

Draft Final
January 2004

Work Plans

Groundwater Investigation

Eastern Landfill

Fort Wingate Depot Activity, Gallup, New Mexico

- 1) Sampling and Analysis Plan**
- 2) Site Safety and Health Plan**

Contract No. DACA63-97-D-0030; D.O. No. 024
Tetra Tech NUS Project No. 794A

Prepared for:



**US Army Corps
of Engineers
Fort Worth District**

Prepared by:



**Tetra Tech NUS, Inc.
Houston, Texas**

SAMPLING AND ANALYSIS PLAN

**GROUNDWATER INVESTIGATION
AT
EASTERN LANDFILL**

**FORT WINGATE DEPOT ACTIVITY
Gallup, McKinley County, New Mexico**

January 2004

Prepared for:

**United States Army Corps of Engineers
Fort Worth District**

Prepared by:

**Tetra Tech NUS, Inc.
Houston, Texas**

**Contract No. DACA63-97-D-0030
Task Order No. 024**



TETRA TECH NUS, INC.

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February 6, 2004

Mr. Larry Fischer
Tooele Army Depot
SOSTE-CS-EO
Building T-8
Tooele, Utah 84074-5004

Subject: Transmittal of Draft Final Work Plan

**Reference: Groundwater Investigation at Eastern Landfill
Fort Wingate Depot Activity, Gallup, New Mexico
Contract No. DACA63-97-D-0030, D.O. No. 0024
Tetra Tech NUS Project No. 794A**

Dear Mr. Fischer:

Please find enclosed four copies of the Draft Final Work Plan document for the Groundwater Investigation at the Eastern Landfill located Fort Wingate Depot Activity, Gallup, New Mexico. This Work Plan document includes the Sampling and Analysis Plan (SAP) and Site Safety and Health Plan (SSHP). This Draft Final Work Plan includes the revisions resulting from the Government's review of the Draft Work Plan. It is our understanding that this Draft Final Work Plan will be submitted to the regulatory agencies for review and comment.

If you have any questions or require further information, please do not hesitate to contact me.

Sincerely,

Linda S. Goddard
for

Mark A. Matranga
Acting Office Manager

MAM:llg

Enclosure

c: Beverly Post, USACE w/o enclosure
L. Basilio, TtNUS w/o enclosure
File 794A 4.1



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January 23, 2004

U.S. Army Corps of Engineers, Fort Worth District
Attn: CESWF-EV-DI (Beverly Post)
819 Taylor St., Room 3A12
P.O. Box 17300
Fort Worth, Texas 76102-0300

Subject: Transmittal of Draft Final Work Plan

**Reference: Groundwater Investigation at Eastern Landfill
Fort Wingate Depot Activity, Gallup, New Mexico
Contract No. DACA63-97-D-0030, D.O. No. 0024
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Dear Ms. Post:

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If you have any questions or require further information, please do not hesitate to contact me at (713) 647-8324, extension 214.

Sincerely,

Larry Basilio
for

Michael K. Meenan
Project Manager

MKM:err

Enclosure

c: L. Basilio w/o enclosure
File 794A (4.1)

SAMPLING AND ANALYSIS PLAN

Groundwater Investigation - Eastern Landfill Fort Wingate Depot Activity, Gallup, New Mexico

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ACRONYMS AND ABBREVIATIONS

BRAC	Base Realignment and Closure Act of 1988
bgs	below ground surface
CLP	Contract Laboratory Program
COCs	Contaminants of Concern
COE	Corps of Engineers
DOT	Department of Transportation
DQO	Data quality objective
EM	Engineering Manual
EPA	Environmental Protection Agency
FSP	Field Sampling Plan
FID	Flame Ionization Detector
FWDA	Fort Wingate Depot Activity
GC/MS	Gas Chromatography/Mass Spectrophotometry
IDW	Investigation-derived waste
IDWMP	Investigation Derived Waste Management Plan
LCS	Laboratory control sample
LDPE	Low Density Polyethylene
LQMP	Laboratory QA/QC management plan
mg/L	milligrams per unit liter
MS/MSD	Matrix spike/matrix spike duplicate
MTBE	Methyl Tert Butyl Ether
PID	Photoionization detector
PMC	Program Management Company
POC	Point of Contact
PPE	Personal Protective Equipment
PQL	Practical Quantitation Limit
PVC	Polyvinyl Chloride
QA/QC	Quality Assurance/Quality Control
QAPP	Quality Assurance Project Plan
RAS	Routine Analytical Services
RI/FS	Remedial Investigation/Feasibility Study
RPD	Relative percent difference
SAP	Sampling and Analysis Plan
SOP	Standard Operating Procedure
SOW	Detailed Statement of Work
SSHPP	Site Safety and Health Plan
STL	Severn Trent Laboratories
SVOC	Semivolatile organic compound
TCLP	Toxicity Characteristic Leaching Procedure

SAMPLING AND ANALYSIS PLAN

Groundwater Investigation - Eastern Landfill Fort Wingate Depot Activity, Gallup, New Mexico

ACRONYMS AND ABBREVIATIONS (Continued)

TtNUS	Tetra Tech NUS, Inc.
USCS	Unified Soil Classification System
VOA	Volatile Organic Analysis
VOCs	Volatile Organic Compounds

1.0 INTRODUCTION

This Sampling and Analysis Plan (SAP) details the tasks that will be performed for the Groundwater Investigation to be conducted at the Eastern Landfill at Fort Wingate Depot Activity (FWDA), Gallup, New Mexico. Figure 1.0-1 is a figure depicting the location of FWDA. Figure 1.0-2 depicts the Eastern Landfill site.

This SAP has been prepared by Tetra Tech NUS, Inc. (TtNUS) for the Fort Worth District, Corps of Engineers (COE) under Contract No. DACA63-97-D-0030, Task Order No. 024.

1.1 Project Overview

The Groundwater Investigation activities described in this SAP focus on the Eastern Landfill of FWDA, as shown in Figure 1.0-2.

1.1.1 General

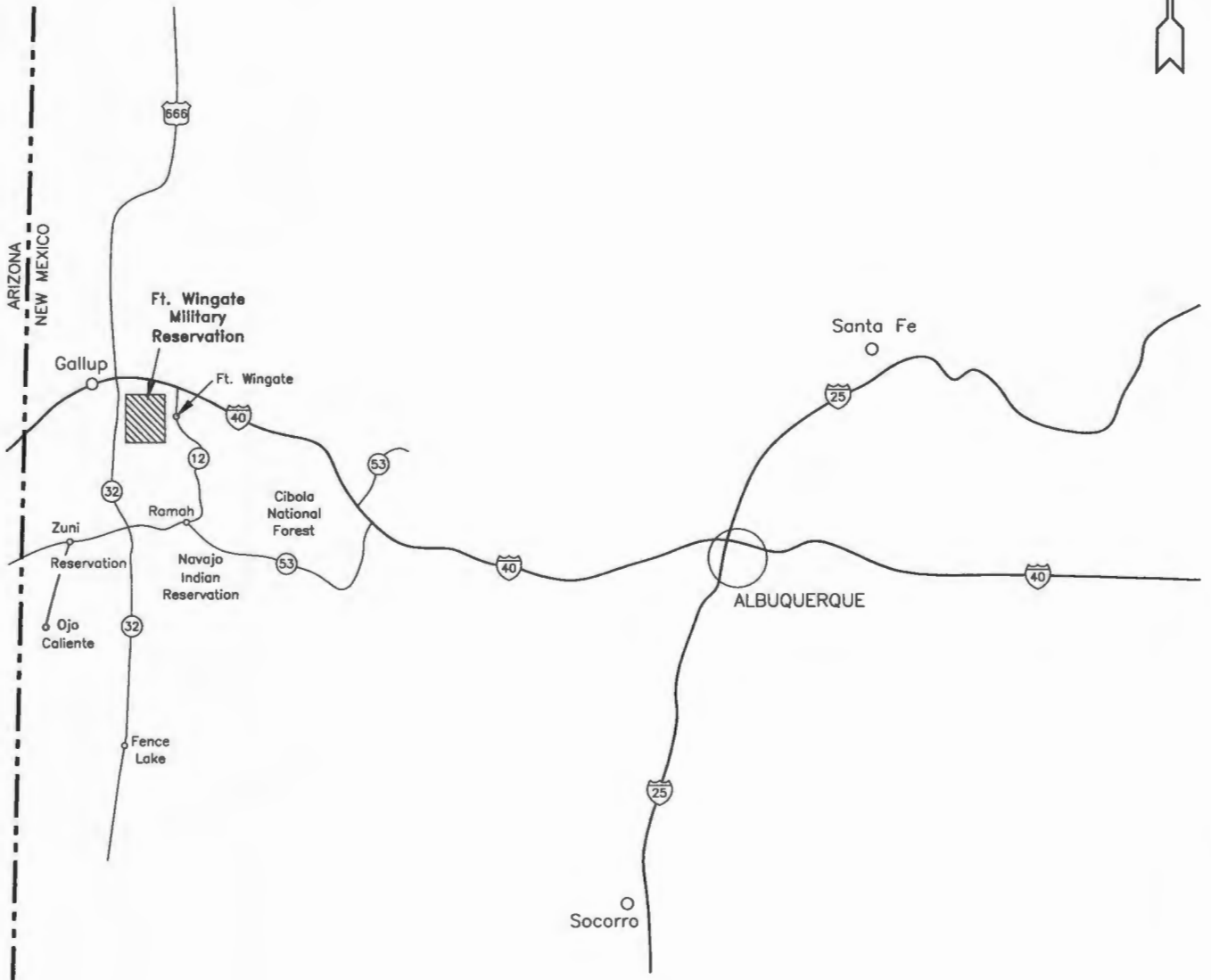
The Eastern Landfill is located approximately one half-mile northeast of the water towers, see Figure 1.0-2. The landfill is reported to have been used for the disposal of garbage, trash, and debris from the Administration Area and for the burning of other solid waste from FWDA. In 1968, the landfill was closed and covered with a layer of soil.

1.1.2 Purpose of the Groundwater Investigation

The primary objective of the Groundwater Investigation is to determine if contaminants have impacted the groundwater beneath the Eastern Landfill at the FWDA.

1.2 SAP Overview

This SAP describes in detail the project organization, field investigation activities, laboratory procedures, quality assurance/quality control (QA/QC) requirements, and contract deliverables pertaining to acquisition of chemical and physical data in support of the Groundwater Investigation.

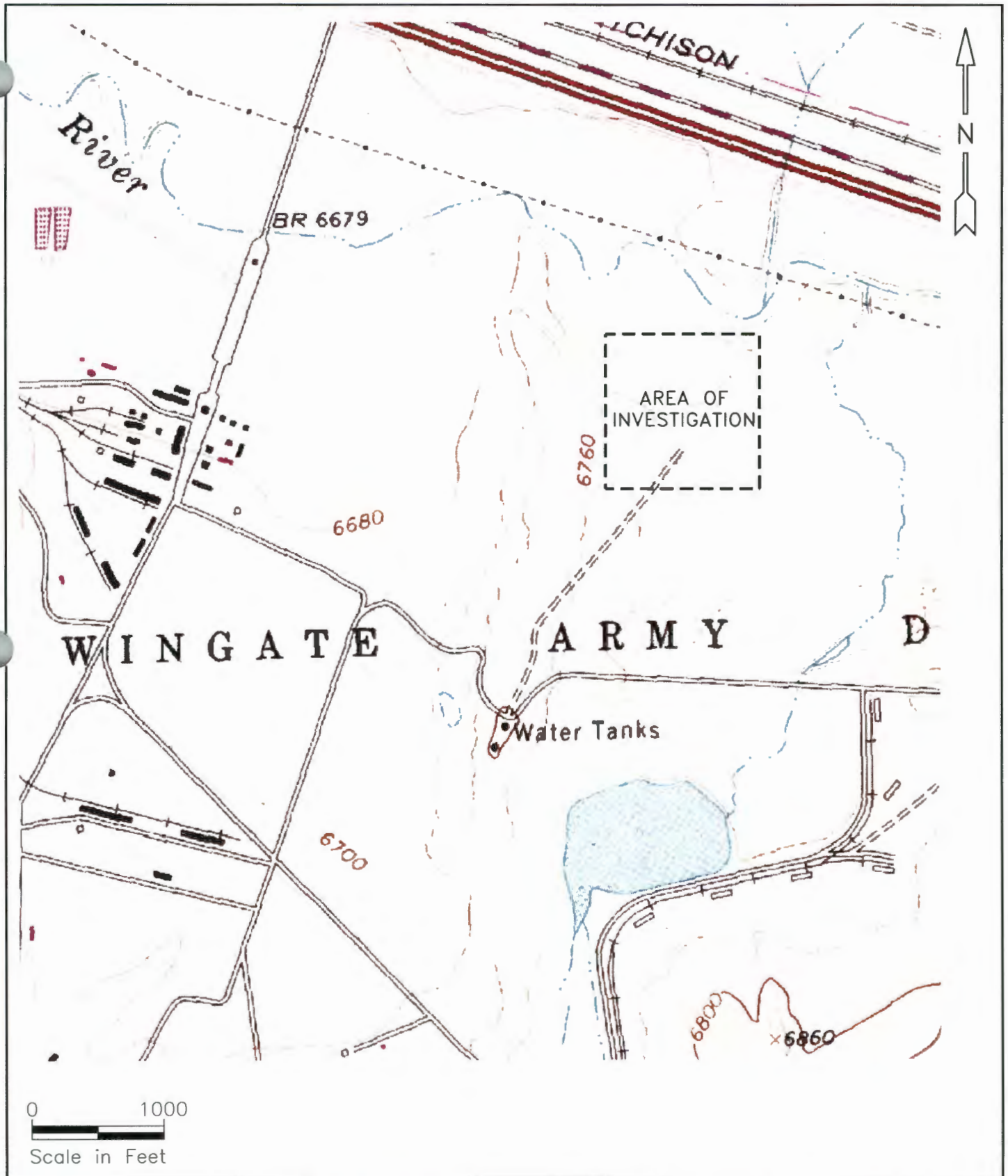


SITE MANAGER: L. BASILIO	
CHECKED BY: M. MASON	
DRAWN BY: J. FLESCHE	
DATE: 09-29-03	SCALE: NONE
GAP DWS NO.: 28735M	PROJ. NO.: W7551.159C



TETRA TECH NUS, INC.
Houston, Texas

FIGURE 1.0-1
SITE LOCATION MAP
FORT WINGATE DEPOT ACTIVITY
GALLUP, NEW MEXICO



SITE MANAGER: K. BELL	
CHECKED BY: K. BELL	
DRAWN BY: J. FLESCHE	
DATE: 11-21-00	SCALE: 1"=1000'
CAD DWG. NO.: 158C_TOPO	PROJ. NO.: N7551.158C



TETRA TECH NUS, INC.
Houston, Texas

FIGURE 1.0-2
EASTERN LANDFILL DELINEATION
SITE VICINITY MAP
FORT WINGATE DEPOT ACTIVITY
GALLUP, NEW MEXICO

This SAP consists of the following sections:

- 1.0 -- Introduction
- 2.0 -- Project Background
- 3.0 -- Project Organization and Responsibilities
- 4.0 -- Data Quality
- 5.0 -- Field Operations
- 6.0 -- Sample Management
- 7.0 -- Laboratory Analytical Procedures
- 8.0 -- Waste Management
- 9.0 -- Data Management
- 10.0 -- Project Health and Safety
- 11.0 -- Corrective Action
- 12.0 -- References

This SAP is organized in general accordance with the contents and format specified in the Fort Worth District, COE's Statement of Work dated September 21, 2001 (revised July 23, 2003) and/or other guidance provided by the Fort Worth District Technical Manager. This SAP addresses and/or incorporates information from the following Government provided documents:

1. FWDA Final Field Sampling Plan (FSP), prepared by Program Management Company (PMC), 9 June 1998 (revised 20 July 2001).
2. FWDA Final Quality Assurance Project Plan (QAPP), prepared by PMC, 9 June 1998.
3. FWDA Final Remedial Investigation/Feasibility Study (RI/FS) Report & RCRA Corrective Action Program Document, prepared by PMC, 15 November 1997.
4. FWDA Installation Utilization Map, last revision dated 30 March 2000.
5. FWDA Final Investigation Derived Waste Management Plan (IDWMP), prepared by U.S. Army Corps of Engineers Fort Worth District COE, August 2000.
6. Eastern Landfill Delineation Work Plan, Tetra Tech NUS, 2000.

2.0 PROJECT BACKGROUND

The following sections provide a brief description of the background of FWDA and the Eastern Landfill along with a summary of the work completed at the Eastern Landfill.

2.1 FWDA Background

FWDA is an inactive U.S. Army depot whose former mission was to store, ship, and receive material and to dispose of obsolete or deteriorated explosives and ammunition. The active mission of FWDA ceased and the installation was closed in January 1993 as a result of the Defense Authorization Amendments and Base Realignment and Closure Act (BRAC) of 1988. Currently, the installation is undergoing final environmental restoration prior to property transfer/reuse.

FWDA is located in McKinley County in northwestern New Mexico, approximately 130 miles west of Albuquerque. The town of Gallup is located approximately 8 miles west of FWDA. FWDA covers approximately 34 square miles (22,120 acres). FWDA is almost entirely surrounded by federally owned or administered lands including both national forest and tribal lands. FWDA is divided into several areas which are defined by location and historical land use. These areas include: the Administrative Area, the Workshop Area, the Magazine Igloo Area, Open Burning and Detonation Area, and the Southern Properties.

2.2 Eastern Landfill Background

The Eastern Landfill is located approximately one half-mile northeast of the water towers, as shown on Figure 1.0-2. The landfill is reported to have been used for the disposal of garbage, trash, and debris from the Administration Area and for the burning of other solid waste from FWDA. In 1968, the landfill was closed and covered with a layer of soil.

As part of the Remedial Investigation (RI) conducted at FWDA, by Program Management Corporation (PMC), an investigation of the Eastern Landfill was conducted. The RI results were documented in the "Final Remedial Investigation/Feasibility Study Report & RCRA Corrective Action Program" document dated November 15, 1997. During the RI, the Eastern Landfill was located and a geophysical survey was conducted. The results of soil sampling indicated that lead, mercury, and barium were present at levels slightly above background. The results of a soil gas survey indicated that low levels of methane were present. Hydrogen sulfide was not detected. Analyses for pesticides, volatile organic carbons or semi-volatile organic carbons were non-detect.

In October 1999, Safe Environment, Inc. removed surface debris in the area of the Eastern Landfill. The material removed consisted of metal ammunitions lids, wire rope, I-beams, pipe, tires, wire fencing, concrete blocks, expended ammunition casings, scrap wood, and tree branches/trunks.

In November 2000, TtNUS performed a site investigation to locate and define the lateral boundaries of the Eastern Landfill. The results are documented in the report entitled "Eastern Landfill Delineation Release Assessment Project" (TtNUS, November 2000).

The area was investigated using surface geophysical methodology (i.e., electromagnetic and magnetic). The geophysical results identified 10 anomalies, which required further investigation by visual or physical means. Ten locations were excavated, and the results confirmed the presence of landfill material in four out of ten anomalies.

The physical identification of the edge of the landfill was matched with geophysical anomalies and from the results identified that the Eastern Landfill consisted of several trenches or cells. The Eastern Landfill cells were identified along with other collections of burned material and debris. Based upon the results, the Eastern Landfill consists of three trenches that are oriented parallel to one another and three areas of surface debris. A topographic survey was conducted at this area. The topographic survey consisted of a one-foot contour map over the area encompassing the Eastern Landfill cells.

2.3 Groundwater Investigation

The primary objective of this Groundwater Investigation is to determine the extent of impact of contaminants of concern (COCs) that may have been released to groundwater beneath the Eastern Landfill. Sampling and groundwater well installation will occur in four locations. One well will be established at a location immediately upgradient of the landfill, and the remaining three hydraulically downgradient wells will be established at locations along the landfill perimeter. Each well location will be continuously sampled to the total depth of each borehole.

3.0 PROJECT ORGANIZATION AND RESPONSIBILITIES

The Fort Worth District COE, along with its consultants, contractors, and subcontractors, will be conducting the groundwater investigation at the Eastern Landfill. TtNUS and its subcontractors will conduct the work described in this SAP.

Figure 3.0-1 provides a project organizational chart for the groundwater investigation to be conducted at the Eastern Landfill.

3.1 Key Project Team Members

Ms. Roxanne Welch, (817-886-1880) is the Fort Worth District COE Engineering Manager for the groundwater investigation conducted at the Eastern Landfill. Ms. Welch will also be the Government point-of-contact (POC) for contract procedures and submittals.

Ms. Beverly Post (817-886-1884) is the Fort Worth District COE Technical Coordinator for the groundwater investigation at the Eastern Landfill. Ms. Post will also be the Technical POC for specific issues regarding the field investigation and final reports for this project.

The TtNUS Project Manager for the Groundwater Investigation is Mr. Michael Meenan, P.E. (713-647-8324, ext. 214).

The TtNUS On-Site Supervisor for the Groundwater Investigation is Mr. Larry Basilio (713-647-8324, ext. 201).

Mr. Matt Soltis, Ph.D., C.I.H., (412-921-8912) is the TtNUS representative responsible for health and safety oversight on this project. Mr. Soltis will oversee all aspects of health and safety operations pertaining to the Groundwater Investigation.

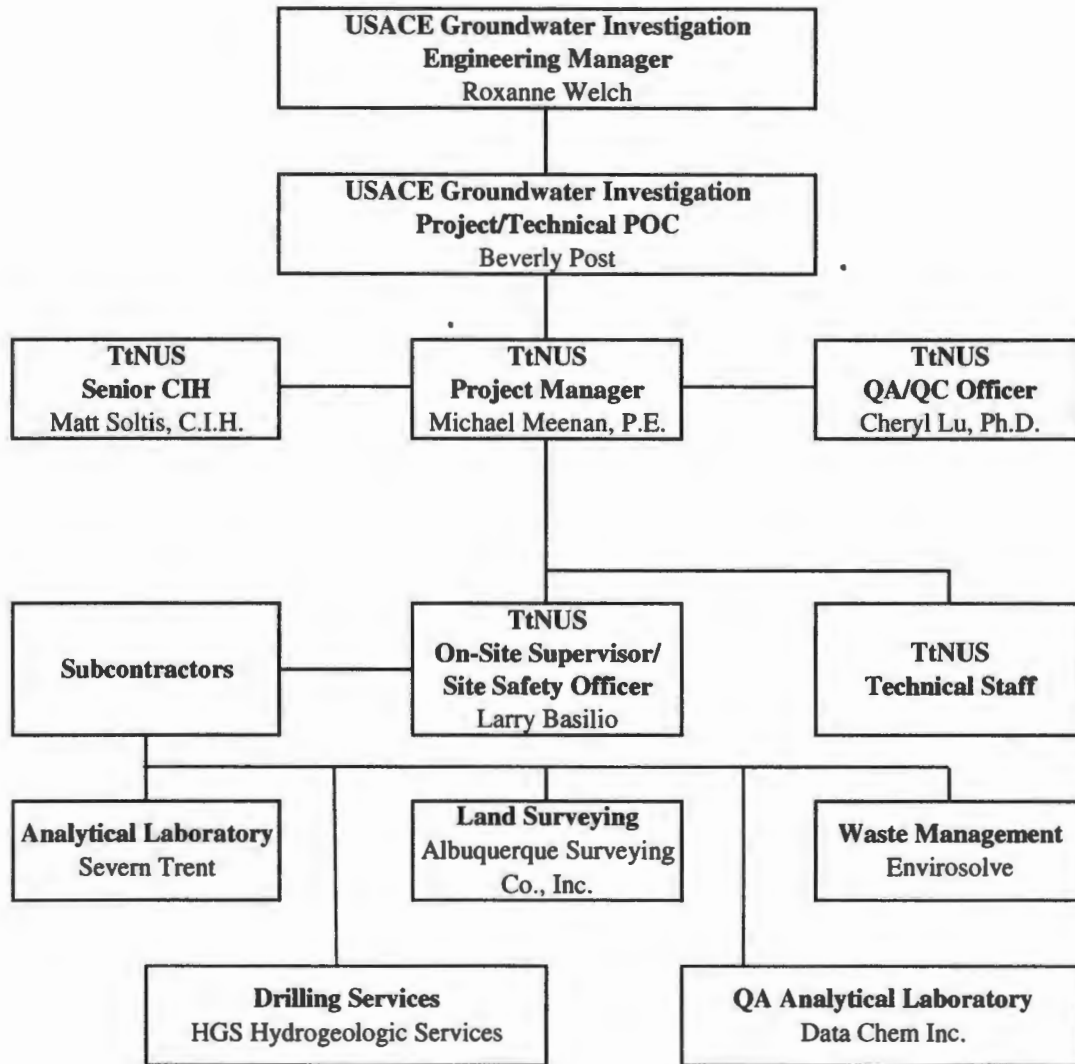
Ms. Cheryle Lu, Ph.D., Senior Toxicologist, (713-647-8324, extension 212) will serve as the Project QA/QC Officer. In this capacity, she will ensure that all field and laboratory project QA/QC procedures are followed. Additionally, she will be responsible for the laboratory data validation procedures described in Section 9.2.

3.2 Subcontractors

TtNUS will use subcontractors to provide drilling, surveying, waste management and analytical services for the Groundwater Investigation.

Figure 3.0-1

**Project Organization
Groundwater Investigation - Eastern Landfill
Fort Wingate Depot Activity
Gallup, New Mexico**



Land surveying in support of the project will be provided by:

Albuquerque Surveying Company, Inc.
2119 Menaul Boulevard, N.E.
Albuquerque, NM 87107
POC: Vlad Jirik

Investigation-derived waste (IDW) generated during the Groundwater Investigation will be stored and disposed of by:

Envirosolve
2120 Southwest Blvd
Tulsa, OK 74107
POC: Scott Logan
Ph: 918-587-9664
Fax: 918-583-2142

Chemical analysis of samples collected during the Groundwater Investigation will be performed by:

Severn Trent Laboratories, Inc.
6310 Rothway
Houston, TX 77040
POC: Linda Butler
Ph: 713-690-4444

Drilling support for the project will be provided by:

HGS Hydrogeologic Services, Inc.
8600 Beverly Hills NE
Albuquerque, NM
POC: Bill Whaley
Ph: 505-856-6498
Fax: 505-856-6501

Chemical analysis of quality assurance samples (field triplicates) collected during the Groundwater Investigation will be performed by:

DataChem Laboratories
960 West LeVoy Dr
Salt Lake City, Utah 84123
POC: Tim Mikesell
Ph: 800-356-9135
Fax: 801-268-9992

4.0 DATA QUALITY

The overall data quality objective (DQO) for the Groundwater Investigation conducted at Eastern Landfill is to produce data of known and acceptable quality at a level that will meet the goals of identifying the presence and concentration of potential groundwater contaminants. Achievement of these objectives will be accomplished through proper adherence to general and project-specific QA/QC procedures. The QA involves those planned and systematic actions necessary to provide adequate confidence that project activities will be performed satisfactorily and safely. The goal of QA is to assure that activities are planned and performed according to accepted standards and practices to ensure that resulting data are valid and retrievable, while continuing to meet project-specific safety requirements. The QC is an integral part of the overall QA functions and is comprised of those actions necessary to control and verify that activities as well as resulting data meet established requirements. The objective of QA/QC is to assure that the uncertainty of the generated data is within an acceptable range that will allow proper evaluation of the study area through the collected data.

Analytical data will be validated in accordance with the U.S. Environmental Protection Agency (EPA) Contract Lab Program (CLP) National Functional Guidelines for Organic Data Review (October 1999) and USEPA CLP National Functional Guidelines for Inorganic Data Review (February, 1994).

4.1 Data Quality Objectives

The DQOs are qualitative and/or quantitative statements regarding the quality of data needed to support project activities. In order to develop site-specific DQOs, the intended use of the data must be defined. Different uses of data require different levels of analytical and sampling certainty. This use must be balanced between data quality needs and time, as well as cost constraints. Data collected from the Groundwater Investigation activities will be used primarily to determine if a release to groundwater at the site has occurred.

Environmental data will be collected from potentially impacted groundwater in the project area. The quality of data depends not only on the analytical method selected and how carefully the method is carried out, but also on the sample point selection, sampling procedures, and sample integrity. The sample locations, matrices, and sampling frequencies and procedures for the Groundwater Investigation are discussed in detail in Section 5.0. The procedures for sample management and proper chain-of-custody procedures that will be employed to ensure the sample integrity are discussed in Section 6.0.

Data quality objectives for work performed at FWDA are provided in the FWDA Final Quality Assurance Project Plan, PMC, June 9, 1998. Numerical goals for accuracy, precision, completeness, representation, comparability, and sensitivity are established in FWDA Final QAPP.

4.2

Data Quality Levels

The five categories of data quality that may be employed to control the data generated for a project are as follows:

- Level I - Field screening - This level is characterized by the use of portable instruments that can provide real-time data to assist in the optimization of sampling point locations and to facilitate health and safety support. Data can be generated regarding the presence or absence of certain contaminants (especially volatiles) at sampling locations. These data are quantitative only for total organics
- Level II - Field analysis - This level is characterized by the use of portable analytical instruments that can be used on-site or in mobile laboratories stationed near a site (close-support laboratories). Depending upon the types of contaminants, sample matrix, and personnel skills, qualitative and quantitative data can be obtained.
- Level III - Laboratory analysis using methods other than the CLP RAS (Contract Laboratory Program Routine Analytical Services) - All analyses are performed in an off-site analytical laboratory using standard methods other than the Environmental Protection Agency (CLP RAS) procedures (e.g., SW-846 Test Methods for Evaluating Solid Waste, Third Edition).
- Level IV - Contract Laboratory Program Routine Analytical Services - This level is characterized by rigorous quality assurance/quality control protocols and documentation. It also provides qualitative and quantitative analytical data. Level IV analysis is performed in a CLP laboratory.
- Level V - Nonstandard methods - Analysis by non-standard methods. Such analyses are performed in an off-site analytical laboratory that may or may not be a CLP laboratory. Method development or method modification may be required for specific constituents or detection limits.

To meet the goals of the Groundwater Investigation conducted at Eastern Landfill, Level I field screening will be used to determine organic vapors with a photoionization detector (PID) or flame ionization detector (FID).

Data quality Level III has been selected for samples that will be analyzed at an off-site laboratory. This type of data will be generated under laboratory conditions using EPA-approved methods. Level III data quality is sufficient to identify the presence and concentration of potential contaminants.

5.0 FIELD OPERATIONS

The following subsections provide a detailed discussion of field operations that will be conducted during the course of the Groundwater Investigation conducted at Eastern Landfill. All tables and figures referenced in this section are included at the end of this section.

5.1 General Description and Information

The purpose of the Groundwater Investigation activities is to determine if COCs have been released to the groundwater at the Eastern Landfill. Groundwater monitoring wells will be installed and groundwater samples will be collected and submitted to the laboratory for chemical analysis.

The soil boring installations will be carried out by using a hollow-stem auger rig that is equipped with air rotary capabilities. Air rotary drilling techniques will become necessary if bedrock is reached prior to the first unconsolidated water-bearing zone. Because of the shallow depth to bedrock in the vicinity of the Eastern Landfill, the boreholes will be advanced to the water-bearing unit or to a maximum depth of 120 feet below ground surface (bgs), whichever comes first. The following sections present detailed descriptions of the sample collection activities described above.

5.2 Soil Boring Program

Four soil borings will be drilled during the Groundwater Investigation at the Eastern Landfill to obtain lithologic and geotechnical data. The soil borings will be located as discussed in Section 5.2.1. Installation procedures for soil borings are discussed in Section 5.2.2. Collection of soil samples for geotechnical analysis is discussed in Section 5.2.3. If groundwater is encountered, the soil boring will be converted into a monitoring well. If no groundwater is encountered, backfilling and abandonment of the soil borings is discussed in Section 5.2.4. Total depth of each soil boring will not exceed a maximum depth of 120 feet bgs, unless approved by the COE.

5.2.1 Soil Boring Locations

The proposed locations of the borings to be completed at Eastern Landfill are shown on Figure 5.2-1. The proposed boring locations were selected by the COE. The boring/groundwater monitoring well locations will be situated so that one (ELF01) is established immediately upgradient to the Eastern Landfill. The remaining three hydraulically downgradient locations will be established along the perimeter of the landfill. Sufficient hydrogeologic information for this area does not currently exist to allow for the determination of groundwater flow direction. The siting of "upgradient" and "downgradient" borings is based on the general surface topography. Actual locations at which soil borings are completed may be shifted slightly from those presented based on actual field conditions and as necessary to avoid obstructions. Any boring locations moved from their original location will be resurveyed at the completion of field activities.

5.2.2 Installation of Soil Borings

All soil borings will be completed using hollow-stem auger techniques with a drill rig equipped with air rotary capabilities. Air rotary techniques should be used because of the high likelihood that bedrock would be encountered in the area prior to encountering first water. Boreholes will be sampled as described in Section 5.2.3.

Each boring will be drilled to the first unconsolidated water-bearing zone, or to a maximum depth of 120 feet bgs. If first groundwater is encountered in the unconsolidated material, the boreholes will be advanced until the depth of refusal, or a maximum of 120 feet bgs. This will provide valuable lithologic data and will document the depth of consolidated bedrock. In the event that a borehole is advanced to a depth below that which groundwater is encountered in the unconsolidated material, the borehole will be backfilled with sand, a minimum 4-foot thick bentonite seal located within an impermeable layer, and a minimum of 1-foot of sand. The well shall be constructed on top of this last sand interval. The thickness of these layers will be dependent upon the lithology encountered in each specific borehole.

Continuous sampling will be conducted from ground surface until the total depth of each borehole is reached. Boreholes will be continuously sampled for lithologic description with hollow stem auger drilling using downhole sampling devices (e.g., 5-ft CME sampler). Blow counts will not be collected during this investigation. While air rotary drilling, lithologic descriptions will be obtained from drill cuttings collected at the surface. Air rotary coring of rock will not be conducted. The minimum borehole diameter will be six inches.

Soil borings will be left open for 24 hours to see if water is present. If water is present, the borings will be converted into monitor wells. If water is not present, the borings will be plugged and abandoned in accordance with Section 5.2.4. If a boring does not produce water, no additional borings will be drilled in an attempt to locate water.

Each boring will be logged by an on-site geologist as it is being drilled using the Field Log of Boring Form shown in Figure 5.2.2-1. Boring logs will meet the following requirements:

- All log entries will be printed.
- Borehole depth information will be from direct measurements, accurate to one tenth of a foot.
- All relevant information blanks in the log heading and log body will be completed. If surveyed horizontal control is not available during field operations, location sketches referenced by measured distances from prominent surface features will be shown or attached to the log.
- Each material type encountered will be described according to the Unified Soil Classification System (USCS).
- Soil recovered will be described with standard geologic nomenclature, including the following information:
 - USCS classification,
 - Plasticity,
 - Consistency,

- Texture,
- Color (using Munsell Soil Color Chart),
- Moisture Content,
- Presence of fractures, joints, bedding planes, and cavities, including any observed filling materials and whether open or closed,
- Other descriptive features, such as fossils or crystals.
- Logs will identify the depth at which water was first encountered, the depth to water at the completion of drilling, and the stabilized depth to water, if possible. The absence of water also will be indicated.
- Logs will show the borehole and sample diameters and depths at which drilling or sampling methods or equipment change (e.g., change from hollow stem auger to a core barrel).
- Logs will show the total depth of penetration of sampling. The bottom of the hole will be clearly identified on the log along with the notation "Bottom of Hole".
- Any special drilling or sampling problems will be recorded on logs, along with descriptions of problem resolutions.
- Logs will show all other pertinent information relevant to the investigation, including, but not limited to, the following:
 - Odors,
 - Field screening or test results, and
 - Any observed evidence of contamination in samples or cuttings.

Copies of computer-generated boring logs only will be included in the final and corrected final Groundwater Investigation report. Air quality will be monitored in and near each borehole during drilling operations using a field handheld FID or PID.

No electronic logging of boreholes will be conducted by TtNUS.

5.2.3 Sampling and Preservation Methodology for Geotechnical Analysis

If first water is encountered in unconsolidated materials, then one soil sample (undisturbed) will be collected from within the saturated portion of the screened interval of each well.

Collection of soil samples for geotechnical analysis will be performed in conjunction with the soil boring program using downhole sampling devices at the Eastern Landfill. Soil samples of unconsolidated material will be collected using a split-spoon sampler or a Shelby tube. Shelby tube samples will be wrapped in plastic and sealed with tape to prevent material from escaping and preserve the in-situ moisture content. Recovered soil cores will be field scanned with a PID or FID at approximate one-foot intervals and at changes in stratigraphy or lithology. All field-screening readings (i.e., PID or FID) will be recorded in the Field Log of Boring. The soil samples will be analyzed for the geotechnical parameters listed in Table 5.2.3-1.

Each member of the sampling crew will don a new pair of disposable latex gloves at each sampling location. The person actually collecting the sample will wear disposable latex gloves and will change them between each sample collected for geotechnical analysis.

Upon filling, sample containers will be appropriately labeled, preserved and packaged for shipment to the geotechnical laboratory. Further details regarding sample management are provided in Section 6.0. The geotechnical samples will be analyzed using the methods listed in the analytical program table in Table 5.2.3-1 and Section 7.0.

5.2.4 Backfilling and Abandonment of Borings

All borings that do not contain groundwater after 24 hours will be backfilled and properly abandoned in accordance with appropriate regulations at the end of field activities.

5.3 Groundwater Sampling

The following section pertains to the drilling and installation, construction and sample collection from monitor wells.

If groundwater is encountered at each soil boring location, the boring will be converted into a monitoring well. Groundwater samples will be collected from each groundwater monitoring well established during the Groundwater Investigation field operations at Eastern Landfill in order to obtain chemical data.

The locations of these groundwater samples are discussed in Section 5.3.1. Monitor well installation and construction are discussed in Section 5.3.2. Monitor well development is discussed in section 5.3.3. The sampling methodology for groundwater sample collection is discussed in Section 5.3.4.

5.3.1 Groundwater Sample Locations

A total of four groundwater monitoring wells will be drilled, installed and sampled in the vicinity of the Eastern Landfill, as shown in Figure 5.2-1.

Borings in which monitor wells are to be installed will be advanced and documented using the procedures described in Section 5.2.2. Soil samples will be collected for geotechnical analyses as discussed in Section 5.2.3. The borehole will be drilled having a minimum (nominal) diameter of 6 inches.

In the event that heaving sands are encountered while drilling in saturated sands, the following procedures will be implemented:

- Potable water obtained from a local municipal supply source will be added to the auger string to prevent sand from entering and plugging the augers. Water introduced will be obtained from a FWDA standpipe identified by the FWDA caretaker. A sample of the water from the standpipe will be collected and analyzed for the parameters listed in Table 5.3.4-1. In addition, a sample of the water from the driller's water storage tank will be collected and analyzed for the same parameters.

- The amount of water introduced will be recorded, as will the amount recovered upon attainment of total depth of the boring.
- The monitor will be developed as soon as possible after well installation is completed.

5.3.2 Monitor Well Installation and Construction

Monitor wells will be constructed using flush-threaded 2-inch diameter polyvinyl chloride (PVC) riser pipe and screen. The inner and outer diameter of well screens and riser pipes will be measured. The riser pipes will be composed of Schedule 40 PVC, and will be set round, plumb, and true to line. In each well, the screen will consist of a minimum of 10-foot section and maximum 15-foot section of flush-threaded Schedule 40 continuously wire wrapped PVC with 0.010-inch slots. No adhesives or solvents will be used to join the threaded PVC sections, but the use of Teflon tape and rubber O-rings on threaded joints is acceptable. The monitoring wells will be installed such that the interface of the first encountered water table is at least two feet below the top of the well screen in order to detect the possible presence of floating non-aqueous contaminants, accounting for seasonal fluctuation of the water table. Surface casing and other measures required by state or local agencies for the protection of water-bearing zones will be installed as necessary.

Well construction diagrams will be completed in the field for all monitor wells. Information provided in the logs will include the following:

- Total depth of the completed well;
- Depth of grouting or sealing, and the amount of cement and/or bentonite used;
- Depth and type of well casing;
- Static water level upon completion of the well and after well development;
- Installation date, and the name of the driller and geologist installing the well;
- Pertinent construction details of the monitoring wells, such as depth to and description of all backfill materials installed (e.g., gravel pack, bentonite, grout, etc.); gradation of sand pack; length, location, diameter, slot size, material (e.g., PVC) and manufacturer of the well screens; location of any blank pipe installed in the well;
- Description of the surface completion, including protective steel casing, protective pipes, and concrete surface seal; and
- Description of any difficulties encountered during well construction and FID or PID readings.

Survey coordinates and elevation of the ground surface as measured at the base of the well and the elevation of the top of casing will be forwarded upon completion of land survey activities.

All well construction materials will be pressure cleaned prior to insertion into the hollow stem augers, unless the well construction materials were previously decontaminated and remain factory-sealed until immediately prior to commencement of well construction activities. Environmental grease may be sparingly used on rod shoulders to ease rod breaking upon completion of the boring. Rod joints will be wiped with a clean cloth to minimize the amount of grease on the exterior of the rod. No attempt will be made to disinfect monitor wells.

The annular space surrounding the well screen will be backfilled with a clean 20/40 silica sand filter pack. The sand will be installed by the tremie method using the auger string as a tremie conduit. The volume of sand used in well construction will be recorded. The sand filter pack will extend from the bottom of the borehole to at least 3 feet above the top of the screen.

The annular space above the sand pack will be backfilled with 3 to 5 feet of dry granular bentonite and allowed to hydrate sufficiently to prevent migration of grout into the sand. The annular area above the bentonite seal will be backfilled with cement/bentonite grout emplaced via the tremie method from the top of the bentonite seal to the ground surface. All grout used in well construction will consist of a mixture of Portland cement (Type II), five percent by weight bentonite powder, and clean potable water mixed in a proportion of not more than 8 gallons of water per bag of cement (on cubic foot or 94 pounds).

The PVC riser stickup equipped with a well cap will be surrounded by a larger diameter protective steel casing rising approximately 24 to 36 inches above ground level and equipped with a locking cap and lock which is set into a concrete pad. Locks for all wells installed in the course of the work described herein will be keyed alike. The protective steel casing will contain no openings below its locking cap.

A concrete pad measuring 4 feet by 4 feet by 6 inches thick will be constructed around the protective steel casing at the final ground elevation, sloped slightly away from the well. Four 4-inch or larger diameter protective steel posts will be installed outside of the concrete surrounding the well pad and will be filled with cement and painted with high visibility orange paint. The well ID will be stenciled onto the side of the protective casing.

5.3.3 Monitor Well Development

Monitor wells will be developed no sooner than 24 hours, nor longer than seven days after completion of the well. Wells will be developed by pumping, mechanical surging, and/or bailing until the formation water is essentially free of suspended sediment and pH/conductivity readings of the produced development water become stable (i.e., variation of less than 0.2 pH units and 10 percent conductivity). For wells installed utilizing hollow stem auger drilling methods, five saturated well volumes will be removed. A saturated well volume consists of the volume of standing water in the well casing and the volume of water in the filter material (assuming 30% porosity of the filter material).

For wells installed utilizing air rotary drilling methods, five saturated well volumes plus five times the volume of any water used in filter material placement or bentonite wetting will be removed.

If these parameters have not stabilized after 8 hours of continuous pumping or the well is pumped dry, the Fort Worth District COE will be contacted and a decision on how to proceed will be made. No water or other liquid will be introduced into any well during development other than formation water derived from the well. All materials used in well development will be decontaminated prior to introduction into a well in accordance with the procedures discussed in Section 5.8.

The turbidity of formation water will be measured with a turbidity meter and recorded upon completion of well development. Information collected during monitor well development will be recorded on a Monitor Well Development Form.

All development water will be disposed of as outlined in Section 8.0.

5.3.4 Sampling and Preservation Methodology for Chemical Analysis

Collection of groundwater samples for chemical analysis will be performed using low flow/low stress groundwater sampling techniques. The volume of groundwater recovered must be adequate for all requisite analytical procedures. Any samplers utilized for collection of samples for chemical analysis will be decontaminated prior to usage. Groundwater samples collected during the Groundwater Investigation at the Eastern Landfill will be analyzed for the target analytes as listed in Table 5.3.4-1. A list of constituents is presented in table 5.3.4-2.

Monitor wells will be allowed to stabilize for a minimum of one day prior to commencement of groundwater sampling. Upon opening the cap of a monitor well for groundwater sampling purposes, a reading of the air quality at the top of the well will be taken using a PID or FID. The water level within the well will be measured from a notched reference point on the PVC well casing of the well using a decontaminated electronic water level indicator.

Prior to initial purging of newly installed wells, the possible presence of non-aqueous floating contaminants at the water surface will be investigated using a bailer or a hydrocarbon interface probe. If floating product is discovered, the Fort Worth District COE will be contacted and a plan will be developed for sampling and shipment procedures. In such instances, collection of a groundwater sample will be delayed until sampling of the floating layer is completed.

An adjustable rate submersible bladder pump constructed of stainless steel, and/or Teflon and polyethylene will be used to collect the groundwater samples. The pump will be placed at the midpoint of the saturated screen length. Low density polyethylene (LDPE) tubing will be used for both the air line and groundwater discharge line of the bladder pump. The water level in the well will be measured again after the pump is in place prior to starting the pump. Gas for operation of the bladder pump will be supplied using an oil-less air compressor or pressurized gas cylinder. A generator or battery source will be used to power the air compressor. If a gas powered generator is used, it will be placed at least 15 feet downwind of the monitor well so fumes will not interfere with the samples. The pump will be started at the lowest setting and increased until discharge occurs. The pump speed will be adjusted until there is little or no water level drawdown (i.e., less than 0.3 feet). If minimal drawdown that can be sustained exceeds 0.3 feet but remains stable, purging will continue until the indicator parameters stabilize. The water level and pumping rate will be measured every 5 minutes. Any adjustments (both time and flow rate) will be recorded. The final purge volume must be greater than the bladder volume plus the extraction tubing volume.

If the recharge rate of the well is lower than the extraction rate of the pump and the well is dewatered during purging, the well will be sampled as soon as the water level has recovered sufficiently to collect the appropriate volume needed for all the samples. Samples will be collected even though the indicator parameters have not stabilized.

During well purging, indicator field parameters (turbidity, temperature, specific conductance, pH and dissolved oxygen) will be monitored and recorded every five minutes. Purging is considered complete and sampling will begin when the indicator parameters have stabilized. Stabilization will have occurred when three consecutive readings, taken at 5 minute intervals, are within the following limits:

- Turbidity – 10% for values greater than 1 NTU
- Dissolved Oxygen – 10%
- Specific Conductance – 3%
- Temperature – 3%
- pH - +/- 0.1 units

Field measurements will be obtained using a flow-through-cell.

Water samples will be collected upon achievement of stabilization. If after 2 hours of purging the indicator parameters have not stabilized, purging will be discontinued and samples will be collected.

Water samples will be collected before the water has passed through the flow-through-cell. Filtered water samples for metals analyses will be collected using the same low flow procedures. An in-line filter with an approximate pore size of 0.45 um will be used to collect the water sample. The filter will be pre-rinsed with approximately 25 to 50 mL of groundwater prior to sample collection.

Following sample collection and removal of equipment from the well, the total depth of the well will be measured.

Purge water will be containerized and disposed of in accordance with the procedures outlined in Section 8.0. Recovered groundwater will be scanned with a PID or FID. Samples collected for analysis will be placed directly into sample containers. Sample aliquots designated for volatile organics analysis will be collected prior to collection of other aliquots. Sample aliquots designated for semi volatile organics analysis will be collected next, followed by the remaining sample aliquots. Preservatives, if required, will have been placed into sample containers at the analytical laboratory prior to transport of the sample containers to the site. Upon filling, sample containers will be appropriately labeled, sealed in plastic "Ziploc" bags, and placed in an ice chest containing ice. The samples will be packaged for shipment at the conclusion of each day's sample collection activities. Further details regarding sample management are provided in Section 6.0.

5.4 Aquifer Testing

Each newly installed monitoring well will be subjected to slug tests to determine aquifer characteristics. Slug tests will be performed by effecting an "instantaneous" rise or drop in the water level in the well using a solid displacement slug of known volume. The volume of the slug will be selected to cause an initial rise or drop in water level between 1 and 3 feet. The water level in the well will be monitored using electronic water level recorders. Where feasible, tests will be considered to be complete when the water level in the well returns to within 0.2 feet of

the initial, undisturbed conditions. A rise in water level will be caused by introducing a displacement slug. A drop will be caused by removing a displacement slug.

