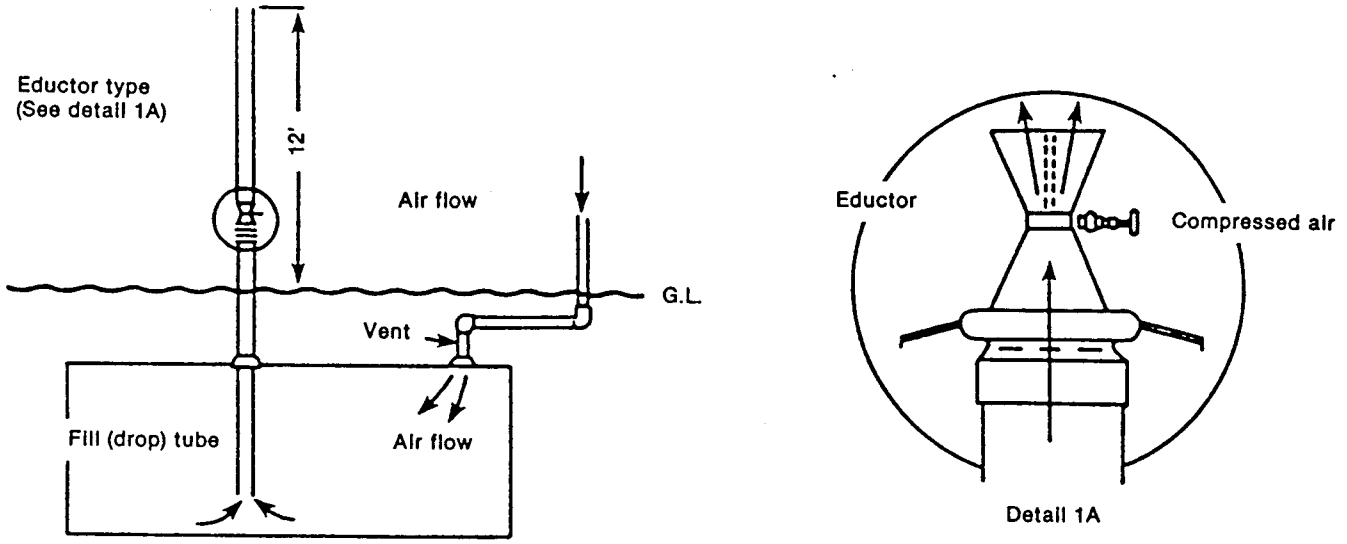
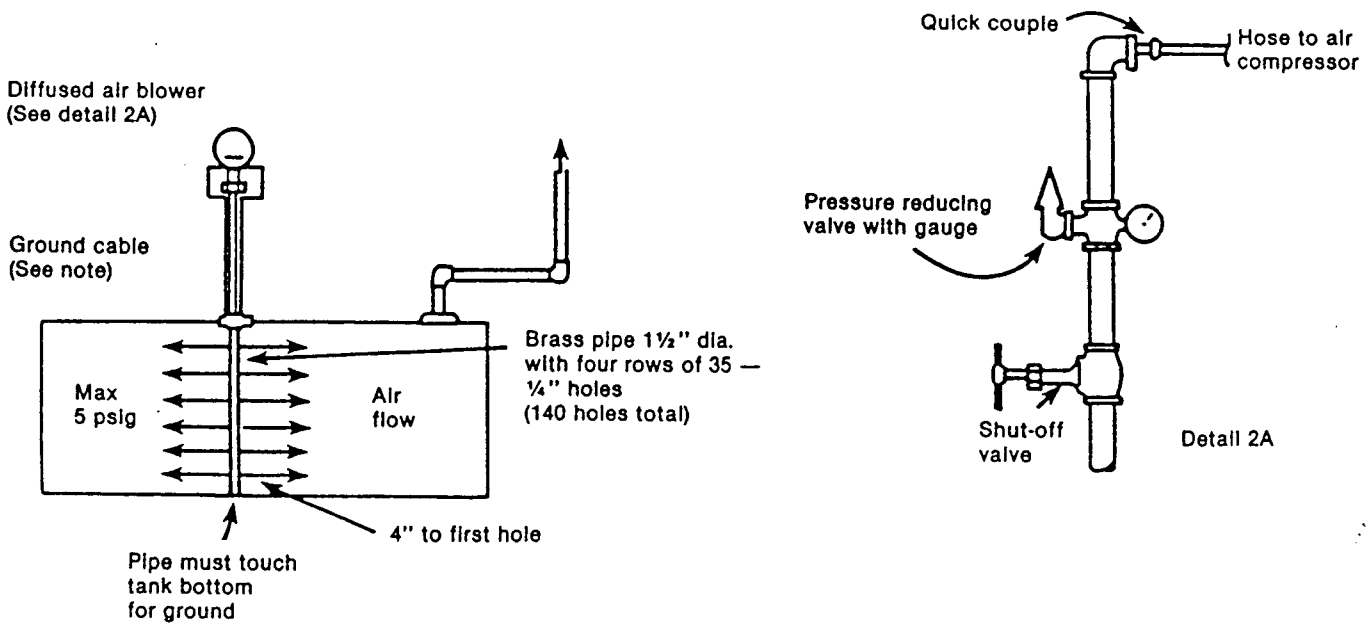


Figure 1—Eductor-Type Air Mover



Note: Ground cable brazed to pipe must be clamped to fill pipe. Use 12 gauge ground wire from fill pipe to water pipe or ground rod.

Figure 2—Diffused Air Blower

from volatile vapors. Air pressure in the tank must not exceed 5 pounds per square inch gauge.

4.2.6 One of the safest and simplest methods for vapor-freeing a tank is to fill the tank with water. However, in certain areas, regulatory requirements for treatment/disposal of water used in the vapor-freeing process may make this method cost-prohibitive. Before employing the method described in 4.2.6.1 through 4.2.6.3, consult local regulations.

4.2.6.1 Fill the tank with water until the floating product nears the fill opening. Remove the floating product and place it in a suitable container for proper disposal. Care should be exercised to ensure that neither product nor water is spilled into the tank excavation.

4.2.6.2 In the process of filling the tank with water, flammable vapors will be expelled through both the vent and fill openings, but primarily at the fill opening. Normal safety precautions should be observed. To minimize this escape of vapor through the fill opening, the opening may be temporarily capped.

4.2.6.3 When the tank is free of vapor, pump out the water and dispose of it in accordance with local regulations.

4.2.7 Steam can be used to clean and vapor-free a tank. However, a large static charge can build up on the nozzle of the steam jet. Insulated objects on which the steam impinges can also become charged. If steam is to be used for either purging or cleaning a tank or other equipment, the steam discharge nozzle and all conductive insulated objects subject to impingement or condensation should be bonded to the tank or be grounded. Steam purging of tanks should be avoided when suitable alternatives are available. Further reference to steam cleaning of tanks is found in NFPA 327.

4.3 Testing

4.3.1 The tank atmosphere and the excavation area should be regularly tested for flammable or combustible vapor concentrations until the tank is removed from both the excavation and the site. Such tests are to be made with a combustible gas indicator which is properly calibrated according to the manufacturer's instructions (typically on pentane or hexane in air), and which is thoroughly checked and maintained in accordance with the manufacturer's instructions. Persons responsible for testing must be completely familiar with the use of the instrument and the interpretation of the instrument's readings.

4.3.2 The tank vapor space is to be tested by placing the combustible gas indicator probe into the fill opening with the drop tube removed. Readings should be taken at the bottom, middle, and upper portions of the tank, and the instrument should be cleared after each reading. If the tank is equipped with a non-removable fill tube, readings should be taken through another opening. Liquid product must not enter the probe. Readings of 20 percent or less of the lower flammable limit must be obtained before the tank is considered safe for removal from the ground.

4.3.3 Combustible gas indicator readings may be misleading where the tank atmosphere contains less than 5 percent by volume oxygen, as in a tank vapor-freed with CO_2, N_2, or another inert gas. In general, readings in oxygen-deficient atmospheres will be on the high, or safe, side. It may be desirable to use an oxygen indicator to assess the oxygen concentration.

4.4 Removal

4.4.1 After the tank has been freed of vapors and before it is removed from the excavation, plug or cap all accessible holes. One plug should have a 1/8-inch vent hole to prevent the tank from being subjected to excessive differential pressure caused by temperature changes. The tank should always be positioned with this vent plug on top of the tank during subsequent transport and storage.

4.4.2 Excavate around the tank to uncover it for removal. Remove the tank from the excavation and place it on a level surface. Use wood blocks to prevent movement of the tank after removal and prior to loading on a truck for transportation. Use screwed (boiler) plugs to plug any corrosion holes in the tank shell.

4.4.3 When partially or totally removing an existing underground storage system, a small amount of contaminated backfill may be encountered. The contamination can be due to minor spills and drips during previous operation of the facility or from drips and minor spills that may occur during removal. Contaminated backfill may be a potential safety and environmental hazard. Spills or drips should be contained to minimize contamination during removal. If contamination is severe, consult local environmental officials, the fire marshal, or the USEPA for assistance and requirements. See API Bulletin 1628 for further information.

4.4.4 Tanks should be labeled after removal from the ground but prior to removal from the site. Regardless of the condition of the tank, the label should contain a

warning against certain types of reuse. The former contents and present vapor state of each tank, including vapor-freeing treatment and date should also be indicated. The label should be similar to the following in legible letters at least 2 inches high:

TANK HAS CONTAINED LEADED GASOLINE*

NOT VAPOR FREE

NOT SUITABLE FOR STORAGE OF FOOD OR LIQUIDS INTENDED FOR HUMAN OR ANIMAL CONSUMPTION

DATE OF REMOVAL: MONTH/DAY/YEAR

*Or other flammable/combustible liquid. Use the applicable designation, for example, DIESEL.

4.4.5 Tanks that have held leaded motor fuels (or whose service history is unknown) should also be clearly labeled with the following information (see API Publication 2015A for additional guidelines):

TANK HAS CONTAINED LEADED GASOLINE
LEAD VAPORS MAY BE RELEASED IF HEAT IS APPLIED TO THE TANK SHELL

4.4.6 Tanks should be removed from the site as promptly as possible after vapor-freeing procedures have been completed, preferably on the day of tank removal from the excavation. If a tank remains at the site overnight or longer, additional vapor may be released from any liquid absorbed in the tank walls or residues remaining in the tank.

4.4.6.1 Before the tank is removed from the site, the tank atmosphere should be checked with a combustible gas indicator as specified in 4.3 to ensure that it does not exceed 20 percent of the lower flammable limit.

4.4.6.2 The tank should be secured on a truck for transportation to the storage or disposal site with the 1/8-inch vent hole located at the uppermost point on the tank. Tanks should be transported in accordance with all applicable local, state, and federal regulations.

SECTION 5—STORAGE OF USED TANKS

5.1 Storage Considerations

Even though used tanks that have contained flammable or combustible liquids have been vapor-freed at one time, they cannot be guaranteed to remain vapor-free. Hydrocarbons may be retained in crevices and under scale and may be released when disturbed or over a period of time. It is important, therefore, that appropriate safety precautions be observed at all times.

5.2 Storage Procedures

5.2.1 Tanks should be vapor-freed before being placed in storage (see 4.2). Tanks should also be free of all liquids and residues. All tank openings should be tightly plugged or capped, with one plug having a 1/8-inch vent hole to prevent the tank from being subjected to excessive differential pressure caused by temperature changes. Tanks should be stored with the vented plug at the highest point on the tank. All tanks should be labeled as described in 4.4.4 and 4.4.5.

5.2.2 Used tanks should be stored in secure areas on the premises of persons familiar with any attendant hazards and where the general public will not have access. A fenced yard, apart from other facilities, is desirable.

SECTION 6—SALE FOR REUSE

6.1 Considerations for Reuse

Careful consideration should be given to the reuse of tanks that have been in petroleum storage service. If a tank is sold for reuse, the purchaser should be given a very clear understanding of the former use and present condition of the tank. The seller of a tank to be returned to service in an underground petroleum storage system must inform the purchaser of the tank of the owner's notification requirements under applicable federal regulations (40 CFR 280.11 and 40 CFR 280.22). There may also be similar state or local regulations. Buyers of such tanks should check with the original manufacturer of the tank to determine its suitability for reuse. It is advisable to test the tanks for flammable vapors (see 4.3) before they are transported.

CAUTION: Tanks that previously contained gasoline must not be used for the subsequent storage of food or liquids intended for animal or human consumption.

6.2 Conditions of Sale

A bill of sale should be used to transfer tank ownership. The bill of sale should include the purchaser's acknowledgement that he assumes all liability related to the tank. Bills of sale should indicate the former use of the tank and carry the following warning regardless of the former contents of the tank:

TANK HAS CONTAINED LEADED GASOLINE*

NOT VAPOR FREE

NOT SUITABLE FOR STORAGE OF FOOD OR LIQUIDS INTENDED FOR HUMAN OR ANIMAL CONSUMPTION

*Or other flammable/combustible liquid. Use the applicable designation, for example, DIESEL.

SECTION 7—DISPOSAL

7.1 Disposal Criteria

7.1.1 Tanks should be disposed of when they are no longer fit for the storage of flammable or combustible liquids or any other appropriate use. Whether sold to a scrap dealer or disposed of at an acceptable facility, sufficient holes should be made in the tanks to render them unfit for further use.

7.1.2 Tanks that have been lined internally or coated externally with epoxy-based or similar materials may not be accepted by scrap processors. Prior inquiries should be made as to the requirements of the processor accepting the tank for scrap.