The slug tests will be recorded using a Model SE 1000C Hermit Environmental Data Logger or equivalent. The slug consists of a solid PVC or equivalent cylinder attached to a dedicated rope. Both falling head (slug-in) and rising head (slug-out) tests will be included in the tests. The following is a description of the procedures utilized in a slug test:

- The data logger pressure transducer probe is lowered into the well
- The static water level in the well is measured to the nearest 0.01 foot using an electric water level meter with an audible alarm. This value is input into the data logger and used as the zero (equilibrium) point. The data logger is then calibrated in accordance with the specific parameters and required data output.
- The slug-in test commences as the solid PVC slug or equivalent of known volume is rapidly lowered into the well until the slug is fully submerged. The recording unit is activated simultaneously with the submersion of the slug.
- The change in height of the water column is recorded at logarithmic time intervals until the well reaches equilibrium (in excess of 90 percent recovery).
- The data logger is then recalibrated for the slug-out test.
- The slug out test commences with the rapid removal of the PVC slug and the simultaneous activation of the recording unit.
- The change in height of the water column is recorded at logarithmic time intervals until the well reaches equilibrium (in excess of 90 percent recovery).

All depths will be reported in feet below grade or feet below the top of the inner casing. The slug should be introduced into the well as quickly as possible and in a manner to minimize the "splashing" of water in the well bore.

The test is complete when the well has recovered to within 0.2 feet of the static water level (approximately 90% recover, i.e., the remaining displacement is less than 0.1 times the predicted initial replacement). If the water level has not recovered to within 0.2 feet of static in 30 minutes, the need for additional measurements will be evaluated by the field geologist.

The data collected will be analyzed by one of three methods identified as appropriate for the hydrogeologic conditions at the well:

- Hvorslev Method (general conditions) (Hvorslev, 1951);
- Bouwer and Rice Method (water table conditions) (Bouwer and Rice, 1967); or
- Cooper and Papadopulos Method (fully penetrating well) (Cooper, et. al., 1967)

It should be recognized in the application of the test results that slug test data provide order of magnitude hydraulic conductivity values. Application of the results are most useful for comparison of relative conductivity in different zones of the aquifer, and are useful for estimating relative water transmission through the various aquifer zones, and for conceptual remedial evaluations.

5.5 Groundwater Elevation Measurements

A groundwater elevation survey will be conducted at nine monitoring wells located at the Eastern Landfill, Work Shop, Administration and TNT Leaching Bed Areas prior to the start of the monitoring activities. These monitor wells include TMW02, TMW05, TMW14A, TMW16, TMW17, TMW18, TMW19, FW35 and TMW28.

All water level measurements in newly-installed monitoring wells, as well as existing wells to be sampled, will be obtained with an electronic water level monitor. Measurements will be made relative to a notch or other permanent mark which serves as a consistent reference point. These measurements will be accurate to 0.01 feet.

5.6 Field QA/QC Sample Description

Field quality control measures include the collection and analysis of QA/QC samples. The QA/QC samples will be collected during the Groundwater Investigation sampling activities to assess the variability introduced in sampling, handling, shipping and analysis. Field QC samples include equipment blanks, trip blanks and field duplicates. Field QA samples include field triplicates. The types and frequency of field QA/QC samples are described in the following subsections.

5.6.1 Equipment (Rinsate) Blanks

Equipment blanks are samples that are prepared in the field to assess the effectiveness of decontamination procedures applicable to groundwater sampling equipment. Equipment blanks will be prepared by pouring analyte-free deionized or distilled water through the decontaminated sampling equipment and collecting the rinsate in appropriate clean sample containers.

Equipment blanks will be collected and analyzed at a rate of 10 percent. One equipment blank will be collected as part of the investigation.

5.6.2 Trip Blanks

Trip blanks will be prepared at the analytical laboratory by pouring analyte-free reagent water into 40-ml Teflon-lined septum vials. They will accompany the sample containers into the field, but will remain unopened until analyzed in the laboratory after being returned from the field. Trip blanks thus serve to identify contamination of the samples that might occur during transport of sample containers from the laboratory to the field and from the field to the laboratory.

One trip blank will accompany each sample shipping container in which groundwater samples designated for volatile organics analysis (VOA) are contained. Trip blanks will be tested only for the volatile organic constituents.

5.6.3 Field Duplicates

Field duplicates are samples that are divided into two portions at the time of sampling. Field duplication provides precision information regarding homogeneity, handling, shipping, storing, preparation, and analysis. Field duplicates will be collected and analyzed at a rate of 10 percent; one field duplicate will be collected as part of the investigation.

The procedures for collection of duplicate groundwater samples are identical to those pertaining to normal environmental samples, as described in Sections 5.3.4.

5.6.4 Field Triplicates

Field triplicates (QA samples) are samples that are divided into three portions at the time of sampling. One portion is designated as an investigation sample, the second portion is a field duplicate, and the third portion is a triplicate. A triplicate is always collected along with a duplicate; triplicate samples will be collected whenever a duplicate sample is collected. The purpose of a field triplicate is to allow for assessment of the laboratory data by an independent laboratory. The procedures for collection of triplicate groundwater samples are identical to those pertaining to normal environmental samples, as described in Sections 5.3.4. The number of triplicate samples is identical to the duplicates listed in Section 5.6.3.

Triplicate samples will be forwarded directly to the QA laboratory (Datachem Laboratories) under strict chain-of-custody procedures.

5.6.5 Matrix Spike/Matrix Spike Duplicate Samples

Site specific matrix spike/matrix spike duplicate samples will not be collected for this investigation.

5.7 Field Measurements

The following subsections present discussions pertaining to field measurements that will be performed in conjunction with the Groundwater Investigation.

5.7.1 Field Parameters

Field parameters to be measured during the course of the Groundwater Investigation to be conducted at the Eastern Landfill are as follows:

- Volatile organics scanning of worker's breathing space and recovered soil and groundwater samples;
- pH, temperature, turbidity and conductivity of water samples; and
- Personnel safety monitoring of LEL, O₂, H₂S and CO.

Volatile organics scanning will be conducted using a Thermo Environmental Instruments Model 580S Organic Vapor Meter photoionization device or equivalent PID/FID apparatus.

Conductivity, pH, turbidity and temperature will be measured using a Horriba U-10 or equivalent. Personnel safety monitoring will be conducted using a MSA Passport or equivalent.

Calibration and maintenance of the equipment discussed above are discussed in Sections 5.7.2 and 5.7.3, respectively.

5.7.2 Equipment Calibration

Instruments used to collect field data will be identified with a unique identification number so that the instrument calibration and maintenance history can be traced. Each instrument will be calibrated prior to its delivery to the field and supplied with fresh calibration standards. Field instruments used to collect data will be calibrated against known standards using the manufacturer's recommended procedures. Standard operating procedures (SOPs) for calibrating the equipment will be provided for field personnel. Calibration standards for field instruments will be obtained from a commercial source and used as received unless otherwise specified by the manufacturer. Traceability of those standards will be maintained through routine procurement documents. Standards for field instruments will be stored in a manner consistent with the manufacturer's recommendations.

The project field notebook or the project calibration logbook will be used to document the calibration of field testing equipment. Documentation of calibration will include the following:

- Date of calibration;
- Identification number of instrument being calibrated;
- Initials of the person performing the calibration; and
- Instrument readings versus standard value.

Additional information will be recorded at the discretion of the individual performing the calibration.

5.7.3 Equipment Maintenance

Equipment used by TtNUS will be maintained in accordance with the manufacturer's instructions. Routine maintenance and equipment repairs performed in the field will be documented in the project field notebook or on equipment maintenance forms and maintained in an equipment maintenance file.

Whenever an instrument fails to operate properly, the instrument may either be repaired in the field or in-house. If these attempts are unsuccessful, the instrument will be sent out for repairs. In most cases, an identical instrument (manufacturer and model) can be obtained as an alternate to the inoperable equipment. In the event that an identical instrument can not be obtained, however, contingency plans will include the following:

- Substitute an instrument of equivalent accuracy and precision as the original; and/or
- Postpone the field event until such time that a suitable replacement instrument can be located or the original equipment can be repaired.

5.8 Decontamination Procedures

Proper decontamination of field equipment is an integral part of the overall QA/QC process. A decontamination pad will be constructed for heavy equipment at each site. It is anticipated that due to the distances between sites and the need to traverse public roads to access the sites, up to three decontamination pads will be constructed. The decontamination pad will be set up at a sufficient distance from the sample locations to prevent cross-contamination. The pad will consist of a 30-mil high density polyethylene membrane liner supported and secured on all sides by a one-foot high berm constructed of soil or landscape timbers. Wash racks will be used at the decontamination pad to hold equipment above the ground to facilitate cleaning during decontamination activities.

If the volume of decontamination fluids generated is less than 55-gallons, the 55-gallon drum containing the decontamination fluid will be left at the site as a satellite storage area. If the volume of decontamination fluid is greater than 55 gallons, the containers will be stored at Building 5 pending receipt of analytical results. All containers used to containerize waste shall be Department of Transportation (DOT) approved. All containers shall be clearly identified and labeled and shall be labeled "PENDING ANALYSIS."

The following subsections detail decontamination procedures that will be affected throughout the duration of field activities associated with the Groundwater Investigation.

5.8.1 Drilling Equipment

Heavy equipment (e.g., bits, rods, tools, etc.) will be pressure washed at the designated decontamination area prior to commencement of intrusive operations, after completion of each boring, and upon the conclusion of intrusive operations. The entire drilling rig will be pressure cleaned prior to the initiation and again prior to demobilization from the site.

Heavy equipment will be free of leaks that could contaminate borings (e.g., hydraulic fluid, oil, gasoline, etc.). Non-hydrocarbon type greases ("environmental grease") may be used sparingly on rod shoulders to ease rod breaking upon completion of borings.

5.8.2 Well Development and Sampling Equipment

Well development sampling equipment (e.g., surge blocks, water level indicators, etc.) will be double rinsed with distilled/deionized water prior to insertion into monitoring wells. Dedicated and previously unused cotton or polypropylene rope will be used to introduce bailers into monitoring wells.

5.8.3 Sampling Equipment

Prior to and after the completion of all sampling events, sampling equipment (e.g., spoons, knives, etc.) will be decontaminated through the following steps:

- Wash in solution of tap water and Liquinox or equivalent
- Tap water rinse

- Double rinse with deionized or distilled water
- Air dry, if feasible.

Rinse water will be dispensed from pump-type sprayers to prevent used rinse water from contaminating other equipment and subsequent samples.

Tap water for decontamination will be obtained from a FWDA standpipe identified by the FWDA caretaker. A sample of the water from the standpipe will be collected and analyzed for the parameters listed in Table 5.3.4-1. In addition, a sample of the water from the driller's water storage tank will be collected and analyzed for the same parameters.

5.8.4 Field Measurement Equipment

Field measurement equipment that does not directly contact environmental media (i.e., PID or FID) will be maintained in a clean manner. In the event that the PID or FID probe contacts soil, the exterior probe will be wiped clean with an unused paper towel prior to reuse. Additionally, the probe will be disconnected and dirt and/or debris will be removed from the interior of the probe before additional measurements are conducted.

Field measurement equipment that directly contacts environmental media will be rinsed with distilled/deionized water after each usage.

5.9 Field Documentation

Field documentation and tracking of sample custody are integral portions of the overall QA/QC process for the Groundwater Investigation. The field documentation system serves as a record of activities conducted in the field during sample collection and data generation and provides the means to identify, track, and monitor each sample from the time of collection through final reporting of data. All field documentation will be completed in the field log book or data sheets (e.g., boring log forms, sampling sheets, etc.) using indelible ink. Procedures pertaining to sample custody and documentation to be employed during the Groundwater Investigation conducted at Eastern Landfill are discussed in Section 6.0.

5.9.1 Sample Identification

The sample identification scheme presented below will be used to identify and label all field samples collected and all field QC blanks created during the Groundwater Investigation activities at the Eastern Landfill. The sample identification procedure will be used for all sample labels and chain-of-custody documents in order to maintain consistency in the labeling process and to allow efficient handling of a large number of samples from different sources.

The sampling numbers will be assigned as follows:

aa-bbbb-cccc-ddd

- **aa** – refers to the site location, where:
 - FW = Fort Wingate
- **bbbb** - describes the sample location and sequence number or QA/QC modifier, where:
 - EMW01 to EMW04 = Eastern Landfill sample locations
- **cccc** - describes the QA/QC modifier, where:
 - RNSW = Equipment Rinsate Blank
 - FLBK = Field Blank
 - FDUP = Field Duplicate
 - FTRP = Field Triplicate
- **ddd** - indicates the depth of the sample, where applicable

In the case where a QA/QC modifier is used (i.e., RNSW or FLBK), the depth indicator will be separately and sequentially incremented for each type of blank. The first equipment blank will be labeled 001, the second 002, etc.

5.9.2 Field Log Books

The sampling coordinator will maintain a field notebook and field data sheets containing pertinent information regarding the samples. The field logs are intended to provide sufficient data and observations to enable the field team and other interested parties to reconstruct events that occur during field activities. The field notebook will be a bound book with consecutively numbered pages. Entries in the field notebook and the associated field data sheets will be made in indelible ink and may include the following information, as appropriate:

- Identification of the project Work Plan (by reference)
- Names of all field personnel present
- Date and times of arrival and departure for all field personnel
- Names, arrival, and departure times of site visitors
- Instrument calibration records
- Chronology of site events
- Arrival and departure of equipment
- Details about drilling and sampling activities
- Location (area) of sampling
- Sample medium (e.g., groundwater)
- Location of sampling points
- Nomenclature of samples collected
- Identity of the sampler(s)
- Date and (military) time of sample collection
- Preservatives used, if any
- Analytical parameters to be measured
- References such as maps or photographs of the sampling site (if necessary)

- Field observations, especially any notice of stained soil, stressed vegetation, or if in a drainage area
- Weather conditions, including estimated temperature
- Any field measurements made (e.g., pH, PID reading, etc.)
- Signature of person who made entries in the sample log book
- Copy of chain-of-custody
- Details about sample handling and transfer of samples
- Details about sample packaging and shipping
- Drum log record, including drum number, date drilled, drum contents (soil or water) and any remarks describing the origin of the waste
- Details about health and safety issues
- Unusual occurrence or activities
- Any procedural steps taken that deviate from those outlined in this SAP.

5.9.3 Boring Logs



Boring logs will be maintained for the four soil borings identified in Section 5.2. Information to be recorded on geologic boring logs is presented in Section 5.2.2. Well logs will be created for each soil boring converted into a monitoring well.

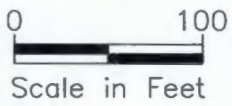
5.10 Land Surveying

Land surveying will be conducted to determine the horizontal and vertical (XYZ) location of all soil boring and monitoring well locations. Horizontal control will be referenced to an existing datum (i.e., 1983 New Mexico State Plane Coordinate System) with an accuracy of plus or minus 0.1 feet. Vertical control will be referenced to the 1988 National Vertical Geodetic Datum with accuracy at 0.01 feet.



LEGEND

-  PROPOSED MONITOR WELL LOCATION
-  CELL BOUNDARY (BASED ON GEOPHYSICAL SURVEY)



SITE MANAGER: L. BASILIO	
CHECKED BY: L. BASILIO	
DRAWN BY: J. FLESCH	
DATE: 01-12-04	SCALE: 1"=100'
CAD DWG. NO.: 794A_SM1	PROJ. NO.: N7551.794A



TETRA Houston, CONTOURS BASED ON SURVEY CONDUCTED BY TTNUS. "EASTERN LANDFILL DELINEATION, ASSESSMENTS PROJECTS, FORT WINGATE DEPOT ACTIVITY, GALLUP, NEW MEXICO", FINAL, 2000.

FOR PROPOSED MONITOR WELL LOCATIONS PROVIDED BY PROGRAM MANAGEMENT, INC.

ORIGINAL PREPARED BY ASTS, INC., 500 COPPER AVE. NW, ALBUQUERQUE, NM 87102. MODIFIED 11-22-00 BY TTNUS.

Figure 5.2.2-1

Field Log of Boring
Fort Wingate Depot Activity, Gallup, New Mexico



Tetra Tech NUS, Inc.
Houston, Texas

BOREHOLE No.:

Page 1 of 1

NORTHING:

EASTING:

ELEVATION/DATUM:

PROJECT INFORMATION		DRILLING INFORMATION	
PROJECT:	Former Gasoline Refueling Station	DRILLING CO.:	
SITE LOCATION:	Blasingame Property	DRILLER:	
JOB NO.:	399B	RIG TYPE:	Mobile Drill
LOGGED BY:		METHOD OF DRILLING:	Hollow stem auger
PROJECT MANAGER:	Mike Meenan	SAMPLING METHODS:	Split spoon
DATES DRILLED:		TOTAL DEPTH:	
NOTES:		☒	Wet during drilling
		☒	Water level in completed well

DEPTH (FEET)	SOIL SYMBOLS	USCS: SOIL DESCRIPTION	SAMPLE NUMBER/ PHOTO	PIV/RECOVER	PID ppm	BORING COMPLETION	WELL DESCRIPTION
0		DESCRIPTION					
-5							
-10							
-15							
-20							
-25							

Table 5.2.3-1

**Summary of Geotechnical Analyses for Soil Samples
Groundwater Investigation – Eastern Landfill
Fort Wingate Depot Activity, Gallup, New Mexico**

Analysis	Test Method
Dry Bulk Density	ASTM D2937
Specific Gravity	ASTM D854
Porosity	API RP40
Total Organic Carbon	Walkley-Black
Cation Exchange Capacity	---

Table 5.3.4-1

**Summary of Chemical Analyses for Groundwater Samples
Groundwater Investigation – Eastern Landfill
Fort Wingate Depot Activity, Gallup, New Mexico**

Analysis	Test Method
Appendix IX VOCs + Methyl Tert Butyl Ether (MTBE)	SW-846 8260
Appendix IX SVOCs	SW-846 8270
Appendix IX Pesticides	SW-846 8081
Appendix IX Pesticides	SW-846 8141
Appendix IX PCBs	SW-846 8082
Appendix IX Herbicides	SW-846 8151
Appendix IX Dioxins	SW-846 8290
Appendix IX Metals (totals) + Al, Fe, Mn	SW-846 6010, 6020, 7470
Appendix IX Metals (dissolved) + Al, Fe, Mn	SW-846 6010, 6020, 7470
Anions (Nitrate as Nitrogen, Chloride, Fluoride, Sulfate)	EPA 300.0
Cyanide	SW-846 9012
Expanded List Explosives	SW-846 8330 Mod.
Nitrate/Nitrite Nonspecific	EPA 353.2
pH	EPA 150.1
Sulfide	EPA 376.1
Total Dissolved Solids	EPA 160.1

Metals (4090/7300)	Appendix IX VOCs (8260)	Appendix IX (817)	CDDs and PCDFs (290)	Other Constituents		
Aluminum	1,1,1,2-Tetrachloroethane					
Antimony	1,1,1-Trichloroethane	1,2,4,5-Tetrachlorobenzene	2,8-TCDD	Method 9012	EPA 300.0	EPA 353.2
Arsenic	1,1,2,2-Tetrachloroethane	1,4-Naphthoquinone	2,8-PeCDD	Cyanide	Anions:	Nitrate/Nitrite Nonspecific
Barium	1,1,2-Trichloroethane	1-Naphthylamine	7,8-HxCDD		Nitrate as Nitrogen	
Beryllium	1,1-Dichloroethane	2,3,4,6-Tetrachlorophenol	7,8-HxCDD		Chloride	
Cadmium	1,1-Dichloroethane	2-AAF	8,9-HxCDD		Fluoride	
Chromium	1,2-Dibromo-3-Chloropropane	2-Naphthylamine	7,8-HpCDD		Sulfate	
Cobalt	1,2-Dibromoethane	2-Picoline	7,8,9-OCDD			
Copper	1,2-Dichloroethane	3,3-Dimethylbenzidine	2,8-TCDF	EPA 150.1	EPA 376.1	EPA 160.1
Cyanide	1,2-Dichloropropane	3-Methylcholanthrene	2,8-PeCDF			
Iron	1,4-Dioxane	4,6-Dinitro-2-methylphenol	7,8-PeCDF	pH	Sulfide	Total Dissolved Solids
Lead	2-Hexanone	4-Aminobiphenyl	7,8-HxCDF			
Manganese	4-Methyl-2-Pentanone	4-Chloro-3-methylphenol	8,9-HxCDF			EPA 314.0 or EPA 9058
Mercury	Acetone	4-Nitroquinoline-1-oxide	7,8-HxCDF			
Nickel	Acetonitrile	5-Nitro-o-tolidine	7,8-HxCDF			Perchlorate
Selenium	Acrolein	7,12-Dimethylbenz(a)anthracene	7,8-HpCDF			
Silver	Acrylonitrile	Acenaphthene	7,8,9-OCDF			
Thallium	Allyl chloride	Acenaphthylene				
Tin	Benzene	Acetophenone				
Vanadium	Bromodichloromethane	alpha,alpha-Dimethylphenethylamine				
Zinc	Bromoform	Aniline				
	Bromomethane	Anthracene				
	Carbon Disulfide	Aramite				
	Carbon Tetrachloride	Benzo(a)anthracene				
	Chlorobenzene	Benzo(a)pyrene				
	Chloroethane	Benzo(b)fluoranthene				
	Chloroform	Benzo(g,h,i)perylene				
	Chloromethane	Benzo(k)fluoranthene				
	Chloroprene	Benzyl alcohol				
	cis-1,3-Dichloropropene	Bis(2-chloroethoxy)methane				
	Dibromochloromethane	Bis(2-chloroethyl)ether				
	Dibromomethane	Bis(2-chloroisopropyl)ether				
	Dichlorodifluoromethane	Bis(2-ethylhexyl)phthalate				
	Dichloromethane	Bromophenyl phenyl ether,4-				
	Ethyl methacrylate	Butyl benzyl phthalate				
	Ethylbenzene	Chlorobenzilate				
	Iodomethane	Chloronaphthalene, 2-				
	MEK	Chlorophenol, 2-				
	methacrylonitrile	Chlorophenyl phenyl ether, 4-				
	Methy methacrylate	Chrysene				
	Methyl-tertbutyl-Ether (MTBE)	Diallate				
	Propionitrile	Dibenzo(a,h)anthracene				
	Styrene	Dibenzofuran				
	Tetrachloroethene	Dichlorobenzene, 1,2-				
	Toluene	Dichlorobenzene, 1,3-				
	cis-1,2-Dichloroethene	Dichlorobenzene, 1,4-				
	trans-1,2-Dichloroethene	Dichlorobenzidine, 3,3-				
	trans-1,3-Dichloropropene	Dichlorophenol, 2,4-				
	trans-1,4-Dichloro-2-butene	Dichlorophenol, 2,6-				
	Trichloroethene	Diethyl phthalate				
	Trichlorofluoromethane	Dimethyl phthalate				
	Vinyl Acetate	Dimethylphenol, 2,4-				
	Vinyl Chloride	Di-n-butylphthalate				
	Xylene (Total)	Dinitrophenol, 2,4-				
	Isobutyl alcohol	Dinitrotoluene, 2,4-				
	1,2,3-Trichloropropane	Dinitrotoluene, 2,6-				
		Di-n-octylphthalate				
		Dinoseb				
		Diphenylamine				
		Ethyl methanesulfonate				

6.0 SAMPLE MANAGEMENT

The procedures for proper management of samples to be collected throughout the course of the Groundwater Investigation conducted at the Eastern Landfill site are discussed in the following subsections.

The following record keeping items will be used to document sample collection and handling:

- Chain-of-custody records (see Section 6.2)
- Sample Data Sheets
- Freight bills for samples shipped via an overnight carrier
- Analytical reports (electronic file and hard copy).

All samples collected during the course of the Groundwater Investigation conducted at the Eastern Landfill will be placed in appropriate laboratory-supplied, decontaminated sample containers.

The following guidelines and procedures pertaining to sample containers shall be effective throughout the course of the Groundwater Investigation:

- The appropriate type and amount of chemical preservative, if required, will be placed in the sample containers prior to sample collection. Addition of preservatives is usually done at the analytical laboratory. Specific sample container and preservative requirements are listed in Section 7.0.
- After samples are collected, caps will be screwed tightly onto the containers to provide a seal and to prevent loosening of the cap during transport to the analytical laboratory.

Each member of the sampling crew will don a new pair of gloves at each sampling location. The person who actually collects the samples will wear disposable latex gloves and will change them between collection of each sample.

The sample numbering scheme to be used for the Groundwater Investigation is discussed in Section 5.9.1.

6.1 Sample Security

Sample security involves procedures that ensure sample integrity. Security is required until final disposal of the sample after laboratory analysis is complete. Aspects of sample security are discussed below.

Security of the Sample in the Field. Samples, once collected, will be in the possession of the sampling crew. The QA and QC samples will be collected, which, when analyzed, also will document the integrity of the sample.

Security of the Sample in the Lab. Samples will be sorted in a secure area in the laboratory with limited access. Upon receipt of the ice chests, laboratory personnel will check the temperature of the ice bath, the condition of the samples, and the accuracy of the accompanying paperwork.

6.2 Sample Custody

The following chain-of-custody procedures are intended to document sample possession from the time of sample collection until ultimate disposal of the sample. For the purposes of these procedures, a sample is considered to be in custody if it is:

- In one's actual possession,
- In view after being in one's possession,
- Secured (i.e., locked up) so that no one can tamper with it, or
- In a secured area, available to authorized personnel only.

Strict chain-of-custody procedures will be maintained throughout the duration of the Groundwater Investigation conducted at the Eastern Landfill. These procedures include the following:

- A custody seal, which is an integral part of the custody process, is used to detect unauthorized tampering with sample containers. The seal will be signed, dated, and affixed to the shipping container. After the custody seal has been attached to the shipping container, the only access to the shipping container is by breaking the custody seal.
- A minimum of two custody seals will be attached to each shipping container used to ship samples.
- A chain-of-custody record will be completed in the field. The original will accompany the samples, and copies will be maintained at intermediate steps.
- At every point where the responsibility for custody of the samples changes, the new custodian will sign the chain-of-custody record and note the date and time. A copy of the signed record will be made by the previous custodian, and a copy will be sent to the TiNUS project manager or his/her designate to allow tracking of possession of the samples.

6.3 Sample Packaging and Shipping Procedures

The following guidelines and procedures pertaining to sample packaging and shipping shall be effective throughout the duration of the Groundwater Investigation:

- Sample containers will be placed in previously unused polyethylene Ziploc bags to keep them dry during shipment to the analytical laboratory. Only one sample container will be placed in each bag. As much air as possible will be removed from the bag to conserve space within the shipping container.
- Sample containers will then be placed in shipping coolers containing packing materials and ice.

- Prior to shipping, confirm that the sample is properly labeled and sealed. To the maximum extent possible, samples from a given sample collection locale should be contained within a single shipping container.
- Place a large, empty, previously unused plastic trash bag in a dry, clean ice chest and place samples into the trash bag without packing them too tightly against one another.
- Place cushioning in the plastic trash bag, surrounding the samples for cushioning and absorption of water.
- Place several double-bagged and sealed Ziploc bags of ice atop the sample containers.
- Twist the trash bag to create a "goose-neck" and seal the trash bag by wrapping duct tape around the "goose-neck".
- Place the completed and signed chain-of-custody form within a Ziploc bag and tape the bag to the inside cover of the ice chest.
- Close the lid of the ice chest and wrap clear packing/strapping tape around the ice chest on both ends of the ice chest. Be sure that the drain plug of the ice chest is taped shut securely.
- Affix a minimum of two custody seals, extending across the junction between the lid and the body of the ice chest, to the ice chest and secure them by placing clear packing/strapping tape over the custody seals and onto the exterior of the shipping container.
- Secure appropriate shipping labels to the shipping container and record the freight bill number within the field notebook.
- Deliver the shipping container(s) to an overnight carrier for shipment.

7.0 LABORATORY ANALYTICAL PROCEDURES

The following subsections present a detailed discussion of the analytical program that will be effective for the Groundwater Investigation conducted at the Eastern Landfill. The site analytical program table (Table 7.0-1) summarizes the analytical parameters, sample matrices, number of samples, analytical methods, sample volumes, container types, and preservation procedures that will be utilized.

All tables referenced in this section are included at the end of this section.

7.1 Analytical Parameters and Methods

The following subsections discuss analysis of groundwater and QA/QC samples that will be collected during the project.

7.1.1 Groundwater Samples - Chemical Analyses

All groundwater samples will be collected as described in Section 5.0. Groundwater samples collected will be analyzed for the parameters listed in Table 7.0-1.

Chemical analysis for this project will be conducted by Severn Trent.

7.1.2 Soil Samples – Geotechnical Analyses

All soil samples will be collected as described in Section 5.0. If first water is encountered in unconsolidated materials, then one soil sample (undisturbed) will be collected from within the saturated portion of the screened interval of each well. The soil sample will be analyzed for the geotechnical parameters listed in Table 7.0-1.

Geotechnical analysis for this project will be conducted by Severn Trent.

7.1.3 QA/QC Samples

The QA/QC samples to be collected during the course of the Groundwater Investigation conducted at the Eastern Landfill are as follows:

- Equipment blanks (see Section 5.6.1);
- Trip Blanks (see Section 5.6.2);
- Duplicates (see Section 5.6.3); and
- Triplicates (see Section 5.6.4).

QA samples will be analyzed by DataChem Laboratories.

7.1.4 Holding Times and Preservatives

Holding times and preservative requirements for all samples are described within Table 7.0-1.

7.2 Method Data Quality Objectives

The DQOs are qualitative and quantitative statements that specify the quality of data required supporting project activities. In order to develop site-specific DQOs, the intended use of the data must be defined. Different uses of data require different levels of analytical and sampling certainty. This use must be balanced between data quality needs and time, as well as cost constraints.

The DQOs of this project have been chosen to meet the goals of contamination identification. These DQOs will be used to develop a plan to be used throughout the investigation. Data developed during the study will be used to determine the presence of contamination. The evaluation of this data will be used to determine whether a release of contaminants has occurred.

Environmental data will be collected from potentially impacted groundwater. The sample locations are described in Section 5.0, and sample matrices and sampling frequencies are presented in the individual site analytical program table for the Eastern Landfill.

The minimum data reporting requirements that will be required of all analytical laboratories includes the following:

- Sample identification numbers cross-referenced with laboratory identification numbers and QC sample numbers.
- Problems with arriving samples noted on an appropriate laboratory form.
- Each analyte reported as an actual value or less than a specified quantitation limit as listed in the method.
- Sampling dates, dilution factors, extraction dates, and analysis dates.
- QC sample analysis for laboratory blanks, surrogate spikes, matrix spikes, laboratory duplicates, field duplicates, and field blanks.
- Copies of fully executed chain-of-custody forms.

7.3 Data Reduction, Validation, and Reporting

Data management is an integral part of the reporting process and provides a basis to ensure the validity, correctness, and completeness of reported data. The procedures for data reduction, validation, and reporting are described in the following subsections.

7.3.1 Analytical Data

Laboratory data reduction procedures are those specified in SW-846, 3rd edition, and those described in the laboratory Standard Operating Procedures.

The laboratory will prepare and retain full analytical and QC documentation. For SW-846 and other analytical methods, the following requirements shall be met. The laboratory will report the data as:

- A group of 20 samples or less, along with QC supporting data.
- Standard forms will be used, preferably CLP or SW-846 recommended format. Copies of preparation log, run log, and raw data (i.e., instrumentation, calibration information, and chromatographs) will be available from the laboratory, when needed.
- The contract laboratory will archive all project raw data for a period of three years after the samples have been analyzed.

Data validation procedures are discussed in Section 9.2.

7.3.2 Electronic Data Formatting

As specified by the Fort Worth District COE, all analytical laboratory data must be presented in electronic format. An example of the electronic format is provided at the end of this section in Table 7.3.2-1.

The electronic analytical data format will be presented in the following format:

- Site Name – refers to sampling location, where:
FW = Fort Wingate Depot Activity
- Lab Name – refers to laboratory performing analysis, where:
STL = Severn Trent Laboratories
DCHM = Data Chem Laboratory
- SDG – refers to sampling delivery group as assigned by laboratory;
- Collection Date – refers to the date the sample was taken;
- Lab ID – refers to the internal sample identification number as assigned by the laboratory;
- Sample ID – refers to sample field identification number (see Section 5.9.1);
- Depth – refers to depth at which sample was retrieved, in the case of groundwater samples, the value reported will be 0.0;
- Chain of Custody Number – refers to number assigned to the chain of custody document accompanying the sample;
- Sample Type – refers to type of sample collected, where:
FBLK = Field Blank;
RNSW = Equipment Rinsate Blank
FDUP = Field Duplicate
FTRP = Field Triplicate
BLK = Laboratory Blank
LCS = Laboratory Control Sample
- Matrix – refers to the sample media (i.e. water or soil);
- Method – refers to the analytical testing methodology to be performed;
- CAS – refers to the Chemical Abstract Number of the analyte;

- Analyte – refers to the target analyte;
- Less Than Flag – refers to a detection value that is lower than the reportable limit;
- Result – refers to the concentration of the target analyte within the tested sample;
- Units – refers to the unit of measure, where:
 UG/L = micrograms per unit liter;
- Lab Flag – refers to a notation assigned by the laboratory, where:
 U = “Non-detect”
 J = Estimated value;
- Dilution – refers to sample dilution;
- Total or Dissolved – refers to the total or dissolved concentration of the target analyte (metals only);
- Method Detection Limit – refers to the limit, or value of concentration, where the analytical method can no longer accurately detect the target analyte;
- Contract Required Detection Limit – refers to a limit, or a value of concentration, required by the contract to be reported, should be lower than Preliminary Remediation Goal (PRG) EPA screening level.
- Extraction/Prep Date – refers to the date on which the collected sample is extracted and prepared for analysis;
- Analysis Date – refers to the date on which the prepared sample is analyzed; and
- Moisture – refers to the percent moisture content of the sample (soil samples only).

7.3.3 Report Contents and Format

The contents and format of the final and corrected final Groundwater Investigation reports will contain the following information:

- Background information
- Detailed description of field investigations including methods and locations of sampling conducted
- Boring logs
- Analytical data reports (hard copy and electronic versions)
- Data Validation Report
- Ground surveyed boring locations coordinates table.

Table 7.0-1

ANALYTICAL PROGRAM
GROUNDWATER INVESTIGATION - EASTERN LANDFILL SITE
Fort Wingate Depot Activity, Gallup, New Mexico

Analysis	Method ⁽¹⁾	Number of Samples						Holding Time	Container Volume and Material	Preservation
		Investigation Samples	Trip Blanks	Rinsate Blanks	Field Duplicate	Field Triplicate	Total			
Groundwater Samples										
Appendix IX VOCs + Methyl Tert Butyl Ether (MTBE)	SW-846 8260	4	1	1	1	1	8	14 days	40 mL VOA vial in triplicate without headspace	pH<2 with HCl, 4°C
Appendix IX SVOCs	SW-846 8270	4	--	1	1	1	7	7 days to extraction, 40 days to analysis	1L, Amber glass	4°C
Appendix IX Pesticides	SW-846 8081	4	--	1	1	1	7	7 days to extraction, 40 days to analysis	1L, Amber glass	4°C
Appendix IX Pesticides	SW-846 8141	4	--	1	1	1	7	7 days to extraction, 40 days to analysis	1L, Amber glass	4°C
Appendix IX PCBs	SW-846 8082	4	--	1	1	1	7	7 days to extraction, 40 days to analysis	1L, Amber glass	4°C
Appendix IX Herbicides	SW-846 8151	4	--	1	1	1	7	7 days to extraction, 40 days to analysis	1L, Amber glass	4°C
Appendix IX Dioxins	SW-846 8290	4	--	1	1	1	7	30 days	1L, Amber glass	4°C
Appendix IX Metals (totals) + Al, Fe, Mn ⁽²⁾	SW-846 6010, 6020, 7470	4	--	1	1	1	7	6 months, Mercury 28 days	1L HDPE or glass	HNO3 to pH < 2
Appendix IX Metals (dissolved) + Al, Fe, Mn ⁽²⁾	SW-846 6010, 6020, 7470	4	--	1	1	1	7	6 months, Mercury 28 days	1L HDPE or glass	HNO3 to pH < 2
Anions (Nitrate as Nitrogen, Chloride, Fluoride, Sulfate)	EPA 300.0	4	--	1	1	1	7	28 days	500 mL HDPE or glass	N/A
Cyanide	SW-846 9012	4	--	1	1	1	7	14 days	1L, HDPE or glass	Ascorbic Acid, NaOH > pH 12, 4°C
Expanded List Explosives	SW-846 8330 Mod.	4	--	1	1	1	7	7 days to extraction, 40 days to analysis	1L, Amber glass	4°C
Nitrate/Nitrite Nonspecific	EPA 353.2	4	--	--	--	--	4	28 days	500 mL HDPE or glass	H2SO4< pH 2; 4°C
pH	EPA 150.1	4	--	--	--	--	4	Analyze Immediately	500 mL HDPE or glass	N/A
Sulfide	EPA 376.1	4	--	--	--	--	4	7 days	500 mL, HDPE or glass	Zinc Acetate and NaOH
Total Dissolved Solids	EPA 160.1	4	--	--	--	--	4	7 days	250 mL, HDPE or glass	4°C
Soil Samples										
Grain-Size Distribution (including hydrometer analysis)	ASTM D422	4	--	--	--	--	4	N/A	1 x 1-quart glass jar or 3" x 2.8" Shelby tube	N/A
Dry Bulk Density	ASTM D2937	4	--	--	--	--	4	N/A		N/A
Specific Gravity	ASTM D854	4	--	--	--	--	4	N/A		N/A
Porosity	API RP40	4	--	--	--	--	4	N/A		N/A
Total Organic Carbon	Walkley-Black	4	--	--	--	--	4	N/A		N/A
Cation Exchange Capacity	--	4	--	--	--	--	4	N/A		N/A

Table 7.0-1 (Continued)

ANALYTICAL PROGRAM
GROUNDWATER INVESTIGATION - EASTERN LANDFILL SITE
Fort Wingate Depot Activity, Gallup, New Mexico

Analysis	Method ⁽¹⁾	Number of Samples						Holding Time	Container Volume and Material	Preservation
		Investigation Samples	Trip Blanks	Rinse Blanks	Field Duplicate	Field Triplicate	Total			
Investigation Derived Waste - Soil										
VOCs	SW-846 8260	1					1	14 days to extraction, 40 days to analysis	2 oz. CWM	4°C
SVOCs	SW-846 8270	1					1	14 days to extraction, 40 days to analysis	4 oz. CWM	4°C
TAL Metals	SW-846 6000, 7000	1					1	6 months	4 oz. CWM	N/A
Pesticides/PCBs	SW-846 8081	1					1	14 days to extraction, 40 days to analysis	4 oz. CWM	4°C
Herbicides	SW-846 8151	1					1	14 days to extraction, 40 days to analysis	4 oz. CWM	4°C
Reactivity, Corrosivity, Ignitability	---	1					1		16 oz.	
Explosives	SW-846 8330	1					1	14 days to extraction, 40 days to analysis	4 oz. CWM	4°C
Investigation Derived Waste - Water										
VOCs	SW-846 8260	1					1	14 days	40 mL VOA vial in triplicate without headspace	HCL < pH 2; 4°C
SVOCs	SW-846 8270	1					1	7 days to extraction, 40 days to analysis	1L, Amber glass	Sodium Thiosulfate if residual chloride, 4°C
TAL Metals	SW-846 6000, 7000	1					1	6 months	500 mL HDPE	HNO3 < pH 2; 4°C
Pesticides/PCBs	SW-846 8081	1					1	7 days to extraction, 40 days to analysis	1L, Amber glass	Sodium Thiosulfate if residual chloride, 4°C
Herbicides	SW-846 8151	1					1	7 days to extraction, 40 days to analysis	1L, Amber glass	Sodium Thiosulfate if residual chloride, 4°C
Reactivity, Corrosivity, Ignitability	---	1					1		1L, Amber glass	
Explosives	SW-846 8330	1					1	7 days to extraction; 40 days to analysis	1L, Amber glass	4°C

Note:

1. All methods from SW-846 except as noted otherwise.
2. Arsenic and thallium will be analyzed using Method 6020B.

Table 7.3.2-1

Example Electronic Analytical Data Format
 Groundwater Investigation - Eastern Landfill
 Fort Wingate Depot Activity, Gallup, New Mexico

Site Name	Lab Name	SDG	Collection Date	Lab ID	Sample ID	Depth	Chain of Custody Number	Sample Type	Matrix	Method	CAS
FW	DataChem	CGDM	04/10/2003	03U00233	FBLK01	0.0	00914	FBLK	WATER	7470A	7439-97-6
FW	DataChem	CGDM	04/10/2003	03U00234	RNSW01	0.0	00913	RNSW	WATER	7470A	7439-97-6
FW	DataChem	CGDM	04/09/2003	03U00236	CMW02	0.0	00900	FDUP	WATER	7470A	7439-97-6
FW	DataChem	CGDM	04/09/2003	03U00245	CMW02	0.0	00900	REG	WATER	7470A	7439-97-6
FW	DataChem	CGDM	04/24/2003	BL-206363-1	LABQC			BLK	WATER	7470A	7439-97-6
FW	DataChem	CGDM	04/24/2003	QC-206363-1	LABQC			LCS	WATER	7470A	7439-97-6
FW	DataChem	CGDM	04/10/2003	03U00232MS	CMW16		00901	MS	WATER	7470A	7439-97-6
FW	DataChem	CGDM	04/10/2003	03U00232MSD	CMW16		00901	MSD	WATER	7470A	7439-97-6

Analyte	Less Than Flag	Result	Units	Lab Flag	Dilution	Total or Dissolved	Method Detection Limit	Contract Required Detection Limit	Extraction/ Prep Date	Analysis Date	Moisture
Mercury	<	0.100	UG/L	U	1	Total	0.0221	0.100	04/24/2003	04/24/2003	
Mercury	<	0.100	UG/L	U	1	Total	0.0221	0.100	04/24/2003	04/24/2003	
Mercury	<	0.100	UG/L	U	1	Total	0.0221	0.100	04/24/2003	04/24/2003	
Mercury	<	0.100	UG/L	U	1	Dissolved	0.0221	0.100	04/24/2003	04/24/2003	
Mercury	<	0.100	UG/L	U	1	Total	0.0221	0.100	04/24/2003	04/24/2003	
Mercury		5.04	UG/L		1	Total	0.0221	0.100	04/24/2003	04/24/2003	
Mercury		1.04	UG/L		1	Total	0.0221	0.100	04/24/2003	04/24/2003	
Mercury		1.05	UG/L		1	Total	0.0221	0.100	04/24/2003	04/24/2003	

8.0 WASTE MANAGEMENT

This section of the SAP describes the procedures that will be used to handle and store investigation-derived waste (IDW) requiring off-site disposal that will be generated from the Groundwater Investigation activities conducted at the Eastern Landfill. IDW at FWDA will be managed in accordance with the Final Investigation Derived Waste Management Plan, FWDA (August 200), which was prepared by USACE.

8.1 Wastes to be Generated

8.1.1 Waste Minimization

Waste minimization techniques will be employed, where possible, to reduce the volume of investigation-derived wastes generated as part of the Groundwater Investigation activities.

8.1.2 Soil Cuttings

Soil cuttings, which are excess soil removed by the hollow-stem, or air rotary drilling techniques, will be generated while advancing the soil borings.

8.1.3 Produced Groundwater

As part of the Groundwater Investigation activities, purge and development water will be generated from the monitoring wells. This water will be pumped or bailed from a well or borehole prior to sampling.

8.1.4 Used Personal Protective Equipment (PPE)

Used PPE will include the disposable work clothing, such as gloves and coveralls, worn by field personnel.

8.1.5 Decontamination Fluids

Procedures for equipment decontamination, as described in Section 5.8, will be implemented to minimize the spread of contamination to clean zones, to reduce exposure to personnel, and to reduce cross-contamination of samples when equipment must be used more than once during a sampling event. Decontamination fluids will include soapy water and rinse water.

8.1.6 Miscellaneous Debris

Miscellaneous debris such as waste paper, boxes, paper cups and miscellaneous containers also will be generated at the site during Groundwater Investigation activities.

8.2 Handling of Wastes Generated During Investigation Activities

8.2.1 Waste Segregation

Waste segregation activities will be utilized to minimize the mixing of potential hazardous and non-hazardous wastes. All wastes will be segregated according to waste type (i.e., solids, liquids, etc.). In addition, wastes within each waste type will be segregated by source.

8.2.2 Soil Cuttings

All drill cuttings generated during the investigation activities will be contained in DOT-approved 55-gallon drums with removable heads or in roll-off bins. Drums will be transported to an on-site 90-day holding area within 3 days of the date on which filling of the drum is completed. The 90-day holding area is located at Building 5 in the Administration Area. If IDW is contained in roll-off bins, the bins will be staged at the drilling site.

8.2.3 Produced Groundwater

All purge and development water generated at the site will be containerized in DOT-approved 55-gallon drums with non-removable heads or a storage tank(s). Drums will be transported to an on-site 90-day holding area within 3 days of the date on which filling of the drum is completed. The 90-day holding area is located at Building 5 in the Administration Area. If IDW is contained in storage tanks, the tanks will be staged in the vicinity of the site.

8.2.4 Used PPE

All used PPE generated during the investigation activities will be placed in polyethylene bags and then placed in DOT-approved 55-gallon drums with removable heads or roll-off bins. Drums will be transported to an on-site 90-day holding area within 3 days of the date on which filling of the drum is completed. The 90-day holding area is located at Building 5 in the Administration Area. If IDW is contained in roll-off bins, the bins will be staged at the drilling site.

8.2.5 Decontamination Fluids

All decontamination fluids generated at the site will be containerized in DOT-approved 55-gallon drums with non-removable heads or a storage tank(s). Drums will be transported to an on-site 90-day holding area within 3 days of the date on which filling of the drum is completed. The 90-day holding area is located at Building 5 in the Administration Area. If IDW is contained in storage tanks, the tanks will be staged in the vicinity of the site.

8.2.6 Miscellaneous Debris

Per the FWDA Final FSP, miscellaneous trash generated during the Groundwater Investigation activities will be disposed of off-site as municipal solid waste.

8.2.7 Drum Labeling

The 55-gallon drums for storage of drill cuttings, used PPE, produced groundwater and decontamination water will be provided by TtNUS. All drums used to containerize waste will be DOT approved. An indelible marker will be used to mark the drums with a unique 10-character identifier as follows:

FWaabbbbcc

Where:

FW – Fort Wingate

aa – AOC number

bbbb – date on which filling commenced in month date format

cc – the consecutive number of the container being filled that day

Additionally, the drum will be marked with the following information:

- Project name;
 - Site name;
 - Date;
 - The type of material contained (e.g., soil or water);
 - The source of the waste material (e.g., boring number);
 - The date of commencement of filling of the container or drum; and
- COE Technical Manager's name and number: Beverly Post, 817-886-1884.

In addition, drums used for storage of waste will be labeled "PENDING ANALYSIS."

A drum log record will be used for drums used to containerize the derived wastes. This record will include the drum number, date generated, contents (soil, water, PPE) and any remarks, if applicable, describing the origin of the waste. An example of the drum log record is included as Figure 8.2.7-1.

An inventory form will be completed for all containers stored at the Building 5 90-day storage area. The FWDA Caretaker will verify the information on the inventory form and fax a copy to the Toole Army Depot. The containers will be inspected weekly.

8.3 Waste Profiling and Disposal

IDW characterization will be completed as follows:

Liquid – One liquid aliquot will be collected from each drum/tank of liquids and composited into one liquid sample. This liquid sample will be analyzed for IDW parameters as listed in Table 7.0-1.

Soils – One soil aliquot will be collected from each drum/roll-off bin and composited into one soil sample. This soil sample will be analyzed for IDW parameters as listed in Table 7.0-1.

All IDW will be disposed of within the lesser of 30 days of receipt of characterization results or within 90 days of placement at the temporary holding area. No IDW containers will be stored beyond 90 days at the holding area. Upon completion of waste profiling activities, the IDW will then be transported to an approved off-site disposal facility. IDW will be removed from the site within 45 days of completion of field activities.

Figure 8.2.7-1

EXAMPLE DRUM LOG SHEET

Drum Number	Date Generated	Contents	Origin of Waste

9.0 DATA MANAGEMENT

Data management is an integral part of the reporting process and provides a basis to ensure the validity, correctness, and completeness of reported data. The following subsections present discussions pertaining to the content of chemical data deliverables; and presents procedures that will be implemented in instances of related non-routine occurrences.

9.1 Laboratory Analytical Report

Project analytical data, including the results of QC samples, will be submitted to the Fort Worth District COE upon receipt and review by TtNUS. The information to be submitted is as follows:

- Data will be submitted in accordance with the electronic data format requirements as presented in Section 7.3.2.
- A tabular presentation will be prepared that correlates contract laboratory sample identification numbers to associated laboratory QA sample numbers. The table also will identify field QA samples (e.g., duplicates, field and travel blanks, etc.) and match investigation samples to all applicable field QA samples.
- The contract analytical laboratory will complete and submit a "Cooler Receipt Form" for all shipments. This form will document the condition of samples submitted to the laboratory and will identify any problems associated with sample packaging, chain-of-custody, and sample preservation.
- For each analytical method run, all analytes will be reported for each sample as either a detected concentration or as less than the specific limits of quantitation. Generally, all samples with out-of-control spike recoveries attributed to matrix interferences will be identified as such. Soil samples submitted for chemical analysis will be reported on a dry weight basis, with percentage moisture also recorded and reported. Dilution factors for each sample as well as the date of sample collection, date of sample extraction (if applicable), and date of analysis also will be reported for all analytical methods pertaining to each sample.
- All analytes will be reported for each laboratory blank.
- Surrogate spike recoveries, concentrations, and percentages will be reported with all organic methods reports where appropriate (e.g., when the method requires surrogate spikes). The report also will specify the control limits for surrogate spike results as well as the spiking concentration.
- Matrix spike recoveries, concentrations, and percentages will be reported, as appropriate, for all organic and inorganic analyses. All general matrix spike results will be designated as corresponding to a particular matrix spike sample. The report will indicate what field sample was spiked, even if it was not a project sample. The report also will specify the control limits for matrix spike results for each method for each matrix.
- Relative percent difference will be reported for all duplicate pairs as well as analyte/matrix control.
- Chain-of-Custody forms (original).
- Narrative comments, if any.

9.2 Data Validation Report

Ten percent of all samples will be subject to a complete data validation (Level III) in accordance with EPA functional guidelines for data validation (EPA, 1994a; EPA, 1994b).

The elements to be checked in the validation and review process include the following:

- Chain-of-custody
- Holding time
- Blanks
- Gas Chromatography/Mass Spectrophotometry(GC/MS) Data
- Laboratory control samples (LCS)
- Matrix spike/matrix spike duplicates
- Surrogate Recoveries
- Field duplicates
- Overall assessment of the data
- Sample Data
- Standard Data

Specific elements of the data package validation procedure will include the following:

- A comparison of the data package to the reporting level requirements to ensure completeness in the analytical data package and compliance with the contract;
- A comparison of sampling dates, sample extraction dates, and analysis dates to ensure that samples were extracted and analyzed within the proper holding times;
- Checks of QA/QC samples (field and laboratory blanks) to evaluate possible contamination sources.

In order to perform the validation, the laboratory will provide all the pertinent information described above. Analytical results for each sample will include a tabulated list of the specific parameters along with the measured concentration (if present), the concentration units, and the detection limit.

Data qualifiers that will be applied to sample results include:

- U - Not detected at the stated detection limit
- J - The associated value is an estimated quantity
- R - The result is unusable
- UJ - Not detected at the stated detection limit, but the associated value is an estimated quantity.

The reasons for any data qualification and associated biases will be explained in the report. The definition of any data qualifiers used will be provided along with the analytical results. Constituents detected for water samples will be reported in concentration units of milligrams per liter (mg/L).

The data validation report will include the following sections:

- ES Executive Summary
- 1.0 Introduction
 - 1.1 Testing laboratory identification numbers
 - 1.2 Number of samples tested by medium
 - 1.3 Analytical methods used
 - 1.4 QA samples
 - 1.5 QC samples
- 2.0 Results and Discussion by Fraction (i.e., metals, volatiles, etc.)
Sample data validation checklists for each sample by analytical method (fraction) will be kept on file. The results will be discussed in detail.
 - 2.1 Accuracy (including spike recoveries)
 - 2.2 Precision/Relative Percent Difference (RPD)
 - 2.3 Representativeness
 - 2.3.1 Chain-of-Custody Forms
 - 2.3.2 Trip Blanks
 - 2.3.3 Equipment Blanks
 - 2.3.4 Method Blanks
 - 2.4 Holding Times
 - 2.5 Effects of Any Variance from Methods Described in the Sampling and Analysis Work Plan
- 3.0 Sensitivity
- 4.0 Completeness
- 5.0 Conclusion

9.3 Non-routine Occurrences

Notice of problems identified, corrective actions, and verbal or written instructions from Fort Worth District, COE personnel regarding sampling or re-analysis will be sent to the TtNUS Project Manager within two working days of discovery of the occurrence. In addition, all information regarding non-routine occurrences will be documented in the laboratory report.

10.0

PROJECT HEALTH AND SAFETY

The purpose of a site-specific Site Safety and Health Plan (SSHP) is to provide health and safety procedures for contractor and subcontractor personnel to follow while engaged in Groundwater Investigation related tasks at the Eastern Landfill. The SSHP addresses measures to be taken during site activities to ensure that all activities will be conducted in an environmentally safe manner for workers and the surrounding community and to protect personnel from the potential hazards associated with the site-specific tasks to be performed.

TtNUS has prepared the site-specific SSHP for the Groundwater Investigation related tasks conducted at the Eastern Landfill. This SSHP, which is included in this document as Volume II, was prepared in accordance with Occupational Safety and Health Administration guidelines outlined in 29 CFR 1910.120 along with the U.S. Army Corps of Engineers Safety and Health Requirements Manual, Engineer Manual (EM) 385-1-1 (September 1996).

If more specific information becomes available, this SSHP will be modified to address any applicable additional requirements.

11.0 CORRECTIVE ACTION

The need for corrective actions may become apparent during surveillance of field activities, procurement of services and supplies, "out of control" situations in laboratories, or other operations that may affect the quality of work. Any and all nonconformance with the established quality control procedures will be expeditiously identified and controlled. No additional work that is dependent on the nonconforming activity will be performed until the identified nonconformance is corrected.

Depending upon the nature of a problem, the corrective action implemented may be formal or informal. In either case, occurrence of the problem, the corrective action employed, the outcome of these actions, and verification that the problem has been eliminated must be documented.

11.1 Field Corrective Action

The site manager or task team leader is responsible for assuring that all field equipment is functioning properly, that proper materials are utilized, and that samples are handled properly. Any situation adverse to quality will be properly investigated, documented in a nonconformance report, and reported to the TtNUS Project Manager for appropriate corrective action.

Whenever a piece of field equipment fails to operate properly, the instrument will either be repaired or replaced with an equivalent instrument. Field data measurements that are suspect (i.e., grossly extreme or significantly different from all the other readings) will be evaluated by project management and repeated if necessary.

11.2 Laboratory Corrective Action

The need for laboratory corrective action may result from several sources: equipment malfunction, failure of internal QC checks, method blank contamination, and noncompliance with QA requirements.

The laboratory department supervisor will review the data generated to ensure that all QC samples have been run as specified in the analytical protocols. Recoveries of matrix spike samples for consistency with method accuracy and matrix duplicate samples for method precision will be evaluated. Data from Laboratory Control Samples (LCSs) will be evaluated according to the Laboratory QA/QC Management Plan (LQMP). Data generated with LCSs that do not fall within control limits are considered suspect, and the analysis will be repeated. If this is not possible, then the results will be reported with qualifiers.

Laboratory personnel will be alerted that corrective action may be necessary if:

- The QC samples are outside the warning or acceptable windows for precision and accuracy established for laboratory samples;
- Blanks contain contaminants at concentrations above the levels specified in the LQMP for any analyte;
- Undesirable trends are detected in matrix spike recoveries or RPD between matrix spike duplicates;
- There are unusual changes in detection limits; or
- Deficiencies are detected by the laboratory QA director during internal or external audits, or from the results of performance evaluation samples.

If any nonconformance in analytical methodologies, quality control sample results, etc., is identified by the bench analyst, corrective actions will be implemented immediately. Corrective action procedures initially will be handled at the bench level by the analyst, who will review the preparation procedures for possible errors and check the instrument calibration, sensitivity, etc. The analyst will immediately notify his/her supervisor as to any problem that is identified and the investigation that is being conducted. If the problem persists or cannot be identified, the matter will be referred to the laboratory supervisor and QA director for further investigation. Once resolved, full documentation of the corrective action procedure will be filed by the laboratory QA director, and the QA/QC Officer will be provided a corrective action memorandum for inclusion into the project file if data are affected.

Data deemed unacceptable following the implementation of the required corrective action measures will not be accepted by the TtNUS Project Manager, and follow-up corrective actions will be explored.

11.3 Corrective Actions Following Data Assessment

The project QA officer will review the field and laboratory data for this project to ensure that all QA/QC objectives are met. If any nonconformances are found in the field procedures, sample collection procedures, field documentation procedures, laboratory analytical and documentation procedures, and data assessment and validation procedures, the impact of those nonconformances on the overall project QA objectives will be assessed. Appropriate actions, including re-sampling, re-analysis, etc., may be recommended to the TtNUS Project Manager so that the project objectives can be accomplished.

12.0**REFERENCES**

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SITE SAFETY AND HEALTH PLAN

**GROUNDWATER INVESTIGATION
AT
EASTERN LANDFILL**

**FORT WINGATE DEPOT ACTIVITY
Gallup, New Mexico**

January 2004

Prepared for:

**United States Army Corps of Engineers
Fort Worth District**

Prepared by:

**Tetra Tech NUS, Inc.
Houston, Texas**

**Contract No. DACA63-97-D-0030
Delivery Order No. 024**

SITE SAFETY AND HEALTH PLAN

Groundwater Investigation – Eastern Landfill Fort Wingate Depot Activity, Gallup, New Mexico

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SITE SAFETY AND HEALTH PLAN

Groundwater Investigation – Eastern Landfill Fort Wingate Depot Activity, Gallup, New Mexico

ACRONYMS AND ABBREVIATIONS

ANSI	American National Standards Institute
BRAC	Base Realignment and Closure Act
CAS	Chemical Abstract Service
CFR	Code of Federal Regulations
CIH	Certified Industrial Hygienist
CO	Contracting Officer
COC	Contaminant of Concern
COE	United States Army Corps of Engineers
ECT	Equivalent Chill Temperature
FWDA	Fort Wingate Depot Activities
GFCI	Ground-Fault Circuit Interrupter
HR	Heart Rate
HTRW	Hazardous, Toxic, Radiological Waste
IDLH	Immediately Dangerous to Life and Health
LEL	Lower Explosive Limit
MSDS	Material Safety Data Sheet
NIOSH	National Institute for Occupational Safety and Health
OS	On-site Supervisor
OSHA	Occupational Safety and Health Administration
OT	Oral Temperature
PID	Photoionization Detector
PPE	Personal Protective Equipment
ppm	parts per million
RI	Remedial Investigation
SAP	Sampling and Analysis Plan
SCBA	Self Contained Breathing Apparatus
SSHP	Site Safety and Health Plan
SSO	Site Safety Officer
TtNUS	Tetra Tech NUS, Inc.
WBGt	Wet Bulb Globe Temperature

1.0 INTRODUCTION

Tetra Tech NUS, Inc. (TtNUS) will be performing various field operations in support of the Groundwater Investigation at the Eastern Landfill, located at the Fort Wingate Depot Activity (FWDA) in the city of Gallup, New Mexico. Figure 1.0-1 is a figure depicting the location of FWDA. Figure 1.0-2 depicts the Eastern Landfill.

This site-specific Site Safety and Health Plan (SSHP) will meet or exceed the requirements outlined in the following documents:

- 1) U.S. Army Corps of Engineers (COE), Safety and Health Requirements Manual, EM 385-1-1, dated August 1996; and
- 2) Occupational Safety and Health Administration (OSHA) Standard 29 Code of Federal Regulations (CFR) 1910.120, Hazardous Waste Operations and Emergency Response.

This SSHP will serve as a stand-alone document. Therefore, to meet COE and OSHA requirements, project personnel must be cognizant of the requirements of the SSHP. In addition, project personnel must be familiar with the TtNUS Health and Safety Policy, which is included in this SSHP as Appendix A.

This SSHP was prepared based on existing information about the site and initial site reconnaissance data, in accordance with applicable COE and OSHA requirements. Prior to conducting any site activities, this SSHP will be reviewed and accepted by the Fort Worth District COE.

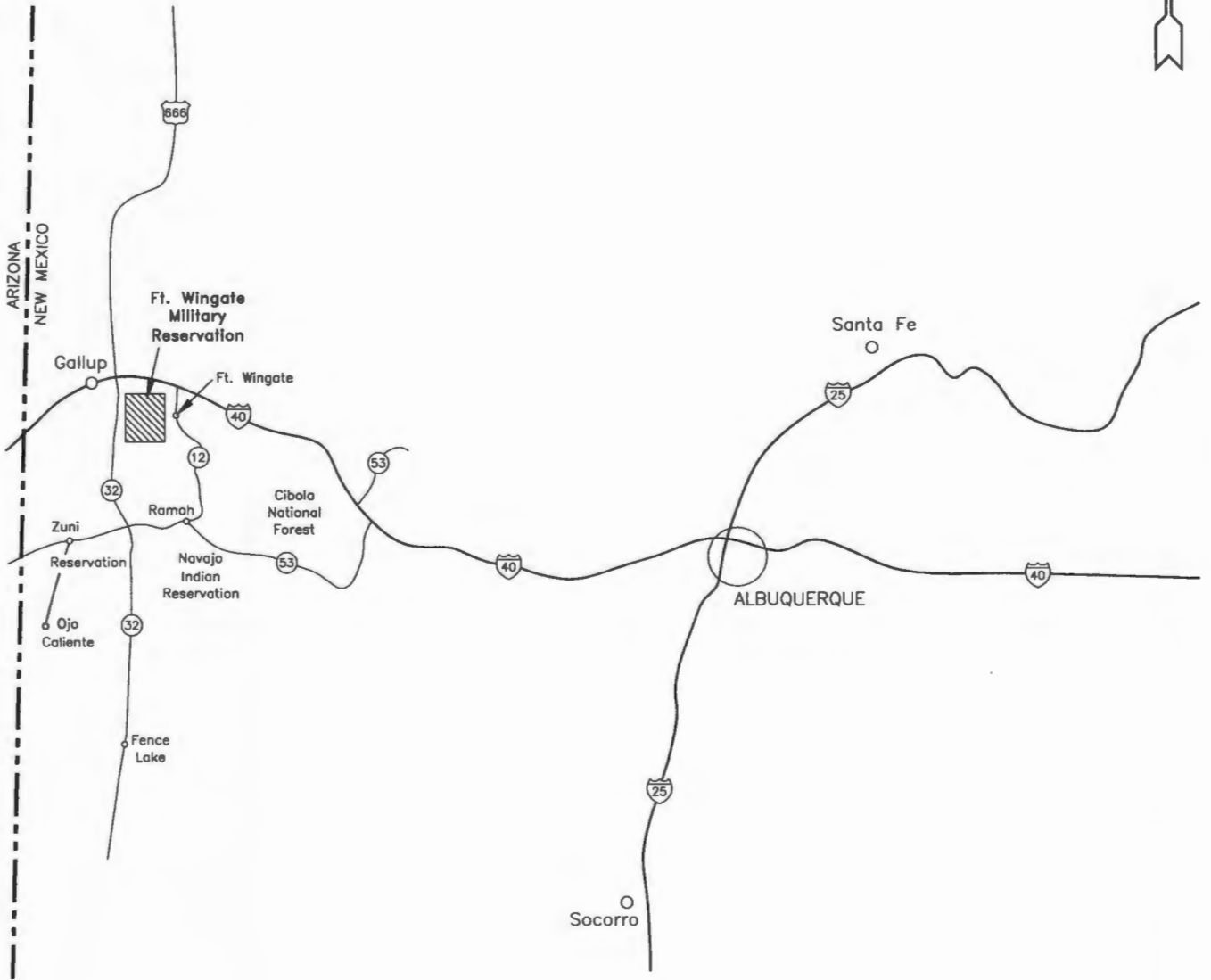
If more specific information becomes available, this SSHP will be modified to address any applicable additional requirements. Appropriate personnel and will be copied on modified project files.

1.1 Purpose

The purpose of this site-specific SSHP is to provide health and safety procedures for TtNUS employees and subcontractor personnel to follow while engaged in Groundwater Investigation related tasks at the Eastern Landfill site. This SSHP establishes site-specific health and safety guidelines, procedures, practices, and equipment for activities conducted at this site. This plan addresses measures to be taken during site activities to ensure that all activities will be conducted in an environmentally safe manner for workers and the surrounding community and to protect personnel from the potential hazards associated with the site-specific tasks to be performed.

1.2 Compliance with SSHP

Consistent with the contents of this SSHP, work at the Eastern Landfill site will be conducted in a safe and environmentally acceptable manner. Specific information or procedures that are applicable to all operations and tasks at these sites are included in this SSHP. These procedures are applicable to all site activities unless otherwise stated herein.

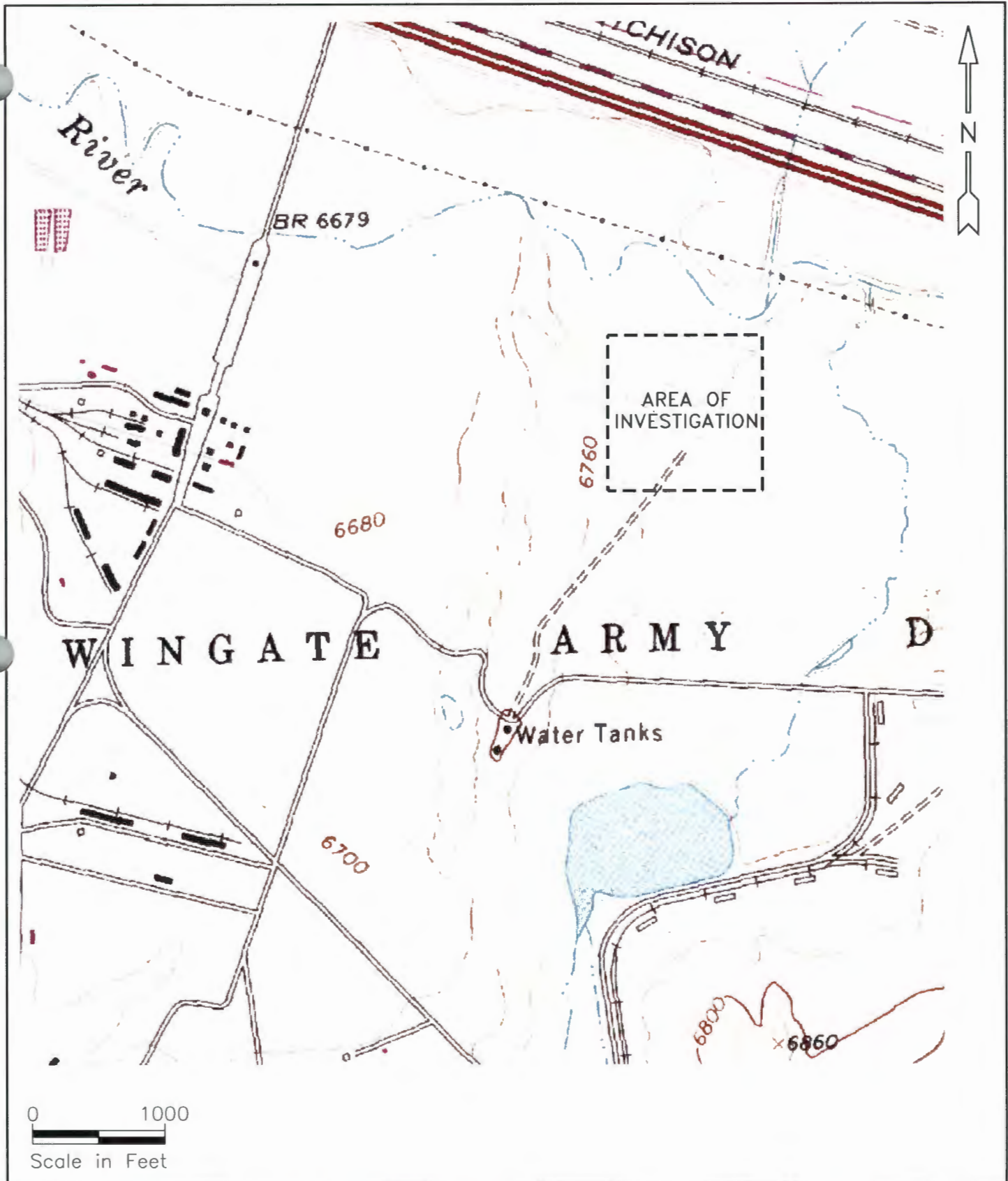


SITE MANAGER: L. BASILIO	
CHECKED BY: M. MASON	
DRAWN BY: J. FLESCHE	
DATE: 09-29-03	SCALE: NONE
CAD SWG. NO.: 287BSM	PROJ. NO.: N7551.159C



TETRA TECH NUS, INC.
Houston, Texas

FIGURE 1.0-1
SITE LOCATION MAP
FORT WINGATE DEPOT ACTIVITY
GALLUP, NEW MEXICO



SITE MANAGER: K. BELL	
CHECKED BY: K. BELL	
DRAWN BY: J. FLESCH	
DATE: 11-21-00	SCALE: 1"=1000'
CAD DWG. NO.: 158C_TOPO	PROJ. NO.: N7551.158C



TETRA TECH NUS, INC.
Houston, Texas

FIGURE 1.0-2
EASTERN LANDFILL DELINEATION
SITE VICINITY MAP
FORT WINGATE DEPOT ACTIVITY
GALLUP, NEW MEXICO

All TtNUS personnel and subcontractors contractually bound to this SSHP will be required to comply with the health and safety requirements specified herein. All field personnel working at the Eastern Landfill site on tasks related to the Groundwater Investigation are required to read and familiarize themselves with the contents of this SSHP and to document this competency through the entry of a signature and date as specified in the Certification Section (Section 13.0) of this plan.

1.3 Scope of Site Activities

The fieldwork associated with the Groundwater Investigation to be conducted at the Eastern Landfill site will include construction of one decontamination pad, drilling of soil borings, installation of monitoring wells, subsurface groundwater sample collection, handling and transport of samples, equipment and personnel decontamination, and management of investigation-derived wastes (e.g., drill cuttings, produced groundwater, personal protective equipment, and decontamination fluids).

2.0 SITE BACKGROUND

2.1 FWDA Background

FWDA is an inactive U.S. Army depot whose former mission was to store, ship, and receive material and to dispose of obsolete or deteriorated explosives and ammunition. The active mission of FWDA ceased and the installation was closed in January 1993 as a result of the Defense Authorization Amendments and Base Realignment and Closure Act (BRAC) of 1988. Currently, the installation is undergoing final environmental restoration prior to property transfer/reuse.

FWDA is located in McKinley County in northwestern New Mexico, approximately 130 miles west of Albuquerque. The town of Gallup is located approximately 8 miles west of FWDA. FWDA covers approximately 34 square miles (22,120 acres). FWDA is almost entirely surrounded by federally owned or administered lands including both national forest and tribal lands. FWDA is divided into several areas which are defined by location and historical land use. These areas include: the Administrative Area, the Workshop Area, the Magazine Igloo Area, Open Burning and Detonation Area, and the Southern Properties.

2.2 Eastern Landfill Background

The Eastern Landfill is located approximately one half-mile northeast of the water towers, as shown on Figure 1.0-2. The landfill is reported to have been used for the disposal of garbage, trash, and debris from the Administration Area and for the burning of other solid waste from FWDA. In 1968, the landfill was closed and covered with a layer of soil.

As part of the Remedial Investigation (RI) conducted at FWDA, by Program Management Corporation (PMC), an investigation of the Eastern Landfill was conducted. The RI results were documented in the "Final Remedial Investigation/Feasibility Study Report & RCRA Corrective Action Program" document dated November 15, 1997. During the RI, the Eastern Landfill was located and a geophysical survey was conducted. The results of soil sampling indicated that lead, mercury, and barium were present at levels slightly above background. The results of a soil gas survey indicated that low levels of methane were present. Hydrogen sulfide was not detected. Analyses for pesticides, volatile organic carbons or semi-volatile organic carbons were non-detect.

In October 1999, Safe Environment, Inc. removed surface debris in the area of the Eastern Landfill. The material removed consisted of metal ammunitions lids, wire rope, I-beams, pipe, tires, wire fencing, concrete blocks, expended ammunition casings, scrap wood, and tree branches/trunks.

In November 2000, TtNUS performed a site investigation to locate and define the lateral boundaries of the Eastern Landfill. The results are documented in the report entitled "Eastern Landfill Delineation Release Assessment Project" (TtNUS, November 2000).

The Eastern Landfill was investigated using surface geophysical methodology (i.e., electromagnetic and magnetic). The geophysical results identified 10 anomalies, which required further investigation by visual or physical means. Ten locations were excavated, and the results confirmed the presence of landfill material in four out of ten anomalies.

The physical identification of the edge of the landfill was matched with geophysical anomalies and from the results identified that the Eastern Landfill consisted of several trenches or cells. The Eastern Landfill cells were identified along with other collections of burned material and debris. Based upon the results, the Eastern Landfill consists of three trenches that are oriented parallel to one another and three areas of surface debris. A topographic survey was conducted at the area. The topographic survey consisted of a one-foot contour map over ten acres encompassing the Eastern Landfill.

2.3 Groundwater Investigation

The primary objective of this groundwater investigation is to determine the extent of impact of contaminants of concern (COCs) that may have been released to groundwater beneath the Eastern Landfill. Sampling and groundwater well installation will occur in four locations. One well will be established at a location immediately upgradient of the landfill, and the remaining three hydraulically downgradient wells will be established at locations along the landfill perimeter. Each well location will be continuously sampled to the total depth of each borehole.

3.0

POTENTIAL SITE CONTAMINANTS AND HAZARD EVALUATION

While the potential hazards to on-site personnel will vary depending on the site conditions and the tasks to be performed, the potential chemical hazards that could reasonably be expected to be encountered at the Eastern Landfill site have been identified by COE based on preliminary assessment information. The potential chemical hazards associated with these constituents are presented in Table 3.0-1. For each chemical, Table 3.0-1 lists the allowable exposure levels for each chemical, signs and symptoms of exposure, dermal absorption hazards, carcinogenicity, physical hazards, Chemical Abstract Service (CAS) number, and physical characteristics, where available. As additional analytical data becomes available, Table 3.0-1 will be updated accordingly.

The field tasks for this site characterization with the potential for exposure to toxic materials are borehole drilling, groundwater sampling, handling and transport of samples, equipment and personnel decontamination, and management of investigation-derived wastes (e.g., drill cuttings, produced groundwater).

A discussion of the potential on-site operational hazards, including physical/noise hazards, is presented in Section 8.1.2 Procedures (General) of this Plan. Additionally, an activity hazard analysis of the field tasks outlined above is presented in Table 3.0-2.

Table 3.0-1

POTENTIAL CHEMICAL HAZARDS

Substance (CAS No.)	Exposure Limits	Flammability	Physical Description	Chemical and Physical Properties	Route of Exposure	Symptoms	Target Organs
Benzene (71-43-2)	OSHA 1 ppm ACGIH 0.5 ppm TWA 2.5 ppm STEL NIOSH 0.1 ppm	LEL - 1.2% UEL - 7.8%	Colorless liquid with an aromatic odor	MW: 78 BP: 176 °F Sol: 0.07% Fl.P: 12 °F IP: 9.25 eV VP: 75 mm MP: 42 °F	Inhalation Ingestion Skin contact	Irritated eyes, nose, respiratory system; giddy; head; nausea; staggered gait; fatigue, anorexia, lassitude, dermatitis, bone marrow depression, abdominal pain	Blood, central nervous system, skin, bone marrow, eyes, respiratory system
Carbon Tetrachloride (56-23-5)	OSHA 10 ppm 25 ppm ceiling ACGIH 5 ppm TWA 10 ppm STEL NIOSH 2 ppm STEL	LEL - NA UEL - NA	Colorless liquid with a characteristic ether- like odor	MW: 153.8 BP: 170 °F Sol: 0.05% Fl.P: NA IP: 11.47 eV VP: 91 mm FRZ: -9 °F	Inhalation Ingestion Skin contact	Central nervous system depression; nausea, vomiting; liver, kidney damage; skin irritation	Central nervous system, eyes, lungs, liver, kidneys, skin
Chlorobenzene (108-90-7)	OSHA 75 ppm ACGIH 10 ppm	LEL - 1.3% UEL - 9.6%	Colorless liquid with an almond- like odor	MW: 112.6 BP: 270 °F Sol: 0.05% Fl.P: 82 °F IP: 9.07 eV VP: 9 mm FRZ: -50 °F	Inhalation Ingestion Skin contact	Irritated skin, eyes, nose; drowsiness, incoordination	Respiratory system, eyes, skin, central nervous system, liver
Chloroform (67-66-3)	OSHA 50 ppm (ceiling) ACGIH 10 ppm NIOSH 2 ppm STEL	LEL - NA UEL - NA	Colorless liquid with a pleasant odor	MW: 119.4 BP: 143 °F Sol: 0.5% Fl.P: NA IP: 11.42 eV VP: 160 mm FRZ: -82 °F	Inhalation Ingestion Skin contact	Dizziness, mental dullness, nausea, disorientation; headache, fatigue; anesthesia; hepatomegaly; irritated eyes, skin	Liver, kidneys, heart, eyes, skin

Table 3.0-1 (Continued)

POTENTIAL CHEMICAL HAZARDS

Substance (CAS No.)	Exposure Limits	Flammability	Physical Description	Chemical and Physical Properties	Route of Exposure	Symptoms	Target Organs
Dichloroethane (75-34-3)	NIOSH/ OSHA/ ACGIH 100 ppm	LEL - 5.4% UEL - 11.4%	Colorless, oily liquid with a chloroform-like odor	MW: 99 BP: 135 °F Sol: 0.6% Fl.P: 2 °F IP: 11.06 eV VP: 182 mm FRZ: -143 °F	Inhalation Ingestion Skin contact	Central nervous system depression; skin irritation; liver, lung and kidney damage	Skin, liver, kidneys, lungs, central nervous system
Dichloroethylene (540-59-0)	NIOSH/ OSHA/ ACGIH 200 ppm	LEL - 5.6% UEL - 12.8%	Colorless liquid (usually a mixture of the cis and trans isomers) with a slightly acrid, chloroform-like odor	MW: 97.0 BP: 118-140 °F Sol: 0.4% Fl.P: 36 °F IP: 9.65 eV VP: 180-264 mm FRZ: -57 to -115 °F	Inhalation Ingestion Skin contact	Irritated eyes, respiratory system; central nervous system depression	Respiratory system, eyes, central nervous system
Tetrachloro- ethylene (127-18-4)	OSHA 100 ppm 200 ppm ceiling ACGIH 25 ppm TWA 100ppm STEL	LEL - NA UEL - NA	Colorless liquid with a mild, chloroform-like odor	MW: 165.8 BP: 250 °F Sol: 0.02% Fl.P: NA IP: 9.32 eV VP: 14 mm FRZ: -2 °F	Inhalation Ingestion Skin contact	Irritated eyes, nose, throat; nausea; flushed face, neck; vertigo, dizziness, incoordination; headache, somnolence; skin erythema; liver damage	Liver, kidneys, eyes, respiratory system, central nervous system, skin
Trichloroethylene (79-01-6)	OSHA 100 ppm 200 ppm ceiling ACGIH 50 ppm 100ppm STEL	LEL - 8% UEL - 10.5%	Colorless liquid (unless dyed blue) with a chloroform- like odor	MW: 131.4 BP: 189 °F Sol: 0.1% Fl.P: 90 °F IP: 9.45 eV VP: 58 mm FRZ: -99 °F	Inhalation Ingestion Skin contact	Headache, vertigo; visual disturbance, tremors, somnolence, nausea, vomiting; irritated eyes; dermatitis; cardiac arrhythmia, parathesia	Respiratory system, heart, liver, kidneys, central nervous system, skin, and eyes

Table 3.0-1 (Continued)

POTENTIAL CHEMICAL HAZARDS

Substance (CAS No.)	Exposure Limits	Flammability	Physical Description	Chemical and Physical Properties	Route of Exposure	Symptoms	Target Organs
Vinyl chloride (75-01-4)	OSHA 1 ppm ACGIH 5 ppm TWA	LEL - 3.6% UEL - 33.0%	Colorless gas or liquid with a pleasant odor at high concentrations	MW: 62.5 BP: 7 °F Sol: 0.1% Fl.P: NA (Gas) IP: 9.99 eV VP: 3.3 atm FRZ: -256 °F	Inhalation Skin contact	Weakness; abdominal pain, gastrointestinal bleeding; hepatomegaly; pallor or cyanosis of extremities	Liver, central nervous system, blood, respiratory system, lymphatic system
Cresol (all isomers) (1319-77-3)	NIOSH 2.3 ppm OSHA 5 ppm ACGIH 5 ppm TWA	LEL - 1.4% (o) 1.1% (m) 1.1% (p) UEL - ?	Colorless, yellow, brown, or pinkish, oily liquids or solids with a sweet, tarry odor	MW: 108.2 BP: 376-397 °F Sol: 2% Fl.P: 178 - 187 °F IP: 8.93 - 8.98 eV VP: 0.11 - 0.29 mm FRZ: -52 to -95 °F	Inhalation Ingestion Skin contact Absorption	Central nervous system effects; confusion, depression, respiratory failure; dyspnea, irregular rapid breathing, weak pulse, skin, eye and skin burns; dermatitis; lung, liver, kidney and pancreas damage	Central nervous system, respiratory system, liver, kidneys, pancreas, skin, eyes, cardiovascular system
Dichlorobenzene (106-46-7)	OSHA 75 ppm ACGIH 10 ppm	LEL - 2.5% UEL - ?	Colorless or white crystalline solid with a mothball- like odor	MW: 147.0 BP: 345 °F Sol: 0.008% Fl.P: 150 °F IP: 8.98 eV VP: 1.3 mm MLT: 128 °F	Inhalation Ingestion Skin contact Absorption	Headache; irritated eyes, swelling around the eyes; profuse rhinitis; anorexia, nausea, vomiting; low- weight, jaundice, cirrhosis	Liver, respiratory system, eyes, kidneys, skin
Dinitrotoluene (25321-14-6)	OSHA 1.5 mg/m ³ ACGIH 0.2 mg/m ³ TWA	LEL - ? UEL - ?	Orange-yellow crystalline solid with a characteristic odor.	MW: 182.2 BP: 572 °F Sol: Insoluble Fl.P: 404 °F IP: ? VP: 1 mm MLT: 158 °F	Inhalation Ingestion Skin contact Absorption	Anoxia; cyanosis; anemia, jaundice; and reproductive effects.	Blood, liver, cardiovascular system and respiratory system

Table 3.0-1 (Continued)

POTENTIAL CHEMICAL HAZARDS

Substance (CAS No.)	Exposure Limits	Flammability	Physical Description	Chemical and Physical Properties	Route of Exposure	Symptoms	Target Organs
Hexachloroethane (67-72-1)	OSHA 1 ppm ACGIH 1 ppm	LEL - NA UEL - NA	Colorless crystals with a camphor- like odor.	MW: 236.7 BP: Sublimes Sol: 0.005% Fl.P: NA IP: 11.22 eV VP: 0.2 mm MLT: 368 °F	Inhalation Absorption Ingestion Skin contact	Irritated eyes, skin, and mucous membranes	Eyes, skin, respiratory system and kidneys
Nitrobenzene (98-95-3)	NIOSH/ OSHA 1 ppm	LEL - 1.8% UEL - ?	Yellow, oily liquid with a pungent odor like paste shoe polish.	MW: 123.1 BP: 411 °F Sol: 0.2% Fl.P: 190 °F IP: 9.92 eV VP: 0.3 mm FRZ: 42 °F	Inhalation Ingestion Skin contact Absorption	Anoxia; irritated eyes; dermatitis; anemia, methemoglobinemia	Blood, liver, kidneys, cardiovascular system, skin, eyes and respiratory system
Pentachloro- phenol (87-86-5)	NIOSH/ OSHA 0.5 mg/m ³	LEL - NA UEL - NA	Colorless to white, crystalline solid with a benzene-like odor	MW: 266.4 BP: 588 °F Sol: 0.001% Fl.P: NA IP: NA VP: 0.0001 mm MLT: 374 °F	Inhalation Ingestion Skin contact Absorption	Irritated eyes, nose, throat; sneezing, cough; weakness, anorexia, low-weight; sweating; headache, dizziness; nausea, vomiting; dyspnea, chest pain; high fever; dermatitis	Cardiovascular system, respiratory system, eyes, liver, kidneys, skin, central nervous system
Pyridine (110-86-1)	NIOSH/ OSHA/ ACGIH 5 ppm TWA	LEL - 1.8% UEL - 12.4%	Colorless to yellow liquid with a nauseating, fish- like odor.	MW: 79.1 BP: 240 °F Sol: Miscible Fl.P: 68 °F IP: 9.27 eV VP: 16 mm FRZ: -44 °F	Inhalation Ingestion Skin contact Absorption	Headache, nervousness, dizziness, insomnia; nausea, anorexia; eye irritation; dermatitis; liver, kidney damage	Central nervous system, liver, kidneys, skin, gastrointestinal tract

Table 3.0-1 (Continued)

POTENTIAL CHEMICAL HAZARDS

Substance (CAS No.)	Exposure Limits	Flammability	Physical Description	Chemical and Physical Properties	Route of Exposure	Symptoms	Target Organs
Chlordane (57-74-9)	OSHA 0.5 mg/m ³ ACGIH 0.5 mg/m ³ TWA	LEL - NA UEL - NA	Amber-colored, viscous liquid with a pungent, chlorine- like odor.	MW: 409.8 BP: Decomposes Sol: Insoluble Fl.P: NA IP: ? VP: 0.00001 mm FRZ: 217 - 228 °F	Inhalation Absorption Ingestion Skin contact	Blurred vision; confusion; ataxia, delirium; coughing; abdominal pain, nausea, vomiting, diarrhea; irritability, tremor, convulsion; anuria	Central nervous system, eyes, lungs, liver, kidneys, skin
Endrin (72-20-8)	NIOSH/ OSHA/ ACGIH 0.1 mg/m ³	LEL - NA UEL - NA	Colorless to tan crystalline solid with a mild, chemical odor.	MW: 380.9 BP: Decomposes Sol: Insoluble Fl.P: NA IP: ? VP: Low MLT: 392 °F	Inhalation Ingestion Skin contact Absorption	Epileptiform convulsions; stupor, headache, dizziness, abdominal discomfort, nausea, vomiting; insomnia; aggressiveness, confusion; lethargy, weakness; anorexia	Central nervous system, liver
Heptachlor (76-44-8)	NIOSH/ OSHA 0.5mg/m ³ ACGIH 0.05 mg/m ³ TWA	LEL - NA UEL - NA	White to light tan crystals with a camphor-like odor	MW: 373.4 BP: 293 °F Sol: 0.0006% Fl.P: NA IP: ? VP: 0.0003 mm MLT: 203 °F	Inhalation Ingestion Skin contact Absorption	In animals: tremors, convulsions, liver damage	In animals: central nervous system, liver
Lindane (58-89-9)	NIOSH/ OSHA/ ACGIH 0.5 mg/m ³ TWA	LEL - NA UEL - NA	White to yellow crystalline powder with a slight musty odor.	MW: 290.8 BP: 614 °F Sol: 0.001% Fl.P: NA IP: ? VP: 0.00001 mm MLT: 235 °F	Inhalation Ingestion Skin contact Absorption	Irritated eyes, nose, throat; headache; nausea; chronic convulsions; respiratory difficulty; cyanosis; aplastic anemia; skin irritation, muscle spasm	Eyes, central nervous system, blood, liver, kidneys, skin, respiratory system

Table 3.0-1 (Continued)

POTENTIAL CHEMICAL HAZARDS

Substance (CAS No.)	Exposure Limits	Flammability	Physical Description	Chemical and Physical Properties	Route of Exposure	Symptoms	Target Organs
Methoxychlor (72-43-5)	OSHA 15 mg/m ³ ACGIH 10 mg/m ³	LEL - ? UEL - ?	Colorless to light yellow crystals with a slight, fruity odor	MW: 345.7 BP: Decomposes Sol: Insoluble F.L.P: ? IP: ? VP: Very Low MLT: 171 °F	Inhalation Ingestion	None known in humans In animals: fasciculation, trembling, convulsions, kidney, liver damage	In animals: central nervous system, liver, kidneys
Arsenic (7740-38-2)	OSHA TWA 0.010 mg/m ³	LEL - NA UEL - NA	Metal; Silver-gray or tin-white, brittle, odorless solid	MW: 74.9 BP: Sublimes Sol: Insoluble F.L.P: NA IP: NA VP: 0 mm (approx.) MP: 1135 °F	Inhalation Skin absorption Ingestion Skin contact and/or eye contact	Ulceration of nasal septum, dermatitis, gastrointestinal disturbances, peripheral neuropathy, respiratory irritation, hyperpigmentation of skin	Liver, kidneys, skin, lungs, lymphatic system
Barium (10022-31-8)	NIOSH/ OSHA/ ACGIH 0.5 mg/m ³ TWA	LEL - NA UEL - NA	White odorless solid	MW: 261.4 BP: Decomposes Sol: 9% F.L.P: NA IP: ? VP: Low MP: 1098 °F	Inhalation Ingestion Skin contact and/or eye contact	Upper respiratory irritation, gastroenteritis, muscle spasm, slow pulse, extrasystoles, hypokalemia, irritated eyes and skin, skin burns	Heart, central nervous system, skin respiratory system, eyes
Cadmium (7440-43-9)	OSHA TWA 0.005 mg/m ³ ACGIH TWA 0.005 mg/m ³ (total) 0.005 mg/m ³ (resp. factor)	LEL - NA UEL - NA	Metal, silver-white, blue-tinged lustrous, odorless solid	MW: 112.4 BP: 1409 °F Sol: Insoluble F.L.P: NA IP: NA VP: 0 mm (approx.) MP: 610 °F	Inhalation Ingestion	Pulmonary edema, dyspnea, cough, chest tightness, substernal pain, headaches, chills, muscle aches, nausea, vomiting, diarrhea, anosmia, emphysema, proteinuria, mild anemia	Respiratory system, kidneys, prostate, blood

Table 3.0-1 (Continued)

POTENTIAL CHEMICAL HAZARDS

Substance (CAS No.)	Exposure Limits	Flammability	Physical Description	Chemical and Physical Properties	Route of Exposure	Symptoms	Target Organs
Chromium (7440-47-3)	NIOSH TWA 0.5 mg/m ³ OSHA TWA 1 mg/m ³ ACGIH TWA 0.5mg/m ³ Cr ⁺³ 0.05 mg/m ³ (soluble Cr ⁺⁶) 0.05 mg/m ³ (insoluble Cr ⁺⁶)	LEL - NA UEL - NA	Blue-white to steel-gray, lustrous, brittle, hard solid	MW: 52.0 BP: 4788 °F Sol: Insoluble Fl.P: NA IP: NA VP: 0 mm (approx.) MP: 3452 °F	Inhalation Ingestion Skin contact	Histologic fibrosis of lungs; irritation of the skin and eyes	Respiratory system, skin and eyes
Lead (7439-92-1)	NIOSH TWA 0.100 mg/m ³ OSHA TWA 0.050 mg/m ³ ACGIH TWA 0.05 mg/m ³	LEL - NA UEL - NA	Metal, a heavy, ductile, soft gray solid	MW: 207.2 BP: 3164 °F Sol: Insoluble Fl.P: NA IP: NA VP: 0 mm (approx.) MP: 621 °F	Inhalation Ingestion Skin contact and/or eye contact	Weak, lassitude, insomnia; facial pallor; pal eye, anorexia, low-weight, malnutrition, constipation, abdominal pain, colic; anemia; gingival lead line; tremor; paralysis wrist, ankles; encephalopathy; nephropathy; irritated eyes; hypertension	Gastrointestinal tract, central nervous system, kidneys, blood, gingival tissue, eyes
Mercury (7439-97-6)	NIOSH TWA 0.05 mg/m ³ OSHA 0.1 mg/m ³ ceiling ACGIH TWA 0.025 mg/m ³	LEL - NA UEL - NA	Silver-white, heavy, odorless liquid	MW: 200.6 BP: 674 °F Sol: Insoluble Fl.P: NA IP: ? VP: 0.0012 mm FRZ: -38 °F	Inhalation Skin absorption Ingestion Skin contact and/or eye contact	Cough, chest pain, dyspnea, bronchitis pneumonia; tremor, insomnia; irritability, indecision; headache, fatigue, weakness; stomatitis, salivation; gastrointestinal disturbance, anorexia, low-weight; proteinuria; irritated eyes, skin	Respiratory system, skin, central nervous system, kidneys, eyes

Table 3.0-1 (Continued)

POTENTIAL CHEMICAL HAZARDS

Substance (CAS No.)	Exposure Limits	Flammability	Physical Description	Chemical and Physical Properties	Route of Exposure	Symptoms	Target Organs
Silver (7440-22-4)	NIOSH/ OSHA TWA 0.01 mg/m ³ ACGIH TWA 0.1 mg/m ³ (metal) 0.01 mg/m ³ (soluble)	LEL - NA UEL - NA	Metal, white, lustrous solid	MW: 107.9 BP: 3632 °F Sol: Insoluble Fl.P: NA IP: NA VP: 0 mm (approx.) MP: 1761 °F	Inhalation Ingestion Skin contact and/or eye contact	Blue-gray eyes, nasal septum, throat, skin; irritated skin, ulceration; gastrointestinal disturbance	Nasal septum, skin, eyes
Selenium (7782-49-2)	NIOSH/ OSHA/ ACGIH 0.2 mg/m ³ TWA	LEL - ? UEL - ?	Element, amorphous or crystalline, red to gray solid	MW: 79.0 BP: 1265 °F Sol: Insoluble Fl.P: ? IP: NA VP: 0 mm (approx.) MP: 392 °F	Inhalation Ingestion Skin contact and/or eye contact	Irritated eyes, nose, throat; visual disturbance; headache; chills, fever; dyspnea, bronchitis; metallic taste, garlic breath, gastrointestinal disturbance; dermatitis; skin, eye burns	Respiratory system, eyes, skin, liver, kidneys, blood, spleen

Table 3.0-2

ACTIVITY HAZARD ANALYSIS

Activity	Principal Steps	Potential Hazards	Recommended Controls
Mobilization	Project Equipment Commissioning	Equipment entering or operating at the jobsite	Ensure that workers are thoroughly trained and competent to perform their assigned task with the equipment used in investigation. Ensure that back-up alarms are functional on equipment. Ensure QA procedures are in place for other equipment purchased or brought onto the site. The equipment operators and on-site Supervisors responsible for the equipment are to ensure that the equipment inspection forms (Appendix L) have been reviewed and completed, and that all moving parts are guarded if such parts are exposed. Check/test all emergency stop controls.
		Heavy lifting (muscle strains and pulls)	Use machinery or multiple personnel for heavy lifts. Use proper lifting techniques.
		Excessive noise levels	Hearing protection should be used to protect against excessive noise if workers standing within 2 feet of each other need to raise their voices in order to communicate.
		Equipment moving parts	Appropriate operator training in the operation of the equipment. Appropriate engineering controls, such as machine guards must be maintained in-place.
		Vehicular traffic when moving large equipment to the support area	Use escort vehicles with flashing lights to warn and control local traffic when moving large equipment to support area.
		Utility lines overhanging the roads used to haul large equipment	Pre-plan the move with the local utility companies if utility lines must be moved. Pre-survey the height of equipment and height of utility lines to determine which lines must be removed or raised. Verify the utility drawings as to where utility lines are located. Equipment should not come within 20 feet of existing overhead utility lines.
		Overhead and Foot Hazards	Wear recommended PPE. As a minimum, hard hat and steel toe foot protection will be required where these hazards may exist.

Table 3.0-2 (Continued)

ACTIVITY HAZARD ANALYSIS

Activity	Principal Steps	Potential Hazards	Recommended Controls
Drilling	Drilling of Monitoring Wells	Exposure to toxic vapors, flammable gases, and drilling fluids	Use LEL and PID monitors. If LEL greater than 10%, prohibit work and initiate measures to ventilate area. If LEL greater than 20%, cease work and retreat to a safe atmosphere. If sustained PID readings exceed established background levels, suspend site activities and retreat to an unaffected area. If PID readings do not subside, withdraw from site and notify CIH for re-evaluation of PPE requirements. Follow PPE requirements, wear dermal protection, and decontamination per procedures in Section 8.4.
		Exposure to airborne particles	Use dust suppression methods such as area wetting as a precaution to minimize airborne particles concerns, and use identified PPE to minimize potential worker exposures.
		Heavy lifting (muscle strains and pulls)	Use machinery or multiple personnel for heavy lifts. Use proper lifting techniques.
		Working with or near heavy equipment	Only designated and trained personnel shall operate equipment. Keep a safe distance away from moving equipment. Supervisor must ensure provision of barricades, signs, and warning tape to keep non-essential personnel out of area.
		Underground utilities	All utility clearances shall be obtained prior to subsurface activities. Prior to any subsurface investigations, the locations of all underground utilities will be identified and marked. Obtain written permit clearance prior to all subsurface investigations.
		Overhead Utilities	Verify location of overhead utility lines. Pre-survey the height of equipment and height of utility lines to determine possible interferences. Pre-plan the move with utility companies if utility lines must be moved or raised. Relocate sampling areas whenever possible if moving utility lines is not practical. Equipment should not come within 20 feet of existing overhead utility lines.
		Pinch points, rotating parts on equipment	Avoid any pinch points. Use gloves to protect hands. Follow lockout/tagout procedures. Rotating equipment must be covered with machine guards per OSHA. Workers must report unguarded equipment to Supervisor. Improperly guarded equipment will not be allowed to operate. Refer to Section 8.1.2 for additional requirements and controls.