7.2 Disposal Procedures

7.2.1 After a tank has been vapor-freed, it should be rendered unsuitable for future use as a storage tank by puncturing, cutting, or drilling numerous holes in all sections of the tank.

7.2.2 All tanks should be labeled as described in 4.4.4 and 4.4.5.

7.2.3 A bill of sale should be used to transfer tank ownership (see 6.2).

7.2.4 Prior to disposal of used tanks, current federal, state, and local regulations should be checked to determine if special procedures or preparations are required.

APPENDIX D

REMOVAL OF UNDERGROUND STORAGE TANKS
EM 1110-3-178

APPENDIX E

CHEMICAL DATA QUALITY MANAGEMENT FOR PETROLEUM STORAGE TANK REMEDIATION PROJECTS

APPENDIX F

CHEMICAL DATA QUALITY MANAGEMENT FOR HAZARDOUS WASTE REMEDIAL ACTIVITIES

APPENDIX G

OSHA § 1926.650 SUBPART P-EXCAVATIONS

APPENDIX H

FORMS

(SAMPLE FORMAT)

TO: CEMRD-ED-GC FROM: _____ DATE__/__/__

SUBJECT: **Request for Evaluation of Commercial Laboratory**

Project Name:_____ _____Contract No.:_____

Superfund _____ FUDS _____ IRP _____ Other _____ Phase _____

Location:_____State:_____

A-E/Contractor:_____State:_____

USACE Project Manager:_____
Phone:_____Address:_____

Approximate Sampling Dates:_____
Laboratory Name:_____
Address:_____
Phone:_____
POC:_____

Laboratory Quality Management Manual Request ON __/__/__

Required analytical methods and approximate number of samples to be taken for above project.

METHOD	# OF WATER SAMPLES	# OF SOIL/SEDIMENT SAMPLES

State or other laboratory certification which will be required for this project:_____

If the laboratory is planning to subcontract any samples to another laboratory or location, all of these are to be evaluated separately. This request should be sent for verification of laboratory status regardless of expiration date on the list of validated laboratories.

(SAMPLE FORMAT)

TO:_____ FROM:_____ DATE:__/__/__

SUBJECT: **Request for Government Quality Assurance Services** (To be sent to the requested USACE Laboratory with a copy to CEMRD-ED-GC)

Project Name:_____ Contract No.:_____

Superfund ____ FUDS ____ IRP ____ Other _____ Phase _____
Location:_____ State:_____

A-E/Contractor:_____ State:_____
USACE Project
Manager:_____
Phone:_____ Address:_____

Laboratory Name:_____
Address:_____
Phone:_____
POC:_____

Approximate Sampling Dates:_____

The following QA Laboratory support is requested for the subject project: USACE Division Laboratory:_____

____ Review and comment on Draft _____
_____
_____
_____

____ Analysis and Reports of Quality Assurance Samples

METHOD	NO. OF WATER SAMPLES*	NO. OF SOIL/SEDIMENT SAMPLES‡

* Includes Blanks

‡ Includes Background Soil Sample

CF: CEMRD-ED-GC

DATE _____

DAY	S	M	T	W	TH	F	S

A-E DAILY QUALITY CONTROL REPORT

WEATHER	Bright Sun	Clear	Overcast	Rain	Snow
TEMP	To 32	32-50	50-70	70-85	85 up
WIND	Still	Moder	High	Recort No.	
HUMIDITY	Dry	Moder	Humid		

COE PROJECT MANAGER _____

PROJECT _____

JOB NO. _____

CONTRACT NO. _____

SUB-CONTRACTORS ON SITE:

EQUIPMENT ON SITE.

WORK PERFORMED (INCLUDING SAMPLING):

SHEET _____ OF _____

(Continuation Sheet)

PROJECT. _____ REPORT NO. _____

JOB NO. _____ DATE _____

QUALITY CONTROL ACTIVITIES (INCLUDING FIELD CALIBRATIONS)

HEALTH AND SAFETY LEVELS AND ACTIVITIES.

PROBLEMS ENCOUNTERED/CORRECTION ACTION TAKEN:

SPECIAL NOTES.

TOMORROW'S EXPECTATIONS:

BY _____ TITLE _____

(SAMPLE FORMAT)

_____ LAB NO.

DEPARTMENT OF THE ARMY
_____ DIVISION, CORPS OF ENGINEERS
DIVISION LABORATORY

_____, _____, _____
(city) (state) (zip)

Subject: Chemical Quality Assurance Report

Project:
Intended Use:
Source of Material:

Submitted by:
Date Sampled: _____, Date Received:
Method of Test or Specification: See attached Tables 1 -

References:

-- REMARKS --

1. CONTRACTOR DATA EVALUATION: (General comments)

   a. ACCURACY:

   b. PRECISION:

   c. LABORATORY CONTMINATION:

2. QA/QC DATA COMPARISON:

3. OTHER PROBLEMS:

4. CORRECTIVE ACTION:

Submitted by:

Director, _____ Laboratory

Table 2.1. Example of a Table that Summarizes the Number of Samples by Analyte and Matrix (page 1 of 4)

Office Symbol
Name of Corps PM
PM Phone Number

U.S. Army Corps of Engineers
Summary of Chemical Analyses to be Performed
Contractor: Include Name of A-E and QA Lab Here
Site: Descriptive Name of Project Here

Matrix and Analyte	Field Samples	Background		Quality Assurance and Quality Control					
				Splits/Dups		Rinsates		Trip Blanks	
		AE	QA	QC(AE)	QA(CE)	QC(AE)	QA(CE)	QC(AE)	QA(CE)
Groundwater:									
Volatiles	___	___	___	___	___	NR	NR	___	___
B/N/A's	___	___	___	___	___	___	___	NR	NR
Pesticides/PCB's	___	___	___	___	___	___	___	NR	NR
TRPH	___	___	___	___	___	___	___	NR	NR
Metals	___	___	___	___	___	___	___	NR	NR
Explosives	___	___	___	___	___	___	___	NR	NR
Characteristics	___	___	___	___	___	___	___	NR	NR
EP Tox Extraction	___	___	___	___	___	___	___	NR	NR
Other:_____	___	___	___	___	___	___	___	NR	NR
ırface water:									
Volatiles	___	___	___	___	___	NR	NR	___	___
B/N/A's	___	___	___	___	___	___	___	NR	NR
Pesticides/PCB's	___	___	___	___	___	___	___	NR	NR
TRPH	___	___	___	___	___	___	___	NR	NR
Metals	___	___	___	___	___	___	___	NR	NR
Explosives	___	___	___	___	___	___	___	NR	NR
Characteristics	___	___	___	___	___	___	___	NR	NR
EP Tox Extraction	___	___	___	___	___	___	___	NR	NR
Other:_____	___	___	___	___	___	___	___	NR	NR
Surface soils:									
Volatiles	___	___	___	___	___	NR	NR	NR	NR
B/N/A's	___	___	___	___	___	NR	NR	NR	NR
Pesticides/PCB's	___	___	___	___	___	NR	NR	NR	NR
TRPH	___	___	___	___	___	NR	NR	NR	NR
Metals	___	___	___	___	___	NR	NR	NR	NR
Explosives	___	___	___	___	___	NR	NR	NR	NR
Characteristics	___	___	___	___	___	NR	NR	NR	NR
EP Tox Extraction	___	___	___	___	___	NR	NR	NR	NR
Other:_____	___	___	___	___	___	___	___	NR	NR

Table 2.1. Example of a Table that Summarizes the Number of Samples by Analyte and Matrix (page 2 of 4)

Matrix and Analyte	Field Samples	Background		Splits/Dups		Rinsates		Trip Blanks	
		AE	QA	QC(AE)	QA(CE)	QC(AE)	QA(CE)	QC(AE)	QA(CE)
Sub-surface soils:									
Volatiles	___	___	___	___	___	NR	NR	NR	NR
B/N/A's	___	___	___	___	___	NR	NR	NR	NR
Pesticides/PCB's	___	___	___	___	___	NR	NR	NR	NR
TRPH	___	___	___	___	___	NR	NR	NR	NR
Metals	___	___	___	___	___	NR	NR	NR	NR
Explosives	___	___	___	___	___	NR	NR	NR	NR
Characteristics	___	___	___	___	___	NR	NR	NR	NR
EP Tox Extraction	___	___	___	___	___	NR	NR	NR	NR
Other:_____	___	___	___	___	___	___	___	NR	NR
Sediments:									
Volatiles	___	___	___	___	___	NR	NR	NR	NR
B/N/A's	___	___	___	___	___	NR	NR	NR	NR
Pesticides/PCB's	___	___	___	___	___	NR	NR	NR	NR
TRPH	___	___	___	___	___	NR	NR	NR	NR
Metals	___	___	___	___	___	NR	NR	NR	NR
Explosives	___	___	___	___	___	NR	NR	NR	NR
Characteristics	___	___	___	___	___	NR	NR	NR	NR
EP Tox Extraction	___	___	___	___	___	NR	NR	NR	NR
Other:_____	___	___	___	___	___	___	___	___	___
UST: Aqueous Phase									
Volatiles	___	NR	NR	___	___	NR	NR	NR	NR
B/N/A's	___	NR	NR	___	___	NR	NR	NR	NR
Pesticides/PCB's	___	NR	NR	___	___	NR	NR	NR	NR
TRPH	___	NR	NR	___	___	NR	NR	NR	NR
Metals	___	NR	NR	___	___	NR	NR	NR	NR
Explosives	___	NR	NR	___	___	NR	NR	NR	NR
Characteristics	___	NR	NR	___	___	NR	NR	NR	NR
EP Tox Extraction	___	NR	NR	___	___	NR	NR	NR	NR
Other:_____	___	NR	NR	___	___	___	___	___	___
UST: Non-aqueous Phase									
Volatiles	___	NR	NR	___	___	NR	NR	NR	NR
B/N/A's	___	NR	NR	___	___	NR	NR	NR	NR
Pesticides/PCB's	___	NR	NR	___	___	NR	NR	NR	NR
TRPH	___	NR	NR	___	___	NR	NR	NR	NR
Metals	___	NR	NR	___	___	NR	NR	NR	NR
Explosives	___	NR	NR	___	___	NR	NR	NR	NR
Characteristics	___	NR	NR	___	___	NR	NR	NR	NR
EP Tox Extraction	___	NR	NR	___	___	NR	NR	NR	NR
Other:_____	___	NR	NR	___	___	___	___	___	___

Table 2.4. Record of Field Change

Contractor's Name: _____ Contract: _____

Corps Division/District: _____

UST/AST Site and Location: _____

To: _____

From: _____

Date of Request: _____

==========

Check one: [ ] Change already implemented without Corps approval
[ ] Approval requested before change will be implemented

==========

Description of Change:

_____

_____

_____

_____

Signature of Field Sampling Supervisor: _____

==========

Recommendation of Corps:

_____

_____

_____

_____

[ ] Change approved [ ] Change not approved

Signature of COR: _____ Date _____

==========

Distribution:
[ ] Corps COR
[ ] Project Manager
[ ] Contractor's QA/QC Manager
[ ] Site Manager
[ ] _____

Table 2.5. Spill Report Sheet[a]

Yes No Has the National Response Center been notified?
(Phone: 800-424-8802)

Part 1. General Information:

Contractor Name: _____ Contract: _____

Corps Division/District: _____

UST/AST Site and Location: _____

To: _____

From: _____

Date and Time of Spill: _____

Part 2. Description of Spill:

Size of spill (gallons): _____

Location of spill: _____

_____

Distance to nearest sewer, stream, surface water:

_____

Depth to ground water (ft): _____

Chemical identity of spill: _____

Comments: _____

_____

_____

Part 3. Remedial Action:

Action Taken: _____

_____

_____

Signature of Field Sampling Supervisor: _____

Part 4. Recommendation of Corps:

_____

_____

_____

Signature of COR: _____ Date _____

Distribution:
- [ ] Corps COR
- [ ] Project Manager
- [ ] Contractor's QA/QC Manager
- [ ] Site Manager
- [ ] State authorities: _____
- [ ] Local authorities: _____
- [ ] _____

a. This form shall be superseded by applicable state or local forms governing spill reporting.

Table 3.3. UST/AST Sample Report Sheet

Part 1. General Information.

UST/AST Site and Location: _____

Sampling Location on Site (as indicated on map): _____

Contractor: _____

Field Sampling Supervisor: _____

Sampled By: _____ Date/Time: _____

Part 2. Tank Inventory:

A. Estimated Total Depth of UST/AST only (ft): _____
USTs only: Depth from soil surface to bottom of UST (ft): _____

B. Sludge present? Circle: No Yes

*If "Yes", estimate thickness of layer (if possible) _____

C. Number of liquid layers present? Circle: None 1 2

D. Depth and Nature of each Liquid Layer:

Layer:	Depth (ft):	Nature (Circle):	Observations:
Bottom (or only) layer	_____	Organic Aqueous	_____
Second Layer (if present)	_____	Organic Aqueous	_____

Part 3. Samples Taken From Tank: [ ] No samples taken or:

Corps Sample Numbers:	Check as Appropriate:
_____ - TK___ - _____	[ ] Field Sample: Bottom Layer
_____ - TK___ - _____	[ ] Field Sample: Second Layer
_____ - TK___ - _____	[ ] Field Sample: Sludge Layer
_____ - TK___ - _____	[ ] QA Sample: Split/Duplicate
_____ - TK___ - _____	[ ] QC Sample: Split/Duplicate
_____ - TK___ - _____	[ ] Sampler Rinsate
_____ - TK___ - _____	[ ] Trip Blank

U.S. ARMY CORPS OF ENGINEERS

CHAIN OF CUSTODY RECORD

PROJ. NO.	PROJECT NAME
SAMPLERS: *(Signature)*	

STA. NO.	DATE	TIME	COMP.	GRAB	STATION LOCATION	NO. OF CON-TAINERS							REMARKS

Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*	Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*
Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*	Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*
Relinquished by: *(Signature)*	Date / Time	Received for Laboratory by: *(Signature)*	Date / Time	Remarks	

Distribution: Original Accompanies Shipment; Copy to Coordinator Field Files

4809

Data Package One

QA/QC COVER PAGE

US Army Corps of Engineers

ANALYTICAL DATA PACKAGE

TABLE I. INORGANIC AND MISCELLANEOUS ANALYSES

Project Site and Location: _____

(Important Note: This form is completed in the field and submitted to the QA laboratory. A copy should be kept for the Contractor's files. This form is NOT submitted to the Contractor's laboratory.)

USACE Field Sample Number[a]:	Designation[b]:	Complete if QA or QC circled[c]	For Duplicates/Splits: Enter Corresponding Field Sample Number:
_____-_____-_____	F QA QC	D S B R	_____-_____-_____
_____-_____-_____	F QA QC	D S B R	_____-_____-_____
_____-_____-_____	F QA QC	D S B R	_____-_____-_____
_____-_____-_____	F QA QC	D S B R	_____-_____-_____
_____-_____-_____	F QA QC	D S B R	_____-_____-_____
_____-_____-_____	F QA QC	D S B R	_____-_____-_____
_____-_____-_____	F QA QC	D S B R	_____-_____-_____
_____-_____-_____	F QA QC	D S B R	_____-_____-_____
_____-_____-_____	F QA QC	D S B R	_____-_____-_____
_____-_____-_____	F QA QC	D S B R	_____-_____-_____
_____-_____-_____	F QA QC	D S B R	_____-_____-_____
_____-_____-_____	F QA QC	D S B R	_____-_____-_____
_____-_____-_____	F QA QC	D S B R	_____-_____-_____
_____-_____-_____	F QA QC	D S B R	_____-_____-_____
_____-_____-_____	F QA QC	D S B R	_____-_____-_____
_____-_____-_____	F QA QC	D S B R	_____-_____-_____
_____-_____-_____	F QA QC	D S B R	_____-_____-_____
_____-_____-_____	F QA QC	D S B R	_____-_____-_____
_____-_____-_____	F QA QC	D S B R	_____-_____-_____
_____-_____-_____	F QA QC	D S B R	_____-_____-_____
_____-_____-_____	F QA QC	D S B R	_____-_____-_____
_____-_____-_____	F QA QC	D S B R	_____-_____-_____
_____-_____-_____	F QA QC	D S B R	_____-_____-_____
_____-_____-_____	F QA QC	D S B R	_____-_____-_____
_____-_____-_____	F QA QC	D S B R	_____-_____-_____
_____-_____-_____	F QA QC	D S B R	_____-_____-_____
_____-_____-_____	F QA QC	D S B R	_____-_____-_____
_____-_____-_____	F QA QC	D S B R	_____-_____-_____
_____-_____-_____	F QA QC	D S B R	_____-_____-_____
_____-_____-_____	F QA QC	D S B R	_____-_____-_____
_____-_____-_____	F QA QC	D S B R	_____-_____-_____
_____-_____-_____	F QA QC	D S B R	_____-_____-_____
_____-_____-_____	F QA QC	D S B R	_____-_____-_____
_____-_____-_____	F QA QC	D S B R	_____-_____-_____
_____-_____-_____	F QA QC	D S B R	_____-_____-_____
_____-_____-_____	F QA QC	D S B R	_____-_____-_____
_____-_____-_____	F QA QC	D S B R	_____-_____-_____
_____-_____-_____	F QA QC	D S B R	_____-_____-_____
_____-_____-_____	F QA QC	D S B R	_____-_____-_____
_____-_____-_____	F QA QC	D S B R	_____-_____-_____
_____-_____-_____	F QA QC	D S B R	_____-_____-_____
_____-_____-_____	F QA QC	D S B R	_____-_____-_____
_____-_____-_____	F QA QC	D S B R	_____-_____-_____

Remarks: _____

_____

Field Sampling Supervisor: _____ Date: _____

US Army Corps of Engineers
ANALYTICAL DATA PACKAGE
TABLE II. SAMPLE NUMBER CORRELATIONS FOR INORGANIC AND MISCELLANEOUS ANALYSES

Project Site and Location: _____ Contract: _____
Sampling Contractor: _____ QA Lab: _____
Contractor's Lab: _____
Corps Division/District/Project Manager: _____

USACE Field Sample Number[a]:	Laboratory Sample Number:
____-____-____	_____
____-____-____	_____
____-____-____	_____
____-____-____	_____
____-____-____	_____
____-____-____	_____
____-____-____	_____
____-____-____	_____
____-____-____	_____
____-____-____	_____
____-____-____	_____
____-____-____	_____
____-____-____	_____
____-____-____	_____
____-____-____	_____
____-____-____	_____
____-____-____	_____
____-____-____	_____
____-____-____	_____
____-____-____	_____
____-____-____	_____
____-____-____	_____
____-____-____	_____

a. Sample number assigned in field by Sampling Team using the USACE Sample Numbering Scheme. See Instructions.

Circle Yes or No in response to all applicable questions:

Yes No Were samples found to be properly preserved?
Yes No Was the temperature in the cooler 4°C upon arrival in the laboratory?
Yes No Were five point (minimum) calibrations used?
Yes No Were ICP interelement corrections applied?
Yes No Were ICP background corrections applied
Yes No (If previous question was answered with YES: Were raw data generated before application of background corrections?)
Yes No Were Preparation Blank Analyses performed for each batch of samples or for each set of 20 samples within THIS PROJECT?
Yes No Were Spiked Sample Analyses and Duplicate Sample Analyses performed for each concentration and matrix for THIS PROJECT or for each set of 20 samples of similar matrix within THIS PROJECT?

Remarks: _____

Laboratory QA/QC Manager: _____ Date: _____

ANALYTICAL DATA PACKAGE

TABLE III. ANALYTICAL RESULTS FOR INORGANIC AND MISCELLANEOUS ANALYSES

==========

art 1. Project Information:

Project Site and Location: _____

Sampling Contractor: _____ Contract: _____

Contractor's Lab: _____ QA Lab: _____

Corps Division/District/Project Manager: _____

==========

Part 2. Sample Information:

Matrix: Soil/Water/Other: _____ Level: Low/Medium % Solids: _____

Date Sampled (Field): _____ Date Received: _____

Lab Sample Number: _____ USACE Sample Number[a]: _____-_____-_____

Sample Description[b]: _____

Container and Preservative used (in field): _____

Concentration Units: (ug/L or mg/kg dry weight)

==========

Part 3. Analytical Results:

Analyte:	EPA Method Numbers: Extr:	Anal:	Concentration:	Actual Holding Time (days)[c] Extr.	Anal.	CRDL[d]	IDL[d]	Laboratory QC Blank Sample No.
Arsenic, As								
Barium, Ba								
Cadmium, Cd								
Chromium, Cr								
Iron, Fe[e]								
Lead, Pb								
Manganese, Mn[e]								
Mercury, Hg								
Selenium, Se								
Silver, Ag								
Sodium, Na[e]								
TRPH[f]								
Other: _____								
Other: _____								
Other: _____								
Other: _____								

a. [Project Code]-[Site Code]-[Sample Code]
b. See Instructions for descriptive terminology (Section 5.2.4).
c. Holding Time for Extr. = Extraction Date minus Field Sampling Date.
   Holding Time for Anal. = Analysis Date minus Extraction Date.
d. CRDL = contract required detection limits; IDL = instrument detection limits
e. Water samples only
f. Total Recoverable Petroleum Hydrocarbons

==========

Remarks: _____

_____

Laboratory QA/QC Manager: _____ Date: _____

BLE IV. ANALYTICAL RESULTS FOR INORGANIC AND MISCELLANEOUS METHOD BLANKS

Part 1. Project Information:
Project Site and Location: _____
Sampling Contractor: _____ Contract: _____
Contractor's Lab: _____ QA Lab: _____
Corps Division/District/Project Manager: _____

Part 2. Method Blank Sample Information:
Matrix: Soil/Water
Lab Sample Number: _____
Concentration Units: (ug/L or mg/kg dry weight)

Method blank information must be provided for each sample set.

Part 3. Analytical Results for Method Blank:

Analyte:	EPA Method Numbers: Extr:	Anal:	Method Blank Concentration:	CRDL[a]	IDL[a]
Arsenic, As					
Barium, Ba					
Cadmium, Cd					
Chromium, Cr					
Iron, Fe[b]					
Lead, Pb					
Manganese, Mn[b]					
Mercury, Hg					
Selenium, Se					
Silver, Ag[b]					
Sodium, Na					
TRPH[c]					
Other: _____					
Other: _____					
Other: _____					
Other: _____					

a. CRDL = contract required detection limits; IDL = instrument detection limits

b. Water samples only

c. Total Recoverable Petroleum Hydrocarbons

Remarks:

_____

_____

_____

Laboratory QA/QC Manager: _____ Date: _____

TABLE V. RESULTS FOR INORGANIC AND MISCELLANEOUS SPIKE SAMPLE RECOVERY

(Submit this form or its equivalent only if a project sample is selected for matrix spike recovery.)

==========

Part 1. Project Information:

Project Site and Location: _____

Sampling Contractor: _____ Contract: _____

Contractor's Lab: _____ QA Lab: _____

Corps Division/District/Project Manager: _____

==========

Part 2. Spike Recovery Sample Information:

Matrix: Soil/Water/Other: _____

Lab Sample Number: _____

USACE Sample Number of field sample spiked: _____-_____-_____

Concentration Units: (ug/L or mg/kg dry weight)

==========

Part 3. Analytical Results for Spike Sample Recovery:

Analyte:	Lower/ Upper Control Limits % R	Sample Result (SR)	Spike Added (SA)	Spiked Sample Result (SSR)	%R[a]	Outside Control Limits?
Arsenic, As	75-125	_____	_____	_____	_____	Yes No
Barium, Ba	75-125	_____	_____	_____	_____	Yes No
Cadmium, Cd	75-125	_____	_____	_____	_____	Yes No
Chromium, Cr	75-125	_____	_____	_____	_____	Yes No
Iron, Fe[b]	75-125	_____	_____	_____	_____	Yes No
Lead, Pb	75-125	_____	_____	_____	_____	Yes No
Manganese, Mn[b]	75-125	_____	_____	_____	_____	Yes No
Mercury, Hg	75-125	_____	_____	_____	_____	Yes No
Selenium, Se	75-125	_____	_____	_____	_____	Yes No
Silver, Ag	75-125	_____	_____	_____	_____	Yes No
Sodium, Na[b]	75-125	_____	_____	_____	_____	Yes No
TRPH[c]	__-___	_____	_____	_____	_____	Yes No
Other: _____	__-___	_____	_____	_____	_____	Yes No
Other: _____	__-___	_____	_____	_____	_____	Yes No
Other: _____	__-___	_____	_____	_____	_____	Yes No
Other: _____	__-___	_____	_____	_____	_____	Yes No

a. %R = [(SSR - SR)/SA] x 100

b. Water samples only

c. Total Recoverable Petroleum Hydrocarbons

==========

Remarks: _____

_____

_____

Laboratory QA/QC Manager: _____ Date: _____

TABLE VI. RESULTS FOR INORGANIC AND MISCELLANEOUS INTERNAL QC DUPLICATE ANALYSES

(Submit this form or its equivalent only if a project sample is selected for internal QC duplicate analysis.)

==========

Part 1. Project Information:

Project Site and Location: _____

Sampling Contractor: _____ Contract: _____

Contractor's Lab: _____ QA Lab: _____

Corps Division/District/Project Manager: _____

==========

Part 2. Internal Duplicate Sample Information:

Matrix: Soil/Water/Other: _____ Level: Low/Medium

Lab Sample Number: _____

Lab Internal Duplicate Sample Number: _____

USACE Sample Number of field sample duplicated: _____-_____-_____

Concentration Units: (ug/L or mg/kg dry weight)

==========

Part 3. Analytical Results Internal Duplicate Analyses:

Analyte:	Lower/ Upper Control Limits[a]	Concentration Sample	Concentration Dupl.	RPD[b]	Outside Control Limits?	
Arsenic, As	___-___	_____	_____	_____	Yes	No
Barium, Ba	___-___	_____	_____	_____	Yes	No
Cadmium, Cd	___-___	_____	_____	_____	Yes	No
Chromium, Cr	___-___	_____	_____	_____	Yes	No
Iron, Fe[c]	___-___	_____	_____	_____	Yes	No
Lead, Pb	___-___	_____	_____	_____	Yes	No
Manganese, Mn[c]	___-___	_____	_____	_____	Yes	No
Mercury, Hg	___-___	_____	_____	_____	Yes	No
Selenium, Se	___-___	_____	_____	_____	Yes	No
Silver, Ag	___-___	_____	_____	_____	Yes	No
Sodium, Na[c]	___-___	_____	_____	_____	Yes	No
TRPH[d]	___-___	_____	_____	_____	Yes	No
Other: _____	___-___	_____	_____	_____	Yes	No
Other: _____	___-___	_____	_____	_____	Yes	No
Other: _____	___-___	_____	_____	_____	Yes	No
Other: _____	___-___	_____	_____	_____	Yes	No

==========

a. Control limits = +/- 20% for samples with [D + S]/2 > 5 * CRDL;
   Control limits = +/- CRDL for samples with [D + S]/2 < 5 * CRDL
b. RPD = Relative Percent Difference = [|S - D|/((S + D)/2)] x 100
c. Water samples only
d. Total Recoverable Petroleum Hydrocarbons

==========

Remarks: _____

_____

Laboratory QA/QC Manager: _____ Date: _____

Data Package Two.