Table 3.0-2 (Continued)

ACTIVITY HAZARD ANALYSIS

Activity	Principal Steps	Potential Hazards	Recommended Controls
Soil and Groundwater Sampling	Sample Subsurface Soil and Groundwater	Excessive noise levels	Hearing protection should be used to protect against excessive noise if workers standing within 2 feet of each other need to raise their voices in order to communicate.
		Heat stress or cold stress	Follow guidelines in Section 8.3. For heat stress, wear light-weight clothing and drink water and/or electrolyte solution frequently. Limit working hours to early morning or evening. Rotate shifts of workers and provide a shaded rest area. For cold stress, wear proper clothing. Monitor each other's exposed skin for signs of frostbite. Drink warm, noncaffeine beverages at breaks. Keep work areas free of ice accumulations. Use melting and traction agents as needed.
		Overhead and Foot Hazards	Wear recommended PPE. As a minimum, hard hat and steel toe foot protection will be required where these hazards may exist.
		Exposure to contaminated water and soil	Wear assigned PPE. Wash off any splashes immediately. Wash hands and face before eating, drinking, and during breaks. Follow decontamination procedures.
		Exposure to toxic vapors	Use LEL and PID monitors. If LEL greater than 10%, prohibit work and initiate measures to ventilate area. If LEL greater than 20%, cease work and retreat to a safe atmosphere. If sustained PID readings exceed established background levels, suspend site activities and retreat to an unaffected area. If PID readings do not subside, withdraw from site and notify CIH for re-evaluation of PPE requirements. Follow PPE requirements, wear dermal protection, and decontamination per procedures in Section 8.4.
		Exposure to airborne particles	Use dust suppression methods such as area wetting as a precaution to minimize airborne particles concerns, and use identified PPE to minimize potential worker exposures.
		Lifting (muscle strains and pulls)	Use machinery or multiple personnel for heavy lifts. Use proper lifting techniques. Avoid any pinch points. Use gloves to protect hands. Follow lockout/tagout procedures.

Table 3.0-2 (Continued)

ACTIVITY HAZARD ANALYSIS

Activity	Principal Steps	Potential Hazards	Recommended Controls
Sample Handling and Transport	Packaging Sample Containers for Shipment	Pinch points, rotating parts on equipment	Rotating equipment must be covered with machine guards per OSHA. Workers must report unguarded equipment to Supervisor. Improperly guarded equipment will not be allowed to operate. Refer to Section 8.1.2 for additional requirements and controls.
		Heat/cold stress	Follow guidelines in Section 8.3. For heat stress, wear light-weight clothing and drink water and/or electrolyte solution frequently. Limit working hours to early morning or evening. Rotate shifts or workers and provide a shaded rest area. For cold stress, wear proper clothing. Monitor each other's exposed skin for signs of frostbite. Drink warm, non-caffeine beverages at breaks. Keep work areas free of ice accumulations. Use melting and traction agents as needed.
		Exposure to broken glass	Wear work gloves when packaging sample vials. Wear safety glasses.
		Exposure to contaminated water and soil	Wear assigned PPE. Wash off any splashes immediately. Wash hands and face before eating, drinking and during breaks.
		Exposure to toxic vapors	Use LEL and PID monitors. If LEL greater than 10%, prohibit work and initiate measures to ventilate area. If LEL greater than 20%, cease work and retreat to a safe atmosphere. If sustained PID readings exceed established background levels, suspend site activities and retreat to an unaffected area. If PID readings do not subside, withdraw from site and notify CIH for re-evaluation of PPE requirements. Follow PPE requirements, wear dermal protection, and decontamination per procedures in Section 8.4.
Waste Materials Management	Preparation of Decontamination Area	Lifting (i.e., coolers containing samples) – muscle strains/pulls	Use machinery or multiple personnel for heavy lifts. Use proper lifting techniques.
		Exposure to heavy equipment	Only designated and trained personnel shall operate equipment. Keep a safe distance away from moving equipment. Shift Supervisor must ensure provision of barricades, signs, and warning tape to keep non-essential personnel out.

Table 3.0-2 (Continued)

ACTIVITY HAZARD ANALYSIS

Activity	Principal Steps	Potential Hazards	Recommended Controls
Drum Handling	Nose		Hearing protection should be used to protect against excessive noise if workers standing within 2 feet of each other need to raise their voices in order to communicate.
	Heat/cold stress		Follow guidelines in Section 8.3. For heat stress, wear light-weight clothing and drink water and/or electrolyte solution frequently. Limit working hours to early morning or evening. Rotate shifts or workers and provide a shaded rest area. For cold stress, wear proper clothing. Monitor each other's exposed skin for signs of frostbite. Drink warm, non-caffeine beverages at breaks. Keep work areas free of ice accumulations. Use melting and traction agents as needed.
	Overhead and Foot Hazards		Wear recommended PPE. As a minimum, hard hat and steel toe foot protection will be required where these hazards may exist.
	Heavy Lifting (muscle Strains/pulls)		Use machinery or multiple personnel for heavy lifts. Use proper lifting techniques.
	Exposure to toxic/flammable vapors		Use LEL and and PID monitors. If LEL greater than 10%, prohibit work and initiate measures to ventilate area. If LEL greater than 20%, cease work and retreat to a safe atmosphere. If sustained PID readings exceed established background levels, suspend site activities and retreat to an unaffected area. If PID readings do not subside, withdraw from site and notify CIH for re-evaluation of PPE requirements. Follow PPE requirements, wear dermal protection, and decontamination per procedures in Section 8.4.
	Exposure to contaminated water or soils		Wear assigned PPE. Wash off any splashes immediately. Wash hands and face before eating, drinking, and during breaks. Follow decontamination procedures.
	Heat/cold stress		Follow guidelines in Section 8.3. For heat stress, wear light-weight clothing and drink water and/or electrolyte solution frequently. Limit working hours to early morning or evening. Rotate shifts or workers and provide a shaded rest area. For cold stress, wear proper clothing. Monitor each other's exposed skin for signs of frostbite. Drink warm, non-caffeine beverages at breaks. Keep work areas free of ice accumulations. Use melting and traction agents as need.
Lifting (muscle strains and pulls)		Use machinery or multiple personnel for heavy lifts. Use proper lifting techniques. Use drum handling equipment to avoid back strain.	

Table 3.0-2 (Continued)

ACTIVITY HAZARD ANALYSIS

Activity	Principal Steps	Potential Hazards	Recommended Controls
Demobilization	Disconnect Utilities	Utility lines overhanging the roads used to haul large equipment	Pre-plan the move with the local utility companies if utility lines must be moved. Pre-survey the height of equipment and height of utility lines to determine which lines must be removed or raised. Verify the utility drawings as to where utility lines are located. Equipment should not come within 20 feet of existing overhead utility lines.
	Decontaminate Heavy Equipment	Dermal and inhalation exposure to contaminants	Use appropriate PPE while decontaminating equipment. Follow Decontamination and Spill Control plans.
	Loading Heavy Equipment	Struck by equipment and materials	<p>Only designated and trained personnel shall operate equipment. Keep a safe distance away from moving equipment. Always be aware of the swing radius of equipment. Do not stand within the swing radius of equipment.</p> <p>Shift Supervisor must ensure provision of barricades, signs, and warning tape to keep non-essential personnel out.</p> <p>Wear safety shoes and hard hat while in area. Do not stand under equipment or materials being moved. Use proper equipment for the job, including adequate weight classification for rigging. Do not use slings or other lifting devices that are damaged. Keep unauthorized personnel away from materials that are being transported. Do not get in front of moving equipment. Tie off materials and equipment, and properly store equipment being used in elevated work areas. Barricade area below the elevated work area. Use spotters when appropriate for the situation.</p>
	Remove Equipment and Facilities	Vehicular traffic when moving equipment and trailers off-site.	Use escort vehicles and flagmen to warn traffic.

4.0 PERSONNEL QUALIFICATIONS

4.1 Training Requirements

Prior to performing any field activities at the Eastern Landfill site, all applicable TtNUS personnel and subcontractors must meet health and safety training requirements as outlined in OSHA 1910.120, paragraph (e). This includes 40 hours of introductory training for personnel along with 24 hours of on-the-job training, and an additional eight hours of training for Site Supervisors. Eight hours of refresher training are required annually for all applicable personnel. TtNUS employees must meet these requirements in accordance with the TtNUS Health and Safety Standard Operating Procedures. In addition, all TtNUS employees are given training as required under the Hazard Communication Standard (29 CFR 1910.1200). The training certificates of the project personnel are attached to this document as Appendix B.

OSHA requirements mandate that TtNUS employees and subcontractor personnel attend a task-specific training session, which will be conducted immediately preceding field activities. The session will consist of the following and will relate to the task assignment in question:

- Names of personnel and their alternates who are responsible for health and safety;
- Safety, health, and other potential hazards present at the site;
- Proper use of personal protective equipment (PPE), including respiratory protection;
- Work practices and restrictions to minimize hazard potentials on the site;
- Safe use of any implemented engineering controls and equipment on the site;
- Medical surveillance requirements, including the recognition of symptoms of overexposure to substances known or suspected to be on the site;
- Monitoring instrumentation to be used on the site;
- The contents of this site-specific SSHP;
- Personnel decontamination procedures;
- Emergency procedures;
- Field communications;
- Fire precautions;
- Spill containment; and
- Other topics as specified in this SSHP.

Site-specific training will be documented using the forms provided in Appendix C.

4.2 Medical Surveillance Program

All TtNUS employees and subcontractors performing site characterization activities must be medically capable of performing their prescribed tasks. All TtNUS employees must meet this requirement through their mandatory participation in the company's Medical Monitoring Program, which includes a medical evaluation from a Licensed Professional Health Care Professional. Before field work commences for a specific task assignment, TtNUS subcontractors are normally required to obtain a detailed certificate from a physician stating that subcontractor personnel may perform their assigned tasks. An example of this certificate is included in Appendix D of this SSHP. The contents of the medical release will assist in ensuring

that TiNUS subcontractors meet the requirements outlined in OSHA 1910.120, paragraph (f). The parameters of the medical examinations and any need for additional testing of personnel will be at the discretion of the examining physician. The medical qualifications include the date of each employee's last medical exam, along with the physician's written opinion on each employee's capability to complete the activities related to the Groundwater Investigation.

5.0 PERSONAL PROTECTIVE EQUIPMENT

5.1 General

PPE will be one of the control measures used to minimize personnel exposure to chemical and physical hazards at the job site. Throughout the course of all activities occurring at the Eastern Landfill site, TtNUS personnel and any subcontractors will be required to wear steel-toe work shoes or boots, coveralls, hard hats (plastic only), safety glasses with side shields, and hearing protection (when needed).

5.2 Chemical Protective Equipment

The types of PPE worn during the investigation are classified by levels based on the level of protection provided, as follows:

- Level A: Provides the highest level of respiratory, skin and eye protection.
- Level B: Provides the highest level of respiratory protection, but a lesser level of skin protection.
- Level C: Provides protection when criteria for air-purifying respirators are met and when a lesser level of skin protection is required.
- Level D: A basic work uniform that does not provide respiratory or skin protection. Level D PPE provides limited protection against physical hazards (i.e., head injuries, eye injuries, etc.), and provides minimal protection against chemical hazards.

The types of hazards for which Levels A, B, C and D protection are appropriate are described in the next four subsections.

5.2.1 Level A

Level A protection should be used when:

- The contaminants present at a site have been identified and are known to require the highest level of protection for skin, eyes, and the respiratory system based on the measured high concentration of atmospheric vapors, gases, or particulates;
- The investigational activities will involve a high potential for splash, immersion, or exposure to unexpected vapors, gases, or particulates of materials that are known to be harmful to skin or capable of being absorbed through the skin; or
- The contaminants present at a site have not been determined, and conditions requiring Level A protection have not been ruled out.

The following is a list of equipment that must be worn to attain Level A protection:

- Open circuit, pressure-demand self-contained breathing apparatus (SCBA);
- Totally encapsulated suit;
- Gloves, inner (surgical type);
- Gloves, outer (chemical protective);

- Boots, chemical-protective, steel-toe; and
- Communications (optional).

Level A protection will not be required during the proposed investigational activities at the Eastern Landfill site.

5.2.2 Level B

Level B protection should be used when:

- The contaminants present at a site have been identified and are known to require a high level of respiratory protection, but less skin protection;
- The atmosphere is known to contain less than 19.5 percent oxygen; or
- The presence of unknown vapors or gases have been identified through the use of an organic vapor detection instrument, but the vapors and gases are not suspected of containing a high level of chemicals that are known to be harmful to skin or capable of being absorbed through the skin.

The following is a list of equipment that must be worn to attain Level B protection:

- Supplied-air respirator, either positive pressure-demand SCBA or positive pressure-demand airline respirator with an escape bottle for immediately dangerous to life and health (IDLH) atmospheres;
- Hooded chemical-resistant one-piece suit with double bonded seams (e.g., Tyvek/Saranex);
- Chemical-resistant outer gloves;
- Chemical-resistant inner gloves;
- Chemical-resistant boots with steel toe and shank; and
- Chemical-resistant, disposable, outer boot covers.

Optional equipment that may be worn includes long cotton underwear and a face shield.

Level B protection will not be required during the proposed investigational activities at the Eastern Landfill site.

5.2.3 Level C

Level C protection should be used when:

- The contaminants present at a site are known and will not adversely affect or be absorbed through any exposed skin;
- The air contaminants identified at a site are present at concentrations that can be removed by an air-purifying respirator; or
- All criteria for the use of air-purifying respirators are met.

The following is a list of equipment that must be worn to attain Level C protection:

- Air-purifying respirator with an organic vapor/acid gas/high efficiency particulate filter cartridge;
- Chemical-resistant one or two-piece suit with double bonded seams (e.g., Tyvek/Saranex);
- Chemical-resistant outer gloves;
- Chemical-resistant inner gloves;
- Chemical-resistant boots with steel toe and shank; and
- Chemical-resistant, disposable, outer boot covers.

Optional equipment that may be worn includes long cotton underwear and a face shield.

Level C protection will not be required during the proposed investigational activities at the Eastern Landfill site.

5.2.4 Level D

Level D protection should be used when:

- The atmosphere contains no known hazard; or
- The likelihood is minimal for splashes, immersion, or inhalation of or contact with hazardous levels of any chemicals.

The following is a list of equipment that must be worn to attain Level D protection:

- Coveralls (e.g., Tyvek);
- Boots with steel toe and shank;
- Hard hat, if overhead hazard exists;
- Safety glasses;
- Hearing protection, as needed.

Modified Level D equipment includes the following, as appropriate:

- Standard work clothing (no personnel protective clothing required);
- Boots with steel toe and shank;
- Chemical-resistant, disposable, outer boot covers;
- Chemical-resistant outer gloves;
- Chemical-resistant inner gloves;
- Hard hat; and
- Safety glasses.

5.3 Anticipated PPE Usage

Table 5.3-1 addresses specific PPE requirements for field activities at the Eastern Landfill site. As mentioned previously, at a minimum, TtNUS personnel and any subcontractors will be required to wear steel-toe work shoes or boots, coveralls, hard hats (plastic only), safety glasses with side shields, and hearing protection (when needed).

5.4 Reassessment of Protection Level

Throughout the course of field work, PPE requirements may be modified (upgraded or downgraded) due to environmental concerns (e.g., dusty conditions, reaching and exceeding monitoring instrument action levels). However, monitoring to determine action levels will not be necessary in all cases (i.e., dust and noise). For these situations, engineering controls like spraying of water as necessary to control windblown dust in the work area will be applied. In addition, hearing protection should be used to protect against excessive noise if workers standing within 2 feet of each other need to raise their voices to communicate. No alteration of PPE requirements or application of engineering controls shall occur without the approval of the On-site Supervisor (OS).

Table 5.4-1 is a list of action levels for upgrading the level of PPE or site withdrawal. Sustained readings (one minute or longer) in the breathing zone will require evacuation to an unaffected area. Work may continue only if background levels are regained. Otherwise, the Senior Certified Industrial Hygienist (CIH) must be contacted for further guidance. Changes or modifications may be made by the OS with the concurrence of the TtNUS Senior CIH.

5.5 Respiratory Protection

Any person who will be required to wear a respirator on-site will be trained in the proper use of the respirators and their limitations, as discussed in Section 4.1 (Training Requirements) of this SSHP. The training will allow users to handle their respirator and to become familiar with all components, its limitations and capabilities, procedures for its maintenance and storage, selection of the proper size for a proper/comfortable fit, wear it in normal air to become used to the breathing resistance, and effective use of the respirator in emergency situations. In addition, users will be capable of conducting a critical component visual inspection and seals check, and self administering a positive and negative pressure fit check. Furthermore, all users will be required to pass an appropriate qualitative or quantitative fit test using an OSHA-accepted protocol.

Table 5.3-1

**PPE ANTICIPATED FOR EACH SITE TASK/OPERATION
Groundwater Investigation - Eastern Landfill
Fort Wingate Depot Activity, Gallup, New Mexico**

Task/Operation	PPE Anticipated
Mobilization, Demobilization	Steel-toe, hard sole work boots.
Drilling	Hard hats, safety glasses, steel-toe, hard sole work boots, and surgical-style gloves. Respirators as per Table 5.4-1.
Subsurface Soil and Groundwater Sampling	Hard hats, safety glasses, steel-toe, hard sole, work boots, and surgical-style gloves. Respirators as per Table 5.4-1.
Waste Handling	Hard hats, safety glasses, steel-toe, hard sole work boots, surgical-style inner gloves, and nitrile outer gloves. Respirators as per Table 5.4-1.
Decontamination of Personnel and Equipment	Hard hats, safety glasses, steel-toe, hard sole work boots, and surgical-style gloves. Respirators as per Table 5.4-1.

Table 5.4-1

**ACTION LEVELS
Groundwater Investigation - Eastern Landfill
Fort Wingate Depot Activity, Gallup, New Mexico**

Constituent	Action Levels
Organic Vapors	<ul style="list-style-type: none"> Sustained PID readings above established background levels in worker breathing zones - Suspend site activities and retreat to an unaffected area. If readings do not subside, withdraw from site and notify Senior CIH for re-evaluation of potential hazards.
Flammable Gases	<ul style="list-style-type: none"> ≥10% LEL - Limit all activities in the area to those that will not generate sparks; wear non-sparking gear and use non-sparking tools. ≥20% LEL - Cease all activities and retreat to a safe atmosphere.
Oxygen	<ul style="list-style-type: none"> <19.5% LEL/O₂ - Use supplied-air respiratory protection. >23.5% LEL/O₂ - Cease all activities and retreat to a safe atmosphere.

Notes:

- (1) Action Levels specified are for sustained readings (one minute or longer).
- (2) Background levels are to be measured and documented at least at the beginning of each day, and more often if necessary (i.e., initiating work at a different area or if ambient weather conditions change).

Only those personnel for whom it has been determined are physically able to perform the work and use the equipment will be assigned to tasks requiring use of respirators. This determination will be documented in writing and provided to the Site Safety Officer (SSO) as described in Section 4.2 (Medical Surveillance Program) of this SSHP.

Respirators will not be worn when conditions prevent a good full seal (i.e., growth of beard, sideburns, bangs, a skull cap or other clothing that projects under the face piece, or temple pieces on glasses). To assure proper protection, the respirator will be thoroughly inspected before each use, and a positive and negative fit check will be performed each time the respirator is donned.

Respirators will be assigned to individuals for their exclusive use during the project. Respirators will be regularly cleaned and disinfected. At a minimum, respirators will be cleaned after each day's use or more often if necessary. Upon completion of the work task, the respirators will be disassembled, inspected and thoroughly cleaned and disinfected. Worn or deteriorated parts will be replaced, and the respirators will be stored in a clean and sanitary location in individual plastic bags.

Selection of the respirator is the responsibility of the TtNUS Senior CIH. Selection will be based on the physical, chemical and physiological properties of the air contaminants and the concentration likely to be encountered. The quality of fit and the nature of the work being performed also will affect the choice of respirators. The capability of the respirators chosen is determined from appropriate governmental approvals, manufacturer's test, and TtNUS experience with respirators.

6.0 MONITORING PROGRAM

6.1 Real Time Monitoring

To monitor the health and safety of TtNUS employees and TtNUS subcontractors, real-time monitoring instruments will be used to aid in detecting airborne chemical hazards. Real-time monitoring instruments provide information on the quality of air in the work zone. During specific task assignments, instruments that may be used include a lower explosive limit and oxygen (LEL/O₂) meter and a photoionization detector (PID). These instruments will be used during various activities to detect the presence of hazardous substances in air.

6.1.1 Lower Explosive Limit and Oxygen Meter (LEL/O₂ Meter)

A combination LEL/O₂ meter shall be used continuously during activities such as well drilling to monitor for potentially explosive atmospheres and oxygen-deficient atmospheres. MSA 260, MSA 241 model, or equivalent, instruments will be used for this purpose.

The LEL portion of this instrument determines the level of organic vapors and gases present in the atmosphere as a percentage of the lower explosive limit of the calibration gas. The indicator measures from 0 to 100 percent of the LEL of the selected calibration gas, with 100 percent being the LEL itself, or a potentially explosive atmosphere.

This instrument shall be factory calibrated to n-hexane as frequently as recommended by the manufacturer. Manufacturer's maintenance and daily field check procedures are to be followed. Daily operational checks for the LEL/O₂ meter are typically performed using a butane lighter, noting instrument readouts and audible alarm functions.

Due to the fact that all LEL readings are a relative ratio of response to the calibration gas, TtNUS has adopted the National Institute for Occupational Safety and Health (NIOSH) criteria for action levels when interpreting LEL readings, which are as follows:

- $\geq 10\%$ LEL - Limit all activities in the area to those that will not generate sparks; wear non-sparking gear and use non-sparking tools.
- $\geq 20\%$ LEL - Cease all activities and retreat to a safe atmosphere.

The oxygen detector in the LEL/O₂ meter measures the atmospheric oxygen concentration in percentages. In accordance with OSHA regulations, oxygen concentrations less than 19.5 percent require the use of supplied-air respiratory protection. Concentrations of oxygen equal to or in excess of 23.5 percent represent oxygen-enriched atmospheres, which can increase the potential for fires and/or explosions. If this level is reached, all site activities shall cease and personnel shall retreat to a safe atmosphere in accordance with the site emergency plan.

6.1.2 Photoionization Detector (PID)

A PID may be needed during planned field activities at this site. The PID will be used to monitor source areas (boreholes, samples, etc.) and worker breathing zones to evaluate airborne concentrations of potential site contaminants. They will be used continuously during all

intrusive and sample collection activities. Any elevated readings at a source area will require worker breathing zones to be screened. Sustained elevated readings in worker breathing zones will require site activities to be suspended and site personnel will be instructed to report to an unaffected area until readings subside.

The PID instrument will be equipped with a 10.6 eV probe (or equivalent) in order to respond to known chemicals present while providing a wide range of detection for organic (and some inorganic) gases and vapors in air.

One major limitation of this type of instrument is that, like all other monitoring instruments, it is not sensitive to all substances that can become airborne. Also, it cannot be used to identify the specific unknown substance(s) that it is detecting. It provides a real-time response to certain substances in parts per million (ppm). In this respect, it basically serves as an overall indicator of a potential problem. The PID has a response range of approximately 0.1 ppm to 2,000 ppm, depending on the span setting and the chemical nature of the molecular species present within the sensor changer. As previously stated, this instrument is sensitive to a wide range of organic substances and some inorganic compounds. Commercially available PIDs do not detect methane or hydrogen cyanide, and are usually sensitive to humid environments.

Recognizing the properties of the known site contaminants and the limitations of the PID, it is important to be aware that this device will not respond (or won't respond predictably) to most of the contaminants that have been previously detected at the Eastern Landfill. Most of these substances, not detectable with a PID, would only present a potential exposure threat in a solid particulate form when they become airborne. This threat can be prevented by using effective dust avoidance and dust suppression methods.

Through use, the instrument demonstrates a tendency to "drift," or lose its sensitivity. As a result, it is to be field calibrated with manufacturer's calibration gas daily. If field calibration methods fail, the instrument should be returned to the designated equipment manager for maintenance and primary or internal calibration.

6.2 Documentation of Instrument Calibration and Use

A record of calibrations and usage of real-time monitoring instrumentation will be made on the logs provided for that purpose in Appendix E.

6.3 Monitoring

Monitoring will be performed whenever required by an OSHA chemical-specific standard found in 29 CFR 1910.1001-.1048 or when deemed necessary to protect the health of the field team members. All monitoring will be performed in accordance with accepted sampling and analytical procedures.

6.4 Initial Survey

In order to establish background levels at the site, the SSO will conduct general site monitoring prior to initiation of any investigational activities.

7.0 SITE CONTROL

The objective of site control is to prevent or reduce the migration of potentially contaminated materials and to prevent the entry of unauthorized personnel into the work area. A log will be used to keep track of all personnel entering active work zones.

7.1 Site Access

Access to FWDA is provided through the main entrance gate of the installation (on U.S. Route 66) located in the Administration Area (north-central area of the installation). Access is controlled by the on-site caretaker located in the Administration Area in Building 34. The main entrance gate is open from 7:00 A.M. to 5:00 P.M. during weekdays (Monday through Friday) and is closed and locked at all other times.

Entry from the Administration Area to the limited access areas of the installation, which include the area under study (Eastern Landfill), is through a locked gate south of the main entrance (on Navajo Boulevard).

7.2 Work Zones

Three work zones will be identified at the work site--the Exclusion Zone, the Contamination Reduction Zone, and the Support Zone.

The On-site Supervisor (OS) will determine the specific location of each zone while mobilization activities take place. As information about the location of contaminants becomes available from the soil and groundwater sampling, the locations of each zone may change. This procedure will allow personnel to inspect the area and to determine the optimum location of these zones. These specific locations will be communicated to other field personnel prior to the commencement of new activities at the site.

Decision-making criteria for each site set-up and subsequent control measures will consider the following:

- Physical and topographic features of the site;
- Weather conditions;
- Potential for explosion and flying debris;
- Physical, chemical, toxicological, and other characteristics of the substances present;
- Cleanup activities required;
- Potential for fire;
- Area needed to conduct operations; and
- Traffic patterns and client requests.

7.2.1 Exclusion Zone

The Exclusion Zone is the innermost area of the three areas and is considered contaminated. The Exclusion Zone will have a diameter of approximately 30 feet centered at each borehole. Within

this area, levels of protection prescribed in this SSHP will be used by all personnel. The boundary between the Exclusion and Contamination Reduction Zones is the hot line, which will be established at a safe distance from the potentially contaminated area. The location of the hot line will be determined by on-site personnel. On-site personnel will use taping attached to stakes to establish the boundary of the exclusion zone and to control pedestrian traffic and entrance of unauthorized personnel.

7.2.2 Contamination Reduction Zone

The area between the Exclusion and Support Zones is the Contamination Reduction Zone. The purpose of this area is to prevent the transfer of contaminants that may have been picked up by personnel or equipment leaving the Exclusion Zone. For this project, the Contamination Reduction Zone will include the decontamination pad.

The level of protection worn in the Contamination Reduction Zone typically is the same level as the level of protection worn in the Exclusion Zone. However, at the SSO's discretion, personnel working in the Contamination Reduction Zone may be allowed to wear one level of protection below that which is worn in the Exclusion Zone.

Again, on-site personnel will use taping attached to stakes to establish the boundary of the contamination reduction zone (decontamination area) and to control pedestrian traffic and entrance of unauthorized personnel.

7.2.3 Support Zone

The Support Zone is the outermost region and is a controlled, uncontaminated area outside the Contamination Reduction Zone. The Support Zone will include the field office, first aid area, and other support facilities. Support facilities will be located upwind from the Exclusion and Contamination Reduction Zones and may change locations throughout the duration of the investigational activities, depending on the direction of the wind.

7.3 Visitors

The SSO will advise all visitors of the hazards associated with the site, including the types of potential contaminants. Any visitor who will be entering the Exclusion Zone will be required to read and to adhere to this site-specific SSHP. The OS will be responsible for ensuring that all visitors entering the Exclusion Zone are escorted at all times. Visitors entering the Exclusion Zone or Contamination Reduction Zone will be expected to comply with all OSHA requirements, including medical monitoring, training and respiratory protection. Visitors will be required to provide verification that they meet all OSHA requirements. In addition, the names of all visitors will be recorded in the field logbook. No exceptions will be made for any visitors to the site.

In addition, visitors will be allowed in the Contamination Reduction Zone at the discretion of the OS, based on real-time instrument monitoring data.

8.0 SAFETY AND EMERGENCY PROCEDURES

8.1 Standard Operating Procedures

The following sections describe standard operating health and safety procedures for this project.

8.1.1 Health and Safety Orientation Program

Identification of the On-site Supervisor (OS) and the Site Safety Officer (SSO)

The identification of the OS and SSO (the OS also may serve as SSO) shall be logged in the field log book prior to beginning the field activities. If the SSO must leave the site, the OS shall designate another TtNUS employee to assume responsibility for health and safety; the identity of the designated individual shall be recorded in the field log book, and all site personnel shall be informed.

Medical Data Sheets

Prior to beginning field work, all on-site personnel must complete the Medical Data Sheet (Appendix D). The completed forms shall be kept at the site with the site-specific SSHP. When medical assistance is needed, the form for the individual requiring treatment shall be delivered to the attending physician.

Health and Safety Plan Review

Prior to beginning field work, the SSO shall review this site-specific SSHP with the TtNUS field team and subcontractor field personnel. All personnel shall sign the acknowledgment on the Pre-Activities Training Session Form (Appendix C) to document the SSHP orientation. During the SSHP review, the OS and SSO will discuss specific tasks to be performed and the objectives of the project with TtNUS and any subcontractor personnel.

Posting the Health and Safety Plan and the OSHA Poster

During the field activities, this SSHP including the completed Medical Data Sheets shall be kept at the site in a location readily accessible to all personnel. As part of the orientation, all personnel shall be shown the location at which the SSHP will be kept. In addition, an 11" x 17" OSHA poster (Figure 8.1.1-1) shall be posted at a visible location as required by law.

Figure 8.1.1-1

You Have a Right to a Safe and Healthful Workplace. IT'S THE LAW!

- You have the right to notify your employer or OSHA about workplace hazards. You may ask OSHA to keep your name confidential.
- You have the right to request an OSHA inspection if you believe that there are unsafe and unhealthful conditions in your workplace. You or your representative may participate in the inspection.
- You can file a complaint with OSHA within 30 days of discrimination by your employer for making safety and health complaints or for exercising your rights under the *OSH Act*.
- You have a right to see OSHA citations issued to your employer. Your employer must post the citations at or near the place of the alleged violation.
- Your employer must correct workplace hazards by the date indicated on the citation and must certify that these hazards have been reduced or eliminated.
- You have the right to copies of your medical records or records of your exposure to toxic and harmful substances or conditions.
- Your employer must post this notice in your workplace.



The *Occupational Safety and Health Act of 1970 (OSH Act)*, P.L. 91-596, assures safe and healthful working conditions for working men and women throughout the Nation. The Occupational Safety and Health Administration, in the U.S. Department of Labor, has the primary responsibility for administering the *OSH Act*. The rights listed here may vary depending on the particular circumstances. To file a complaint, report an emergency, or seek OSHA advice, assistance, or products, call 1-800-321-OSHA or your nearest OSHA office: • Atlanta (404) 562-2300 • Boston (617) 565-9860 • Chicago (312) 353-2220 • Dallas (214) 767-4731 • Denver (303) 844-1600 • Kansas City (816) 426-5861 • New York (212) 337-2378 • Philadelphia (215) 861-4900 • San Francisco (415) 975-4310 • Seattle (206) 553-5930. Teletypewriter (TTY) number is 1-877-889-5627. To file a complaint online or obtain more information on OSHA federal and state programs, visit OSHA's website at www.osha.gov. If your workplace is in a state operating under an OSHA-approved plan, your employer must post the required state equivalent of this poster.

1-800-321-OSHA www.osha.gov

8.1.2 Procedures (General)

Chemical Hazards

Workers at this project site may encounter varying levels of exposure to the previously mentioned chemicals. The use of monitoring equipment will be required during the investigational activities to screen the breathing zone of the work area. Additionally, an explosimeter (LEL/O₂ meter) will be required to monitor potential fire/explosion hazards during the activities. Calibration of instrumentation will occur daily prior to the commencement of field activities, with the calibration results documented in the field log book.

Appendix F contains Material Safety Data Sheets (MSDS) for the known materials that will be brought and used on site during performance of activities associated with this project (i.e., decontamination activities, etc). The MSDS provide sufficient information regarding health, flammability, and reactivity hazards associated with handling these materials. Appropriate MSDS must be reviewed by the workers prior to commencing work. A complete and accurate inventory of chemicals brought and used on site will be maintained throughout the duration of the field activities. Appendix F will be supplemented with additional MSDS as required during performance of field activities.

In addition to the PPE mentioned in Section 5, other basic PPE used for dermal protection from chemical hazards typically will include chemical splash goggles, latex gloves, and impervious coveralls when handling potentially contaminated sludge or water. Any unnecessary contact with potentially contaminated substances must be avoided. This includes contact with potentially contaminated surfaces and/or equipment. Monitoring instruments and other hand-held items are not to be placed on potentially contaminated surfaces.

Site personnel must notify the SSO of all occurrences or suspected occurrences of exposure for further direction.

Biological Hazards

The FWDA is located in the desert southwest and presents several hazards associated with indigenous biological species.

Snakebites - The area may be inhabited by snakes, particularly rattlesnakes (which may be found in burrows, heavy brush, and under rocks, logs or debris). Snake chaps will be required in areas that may be inhabited by snakes. Seek medical attention for snakebite immediately. Procedures for snakebite are included in Appendix G. NEVER reach under or move anything by hand or foot without first checking for snakes.

Rodents - This area may be inhabited by rodents. Seek medical attention for rodent bites immediately.

Scorpions and Spiders - The area may be inhabited by scorpions and spiders indigenous to the area (which live under rocks and debris). Seek medical attention for scorpion or spider stings. **Always** shake out boots and clothing prior to donning.

Fire Ants - The area may be inhabited by fire ants. The fire ant bite is very painful compared to bites of other ants. The bites are characterized by redness, stinging, burning, itching and can form pus pockets. Persons with a history of previous exposure or allergic reactions may be more susceptible and should avoid contact. Avoid walking, sitting or standing upon or in the area of mounds. Multiple bites may require medical attention.

Poisonous Plants (i.e., poison ivy, poison oak, etc.) - Poisonous plants may be present at this site. Contact with these plants may result in a rash, which may be extensive depending on the amount of contact and the severity of each individual's allergic reaction. Prior to initiation of activities at the site, survey the area to determine the presence of poisonous plants. Avoid contact with all poisonous plants, if possible. If contact should occur, wash areas coming in contact with the leaves and stems of these plants with soap and water as soon as possible after exposure.

Fire Hazards

Fuels and chemicals present at this site are flammable and potentially explosive. Spark-producing devices, such as lighters, and smoking will not be permitted in or near the area at which flammable and potentially explosive fuels and chemicals will be used. Dry chemical, foam, or carbon dioxide fire extinguishers must be readily available during all work activities. Every precaution will be made to keep waste product and vapors from ignition sources.

Manual Lifting

During any manual lifting or handling tasks, personnel should lift with the load supported with their legs and not with their backs. To lift or handle heavy loads, sufficient personnel must be used to avoid back strain.

Noise

This project will involve the use of machinery that will generate some noise as a result of their operations (i.e., drill rig). In addition, by regulation, certain machines must have "back up" alarms that are, out of necessity, loud so that they may be heard. Hearing protection will be worn during drilling operations. Noise levels will be measured to ensure compliance with OSHA requirements, and to determine the need for hearing protection.

Inclement Weather Conditions

Weather hazards in the desert southwest are associated mainly with elevated temperatures and violent weather changes such as thunderstorms and flooding associated with rainstorm events. Work cessation due to electrical storms, extremely high ambient heat loads, potential for flash floods or other such adverse weather conditions shall be determined by the on-site project personnel.

When required activities take place during hot conditions, workers will be instructed to increase normal fluid intake by drinking approximately 16 ounces of water or other dilute fluids containing an electrolyte solution before beginning work and by maintaining adequate consumption of water throughout the work period. Efforts will be made to schedule work in the

early morning or evening, or even at night, during extremely hot weather. Rotating shifts may be utilized if personnel are required to wear impervious clothing.

Thunderstorms pose hazards both through lightning and through flash flooding in and around waterways (i.e., arroyos). If storms with associated lightning are in the area, measures should be taken to avoid locations where lightning strikes are likely (i.e., near drill rigs, under trees, open areas). Likewise, caution should be exercised because flash flooding may topple equipment or vehicles and sweep them with the current.

Personnel Decontamination

Upon leaving the designated Exclusion Zone, hands and face must be thoroughly washed as soon as possible following personnel decontamination. Any protective outer clothing is to be removed and left at a designated area prior to entering the Support Zone.

Emergency Stop Buttons

TtNUS and subcontractor personnel must be shown the locations and operation of emergency stop buttons and switches on the drill rig and other equipment. Emergency stop buttons must be tested daily or in accordance with the manufacturer's recommendations.

Drill Rigs

The driller and helper shall not handle swivels or flights on the drill stem while the rig is operating. A standby person must be available to activate the emergency stop button or switch at all times during drilling operations. Appropriate blow-out prevention procedures shall also be followed. The driller must never leave the controls while tools are rotating. Only equipment that has been approved by the manufacturer may be used in conjunction with site equipment. Pins that protrude excessively from augers will not be allowed. No person shall climb the drill mast while tools are rotating. Hands and feet shall not be used to clear cuttings away from the hole and rotating equipment. A remote sampling device must be used if the tools are rotating or are capable of rotating.

Fall Protection

Drillers shall not climb the boom of a drill rig unless the appropriate fall protection is used. Fall protection shall include American National Standards Institute (ANSI) approved safety belts/harnesses and lanyards. The lanyard shall be affixed overhead and reattached as the worker progresses up the boom.

Loose Clothing

Drillers and helpers shall secure all loose clothing to prevent contact with moving machinery.

Explosion Level Monitoring

Explosimeter monitoring at the openings of wells shall be initiated at the beginning of drilling or sample collection operations and shall continue until repeated readings indicate that the potential for fire/explosion has been ruled out.

Man watches

Man watches shall be maintained during all confined space entry activities (see Section 8.7). For this scope of work, no confined space operations are anticipated. If this should change, work will be suspended until the Senior CIH is contacted and appropriate measures can be taken in accordance with OSHA 29 CFR 1910.146.

Compressed Gases

All compressed gas cylinders must be stored and used in an upright position, properly secured and protected from damage, and segregated and labeled as to their contents and identifying them as empty or full.

Daily Log Book

The SSO must make entries into the Daily Log Book including: weather conditions, site personnel, new arrivals, air monitoring data, indications or suspicion of exposure, deviations from the SSHP, and general health and safety problems and corrective measures.

Buddy System

The "Buddy System" will be employed for all site activities as well as any off-site sampling activities.

Hot Work

Hot work indicates any welding or cutting jobs incidental to this project. Hot work procedures and permit are located in Appendix H.

General Safety Rules

- All work will be planned and supervised to prevent injuries.
- Equipment operators will be thoroughly trained on the safe operation of their equipment.
- All injuries and accidents will be reported to the SSO for reporting to the CO.
- Supervisors will ensure that employees observe and obey all safety rules and regulations required for the safe conduct of work.
- An employee reporting for work who, in the opinion of his/her supervisor, is unable to perform the assigned duties in a safe and reasonable manner will not be allowed on the job.
- Alcoholic beverages and non-prescription drugs are not allowed on-site.
- No employee will be assigned a task without first having been instructed on the proper methods of carrying out the task.
- There will be no horseplay or practical joking on-site.
- All posted safety signs will be obeyed.
- Smoking is not allowed on the job site except in designated areas.

Site Appearance

- An adequate passageway for firefighting vehicles will be maintained at entrances and exits to the job site. Space around emergency vehicles must be kept clear.
- Trash and discarded materials will be staged in an orderly manner.

Equipment

- Employees shall not handle or attempt to operate power tools or motorized vehicles without first being properly trained.
- Materials, tools, or other objects shall not be thrown, tossed, or dropped. **Always hand or lower items as needed.**
- Apparatus, tools, equipment, and machinery shall not be repaired while in operation. Appropriate lock out/tag out procedures will be observed, in accordance with OSHA 29 CFR 1910.147.
- Prior to digging or drilling, verification of buried utilities shall be performed.
- All equipment which is defective or in need of service shall be reported and tagged.

8.2 Medical Emergencies

The OS will serve as the emergency coordinator for medical emergencies. In accordance with EM 385-1-1, at least two people trained in first aid and CPR will be on-site at all times. The OS will be notified immediately if a team member is injured. If needed, first aid (and CPR, if necessary) will be administered. The OS will make the decision to notify emergency responders (i.e., medical facilities and personnel, ambulance) depending on the severity of the injury.

In addition, the following safety concerns will be addressed:

- First aid kits, at a ratio of one per every 10 field team members, will be located in the vehicle supporting the activity (i.e., Sampling Team, Drilling Teams). At a minimum, these first aid kits will be 16-unit first aid kits.
- A portable 15-minute emergency eye-wash station will be provided within the Support Zone. An identification marker will be provided to readily denote the location of the eyewash station.
- Emergency telephone numbers and reporting instructions for ambulance, hospital, poison control center, fire and police will be conspicuously posted in the Support Zone (see Appendix D).

8.2.1 Accident Reporting

All accidents that occur incidentally to this project must be reported to the OS and to the COE Safety Office in accordance with EM 385-1-1. A Supervisor's Accident Form (Appendix J) must be completed by the SSO and filed with the TtNUS Senior CIH. In addition, all injuries or illnesses that require attention beyond simple first aid will be reported to the CO as soon as possible, but no later than 24 hours after the accident. The SSO will complete and submit the Accident Report (Engineer Form 3394) to the CO in accordance with EM 385-1-1 within two working days of the accident. In addition, the SSO will complete the Initial Notification of

Accident form and fax it to the COE Safety Office at 817-978-3396 within 24 hours. All accidents or injuries also will be logged on the OSHA 200 form located in Appendix J, according to the criteria listed on the form. A copy of Engineer Form 3394 and the Initial Notification of Accident form also is included in Appendix J. The required State Workers Compensation form, which will be obtained by the SSO from the State Worker's Compensation Office, also will be completed and submitted. All completed forms will be copied to the TtNUS Senior CIH, project manager, and to the project files.

8.2.2 Hospital Route

Figure 8.2.2-1 shows the location of the nearest hospital in relation to the site. Specific directions from the site to the hospital are included in Appendix I. The figure and directions will be conspicuously posted in the Support Zone. In addition, the SSO will drive the route prior to initiation of investigational field activities.

8.3 Temperature Extremes

8.3.1 Heat Stress Monitoring

The heat stress monitoring program will be managed on-site by the SSO. Table 8.3.1-1 provides a summary of the types of heat-related illnesses that are possible when working in hot temperature extremes. Monitoring will increase with temperature extremes.

Table 8.3.1-1

SUMMARY OF HEAT RELATED ILLNESSES

Heat Related Illness	Signs and Symptoms	Emergency Care
Heat Rash	Red skin rash and reduced sweating	Keep the skin clean, change all clothing daily, cover affected areas with powder containing corn starch or regular corn starch
Heat Cramps	Severe muscle cramps, exhaustion, sometimes with dizziness or periods of faintness	Move the patient to a nearby cool place; give the patient half-strength electrolyte fluids; if cramps persist, or if more serious signs develop, seek medical attention
Heat Exhaustion	Rapid breathing, weak pulse, cold and clammy skin, heavy perspiration, total body weakness, dizziness that sometimes leads to unconsciousness	Move the patient to a nearby cool place; keep the patient at rest, give the patient half-strength electrolyte fluids, treat for shock, seek medical attention DO NOT TRY TO ADMINISTER FLUIDS TO AN UNCONSCIOUS PATIENT
Heat Stroke	Deep breaths, then shallow breathing; rapid, strong pulse, then rapid weak pulse; dry, hot skin; dilated pupils, loss of consciousness (possible coma); seizures or muscular twitching may be seen	Cool the patient rapidly; treat for shock; if cold packs or ice bags are available, wrap them and place one bag or pack under each armpit, behind each knee, one in the groin, one on each wrist and ankle, and one on each side of the neck; seek medical attention as rapidly as possible; monitor the patient's vital signs constantly DO NOT ADMINISTER FLUIDS OF ANY KIND

Figure 8.2.2-1

Route to Hospital Gallup, NM

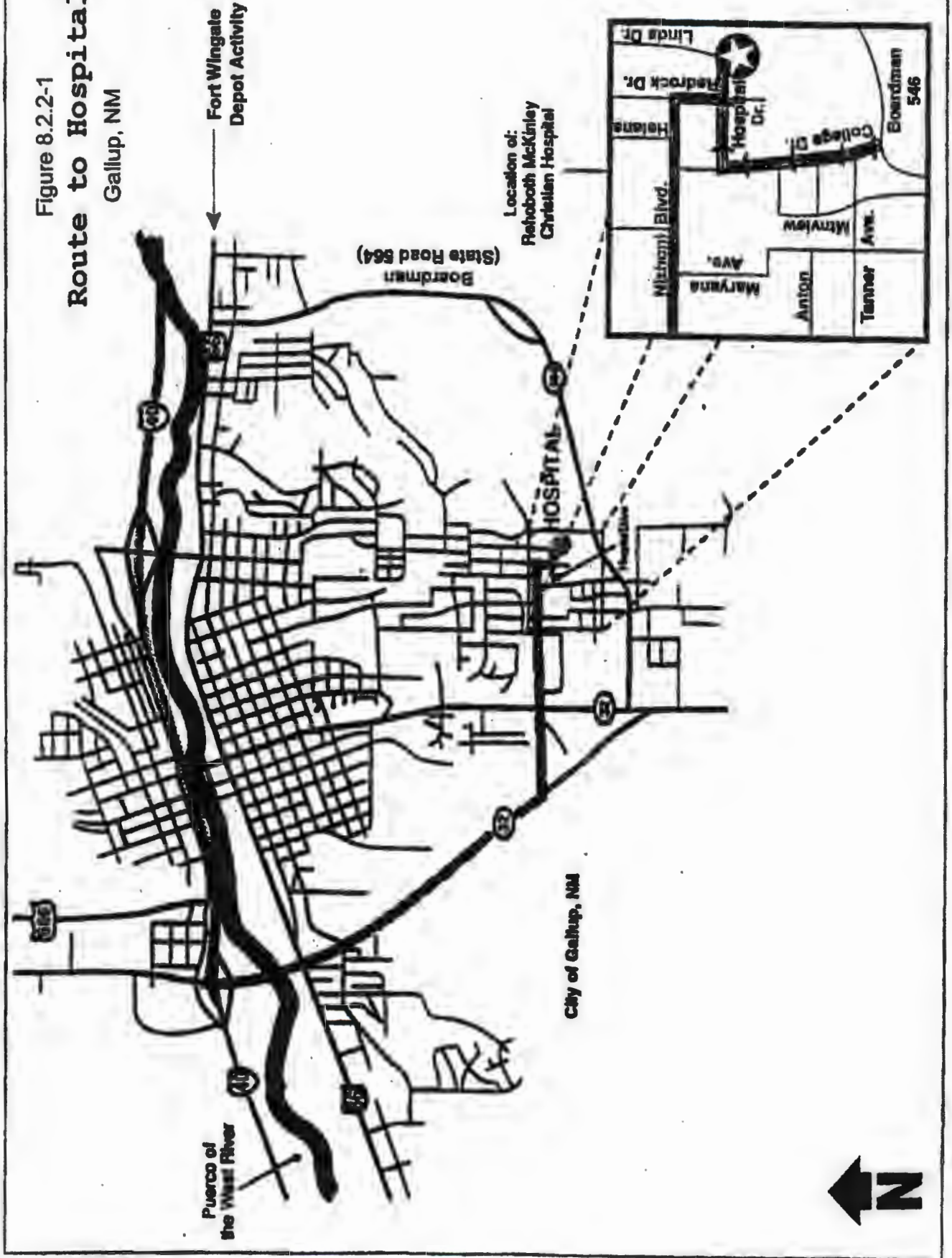


Table 8.3.1-2

**GUIDELINES FOR PREVENTION OF HEAT STRESS
THROUGH FLUID INTAKE**

<p>1. The sense of thirst is not an adequate regulator of water replacement needs during heat exposure. Therefore, fluids must be replaced at prescribed intervals. Water or other flavored drinks will be provided:</p> <ul style="list-style-type: none">a. Before work begins, drink two eight-ounce glasses of fluid.b. During each rest period, drink at least two eight-ounce glasses of fluid.
<p>2. An adequate supply of potable water or electrolyte solution and drinking cups will be readily available, such as in the support zone, to provide water during the rest periods. Recommended drinks are:</p> <ul style="list-style-type: none">a. Plain water served coolb. Juice diluted 3:1 with water the main constituentc. Electrolyte solutions, such as Gatorade, diluted with water, with water being the main constituent.
<p>3. Adding salt to water is not recommended. Do not use salt tablets! Also avoid the following:</p> <ul style="list-style-type: none">a. Alcoholic beveragesb. Concentrated juicesc. Water with salt added.