QA/QC COVER PAGE
US Army Corps of Engineers
ANALYTICAL DATA PACKAGE
TABLE I. VOLATILE ORGANIC ANALYSES
(page 1 of __)

Project Site and Location: _____
Sampling Contractor: _____ Contract: _____
Contractor's Lab: _____ QA Lab: _____
Corps Division/District/Project Manager: _____

(Important Note: This form is completed in the field and submitted to the QA laboratory. A copy should be kept for the Contractors files. This form is NOT submitted to the Contractor's laboratory.)

USACE Field Sample Number[a]:	Designation[b]:	Complete if QA or QC circled[c]	For Duplicates: Enter Corresponding Field Sample Number:
_____-_____- 0001	F QA QC	D B R T	_____-_____-_____
_____-_____- 0002	F QA QC	D B R T	_____-_____-_____
_____-_____- 0003	F QA QC	D B R T	_____-_____-_____
_____-_____- 0004	F QA QC	D B R T	_____-_____-_____
_____-_____- 0005	F QA QC	D B R T	_____-_____-_____
_____-_____- 0006	F QA QC	D B R T	_____-_____-_____
_____-_____- 0007	F QA QC	D B R T	_____-_____-_____
_____-_____- 0008	F QA QC	D B R T	_____-_____-_____
_____-_____- 0009	F QA QC	D B R T	_____-_____-_____
_____-_____- 0010	F QA QC	D B R T	_____-_____-_____
_____-_____- 0011	F QA QC	D B R T	_____-_____-_____
_____-_____- 0012	F QA QC	D B R T	_____-_____-_____
_____-_____- 0013	F QA QC	D B R T	_____-_____-_____
_____-_____- 0014	F QA QC	D B R T	_____-_____-_____
_____-_____- 0015	F QA QC	D B R T	_____-_____-_____
_____-_____- 0016	F QA QC	D B R T	_____-_____-_____
_____-_____- 0017	F QA QC	D B R T	_____-_____-_____
_____-_____- 0018	F QA QC	D B R T	_____-_____-_____
_____-_____- 0019	F QA QC	D B R T	_____-_____-_____
_____-_____- 0020	F QA QC	D B R T	_____-_____-_____

a. Sample number assigned in field by Sampling Team using the USACE Sample Numbering Scheme. See Instructions.
[Project Code]-[Site Code]-[Sample Code]. Site Code:

TK__ - Tank	SB__ - Subsurface soil	SL__ - Sludge
SS__ - Surface soil	MW__ - Monitoring well	DR__ - Drum
SW__ - Surface water	SD__ - Sediment	

____ - Other: _____

b. F = Field Sample; QA = Quality Assurance sample for Corps laboratory; QC = Quality Control sample for Contractor's laboratory.

c. Duplicate; Background; Rinsate blank; Trip blank

Comments: _____

Field Sampling Supervisor: _____ Date: _____

Data Package Two.

QA/QC COVER PAGE
US Army Corps of Engineers
ANALYTICAL DATA PACKAGE
TABLE I. VOLATILE ORGANIC ANALYSES
(page __ of __)

Project Site and Location: _____

(Important Note: This form is completed in the field and submitted to the QA laboratory. A copy should be kept for the Contractors files. This form is NOT submitted to the Contractor's laboratory.)

USACE Field Sample Number[a]:	Designation[b]:	Complete if QA or QC circled[c]	For Duplicates: Enter Corresponding Field Sample Number:
_____-_____-_____	F QA QC	D B R T	_____-_____-_____
_____-_____-_____	F QA QC	D B R T	_____-_____-_____
_____-_____-_____	F QA QC	D B R T	_____-_____-_____
_____-_____-_____	F QA QC	D B R T	_____-_____-_____
_____-_____-_____	F QA QC	D B R T	_____-_____-_____
_____-_____-_____	F QA QC	D B R T	_____-_____-_____
_____-_____-_____	F QA QC	D B R T	_____-_____-_____
_____-_____-_____	F QA QC	D B R T	_____-_____-_____
_____-_____-_____	F QA QC	D B R T	_____-_____-_____
_____-_____-_____	F QA QC	D B R T	_____-_____-_____
_____-_____-_____	F QA QC	D B R T	_____-_____-_____
_____-_____-_____	F QA QC	D B R T	_____-_____-_____
_____-_____-_____	F QA QC	D B R T	_____-_____-_____
_____-_____-_____	F QA QC	D B R T	_____-_____-_____
_____-_____-_____	F QA QC	D B R T	_____-_____-_____
_____-_____-_____	F QA QC	D B R T	_____-_____-_____
_____-_____-_____	F QA QC	D B R T	_____-_____-_____
_____-_____-_____	F QA QC	D B R T	_____-_____-_____
_____-_____-_____	F QA QC	D B R T	_____-_____-_____
_____-_____-_____	F QA QC	D B R T	_____-_____-_____
_____-_____-_____	F QA QC	D B R T	_____-_____-_____
_____-_____-_____	F QA QC	D B R T	_____-_____-_____
_____-_____-_____	F QA QC	D B R T	_____-_____-_____
_____-_____-_____	F QA QC	D B R T	_____-_____-_____
_____-_____-_____	F QA QC	D B R T	_____-_____-_____
_____-_____-_____	F QA QC	D B R T	_____-_____-_____
_____-_____-_____	F QA QC	D B R T	_____-_____-_____
_____-_____-_____	F QA QC	D B R T	_____-_____-_____
_____-_____-_____	F QA QC	D B R T	_____-_____-_____
_____-_____-_____	F QA QC	D B R T	_____-_____-_____
_____-_____-_____	F QA QC	D B R T	_____-_____-_____
_____-_____-_____	F QA QC	D B R T	_____-_____-_____
_____-_____-_____	F QA QC	D B R T	_____-_____-_____
_____-_____-_____	F QA QC	D B R T	_____-_____-_____
_____-_____-_____	F QA QC	D B R T	_____-_____-_____
_____-_____-_____	F QA QC	D B R T	_____-_____-_____
_____-_____-_____	F QA QC	D B R T	_____-_____-_____
_____-_____-_____	F QA QC	D B R T	_____-_____-_____
_____-_____-_____	F QA QC	D B R T	_____-_____-_____
_____-_____-_____	F QA QC	D B R T	_____-_____-_____
_____-_____-_____	F QA QC	D B R T	_____-_____-_____
_____-_____-_____	F QA QC	D B R T	_____-_____-_____
_____-_____-_____	F QA QC	D B R T	_____-_____-_____

Remarks: _____

Field Sampling Supervisor: _____ Date: _____

US Army Corps of Engineers

ANALYTICAL DATA PACKAGE

TABLE II. SAMPLE NUMBER CORRELATIONS FOR VOLATILE ORGANIC ANALYSES

Project Site and Location: _____

Sampling Contractor: _____ Contract: _____

Contractor's Lab: _____ QA Lab: _____

Corps Division/District/Project Manager: _____

==========

USACE Field Sample Number[a]:	Laboratory Sample Number:
_____-_____-_____	_____
_____-_____-_____	_____
_____-_____-_____	_____
_____-_____-_____	_____
_____-_____-_____	_____
_____-_____-_____	_____
_____-_____-_____	_____
_____-_____-_____	_____
_____-_____-_____	_____
_____-_____-_____	_____
_____-_____-_____	_____
_____-_____-_____	_____
_____-_____-_____	_____
_____-_____-_____	_____
_____-_____-_____	_____
_____-_____-_____	_____

a. Sample number assigned in field by Sampling Team using the USACE Sample Numbering Scheme. See Instructions.

==========

Circle Yes or No in response to all applicable questions:

Yes No Were samples found to be properly preserved and at 4°C upon arrival in the laboratory??

Yes No Did any of the aqueous samples have headspace? (If so this must be recorded.)

Yes No Were five point calibrations used?

Were the following checks made on a 12 hr basis during the course of these analyses?

Yes No * Continuing Calibration Check
Yes No * System Performance Response Factor
Yes No * BFB Tuning Check

emarks: _____

Laboratory QA/QC Manager: _____ Date: _____

TABLE III. ANALYTICAL RESULTS FOR VOLATILE ORGANIC ANALYSES
(page 1 of 2)

Part 1. Project Information:

Project Site and Location: _____

Sampling Contractor: _____ Contract: _____

Contractor's Lab: _____ QA Lab: _____

Corps Division/District/Project Manager: _____

Part 2. Sample Information:

Matrix: Soil/Water/Other: _____ Level: Low/Medium % Solids: _____

Date Sampled (Field): _____ Date Received: _____

Lab Sample Number: _____ USACE Sample Number[a]: _____-_____-_____

Sample Description[b]: _____

Container and Preservative used (in field): _____

Actual holding times for analysis: ____days[c]

EPA Method Used: 624/8240/CLP/8020 Conc/Dil Factor: _____

Column: (packed/capillary) Sample wt/vol: _____ (g/mL)

Concentration Units: (ug/L or ug/kg dry weight)

Part 3. Analytical Results:

A. HSL Compounds[d].

Analyte:	Concentration:	CRDL[e]	IDL[e]
74-87-3 Chloromethane	_____	_____	_____
74-83-9 Bromomethane	_____	_____	_____
75-01-4 Vinyl Chloride	_____	_____	_____
75-00-3 Chloroethane	_____	_____	_____
75-09-2 Methylene Chloride	_____	_____	_____
67-64-1 Acetone	_____	_____	_____
75-15-0 Carbon Disulfide	_____	_____	_____
75-35-4 1,1-Dichloroethene	_____	_____	_____
75-34-3 1,1-Dichloroethane	_____	_____	_____
156-60-5 trans-1,2-Dichloroethene	_____	_____	_____
67-66-3 Chloroform	_____	_____	_____
107-06-2 1,2-Dichloroethane	_____	_____	_____
78-93-3 2-Butanone	_____	_____	_____
71-55-6 1,1,1-Trichloroethane	_____	_____	_____
56-23-5 Carbon Tetrachloride	_____	_____	_____
108-05-4 Vinyl Acetate	_____	_____	_____
75-27-4 Bromodichloromethane	_____	_____	_____
79-34-5 1,1,2,2-Tetrachloroethane	_____	_____	_____
78-87-5 1,2-Dichloropropane	_____	_____	_____
10061-02-6 trans-1,3-Dichloropropene	_____	_____	_____
79-01-6 Trichloroethene	_____	_____	_____
124-48-1 Dibromochloromethane	_____	_____	_____
79-00-5 1,1,2-Trichloroethane	_____	_____	_____
71-43-2 Benzene	_____	_____	_____
10061-01-5 trans-1,3-Dichloropropene	_____	_____	_____
110-75-8 2-Chloro Ethyl Vinyl Ether	_____	_____	_____

TABLE III. ANALYTICAL RESULTS FOR VOLATILE ORGANIC ANALYSES
(page 2 of 2)

Analyte:	Concentration:	CRDL[e]	IDL[e]
75-25-2 Bromoform	_____	_____	_____
591-78-6 2-Hexanone	_____	_____	_____
108-10-1 4-Methyl-2-pentanone	_____	_____	_____
127-18-4 Tetrachloroethene	_____	_____	_____
108-88-3 Toluene	_____	_____	_____
108-90-7 Chlorobenzene	_____	_____	_____
100-41-4 Ethyl Benzene	_____	_____	_____
100-42-5 Styrene	_____	_____	_____
00000-00-0 Xylenes (Total)	_____	_____	_____

a. [Project Code]-[Site Code]-[Sample Code]
b. See Instructions for descriptive terminology (Section 5.2.4).
c. Holding Time for Anal. = Analysis Date minus Field Sampling Date.
d. Compounds as listed in SW-846, 3rd Edition, 1986.
e. CRDL = contract required detection limits; IDL = instrument detection limits

B. Tentatively Identified Compounds (10 maximum non-HSL peaks from library search)

Compound Name and CAS Number	RT	Estimated Conc
1. _____	_____	_____
2. _____	_____	_____
3. _____	_____	_____
4. _____	_____	_____
5. _____	_____	_____
6. _____	_____	_____
7. _____	_____	_____
8. _____	_____	_____
9. _____	_____	_____
10. _____	_____	_____

C. Surrogate Recovery Results

Surrogate	QC Limits Water	QC Limits Soil	Actual Recovery	Within QC Limits?	
Toluene-d^8	88 - 110 %	81 - 117 %	_____%	Yes	No
Bromofluorobenzene	86 - 115 %	74 - 121 %	_____%	Yes	No
1,2-Dichloroethane-d^4	76 - 114 %	70 - 121 %	_____%	Yes	No

Remarks: _____

Laboratory QA/QC Manager: _____ Date: _____

TABLE IV. VOLATILE ORGANIC ANALYSIS METHOD BLANK RESULTS

Part 1. Project Information:

Project Site and Location: _____

Sampling Contractor: _____ Contract: _____

Contractor's Lab: _____ QA Lab: _____

Corps Division/District/Project Manager: _____

Part 2. Method Blank Sample Information:

Matrix: Water Date Analyzed: _____

EPA Method Used: 624/8240/CLP Column: (packed/cap)

Laboratory QC Blank Sample Number: _____

Concentration Units: (ug/L)

Method blank information must be provided for each sample set.