Of particular importance is heat stress resulting when protective clothing decreases natural body ventilation. One or more of the following will help reduce heat stress:

- Drinking water and/or electrolyte solution will be made available to the workers in such a way that they are stimulated to frequently drink small amounts (i.e., two or more cups at every break period). The fluid will be kept reasonably cool (55-60°F) and shall be placed close to the workplace so that the worker can reach it without abandoning the work area. However, where contaminants that pose an ingestion toxicity hazard are known/suspected to exist, workers will not be permitted to consume any fluids without first being decontaminated and going to an uncontaminated area. Table 8.3.1-2 represents guidelines for prevention of heat stress through fluid intake.
- Light-weight clothing acts as a wick to help absorb moisture and to protect the skin from direct contact with heat-absorbing protective clothing.
- When necessary/applicable, install mobile showers and/or hose-down facilities to reduce body temperature and cool protective clothing.
- In extremely hot weather, conduct non-emergency response operations in the early morning or evening.
- In hot weather, rotate shifts or workers wearing impervious clothing.

- Good hygienic standards must be maintained by frequent changes of clothing and daily showering. Clothing should be permitted to dry during rest periods. Persons who notice skin problems should immediately consult medical personnel.
- Acclimatization to heat involves a series of physiological and psychological adjustments that occur in an individual during his first week of exposure to hot environmental conditions. The work-rest regimen in this procedure is valid for acclimated workers who are physically fit. Extra caution must be employed when unacclimated or physically unfit workers must be exposed to heat stress conditions.
- Provide a shaded rest area.

Heat Stress Monitoring

In the event that heat stress/heat exhaustion is observed during work activities, the on-site TtNUS representative determines that the type of work may require careful monitoring, or environmental conditions dictate careful monitoring (e.g., respirators, plastic Types, and heavy workload), the following procedures could be implemented.

Work-Rest Regimen

In order to establish a proper work-rest regimen, the Wet Bulb Globe Temperature (WBGT) may be used in conjunction with the workload required to perform each task. Light work examples include sitting or standing to control machines or performing light hand or arm work. Moderate work includes walking about with moderate lifting and pushing or use of coated coveralls and respirators. Heavy work corresponds to pick and shovel-type work or the use of full body protective clothing. It must be assumed that any activity involving this type of clothing will be considered heavy work.

The work-rest regimen selected using the WBGT procedure will be used as a baseline. Work cycles and rest periods listed in Table 8.3.1-3 will be followed based on heat stress monitoring.

Table 8.3.1-3

**HEAT STRESS PREVENTION WORK-REST REGIMEN GUIDELINES
(Values are given in °F WBGT)**

Work-Rest Regimen	Work Load		
	Light	Moderate	Heavy
Continuous Work	86.0	80.0	77.0
75% Work - 25% Rest Each Hour	87.0	82.0	78.6
50% Work - 50% Rest Each Hour	89.0	85.0	82.0
25% Work - 75% Rest Each Hour	90.0	88.0	86.0

Biological Monitoring

One of the following procedures shall be followed when the work-place temperature is 70°F or above, and/or upon the SSO's discretion, in order to make sure the work/rest regime is providing proper personal protection and to document exposure.

- Heart rate (HR) shall be measured by the pulse for 30 seconds as early as possible in the resting period. The HR at the beginning of the rest period should not exceed 110 beats/min. If the HR is higher, the next work period should be shortened by 10 minutes (or 33 percent), while the length of rest stays the same. If the pulse rate is 100 beats/min at the beginning of the next rest period, the following work cycle should be shortened by 33 percent.
- Body temperature shall be measured orally with a clinical thermometer as early as possible in the resting period. Oral temperature (OT) at the beginning of the rest period should not exceed 99°F. If it does, the next work period should be shortened by 10 minutes (or 33 percent), while the length of the rest period stays the same. However, if the OT exceeds 99.7°F at the beginning of the next rest period, the following work cycle should be further shortened by 33 percent. The worker's OT should be measured at the end of the rest period to make sure that it has dropped below 99°F. At no time shall work begin with OT above 99°F.

8.3.2 Cold Stress Monitoring

Cold stress monitoring will be managed on-site by the SSO and will apply to all personnel who may be exposed to environments with an ambient temperature of 30°F or less.

Persons working outdoors in temperatures at or below freezing may experience frostbite. Extreme cold for a short time may cause severe injury to the surface of the body. Areas of the body that have high surface area to volume ratio, such as fingers, toes, and ears, are the most susceptible.

Two factors influence the development of a cold injury: ambient temperature and the velocity of the wind. Table 8.3.2-1 demonstrates the cooling power of wind on exposed flesh expressed as an equivalent temperature. As a general rule, the greatest incremental increase in wind chill occurs when a wind of 5 miles per hour (mph) increases to 10 mph. Additionally, water conducts heat 240 times faster than air. Thus, the body cools suddenly when chemical-protective equipment is removed, if the clothing underneath is soaked with perspiration.

Table 8.3.2-1

**COOLING POWER OF WIND ON EXPOSED FLESH EXPRESSED AS AN EQUIVALENT TEMPERATURE
(UNDER CALM CONDITIONS)***

Estimated Wind Speed (In mph)	Actual Temperature Reading (°F)											
	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
Equivalent Chill Temperature (°F)												
Calm	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
5	48	37	27	16	6	-5	-15	-26	-36	-47	-57	-68
10	40	28	16	4	-9	-24	-33	-46	-58	-70	-83	-95
15	36	22	9	-5	-18	-32	-45	-58	-72	-85	-99	-112
20	32	18	4	-10	-25	-39	-53	-67	-82	-96	-110	-121
25	30	16	0	-15	-29	-44	-59	-74	-88	-104	-118	-133
30	28	13	-2	-18	-33	-48	-63	-79	-94	-109	-125	-140
35	27	11	-4	-20	-35	-51	-67	-82	-98	-113	-129	-145
40	26	10	-6	-21	-37	-53	-69	-85	-100	-116	-132	-148
(Wind speeds greater than 40 mph have little additional effect.)	LITTLE DANGER In less than one hour with dry skin. Maximum danger of false sense of security.			INCREASING DANGER Danger from freezing of exposed flesh within one minute.				GREAT DANGER Flesh may freeze within 30 seconds.				
Trenchfoot and immersion foot may occur at any point on this chart.												

* Developed by U.S. Army Research Institute of Environmental Medicine, Natick, MA.

Frostbite

Local injury resulting from cold is included in the generic term frostbite. There are several degrees of damage. Frostbite of the extremities can be categorized into:

- Frost nip or incident frostbite - the conditions are characterized by sudden blanching or whitening of skin.
- Superficial frostbite - skin has a waxy or white appearance and is firm to the touch, but tissue beneath is resilient.
- Deep frostbite - tissues are cold, pale, and solid; extremely serious injury.

Hypothermia

There are degrees of hypothermia that are categorized as "moderate" and "severe". The signs of hypothermia include the following:

- Severe shivering;
- Abnormal behavior;
- Slowing;
- Stumbling;
- Weakness;
- Repeated falling;
- Inability to walk;
- Collapse;
- Stupor; and
- Unconsciousness.

A victim of moderate hypothermia, who may exhibit the first seven signs of hypothermia listed above, is still conscious but often confused. Severe hypothermia is determined by extreme skin coldness, loss of consciousness, faint pulse and shallow, infrequent, or apparently absent respiration. Death is the ultimate result. Table 8.3.2-2 lists the signs of hypothermia associated with the body's core temperature.

Practically, the onset of severe shivering signals danger to personnel. Exposure to cold shall be immediately terminated for any severely shivering worker.

Emergency Action

In the event that a worker becomes susceptible to cold stress, the following actions will be taken:

- Remove the victim from the hypothermia-/frostbite-producing environment.
- Seek expert medical help immediately.
- Reduce handling to a minimum. Do not rub or massage the victim.
- Prevent further body heat loss by covering the victim lightly with blankets. Plastic may be used for further insulation. Do not cover the victim's face.

- If the victim is still conscious, administer hot drinks. Encourage activity, such as walking, while wrapped in a blanket. Do not administer any form of sedative, tranquilizer, or analgesic (pain reliever), because these may facilitate further heat loss and convert moderate hypothermia into a severe case.

Table 8.3.2-2

SIGNS OF HYPOTHERMIA

Core Temperature		Clinical Signs
°C	°F	
37.6	99.8	A "Normal" rectal temperature.
37	98.6	A "Normal" oral temperature.
36	96.8	Metabolic rate increases in an attempt to compensate for heat loss.
35	95.0	Maximum shivering.
34	93.2	Victim conscious and responsive, with normal blood pressure.
33	91.4	Severe hypothermia below this temperature.
32	89.4	Consciousness clouded, blood pressure becomes difficult to obtain but pupils react to light; shivering ceases.
31	87.8	
30	86.0	Progressive loss of consciousness; muscular rigidity increases; pulse and blood pressure difficult to obtain; respiratory rate decreases.
29	84.2	
28	82.4	Ventricular fibrillation possible with myocardial irritability.
27	80.6	Voluntary motion ceases; pupils nonreactive to light; deep tendon and superficial reflexes absent.
26	78.8	Victim seldom conscious.
25	77.0	Ventricular fibrillation may occur spontaneously.
24	75.2	Pulmonary edema.
22	71.6	Maximum risk of ventricular fibrillation.
21	69.8	
20	68.0	Cardiac standstill.
18	64.4	Lowest accidental hypothermia victim to recover.
17	62.6	Isoelectric electroencephalogram.
9	48.2	Lowest artificially cooled hypothermia patient to recover.

Work Place Monitoring

Work place monitoring will occur as follows:

- A thermometer accurate to 1°F shall be assigned at any workplace where the environmental temperature is known or expected to be below 45°F, to enable overall compliance with this procedure.
- Whenever the air temperature at a workplace falls to 30°F or below, the dry-bulb temperature and wind speed shall be measured and recorded at least every four work-hours.
- The equivalent (wind) chill temperature (ECT) shall be obtained from Table 8.3.2-1 and shall be recorded with the other data in the site log, together with a record of the length of time spent working and resting.

Work-Warming Regimen

If work is performed continuously in the cold at an ECT of 20°F or below, heated warming shelters shall be made available for use by employees during warm-up breaks. A work-warming regimen will be established using Table 8.3.2-3. This table assumes that all workers are properly clothed for periods of work temperatures below freezing.

Special Medical Considerations

Employees shall be excluded from work in the cold at 30°F or below if they are suffering from diseases or taking medication that interferes with normal body temperature regulation or reduces tolerance to work in cold environments. The SSO shall document this situation for each worker during site training.

Trauma sustained in freezing or subzero conditions requires special attention, because an injured worker is predisposed to secondary cold injury. Special provisions must be made to prevent hypothermia and secondary freezing of damaged tissues, in addition to providing for first-aid treatment.

At air temperatures of 36°F or less, any worker who becomes immersed in water or whose clothing becomes wet will immediately be provided a change of clothing and be treated for hypothermia.

Table 8.3.2-3

WORK/WARM-UP SCHEDULE FOR FOUR-HOUR SHIFT*

Air Temperature	No Noticeable Wind		5 mph Wind		10 mph Wind		15 mph Wind		20 mph Wind		
	Sunny Sky (°F)	Max. No. of Period	Work Breaks	Max. No. of Period	Work Breaks	Max. No. of Period	Work Breaks	Max. No. of Period	Work Breaks	Max. No. of Period	Work Breaks
-15 to -19	(Norm Breaks)	1	(Norm Breaks)	1	75 min.	2	55 min.	3	40 min.	4	
-20 to -24	(Norm Breaks)	1	75 min.	2	55 min.	3	40 min.	4	30 min.	5	
-25 to -29	75 min.	2	55 min.	3	40 min.	4	30 min.	5	Non-emergency work should cease.		
-30 to -34	55 min.	3	40 min.	4	30 min.	5	Non-emergency work should cease.				
-35 to -39	40 min.	4	30 min.	5	Non-emergency work should cease.						
-40 to -44	30 min.	5	Non-emergency work should cease.								
-45 and below	Non-emergency work should cease.										

Notes:

- (1) Schedule applies to moderate to heavy work activity with warm-up breaks of 10 minutes in a warm location. For light-to-moderate work (limited physical movement): apply the schedule one step lower. For example, at -30°F with no noticeable wind (Step 4), a worker at a job with little physical movement should have a maximum work period of 40 minutes with four breaks in a 4-hour period (Step 5).
- (2) The following is suggested as a guide for estimating wind velocity. If accurate information is not available--5 mph: light flag moves; 10 mph: light flag fully extended; 15 mph: raises newspaper sheet; 20 mph: blowing and drifting snow.

* From Occupational Health & Safety Division, Saskatchewan Department of Labor.

8.4 Decontamination Procedures

8.4.1 General

Procedures for equipment and personnel decontamination will be implemented to minimize the spread of contamination to clean zones, to reduce exposure to personnel, and to reduce cross-contamination of samples when equipment must be used more than once during a sampling event.

The procedures that will be used for decontamination of personnel, vehicles, sampling equipment and field measurement equipment are described in detail in Section 5.8 of the Sampling and Analysis Plan (SAP). The types of decontamination solutions that will be used and the types of decontamination wastes that will be generated are discussed in Section 8.0 of the SAP.

8.4.2 Emergency Decontamination

In an emergency, the primary concern is to administer first aid to the injured team member(s), and to prevent further injury to other team members. However, decontamination of personnel injured in the Exclusion Zone, to the maximum extent possible, must still occur before the injured team member(s) can enter the Support Zone.

8.5 Disposition and Disposal of Decontamination Wastes

All decontamination wastes generated as part of the investigational activities conducted at the Eastern Landfill site will be collected, stored and disposed of as discussed in Section 8.0 of the SAP.

8.6 Communications

When team members are separated by distance great enough to make hand signals ineffective between crew supervisors, walkie-talkies will be provided for each supervisor. In addition, at least one mobile telephone will be available for communications with off-site personnel. The mobile telephone also will be available to contact emergency personnel in the event an emergency response (medical or otherwise) is deemed necessary.

8.7 Confined Space Entry Procedures

Confined space entry procedures must be addressed in all SSHPs whose contents are governed by OSHA 1910.120 legislation. Entry of project personnel into areas meeting the accepted definitions of confined spaces shall be controlled in accordance with all applicable regulations. At a minimum, this will be accomplished by adherence to the procedures contained in Appendix K of this SSHP, and all other applicable guidelines. Confined Space Entry Permits shall be obtained from the SSO prior to any activity requiring entry into a confined space. While it is not anticipated that confined space entry will be made in the course of this scope of work, the procedures and permit are located in Appendix K.

9.0 **EMERGENCY ACTION PLAN**

Emergency situations can easily be recognized by visual observations, worker complaints or monitoring instruments. A chemical release shall be considered an emergency when it is sufficient to affect unprotected personnel, including site workers and the public.

9.1 Preplanning

The OS shall be responsible for the overall direction and implementation of emergency response activities, and for overall coordination of any emergency response actions. The SSO shall serve as assistant and alternate to the OS and shall provide health and safety input during emergencies.

The OS will contact local emergency response agencies (i.e., fire department or other local response agencies) prior to initiation of investigational activities to arrange for them to respond to emergencies that may occur at the site. The OS will provide site-specific information to these emergency response agencies, including the types of activities that will be conducted at the site and the types of potential contaminants that will be encountered.

9.2 Reporting Emergencies

The OS must be notified of all emergencies that occur at the site. The OS will then determine if the emergency can be remedied by using on-site resources. If not, the OS will initiate notification of emergency response agencies, as discussed in the previous section.

9.3 Notification

The OS is responsible for all notifications--to emergency response agencies, to COE contacts, and to TtNUS personnel. In the event of an emergency, the OS will notify the emergency response agency (if deemed necessary), the TtNUS project manager and Senior CIH, and the CO.

9.4 Emergency Contacts

As mentioned previously, Appendix I includes a list of emergency telephone numbers and reporting instructions for ambulance, hospital, poison control center, fire, police, local hazmat team, emergency rescue team, client contact and site contact. This list of emergency telephone numbers will be posted in the Support Zone.

9.5 Fire or Explosion

In the event of a fire or explosion, the local fire department will be notified immediately. The fire department will be notified of the location and nature of the fire or explosion and of the nature of contaminants located on-site. The OS is responsible for making all notifications to emergency response agencies.

9.6 **Spills or Leaks**

In the event of a spill or leak, the following procedures will be followed:

- Inform the OS;
- Inform the site contact;
- Locate the source and attempt to stop the flow;
- Contain the spill;
- Notify the local emergency response agency if the spill can not be controlled;
- Notify the local emergency response agency if the chemical release has the potential of impacting the general public.

If the OS determines that the chemical release has the potential of impacting the general public (off-site), the OS will notify the National Response Center of the following information:

- Name and telephone number of reporter;
- Name and address of facility;
- Time and type of incident (e.g., fire, release);
- Name and quantity of material(s) involved, to the extent known, and the location of the discharge within the site;
- The extent of injuries, if any;
- The possible hazards to human health, or the environment, outside of the site area;
- Actions the person reporting the discharge proposes to take to contain, clean up, and remove the substance.

9.7 **Evacuation Procedures**

Prior to initiation of investigational activities, an evacuation route and meeting point will be identified. The evacuation route will be identified to direct team members away from the Exclusion Zone as quickly as possible.

The meeting point will be a location at which all team members will congregate following an evacuation. The meeting point will be established at a safe distance from potential emergencies. In the event of an emergency, all personnel will be directed to congregate at the meeting point, at which time the OS will survey the group in an effort to account for everyone. If the OS can not account for all personnel, emergency response agencies will be notified to initiate a search and rescue effort. All personnel will remain at the meeting point until advised otherwise by the OS.

9.8 **Critique of Response and Follow-up**

A follow-up meeting will be conducted after each emergency situation to review the emergency response actions. The SSO will coordinate the meeting, which will be attended by all personnel associated with the emergency situation. A record of the meeting will be prepared by the SSO. In addition, items discussed during the meeting will be incorporated into future responses to emergency situations.

10.0 TEAM MEMBER RESPONSIBILITIES

10.1 Managerial Responsibility

10.1.1 Health and Safety Senior CIH

The Senior CIH is responsible for providing the Project Manager with assistance and support with regard to all regulatory and safety aspects of site activity.

10.1.2 Project Manager

The Project Manager is responsible for ensuring that this SSHP is implemented and for assigning the On-site Supervisor (OS) to direct on-site activities.

10.2 Team Organization and Responsibility

Figure 10.2-1 presents the project organization as it has been designed by the project manager.

10.2.1 On-site Supervisor (OS)

The OS is responsible for ensuring that all work is performed in accordance with this plan to protect the health and safety of the workers and the public. The OS may delegate his responsibilities for health and safety to a Site Safety Officer (SSO) or other appropriate team personnel. However, the overall responsibility for the health and safety of TtNUS team members rests with the OS and ultimately with the Project Manager. In many cases, the OS will serve a dual purpose as the individual responsible for health and safety and successful completion of the project.

10.2.2 Site Safety Officer (SSO)

The SSO is responsible for implementing the requirements of this plan. The SSO will exercise his or her authority and responsibility to stop any activity if the safety or health of site personnel is being compromised. Resumption of activities will occur only when the unsafe condition has been corrected.

10.2.3 Field Team

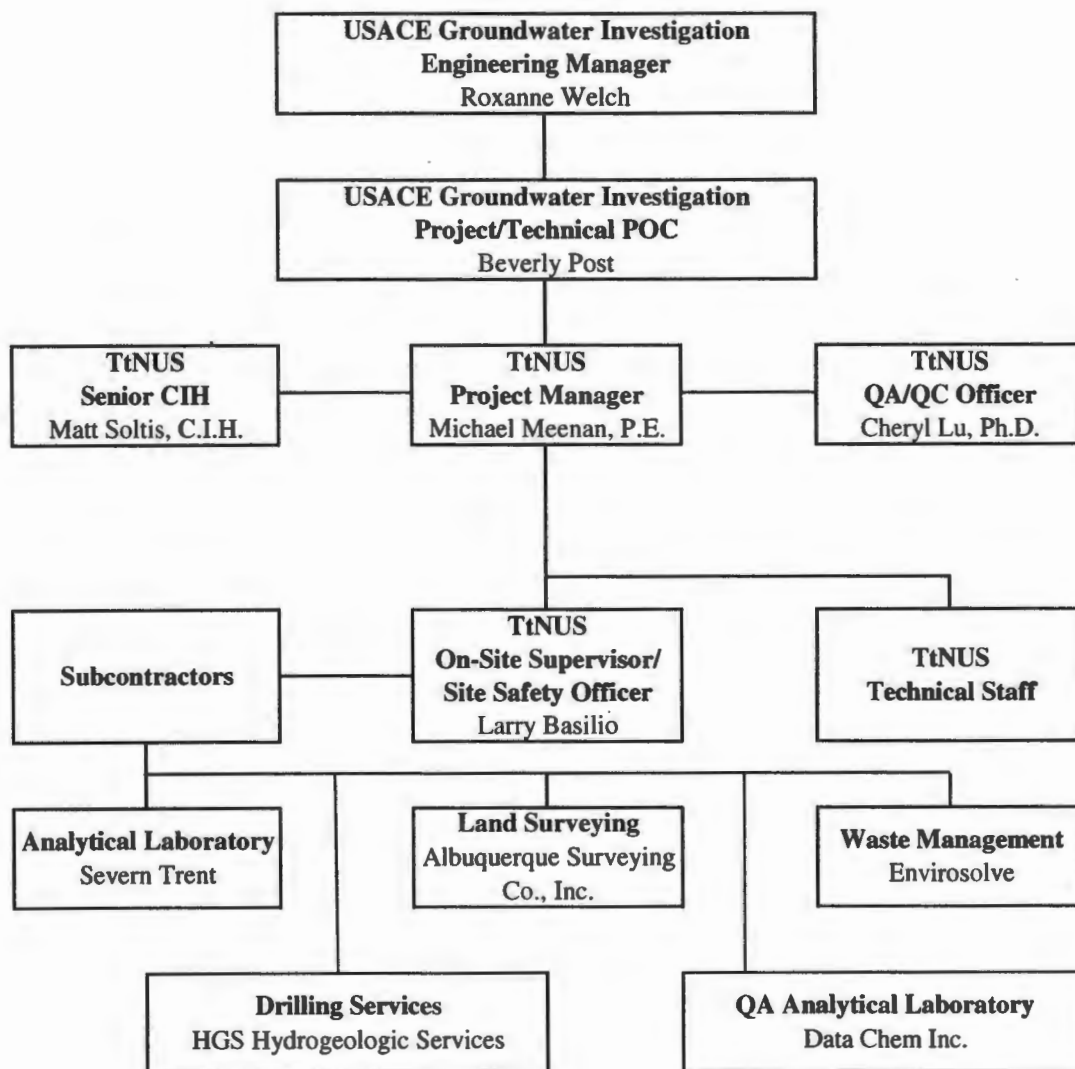
The field team is the TtNUS personnel assigned to conduct all investigational field work activities under the OS's oversight. All field team members agree to adhere to the provisions in the SSHP (see Section 1.2).

10.2.4 Subcontractors

Each subcontractor is responsible for compliance with applicable Federal, state, local and TtNUS health and safety requirements and the health and safety of their employees.

Figure 10.2-1

**Project Organization
Groundwater Investigation - Eastern Landfill
Fort Wingate Depot Activity
Gallup, New Mexico**



11.0

ACCIDENT PREVENTION

Subcontractor Supervision: Each subcontractor is responsible for compliance with applicable Federal, state, local and TtNUS health and safety requirements and the health and safety of their employees.

Fire Prevention and Protection: Fire prevention codes of the COE, local building codes, recommendations of the National Fire Prevention Association will cover activities at this site. Portable fire extinguishers will be provided where needed. Fire extinguishers will be distinctly marked, readily accessible, and maintained in a fully charged and operable condition. Other fire equipment will be provided and maintained as required.

Excavations: Excavations will be planned and potential hazards or obstructions will be evaluated before work begins. Soil testing may be required to determine proper means of protection for workers entering excavations. The competent person and front-line supervisor are required to inspect excavations daily before work begins. Inspections will be documented.

Site Housekeeping: The site will be maintained in good order. Trash will be removed and disposed of in accordance with regulations.

Mechanical Equipment Inspection: Mechanical equipment will be inspected as required and documented on form CESP 150 - R, included in Appendix L.

Sanitation: Sanitation facilities are not available.

Safety Inspections: The SSO will conduct daily safety inspections of the work site, material and equipment. Deficiencies and corrective actions will be documented using the Safety Inspection Form located in Appendix L.

Accident Prevention Measures:

- Identify and delineate hazardous work areas;
- Do not enter hazardous work areas unless required by your job duties;
- Use safety equipment to limit hazards;
- Know the location of emergency and safety equipment including, as appropriate, eyewash stations, safety showers, fire extinguishers, and air horn alarms in the work area;
- Wear appropriate personal protective equipment as noted in Section 5 of this SSHP;
- Do not operate a forklift or hoist or rigging equipment without proper training and current license. Learn crane operating limits, and do not lift loads over personnel;
- When operating heavy equipment on uneven terrain, follow manufacturer's specifications for appropriate track for soil type and degree of slope. Benching of the slope may be required;
- If ground is snow-covered or icy, suspend unloading, moving, or other forklift and vehicular operations. Upon approval and direction by SSO, commence operations. Prerequisites for approval may include removal of ice or snow, spreading of sand or salt, and use of vehicles properly equipped for snow;

- Prevent use of defective equipment by visual examination of equipment for wear and tear before use;
- Use only properly grounded electrical power tools, lighting, and equipment. This might include double insulated tools and ground-fault circuit interrupters (GFCIs);
- Use proper lighting for night operations, a minimum of 30 foot candles at active work areas;
- Maintain dry surfaces when working with electricity;
- Maintain the work area in a neat and orderly condition;
- Return all tools, equipment and supplies to their proper place after use;
- Be familiar with the operation of equipment, including pumps, material handling equipment, motors, mixers, tanks, and related power supply systems; and
- Maintain familiarity with health and safety procedures.

12.0 DOCUMENTATION

This SSHP and all forms completed as required by this SSHP shall be retained in the project files. The documents that must be retained in the files include the following:

- Title page of the SSHP used at the site;
- Site-specific addendum to the SSHP;
- Medical Data Sheets; and
- Incident Reports.

Additional notes regarding health and safety shall be recorded in the field logbook.

13.0 CERTIFICATION

By my signature, I certify that:

- I understand, and
- I will abide by the Site Safety and Health Plan for the Eastern Landfill site.

Printed Name	Signature	Date	Affiliation

14.0 RECORD OF CHANGES

This space is included to note changes of health and safety procedures during the Groundwater Investigation. All entries shall be dated and initialed by the Site Safety Officer.

15.0 REFERENCES

1. USACE 1991. Safety and Occupational Health Document Requirements for Hazardous, Toxic, and Radioactive (HTRW) Activities. Regulation No. 385-1-92. U.S. Army Corps of Engineers, December 13, 1991.
2. USACE 1992. Safety and Health Requirements Manual. Manual No. 385-1-1. U.S. Army Corps of Engineers, may 1996.
3. USACE 1995. Tulsa District Respirator Protection Program. U.S. Army Corps of Engineers. February 15, 1995.
4. USACE 2003. Detailed Statement of Work for Groundwater Investigation, Fort Wingate Depot Activity – Eastern Landfill, Gallup, New Mexico. Contract No. DACA63-97-D-0030, Delivery Order No. 0024. U.S. Army Corps of Engineers, Fort Worth District, September 2001 (revised July 23, 2003).
5. FWDA Final Field Sampling Plan, PMC, June 8, 1998.
6. FWDA Final Quality Assurance Project Plan, PMC, June 9, 1998.
7. FWDA Final Health and Safety Plan, PMC, March 6, 1998.
8. FWDA Final Remedial Investigation/Feasibility Study Report & RCRA Corrective Action Program Documents, PMC, November 15, 1998.
9. TtNUS 2000. Work Plan - Release Assessments and Delineation of Eastern Landfill, Tetra Tech NUS, Inc., October 2000.

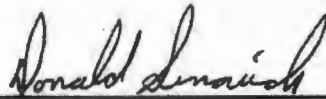
APPENDIX A

TETRA TECH NUS, INC. HEALTH AND SAFETY POLICY

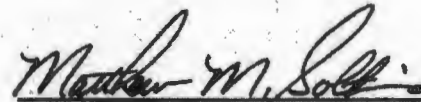
TETRA TECH NUS, INC. HEALTH AND SAFETY POLICY

Tetra Tech NUS, Inc., is committed to providing our employees with a safe and healthful workplace. We believe that occupational injuries and illness can be prevented; and we are convinced that a strong Health and Safety Program is essential to achieve this objective.

- To implement these Program objectives, we require that our managers and employees:
- Recognize a *personal responsibility* for his/her own health and safety, and for actions which affect fellow employees:
- Integrate safety and health with all aspects of their work, with the well-being of employees as the primary concern in all activities.
- Comply with applicable federal, state and local regulations, as well as with Tetra Tech's and our clients policies and procedures.
- Be actively involved in the Health and Safety Program by providing input and constructive criticism for Program improvements.



Donald Senovich
President



Matthew M. Soltis, CIH, CSP
Health and Safety Manager



Tetra Tech NUS, Inc

February 1998

APPENDIX B
PROJECT PERSONNEL DOCUMENTATION FORMS

CERTIFICATE OF COMPLETION

This Certifies That:

Larry Basilio

110-52-2973

Has Successfully Completed

8-Hour Hazardous Materials Refresher Training

**PERSONAL PROTECTION AND
SAFETY FOR HAZARDOUS
MATERIALS ACTIVITIES**

As Prescribed in Standard

29 CFR 1910.120

Conducted By:

Ecological Safety Services, Inc.

4500 S. Wayside Suite 100 - Houston, TX 77087 - (713) 649-7001

Instructor: 

Date of Completion: **May 30, 2003**

Certificate Number: **03:0433**



CERTIFICATE OF TRAINING

THIS CERTIFIES THAT

LARRY BASILIO

**has successfully completed a 40 hour course of instruction in
HAZARDOUS MATERIALS OPERATIONS TRAINING**

**prepared and conducted by the
NUS Corporation,
Pittsburgh, Pennsylvania**

AUGUST 22-26, 1988

Date of Award

Richard C. Gerlach

**Richard C. Gerlach, Ph.D, C.I.H.
Program Manager, Health Sciences**

David P. Bour

**David P. Bour
Vice President and General Manager,
Central Business Operations**

APPENDIX C
TRAINING DOCUMENTATION FORM

PRE-ACTIVITIES TRAINING SESSION FORM

PROJECT: Groundwater Investigations, Eastern Landfill FWDA, Fort Wingate, Gallup, New Mexico

DATE: _____

THE FOLLOWING SSHP ELEMENTS MUST BE COVERED BEFORE FIELD ACTIVITIES BEGIN:

- ____ 1. Personnel responsible for health and safety:
- ____ 2. Potential health and safety hazards at the site:
 - a. Chemical hazards
 - b. Fire and explosion potential always exists when working with flammable and combustible materials.
 - c. Contact with energized sources - use lockout/tagout - maintain safe distance from energized power sources.
 - d. Exposure to moving machinery.
 - e. Uneven or unstable terrain.
 - f. Manual lifting techniques.
 - g. Noise - use hearing protection.
 - h. Traffic at the site.
 - I. Heat stress during hot and humid weather.
 - j. Cold stress during cold and wet weather.
 - k. Snakes, bugs.
 - l. Poisonous plants.
 - m. Animal bites.
- ____ 3. Proper use of personal protective equipment
 - a. Hard hats, safety glasses, steel-toed safety shoes or boots, hearing protection and respiratory protection if needed.
 - b. Review levels of PPE.
- ____ 4. Work practices and restriction to minimize hazards
 - a. Review the Site Safety and Health Safety Plan
 - b. Follow all applicable OSHA and FWCOE rules.
 - c. Observe precautions against heat and cold stress.
 - d. Ensure that all fire extinguishers are operable and properly located. One in each piece of heavy equipment.
- ____ 5. Safe use of engineering controls and equipment
 - a. Follow manufacturer's recommendations.
 - b. Follow all applicable OSHA and FWCOE rules.
 - c. Follow action level guidelines.

- ___6. Medical surveillance/symptoms of exposure
 - a. Medical surveillance program in place to ensure that workers can perform assigned jobs.

- ___7. Monitoring equipment to be used on-site
 - a. LEL/O₂ monitor
 - b. Organic vapor detector

- ___8. Contents of the Site Safety and Health Plan (SSHP)
 - a. Review all pages of the SSHP and follow its rules.

- ___9. Personnel decontamination procedures

- ___10. Emergency response procedures
 - a. Immediately contact the On-site Supervisor.
 - b. Utilize the local emergency management services.
 - c. Use Emergency Procedures listed in Section 8 of the SSHP.
 - d. Review emergency contact list and telephone numbers.

- ___11. Field communications
 - a. Voice communications will be the primary means of communicating between workers.
 - b. Use hand signals when appropriate.
 - c. Use cellular phone when needed.
 - d. Hand-held radios may be used for coordination of activities.

- ___12. Fire precautions
 - a. NO SMOKING ON THE PROJECT SITE - THE DESIGNATED SMOKING AREAS WILL BE DETERMINED AND MARKED BY THE SSO.
 - b. Make sure that at least two fire extinguishers are charged and available for fighting a small fire.

- ___13. Other important health and safety information
 - a. Certain equipment to be used during the performance of this project may generate noise that may require the posting of warning signs and the use of hearing protection devices.

WE CERTIFY THAT THE ABOVE HEALTH AND SAFETY INFORMATION HAS BEEN PRESENTED TO THE BELOW NAMED PERSONNEL BEFORE BEGINNING FIELD ACTIVITIES ON THIS PROJECT.

PROJECT MANAGER _____ DATE _____

APPENDIX D
MEDICAL SURVEILLANCE PROGRAM DOCUMENTATION

SUBCONTRACTOR MEDICAL APPROVAL FORM

For employees of _____
Company Name

Participant Name: _____ Date of Exam: _____

Part A

The above-named individual has:

1. Undergone a physical examination in accordance with OSHA Standard 29 CFR §1910.120, paragraph (f) and found to be medically (check one):

- qualified to perform work at the work site.
- not qualified to perform work at the work site.

2. Undergone a physical examination as per OSHA 29 CFR §1910.134 (b)(10) and found to be medically (check one):

- qualified to work in respiratory protection.
- not qualified to work in respiratory protection.

My evaluation has been based on the following information, as provided to me by the employer.

- A copy of OSHA Standard 29 CFR §1910.120 and appendices.
- A description of the employee's duties as they relate to the employee's exposures.
- A list of known/suspected contaminants and their concentrations (if known).
- A description of any personal protective equipment used or to be used.
- Information from previous medical examinations of the employee, which is not readily available to the examining physician.

Part B

I, _____, have examined _____
Physician's Name (print) Participant's Name (print)

and have determined the following information:

Subcontractor Medical Approval Form
Page 2

1. Results of the medical examination and tests (excluding findings or diagnoses unrelated to occupational exposure):
2. Any detected medical conditions which would place the employee at increased risk of material impairment of the employee's health:
3. Recommended limitations upon the employee's assigned work:

I have informed this participant of the results of this medical examination and any medical conditions which require further examination or treatment.

Based on the information provided to me, and in view of the activities and hazard potentials involved at the work site, this participant (check one)

- may
 may not

perform his/her assignment task

Physician's Signature _____

Address _____

Phone Number _____

NOTE: Copies of test results are maintained and available at: _____

MEDICAL DATA SHEET

Each field worker must complete a Medical Data Sheet prior to the commencement of field activities. Deliver this form to the attending physician when medical assistance is needed.

Name: _____ Site: _____

Home Telephone: _____ Work Telephone: _____

Address: _____

Age: _____ Height: _____ Weight: _____

Name of Next of Kin: _____ Telephone: _____

Drug Allergies or Other Allergies: _____

Previous Illnesses or Exposure to Hazardous Substances: _____

Current Medication (Prescription and Non-Prescription): _____

Medical Restrictions: _____

Name, Address, and Telephone Number of Personal Physician: _____

The above information is accurate and complete to the best of my knowledge.

Signature

Date

APPENDIX E
DOCUMENTATION OF INSTRUMENT CALIBRATION AND USE

APPENDIX F
MATERIAL SAFETY DATA SHEETS

International Chemical Safety Cards

ISOBUTENE

ICSC: 1027

ISOBUTENE Isobutylene 2-Methylpropene (cylinder) $C_4H_8/CH_2=C(CH_3)_2$ Molecular mass: 56.1			
CAS # 115-11-7 RTECS # UD0890000 ICSC # 1027 UN # 1055 EC # 601-012-00-4			
TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Extremely flammable.	NO open flames, NO sparks, and NO smoking. NO contact with oxidizing materials.	Shut off supply; if not possible and no risk to surroundings, let the fire burn itself out; in other cases extinguish with sand, powder, carbon dioxide.
EXPLOSION	Gas/air mixtures are explosive. Risk of fire and explosion on contact with oxidants, halogens (see Chemical Dangers).	Closed system, ventilation, explosion-proof electrical equipment and lighting. Prevent build-up of electrostatic charges (e.g., by grounding). Use non-sparking handtools.	In case of fire: keep drums, etc., cool by spraying with water. Combat fire from a sheltered position.
EXPOSURE			
• INHALATION	Dizziness. Drowsiness. Dullness. Nausea. Unconsciousness. Vomiting.	Closed system and ventilation.	Fresh air, rest. Artificial respiration if indicated. Refer for medical attention.
• SKIN	ON CONTACT WITH LIQUID: FROSTBITE.	Cold-insulating gloves.	ON FROSTBITE: rinse with plenty of water, do NOT remove clothes. Refer for medical attention.
• EYES	Frostbite.	Face shield or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
• INGESTION			
SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING	
Evacuate danger area! Consult an expert! Ventilation. Remove all sources of ignition. Do NOT wash away into sewer. NEVER direct water jet on liquid (extra personal protection: self-contained breathing apparatus).	Fireproof. Separated from incompatible substances (see Chemical Dangers). Cool.	F symbol F+ symbol R: 12 S: (2-)9-16-33 Note: C UN Hazard Class: 2.1	
SEE IMPORTANT INFORMATION ON BACK			
ICSC: 1027		Prepared in the context of cooperation between the International Programme on Chemical Safety & the Commission of the European Communities © IPCS CEC 1993	

International Chemical Safety Cards

ISOBUTENE

ICSC: 1027

<p style="text-align: center;">I M P O R T A N T D A T A</p>	<p>PHYSICAL STATE; APPEARANCE: COLOURLESS COMPRESSED LIQUEFIED GAS OR COLOURLESS VOLATILE LIQUID, WITH CHARACTERISTIC ODOUR.</p> <p>PHYSICAL DANGERS: The gas is heavier than air and may travel along the ground; distant ignition possible, and may accumulate in low ceiling spaces causing deficiency of oxygen. As a result of flow, agitation, etc., electrostatic charges can be generated.</p> <p>CHEMICAL DANGERS: The substance can presumably form explosive peroxides. The substance is able to polymerize with fire or explosion hazard. Reacts violently with oxidants, chlorine, fluorine, nitrogen oxides, hydrogen chloride, hydrogen bromide, causing fire and explosion hazard.</p> <p>OCCUPATIONAL EXPOSURE LIMITS (OELs): MAK not established.</p>	<p>ROUTES OF EXPOSURE: The substance can be absorbed into the body by inhalation.</p> <p>INHALATION RISK: On loss of containment this liquid evaporates very quickly causing supersaturation of the air with serious risk of suffocation when in confined areas. A harmful contamination of the air can be reached very quickly on evaporation of this substance at 20°C.</p> <p>EFFECTS OF SHORT-TERM EXPOSURE: Rapid evaporation of the liquid may cause frostbite. The substance may cause effects on the central nervous system. Exposure may result in death. Medical observation is indicated.</p> <p>EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:</p>
<p style="text-align: center;">PHYSICAL PROPERTIES</p>	<p>Boiling point: -6.9°C Melting point: -140.3°C Relative density (water = 1): 0.59 Solubility in water: practically insoluble Vapour pressure, kPa at 20°C: 1976</p>	<p>Relative vapour density (air = 1): 1.94 Flash point: flammable°C Auto-ignition temperature: 465°C Explosive limits, vol% in air: 1.8-9.6%</p>
<p style="text-align: center;">ENVIRONMENTAL DATA</p>		
NOTES		
<p>Density of the liquid at boiling point: 0.605 kg/l. High concentrations in the air cause a deficiency of oxygen with the risk of unconsciousness or death. Check oxygen content before entering area. Turn leaking cylinder with the leak up to prevent escape of gas in liquid state.</p> <p style="text-align: right;">Transport Emergency Card: TEC (R)-502 NFPA Code: H 1; F 4; R 0;</p>		
ADDITIONAL INFORMATION		
<p>ICSC: 1027</p>	<p>© IPCS, CEC, 1993</p>	<p>ISOBUTENE</p>
<p style="text-align: center;">IMPORTANT LEGAL NOTICE:</p>	<p>Neither the CEC or the IPCS nor any person acting on behalf of the CEC or the IPCS is responsible for the use which might be made of this information. This card contains the collective views of the IPCS Peer Review Committee and may not reflect in all cases all the detailed requirements included in national legislation on the subject. The user should verify compliance of the cards with the relevant legislation in the country of use.</p>	

LIQUID AIR -- ISOBUTYLENE IN AIR,0.01 %,DC 102573,101-350-N - CALIBRATING GAS CYLI
MATERIAL SAFETY DATA SHEET
NSN: 6665012148247
Manufacturer's CAGE: 24274
Part No. Indicator: A
Part Number/Trade Name: ISOBUTYLENE IN AIR,0.01 %,DC 102573,101-350-N

=====

General Information

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Item Name: CALIBRATING GAS CYLINDER
Company's Name: LIQUID AIR CORP
Company's Street: 2700 POST OAK BLVD 18TH FLOOR
Company's City: HOUSTON
Company's State: TX
Company's Country: US
Company's Zip Code: 77056
Company's Emerg Ph #: 800-231-1366/800-424-9300 (CHEMTREC)
Company's Info Ph #: 713-624-8000
Distributor/Vendor # 1: HNU SYSTEMS INC (800-724-5600)
Distributor/Vendor # 1 Cage: 57631
Record No. For Safety Entry: 002
Tot Safety Entries This Stk#: 005
Status: SE
Date MSDS Prepared: 01JAN92
Safety Data Review Date: 19SEP97
Supply Item Manager: CX
MSDS Preparer's Name: UNKNOWN
MSDS Serial Number: CFKHB
Specification Number: NONE
Spec Type, Grade, Class: NONE
Hazard Characteristic Code: G3
Unit Of Issue: CY
Unit Of Issue Container Qty: 0.6 LB (DDR) V
Type Of Container: CYLINDER
Net Unit Weight: 0.6 LB
NRC/State License Number: NOT RELEVANT

=====

Ingredients/Identity Information

=====

Proprietary: NO
Ingredient: AIR
Ingredient Sequence Number: 01
Percent: 100
NIOSH (RTECS) Number: AX5275000
OSHA PEL: NOT ESTABLISHED
ACGIH TLV: NOT ESTABLISHED
Other Recommended Limit: NONE RECOMMENDED

Proprietary: NO
Ingredient: ISOBUTYLENE (DDR) PROVIDED & FOR ISOBUTYLENE)
Ingredient Sequence Number: 02
Percent: 0.01
NIOSH (RTECS) Number: UD0890000
CAS Number: 115-11-7
OSHA PEL: NOT ESTABLISHED
ACGIH TLV: NOT ESTABLISHED
Other Recommended Limit: NONE RECOMMENDED

=====

Physical/Chemical Characteristics

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Appearance And Odor: COLORLESS, ODORLESS GAS
Boiling Point: -318F (AIR)
Vapor Pressure (MM Hg/70 F): UNKNOWN

Vapor Density (Air=1): 1
Specific Gravity: NOT RELEVANT
Evaporation Rate And Ref: NOT RELEVANT (GAS)
Solubility In Water: SLIGHTLY
Percent Volatiles By Volume: 100
Viscosity: NOT RELEVANT
Radioactivity: NOT RELEVANT

Fire and Explosion Hazard Data

Flash Point: NONE
Lower Explosive Limit: NOT RELEVANT
Upper Explosive Limit: NOT RELEVANT
Extinguishing Media: USE WATER FOG, CARBON DIOXIDE, FOAM, OR DRY CHEMICAL FOR SURROUNDING FIRE. KEEP FIRE-EXPOSED CYLINDERS COOL WITH WATER.
Special Fire Fighting Proc: AS WITH ANY FIRE, WEAR PROTECTIVE CLOTHING AND NIOSH-APPROVED SELF-CONTAINED BREATHING APPARATUS IF NEEDED.
Unusual Fire And Expl Hazrds: AIR AT HIGH PRESSURES WILL ACCELERATE THE BURNING OF MATERIALS TO A GREATER RATE THAN THEY BURN AT ATMOSPHERIC PRESSURE.

Reactivity Data

Stability: YES
Cond To Avoid (Stability): HEATING CYLINDER
Materials To Avoid: NONE
Hazardous Decomp Products: NONE
Hazardous Poly Occur: NO
Conditions To Avoid (Poly): NOT RELEVANT

Health Hazard Data

LD50-LC50 Mixture: NOT RELEVANT
Route Of Entry - Inhalation: YES
Route Of Entry - Skin: NO
Route Of Entry - Ingestion: NO
Health Haz Acute And Chronic: TARGET ORGANS:NONE. ACUTE AND CHRONIC- NONE. THESE MIXTURES SHOULD BE CONSIDERED SIMILAR TO AIR AND WOULD THEREFORE CAUSE NO SYMPTOMS OF EXPOSURE.
Carcinogenicity - NTP: NO
Carcinogenicity - IARC: NO
Carcinogenicity - OSHA: NO
Explanation Carcinogenicity: NONE
Signs/Symptoms Of Overexp: NONE
Med Cond Aggravated By Exp: NONE.
Emergency/First Aid Proc: NONE NEEDED.

Precautions for Safe Handling and Use

Steps If Matl Released/Spill: NOT RELEVANT
Neutralizing Agent: NOT RELEVANT
Waste Disposal Method: NOT RELEVANT
Precautions-Handling/Storing: STORE CYLINDERS SECURE, IN COOL, DRY, VENTILATED AREA BELOW 125F. PROTECT CYLINDERS FROM PHYSICAL DAMAGE. FULL & EMPTY CYLINDERS SHOULD BE SEGREGATED.
Other Precautions: VENTING OF AIR FROM CYLINDER MUST BE ACCOMPLISHED SLOWLY. USE A "FIRST IN-FIRST OUT" INVENTORY SYSTEM. CLOSE VALVE AFTER EACH USE AND WHEN EMPTY.

Control Measures

Respiratory Protection: NONE NEEDED.
Ventilation: NONE
Protective Gloves: LEATHER WHEN HANDLING CYLINDERS

Eye Protection: GOGGLES RECOMMENDED
Other Protective Equipment: EAR PROTECTION WHEN VENTING AIR
Work Hygienic Practices: OBSERVE GOOD INDUSTRIAL HYGIENE PRACTICES AND
RECOMMENDED PROCEDURES.