Part 3. Analytical Results for Method Blank:

Analyte:		Concentration:	CRDL[a]	IDL[a]
74-87-3	Chloromethane	_____	_____	_____
74-83-9	Bromomethane	_____	_____	_____
75-01-4	Vinyl Chloride	_____	_____	_____
75-00-3	Chloroethane	_____	_____	_____
75-09-2	Methylene Chloride	_____	_____	_____
67-64-1	Acetone	_____	_____	_____
75-15-0	Carbon Disulfide	_____	_____	_____
75-35-4	1,1-Dichloroethene	_____	_____	_____
75-34-3	1,1-Dichloroethane	_____	_____	_____
156-60-5	trans-1,2-Dichloroethene	_____	_____	_____
67-66-3	Chloroform	_____	_____	_____
107-06-2	1,2-Dichloroethane	_____	_____	_____
78-93-3	2-Butanone	_____	_____	_____
71-55-6	1,1,1-Trichloroethane	_____	_____	_____
56-23-5	Carbon Tetrachloride	_____	_____	_____
108-05-4	Vinyl Acetate	_____	_____	_____
75-27-4	Bromodichloromethane	_____	_____	_____
79-34-5	1,1,2,2-Tetrachloroethane	_____	_____	_____
78-87-5	1,2-Dichloropropane	_____	_____	_____
10061-02-6	trans-1,3-Dichloropropene	_____	_____	_____
79-01-6	Trichloroethene	_____	_____	_____
124-48-1	Dibromochloromethane	_____	_____	_____
79-00-5	1,1,2-Trichloroethane	_____	_____	_____
71-43-2	Benzene	_____	_____	_____
10061-01-5	trans-1,3-Dichloropropene	_____	_____	_____
110-75-8	2-Chloro Ethyl Vinyl Ether	_____	_____	_____
75-25-2	Bromoform	_____	_____	_____
591-78-6	2-Hexanone	_____	_____	_____
108-10-1	4-Methyl-2-pentanone	_____	_____	_____
127-18-4	Tetrachloroethene	_____	_____	_____
108-88-3	Toluene	_____	_____	_____
108-90-7	Chlorobenzene	_____	_____	_____
100-41-4	Ethyl Benzene	_____	_____	_____
100-42-5	Styrene	_____	_____	_____
00000-00-0	Xylenes (Total)	_____	_____	_____

a. CRDL = contract required detection limits; IDL = instrument detection limits

Laboratory QA/QC Manager: _____ Date: _____

ANALYTICAL DATA PACKAGE

TABLE V. VOLATILE ORGANIC ANALYSIS DATA SHEET FOR MATRIX SPIKE RECOVERY

(Submit this form or its equivalent only if a project sample is selected for matrix spike recovery.)

==========

Part 1. Project Information:
Project Site and Location: _____
Sampling Contractor: _____ Contract: _____
Contractor's Lab: _____ QA Lab: _____
Corps Division/District/Project Manager: _____

==========

Part 2. Sample Information:
Original Sample Matrix: Soil/Water/Other: _____
Lab Sample Number: _____
USACE Sample Number of field sample spiked: _____-_____-_____
Concentration Units: (ug/L or ug/kg dry weight)

==========

Part 3. Results:

Analyte:	Required QC Limits (%R) Water	Required QC Limits (%R) Soil	Sample Result (SR)	Spike Added (SA)	Matrix Spike SSR[a]	Matrix Spike %R[b]	Is the Result Within Limits
1,1-Dichloroethene	61-145	59-172	_____	_____	_____	_____	Yes No
Trichloroethene	71-120	62-137	_____	_____	_____	_____	Yes No
Benzene	76-127	66-142	_____	_____	_____	_____	Yes No
Toluene	76-125	59-139	_____	_____	_____	_____	Yes No
Chlorobenzene	75-130	60-133	_____	_____	_____	_____	Yes No

==========

a. SSR = Spiked Sample Result (Concentration)

b. %R = [(SSR - SR)/SA] x 100

==========

Remarks:

_____
_____
_____
_____
_____
_____

Laboratory Manager: _____ Date: _____

ANALYTICAL DATA PACKAGE

TABLE VI. VOLATILE ORGANIC ANALYSIS DATA SHEET FOR LABORATORY INTERNAL QC DUPLICATE RESULTS
(page 1 of 2)

(Submit this form or its equivalent only if a project sample is selected for internal QC duplicate analysis.)

==========

Part 1. Project Information:

Project Site and Location: _____

Sampling Contractor: _____ Contract: _____

Contractor's Lab: _____ QA Lab: _____

Corps Division/District/Project Manager: _____

==========

Part 2. Internal Duplicate Sample Information:

Matrix: Soil/Water/Other: _____ Level: Low/Medium

Lab Sample Number: _____ Date Analyzed: _____

Lab Internal Duplicate Sample Number: _____

USACE Sample Number of field sample duplicated: _____-_____-_____

Concentration Units: (ug/L or ug/kg dry weight)

==========

Part 3. Analytical Results Internal Duplicate Analyses:

Analyte:	Lower/ Upper Control Limits	Concentration Sample	Concentration Dupl.	RPD[a]	Outside Control Limits?	
74-87-3 Chloromethane	___-___	_____	_____	_____	Yes	No
74-83-9 Bromomethane	___-___	_____	_____	_____	Yes	No
75-01-4 Vinyl Chloride	___-___	_____	_____	_____	Yes	No
75-00-3 Chloroethane	___-___	_____	_____	_____	Yes	No
75-09-2 Methylene Chloride	___-___	_____	_____	_____	Yes	No
67-64-1 Acetone	___-___	_____	_____	_____	Yes	No
75-15-0 Carbon Disulfide	___-___	_____	_____	_____	Yes	No
75-35-4 1,1-Dichloroethene	___-___	_____	_____	_____	Yes	No
75-34-3 1,1-Dichloroethane	___-___	_____	_____	_____	Yes	No
156-60-5 trans-1,2-Dichloro-ethene	___-___	_____	_____	_____	Yes	No
67-66-3 Chloroform	___-___	_____	_____	_____	Yes	No
107-06-2 1,2-Dichloroethane	___-___	_____	_____	_____	Yes	No
78-93-3 2-Butanone	___-___	_____	_____	_____	Yes	No
71-55-6 1,1,1-Trichloroethane	___-___	_____	_____	_____	Yes	No
56-23-5 Carbon Tetrachloride	___-___	_____	_____	_____	Yes	No
108-05-4 Vinyl Acetate	___-___	_____	_____	_____	Yes	No
75-27-4 Bromodichloromethane	___-___	_____	_____	_____	Yes	No
79-34-5 1,1,2,2-Tetrachloro ethane	___-___	_____	_____	_____	Yes	No
78-87-5 1,2-Dichloropropane	___-___	_____	_____	_____	Yes	No
10061-02-6 trans-1,3-Dichloro-propene	___-___	_____	_____	_____	Yes	No
79-01-6 Trichloroethene	___-___	_____	_____	_____	Yes	No
124-48-1 Dibromochloromethane	___-___	_____	_____	_____	Yes	No
79-00-5 1,1,2-Trichloroethane	___-___	_____	_____	_____	Yes	No
71-43-2 Benzene	___-___	_____	_____	_____	Yes	No

ANALYTICAL DATA PACKAGE

TABLE VI. VOLATILE ORGANIC ANALYSIS DATA SHEET FOR LABORATORY INTERNAL QC DUPLICATE RESULTS
(page 2 of 2)

Analyte:	Lower/ Upper Control Limits	Concentration Sample	Concentration Dupl.	RPD[a]	Outside Control Limits?
10061-01-5 trans-1,3-Dichloro-propene	___-___	_____	_____	_____	Yes No
110-75-8 2-Chloro Ethyl Vinyl Ether	___-___	_____	_____	_____	Yes No
75-25-2 Bromoform	___-___	_____	_____	_____	Yes No
591-78-6 2-Hexanone	___-___	_____	_____	_____	Yes No
108-10-1 4-Methyl-2-pentanone	___-___	_____	_____	_____	Yes No
127-18-4 Tetrachloroethene	___-___	_____	_____	_____	Yes No
108-88-3 Toluene	___-___	_____	_____	_____	Yes No
108-90-7 Chlorobenzene	___-___	_____	_____	_____	Yes No
100-41-4 Ethyl Benzene	___-___	_____	_____	_____	Yes No
100-42-5 Styrene	___-___	_____	_____	_____	Yes No
00000-00-0 Xylenes (Total)	___-___	_____	_____	_____	Yes No

a. RPD = Relative Percent Difference = $[|S - D|/((S + D)/2)] \times 100$

Remarks: _____

Laboratory QA/QC Manager: _____ Date: _____

QA/QC COVER PAGE

US Army Corps of Engineers
ANALYTICAL DATA PACKAGE
TABLE I. PCB ANALYSES

Project Site and Location: _____
Sampling Contractor: _____ Contract: _____
Contractor's Lab: _____ QA Lab: _____
Corps Division/District/Project Manager: _____

(Important Note: This form is completed in the field and submitted to the QA laboratory. A copy should be kept for the Contractor's files. This form is NOT submitted to the Contractor's laboratory.)

USACE Field Sample Number[a]:	Designation[b]:	Complete if QA or QC circled[c]	For Duplicates/Splits: Enter Corresponding Field Sample Number:
_____-_____- 0001	F QA QC	D S B R T	_____-_____-_____
_____-_____- 0002	F QA QC	D S B R T	_____-_____-_____
_____-_____- 0003	F QA QC	D S B R T	_____-_____-_____
_____-_____- 0004	F QA QC	D S B R T	_____-_____-_____
_____-_____- 0005	F QA QC	D S B R T	_____-_____-_____
_____-_____- 0006	F QA QC	D S B R T	_____-_____-_____
_____-_____- 0007	F QA QC	D S B R T	_____-_____-_____
_____-_____- 0008	F QA QC	D S B R T	_____-_____-_____
_____-_____- 0009	F QA QC	D S B R T	_____-_____-_____
_____-_____- 0010	F QA QC	D S B R T	_____-_____-_____
_____-_____- 0011	F QA QC	D S B R T	_____-_____-_____
_____-_____- 0012	F QA QC	D S B R T	_____-_____-_____
_____-_____- 0013	F QA QC	D S B R T	_____-_____-_____
_____-_____- 0014	F QA QC	D S B R T	_____-_____-_____
_____-_____- 0015	F QA QC	D S B R T	_____-_____-_____
_____-_____- 0016	F QA QC	D S B R T	_____-_____-_____
_____-_____- 0017	F QA QC	D S B R T	_____-_____-_____
_____-_____- 0018	F QA QC	D S B R T	_____-_____-_____
_____-_____- 0019	F QA QC	D S B R T	_____-_____-_____
_____-_____- 0020	F QA QC	D S B R T	_____-_____-_____

a. Sample number assigned in field by Sampling Team using the USACE Sample Numbering Scheme. See Instructions. [Project Code]-[Site Code]-[Sample Code]. Site Code:

TK__ - Tank	SB__ - Subsurface soil
SS__ - Surface soil	MW__ - Monitoring well
SW__ - Surface water	SD__ - Sediment
SL__ - Sludge	DR__ - Drum
____ - Other: _____	

b. F = Field Sample; QA = Quality Assurance sample for Corps laboratory; QC = Quality Control sample for Contractor's laboratory.

c. D = duplicate; S = split; B = background; R = rinsate blank; T = trip blank

Remarks: _____

Field Sampling Supervisor: _____ Date: _____

QA/QC COVER PAGE

US Army Corps of Engineers
ANALYTICAL DATA PACKAGE
TABLE I. PCB ANALYSES

Project Site and Location: _____

(Important Note: This form is completed in the field and submitted to the QA laboratory. A copy should be kept for the Contractor's files. This form is NOT submitted to the Contractor's laboratory.)