Transportation Data

Trans Data Review Date: 97262
DOT PSN Code: DQQ
DOT Proper Shipping Name: COMPRESSED GASES, N.O.S.
DOT Class: 2.2
DOT ID Number: UN1956
DOT Label: NONFLAMMABLE GAS
DOT/DoD Exemption Number: NOT RELEVANT
IMO PSN Code: EQH
IMO Proper Shipping Name: COMPRESSED GAS, N.O.S. o
IMO Regulations Page Number: 2124
IMO UN Number: 1956
IMO UN Class: 2(2.2)
IMO Subsidiary Risk Label: -
IATA PSN Code: HDO
IATA UN ID Number: 1956
IATA Proper Shipping Name: COMPRESSED GAS, N.O.S. *
IATA UN Class: 2.2
IATA Label: NON-FLAMMABLE GAS
AFI PSN Code: HDO
AFI Symbols: *
AFI Prop. Shipping Name: COMPRESSED GAS, N.O.S.
AFI Class: 2.2
AFI ID Number: UN1956
AFI Special Prov: P5
AFI Basic Pac Ref: A6.3, A6.5, A6.6
N.O.S. Shipping Name: 0.001% ISOBUTYLENE IN AIR

Disposal Data

Label Data

Label Required: NO
Technical Review Date: 19SEP97
Label Status: N
Label Name: LIQUID AIR CORP
Label Street: 2700 POST OAK BLVD 18TH FLOOR
Label City: HOUSTON
Label State: TX
Label Zip Code: 77056
Label Country: US
Label Emergency Number: 800-231-1366/800-424-9300 (CHEMTREC)

AIR LIQUIDE AMERICA CORP-FMLY BIG THREE INDUS -- ISOBUTYLENE - CALIBRATION GAS CYL
MATERIAL SAFETY DATA SHEET
NSN: 6665012148247
Manufacturer's CAGE: 17688
Part No. Indicator: A
Part Number/Trade Name: ISOBUTYLENE

General Information

Item Name: CALIBRATION GAS CYLINDER
Company's Name: AIR LIQUIDE AMERICA CORP-FMLY BIG THREE INDUSTRIES
Company's Street: 3535 W 12TH ST
Company's P. O. Box: 3047
Company's City: HOUSTON
Company's State: TX
Company's Country: US
Company's Zip Code: 77253
Company's Emerg Ph #: 800-424-9300 CHEMTREC
Company's Info Ph #: 713-868-0440 FAX: 800-231-1366
Distributor/Vendor # 1: HNU SYSTEMS INC
Distributor/Vendor # 1 Cage: 57631
Record No. For Safety Entry: 001
Tot Safety Entries This Stk#: 005
Status: SE
Date MSDS Prepared: 20FEB97
Safety Data Review Date: 19AUG97
Supply Item Manager: CX
MSDS Preparer's Name: UNKNOWN
Preparer's Company: CHEMICAL SAFETY ASSOCIATES, INC.
Preparer's St Or P. O. Box: 9163 CHESAPEAKE DR
Preparer's City: SAN DIEGO
Preparer's State: CA
Preparer's Zip Code: 92123-1002
MSDS Serial Number: CFCVY
Specification Number: NONE
Spec Type, Grade, Class: NONE
Hazard Characteristic Code: G3
Unit Of Issue: EA
Unit Of Issue Container Qty: 0.6 LB
Type Of Container: CYLINDER
Net Unit Weight: 0.6

Ingredients/Identity Information

Proprietary: NO
Ingredient: ISOBUTYLENE (CYLINDER CONTAINS 75 PPM IN AIR).
Ingredient Sequence Number: 01
Percent:

SCOTT SPECIALTY GASES -- ISOBUTYLENE IN AIR - CALIBRATION GAS CYL
MATERIAL SAFETY DATA SHEET
NSN: 6665012148247
Manufacturer's CAGE: 51847
Part No. Indicator: A
Part Number/Trade Name: ISOBUTYLENE IN AIR

General Information

Item Name: CALIBRATION GAS CYL
Company's Name: SCOTT SPECIALTY GASES
Company's Street: ROUTE 611 NORTH
Company's City: PLUMSTEADVILLE
Company's State: PA
Company's Country: US
Company's Zip Code: 18949
Company's Emerg Ph #: 215-766-8861; 908-754-7700
Company's Info Ph #: 215-766-8861
Record No. For Safety Entry: 003
Tot Safety Entries This Stk#: 005
Status: SMJ
Date MSDS Prepared: 23APR92
Safety Data Review Date: 27SEP94
MSDS Serial Number: BVRGC
Hazard Characteristic Code: G3

Ingredients/Identity Information

Proprietary: NO
Ingredient: PROPENE, 2-METHYL-; (ISOBUTYLENE)
Ingredient Sequence Number: 01
NIOSH (RTECS) Number: UD0890000
CAS Number: 115-11-7
OSHA PEL: N/K (FP N)
ACGIH TLV: N/K (FP N)

Proprietary: NO
Ingredient: AIR, REFRIGERATED LIQUID; AIR COMPRESSED (UN1002, DOT); AIR
REFRIGERATED LIQUID (CRYOGENIC LIQUID) (UN1003) (DOT)
Ingredient Sequence Number: 02
NIOSH (RTECS) Number: AX5271000
OSHA PEL: N/K (FP N)
ACGIH TLV: N/K (FP N)

Physical/Chemical Characteristics

Appearance And Odor: COLORLESS GAS W/POSSIBLE SLIGHT OLEFINIC ODOR.
Boiling Point: -318F, -194C
Vapor Pressure (MM Hg/70 F): N/A
Vapor Density (Air=1): 1.2
Specific Gravity: 0.88 (H*20=1)
Evaporation Rate And Ref: NOT APPLICABLE
Solubility In Water: INSOLUBLE
Percent Volatiles By Volume: 100

Fire and Explosion Hazard Data

Flash Point: NONFLAMMABLE
Lower Explosive Limit: N/A
Upper Explosive Limit: N/A
Extinguishing Media: USE WHAT IS APPROPRIATE FOR SURROUNDING FIRE.
Special Fire Fighting Proc: USE NIOSH/MSHA APPROVED SCBA & FULL PROTECTIVE
EQUIPMENT (FP N). USE WATER SPRAY TO KEEP FIRE EXPOSED CYLINDERS COOL.

Unusual Fire And Expl Hazrds: COMPRESSED AIR AT HIGH PRESSURES WILL ACCELERATE THE BURNING OF FLAMMABLE MATERIALS.

Reactivity Data

Stability: YES
Cond To Avoid (Stability): NONE SPECIFIED BY MANUFACTURER.
Materials To Avoid: NONE.
Hazardous Decomp Products: NONE.
Hazardous Poly Occur: NO
Conditions To Avoid (Poly): NOT RELEVANT

Health Hazard Data

LD50-LC50 Mixture: NONE SPECIFIED BY MANUFACTURER.
Route Of Entry - Inhalation: YES
Route Of Entry - Skin: NO
Route Of Entry - Ingestion: NO
Health Haz Acute And Chronic: ACUTE:CONCENTRATION OF ISOBUTYLENE IS THIS MIXTURE SHOULD NOT PRESENT ANY SYMPTOMS OF TOXICITY. CHRONIC:NONE.
Carcinogenicity - NTP: NO
Carcinogenicity - IARC: NO
Carcinogenicity - OSHA: NO
Explanation Carcinogenicity: NOT RELEVANT
Signs/Symptoms Of Overexp: NONE SPECIFIED BY MANUFACTURER.
Med Cond Aggravated By Exp: NONE.
IMMEDIATELY FLUSH W/POTABLE WATER FOR A MINIMUM OF 15 MINUTES, SEEK ASSISTANCE FROM MD (FP N). SKIN:FLUSH W/COPIOUS AMOUNTS OF WATER. CALL MD (FP N). INHAL:IMMEDIATELY REMOVE VICTIM TO FRESH AIR. IF BREATHING HAS STOPPED, GIVE ARTIFICIAL RESPIRATION. IF BREATHING IS DIFFICULT, GIVE OXYGEN.

Precautions for Safe Handling and Use

Steps If Matl Released/Spill: EVACUATE & VENTILATE AREA. REMOVE LEAKING CYLINDER TO EXHAUST HOOD OR SAFE OUTDOORS AREA IF THIS CAN BE DONE SAFELY.
Neutralizing Agent: NONE SPECIFIED BY MANUFACTURER.
Waste Disposal Method: DISPOSAL MUST BE I/A/W FEDERAL, STATE & LOCAL REGULATIONS (FP N). RETURN CYLS TO SUPPLIER FOR PROPER DISP W/ANY VALVE OUTLET PLUGS/CAPS SECURED & VALVE PROT CAP IN PLACE. ALLOW GAS TO DISCHARGE AT SLOW RATE TO ATM IN UNCONFINED AREA/EXHST HOOD.
Precautions-Handling/Storing: STORE IN WELL VENTILATED AREAS ONLY. KEEP VALVE PROT CAP ON CYLS WHEN NOT IN USE & SECURE CYL WHEN USING TO PROT FROM FALLING.
Other Precautions: USE SUITABLE HAND TRUCK TO MOVE CYLS. PROT CYLS FROM PHYSICAL DMG. DO NOT DEFACE CYLS/LBLS. MOVE CYL W/ADEQ HAND TRUCK. CYL SHOULD BE REFILLED BY QUALIFIED PRODUCERS OF COMPRESSED GAS. SHIPMENT OF COMPRESSED GAS CYL WHICH HAS NOT (SUPDAT)

Control Measures

Respiratory Protection: USE NIOSH/MSHA APPROVED SCBA IN CASE OF EMERGENCY OR NON-ROUTINE USE.
Ventilation: PROVIDE ADEQUATE GENERAL & LOCAL EXHAUST VENTILATION.
Protective Gloves: RUBBER GLOVES.
Eye Protection: ANSI APPROVED CHEM WORKERS GOGGS (FP N).
Other Protective Equipment: WEAR SAFETY SHOES. A SAFETY SHOWER & EYEWASH STATION SHOULD BE READILY AVAILABLE.
Work Hygienic Practices: NONE SPECIFIED BY MANUFACTURER.
Suppl. Safety & Health Data: OTHER PREC:BEEN FILLED BY OWNER OR WITH HIS WRITTEN CONSENT IS A VIOLATION OF FEDERAL LAW (49 CFR).

Transportation Data

Trans Data Review Date: 94269

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Disposal Data

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Label Data

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Label Required: YES
Technical Review Date: 27SEP94
Label Date: 26SEP94
Label Status: G
Common Name: ISOBUTYLENE IN AIR
Chronic Hazard: NO
Signal Word: NONE
Acute Health Hazard-None: X
Contact Hazard-None: X
Fire Hazard-None: X
Reactivity Hazard-None: X
Special Hazard Precautions: ACUTE:CONCENTRATION OF ISOBUTYLENE IS THIS MIXTURE SHOULD NOT PRESENT ANY SYMPTOMS OF TOXICITY. CHRONIC:NONE LISTED BY MANUFACTURER.
Protect Eye: Y
Protect Skin: Y
Protect Respiratory: Y
Label Name: SCOTT SPECIALTY GASES
Label Street: ROUTE 611 NORTH
Label City: PLUMSTEADVILLE
Label State: PA
Label Zip Code: 18949
Label Country: US
Label Emergency Number: 215-766-8861; 908-754-7700

LIQUID AIR CALIFORNIA PLZ -- 0-200 PPM CARBON MONOXIDE IN AIR, 81-0230-200 PP-CO -
MATERIAL SAFETY DATA SHEET
NSN: 6695013004627
Manufacturer's CAGE: 18260
Part No. Indicator: A
Part Number/Trade Name: 0-200 PPM CARBON MONOXIDE IN AIR, 81-0230-200 PP-CO
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General Information

Item Name: CALIBRATION SET, PRIMARY REFERENCE STANDARD
Company's Name: LIQUID AIR CORP CALIFORNIA PLZ
Company's Street: 2121 N CALIFORNIA BLVD
Company's City: WALNUT CREEK
Company's State: CA
Company's Country: US
Company's Zip Code: 94596
Company's Emerg Ph #: 415-977-6500
Company's Info Ph #: 415-977-6500 / FAX 415-977-6747
Distributor/Vendor # 1: AERFORM INSTRUMENTS INC (919-691-0333)
Distributor/Vendor # 1 Cage: 0WK23
Record No. For Safety Entry: 001
Tot Safety Entries This Stk#: 003
Status: SE
Date MSDS Prepared: 04JUN90
Safety Data Review Date: 21OCT96
Supply Item Manager: CX
MSDS Preparer's Name: UNKNOWN
MSDS Serial Number: BYTCH
Specification Number: UNKNOWN
Spec Type, Grade, Class: UNKNOWN
Hazard Characteristic Code: G3
Unit Of Issue: EA
Unit Of Issue Container Qty: 17 L (VENDOR)
Type Of Container: CYLINDER
Net Unit Weight: 0.02 KG
NRC/State License Number: NOT RELEVANT

Ingredients/Identity Information

Proprietary: NO
Ingredient: CARBON MONOXIDE (0 - 200 PPM)
Ingredient Sequence Number: 01
Percent: SEE ING
NIOSH (RTECS) Number: FG3500000
CAS Number: 630-08-0
OSHA PEL: 50 PPM
ACGIH TLV: 25 PPM; 9596
Other Recommended Limit: NONE RECOMMENDED

Proprietary: NO
Ingredient: AIR
Ingredient Sequence Number: 02
Percent: BALANCE
NIOSH (RTECS) Number: AX5275000
OSHA PEL: NOT ESTABLISHED
ACGIH TLV: NOT ESTABLISHED
Other Recommended Limit: NONE RECOMMENDED

Physical/Chemical Characteristics

Appearance And Odor: COLORLESS, ODORLESS COMPRESSED GAS
Boiling Point: -318F, -194C

Melting Point: -318F,-194C
Vapor Pressure (MM Hg/70 F): 13168 @70F
Vapor Density (Air=1): 1.2 KG/M3
Specific Gravity: 0.88
Evaporation Rate And Ref: NOT RELEVANT (GAS)
Solubility In Water: UNKNOWN
Percent Volatiles By Volume: 100
Viscosity: NOT RELEVANT
Radioactivity: NOT RELEVANT

Fire and Explosion Hazard Data

Extinguishing Media: USE WATER FOG, CARBON DIOXIDE, FOAM, OR DRY CHEMICAL FOR SURROUNDING FIRE. AIR CANNOT CATCH FIRE.
Special Fire Fighting Proc: WEAR PROTECTIVE CLOTHING AND NIOSH-APPROVED SELF-CONTAINED BREATHING APPARATUS IF NEEDED. COOL FIRE-EXPOSED CYLINDERS WITH WATER.
Unusual Fire And Expl Hazrds: GAS CYLINDERS MAY RUPTURE OR EXPLODE DUE TO HEAT OF FIRE. THIS GAS IS NON-FLAMMABLE. COMPRESSED AIR AT HIGH PRESSURE WILL ACCELERATE BURNING OF OTHER MATERIALS.

Reactivity Data

Stability: YES
Cond To Avoid (Stability): EXCESSIVE HEAT (TEMPERATURES ABOVE 125F)
Materials To Avoid: NONE
Hazardous Decomp Products: NONE
Hazardous Poly Occur: NO
Conditions To Avoid (Poly): NOT RELEVANT

Health Hazard Data

LD50-LC50 Mixture: NOT RELEVANT
Route Of Entry - Inhalation: YES
Route Of Entry - Skin: NO
Route Of Entry - Ingestion: NO
Health Haz Acute And Chronic: TARGET ORGANS:LUNG. ACUTE- CARBON MONOXIDE IN THESE MIXTURES SHOULD NOT PRESENT ANY SERIOUS TOXICITY. AIR IS NONTOXIC AND IS NECESSARY TO SUPPORT LIFE. CARBON MONOXIDE ACTS AS A CHEMICAL ASPHYXIANT BY REDUCING OXYGEN TRANSPORT PROPERTIES OF BLOOD. IT FORMS CARBOXYHEMOGLOBIN PREVENTING OXYGEN TRANSFER. CHRONIC- UNKNOWN.
Carcinogenicity - NTP: NO
Carcinogenicity - IARC: NO
Carcinogenicity - OSHA: NO
Explanation Carcinogenicity: NONE
Signs/Symptoms Of Overexp: TINGLING OF FINGERS AND TOES, VISUAL DISTURBANCES, ABNORMAL SENSATIONS, IMPAIRED COORDINATION, CONFUSION, MUSCLE TWITCHING
Med Cond Aggravated By Exp: NONE KNOWN OR EXPECTED
Emergency/First Aid Proc: PROMPT MEDICAL ATTENTION IS MANDATORY IN ALL CASES OF OVEREXPOSURE TO CARBON MONOXIDE. CONSCIOUS PERSONS SHOULD BE REMOVED TO AN UNCONTAMINATED AREA AND BE TREATED WITH SUPPLEMENTAL OXYGEN. QUICK REMOVAL FROM CONTAMINATED AREA IS MOST IMPORTANT. ADMINISTRATION OF OXYGEN AT AN ELEVATED PRESSURE (UP TO 2-2.5 ATMOSPHERES) HAS SHOWN TO BE BENEFICIAL AS HAS TREATMENT IN A HYPERBARIC CHAMBER.

Precautions for Safe Handling and Use

Steps If Matl Released/Spill: EVACUATE ALL PERSONNEL FROM AFFECTED AREA. USE APPROPRIATE PROTECTIVE EQUIPMENT. VENTILATE AREA. IF LEAK IS IN CONTAINER OR CONTAINER VALVE, CONTACT THE CLOSEST LIQUID AIR CORPORATION LOCATION.
Neutralizing Agent: NOT RELEVANT
Waste Disposal Method: DISPOSE OF IN ACCORDANCE WITH ALL LOCAL, STATE AND

FEDERAL REGULATIONS. DO NOT ATTEMPT TO DISPOSE OF RESIDUAL OR UNUSED QUANTITIES. RETURN IN THE SHIPPING CONTAINER PROPERLY LABELED, WITH ANY VALVE OR CAPS SECURED TO LIQUID AIR CO FOR PROPER DISPOSAL
Precautions-Handling/Storing: STORE UPRIGHT, IN COOL, DRY AREA BELOW 125F AWAY FROM HEAVILY TRAFFIC AREAS & EMERGENCY EXITS. SECUR CYLINDERS. DO NOT DROP.

Other Precautions: PROTECT CYLINDERS FROM PHYSICAL DAMAGE. DO NOT BREATHE GAS. COMPRESSED GAS CYLINDERS SHOULD NOT BE REFILLED EXCEPT BY QUALIFIED PRODUCERS OF COMPRESSED GASES. NEVER TRANSPORT CYLINDERS IN TRUNK OF VEHICLE, ENCLOSED VANS.

Control Measures

Respiratory Protection: USE WITH ADEQUATE VENTILATION.
Ventilation: ADEQUATE
Protective Gloves: LEATHER RECOMMENDED (HANDLING CYLINDERS)
Eye Protection: SAFETY GLASSES RECOMMENDED
Other Protective Equipment: SAFETY SHOES RECOMMENDED
Work Hygienic Practices: WASH HANDS THOROUGHLY BEFORE EATING OR DRINKING.
Suppl. Safety & Health Data: HEALTH HAZ:INSTEAD OF NORMAL RX W/OXY IN LUNGS TO FORM OXYHEMOGLOBIN.HEMOGLOBIN AFFI FOR CO 200-300X >OXY.ALL DISORDERS DUE TO MARKEDLY REDUCED CELLULAR RESP,INCLUDE CNS IMPAIR, CARDIOVASCULAR COLLAPSE,RENAL INSUFF,COMA,ETC. LIQ DENS:49.23LB/FT3;GAS DENS @70F/1ATM:0.072LB/FT3. PRECAUT:>500PSIG FORMS TOX/CORR CARBONYL GS

Transportation Data

Trans Data Review Date: 96295
DOT PSN Code: DQQ
DOT Proper Shipping Name: COMPRESSED GASES, N.O.S.
DOT Class: 2.2
DOT ID Number: UN1956
DOT Label: NONFLAMMABLE GAS
DOT/DoD Exemption Number: NOT RELEVANT
IMO PSN Code: EQH
IMO Proper Shipping Name: COMPRESSED GAS, N.O.S. o
IMO Regulations Page Number: 2124
IMO UN Number: 1956
IMO UN Class: 2(2.2)
IMO Subsidiary Risk Label: -
IATA PSN Code: HDO
IATA UN ID Number: 1956
IATA Proper Shipping Name: COMPRESSED GAS, N.O.S. *
IATA UN Class: 2.2
IATA Label: NON-FLAMMABLE GAS
AFI PSN Code: HDO
AFI Prop. Shipping Name: COMPRESSED GAS, N.O.S.
AFI Class: 2.2
AFI ID Number: UN1956
AFI Basic Pac Ref: A6.3,A6.5,A6.7
N.O.S. Shipping Name: CARBON MONOXIDE IN AIR
Additional Trans Data: PROPER SHIPPING NAME, UN ID NUMBER PER MSDS. VENDOR CALCULATED GAS WEIGHT: (1.2 KG/1000 LITERS) X 17 LITERS = 0.02 KG.

Disposal Data

Label Data

Label Required: YES
Technical Review Date: 21OCT96
MFR Label Number: UNKNOWN
Label Status: F
Common Name: 0-200 PPM CARBON MONOXIDE IN AIR,81-0230-200 PP-CO

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Signal Word: CAUTION!

Acute Health Hazard-Slight: X

Contact Hazard-None: X

Fire Hazard-None: X

Reactivity Hazard-None: X

Special Hazard Precautions: TARGET ORGANS:LUNG. ACUTE- CARBON MONOXIDE IN THESE MIXTURES SHOULD NOT PRESENT ANY SERIOUS TOXICITY. CARBON MONOXIDE ACTS AS A CHEMICAL ASPHYXIANT. IT FORMS CARBOXYHEMOGLOBIN PREVENTING OXYGEN TRANSFER. CHRONIC- UNKNOWN. STORE UPRIGHT, IN COOL, DRY AREA. IF LEAK IS IN CONTAINER, CONTACT CLOSEST LIQUID AIR CORPORATION LOCATION. FIRST AID- PROMPT MEDICAL ATTENTION IS MANDATORY. CONSCIOUS PERSONS SHOULD BE REMOVED TO AN UNCONTAMINATED AREA & BE TREATED WITH SUPPLEMENTAL OXYGEN. QUICK REMOVAL FROM CONTAMINATED AREA IS MOST IMPORTANT. ADMINISTRATION OF OXYGEN AT AN ELEVATED PRESSURE (UP TO 2-2.5 ATMOSPHERES) HAS SHOWN TO BE BENEFICIAL.

Protect Eye: Y

Protect Skin: Y

Protect Respiratory: Y

Label Name: LIQUID AIR CORP CALIFORNIA PLZ

Label Street: 2121 N CALIFORNIA BLVD

Label City: WALNUT CREEK

Label State: CA

Label Zip Code: 94596

Label Country: US

Label Emergency Number: 415-977-6500

Year Procured: 1996

LIQUID AIR CALIFORNIA PLZ -- 20-50 PPM CARBON MONOXIDE IN AIR - CANISTER,CALIBRATE
MATERIAL SAFETY DATA SHEET
NSN: 4470013628594
Manufacturer's CAGE: 18260
Part No. Indicator: A
Part Number/Trade Name: 20-50 PPM CARBON MONOXIDE IN AIR

General Information

Item Name: CANISTER,CALIBRATED GAS,SPECIAL
Company's Name: LIQUID AIR CORP CALIFORNIA PLZ
Company's Street: 2121 N CALIFORNIA BLVD
Company's City: WALNUT CREEK
Company's State: CA
Company's Country: US
Company's Zip Code: 94596
Company's Emerg Ph #: 415-977-6500
Company's Info Ph #: 415-977-6500 / FAX 415-977-6747
Record No. For Safety Entry: 001
Tot Safety Entries This Stk#: 001
Date MSDS Prepared: 04JUN90
Safety Data Review Date: 13AUG97
Supply Item Manager: HD
MSDS Serial Number: CFCXK
Hazard Characteristic Code: G3

Ingredients/Identity Information

Physical/Chemical Characteristics

Fire and Explosion Hazard Data

Reactivity Data

Health Hazard Data

Health Haz Acute And Chronic: .
Med Cond Aggravated By Exp: .

Precautions for Safe Handling and Use

Steps If Matl Released/Spill: .

Control Measures

Respiratory Protection: .

Transportation Data

Disposal Data

Label Data

LIQUID AIR -- 100 PPM CARBON MONOXIDE IN AIR
MATERIAL SAFETY DATA SHEET
NSN: 683000N058742
Manufacturer's CAGE: 18260
Part No. Indicator: A
Part Number/Trade Name: 100 PPM CARBON MONOXIDE IN AIR

General Information

Company's Name: LIQUID AIR CORP
Company's Street: 2121 NORTH CALIFORNIA BLVD
Company's City: WALNUT CREEK
Company's State: CA
Company's Country: US
Company's Zip Code: 94596
Company's Emerg Ph #: 800-424-9300 (CHEMTREC)
Company's Info Ph #: 415-977-6500
Record No. For Safety Entry: 001
Tot Safety Entries This Stk#: 001
Status: SMJ
Date MSDS Prepared: 01NOV90
Safety Data Review Date: 12APR95
MSDS Serial Number: BXDMC

Ingredients/Identity Information

Proprietary: NO
Ingredient: CARBON MONOXIDE
Ingredient Sequence Number: 01
NIOSH (RTECS) Number: FG3500000
CAS Number: 630-08-0
OSHA PEL: 50 PPM
ACGIH TLV: 25 PPM

Proprietary: NO
Ingredient: AIR, REFRIDGERATED LIQUID; (ATMOSPHERIC AIR)
Ingredient Sequence Number: 02
NIOSH (RTECS) Number: AX5271000
OSHA PEL: N/K (FP N)
ACGIH TLV: N/K (FP N)

Proprietary: NO
Ingredient: SUP DAT: CONNECTING CYLINDER TO LOWER PRESS (

LIQUID AIR -- 20-50 PPM CARBON MONOXIDE IN AIR
MATERIAL SAFETY DATA SHEET
NSN: 6830009737286
Manufacturer's CAGE: 18260
Part No. Indicator: A
Part Number/Trade Name: 20-50 PPM CARBON MONOXIDE IN AIR

General Information

Company's Name: LIQUID AIR CORP
Company's Street: 2121 N CALIFORNIA BLVD, STE 296
Company's City: WALNUT CREEK
Company's State: CA
Company's Country: US
Company's Zip Code: 94596
Company's Emerg Ph #: 415-977-6500
Company's Info Ph #: 415-977-6500
Safety Data Action Code: A
Record No. For Safety Entry: 002
Tot Safety Entries This Stk#: 006
Status: SE
Date MSDS Prepared: 06JUN88
Safety Data Review Date: 27DEC93
Preparer's Company: LIQUID AIR CORP
Preparer's St Or P. O. Box: 2121 N CALIFORNIA BLVD, STE 296
Preparer's City: WALNUT CREEK
Preparer's State: CA
Preparer's Zip Code: 94596
MSDS Serial Number: BBLKR

Ingredients/Identity Information

Proprietary: NO
Ingredient: CARBON MONOXIDE
Ingredient Sequence Number: 01
NIOSH (RTECS) Number: FG3500000
CAS Number: 630-08-0
OSHA PEL: 50 PPM
ACGIH TLV: 25 PPM; 9293
Other Recommended Limit: 50 PPM

Physical/Chemical Characteristics

Appearance And Odor: COLORLESS, ODORLESS GAS
Boiling Point: -317.9F

Fire and Explosion Hazard Data

Special Fire Fighting Proc: NON-FLAMMABLE GAS
Unusual Fire And Expl Hazrds: COMPRESSED AIR AT HIGH PRESSURE WILL
ACCELERATE THE BURNING OF MATERIALS TO A GREATER RATE THAN THEY BURN AT
ATMOSPHERIC PRESSURE.

Reactivity Data

Stability: YES
Cond To Avoid (Stability): TEMPERATURES >130F, HEAT, MOISTURE.
Materials To Avoid: SULFUR DIOXIDE, CHLORINE
Hazardous Decomp Products: METAL OXIDES
Hazardous Poly Occur: NO

Health Hazard Data

Route Of Entry - Inhalation: YES

Route Of Entry - Skin: NO

Route Of Entry - Ingestion: NO

Health Haz Acute And Chronic: INHALATION: HEADACHE, DIZZINESS, HEART PALPITATIONS, WEAKNESS, CONFUSION, NAUSEA, CONVULSIONS, UNCONSCIOUSNESS, & DEATH. THE OXYGEN TRANSPORT FUNCTION OF THE HEMOGLOBIN OF THE BLOOD IS REDUCED, IT REACTS W/INHALED CO TO FORM CARBOXY HEMOGLOBIN INSTEAD OF ITS NORMAL REACTION W/OXYGEN IN LUNGS TO FORM OXYHEMOGLOBIN.

Carcinogenicity - NTP: NO

Carcinogenicity - IARC: NO

Carcinogenicity - OSHA: NO

Explanation Carcinogenicity: NONE

Signs/Symptoms Of Overexp: INHALATION: HEADACHE, DIZZINESS, HEART PALPITATIONS, WEAKNESS, CONFUSION, NAUSEA, CONVULSIONS, UNCONSCIOUSNESS, & DEATH. OXYGEN TRANSPORT FUNCTION OF HEMOGLOBIN OF BLOD IS REDUCED SINCE ITS NORMAL REACTION W/OXYGEN IN LUNGS TO FORM OXYHEMOGLOBIN. CNS IMPAIRMENT, CARDIOVASCULAR COLLAPSE, RENAL INSUFFICIECY, & COMA.

Emergency/First Aid Proc: INHALATION: REMOVE TO FRESH AIR. GIVE CPR OR OXYGEN IF NEEDED. THE ADMINISTERING OF OXYGEN AT AN ELEVATED PRESSURE (UP TO 2-2.5 ATMOSPHERES) HAS SHOWN TO BE BENEFICIAL AS HAS TREATMENT IN A HYPERBARIC CHAMBER. THE PHYSICIAN SHOULD BE INFORMED THAT THE PATIENT HAS INHALED TOXIC QUANTITIES OF CARBON MONOXIDE. OBTAIN MEDICAL ATTENTION IN ALL CASES.

Precautions for Safe Handling and Use

Steps If Matl Released/Spill: EVACUATE ALL PERSONNEL FROM AFFECTED AREA. USE APPROPRIATE PROTECTIVE EQUIPMENT. IF LEAK IS IN CONTAINERS/CONTAINER VALVE, CONTACT THE CLOSEST LIQUID AIR CORPORATION LOCATION.

Waste Disposal Method: DON'T ATTEMPT TO DISPOSE OF RESIDUAL OR UNUSED QUANTITIES. RETURN IN THE SHIPPING CONTAINER PROPERLY LABELED, WITH ANY VALVE OUTLET PLUGS OR CAPS SECURED & VALVE PROTECTION CAP IN PLACE TO LIQUID AIR CORPORATION FOR PROPER DISPOSAL. UN 1956.

Precautions-Handling/Storing: PROTECT CYLINDERS FROM PHYSICAL DAMAGE. STORE UPRIGHT IN COOL, DRY, WELL-VENTILATED AREA OF NON-COMBUSTIBLE CONSTRUCTION & STORE TWA.

Protective Gloves: PLASTIC OR RUBBER

Eye Protection: SAFETY GOGGLES OR GLASSES

Other Protective Equipment: SAFETY SHOES & SHOWER.

Suppl. Safety & Health Data: USE A SUITABLE HAND TRUCK FOR CYLINDER MOVEMENT. USE A PRESSURE REDUCING REGULATOR WHEN CONNECTING CYLINDER TO LOWER PRESSURE PIPING OR SYSTEMS. DON'T HEAT CYLINDER BY ANY MEANS TO INCREASE THE DISCHARGE REATE OF PRODUCT FROM THE CYLINDER. USE A CHECK VALVE OR TRAP IN THE DISCHARGE LINE TO PREVENT HAZARDOUS BACK FLOW.

Transportation Data

Disposal Data

Label Data

LIQUID AIR -- 100 PPM CARBON MONOXIDE
MATERIAL SAFETY DATA SHEET
NSN: 683000N047539
Manufacturer's CAGE: 42568
Part No. Indicator: A
Part Number/Trade Name: 100 PPM CARBON MONOXIDE

General Information

Company's Name: LIQUID AIR CORP
Company's Street: 2121 N CALIFORNIA BLVD
Company's City: WALNUT CREEK
Company's State: CA
Company's Country: US
Company's Zip Code: 94596
Company's Emerg Ph #: 510-977-6500
Company's Info Ph #: 510-977-6500
Record No. For Safety Entry: 001
Tot Safety Entries This Stk#: 002
Status: SMJ
Date MSDS Prepared: 01JAN92
Safety Data Review Date: 15NOV95
MSDS Serial Number: BSWQV
Hazard Characteristic Code: G3

Ingredients/Identity Information

Proprietary: NO
Ingredient: CARBON MONOXIDE; (CO). BP: -311.9F(-191.1C). VP: ABOVE
CRITICAL TEMPERATURE @ 70F. FREEZING: -337.1F(-205.1C)
Ingredient Sequence Number: 01
NIOSH (RTECS) Number: FG3500000
CAS Number: 630-08-0
OSHA PEL: 50 PPM
ACGIH TLV: 25 PPM

Proprietary: NO
Ingredient: PENTANE; (C*5H*12). BOILING PT: 97F (36C). VP: 15 PSIA (103
KPA) @ 100F. FREEZING PT: -201.5F(-129.7)
Ingredient Sequence Number: 02
NIOSH (RTECS) Number: RZ9450000
CAS Number: 109-66-0
OSHA PEL: 1000 PPM;750 STEL
ACGIH TLV: 600 PPM;750 STEL

Proprietary: NO
Ingredient: OXYGEN; (O*2). BP: -297.3F(-182.9C). VP: ABOVE CRITICAL TEMP
@70F. FREEZING PT: -361.8F(-218.8C)
Ingredient Sequence Number: 03
NIOSH (RTECS) Number: RS2060000
CAS Number: 7782-44-7
OSHA PEL: N/K (FP N)
ACGIH TLV: N/K (FP N)

Proprietary: NO
Ingredient: NITROGEN; (N*2). BOILING PT: -320.5F(-195.8C). VP: ABOVE
CRITICAL TEMP @ 70F. FREEZING PT: -345.9F (-209.9C)
Ingredient Sequence Number: 04
NIOSH (RTECS) Number: QW9700000
CAS Number: 7727-37-9
OSHA PEL: N/K (FP N)
ACGIH TLV: ASPHYXIAN

Proprietary: NO
Ingredient: SUPP DATA: USED W/ALL MATLS OF CONSTUCTION. MOISTURE CAUSES METAL OXIDES WHICH ARE FORMED W/AIR TO BE HYDRATED (ING 6)
Ingredient Sequence Number: 05
NIOSH (RTECS) Number: 9999999ZZ
OSHA PEL: NOT APPLICABLE
ACGIH TLV: NOT APPLICABLE

Proprietary: NO
Ingredient: ING 5:SO THAT THEY INCREASE IN VOLUME AND LOSE THEIR PROTECTIVE ROLE (RUST FORMATION). CONCS OF SO*2, CL*2, SALT, (ING 7)
Ingredient Sequence Number: 06
NIOSH (RTECS) Number: 9999999ZZ
OSHA PEL: NOT APPLICABLE
ACGIH TLV: NOT APPLICABLE

Proprietary: NO
Ingredient: ING 6: ETC IN THE MOISTURE ENHANCES THE RUSTING OF METALS IN AIR. DOT 39 CYLINDERS MAY NOT BE REUSED OR REFILLED (ING 8)
Ingredient Sequence Number: 07
NIOSH (RTECS) Number: 9999999ZZ
OSHA PEL: NOT APPLICABLE
ACGIH TLV: NOT APPLICABLE

Proprietary: NO
Ingredient: ING 7: (49 CFR). NEVER TRANSPORT THESE CYLINDERS IN TRUNKS OF VEHICLES, ENCLOSED VANS, TRUCK CABS OR IN PASSENGER(ING 9)
Ingredient Sequence Number: 08
NIOSH (RTECS) Number: 9999999ZZ
OSHA PEL: NOT APPLICABLE
ACGIH TLV: NOT APPLICABLE

Proprietary: NO
Ingredient: ING 8: COMPARTMENTS. TRANSPORT THEM "CONTAINED" IN OPEN FLATBED OR OPEN PICK-UP TYPE VEHICLES.
Ingredient Sequence Number: 09
NIOSH (RTECS) Number: 9999999ZZ
OSHA PEL: NOT APPLICABLE
ACGIH TLV: NOT APPLICABLE

Physical/Chemical Characteristics

Appearance And Odor: COLORLESS GAS W/VERY SLIGHT PARAFFINIC ODOR.
Boiling Point: SEE INGS
Vapor Pressure (MM Hg/70 F): SEE INGS
Specific Gravity: 1.0 (AIR=1)
Solubility In Water: VERY SLIGHTLY

Fire and Explosion Hazard Data

Flash Point: NOT APPLICABLE
Lower Explosive Limit: N/A
Upper Explosive Limit: N/A
Extinguishing Media: NONFLAMMABLE GAS MIXTURE. EXTINGUISHING MEDIA SUITABLE FOR SURROUNDING FIRE (FP N).
Special Fire Fighting Proc: IF CYLINDERS ARE INVOLVED IN A FIRE, SAFELY RELOCATE OR KEEP COOL W/WATER SPRAY. WEAR NIOSH/MSHA APPROVED SCBA AND FULL PROTECTIVE EQUIPMENT (FP N).
Unusual Fire And Expl Hazrds: THIS MIXTURE AT HIGH PRESSURES WILL ACCELERATE THE BURNING OF MATERIALS TO A GREATER RATE THAN THEY BURN AT ATMOSPHERIC PRESSURE.

Reactivity Data

Stability: YES
Cond To Avoid (Stability): NOT APPLICABLE
Materials To Avoid: NONE
Hazardous Decomp Products: NONE
Hazardous Poly Occur: NO
Conditions To Avoid (Poly): NOT RELEVANT

Health Hazard Data

LD50-LC50 Mixture: NONE SPECIFIED BY MANUFACTURER.
Route Of Entry - Inhalation: YES
Route Of Entry - Skin: NO
Route Of Entry - Ingestion: YES
Health Haz Acute And Chronic: THIS MIXTURE SHOULD BE CONSIDERED SIMILAR TO AIR AND WOULD THEREFORE CAUSE NO SYMPTOMS OF EXPOSURE.
Carcinogenicity - NTP: NO
Carcinogenicity - IARC: NO
Carcinogenicity - OSHA: NO
Explanation Carcinogenicity: NOT RELEVANT
Signs/Symptoms Of Overexp: SEE HEALTH HAZARDS.
Med Cond Aggravated By Exp: NONE SPECIFIED BY MANUFACTURER.
Emergency/First Aid Proc: EYE: IMMEDIATELY FLUSH WITH POTABLE WATER FOR AT LEAST 15 MIN. SEEK ASSISTANCE FROM MD (FP N). SKIN: FLUSH WITH COPIOUS AMOUNTS OF WATER. CALL MD (FP N). INHAL: REMOVE TO FRESH AIR. SUPPORT BREATHING (GIVE O₂/ARTF RESP) (FP N). INGEST: GET MD IMMEDIATELY (FP N).

Precautions for Safe Handling and Use

Steps If Matl Released/Spill: NOT APPLICABLE
Neutralizing Agent: NONE SPECIFIED BY MANUFACTURER.
Waste Disposal Method: DISPOSAL MUST BE IN ACCORDANCE WITH FEDERAL, STATE AND LOCAL REGULATIONS (FP N).
Precautions-Handling/Storing: USE A PRESSURE REDUCING REGULATOR WHEN CONNECTING CYLINDER TO LOW PRESSURE (

LIQUID AIR -- 100 PPM ISOBUTYLENE IN AIR
MATERIAL SAFETY DATA SHEET
NSN: 683000N074507
Manufacturer's CAGE: 18260
Part No. Indicator: A
Part Number/Trade Name: 100 PPM ISOBUTYLENE IN AIR

General Information

Company's Name: LIQUID AIR CORP
Company's Street: 2121 NORTH CALIFORNIA BLVD
Company's City: WALNUT CREEK
Company's State: CA
Company's Country: US
Company's Zip Code: 94596
Company's Emerg Ph #: 800-231-1366;800-424-9300 (CHEMTREC)
Company's Info Ph #: 800-231-1366
Record No. For Safety Entry: 001
Tot Safety Entries This Stk#: 001
Status: SMJ
Date MSDS Prepared: 04JUN90
Safety Data Review Date: 25FEB97
MSDS Serial Number: CDMVG

Ingredients/Identity Information

Proprietary: NO
Ingredient: PROPENE, 2-METHYL-; (ISOBUTYLENE)
Ingredient Sequence Number: 01
NIOSH (RTECS) Number: UD0890000
CAS Number: 115-11-7
OSHA PEL: N/K (FP N)
ACGIH TLV: N/K (FP N)

Proprietary: NO
Ingredient: AIR
Ingredient Sequence Number: 02
NIOSH (RTECS) Number: 1005486AI
OSHA PEL: N/K (FP N)
ACGIH TLV: N/K (FP N)

Proprietary: NO
Ingredient: SUP DAT: DO NOT ALLOW TEMP WHERE CYLS ARE STORED TO EXCEED 130F (54C). CYLS SHOULD BE STORED UPRIGHT & FIRMLY (ING 4)
Ingredient Sequence Number: 03
NIOSH (RTECS) Number: 9999999ZZ
OSHA PEL: NOT APPLICABLE
ACGIH TLV: NOT APPLICABLE

Proprietary: NO
Ingredient: ING 3: SECURED TO PVNT FALLING/BEING KNOCKED OVER. FULL & EMPTY CYLS SHOULD BE SEGREGATED. USE A "FIRST IN-FIRST (ING 5)
Ingredient Sequence Number: 04
NIOSH (RTECS) Number: 9999999ZZ
OSHA PEL: NOT APPLICABLE
ACGIH TLV: NOT APPLICABLE

Proprietary: NO
Ingredient: ING 4: OUT" INVENTORY SYS TO PVNT FULL CYLS BEING STORED FOR EXCESS PERIODS OF TIME. IF THIS MIX IS DRY IT IS (ING 6)
Ingredient Sequence Number: 05
NIOSH (RTECS) Number: 9999999ZZ
OSHA PEL: NOT APPLICABLE

ACGIH TLV: NOT APPLICABLE

Proprietary: NO

Ingredient: ING 5: NON-CORR & MAY BE USED W/ALL MATLS OF CONSTRUCTION.
MOISTURE CAUSES METAL OXIDES WHICH ARE FORMED W/AIR (ING 7)

Ingredient Sequence Number: 06

NIOSH (RTECS) Number: 9999999ZZ

OSHA PEL: NOT APPLICABLE

ACGIH TLV: NOT APPLICABLE

Proprietary: NO

Ingredient: ING 6: TO BE HYDRATED SO THAT THEY INCREASE IN VOL & LOSE
THEIR PROT ROLE (RUST FORM). CONCS OF SO*2, CL*2, (ING 8)

Ingredient Sequence Number: 07

NIOSH (RTECS) Number: 9999999ZZ

OSHA PEL: NOT APPLICABLE

ACGIH TLV: NOT APPLICABLE

Proprietary: NO

Ingredient: ING 7: SALT, ETC, IN THE MOISTURE ENHANCES THE RUSTING OF
METALS IN THIS MIX. COMPRESSED GAS CYLS SHOULD NOT BE (ING 9)

Ingredient Sequence Number: 08

NIOSH (RTECS) Number: 9999999ZZ

OSHA PEL: NOT APPLICABLE

ACGIH TLV: NOT APPLICABLE

Proprietary: NO

Ingredient: ING 8: REFILLED EXCEPT BY QUALIFIED PRODUCERS OF COMPRESSED
GASES. SHIPMENT OF A COMPRESSED GAS CYL WHICH HAS (ING 10)

Ingredient Sequence Number: 09

NIOSH (RTECS) Number: 9999999ZZ

OSHA PEL: NOT APPLICABLE

ACGIH TLV: NOT APPLICABLE

Proprietary: NO

Ingredient: ING 9: NOT BEEN FILLED BY THE OWNER/WITH HIS (WRITTEN) CONSENT
IS A VIOLATION OF FED LAW (49 CFR). ALWAYS (ING 11)

Ingredient Sequence Number: 10

NIOSH (RTECS) Number: 9999999ZZ

OSHA PEL: NOT APPLICABLE

ACGIH TLV: NOT APPLICABLE

Proprietary: NO

Ingredient: ING 10: SECURE CYLS IN AN UPRIGHT POSITION BEFORE TRANSPORTING
THEM. NEVER TRANSPORT CYLS IN TRUNKS OF (ING 12)

Ingredient Sequence Number: 11

NIOSH (RTECS) Number: 9999999ZZ

OSHA PEL: NOT APPLICABLE

ACGIH TLV: NOT APPLICABLE

Proprietary: NO

Ingredient: ING 11: VEHICLES, ENCLOSED VANS, TRUCK CABS/IN PASSENGER
COMPARTMENTS. TRANSPORT CYLINDERS SECURED IN OPEN (ING 13)

Ingredient Sequence Number: 12

NIOSH (RTECS) Number: 9999999ZZ

OSHA PEL: NOT APPLICABLE

ACGIH TLV: NOT APPLICABLE

Proprietary: NO

Ingredient: ING 12: FLATBED OR IN OPEN PICK-UP TYPE VEHICLES.

Ingredient Sequence Number: 13

NIOSH (RTECS) Number: 9999999ZZ

OSHA PEL: NOT APPLICABLE

ACGIH TLV: NOT APPLICABLE

Physical/Chemical Characteristics

Appearance And Odor: COLORLESS GAS WITH POSSIBLE VERY SLIGHT OLEFINIC ODOR
Boiling Point: -318F, -194C
Solubility In Water: SUP DAT

Fire and Explosion Hazard Data

Flash Point: N/A
Lower Explosive Limit: N/A
Upper Explosive Limit: N/A
Extinguishing Media: NON-FLAMMABLE GAS. USE MEDIA SUITABLE FOR SURROUNDING FIRE (FP N).
Special Fire Fighting Proc: WEAR NIOSH APPROVED SCBA & FULL PROTECTIVE EQUIPMENT (FP N).
Unusual Fire And Expl Hazrds: COMPRESSED AIR AT HIGH PRESSURES WILL ACCELERATE THE BURNING OF MATERIALS TO A GREATER RATE THAN THEY BURN AT ATMOSPHERIC PRESSURE.

Reactivity Data

Stability: YES
Cond To Avoid (Stability): NONE SPECIFIED BY MANUFACTURER.
Materials To Avoid: NONE.
Hazardous Decomp Products: NONE.
Hazardous Poly Occur: NO
Conditions To Avoid (Poly): NOT RELEVANT.

Health Hazard Data

LD50-LC50 Mixture: NONE SPECIFIED BY MANUFACTURER.
Route Of Entry - Inhalation: YES
Route Of Entry - Skin: YES
Route Of Entry - Ingestion: YES
Health Haz Acute And Chronic: ACUTE: THE AMT OF ISO-BUTYLENE IN THIS MIX SHOULD NOT PRESENT ANY SYMPS OF TOX IF THIS MIX IS BREATHED. AIR IS NON-TOX & NEC TO SUPPORT LIFE. INHAL OF AIR IN A HIGH PRESS ENVIRON SUCH AS UNDERWATER DIVING, CAISSONS/HYPERBARIC CHAMBERS CAN RSLT IN SYMPS SIMILAR TO OVEREXP TO PURE OXYGEN. THESE INCL (EFTS OF OVEREXP)
Carcinogenicity - NTP: NO
Carcinogenicity - IARC: NO
Carcinogenicity - OSHA: NO
Explanation Carcinogenicity: NOT RELEVANT.
Signs/Symptoms Of Overexp: HLTH HAZ: TINGLING OF FINGERS & TOES, ABNORMAL SENSATIONS, IMPAIRED COORD & CONFUSION. DECOMPRESSION SICKNESS PAINS OR "BENDS" ARE POSS FOLLOWING RAPID DECOMPRESSION. TOX PROPERTIES: HIGH PRESS EFTS (GREATER THAN 2 ATM OF OXYGEN) ARE ON CNS. IMPROPER DECOMPRESSION RESULTS IN THE ACCUMULATION OF NITROGEN IN THE BLOOD.
Med Cond Aggravated By Exp: NONE SPECIFIED BY MANUFACTURER.
Emergency/First Aid Proc: FACILITIES/PRACT AT WHICH AIR IS BREATHED IN HIGH PRESS ENVIRON SHOULD BE PREPARED TO DEAL W/ILLNESSES ASSOC W/ DECOMPRESSION (BENDS/CAISSON DISEASE). DECOMPRESSION EQUIP MAY BE REQUIRED. EYE: FLUSH W/POTABLE WATER FOR AT LEAST 15 MIN. SEE MD(FP N). SKIN: FLUSH W/ COPIOUS AMTS OF WATER. SEE MD(FP N). INHAL: REMOVE TO FRESH AIR. SUPPORT BRTHG (GIVE OXYGEN/ARTF RESP) (FP N). INGEST: CALL MD IMMED(FP N).

Precautions for Safe Handling and Use

Steps If Matl Released/Spill: NONE SPECIFIED BY MANUFACTURER.
Neutralizing Agent: NONE SPECIFIED BY MANUFACTURER.
Waste Disposal Method: DISPOSE OF IN ACCORDANCE WITH LOCAL, STATE AND FEDERAL REGULATIONS (FP N).
Precautions-Handling/Storing: VALVE PROT CAPS MUST REMAIN IN PLACE UNLESS

CONTR IS SECURED W/VALVE OUTLET PIPED TO USE POINT. DO NOT DRAG, SLIDE/ROLL CYLINDERS.

Other Precautions: USE SUITABLE HAND TRUCK FOR CYL MOVEMENT. USE PRESS REDUCING REGULATOR WHEN CONNECTING CYL TO LOWER PRESS (

APPENDIX G
SNAKEBITE PROCEDURES

SNAKE BITE TREATMENT

1. Keep the victim quiet and keep the involved extremity immobile. Keep the involved area below the level of the victim's heart.
2. Apply a loose fitting tourniquet, no tighter than a rubber band, about 2 - 4 inches *above* the bite. Do not make the tourniquet tight enough to close off the blood supply to the deep blood vessels of the extremity or to produce a "throbbing" sensation in the extremity. You should be able to slip your index finger under the tourniquet.
3. Apply ice to the involved extremity or an ice pack over the bite if it is on the body. (Do not crush ice).
4. Advise the crew supervisor so that the victim may be transported *immediately* to the nearest medical care office/clinic. Alert state police or highway patrol so they may clear the way for you if necessary.
5. DO NOT MAKE A CUT OVER THE BITE. This is an unnecessary and possibly dangerous procedure.
6. Use no stimulants, including ammonia and/or alcoholic beverages, on the victim. Stimulants may increase the heart rate, thereby causing increased flow of blood and possibly quickening the spread of the venom.

APPENDIX H
HOT WORK PROCEDURE AND PERMIT



TETRA TECH, INC.
HEALTH AND SAFETY MANUAL
VOLUME III

SAFE WORK PRACTICES (SWP)

HOT WORK PRACTICES

SWP NO.: 6-6

ISSUE DATE: JULY 1998

REVISION NO.: 1

Disclaimer: This safe work practice (SWP) is the property of Tetra Tech, Inc. (Tetra Tech), and its subsidiaries. Any reuse of the SWP without Tetra Tech's permission is at the sole risk of the user. The user will hold harmless Tetra Tech for any damages that result from unauthorized reuse of this SWP. Authorized users are responsible for obtaining proper training and qualification from their employer before performing operations described in this SWP.

hot_work_procedures (swp 6-6).doc

HOT WORK PRACTICES

This safe work practice (SWP) documents procedures to protect employees and prevent combustible materials from exposure to fire, sparks, hot metal, or any other source of ignition whenever hot work is performed outside of a designated safe hot work area. Definitions, responsibilities, hot work requirements, and hot work in confined spaces are discussed below. This SWP also addresses Occupational Safety and Health Administration (OSHA) requirements specified in Title 29 of the *Code of Federal Regulations* (CFR) 1910.252 for fire prevention and protection during welding, cutting, and brazing.

1.0 DEFINITIONS

Designated Safe Hot Work Area: An area that has been designed and constructed specifically for performing open-flame or spark-producing work (for example, maintenance shops are designated safe hot work areas)

Fire watch: At least one individual dedicated solely to the look out and control of stray fires; the fire watch shall remain in a location that allows immediate communication with the individual(s) performing hot work; the fire watch shall also remain in the work area after work is completed to ensure the risk of fire from hot work has passed (at a minimum, this period will last at least 0.5 hour)

Hot Work: Work using an open-flame or spark-producing apparatus; hot work includes, but is not limited to, welding, cutting, burning, grinding, and related heat-producing jobs that could ignite combustible materials or flammable atmospheres

2.0 RESPONSIBILITIES

The project manager must issue hot work permits, ensure that employees are trained in hot work requirements, and ensure that contract personnel meet requirements detailed in this SWP. Hot work shall not begin until the project manager can ensure and document in the site logbook the following:

- People and combustible materials will not be exposed to fire, sparks, or any other source of ignition.

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- Emergency response procedures are in place.
- The work area is safe.

The site safety coordinator (SSC), working under the authority of the project manager, is responsible for on-site compliance with hot work requirements including completion of hot work permits. Tetra Tech health and safety specialists are available to assist in site-specific procedure development. The SSC should periodically evaluate the effectiveness and integrity of site-specific hot work procedures.

The fire watch shall attend all hot work performed in circumstances where a fire might develop. These circumstances exist when one or more of the following is true:

- An appreciable amount of combustible material that can be easily ignited (including material such as the building structure or other materials) is within 35 feet of the hot work area
- Wall or floor openings exist within a 35-foot-radius of the hot work area that expose combustible materials in adjacent areas; openings include concealed spaces in walls or floors
- Combustible materials likely to be ignited by conduction or radiation are near the other side of hot work areas near the metal partitions, walls, ceilings, or roofs

The fire watch shall also ensure that the appropriate extinguishing equipment is readily available and be trained in its use. The type of hot work procedures performed shall determine equipment required. At a minimum, an extinguisher rated at 2A:40BC shall be provided. Depending on the amount of combustible materials in the area and the location of the hot work, a hose with a stream diameter of up to 1.5 inches may be required. A Tetra Tech health and safety specialist should be consulted for assistance with fire extinguisher selection.

The fire watch shall be familiar with the equipment for sounding an alarm in the event of a fire and watch for fires in all exposed areas. Personnel should not try to extinguish fires unless the fire is extinguishable given the capacity of the equipment available. In the event of fire beyond the extinguisher's capacity, the fire watch shall summon aid.

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3.0 HOT WORK REQUIREMENTS

The following minimum requirements apply at sites where hot work will be performed:

- A hot work permit shall be completed to authorize hot work performed outside of designated safe hot work areas. Hot work may not begin until a permit has been obtained. Form HW-1 in Volume III, "Hot Work Permit," is suitable for most work.
- Combustible materials, including ordinary combustible materials, and flammable and combustible liquids should be relocated at least 35 feet from the hot work area. If relocation is impractical, combustibles shall be protected with flame-proof covers or shielded with metal or flame-proof curtains.
- The hot work permit should specify the concentrations of vapors and gases in areas as applicable.
- If flammable vapors or gases are present but their levels do not exceed 10 percent of the lower explosive limit (LEL), hot work should not be started until the person approving the permit
 - Knows the source of the flammable gases or vapors and
 - Determines that their concentration will not increase while the hot work is in progress.
- Hot work should not be performed if the concentration of flammable gases or vapors exceeds 10 percent of the LEL.
- Lower areas should be roped off when hot work is performed overhead. Warning signs must then be posted to prevent combustible materials and personnel from entering the lower areas.
- Barriers should be placed around and under hot work areas to confine sparks unless this action is physically impossible.
- Open drains leading to underground systems that may contain flammable or combustible materials should be protected by the following:
 - The atmosphere should be tested for flammable vapors before a permit is issued and
 - The open drain should be covered with a fire blanket or similar protective shield to prevent the entry of sparks, even if a safe atmosphere currently exists.

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4.0 HOT WORK IN CONFINED SPACES

When performing hot work in confined spaces, employees shall comply with the Confined Space Entry Program (see Document Control No. 2-5 in Volume D). In addition, employees shall do the following:

- Keep all gas cylinders and welding machines outside of confined spaces
- Positively isolate the gas supply outside the confined space when torches are not in use for a substantial period of time (such as during a lunch break); when practical, employees shall also remove torches and hoses from confined spaces
- De-energize electrode holders by electrically disconnecting the power supply when arc welding is to be suspended for an appreciable amount of time or the welder has occasion to leave work
- Use insulating mats or similar insulating equipment to protect welders using alternating current equipment over 50 volts from electrical contact with conductive materials
- Ensure that available ventilation in the confined space meets the ventilation requirements set forth in 29 CFR 1910.252(c).

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**TETRA TECH, INC.
HOT WORK PERMIT**

(for electric or gas welding and cutting operations)

Project Name: _____ Project No.: _____

Date: _____ Completed by: _____

Work Location: _____

Work to be Performed: _____

Hazard Assessment

Are combustible materials within 35 feet of operations? Yes No

Are open grates or cracks in floor, walls, or windows? Yes No

Are lower areas protected from overhead work? Yes No

Note: Confined space work must follow confined space entry procedures established in Document Control No. 2-5 of the Tetra Tech, Inc., Health and Safety Manual.

Fire Prevention and Response

Spark Containment Method: _____

Fire Extinguisher Size and Type: _____

Location of Nearest Telephone: _____

Emergency Telephone Numbers: _____

Location of Emergency Alarm: _____

Note: Fire watch must continue for at least 0.5 hour after completion of hot work.

Monitoring

Potential Contaminants: _____

Monitoring Instruments: _____

Sign-Offs

Fire Watch (signature)

Lead Hot Work Employee (signature)

APPENDIX I
EMERGENCY CONTACTS AND DIRECTIONS TO HOSPITAL

APPENDIX I

EMERGENCY CONTACTS Groundwater Investigation - Eastern Landfill Fort Wingate Depot Activity Gallup, New Mexico

Organization	Contact	Telephone
Ambulance	Medstar (Private) Ambulance	(505) 722-7746
Hospital	Rehoboth McKinley Christian Hospital – Gallup, NM	(505) 863-7000 (General) (505) 863-7141 (ER)
Police	City of Gallup NM State Police - Gallup	(505) 863-9365 (505) 863-9353
FWDA-Fire/Security	Duke Davis - Caretaker	(505) 488-5411
TtNUS Project Manager	Michael Meenan, P.E.	(713) 647-8324 ext. 214
TtNUS Senior CIH	Matt Soltis	(412) 921-7090
TtNUS On-site Supervisor / Safety Officer	Larry Basilio	(713) 647-8324 ext. 201
COE Engineering Manager	Roxanne Welch	(817) 886-1880
COE Technical Coordinator	Beverly Post	(817) 886-1884
Corps of Engineers Safety Office		(817)-886-1316
Poison Control Center		(800) 522-4611
National Response Center		(800) 424-8802
Centers for Disease Control		(404) 488-4100
CHEMTREC		(800) 424-9300
Bureau of Explosives		(202) 835-9500
RCRA Hotline		(800) 424-9346
USEPA Region VI (Dallas, Texas)	Charles Hendrickson	(214) 665-2196
State of New Mexico – Environmental Department	Environmental Response Center	(800) 879-3421

APPENDIX I

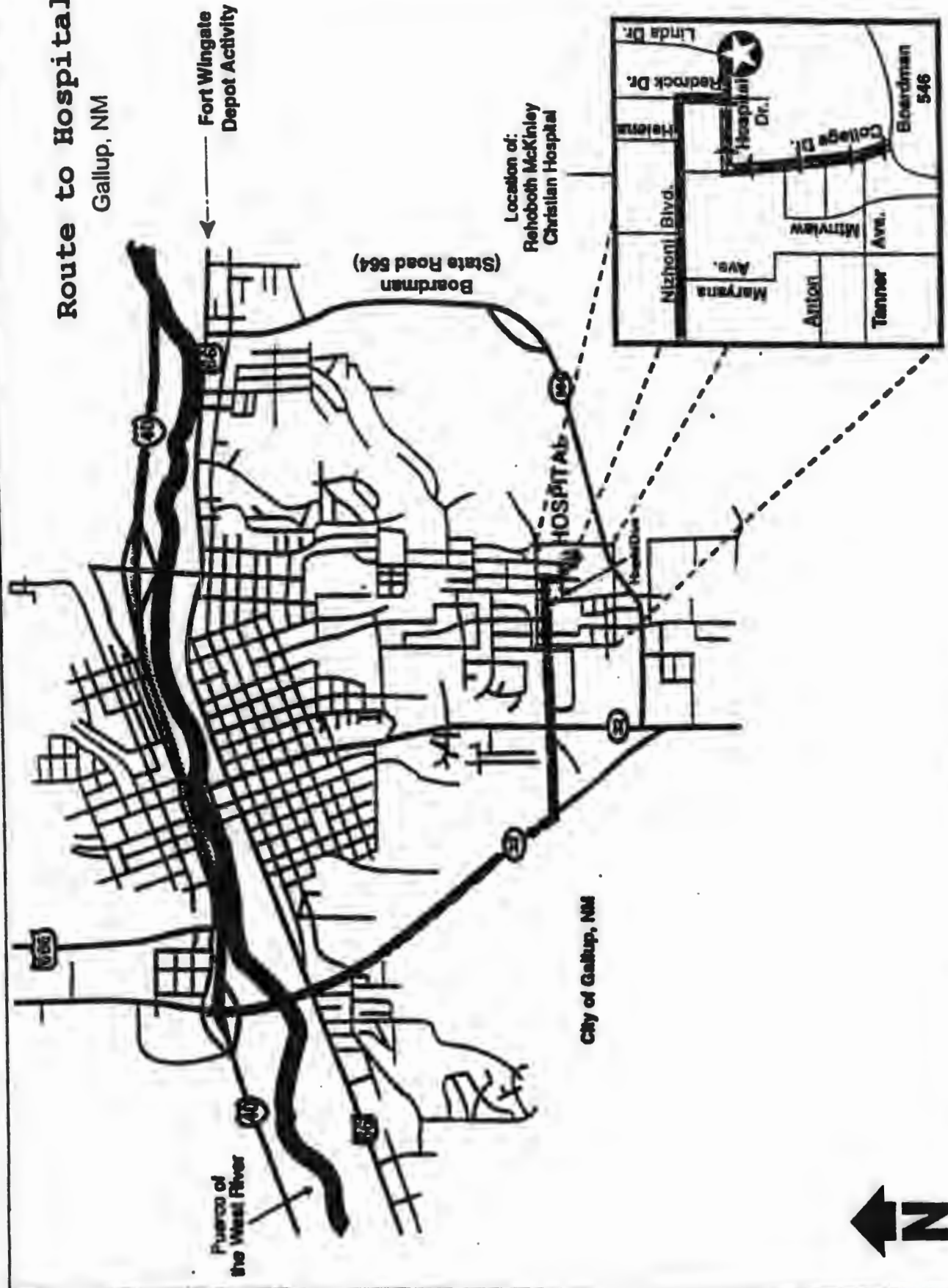
DIRECTIONS TO HOSPITAL FROM FORT WINGATE DEPOT ACTIVITY, GALLUP, NEW MEXICO

The local hospital is the Rehoboth McKinley Christian Hospital located at 1901 Redrock Drive in the nearby city of Gallup. The route to the hospital from the installation is as follows:

- Depart Fort Wingate through the main entrance (north) and turn left (west) onto Service Road, U.S. Route 66.
- Continue on Route 66 (traveling west) into the city of Gallup to Boardman.
- Once in Gallup turn left (south) onto Boardman which is also State Road 564.
- Proceed on Boardman (south/southwest) to College Drive (first stop sign).
- Turn right (north) onto College Drive and proceed on College Drive to Hospital Drive.
- Turn right (east) on Hospital Drive and travel to Redrock Drive (next stop sign).
- Turn right (south) onto Redrock Drive and proceed approximately one block to the hospital's emergency entrance located on the left side of the street.

The approximate driving distance from the installation to the hospital is 25 miles.

Route to Hospital Gallup, NM



Location of:
Rehoboth McKinley
Christian Hospital

City of Gallup, NM



APPENDIX J
ACCIDENT REPORTING FORMS



TETRA TECH, INC.

ACCIDENT AND ILLNESS INVESTIGATION REPORT

To: _____
Subsidiary Health and Safety Representative

Prepared by: _____

Cc: _____
Workers Compensation Administrator

Position: _____

Project name: _____

Office: _____

Project number: _____

Telephone number: _____

Fax number: _____

Information Regarding Injured or Ill Employee

Name: _____

Office: _____

Home address: _____

Gender: M F No. of dependents: _____

Home telephone number: _____

Marital status: _____

Occupation (regular job title): _____

Date of birth: _____

Social Security Number: _____

Department: _____

Date of Accident: _____

Time of Accident: _____ a.m. p.m.

Time Employee Began Work: _____

Check if time cannot be determined

Location of Accident

Street address: _____

City, state, and zip code: _____

County: _____

Was place of accident or exposure on employer's premises? Yes No

Information About the Case

What was the employee doing just before the incident occurred?: Describe the activity, as well as the tools, equipment, or material the employee was using. Be specific. Examples: "climbing a ladder while carrying roofing materials"; "spraying chlorine from hand sprayer"; "daily computer key-entry."

What Happened?: Describe how the injury occurred. Examples: "When ladder slipped on wet floor, worker fell 20 feet"; "Worker was sprayed with chlorine when gasket broke during replacement"; "Worker developed soreness in wrist over time."

This form contains information relating to employee health and must be used in a manner that protects the confidentiality of the employee to the extent possible while the information is being used for occupational safety and health purposes.



TETRA TECH, INC.

ACCIDENT AND ILLNESS INVESTIGATION REPORT (Continued)

Information About the Case (Continued)

What was the injury or illness? Describe the part of the body that was affected and how it was affected; be more specific than "hurt," "pain," or "sore." Examples "strained back"; "chemical burn, right hand"; "carpal tunnel syndrome, left wrist."

Describe the Object or Substance which Directly Harmed the Employee: Examples: "concrete floor"; "chlorine"; "radial arm saw." If this question does not apply to the incident, enter a NA.

Did the employee die? Yes [] No [] Date of death: _____

Was employee performing regular job duties? Yes [] No []

Was safety equipment provided? Yes [] No [] Was safety equipment used? Yes [] No []

Note: Attach any police reports or related diagrams to this accident report.

Witness(es):

Name: _____

Company: _____

Street address: _____

City: _____ State: _____ Zip code: _____

Telephone number: _____

Name: _____

Company: _____

Street address: _____

City: _____ State: _____ Zip code: _____

Telephone number: _____

Medical Treatment Required? [] Yes [] No [] First Aid only

Name of physician or health care professional: _____

If treatment was provided away from the work-site, where was it given?

Facility name: _____

Street address: _____

City: _____ State: _____ Zip code: _____

Telephone number: _____

Was the employee treated in an emergency room? [] Yes [] No

Was the employee hospitalized overnight as an in-patient? [] Yes [] No

This form contains information relating to employee health and must be used in a manner that protects the confidentiality of the employee to the extent possible while the information is being used for occupational safety and health purposes.



TETRA TECH, INC.

ACCIDENT AND ILLNESS INVESTIGATION REPORT (Continued)

Corrective Action(s) Taken by Unit Reporting the Accident:

Corrective Action Still to be Taken (by whom and when):

Name of Tetra Tech employee the injury or illness was first reported to: _____

Date of Report: _____ Time of Report: _____

I have reviewed this investigation report and agree, to the best of my recollection, with its contents.

Printed Name of Injured Employee _____

Telephone Number _____

Signature of Injured Employee _____

Date _____

The signatures provided below indicate that appropriate personnel have been notified of the incident.

Title	Printed Name	Signature	Telephone Number	Date
Project or Office Manager				
Site Safety Coordinator				

This form contains information relating to employee health and must be used in a manner that protects the confidentiality of the employee to the extent possible while the information is being used for occupational safety and health purposes.



TETRA TECH, INC.

ACCIDENT AND ILLNESS INVESTIGATION REPORT (Continued)

To be completed by the Subsidiary Safety and Health Representative:

Classification of Incident:

Injury Illness

Result of Incident:

- First Aid Only
- Days Away From Work
- Remained at Work but Incident Resulted in Job Transfer or Work Restriction
- Incident Involved Days Away and Job Transfer or Work Restriction
- Medical Treatment Only

No. of Days Away From Work _____

Date Employee Left Work _____

Date Employee Returned to Work _____

No. of Days Placed on Restriction or Job Transfer: _____

OSHA Recordable Case Number _____

To be completed by Human Resources:

SSN: _____

Date of hire: _____ Hire date in current job: _____

Wage information: \$ _____ per Hour Day Week Month

Position at time of hire: _____

Current position: _____ Shift hours: _____

State in which employee was hired: _____

Status: Full-time Part-time Hours per week: _____ Days per week: _____

Temporary job end date: _____

To be completed during report to workers' compensation carrier:

Date reported: _____ Reported by: _____

Confirmation number: _____

Name of contact: _____

Field office of claims adjuster: _____

This form contains information relating to employee health and must be used in a manner that protects the confidentiality of the employee to the extent possible while the information is being used for occupational safety and health purposes.

Send the specified copies to your
Workers' Compensation Insurance Carrier
 and the injured employee.
***Employers - Do not send this form to the
 Texas Workers' Compensation Commission,
 unless the Commission specifically requests a direct
 filing.**

TWCC CLAIM # _____

CARRIER'S CLAIM # _____

EMPLOYER'S FIRST REPORT OF INJURY OR ILLNESS

1. Name (Last, First, M.I.)		2. Sex F <input type="checkbox"/> M <input type="checkbox"/>		15. Date of Injury (m-d-y) - -	16. Time of Injury : am <input type="checkbox"/> pm <input type="checkbox"/>	17. Date Lost Time Began (m-d-y) - -	
3. Social Security Number - -	4. Home Phone ()	5. Date of Birth (m-d-y) - -		18. Nature of Injury*		19. Part of Body Injured or Exposed*	
6. Does the Employee Speak English? If No, Specify Language YES <input type="checkbox"/> NO <input type="checkbox"/>				20. How and Why Injury/Illness Occurred*			
7. Race White <input type="checkbox"/> Black <input type="checkbox"/> Asian <input type="checkbox"/>		8. Ethnicity Hispanic <input type="checkbox"/> Native American <input type="checkbox"/> Other <input type="checkbox"/>		21. Was employee doing his regular job? YES <input type="checkbox"/> NO <input type="checkbox"/>		22. Worksite Location of Injury (stairs, dock, etc.)*	
9. Mailing Address Street or P.O. Box City State Zip Code County				23. Address Where Injury or Exposure Occurred Name of business if incident occurred on a business site Street or P.O. Box County City State Zip Code			
10. Marital Status Married <input type="checkbox"/> Widowed <input type="checkbox"/> Separated <input type="checkbox"/> Single <input type="checkbox"/> Divorced <input type="checkbox"/>				24. Cause of Injury (fall, tool, machine, etc.)*			
11. Number of Dependent Children		12. Spouse's Name		25. List Witnesses			
13. Doctor's Name				26. Return to work date/or expected (m-d-y) - -		27. Did employee die? YES <input type="checkbox"/> NO <input type="checkbox"/>	
14. Doctor's Mailing Address (Street or P.O.Box) City State Zip Code				28. Supervisor's Name		29. Date Reported (m-d-y) - -	

30. Date of Hire (m-d-y) - -	31. Was employee hired or recruited in Texas? YES <input type="checkbox"/> NO <input type="checkbox"/>	32. Length of Service in Current Position Months _____ Years _____	33. Length of Service in Occupation Months _____ Years _____
34. Employee Payroll Classification Code		35. Occupation of Injured Worker	
36. Rate of Pay at this Job \$ _____ Hourly \$ _____ Weekly	37. Full Work Week is: _____ Hours _____ Days	38. Last Paycheck was: \$ _____ for _____ Hours or _____ Days	39. Is employee an Owner, Partner, or Corporate Officer? YES <input type="checkbox"/> NO <input type="checkbox"/>

40. Name and Title of Person Completing Form		41. Name of Business	
42. Business Mailing Address and Telephone Number Street or P.O. Box Telephone () City State Zip Code		43. Business Location (If different from mailing address) Number and Street City State Zip Code	
44. Federal Tax Identification Number	45. Primary Standard Industrial Classification (SIC) Code* (4 digit)	46. Specific SIC Code* (4 digit)	47. Texas Comptroller Taxpayer No.
48. Workers' Compensation Insurance Company		49. Policy Number	

50. Did you request accident prevention services in past 12 months?
 YES NO If yes, did you receive them? YES NO

51. Signature and Title (READ INSTRUCTIONS ON INSTRUCTION SHEET BEFORE SIGNING)
X _____ Date _____

Form TWCC-1
(Employer's First Report of Injury or Illness)

The **employer** is required to file an **Employer's First Report of Injury or Illness** [Form TWCC-1 (2/91)] with the injured worker's insurance carrier, and the injured claimant or the claimant's representative within 8 days after the employee's absence from work or receipt of notice of occupational disease [Article 8308, Section 5.01(a)].

The **Employer's First Report of Injury or Illness** provides information on the claimant, employer, insurance carrier and medical practitioner necessary to begin the claims process. Details of the claimant's employment and circumstances surrounding the injury or illness are also requested.

Send the specified copies to your **Workers' Compensation Insurance Carrier** and the injured employee. ***Employers - Do not send this form to the Texas Workers' Compensation Commission, unless the Commission specifically requests a direct filing.**

[Article 8308, Sec. 5.05. Employer Report of Injury; Administrative Violation, Texas Workers' Compensation Act; Rule 120.2]

INSTRUCTIONS FOR EMPLOYERS FIRST REPORT OF INJURY OR ILLNESS (TWCC-1)

Type (or print in black ink) each item on this form. Failure to complete each item may delay the processing of the injury claim.

Article 8308 - 5.05, Texas Workers' Compensation Act, requires an Employer's First Report of Injury or Illness (Form TWCC - 1 (2-91)) to be filed with the Workers' Compensation Insurance Carrier not later than the eighth day after the receipt of notice of occupational disease, or the employee's first day of absence from work due to injury or death. A copy of this report must be sent to the employee or the employee's representative. For purposes of this section, a report is filed when personally delivered, or postmarked. Send the specified copies to your **Workers' Compensation Insurance Carrier** and the injured employee. ***Employers - Do not send this form to the Texas Workers' Compensation Commission, unless the Commission specifically requests a direct filing.**

If a report has not been received by the carrier, the employer has the burden of proving that the report was filed within the required time frame. The employer has the burden of proving that good cause existed if the employer failed to file the report on time.

An employer who fails to file the report without good cause may be assessed an administrative penalty not to exceed \$500.00. An employer who fails to file the report without good cause waives the right to reimbursement of voluntary benefits even if no administrative penalty is assessed.

Once the employer has completed all information pertaining to the injury the employer should maintain the copy of this report to serve as the Employer's Record of Injury required by Article 8308 -5.04. Send the specified copies to your **Workers' Compensation Insurance Carrier** and the injured employee. ***Employers - Do not send this form to the Texas Workers' Compensation Commission, unless the Commission specifically requests a direct filing.** The Commission's Health and Safety Division will use data from this report for the Job Safety Information System established in Article 8308 - 7.03 of the Texas Workers' Compensation Act.

This report may not be considered admission or evidence against the employer or the insurance carrier in any proceeding before the Commission or a court in which facts set out in the report are contradicted by the employer or insurance carrier.

"SPECIAL INSTRUCTIONS FOR CERTAIN ITEMS"

- Items 2,7,8: Article 8308 - 2.13(e), Texas Workers' Compensation Act requires the Commission to maintain information as to the race, ethnicity and sex on every compensable injury. This information will be maintained for non-discriminatory statistical use.
- Item 4: If no home phone, please provide a phone number where the employee can be reached.
- Items 5,15,17, 26,29,30: Enter data in month, day, year format. Example: 08-13-54.
- Item 18: List nature of accident or exposure, e.g., fall from scaffold, contact with radiation, etc. If occupational disease, so state.
- Item 19: List specific body part, e.g., chin, right leg, forehead, left upper arm, etc. If more than one body part is affected, list each part.
- Item 20: Describe in detail (1) the events leading up to the injury/illness, (2) the actual injury, e.g., cut left forearm, broken right foot, etc., and (3) the reason(s) why accident/injury occurred. Use an additional sheet of paper if necessary.
- Item 22: State the exact work-site location of the injury, e.g., construction site, office area, storage area, etc.
- Item 24: List object, substance, or exposure that directly inflicted the injury or illness, e.g., floor, hammer, chemicals, etc.
- Items 32,33: Enter date in month-year format. Example: 02-56.
- Item 37: Enter the number of days or hours that make up a full work week for your employees.
- Item 45: Enter the 4-digit primary standard industrial classification code (SIC) of the employer. The primary code is the code which appears in block 5 of Form C-3, "Employer's Quarterly Report" to the Texas Employment Commission.
- Item 46: For companies with a single SIC code, the specific code is the same as the primary code. For companies with multiple SIC codes, enter the code that identifies the specific business, activity, or work-site location the employee was working in at the time of the injury. This may or may not be the same as the primary code.

1. ACCIDENT CLASSIFICATION

PERSONNEL CLASSIFICATION	INJURY/ILLNESS/FATAL	PROPERTY DAMAGE	MOTOR VEHICLE INVOLVED	DIVING
GOVERNMENT <input type="checkbox"/> CIVILIAN <input type="checkbox"/> MILITARY	<input type="checkbox"/>	<input type="checkbox"/> FIRE INVOLVED <input type="checkbox"/> OTHER	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> CONTRACTOR	<input type="checkbox"/>	<input type="checkbox"/> FIRE INVOLVED <input type="checkbox"/> OTHER	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> PUBLIC	<input type="checkbox"/> FATAL <input type="checkbox"/> OTHER	X	<input type="checkbox"/>	X

2. PERSONAL DATA

a. NAME (Last, First, MI) _____ b. AGE _____ c. SEX MALE FEMALE d. SOCIAL SECURITY NUMBER _____ e. GRADE _____

f. JOB SERIES/TITLE _____ g. DUTY STATUS AT TIME OF ACCIDENT ON DUTY TDY OFF DUTY

h. EMPLOYMENT STATUS AT TIME OF ACCIDENT: ARMY ACTIVE ARMY RESERVE VOLUNTEER PERMANENT FOREIGN NATIONAL SEASONAL TEMPORARY STUDENT OTHER (Specify) _____

3. GENERAL INFORMATION

a. DATE OF ACCIDENT (month/day/year) ____/____/____ b. TIME OF ACCIDENT (Military time) _____ c. EXACT LOCATION OF ACCIDENT _____ d. CONTRACTOR'S NAME (1) PRIME: _____ (2) SUBCONTRACTOR: _____

e. CONTRACT NUMBER _____ f. TYPE OF CONTRACT CONSTRUCTION SERVICE A/E DREDGE OTHER (Specify) _____ g. HAZARDOUS/TOXIC WASTE ACTIVITY SUPERFUND DERP IRP OTHER (Specify) _____

4. CONSTRUCTION ACTIVITIES ONLY (Fill in line and corresponding code number in box from list - see instructions)

a. CONSTRUCTION ACTIVITY _____ (CODE) # _____ b. TYPE OF CONSTRUCTION EQUIPMENT _____ (CODE) # _____

5. INJURY / ILLNESS INFORMATION (Include name on line and corresponding code number in box for items e, f & g - see instructions)

a. SEVERITY OF ILLNESS / INJURY _____ (CODE) # _____ b. ESTIMATED DAYS LOST _____ c. ESTIMATED DAYS HOSPITALIZED _____ d. ESTIMATED DAYS RESTRICTED DUTY _____

e. BODY PART AFFECTED (CODE) # _____ g. TYPE AND SOURCE OF INJURY/ILLNESS TYPE _____ (CODE) # _____ SOURCE _____ (CODE) # _____

f. NATURE OF ILLNESS / INJURY _____ (CODE) # _____

6. PUBLIC FATALITY (Fill in line and corresponding code number in box - see instructions)

a. ACTIVITY AT TIME OF ACCIDENT _____ (CODE) # _____ b. PERSONAL FLOATATION DEVICE USED? YES NO N/A

7. MOTOR VEHICLE ACCIDENT

a. TYPE OF VEHICLE PICKUP/VAN AUTOMOBILE TRUCK OTHER (Specify) _____ b. TYPE OF COLLISION SIDE SWIPE HEAD ON REAR END BROADSIDE ROLL OVER BACKING OTHER (Specify) _____ c. SEAT BELTS USED NOT USED NOT AVAILABLE (1) FRONT SEAT (2) REAR SEAT

8. PROPERTY/MATERIAL INVOLVED

a. NAME OF ITEM	b. OWNERSHIP	c. \$ AMOUNT OF DAMAGE
(1) _____	_____	_____
(2) _____	_____	_____
(3) _____	_____	_____

9. VESSEL / FLOATING PLANT ACCIDENT (Fill in line and corresponding code number in box from list - see instructions)

a. TYPE OF VESSEL/FLOATING PLANT _____ (CODE) # _____ b. TYPE OF COLLISION/MISHAP _____ (CODE) # _____

10. ACCIDENT DESCRIPTION (Use additional paper, if necessary)

<p>a. (Explain YES answers in item 13)</p> <p>DESIGN: Was design of facility, workplace or equipment a factor? <input type="checkbox"/> YES <input type="checkbox"/> NO</p> <p>INSPECTION/MAINTENANCE: Were inspection & maintenance procedures a factor? <input type="checkbox"/> YES <input type="checkbox"/> NO</p> <p>PERSON'S PHYSICAL CONDITION: In your opinion, was the physical condition of the person a factor? <input type="checkbox"/> YES <input type="checkbox"/> NO</p> <p>OPERATING PROCEDURES: Were operating procedures a factor? <input type="checkbox"/> YES <input type="checkbox"/> NO</p> <p>JOB PRACTICES: Were any job safety/health practices not followed when the accident occurred? <input type="checkbox"/> YES <input type="checkbox"/> NO</p> <p>HUMAN FACTORS: Did any human factors such as, size or strength of person, etc., contribute to accident? <input type="checkbox"/> YES <input type="checkbox"/> NO</p> <p>ENVIRONMENTAL FACTORS: Did heat, cold, dust, sun, glare, etc., contribute to the accident? <input type="checkbox"/> YES <input type="checkbox"/> NO</p>		<p>a. (CONTINUED)</p> <p>CHEMICAL AND PHYSICAL AGENT FACTORS: Did exposure to chemical agents, such as dust, fumes, mists, vapors or physical agents, such as, noise, radiation, etc., contribute to accident? <input type="checkbox"/> YES <input type="checkbox"/> NO</p> <p>OFFICE FACTORS: Did office setting such as, lifting office furniture, carrying, stooping, etc., contribute to the accident? <input type="checkbox"/> YES <input type="checkbox"/> NO</p> <p>SUPPORT FACTORS: Were inappropriate tools/resources provided to properly perform the activity/task? <input type="checkbox"/> YES <input type="checkbox"/> NO</p> <p>PERSONAL PROTECTIVE EQUIPMENT: Did the improper selection, use or maintenance of personal protective equipment contribute to the accident? <input type="checkbox"/> YES <input type="checkbox"/> NO</p> <p>DRUGS/ALCOHOL: In your opinion, was drugs or alcohol a factor to the accident? <input type="checkbox"/> YES <input type="checkbox"/> NO</p> <p>b. WAS A WRITTEN JOB/ACTIVITY HAZARD ANALYSIS COMPLETED FOR TASK BEING PERFORMED AT TIME OF ACCIDENT?</p> <p><input type="checkbox"/> YES (If yes, attach a copy.) <input type="checkbox"/> NO</p>
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12 TRAINING		
<p>a. WAS PERSON TRAINED TO PERFORM ACTIVITY/TASK?</p> <p><input type="checkbox"/> YES <input type="checkbox"/> NO</p>	<p>b. TYPE OF TRAINING.</p> <p><input type="checkbox"/> CLASSROOM <input type="checkbox"/> ON JOB</p>	<p>c. DATE OF MOST RECENT FORMAL TRAINING.</p> <p style="text-align: center;">/ /</p> <p style="text-align: center;">(Month) (Day) (Year)</p>

13. FULLY EXPLAIN WHAT ALLOWED OR CAUSED THE ACCIDENT; INCLUDE DIRECT AND INDIRECT CAUSES (See instruction for definition of direct and indirect causes.) (Use additional paper, if necessary)

a. DIRECT CAUSE

b. INDIRECT CAUSE(S)

14. ACTION(S) TAKEN, ANTICIPATED OR RECOMMENDED TO ELIMINATE CAUSE(S).

DESCRIBE FULLY:

15. DATES FOR ACTIONS IDENTIFIED IN BLOCK 14.

<p>a. BEGINNING (Month/Day/Year) / /</p>	<p>b. ANTICIPATED COMPLETION (Month/Day/Year) / /</p>		
<p>c. SIGNATURE AND TITLE OF SUPERVISOR COMPLETING REPORT</p> <p>CORPS _____</p> <p>CONTRACTOR _____</p>	<p>d. DATE (Mo/Da/Yr)</p> <p>___ / ___ / ___</p>	<p>e. ORGANIZATION IDENTIFIER (Div, Br, Sect)</p>	<p>f. OFFICE SYMBOL</p>

16. MANAGEMENT REVIEW (1st).

a. CONCUR b. NON CONCUR c. COMMENTS

SIGNATURE	TITLE	DATE
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17. MANAGEMENT REVIEW (2nd - Chief Operations, Construction, Engineering, etc.)

a. CONCUR b. NON CONCUR c. COMMENTS

SIGNATURE	TITLE	DATE
-----------	-------	------

18. SAFETY AND OCCUPATIONAL HEALTH OFFICE REVIEW

a. CONCUR b. NON CONCUR c. ADDITIONAL ACTIONS/COMMENTS.

SIGNATURE	TITLE	DATE
-----------	-------	------

19. COMMAND APPROVAL

COMMENTS

COMMANDER SIGNATURE	DATE
---------------------	------

GENERAL. Complete a separate report for each person who was injured, caused, or contributed to the accident (excluding uninjured personnel and witnesses). Use of this form for reporting USACE employee first-aid type injuries not submitted to the Office of Workers' Compensation Programs (OWCP) shall be at the discretion of the FOA commander. Please type or print legibly. Appropriate items shall be marked with an "X" in box(es). If additional space is needed, provide the information on a separate sheet and attach to the completed form. Ensure that these instructions are forwarded with the completed report to the designated management reviewers indicated in sections 16 and 17.

INSTRUCTIONS FOR SECTION 1 — ACCIDENT CLASSIFICATION. (Mark All Boxes That Are Applicable.)

- a. **GOVERNMENT.** Mark "CIVILIAN" box if accident involved government civilian employee; mark "MILITARY" box if accident involved U.S. military personnel.
- (1) **INJURY/ILLNESS/FATALITY**—Mark if accident resulted in any government civilian employee injury, illness, or fatality that requires the submission of OWCP Forms CA-1 (injury), CA-2 (illness), or CA-6 (fatality) to OWCP; mark if accident resulted in military personnel lost-time or fatal injury or illness.
 - (2) **PROPERTY DAMAGE**—Mark the appropriate box if accident resulted in any damage of \$1000 or more to government property (including motor vehicles).
 - (3) **VEHICLE INVOLVED**—Mark if accident involved a motor vehicle, regardless of whether "INJURY/ILLNESS/FATALITY" or "PROPERTY DAMAGE" are marked.
 - (4) **DIVING ACTIVITY**—Mark if the accident involved an in-house USACE diving activity.
- b. **CONTRACTOR.**
- (1) **INJURY/ILLNESS/FATALITY**—Mark if accident resulted in any contractor lost-time injury/illness or fatality.
 - (2) **PROPERTY DAMAGE**—Mark the appropriate box if accident resulted in any damage of \$1000 or more to contractor property (including motor vehicles).
 - (3) **VEHICLE INVOLVED**—Mark if accident involved a motor vehicle, regardless of whether "INJURY/ILLNESS/FATALITY" or "PROPERTY DAMAGE" are marked.
 - (4) **DIVING ACTIVITY**—Mark if the accident involved a USACE Contractor diving activity.
- c. **PUBLIC.**
- (1) **INJURY/ILLNESS/FATALITY**—Mark if accident resulted in public fatality or permanent total disability. (The "OTHER" box will be marked when requested by the FOA to report an unusual non-fatal public accident that could result in claims against the government or as otherwise directed by the FOA Commander).
 - (2) **VOID SPACE**—Make no entry.
 - (3) **VEHICLE INVOLVED**—Mark if accident resulted in a fatality to a member of the public and involved a motor vehicle, regardless of whether "INJURY/ILLNESS/FATALITY" is marked.
 - (4) **VOID SPACE**—Make no entry.

INSTRUCTIONS FOR SECTION 2 — PERSONAL DATA

- a. **NAME**—(MANDATORY FOR GOVERNMENT ACCIDENTS. OPTIONAL AT THE DISCRETION OF THE FOA COMMANDER FOR CONTRACTOR AND PUBLIC ACCIDENTS). Enter last name, first name, middle initial of person involved.
- b. **AGE**—Enter age.
- c. **SEX**—Mark appropriate box.
- d. **SOCIAL SECURITY NUMBER**—(FOR GOVERNMENT PERSONNEL ONLY) Enter the social security number (or other personal identification number if no social security number issued).
- e. **GRADE**—(FOR GOVERNMENT PERSONNEL ONLY) Enter pay grade. Example: O-8; E-7; WG-8; WS-12; GS-11; etc.

- f. **JOB SERIES/TITLE**—For government civilian employees enter the pay plan, full series number, and job title, e.g. GS-0810/Civil Engineer. For military personnel enter the primary military occupational specialty (PMOS), e.g., 15A30 or 11G50. For contractor employees enter the job title assigned to the injured person, e.g. carpenter, laborer, surveyor, etc..
- g. **DUTY STATUS**—Mark the appropriate box.
- (1) **ON DUTY**—Person was at duty station during duty hours or person was away from duty station during duty hours but on official business at time of the accident.
 - (2) **TDY** - Person was on official business, away from the duty station and with travel orders at time of accident. Line-of-duty investigation required.
 - (3) **OFF DUTY** - Person was not on official business at time of accident
- h. **EMPLOYMENT STATUS**—(FOR GOVERNMENT PERSONNEL ONLY) Mark the most appropriate box. If "OTHER" is marked, specify the employment status of the person.

INSTRUCTION FOR SECTION 3 — GENERAL INFORMATION

- a. **DATE OF ACCIDENT**—Enter the month, day, and year of accident.
- b. **TIME OF ACCIDENT**—Enter the local time of accident in military time. Example: 1430 hrs (not 2:30 p.m.).
- c. **EXACT LOCATION OF ACCIDENT**—Enter facts needed to locate the accident scene. (installation/project name, building number, street, direction and distance from closest landmark, etc.,).
- d. **CONTRACTOR NAME**
- (1) **PRIME**—Enter the exact name (title of firm) of the prime contractor.
 - (2) **SUBCONTRACTOR**—Enter the name of any subcontractor involved in the accident.
- e. **CONTRACT NUMBER**—Mark the appropriate box to identify if contract is civil works, military, or other: if "OTHER" is marked, specify contract appropriation on line provided. Enter complete contract number of prime contract, e.g., DACW 09-85-C-0100.
- f. **TYPE OF CONTRACT**—Mark appropriate box. A/E means architect/engineer. If "OTHER" is marked, specify type of contract on line provided.
- g. **HAZARDOUS/TOXIC WASTE ACTIVITY (HTW)**—Mark the box to identify the HTW activity being performed at the time of the accident. For Superfund, DERP, and Installation Restoration Program (IRP) HTW activities include accidents that occurred during inventory, predesign, design, and construction. For the purpose of accident reporting, DERP Formerly Used DoD Site (FUDS) activities and IRP activities will be treated separately. For Civil Works O&M HTW activities mark the "OTHER" box.

INSTRUCTIONS FOR SECTION 4 — CONSTRUCTION ACTIVITIES

- a. **CONSTRUCTION ACTIVITY**—Select the most appropriate construction activity being performed at time of accident from the list below. Enter the activity name and place the corresponding code number identified in the box.

CONSTRUCTION ACTIVITY LIST

- | | |
|-------------------------|----------------------------|
| 1. MOBILIZATION | 14. ELECTRICAL |
| 2. SITE PREPARATION | 15. SCAFFOLDING/ACCESS |
| 3. EXCAVATION/TRENCHING | 16. MECHANICAL |
| 4. GRADING (EARTHWORK) | 17. PAINTING |
| 5. PIPING/UTILITIES | 18. EQUIPMENT/MAINTENANCE |
| 6. FOUNDATION | 19. TUNNELING |
| 7. FORMING | 20. WAREHOUSING/STORAGE |
| 8. CONCRETE PLACEMENT | 21. PAVING |
| 9. STEEL ERECTION | 22. FENCING |
| 10. ROOFING | 23. SIGNING |
| 11. FRAMING | 24. LANDSCAPING/IRRIGATION |
| 12. MASONRY | 25. INSULATION |
| 13. CARPENTRY | 26. DEMOLITION |

b. TYPE OF CONSTRUCTION EQUIPMENT — Select the equipment involved in the accident from the list below. Enter the name and place the corresponding code number identified in the box. If equipment is not included below, use code 24, "OTHER", and write in specific type of equipment.

CONSTRUCTION EQUIPMENT

- | | |
|------------------------------------|--------------------------------|
| 1. GRADER | 13. DUMP TRUCK (OFF HIGHWAY) |
| 2. DRAGLINE | 14. TRUCK (OTHER) |
| 3. CRANE (ON VESSEL/BARGE) | 15. FORKLIFT |
| 4. CRANE (TRACKED) | 16. BACKHOE |
| 5. CRANE (RUBBER TIRE) | 17. FRONT-END LOADER |
| 6. CRANE (VEHICLE MOUNTED) | 18. PILE DRIVER |
| 7. CRANE (TOWER) | 19. TRACTOR (UTILITY) |
| 8. SHOVEL | 20. MANLIFT |
| 9. SCRAPER | 21. DOZER |
| 10. PUMP TRUCK (CONCRETE) | 22. DRILL RIG |
| 11. TRUCK (CONCRETE/TRANSIT MIXER) | 23. COMPACTOR/VIBRATORY ROLLER |
| 12. DUMP TRUCK (HIGHWAY) | 24. OTHER |

INSTRUCTIONS FOR SECTION 5 — INJURY/ILLNESS INFORMATION

a. SEVERITY OF INJURY / ILLNESS - Reference para 2-10 of USACE Suppl 1 to AR 385-40 and enter code and description from list below.

- NOI NO INJURY
- FAT FATALITY
- PTL PERMANENT TOTAL DISABILITY
- PPR PERMANENT PARTIAL DISABILITY
- LWD LOST WORKDAY CASE INVOLVING DAYS AWAY FROM WORK
- NLW RECORDABLE CASE WITHOUT LOST WORKDAYS
- RFA RECORDABLE FIRST AID CASE
- NRI NON-RECORDABLE INJURY

b. ESTIMATED DAYS LOST — Enter the estimated number of workdays the person will lose from work.

c. ESTIMATED DAYS HOSPITALIZED — Enter the estimated number of workdays the person will be hospitalized.

d. ESTIMATED DAYS RESTRICTED DUTY — Enter the estimated number of workdays the person, as a result of the accident, will not be able to perform all of their regular duties.

e. BODY PART AFFECTED — Select the most appropriate primary and when applicable, secondary body part affected from the list below. Enter body part name on line and place the corresponding code letters identifying that body part in the box.

GENERAL BODY AREA	CODE	BODY PART NAME
ARM/WRIST	AB	ARM AND WRIST
	AS	ARM OR WRIST
TRUNK, EXTERNAL MUSCULATURE	B1	SINGLE BREAST
	B2	BOTH BREASTS
	B3	SINGLE TESTICLE
	B4	BOTH TESTICLES
	BA	ABDOMEN
	BC	CHEST
	BL	LOWER BACK
	BP	PENIS
	BS	SIDE
	BU	UPPER BACK
	BW	WAIST
	BZ	TRUNK OTHER
HEAD, INTERNAL	C1	SINGLE EAR INTERNAL
	C2	BOTH EARS INTERNAL
	C3	SINGLE EYE INTERNAL
	C4	BOTH EYES INTERNAL
	CB	BRAIN
	CC	CRANIAL BONES
	CD	TEETH
	CJ	JAW
	CL	THROAT, LARYNX
	CM	MOUTH

	CN	NOSE
	CR	THROAT, OTHER
	CT	TONGUE
	CZ	HEAD OTHER INTERNAL
ELBOW	EB	BOTH ELBOWS
	ES	SINGLE ELBOW
FINGER	F1	FIRST FINGER
	F2	BOTH FIRST FINGERS
	F3	SECOND FINGER
	F4	BOTH SECOND FINGERS
	F5	THIRD FINGER
	F6	BOTH THIRD FINGERS
	F7	FOURTH FINGER
	F8	BOTH FOURTH FINGERS
TOE	G1	GREAT TOE
	G2	BOTH GREAT TOES
	G3	TOE OTHER
	G4	TOES OTHER
HEAD, EXTERNAL	H1	EYE EXTERNAL
	H2	BOTH EYES EXTERNAL
	H3	EAR EXTERNAL
	H4	BOTH EARS EXTERNAL
	HC	CHIN
	HF	FACE
	HK	NECK/THROAT
	HM	MOUTH/LIPS
	HN	NOSE
	HS	SCALP
KNEE	KB	BOTH KNEES
	KS	KNEE
LEG, HIP, ANKLE, BUTTOCK	LB	BOTH LEGS/HIPS/ ANKLES/BUTTOCKS
	LS	SINGLE LEG/HIP ANKLE/BUTTOCK
HAND	MB	BOTH HANDS
	MS	SINGLE HAND
FOOT	PB	BOTH FEET
	PS	SINGLE FOOT
TRUNK, BONES	R1	SINGLE COLLAR BONE
	R2	BOTH COLLAR BONES
	R3	SHOULDER BLADE
	R4	BOTH SHOULDER BLADES
	RB	RIB
	RS	STERNUM (BREAST BONE)
	RV	VERTEBRAE (SPINE; DISC)
	RZ	TRUNK BONES OTHER
SHOULDER	SB	BOTH SHOULDERS
	SS	SINGLE SHOULDER
THUMB	TB	BOTH THUMBS
	TS	SINGLE THUMB
TRUNK, INTERNAL ORGANS	V1	LUNG, SINGLE
	V2	LUNGS, BOTH
	V3	KIDNEY, SINGLE
	V4	KIDNEYS, BOTH
	VH	HEART
	VL	LIVER
	VR	REPRODUCTIVE ORGANS
	VS	STOMACH
	VV	INTESTINES
	VZ	TRUNK, INTERNAL; OTHER

f. NATURE OF INJURY/ILLNESS - Select the most appropriate nature of injury / illness from the list below. This nature of injury / illness shall correspond to the primary body part selected in 5e, above. Enter the nature of injury / illness name on the line and place the corresponding CODE letters in the box provided.