USACE Field Sample Number[a]:	Designation[b]:	Complete if QA or QC circled[c]	For Duplicates/Splits: Enter Corresponding Field Sample Number:
_____-_____-_____	F QA QC	D S B R T	_____-_____-_____
_____-_____-_____	F QA QC	D S B R T	_____-_____-_____
_____-_____-_____	F QA QC	D S B R T	_____-_____-_____
_____-_____-_____	F QA QC	D S B R T	_____-_____-_____
_____-_____-_____	F QA QC	D S B R T	_____-_____-_____
_____-_____-_____	F QA QC	D S B R T	_____-_____-_____
_____-_____-_____	F QA QC	D S B R T	_____-_____-_____
_____-_____-_____	F QA QC	D S B R T	_____-_____-_____
_____-_____-_____	F QA QC	D S B R T	_____-_____-_____
_____-_____-_____	F QA QC	D S B R T	_____-_____-_____
_____-_____-_____	F QA QC	D S B R T	_____-_____-_____
_____-_____-_____	F QA QC	D S B R T	_____-_____-_____
_____-_____-_____	F QA QC	D S B R T	_____-_____-_____
_____-_____-_____	F QA QC	D S B R T	_____-_____-_____
_____-_____-_____	F QA QC	D S B R T	_____-_____-_____
_____-_____-_____	F QA QC	D S B R T	_____-_____-_____
_____-_____-_____	F QA QC	D S B R T	_____-_____-_____
_____-_____-_____	F QA QC	D S B R T	_____-_____-_____
_____-_____-_____	F QA QC	D S B R T	_____-_____-_____
_____-_____-_____	F QA QC	D S B R T	_____-_____-_____
_____-_____-_____	F QA QC	D S B R T	_____-_____-_____
_____-_____-_____	F QA QC	D S B R T	_____-_____-_____
_____-_____-_____	F QA QC	D S B R T	_____-_____-_____
_____-_____-_____	F QA QC	D S B R T	_____-_____-_____
_____-_____-_____	F QA QC	D S B R T	_____-_____-_____
_____-_____-_____	F QA QC	D S B R T	_____-_____-_____
_____-_____-_____	F QA QC	D S B R T	_____-_____-_____
_____-_____-_____	F QA QC	D S B R T	_____-_____-_____
_____-_____-_____	F QA QC	D S B R T	_____-_____-_____
_____-_____-_____	F QA QC	D S B R T	_____-_____-_____
_____-_____-_____	F QA QC	D S B R T	_____-_____-_____
_____-_____-_____	F QA QC	D S B R T	_____-_____-_____
_____-_____-_____	F QA QC	D S B R T	_____-_____-_____
_____-_____-_____	F QA QC	D S B R T	_____-_____-_____
_____-_____-_____	F QA QC	D S B R T	_____-_____-_____
_____-_____-_____	F QA QC	D S B R T	_____-_____-_____
_____-_____-_____	F QA QC	D S B R T	_____-_____-_____
_____-_____-_____	F QA QC	D S B R T	_____-_____-_____
_____-_____-_____	F QA QC	D S B R T	_____-_____-_____
_____-_____-_____	F QA QC	D S B R T	_____-_____-_____
_____-_____-_____	F QA QC	D S B R T	_____-_____-_____
_____-_____-_____	F QA QC	D S B R T	_____-_____-_____
_____-_____-_____	F QA QC	D S B R T	_____-_____-_____

Remarks: _____

Field Sampling Supervisor: _____ Date: _____

US Army Corps of Engineers

ANALYTICAL DATA PACKAGE

TABLE II. SAMPLE NUMBER CORRELATIONS FOR PCB ANALYSES

Project Site and Location: _____
Sampling Contractor: _____ Contract: _____
Contractor's Lab: _____ QA Lab: _____
Corps Division/District/Project Manager: _____

USACE Field Sample Number[a]:	Laboratory Sample Number:
____-____-____	_____
____-____-____	_____
____-____-____	_____
____-____-____	_____
____-____-____	_____
____-____-____	_____
____-____-____	_____
____-____-____	_____
____-____-____	_____
____-____-____	_____
____-____-____	_____
____-____-____	_____
____-____-____	_____
____-____-____	_____
____-____-____	_____
____-____-____	_____
____-____-____	_____
____-____-____	_____
____-____-____	_____
____-____-____	_____
____-____-____	_____
____-____-____	_____
____-____-____	_____
____-____-____	_____

a. Sample number assigned in field by Sampling Team using the USACE Sample Numbering Scheme. See Instructions.

Circle Yes or No in response to all applicable questions:

Yes No Was the temperature in the cooler 4°C upon arrival in the laboratory?

Yes No Were three point calibration curves used?

Yes No Were daily calibrations done during the course of these analyses?

Yes No Was a second column confirmation used on all samples giving a positive hit with the first column?

Yes No Was GC/MS confirmation done on observed peaks?

Int Ext Was an internal standard or an external calibration curve used?

Remarks: _____

Laboratory QA/QC Manager: _____ Date: _____

ANALYTICAL DATA PACKAGE

TABLE III. ANALYTICAL RESULTS FOR PCB ANALYSES

==========

art 1. Project Information:
Project Site and Location: _____
Sampling Contractor: _____ Contract: _____
Contractor's Lab: _____ QA Lab: _____
Corps Division/District/Project Manager: _____

==========

Part 2. Sample Information:
Matrix: Soil/Water/Other: _____ Level: Low/Medium % Solids: _____
Date Sampled (Field): _____ Date Received: _____
Lab Sample Number: _____ USACE Sample Number[a]: _____-_____-_____
Sample Description[b]: _____
Container and Preservative used (in field): _____
Actual Holding Times: For extraction: ____days; For analysis: ____days[c]
EPA Method Used: 608/8080/CLP Conc/Dil Factor: _____
Column: (packed/capillary) Sample wt/vol: _____ (g/mL)
Contractor Laboratory QC Blank Sample Number: _____
Concentration Units: (ug/L or ug/kg dry weight)

==========

Part 3. Analytical Results:

A. HSL Compounds[d].

Analyte:	Concentration:	CRDL[e]	IDL[e]
12674-11-2 Aroclor-1016	_____	_____	_____
11104-28-2 Aroclor-1221	_____	_____	_____
11141-16-5 Aroclor-1232	_____	_____	_____
53469-21-9 Aroclor-1242	_____	_____	_____
12672-29-6 Aroclor-1248	_____	_____	_____
11097-69-1 Aroclor-1254	_____	_____	_____
11096-82-5 Aroclor-1260	_____	_____	_____

Was evidence of other peaks noted in the chromatogram? Circle: Yes No

a. [Project Code]-[Site Code]-[Sample Code]
b. See Instructions for descriptive terminology (Section 5.2.4).
c. Holding Time for Extr. = Extraction Date minus Field Sampling Date.
   Holding Time for Anal. = Analysis Date minus Extraction Date.
d. Compounds as listed in CLP User's Guide, 1986.
e. CRDL = contract required detection limits; IDL = instrument detection limits

==========

B. Surrogate Recovery Results

Surrogate	QC Limits Water	QC Limits Soil	Actual Recovery	Within QC Limits?
Dibutylchlorendate	24 - 154 %	20 - 150 %	_____%	Yes No

==========

Remarks: _____

_____

Laboratory QA/QC Manager: _____ Date: _____

TABLE IV. PCB ANALYSIS METHOD BLANK RESULTS

Part 1. Project Information:

Project Site and Location: _____

Sampling Contractor: _____ Contract: _____

Contractor's Lab: _____ QA Lab: _____

Corps Division/District/Project Manager: _____

Part 2. Method Blank Sample Information:

Matrix: Water Date Analyzed: _____

EPA Method Used: 608/8080/CLP Column: (packed/cap)

Laboratory QC Blank Sample Number: _____

Concentration Units: (ug/L)

Method blank information must be provided for each data set.

Part 3. Analytical Results for Method Blank:

Analyte:	Concentration:	CRDL[a]	IDL[a]
12674-11-2 Aroclor-1016	_____	_____	_____
11104-28-2 Aroclor-1221	_____	_____	_____
11141-16-5 Aroclor-1232	_____	_____	_____
53469-21-9 Aroclor-1242	_____	_____	_____
12672-29-6 Aroclor-1248	_____	_____	_____
11097-69-1 Aroclor-1254	_____	_____	_____
11096-82-5 Aroclor-1260	_____	_____	_____

a. CRDL = contract required detection limits; IDL = instrument detection limits

Remarks: _____

Laboratory QA/QC Manager: _____ Date: _____

ANALYTICAL DATA PACKAGE

TABLE V. PCB ANALYSIS DATA SHEET FOR

MATRIX SPIKE RECOVERY

(Submit this form or its equivalent only if a project sample is selected for matrix spike recovery.)

==========

Part 1. Project Information:

Project Site and Location: _____

Sampling Contractor: _____ Contract: _____

Contractor's Lab: _____ QA Lab: _____

Corps Division/District/Project Manager: _____

==========

Part 2. Sample Information:

Original Sample Matrix: Soil/Water/Other: _____

Lab Sample Number: _____

USACE Sample Number of field sample spiked: _____-_____-_____

Concentration Units: (ug/L or ug/kg dry weight)

==========

Part 3. Results:

Analyte:	Required QC Limits (%R) Water	Required QC Limits (%R) Soil	Sample Result (SR)	Spike Added (SA)	Matrix Spike SSR[a]	Matrix Spike %R[b]	Is the Result Within Limits
Lindane	56-123	46-127	_____	_____	_____	_____	Yes No
Heptachlor	40-131	35-130	_____	_____	_____	_____	Yes No
Aldrin	40-120	34-132	_____	_____	_____	_____	Yes No
Dieldrin	52-126	31-134	_____	_____	_____	_____	Yes No
Endrin	56-121	42-139	_____	_____	_____	_____	Yes No
4,4'-DDT	38-127	23-134	_____	_____	_____	_____	Yes No

==========

a. SSR = Spiked Sample Result (Concentration)

b. %R = [(SSR - SR)/SA] x 100

==========

Remarks:

_____

_____

_____

_____

_____

_____

Laboratory Manager: _____ Date: _____

ANALYTICAL DATA PACKAGE

TABLE VI. PCB ANALYSIS DATA SHEET FOR LABORATORY

INTERNAL QC DUPLICATE RESULTS

(Submit this form or its equivalent only if a project sample is selected for internal QC duplicate analysis.)

==========

Part 1. Project Information:

Project Site and Location: _____

Sampling Contractor: _____ Contract: _____

Contractor's Lab: _____ QA Lab: _____

Corps Division/District/Project Manager: _____

==========

Part 2. Internal Duplicate Sample Information:

Matrix: Soil/Water/Other: _____ Level: Low/Medium

Lab Sample Number: _____ Date Analyzed: _____

Lab Internal Duplicate Sample Number: _____

USACE Sample Number of field sample duplicated: _____-_____-_____

Concentration Units: (ug/L or ug/kg dry weight)

==========

Part 3. Analytical Results Internal Duplicate Analyses:

Analyte:	Lower/ Upper Control Limits	Concentration Sample	Concentration Dupl.	RPD[a]	Outside Control Limits?
12674-11-2 Aroclor-1016	___-___	_____	_____	_____	Yes No
11104-28-2 Aroclor-1221	___-___	_____	_____	_____	Yes No
11141-16-5 Aroclor-1232	___-___	_____	_____	_____	Yes No
53469-21-9 Aroclor-1242	___-___	_____	_____	_____	Yes No
12672-29-6 Aroclor-1248	___-___	_____	_____	_____	Yes No
11097-69-1 Aroclor-1254	___-___	_____	_____	_____	Yes No
11096-82-5 Aroclor-1260	___-___	_____	_____	_____	Yes No

a. RPD = Relative Percent Difference = $[|S - D|/((S + D)/2)] \times 100$

==========

Remarks: _____

_____

_____

_____

_____

_____

Laboratory QA/QC Manager: _____ Date: _____

Data Package Four.

QA/QC COVER PAGE

US Army Corps of Engineers
ANALYTICAL DATA PACKAGE
TABLE I. BTX & E ANALYSES
(page 1 of __)

Project Site and Location: _____

Sampling Contractor: _____ Contract: _____

Contractor's Lab: _____ QA Lab: _____

Corps Division/District/Project Manager: _____

(Important Note: This form is completed in the field and submitted to the QA laboratory. A copy should be kept for the Contractors files. This form is NOT submitted to the Contractor's laboratory.)

USACE Field Sample Number[a]:	Designation[b]:	Complete if QA or QC circled[c]	For Duplicates: Enter Corresponding Field Sample Number:
_____-_____- 0001	F QA QC	D B R T	_____-_____-_____
_____-_____- 0002	F QA QC	D B R T	_____-_____-_____
_____-_____- 0003	F QA QC	D B R T	_____-_____-_____
_____-_____- 0004	F QA QC	D B R T	_____-_____-_____
_____-_____- 0005	F QA QC	D B R T	_____-_____-_____
_____-_____- 0006	F QA QC	D B R T	_____-_____-_____
_____-_____- 0007	F QA QC	D B R T	_____-_____-_____
_____-_____- 0008	F QA QC	D B R T	_____-_____-_____
_____-_____- 0009	F QA QC	D B R T	_____-_____-_____
_____-_____- 0010	F QA QC	D B R T	_____-_____-_____
_____-_____- 0011	F QA QC	D B R T	_____-_____-_____
_____-_____- 0012	F QA QC	D B R T	_____-_____-_____
_____-_____- 0013	F QA QC	D B R T	_____-_____-_____
_____-_____- 0014	F QA QC	D B R T	_____-_____-_____
_____-_____- 0015	F QA QC	D B R T	_____-_____-_____
_____-_____- 0016	F QA QC	D B R T	_____-_____-_____
_____-_____- 0017	F QA QC	D B R T	_____-_____-_____
_____-_____- 0018	F QA QC	D B R T	_____-_____-_____
_____-_____- 0019	F QA QC	D B R T	_____-_____-_____
_____-_____- 0020	F QA QC	D B R T	_____-_____-_____

a. Sample number assigned in field by Sampling Team using the USACE Sample Numbering Scheme. See Instructions.
[Project Code]-[Site Code]-[Sample Code]. Site Code:

TK__ - Tank	SB__ - Subsurface soil	SL__ - Sludge
SS__ - Surface soil	MW__ - Monitoring well	DR__ - Drum
SW__ - Surface water	SD__ - Sediment	
____ - Other: _____		

b. F = Field Sample; QA = Quality Assurance sample for Corps laboratory; QC = Quality Control sample for Contractor's laboratory.

c. Duplicate; Background; Rinsate blank; Trip blank

Comments: _____

_____

Field Sampling Supervisor: _____ Date: _____

Data Package Four.

QA/QC COVER PAGE

US Army Corps of Engineers
ANALYTICAL DATA PACKAGE
TABLE I. BTX & E ANALYSES
(page __ of __)

Project Site and Location: _____

(Important Note: This form is completed in the field and submitted to the QA laboratory. A copy should be kept for the Contractors files. This form is NOT submitted to the Contractor's laboratory.)

USACE Field Sample Number[a]:	Designation[b]:	Complete if QA or QC circled[c]	For Duplicates: Enter Corresponding Field Sample Number:
____-____-____	F QA QC	D B R T	____-____-____
____-____-____	F QA QC	D B R T	____-____-____
____-____-____	F QA QC	D B R T	____-____-____
____-____-____	F QA QC	D B R T	____-____-____
____-____-____	F QA QC	D B R T	____-____-____
____-____-____	F QA QC	D B R T	____-____-____
____-____-____	F QA QC	D B R T	____-____-____
____-____-____	F QA QC	D B R T	____-____-____
____-____-____	F QA QC	D B R T	____-____-____
____-____-____	F QA QC	D B R T	____-____-____
____-____-____	F QA QC	D B R T	____-____-____
____-____-____	F QA QC	D B R T	____-____-____
____-____-____	F QA QC	D B R T	____-____-____
____-____-____	F QA QC	D B R T	____-____-____
____-____-____	F QA QC	D B R T	____-____-____
____-____-____	F QA QC	D B R T	____-____-____
____-____-____	F QA QC	D B R T	____-____-____
____-____-____	F QA QC	D B R T	____-____-____
____-____-____	F QA QC	D B R T	____-____-____
____-____-____	F QA QC	D B R T	____-____-____
____-____-____	F QA QC	D B R T	____-____-____
____-____-____	F QA QC	D B R T	____-____-____
____-____-____	F QA QC	D B R T	____-____-____
____-____-____	F QA QC	D B R T	____-____-____
____-____-____	F QA QC	D B R T	____-____-____
____-____-____	F QA QC	D B R T	____-____-____
____-____-____	F QA QC	D B R T	____-____-____
____-____-____	F QA QC	D B R T	____-____-____
____-____-____	F QA QC	D B R T	____-____-____
____-____-____	F QA QC	D B R T	____-____-____
____-____-____	F QA QC	D B R T	____-____-____
____-____-____	F QA QC	D B R T	____-____-____
____-____-____	F QA QC	D B R T	____-____-____
____-____-____	F QA QC	D B R T	____-____-____
____-____-____	F QA QC	D B R T	____-____-____
____-____-____	F QA QC	D B R T	____-____-____
____-____-____	F QA QC	D B R T	____-____-____
____-____-____	F QA QC	D B R T	____-____-____
____-____-____	F QA QC	D B R T	____-____-____
____-____-____	F QA QC	D B R T	____-____-____
____-____-____	F QA QC	D B R T	____-____-____
____-____-____	F QA QC	D B R T	____-____-____
____-____-____	F QA QC	D B R T	____-____-____
____-____-____	F QA QC	D B R T	____-____-____

Remarks: _____

Field Sampling Supervisor: _____ Date: _____

US Army Corps of Engineers

ANALYTICAL DATA PACKAGE

TABLE II. SAMPLE NUMBER CORRELATIONS FOR BTX & E ANALYSES

Project Site and Location: _____

Sampling Contractor: _____ Contract: _____

Contractor's Lab: _____ QA Lab: _____

Corps Division/District/Project Manager: _____

USACE Field Sample Number[a]:	Laboratory Sample Number:
_____-_____-_____	_____
_____-_____-_____	_____
_____-_____-_____	_____
_____-_____-_____	_____
_____-_____-_____	_____
_____-_____-_____	_____
_____-_____-_____	_____
_____-_____-_____	_____
_____-_____-_____	_____
_____-_____-_____	_____
_____-_____-_____	_____
_____-_____-_____	_____
_____-_____-_____	_____
_____-_____-_____	_____
_____-_____-_____	_____
_____-_____-_____	_____
_____-_____-_____	_____

a. Sample number assigned in field by Sampling Team using the USACE Sample Numbering Scheme. See Instructions.

Circle Yes or No in response to all applicable questions:

Yes No Were samples found to be properly preserved and at 4°C upon arrival in the laboratory??

Yes No Did any of the aqueous samples have headspace? (If so this must be recorded.)

Yes No Were five point calibrations used?

Yes No Were Continuing Calibration Checks made on a 12 hr basis during the course of these analyses?

Yes No Were internal standards used?

Remarks: _____

_____

_____

Laboratory QA/QC Manager: _____ Date: _____

TABLE III. ANALYTICAL RESULTS FOR BTX & E ANALYSES

==========

Part 1. Project Information:

Project Site and Location: _____

Sampling Contractor: _____ Contract: _____

Contractor's Lab: _____ QA Lab: _____

Corps Division/District/Project Manager: _____

==========

Part 2. Sample Information:

Matrix: Soil/Water/Other: _____ Level: Low/Medium % Solids: _____

Date Sampled (Field): _____ Date Received: _____

Lab Sample Number: _____ USACE Sample Number[a]: _____-_____-_____

Sample Description[b]: _____

Container and Preservative used (in field): _____

Actual holding times for analysis: ____days[c]

Method Used: 8015(FID)/8020(PID)/Other: _____

Conc/Dil Factor: _____

Column: (packed/capillary) Sample wt/vol: _____ (g/mL)

Concentration Units: (ug/L or ug/kg dry weight)

==========

Part 3. Analytical Results:

A. HSL Compounds.

Analyte:	Concentration:	CRDL[e]	IDL[e]
71-43-2 Benzene	_____	_____	_____
108-88-3 Toluene	_____	_____	_____
100-41-4 Ethyl Benzene	_____	_____	_____
00000-00-0 Xylenes (Total)	_____	_____	_____

a. [Project Code]-[Site Code]-[Sample Code]
b. See Instructions for descriptive terminology (Section 5.2.4).
c. Holding Time for Anal. = Analysis Date minus Field Sampling Date.
d.
e. CRDL = contract required detection limits; IDL = instrument detection limits

==========

B. Surrogate Recovery Results

Surrogate	QC Limits Water	QC Limits Soil	Actual Recovery	Within QC Limits?	
_____	___ - ___%	___ - ___%	_____%	Yes	No
trifluorotoluene[a]	___ - ___%	___ - ___%	_____%	Yes	No

a. Method 8020 recommends use of α, α, α-trifluorotoluene as a surrogate.

==========

Remarks: _____

_____

Laboratory QA/QC Manager: _____ Date: _____

TABLE IV. BTX & E ANALYSIS METHOD BLANK RESULTS

Part 1. Project Information:

Project Site and Location: _____

Sampling Contractor: _____ Contract: _____

Contractor's Lab: _____ QA Lab: _____

Corps Division/District/Project Manager: _____

Part 2. Method Blank Sample Information:

Method Used: 8015(FID)/8020(PID)/Other: _____

Matrix: Water Date Analyzed: _____

Column: (packed/cap)

Laboratory QC Blank Sample Number: _____

Concentration Units: (ug/L)

Method blank information must be provided for each sample set.

Part 3. Analytical Results for Method Blank:

Analyte:	Concentration:	CRDL[a]	IDL[a]
71-43-2 Benzene	_____	_____	_____
108-88-3 Toluene	_____	_____	_____
100-41-4 Ethyl Benzene	_____	_____	_____
00000-00-0 Xylenes (Total)	_____	_____	_____

a. CRDL = contract required detection limits; IDL = instrument detection limits

Laboratory QA/QC Manager: _____ Date: _____

ANALYTICAL DATA PACKAGE

TABLE V. BTX & E ANALYSIS DATA SHEET FOR

MATRIX SPIKE RECOVERY

(Submit this form or its equivalent only if a project sample is selected for matrix spike recovery.)

==========

Part 1. Project Information:

Project Site and Location: _____

Sampling Contractor: _____ Contract: _____

Contractor's Lab: _____ QA Lab: _____

Corps Division/District/Project Manager: _____

==========

Part 2. Sample Information:

Original Sample Matrix: Soil/Water/Other: _____

Lab Sample Number: _____

USACE Sample Number of field sample spiked: _____-_____-_____

Concentration Units: (ug/L or ug/kg dry weight)

==========

Part 3. Results:

Analyte:	Required QC Limits (%R) Water	Required QC Limits (%R) Soil	Sample Result (SR)	Spike Added (SA)	Matrix Spike SSR[a]	Matrix Spike %R[b]	Is the Result Within Limits
Benzene	__-___	__-___	_____	_____	_____	_____	Yes No
Toluene	__-___	__-___	_____	_____	_____	_____	Yes No

==========

a. SSR = Spiked Sample Result (Concentration)

b. %R = [(SSR - SR)/SA] x 100

==========

Remarks:

_____

_____

_____

_____

_____

_____

Laboratory Manager: _____ Date: _____

ANALYTICAL DATA PACKAGE

TABLE VI. BTX & E ANALYSIS DATA SHEET FOR LABORATORY

INTERNAL QC DUPLICATE RESULTS

(Submit this form or its equivalent only if a project sample is selected for internal QC duplicate analysis.)

==========

Part 1. Project Information:

Project Site and Location: _____

Sampling Contractor: _____ Contract: _____

Contractor's Lab: _____ QA Lab: _____

Corps Division/District/Project Manager: _____

==========

Part 2. Internal Duplicate Sample Information:

Matrix: Soil/Water/Other: _____ Level: Low/Medium

Lab Sample Number: _____ Date Analyzed: _____

Lab Internal Duplicate Sample Number: _____

USACE Sample Number of field sample duplicated: _____-_____-_____

Concentration Units: (ug/L or ug/kg dry weight)

==========

Part 3. Analytical Results Internal Duplicate Analyses:

Analyte:	Lower/ Upper Control Limits	Concentration Sample	Concentration Dupl.	RPD[a]	Outside Control Limits?	
71-43-2 Benzene	___-___	_____	_____	_____	Yes	No
108-88-3 Toluene	___-___	_____	_____	_____	Yes	No
100-41-4 Ethyl Benzene	___-___	_____	_____	_____	Yes	No
00000-00-0 Xylenes (Total)	___-___	_____	_____	_____	Yes	No

a. RPD = Relative Percent Difference = $[|S - D|/((S + D)/2)] \times 100$

==========

Remarks: _____

_____

_____

_____

_____

_____

Laboratory QA/QC Manager: _____ Date: _____

FIGURE 1-3. UST CLOSURE CHECKLIST

Date Completed/ & Initials	
_____	1. Have the major decision-makers been identified? _____ Environmental Coordinator _____ USACE District Office Contracting Representative _____ Implementing Agency Contact
_____	2. Has the tank to be closed been identified and located?
_____	3. Is the tank history complete? _____ As-built Drawings _____ Utility Surveys
_____	4. Have the contents been identified?
_____	5. Has a visual site inspection been performed to identify potential construction difficulties and/or signs of leakage?
_____	6. Have the planning documents been prepared and approved? _____ Site Safety & Health Plan _____ Chemical Data Acquisition Plan
_____	7. Has a validated laboratory been identified and approved?
_____	8. Has a preliminary site investigation been conducted to determine whether site remediation is required?
_____	9. Have all permits been obtained? _____ Excavation _____ Tank Removal (regulatory agency permit)
_____	10. Have provisions been made for product and sludge removal? _____ Recycle of POLs _____ Manifest for Waste Disposal
_____	11. Have provisions been made for disposal of contaminated water? _____ POTW Acceptance of Waters _____ Recycle/Separation/Treatment _____ Manifest Waste Disposal
_____	12. Have the appropriate agencies been notified for exact date of tank removal? _____ Fire Department _____ Implementing Agency _____ Environmental Coordinator
_____	13. Have action levels and screening methods been determined for excavation of soils?
_____	14. Have the methods for soil treatment and/or disposal been identified?
_____	15. Have provisions been made for tank destruction certification?
_____	16. Have provisions been made for site restoration?

TABLE D-1
CONFINED SPACE ENTRY PERMIT MINIMUM REQUIREMENTS

Space to be Entered: _____
Nature of Task: _____
Duration of Permit: From: _____ To: _____
Person In Charge: _____
Authorized Entrants: _____
_____
_____

Attendant: _____

Coordinator Signature: _____

Pre-Entry Check List

Needed? In Place? (To Be Initialed By Person In Charge)

Needed?	In Place?	
____	____	Traffic cones or barriers in place.
____	____	Safety harness with retrieval tripod in place.
____	____	SCBA ready for emergency use.
____	____	Valves tagged out (mark N/A if not applicable).
____	____	Electrical equipment disconnected & locked out (or N/A).
____	____	Protective clothing & equipment donned appropriately.
____	____	Rescue worker is within easy reach.

Personal Protective Equipment

Needed?	In Place?		Needed?	In Place?	
____	____	Airline breathing mask, or	____	____	SCBA.
____	____	Steel-toe safety shoes.	____	____	Hard hat.
____	____	Surgical PVC inner gloves.	____	____	Rubber outer gloves.
____	____	Chemical safety goggles.	____	____	Rubber overboots.
____	____	PVC rain suit.	____	____	Duct tape on seams.
____	____	Forced ventilation blower.	____	____	5-minute escape packs.

Atmospheric Testing

Needed?	In Place?	
____	____	Oxygen deficiency (>19.5% and <21.5%).
____	____	Flammable gases (<10% LEL).
____	____	Toxic gases (< PELs). (Specify: _____)
____	____	Ventilation blower pushing clean air into space.
____	____	Gas Detector(s) – on the belts or suits of entrants.
____	____	Atmospheric Testing – after period of ventilation.

ENTRY APPROVED: _____ _____
Person-in-Charge Date

APPENDIX I

NOTICE OF INTENT

NOTICE OF INTENT

1. NAME AND ADDRESS OF PERSON MAKING DISCHARGE.

   United States Army Corps of Engineers, Albuquerque District in conjunction with Cannon Air Force Base (CAFB), Clovis, New Mexico.

2. LOCATION OF THE DISCHARGE.

   Landfarm facility will be located at the north end of a decommissioned runway on CAFB property in Clovis, New Mexico.

3. THE MEANS OF DISCHARGE (TO A LAGOON, FLOWING STREAM, WATER COURSE, ARROYO, SEPTIC TANK-LEACH FIELD, OTHER-SPECIFY).

   No discharges will be permitted from the landfarm. The landfarm facility will be constructed on top of a decommissioned concrete runway and a newly placed 2-inch layer of asphalt pavement. The sides of the berm will consist of precast concrete highway barriers. The inside of the landfarm will be completely lined with 30- to 35-mil reinforced, flexible membrane liner, an approximately 10-ounce cushioning geotextile on top of the liner, and a geoweb filled with aggregate for the working surface of the landfarm facility. A geoweb is a honeycomb-shaped, 8-inch-deep geosynthetic material which is filled with aggregate. A geoweb provides a stable working surface for working equipment. This type of construction exceeds landfarm requirements outlined in the State of New Mexico Underground Storage Tank Regulations and the UST Soil/Water Sampling & Disposal Guidelines since groundwater is greater than 200 feet below ground surface.

4. THE ESTIMATED CONCENTRATION OF CONTAMINANTS IN THE DISCHARGE.

   Petroleum impacted soils will be treated in the landfarm facility. The volume of impacted soil to be treated is estimated to be 2,400 cubic yards. Total recoverable petroleum hydrocarbon (TRPH) concentrations in the soils range from levels slightly above non-detect to greater than 28,000 milligrams per kilogram (mg/kg). The soils treated within the landfarm facility will be kept moist to enhance biodegradation of the petroleum hydrocarbons. The soils will not be saturated nor will any discharges be permitted.

5. THE TYPE OF OPERATION FROM WHICH THE DISCHARGE WILL BE DERIVED.

   The landfarm will be used to remediate soil excavated from 19 solid waste management units (SWMUs). The landfarm facility will be constructed with three cells. One cell (80 feet by 270 feet) will be used to remediate soils associated with underground storage tank (UST) removal operations and will have a maximum soil depth of 6 inches as required by the State of New Mexico Underground Storage Tank Regulations. The second cell (80 feet by 340 feet) will be used to remediate soils associated with the removal of oil/water separators (OWS), sand traps, drains, leach wells, and associated piping and will have a maximum soil depth of 24 inches. The third cell (40 feet by 40 feet) will provide for stockpiling of excavated soils prior to placement in the remediation cells and will be covered with a flexible membrane liner anchored with sandbags. Attachment A provides additional information on landfarm operations and maintenance.

   OWS are considered process tanks, not USTs, and are therefore not regulated by UST guidelines. All excavated soils will be remediated to cleanup levels specified by the New Mexico Environment Department (NMED) UST Division (i.e., 100 mg/kg TRPH, 50 mg/kg benzene, toluene, ethylbenzene, and xylene (BTEX), and 10 mg/kg benzene). Soil samples will be collected, according to NMED UST Soil/Water Sampling and Disposal Guidelines, upon excavation to establish a contaminant baseline, every two weeks for the first two months, and thereafter on a monthly basis to

evaluate remediation efforts. In addition to TRPH (U.S. Environmental Protection Agency [EPA] Method 8015 Modified) and BTEX (EPA Method 8020) analysis, a sample will be collected per 400 cubic yards of soil from the landfarm cells for toxicity characteristic leaching procedure (TCLP) analysis for the following analytes: Resource Conservation and Recovery Act (RCRA) and other metals by EPA Method 6010; volatile organic compounds (VOCs) by EPA Method 8240; and semi-volatile organic compounds (SVOCs) by EPA Method 8270. The data from the TCLP analyses will be used to evaluate the presence and concentrations of metals, VOCs, and SVOCs present in the soils. Attachment B provides additional information on soil sampling and analysis procedures.

6. THE ESTIMATED FLOW TO BE DISCHARGED PER DAY.

0 gallons/day

7. THE ESTIMATED DEPTH TO GROUNDWATER.

Groundwater is located approximately 280 feet below ground surface.

Signed:_____ Date: _____

ATTACHMENT A

LANDFARM OPERATIONS AND MAINTENANCE

(excerpted from the Construction Work Plan, Appendix II and III, Solid Waste Management Units, Cannon Air Force Base, Clovis, New Mexico, prepared by ESE, dated September 1995)

LANDFARM OPERATIONS AND MAINTENANCE

All excavated soils impacted above the removal action level shall be transported to the landfarming facility for remediation of petroleum hydrocarbon contaminants. The general approaches for operating and maintaining the landfarm facility are provided herein.

The initial soil excavated from unit removal operations shall be transported to the landfarm cell with end-dump haul trucks. The end-dump haul trucks shall access the landfarm cell through the decontamination pad and shall place the excavated soil in the appropriate landfarm cell. UST-related soil shall be spread in Cell 1 and other UST-related soils shall be spread in Cell 2. The soil shall be spread in Cells 1 and 2 in one lift with a maximum thickness of 6 inches and 24 inches, respectively. The earthmoving equipment recommended for spreading and loading soil in the landfarm cell is a rubber-tired, front-end loader. The earthmoving equipment shall be operated by an equipment operator with an excellent history of experience in the operation of that specific piece of equipment. Extreme care shall be exercised by the equipment operator so that the geotextile and FML lining of the landfarm and storage cells are not touched by the earthmoving equipment.

Soil shall be stored in the storage cell after one 6-inch and 24-inch lift is placed in each of the landfarm cells for remediation. Soil shall be transported into the storage cell through the decontamination pad by an end-dump haul truck. The end-dump trucks shall place the soil in piles in the center of the storage cell so that at least a 10-foot-wide buffer zone remains between the concrete barrier and the stored soil piles. The FML storage cell soil cover shall be placed over the soil pile after unloading the soil and shall be anchored by sufficient sand bags to resist uplift by the wind. The soil shall not remain uncovered for a period of more than 30 minutes after being unloaded. The soil shall be covered immediately if health and safety conditions warrant that action according to the HASP.

In exceedance of the State of New Mexico UST Regulations requirements, provided in Appendix B, soils contained in both cells shall be aerated by turning every week. Ripping and discing of the soils will aerate the soils, enhancing biodegradation and volatilization of the petroleum hydrocarbon compounds. A farm tractor equipped with a farming disc and/or ripper is recommended. The tractor shall complete two sets of the following passes: parallel to the length of the landfarm cell until the whole width of the cell is tilled; followed by passes parallel to the width of the landfarm cell, until the whole length of the cell is tilled. If this method does not appear to turn all of the 6-inch or 24-inch lift, additional passes or use of rippers shall be performed until the whole lift appears to be totally remixed.

Following placement and daily thereafter, the soils shall be moisture conditioned using the permanent automatic sprinkler system. Moistening the soils at this frequency shall enhance natural microbial activity and biodegradation of petroleum hydrocarbon contaminants, as well as reduce the generation of dust from exposed soils. The sprinkler system shall be set on a timer to apply a water spray across the landfarm cells on a daily basis at about 6:00 AM or at the time of day which typically is the least windy, based on CAFB personnel observations and meteorological records.

The optimum moisture content for landfarm remediation of soil is approximately equal to or slightly more moist than the optimum moisture content for the maximum compaction of soils according to ASTM D-698. If the soil to be remediated is silty sand or clayey sand, as described in the RFIs, the optimum moisture content for remediation will be approximately 15 to 18 percent by weight. The contractor shall collect a sample of clean soil similar to the contaminated soil and perform a standard compaction test, according to ASTM D-698 to determine the optimum moisture content. The contractor shall test the moisture content of the soil being remediated according to ASTM D-2216, D-4643, or D-4959 at a rate of once per month. The contractor shall use the "feel" of the soil (using gloves specified in the HASP) at the optimum moisture content during the above tests to calibrate him or herself so that the contractor can gauge whether the soil in the landfarm is at the optimum moisture content by "feel" alone. The contractor shall then shorten or lengthen the standard amount of time that the sprinkler operates each day.

The automatic sprinkler system shall be turned off by the contractor before and during periods of frost or freezing temperatures. The sprinkler system shall be constructed according to Specification 02811. The system

will automatically drain at drainoff valves in the manifold box and at each sprinkler head so that water does not freeze in the pipes or valves and damage the system.

Maintenance of the landfarm facility shall include the following items:

- Periodic inspection of the spray system for faulty sprinkler heads, misaligned sprayheads, correct length and radius of spray coverage, leaking sprinkler system pipes, leaking valves or pipes in the manifold box or connections, correct timer programming

- Visual inspection of landfarm and storage cell integrity including observation of the inside and outside surfaces of the concrete barriers for spalling or damage from earthmoving equipment and haul trucks; observation of the geotextile and FML along the inside of the concrete barrier for signs of damage by earthmoving equipment or degradation; observation of the batten bar anchoring the geotextile and FML for signs of deterioration of the geosynthetics; observation of the geoweb and aggregate infill when it is exposed during the period between removing the remediated soil and spreading the next lift of soil to be remediated; observation of leakage from the perimeter of the cells along the junction of the concrete barrier and the asphalt pavement

- Observation of discing and tilling operations to verify that the soil is being totally turned over by the number and method of equipment passes

- Observation of the storage cell FML cover and sandbag anchoring system including observation to verify that soil is properly covered and is not eroded by the wind; observation of the integrity of the FML cover and sandbags

- Visual inspection of the decontamination pads including observation of the integrity and wear of the geoweb and aggregate infill; observation of piping of any of the compacted soil through the FML, geotextile and geoweb

- Shoveling of any soil or residue in the decontamination pad to the landfarm cell for remediation with the other soil

- Siphoning of decontamination pad water to the adjacent landfarm cell through a hose if decontamination pad water collects to a maximum depth of 1 foot deep

- Visual inspection of the access ramps between the decontamination pads and the cells for settling of the compacted soil under the layer of FML, geotextile and geoweb

- Visual inspection of the decontamination pad hose stations for signs of degradation and contamination by soil or decontamination rinsewater

- Soil sampling and testing to evaluate remediation efforts, performed according to the SAP

If any of the inspections described above or other observations indicate partial, total or impending failure of a component or an operational method of the landfarm facility, the contractor shall notify USACE immediately and confer on a possible solution to the problem.

After the 6 inches and 24 inches, respectively, of soil in the landfarm cells is remediated, according to the soil sample tests (described in the SAP, Section 4.0) and the action levels (described in Section 3.12), the remediated soil will be loaded within the landfarm cells into end-dump haul trucks by the rubber-tired front-end loader. The soil will then be transported to a USACE-designated location on CAFB to be used as clean fill. Soil will then be transported by the earthmoving equipment from the storage cell into the emptied landfarm cells and spread out into a maximum 6-inch and 24-inch lift, respectively, for remediation. This process will be repeated until no more soil is present in the storage cell. If soil does not meet cleanup levels for analytes which cannot be remediated in the landfarm, such as heavy metals, the contractor shall follow the procedures described in Section 3.12.

ATTACHMENT B

SOIL SAMPLING AND ANALYSIS

(excerpted from the Construction Work Plan, Appendix II and III, Solid Waste Management Units, Cannon Air Force Base, Clovis, New Mexico, prepared by ESE, dated September 1995)

LANDFARM

Upon reception of the impacted soil at the landfarming facility and prior to initiating landfarming, representative samples of the soil shall be obtained for TRPH and BTEX testing to provide a baseline for monitoring remediation efforts performance. Representative sampling shall consist of at least one sample per 100 cubic yards of soil. Analytical data acquired during unit removal operations can also be used for baseline characterization of contaminant levels within soils transported to the landfarming facility. The during-unit-removal and representative-sampling-at-the-landfarm test results shall be summarized in a table format. One table shall summarize baseline data for the UST-related soil and one table shall summarize baseline data for all other excavated soil. The tables of baseline data shall be used as a reference to compare to later soil sample test results from the landfarmed soil. The amount of decrease of TRPH and BTEX concentrations from later landfarm soil sample test results can be gauged by comparing to the original or baseline concentrations.

Following this initial sampling, additional sampling shall be conducted every two weeks for the first two months of operation to establish remediation performance. After two months, sampling shall be performed on a monthly basis if a decrease of at least 100 ppm TRPH has occurred each month. If a decrease of at least 100 ppm TRPH has not occurred each month, soil sampling shall be conducted every two months and the frequency of tilling/ discing shall be increased to twice per week.

Landfarm facility sampling will be conducted using standard household gardening equipment. Soil samples shall be collected from the following depths and analyzed for TRPH to evaluate remedial efforts:

- Cell 1 - 3 inches and 1 foot
- Cell 2 - 3 inches, 1 and 2 feet

Personnel collecting samples shall wear appropriate personal protective equipment (PPE) as outlined in the HASP (i.e., latex surgical gloves, etc.) and sample soils at depth using shovels or picks. In order to pack soil into sample jars, gloved hands shall be used. One discrete sample shall be collected at each depth. Sampler(s) shall change gloves between each sample. If a spade or other gardening instrument is used to collect the sample, the sample collection device will be decontaminated as outlined in the HASP before sampling and between each consecutive sample. The contractor shall follow the referenced guideline documents for soil sampling at unit removal locations.

Treatment of the impacted soils shall be continued until the contaminant concentrations in one soil sample tested per 100 cubic yards of treated soil are below 100 ppm for TRPH, 50 ppm for BTEX, and 10 ppm for benzene. After petroleum hydrocarbon soil cleanup levels have been reached, one sample shall be collected per 400 cubic yards of soil for TCLP tests for the following:

- Metals listed in Table 1
- VOCs by EPA Method 8240
- SVOCs by EPA Method 8270

The results of these tests shall be used by the contractor and USACE to determine appropriate disposal methods for the soil as described in Section 3.12.

TO VIEW THE MAP AND/OR MAPS WITH THIS DOCUMENT, PLEASE CALL THE HAZARDOUS WASTE BUREAU AT 505-476-6000 TO MAKE AN APPOINTMENT