* The injury or condition selected below must be caused by a specific incident or event which occurred during a single work day or shift.

GENERAL NATURE CATEGORY	CODE	NATURE OF INJURY NAME
*TRAUMATIC INJURY OR DISABILITY	TA	AMPUTATION
	TB	BACK STRAIN.
	TC	CONTUSION; BRUISE; ABRASION
	TD	DISLOCATION
	TF	FRACTURE
	TH	HERNIA
	TK	CONCUSSION
	TL	LACERATION, CUT
	TP	PUNCTURE
	TS	STRAIN, MULTIPLE
	TU	BURN, SCALD, SUNBURN
	TI	TRAUMATIC SKIN DISEASES/ CONDITIONS INCLUDING DERMATITIS
	TR	TRAUMATIC RESPIRATORY DISEASE
	TQ	TRAUMATIC FOOD POISONING
	TW	TRAUMATIC TUBERCULOSIS
	TX	TRAUMATIC VIROLOGICAL/ INFECTIVE/PARASITIC DISEASE
	T1	TRAUMATIC CEREBRAL VASCULAR CONDITION/STROKE
	T2	TRAUMATIC HEARING LOSS
T3	TRAUMATIC HEART CONDITION	
T4	TRAUMATIC MENTAL DISORDER; STRESS; NERVOUS CONDITION	
T8	TRAUMATIC INJURY — OTHER (EXCEPT DISEASE, ILLNESS)	

**A nontraumatic physiological harm or loss of capacity produced by systemic infection; continued or repeated stress or strain; exposure to toxins, poisons, fumes, etc.; or other continued and repeated exposures to conditions of the work environment over a long period of time. For practical purposes, an occupational illness/disease or disability is any reported condition which does not meet the definition of traumatic injury or disability as described above.

GENERAL NATURE CATEGORY	CODE	NATURE OF INJURY NAME	
**NON-TRAUMATIC ILLNESS/DISEASE OR DISABILITY			
RESPIRATORY DISEASE	RA	ASBESTOSIS	
	RB	BRONCHITIS	
	RE	EMPHYSEMA	
	RP	PNEUMOCONIOSIS	
	RS	SILICOSIS	
	R9	RESPIRATORY DISEASE, OTHER	
	VIROLOGICAL, INFECTIVE & PARASITIC DISEASES	VB	BRUCELLOSIS
		VC	COCCIDIOMYCOSIS
		VF	FOOD POISONING
VH		HEPATITIS	
VM		MALARIA	
VS		STAPHYLOCOCCUS	
VT		TUBERCULOSIS	
V9		VIROLOGICAL/INFECTIVE/ PARASITIC — OTHER	
DISABILITY, OCCUPATIONAL		DA	ARTHRITIS, BURSITIS
	DB	BACK STRAIN, BACK SPRAIN	
	DC	CEREBRAL VASCULAR CONDITION; STROKE	
	DD	ENDEMIC DISEASE (OTHER THAN CODE TYPES R&S)	
	DE	EFFECT OF ENVIRONMENTAL CONDITION	
	DH	HEARING LOSS	
	DK	HEART CONDITION	
	DM	MENTAL DISORDER, EMOTIONAL STRESS NERVOUS CONDITION	
	DR	RADIATION	
	DS	STRAIN, MULTIPLE	
	DU	ULCER	
	DV	OTHER VASCULAR CONDITIONS	
	D9	DISABILITY, OTHER	

GENERAL NATURE CATEGORY	CODE	NATURE OF INJURY NAME
SKIN DISEASE OR CONDITION	SB	BIOLOGICAL
	SC	CHEMICAL
	S9	DERMATITIS, UNCLASSIFIED

g. TYPE AND SOURCE OF INJURY/ILLNESS (CAUSE) - Type and Source Codes are used to describe what caused the incident. The Type Code stands for an ACTION and the Source Code for an OBJECT or SUBSTANCE. Together, they form a brief description of how the incident occurred. Where there are two different sources, code the initiating source of the incident (see example 1, below). Examples:

- (1) An employee tripped on carpet and struck his head on a desk.
TYPE: 210 (fell on same level) SOURCE: 0110 (walking/working surface)
- NOTE: This example would NOT be coded 120 (struck against) and 0140 (furniture).
- (2) A Park Ranger contracted dermatitis from contact with poison ivy/oak.
TYPE: 510 (contact) SOURCE: 0920 (plant)
- (3) A lock and dam mechanic punctured his finger with a metal sliver while grinding a turbine blade.
TYPE: 410 (punctured by) SOURCE: 0830 (metal)
- (4) An employee was driving a government vehicle when it was struck by another vehicle.
TYPE: 800 (traveling in) SOURCE: 0421 (government-owned vehicle, as driver)

NOTE: The Type Code 800, "Traveling In" is different from the other type codes in that its function is not to identify factors contributing to the injury or fatality, but rather to collect data on the type of vehicle the employee was operating or traveling in at the time of the incident.

Select the most appropriate TYPE and SOURCE identifier from the list below and enter the name on the line and the corresponding code in the appropriate box.

CODE	TYPE OF INJURY NAME
	STRUCK
0110	STRUCK BY
0111	STRUCK BY FALLING OBJECT
0120	STRUCK AGAINST
	FELL, SLIPPED, TRIPPED
0210	FELL ON SAME LEVEL
0220	FELL ON DIFFERENT LEVEL
0230	SLIPPED, TRIPPED (NO FALL)
	CAUGHT
0310	CAUGHT ON
0320	CAUGHT IN
0330	CAUGHT BETWEEN
	PUNCTURED, LACERATED
0410	PUNCTURED BY
0420	CUT BY
0430	STUNG BY
0440	BITTEN BY
	CONTACTED
0510	CONTACTED WITH (INJURED PERSON MOVING)
0520	CONTACTED BY (OBJECT WAS MOVING)
	EXERTED
0610	LIFTED, STRAINED BY (SINGLE ACTION)
0620	STRESSED BY (REPEATED ACTION)
	EXPOSED
0710	INHALED
0720	INGESTED
0730	ABSORBED
0740	EXPOSED TO
0800	TRAVELING IN
CODE	SOURCE OF INJURY NAME
0100	BUILDING OR WORKING AREA
0110	WALKING/WORKING SURFACE (FLOOR, STREET, SIDEWALKS, ETC)
0120	STAIRS, STEPS
0130	LADDER
0140	FURNITURE, FURNISHINGS, OFFICE EQUIPMENT
0150	BOILER, PRESSURE VESSEL
0160	EQUIPMENT LAYOUT (ERGONOMIC)
0170	WINDOWS, DOORS
0180	ELECTRICITY

CODE	SOURCE OF INJURY NAME
0200	ENVIRONMENTAL CONDITION
0210	TEMPERATURE EXTREME (INDOOR)
0220	WEATHER (ICE, RAIN, HEAT, ETC.)
0230	FIRE, FLAME, SMOKE (NOT TOBACCO)
0240	NOISE
0250	RADIATION
0260	LIGHT
0270	VENTILATION
0271	TOBACCO SMOKE
0280	STRESS (EMOTIONAL)
0290	CONFINED SPACE
0300	MACHINE OR TOOL
0310	HAND TOOL (POWERED: SAW, GRINDER, ETC.)
0320	HAND TOOL (NONPOWERED)
0330	MECHANICAL POWER TRANSMISSION APPARATUS
0340	GUARD, SHIELD (FIXED, MOVEABLE, INTERLOCK)
0350	VIDEO DISPLAY TERMINAL
0360	PUMP, COMPRESSOR, AIR PRESSURE TOOL
0370	HEATING EQUIPMENT
0380	WELDING EQUIPMENT
0400	VEHICLE
0411	AS DRIVER OF PRIVATELY OWNED/RENTAL VEHICLE
0412	AS PASSENGER OF PRIVATELY OWNED/RENTAL VEHICLE
0421	DRIVER OF GOVERNMENT VEHICLE
0422	PASSENGER OF GOVERNMENT VEHICLE
0430	COMMON CARRIER (AIRLINE, BUS, ETC.)
0440	AIRCRAFT (NOT COMMERCIAL)
0450	BOAT, SHIP, BARGE
0500	MATERIAL HANDLING EQUIPMENT
0510	EARTHMOVER (TRACTOR, BACKHOE, ETC.)
0520	CONVEYOR (FOR MATERIAL AND EQUIPMENT)
0530	ELEVATOR, ESCALATOR, PERSONNEL HOIST
0540	HOIST, SLING CHAIN, JACK
0550	CRANE
0551	FORKLIFT
0560	HANDTRUCK, DOLLY
0600	DUST, VAPOR, ETC.
0610	DUST (SILICA, COAL, ETC.)
0620	FIBERS
0621	ASBESTOS
0630	GASES
0631	CARBON MONOXIDE
0640	MIST, STEAM, VAPOR, FUME
0641	WELDING FUMES
0650	PARTICLES (UNIDENTIFIED)
0700	CHEMICAL, PLASTIC, ETC.
0711	DRY CHEMICAL—CORROSIVE
0712	DRY CHEMICAL—TOXIC
0713	DRY CHEMICAL—EXPLOSIVE
0714	DRY CHEMICAL—FLAMMABLE
0721	LIQUID CHEMICAL—CORROSIVE
0722	LIQUID CHEMICAL—TOXIC
0723	LIQUID CHEMICAL—EXPLOSIVE
0724	LIQUID CHEMICAL—FLAMMABLE
0730	PLASTIC
0740	WATER
0750	MEDICINE
0800	INANIMATE OBJECT
0810	BOX, BARREL, ETC.
0820	PAPER
0830	METAL ITEM, MINERAL
0831	NEEDLE
0840	GLASS
0850	SCRAP, TRASH
0860	WOOD
0870	FOOD
0880	CLOTHING, APPAREL, SHOES
0900	ANIMATE OBJECT
0911	DOG
0912	OTHER ANIMAL
0920	PLANT
0930	INSECT
0940	HUMAN (VIOLENCE)
0950	HUMAN (COMMUNICABLE DISEASE)
0960	BACTERIA, VIRUS (NOT HUMAN CONTACT)

CODE	SOURCE OF INJURY NAME
1000	PERSONAL PROTECTIVE EQUIPMENT
1010	PROTECTIVE CLOTHING, SHOES, GLASSES, GOGGLES
1020	RESPIRATOR, MASK
1021	DIVING EQUIPMENT
1030	SAFETY BELT, HARNESS
1040	PARACHUTE

INSTRUCTIONS FOR SECTION 6 — PUBLIC FATALITY

- a. **ACTIVITY AT TIME OF ACCIDENT**—Select the activity being performed at the time of the accident from the list below. Enter the activity name on the line and the corresponding number in the box. If the activity performed is not identified on the list, select from the most appropriate primary activity area (water related, non-water related or other activity), the code number for "Other", and write in the activity being performed at the time of the accident.

WATER RELATED RECREATION

- | | |
|-----------------------------------|--|
| 1. Sailing | 9. Swimming/designated area |
| 2. Boating—powered | 10. Swimming/other area |
| 3. Boating—unpowered | 11. Underwater activities (skin diving, scuba, etc.) |
| 4. Water skiing | 12. Wading |
| 5. Fishing from boat | 13. Attempted rescue |
| 6. Fishing from bank dock or pier | 14. Hunting from boat |
| 7. Fishing while wading | 15. Other |
| 8. Swimming/supervised area | |

NON-WATER RELATED RECREATION

- | | |
|--|---|
| 16. Hiking and walking | 23. Sports/summer (baseball, football, etc.) |
| 17. Climbing (general) | 24. Sports/winter (skiing, sledding, snowmobiling etc.) |
| 18. Camping/picnicking authorized area | 25. Cycling (bicycle, motorcycle, scooter) |
| 19. Camping/picnicking unauthorized area | 26. Gliding |
| 20. Guided tours | 27. Parachuting |
| 21. Hunting | 28. Other non-water related |
| 22. Playground equipment | |

OTHER ACTIVITIES

- | | |
|--|----------------------------------|
| 29. Unlawful acts (fights, riots, vandalism, etc.) | 33. Sleeping |
| 30. Food preparation/serving | 34. Pedestrian struck by vehicle |
| 31. Food consumption | 35. Pedestrian other acts |
| 32. Housekeeping | 36. Suicide |
| | 37. "Other" activities |

- b. **PERSONAL FLOTATION DEVICE USED**—If fatality was water-related was the victim wearing a person flotation device? Mark the appropriate box.

INSTRUCTIONS FOR SECTION 7 — MOTOR VEHICLE ACCIDENT

- a. **TYPE OF VEHICLE**—Mark appropriate box for each vehicle involved. If more than one vehicle of the same type is involved, mark both halves of the appropriate box. USACE vehicle(s) involved shall be marked in left half of appropriate box.
- b. **TYPE OF COLLISION**—Mark appropriate box.
- c. **SEAT BELT**—Mark appropriate box.

INSTRUCTIONS FOR SECTION 8 — PROPERTY/ MATERIAL INVOLVED

- a. **NAME OF ITEM**—Describe all property involved in accident. Property/material involved means material which is damaged or whose use or misuse contributed to the accident. Include the name, type, model; also include the National Stock Number (NSN) whenever applicable.
- b. **OWNERSHIP**—Enter ownership for each item listed. (Enter one of the following: *USACE; OTHER GOVERNMENT; CONTRACTOR; PRIVATE*)
- c. **\$ AMOUNT OF DAMAGE**—Enter the total estimated dollar amount of damage (parts and labor), if any.

INSTRUCTIONS FOR SECTION 9—VESSEL/ FLOATING PLANT ACCIDENT

- a. TYPE OF VESSEL/FLOATING PLANT—Select the most appropriate vessel/floating plant from list below. Enter name and place corresponding number in box. If item is not listed below, enter item number for "OTHER" and write in specific type of vessel/floating plant.

VESSEL/FLOATING PLANTS

- | | |
|------------------------|-----------------------------|
| 1. ROW BOAT | 7. DREDGE/DIPPER |
| 2. SAIL BOAT | 8. DREDGE/CLAMSHELL, BUCKET |
| 3. MOTOR BOAT | 9. DREDGE/PIPE LINE |
| 4. BARGE | 10. DREDGE/DUST PAN |
| 5. DREDGE/HOPPER | 11. TUG BOAT |
| 6. DREDGE/SIDE CASTING | 12. OTHER |

- b. COLLISION/MISHAP—Select from the list below the object(s) that contributed to the accident or were damaged in the accident.

COLLISION/MISHAP

- | | |
|-----------------------------|-----------------------|
| 1. COLLISION W/OTHER VESSEL | 7. HAULAGE UNIT |
| 2. UPPER GUIDE WALL | 8. BREAKING TOW |
| 3. UPPER LOCK GATES | 9. TOW BREAKING UP |
| 4. LOCK WALL | 10. SWEEP DOWN ON DAM |
| 5. LOWER LOCK GATES | 11. BUOY/DOLPHIN/CELL |
| 6. LOWER GUIDE WALL | 12. WHARF OR DOCK |
| | 13. OTHER |

INSTRUCTIONS FOR SECTION 10—ACCIDENT DESCRIPTION

DESCRIBE ACCIDENT—Fully describe the accident. Give the sequence of events that describe what happened leading up to and including the accident. Fully identify personnel and equipment involved and their role(s) in the accident. Ensure that relationships between personnel and equipment are clearly specified. Continue on blank sheets if necessary and attach to this report.

INSTRUCTIONS FOR SECTION 11—CAUSAL FACTORS

- a. Review thoroughly. Answer each question by marking the appropriate block. If any answer is yes, explain in item 13 below. Consider, as a minimum, the following:
- (1) DESIGN—Did inadequacies associated with the building or work site play a role? Would an improved design or layout of the equipment or facilities reduce the likelihood of similar accidents? Were the tools or other equipment designed and intended for the task at hand?
 - (2) INSPECTION/MAINTENANCE—Did inadequately or improperly maintained equipment, tools, workplace, etc. create or worsen any hazards that contributed to the accident? Would better equipment, facility, work site or work activity inspections have helped avoid the accident?
 - (3) PERSON'S PHYSICAL CONDITION—Do you feel that the accident would probably not have occurred if the employee was in "good" physical condition? If the person involved in the accident had been in better physical condition, would the accident have been less severe or avoided altogether? Was over exertion a factor?
 - (4) OPERATING PROCEDURES—Did a lack of or inadequacy within established operating procedures contribute to the accident? Did any aspect of the procedures introduce any hazard to, or increase the risk associated with the work process? Would establishment or improvement of operating procedures reduce the likelihood of similar accidents?
 - (5) JOB PRACTICES—Were any of the provisions of the Safety and Health Requirements Manual (EM 385-1-1) violated? Was the task being accomplished in a manner which was not in compliance with an established job hazard analysis or activity hazard analysis? Did any established job practice (including EM 385-1-1) fail to adequately address the task or work process? Would better job practices improve the safety of the task?

- (6) HUMAN FACTORS—Was the person under undue stress (either internal or external to the job)? Did the task tend toward overloading the capabilities of the person; i.e., did the job require tracking and reacting to many external inputs such as displays, alarms, or signals? Did the arrangement of the workplace tend to interfere with efficient task performance? Did the task require reach, strength, endurance, agility, etc., at or beyond the capabilities of the employee? Was the work environment ill-adapted to the person? Did the person need more training, experience, or practice in doing the task? Was the person inadequately rested to perform safely?
 - (7) ENVIRONMENTAL FACTORS—Did any factors such as moisture, humidity, rain, snow, sleet, hail, ice, fog, cold, heat, sun, temperature changes, wind, tides, floods, currents, dust, mud, glare, pressure changes, lightning, etc., play a part in the accident?
 - (8) CHEMICAL AND PHYSICAL AGENT FACTORS—Did exposure to chemical agents (either single shift exposure or long-term exposure) such as dusts, fibers (asbestos, etc.), silica, gases (carbon monoxide, chlorine, etc.), mists, steam, vapors, fumes, smoke, other particulates, liquid or dry chemicals that are corrosive, toxic, explosive or flammable, by-products of combustion or physical agents such as noise, ionizing radiation, non-ionizing radiation (UV radiation created during welding, etc.) contribute to the accident/incident?
 - (9) OFFICE FACTORS—Did the fact that the accident occurred in an office setting or to an office worker have a bearing on its cause? For example, office workers tend to have less experience and training in performing tasks such as lifting office furniture. Did physical hazards within the office environment contribute to the hazard?
 - (10) SUPPORT FACTORS—Was the person using an improper tool for the job? Was inadequate time available or utilized to safely accomplish the task? Were less than adequate personnel resources (in terms of employee skills, number of workers, and adequate supervision) available to get the job done properly? Was funding available, utilized, and adequate to provide proper tools, equipment, personnel, site preparation etc?
 - (11) PERSONAL PROTECTIVE EQUIPMENT—Did the person fail to use appropriate personal protective equipment (gloves, eye protection, hard-toed shoes, respirator, etc.) for the task or environment? Did protective equipment provided or worn fail to provide adequate protection from the hazard(s)? Did lack of or inadequate maintenance of protective gear contribute to the accident?
 - (12) DRUGS/ALCOHOL—Is there any reason to believe the person's mental or physical capabilities, judgement, etc., were impaired or altered by the use of drugs or alcohol? Consider the effects of prescription medicine and over the counter medications as well as illicit drug use. Consider the effect of drug or alcohol induced "hangovers".
- b. WRITTEN JOB/ACTIVITY HAZARD ANALYSIS—Was a written Job/Activity Hazard Analysis completed for the task being performed at the time of the accident? Mark the appropriate box. *one was performed, attach a copy of the analysis to the report.*

INSTRUCTIONS FOR SECTION 12—TRAINING

- a. WAS PERSON TRAINED TO PERFORM ACTIVITY/TASK?—For the purpose of this section "trained" means the person has been provided the necessary information (either formal and/or on-the-job (CJT) training) to competently perform the activity/task in a safe and healthful manner.
- b. TYPE OF TRAINING—Mark the appropriate box that best indicates the type of training; (classroom or on-the-job) that the injured person received before the accident happened.
- c. DATE OF MOST RECENT TRAINING—Enter the month, day, and year of the last formal training completed that covered the activity task being performed at the time of the accident.

INSTRUCTIONS FOR SECTION 13—CAUSES

- a. **DIRECT CAUSES**—The direct cause is that single factor which most directly lead to the accident. See examples below.
- b. **INDIRECT CAUSES**—Indirect causes are those factors which contributed to but did not directly initiate the occurrence of the accident.

Examples for section 13:

- a. Employee was dismantling scaffold and fell 12 feet from unguarded opening.
Direct cause: failure to provide fall protection at elevation.
Indirect causes: failure to enforce USACE safety requirements; improper training/motivation of employee (possibility that employee was not knowledgeable of USACE fall protection requirements or was lax in his attitude towards safety); failure to ensure provision of positive fall protection whenever elevated; failure to address fall protection during scaffold dismantling in phase hazard analysis.
- b. Private citizen had stopped his vehicle at intersection for red light when vehicle was struck in rear by USACE vehicle. (note USACE vehicle was in proper/safe working condition).
Direct cause: failure of USACE driver to maintain control of and stop USACE vehicle within safe distance.
Indirect cause: Failure of employee to pay attention to driving (defensive driving).

INSTRUCTIONS FOR SECTION 14—ACTION TO ELIMINATE CAUSE(S)

DESCRIPTION—Fully describe all the actions taken, anticipated, and recommended to eliminate the cause(s) and prevent reoccurrence of similar accidents/illnesses. Continue on blank sheets of paper if necessary to fully explain and attach to the completed report form.

INSTRUCTIONS FOR SECTION 15—DATES FOR ACTION

- a. **BEGIN DATE**—Enter the date when the corrective action(s) identified in Section 14 will begin.
- b. **COMPLETE DATE**—Enter the date when the corrective action(s) identified in Section 14 will be completed.
- c. **TITLE AND SIGNATURE**—Enter the title and signature of supervisor completing the accident report. For a **GOVERNMENT** employee accident/illness the immediate supervisor will complete and sign the report. For **PUBLIC** accidents the USACE Project Manager/Area Engineer responsible for the USACE property where the accident happened shall complete and sign the report. For **CONTRACTOR** accidents the Contractor's project manager shall complete and sign the report and provide to the USACE supervisor responsible for oversight of that contractor activity. This USACE Supervisor shall also sign the report. Upon entering the information required in 15.d, 15.e and 15.f below, the responsible USACE supervisor shall forward the report for management review as indicated in Section 16.
- d. **DATE SIGNED**—Enter the month, day, and year that the report was signed by the responsible supervisor.
- e. **ORGANIZATION NAME**—For **GOVERNMENT** employee accidents enter the USACE organization name (Division, Branch, Section, etc.) of the injured employee. For **PUBLIC** accidents enter the USACE organization name for the person identified in block 15.c. For **CONTRACTOR** accidents enter the USACE organization name for the USACE office responsible for providing contract administration oversight.

- f. **OFFICE SYMBOL**—Enter the latest complete USACE Office Symbol for the USACE organization identified in block 15.e.

INSTRUCTIONS FOR SECTION 16—MANAGEMENT REVIEW (1st)

1ST REVIEW—Each USACE FOA shall determine who will provide 1st management review. The responsible USACE supervisor in section 15.c shall forward the completed report to the USACE office designated as the 1st Reviewer by the FOA. Upon receipt, the Chief of the Office shall review the completed report, mark the appropriate box, provide substantive comments, sign, date, and forward to the FOA Staff Chief (2nd review) for review and comment.

INSTRUCTIONS FOR SECTION 17—MANAGEMENT REVIEW (2nd)

2ND REVIEW—The FOA Staff Chief (i.e., FOA Chief of Construction Operations, Engineering, Planning, etc.) shall mark the appropriate box, review the completed report, provide substantive comments, sign date, and return to the FOA Safety and Occupational Health Office.

INSTRUCTIONS FOR SECTION 18—SAFETY AND OCCUPATIONAL HEALTH REVIEW

3RD REVIEW—The FOA Safety and Occupational Health Office shall review the completed report, mark the appropriate box, ensure that any inadequacies, discrepancies, etc. are rectified by the responsible supervisor and management reviewers, provide substantive comments, sign, date and forward to the FOA Commander for review comment, and signature.

INSTRUCTION FOR SECTION 19—COMMAND APPROVAL

4TH REVIEW—The FOA Commander shall (to include the person designated Acting Commander in his absence) review the completed report, comment if required, sign, date, and forward the report to the FOA Safety and Occupational Health Office. Signature authority shall not be delegated.

APPENDIX K

CONFINED SPACE ENTRY PROCEDURES AND PERMIT

TETRA TECH, INC. CONFINED SPACE ENTRY PROGRAM

The purpose of this confined space entry program is to establish specific procedures to protect Tetra Tech, Inc. (Tetra Tech), and subcontractor employees from the hazards of entry into both non-permit and permit-required confined spaces. Procedures for confined space entry are based on the requirements of Title 29 of the *Code of Federal Regulations* (CFR), Part 1910.146.

All requirements specified in this program will apply to all Tetra Tech employees and subcontractors working under the direct supervision of Tetra Tech. Evaluation of confined space entry program compliance and associated recordkeeping will be completed during regional and subsidiary audits conducted by the corporate health and safety office.

Definitions, responsibilities, program elements, and recordkeeping associated with the confined space entry program are discussed below.

1.0 DEFINITIONS

The following definitions apply to Tetra Tech's confined space entry program:

Attendant: A person who is stationed outside of a permit-required confined space, monitors the authorized entrants, performs other duties for the work, and has the authority to cancel the permit or certification if necessary and when the work is complete

Confined Space: A space or work area containing all of the following characteristics:

- Is large enough and configured so that an employee can bodily enter the space or area and perform assigned work
- Has limited or restricted means for entry or exit; examples are tanks, silos, vats, degreasers, sewers, tunnels, hoppers, underground utility vaults, and pipelines; low-lying outdoor areas such as ravines, ditches, pits, and trenches tend to accumulate heavier-than-air vapors and gases and may also qualify as confined spaces
- Is not designed for continuous employee occupancy

Non-Permit Required Confined Space: A confined space that does not contain, or, with respect to atmospheric hazards, have the potential to contain any hazard capable of causing death or serious physical harm

Permit-Required Confined Space: Any space or work area that has one or more of the following characteristics:

- Contains or has the potential to contain a hazardous atmosphere
- Contains a material that has the potential for engulfing an entrant
- Has an internal configuration that can trap or asphyxiate an entrant by inwardly converging walls or by a floor that slopes downward and tapers to a smaller cross-section
- Contains any other recognized serious safety or health hazard

Hazardous Atmosphere: An atmosphere that may expose employees to the risk of death, incapacitation, impairment of ability to self-rescue (escape unaided from a space), injury, or acute illness from one or more of the following causes:

- Flammable gas, vapor, or mist in excess of 10 percent of its lower explosive limit (LEL)
- Airborne combustible dust at a concentration that meets or exceeds its LEL (this condition is met if dust obscures vision at a distance of 5 feet or less)
- Atmospheric oxygen concentration below 19.5 percent or above 23.5 percent
- Atmospheric concentration of any substance that could result in employee exposure in excess of the substance's permissible exposure limit
- Any other atmospheric condition that is immediately dangerous to life or health (IDLH)

Entry: The action by which a person passes through an opening into a permit-required confined space; entry is considered to have occurred as soon as any part of the entrant's body breaks the plane of an opening into the space

2.0 RESPONSIBILITIES

The responsibilities of personnel involved in the confined space entry program or that supervise such activities are as follows:

Operations Manager: The operations manager shall ensure the communication and implementation of the confined space entry program within his or her affected areas.

Project Manager: All project managers are responsible for implementation of the confined space entry program within their respective projects. Specifically, project managers shall ensure the following:

- Completion of a confined space entry permit (CSEP) or entry certificate, as appropriate, and that the conditions of each permit or certificate are not violated
- The availability of proper equipment necessary for safe confined space entry; equipment may include, but not be limited to communication, rescue, testing, and ventilation equipment, and personal protective equipment (PPE)
- That individuals authorizing CSEPs are qualified and trained
- That all personnel, including subcontractors, identified as authorized entrants or attendants have been properly trained
- That all documentation of training, permits, or certificates are maintained in permanent file records

Site Safety Coordinator (SSC): The SSC shall assist the project manager as necessary in preparation for confined space entry work, including obtaining equipment, implementing training, preparing health and safety plans (HASP), and other activities.

Corporate Health and Safety Manager (CHSM): The CHSM shall provide oversight and auditing of regional and subsidiary confined space entry program implementation.

3.0 PROGRAM ELEMENTS

Tetra Tech employees and subcontractor employees shall not enter a confined space without strict adherence to all preparation and entry procedures outlined in this program. Confined spaces that cannot be cleared of atmospheric hazards shall not be entered until all provisions and procedures for entry into a permit-required confined spaces are followed. Permit-required confined space entry procedures are provided in Safe Work Practices (SWP) 6-23 (see Volume III, "Safe Work Practices"). The CSEP is Form CS-1 in Volume III, "Forms."

Procedures for entry into non-permit required confined spaces are outlined in SWP 6-24. The entry form is Form CS-2, "Preparation and Testing of Non-Permit Required Confined Space," in Volume III, "Forms." Non-permit required confined spaces meet the definition detailed in Section 1.0 of this program. The non-permit required confined space shall not have continuous sources of atmospheric hazards or uncontrolled physical hazards. If these conditions cannot be achieved, then the space shall be classified as a permit-required confined space.

If the project manager can demonstrate the absence of any hazardous conditions preventing safe entry through monitoring and inspection data, then entry into these confined space may follow the non-permit required entry procedures outlined in SWP 6-24 and Form CS-2. If initial entry is required to obtain monitoring and inspection data, then the initial entry shall be conducted in accordance with the permit-required confined space entry procedures.

Hazard identification, hazard control, permit and certification systems, and employee training under the confined space entry program are discussed below. These program elements fulfill the requirements of 29 CFR 1910.146.

3.1 HAZARD IDENTIFICATION

The project manager and SSC shall evaluate the scope of work at each job site and identify all confined space entry locations. All confined spaces shall be considered permit-required confined spaces until pre-entry procedures described in SWPs 6-23 and 6-24 demonstrate otherwise.

If the site contains permit-required confined spaces, Tetra Tech shall inform exposed employees, the client, and all subcontractors of the existence, location, and danger posed by the permit-required confined spaces by posting signs or another equally effective means.

3.2 HAZARD CONTROL

Employees entering confined spaces are subject to chemical and nonchemical hazards. The nonchemical hazards include the following:

Thermal Effects: Workers within confined spaces are prone to heat stress. Because of the nature and design of confined spaces, moisture control and radiant heat are difficult to control. All personnel

working within and around confined spaces shall be trained in the recognition of the signs and symptoms of heat stress and work and rest regimen guidelines. Special precautions must also be taken in cold environments to prevent frostbite, trench foot, and general hypothermia. Heat and cold stress control measures are outlined in SWPs 6-15 and 6-16 in Volume III, "Safe Work Practices."

Noise: Because of the nature of confined spaces, noise may be intensified and expose the employee to higher decibel levels than in an outside environment. The project manager shall evaluate noise exposures within the confined space as appropriate and comply with the Tetra Tech Hearing Conservation Program as necessary (see Document Control No. 2-4). Noise within the confined space may also interfere with communication between personnel inside and outside the space. Measures such as intrinsically safe communication devices, hand signals, or air horns shall be used if workers are unable to hear voice commands or danger signals because of excessive noise.

The hazard control measures discussed below for lockout and tagging, cleaning, entry and exit, and equipment and tools shall apply to all confined space work.

3.2.1 Lockout and Tagout

If activation of electrical or mechanical equipment would cause injury to confined space entrants, then the equipment shall be removed from service and stored energy must be released to prevent inadvertent activation before workers enter the confined space. The Tetra Tech lockout and tagout SWP shall be used for equipment deactivation (see SWP 6-2 in Volume III).

All confined spaces shall be completely isolated from other systems such as feed lines for liquids, solids, or gases, by physically disconnecting, double-blocking and bleeding, or blanking off all feed lines. In a continuous system where complete isolation is impossible, such as sewers or utility tunnels, specific procedures for isolation shall be included in the site-specific HASP for that site. Blanks used to seal off lines shall be capable of withstanding the maximum working pressure or load of the line (with a minimum safety factor of 4), have a gasket on the pressure side that can ensure a leak-proof seal, and be made of chemically nonreactive material. Shut-off valves servicing the confined space shall be locked in the closed position and tagged for identification.

3.2.2 Cleaning

Procedures and processes used to clean the inside of a confined space shall be specified in the site-specific HASP and site work plan then reviewed and authorized by the SSC or another qualified individual. The cleaning method used will depend on the space and the contents of the space. If possible, standing fluids that may produce toxic or displacing gases, vapors, or dust should be removed prior to entry. Also if possible, initial cleaning should be conducted outside the confined space. Special procedures should be evaluated and addressed in the site-specific HASP for situations where unique hazards may be created by the cleaning process itself.

3.2.3 Entry and Exit

The extent of entry and exit precautions needed to maintain a safe confined space work area will be determined by the SSC at each confined space entry location. All necessary entry and exit equipment shall be identified on the applicable permit. The following items shall be evaluated and considered:

- Type of confined space to be entered
- Barriers within the space
- The occupancy load of the space
- Time required for emergency exiting
- Time required for emergency rescue

At a minimum, all confined spaces deeper than 4 feet or the employee's shoulder height (whichever is less) shall be required to have a ladder securely fixed within the space. This ladder shall not be removed until all employees have exited the space.

3.2.4 Equipment and Tools

Confined space entry shall be allowed only when all equipment necessary for a safe entry has been assembled and shown to be in proper working order. Equipment that may be necessary includes: (1) atmospheric testing equipment, (2) PPE, (3) communication devices, and (4) entry and exit and rescue equipment. All equipment and tools to be used within a confined space shall be inspected and meet the following requirements:

- Hand tools shall be kept clean and in good repair and selected according to intended use.
- If portable electrical tools and equipment are used, they shall be equipped with a ground fault circuit interrupter and checked before use within a confined space.
- All electrical cords, tools, and equipment shall be of heavy-duty type with heavy-duty insulation and inspected for visual defects prior to use.
- All equipment that may be used in a flammable atmosphere shall be explosion-proof or intrinsically safe for the atmosphere involved.
- Lighting used within a confined space shall be of explosion-proof design and equipped with guards. Lighting must be listed by the Underwriters Laboratories for use in Division 1 atmospheres of the appropriate class and group, or be approved by the U.S. Bureau of Mines, the Mine Safety and Health Administration, or the U.S. Coast Guard.
- Lighting shall not be hung by electrical cords unless specifically designed for that purpose. The illumination of the area shall be sufficient to provide for safe work conditions.
- Cylinders of compressed gases shall never be taken into a confined space. When not in use, cylinders shall be turned off at the cylinder valve and capped. This restriction does not apply to self-contained breathing apparatuses or resuscitation equipment.
- Any hot work (such as welding, burning, or use of open flame) must follow guidelines outlined in the Hot Work SWP (SWP 6-6 in Volume III).

3.3 PERMIT AND CERTIFICATION SYSTEMS

Confined space entries shall be controlled through the implementation of either a permit or certification system. The appropriate permit or certificate must be completed prior to any entry of a confined space. The type of confined space to be entered will determine the need for either a permit or certification.

A permit-required confined space shall require a CSEP. Details of how the permit is completed are presented in SWP 6-23 in Volume III. The CSEP is Form CS-1 in Volume III, "Forms."

A non-permit confined space requires completion of a certification, which Tetra Tech has titled "Preparation and Testing of Non-Permit Required Confined Space" (Form CS-2 in Volume III, "Forms"), prior to the entry of any person. Instructions for completion and use of this form are provided in SWP 6-24.

Each permit and Form CS-2 is valid for only one shift and will be "canceled" when confined space work is complete and may not be used for any future entries. Permits and Form CS-2 shall serve as a permanent record of entry activities and shall be kept in the project file after completion of work.

3.4 EMPLOYEE TRAINING

Awareness level confined space entry training shall be provided to all Tetra Tech field employees and employees supervising subcontractor personnel entering confined spaces. Confined space entry training of Tetra Tech employees may be conducted as a stand-alone course or as part of the 40-hour initial health and safety training and annual refresher training classes. Project managers shall verify that all subcontractor personnel have received training and are proficient and certified in their duties as required by this program.

Employees actually entering confined spaces must have the additional training described below for non-permit required and permit-required confined spaces before entry and must be briefed on site-specific hazards while on site.

3.4.1 Non-Permit Required Confined Space Training

Tetra Tech personnel performing non-permit required confined space entry shall receive training in the following:

- Definition of confined spaces
- Recognition, evaluation, and control of chemical and physical hazards within a confined space
- Requirements of the confined space standard (29 CFR 1910.146) and the Tetra Tech confined space entry program
- Use and limitations of atmospheric testing and PPE
- Use of the "Preparation and Testing of Non-Permit Required Confined Space" Form CS-2

3.4.2 Permit-Required Confined Space Training

Tetra Tech employees involved in permit-required confined space entries shall receive training to include the subjects listed in Section 3.4.1 plus additional specific training as necessary to safely perform the following assigned duties:

- Authorized entrants for permit-required confined spaces shall be trained and knowledgeable in the following:
 - The hazards of confined space entry, including information on the mode, signs, symptoms, and consequences of the hazard exposure
 - Communication rules
 - Rescue procedures
- Authorized attendants for permit-required confined space entries shall be trained and knowledgeable in the following:
 - The hazards of confined spaces and how to monitor confined space conditions to determine if it is safe for entrants to remain in the space
 - The mode, signs, symptoms, and possible behavioral effects of hazard exposure
 - Authorized entry identification requirements and the maintenance of an accurate count of personnel in permit spaces
 - Communication requirements with the entrants, including maintaining effective and continuous contact with the entrants
 - The reasons to order an evacuation, such as (1) observing conditions not allowed on the permit, (2) observing dangerous situations outside the space, (3) observing behavioral effects in authorized entrants, and (4) if the attendant must leave the work station or cannot safely perform his or her duties
- Individuals responsible for authorizing permits or in charge of entry into permit-required confined spaces must be trained and knowledgeable of the following:
 - Requisite information for permits
 - Procedures, practices, and equipment necessary for safe entry
 - Conditions under which permits should be canceled or entry terminated
 - How to deal with unauthorized personnel entry

4.0 RECORDKEEPING

This section outlines recordkeeping requirements under this program for permits, Form CS-2, and training certificates.

4.1 PERMITS AND FORMS

Copies of all permits and Form CS-2 shall be kept in the permanent project file. On an annual basis, each office health and safety representative shall review canceled permits or forms used on each project within his or her office to evaluate the effectiveness of the program. A brief summary of office compliance shall be forwarded to each regional health and safety representative or subsidiary health and safety representative. If there is reason to believe that the measures taken under this program are not protecting employees, the program will be revised to correct the deficiencies found.

4.2 TRAINING CERTIFICATES

Proof of training shall be issued to all employees successfully completing the appropriate confined space entry training. Proof shall consist of certificates of completion issued with 40-hour initial and 8-hour refresher health and safety training courses. Certificates shall contain the employee's name, signatures of the trainers, and the dates of the training. This certification shall be available for inspection by employees and their representatives.



TETRA TECH, INC.
CONFINED SPACE ENTRY PERMIT

This permit must be posted at the job site until the job is completed.

Permit Valid from : _____ a.m./p.m. to _____ a.m./p.m. Date:

Site Information																		
Project Name: _____		Project No.: _____																
Field Location: _____																		
Description of Work Performed: _____																		
Permit Space Hazards (indicate specific hazards with initials) <input type="checkbox"/> Oxygen deficiency (less than 19.5%) <input type="checkbox"/> Oxygen enrichment (greater than 23.5%) <input type="checkbox"/> Flammable gases or vapors (greater than 10% of LEL) <input type="checkbox"/> Airborne combustible dust (meets or exceeds LEL) <input type="checkbox"/> Toxic gases or vapors (greater than PEL) <input type="checkbox"/> Mechanical hazard <input type="checkbox"/> Electrical shock <input type="checkbox"/> Material harmful to skin <input type="checkbox"/> Engulfment <input type="checkbox"/> Other: _____		Equipment Required for Entry and Work (specify as required) Protective clothing: _____ _____ Respiratory protection: _____ _____ Air monitoring: _____ _____ Communication: _____ _____ Rescue equipment: _____ Other: _____ _____																
Communication Procedures (to be used by attendants and entrants)		Authorized Entrants (List by name or attach roster)																
<table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th style="width:60%;">Emergency Service Name of Service</th> <th style="width:40%;">Telephone Number</th> </tr> </thead> <tbody> <tr><td>_____</td><td>_____</td></tr> <tr><td>_____</td><td>_____</td></tr> <tr><td>_____</td><td>_____</td></tr> </tbody> </table>		Emergency Service Name of Service	Telephone Number	_____	_____	_____	_____	_____	_____	<table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th style="width:60%;">Authorized Attendants (List by name or attach roster)</th> <th style="width:40%;"></th> </tr> </thead> <tbody> <tr><td>_____</td><td>_____</td></tr> <tr><td>_____</td><td>_____</td></tr> <tr><td>_____</td><td>_____</td></tr> </tbody> </table>	Authorized Attendants (List by name or attach roster)		_____	_____	_____	_____	_____	_____
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Authorized Attendants (List by name or attach roster)																		
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Additional Information																		

Permit Authorization																		
I certify that all safety precautions have been taken and necessary equipment has been provided for safe entry and work in this confined space. Air monitoring results will be recorded on this permit.																		
Permit Authorized by (printed name): _____																		
Signature: _____		Time: _____ Date: _____																



TETRA TECH, INC.
CONFINED SPACE ENTRY PERMIT (Continued)

Preparation for Entry

(check after steps have been taken)

Notification of affected departments of service interruption

Emergency Response Team available

Isolation methods:

Lockout/tagout

Blank/blind

Purge/clean

Inerting

Ventilate

Atmospheric test

Barriers

Other: _____

Personnel awareness:

Pre-entry briefing on specific hazards and control methods

Notify contractors of permit and hazard conditions

Other: _____

Additional permits required and attached:

Hot work

Line breaking

Other: _____

Testing Record

Result

	Acceptable Conditions	_____ : _____ am/pm	_____ : _____ am/pm	_____ : _____ am/pm	_____ : _____ am/pm	_____ : _____ am/pm	_____ : _____ am/pm
Oxygen-min.	19.5%						
Oxygen-max.	23.5%						
Flammability	<10% LEL						
H ₂ S	<10 ppm						
Cl ₂	<0.5 ppm						
CO	<35 ppm						
SO ₂	<2 ppm						
Heat	°F/°C						
Toxic (specify)							
Other							
Tester Initials							

Notes:

- | | | | | | |
|------------------|---|-----------------------|-----------------|---|----------------------------|
| Cl ₂ | = | Chlorine | PEL | = | Permissible exposure limit |
| CO | = | Carbon monoxide | ppm | = | Part per million |
| H ₂ S | = | Hydrogen sulfide | SO ₂ | = | Sulfur dioxide |
| LEL | = | Lower explosive limit | | | |

Permit Authorizer's Signature: _____

Original to project file

Copies to project manager and office health and safety representatives

APPENDIX L
SAFETY INSPECTION FORMS

PROJECT _____

DATE _____

SAFETY INSPECTION CHECKLIST

Action Level 'A' items marked "NO" must be corrected immediately. Other items marked "NO" must be corrected with five working days. Describe the action taken in "COMMENTS" section.

PERSONAL PROTECTIVE EQUIPMENT	YES	NO	N/A	ACTION LEVEL
Protective Glasses or Goggles				A
Hearing Protection				
Hand Protection				
Foot Protection				
Lower Leg Protection				
Tyvek Coveralls				
Respiratory Protection				A

ADDITIONAL	YES	NO	N/A	ACTION LEVEL
Life Preservers				A
Shower & Eye Wash Operable				
First Aid Kit				A
Insect Repellant				
Fresh Drinking Water				A
Food Storage and Surfaces				

FIRE EQUIPMENT	YES	NO	N/A	ACTION LEVEL
Extinguishers on Motorized Equipment				
Operable				A
Inspected				

SPILL CONTAINMENT EQUIPMENT	YES	NO	N/A	ACTION LEVEL
Absorbent Booms or Pillows				
Absorbent Clay				
Non-Sparking Shovel				
Labeled Disposable Container				
Drip Pans				

TOOLS AND EQUIPMENT	YES	NO	N/A	ACTION LEVEL
In Safe Condition				
Used Properly				
Inspected and Coded Properly				
Valid Operators License (where applicable)				

PERMITS (When required, all are Level A)	YES	NO	N/A	ACTION LEVEL
Work Permit				A
Hot Work Permit				A
Atmospheric (Gas) Test				A
Confined Space Entry Permit				A
Special Permits (COE)				A
WORK AREA CONDITIONS	YES	NO	N/A	ACTION LEVEL
Clean, Trash in Receptacles				
Barricades (Tagged)				
Materials Storage Secure				
Adequate Machine Guards in Place				A
Cylinder Bottles Stored Properly				
Walkways Clear of Hazards				
Chemicals (Identified and Labeled)				
Field Sanitation				
Lighting				
LOCK OUT/TAG OUT (When required, all are Level A)	YES	NO	N/A	ACTION LEVEL
De-energized				A
Locked-out				A
Tagged-out				A
Inspected				A
RULES, PROCEDURES, OPERATING INSTRUCTIONS	YES	NO	N/A	ACTION LEVEL
Adequately Reviewed and Understood				
Maintained				

COMMENTS

SIGNATURE: _____
Safety Inspector

SAFETY INSPECTION CHECK LIST FOR CONSTRUCTION EQUIPMENT

(Including Cranes, Derricks, and Hoisting Equipment)

PROJECT	CONTRACTOR	CONTRACT NO.
TYPE AND MAKE OF EQUIPMENT	MODEL	SERIAL NO.

Before any machinery or mechanized equipment is placed in use, it shall be inspected and tested by a competent mechanic and certified to be in good operating condition. Records of tests and inspections shall be maintained as part of the active contract file at Project or Resident Office. Check set forth herein requires the application of EM 385-1-1, Safety and Health Requirements Manual, 1 Oct 87. The appropriate EM paragraph to be applied is listed at the end of each testing requirement.

CHECK LIST	Yes	No	R A
1. ARE ADEQUATE AND SERVICEABLE FIRE EXTINGUISHERS PROVIDED? (18A.01)			
2. ARE ALL WIRE ROPE CABLES IN GOOD CONDITION? (17.E.01)			
3. ARE WIRE ROPE, SOCKETS, SPLICES, THIMBLES AND CLIPS ADEQUATE AND PROPERLY APPLIED? (17.E.00)			
4. ARE HOOKS, SAFETY HOOKS, SHACKLES, RINGS, ETC., IN GOOD CONDITION? (17.A.02, 17.A.00)			
5. ARE NECESSARY PLATFORMS, FOOTWALKS, ETC., PROVIDED? (18.B.00)			
6. ARE ACCESS STEPS, PLATFORMS, ETC., PROVIDED WITH NON-SLIP SURFACES? (18.B.00, 18.A.14, 18.B.03)			
7. IS OPERATOR PROTECTED AGAINST THE ELEMENTS, FALLING OR FLYING OBJECTS, SWINGING LOADS, AND SIMILAR HAZARDS? (18.B.10, 18.A.10, 18.B.17, 18.B.10, 18.B.01)			
8. ARE ALL GLASSES IN OPERATOR'S COMPARTMENT SAFETY GLASS AND IN GOOD REPAIR? (19.A.10, 18.A.10, 18.B.10)			
9. IS SUITABLE ACCESS PROVIDED TO LUBRICATION POINTS? (18.A.10)			
10. DO ALL MODIFICATIONS, EXTENSIONS, REPLACEMENT PARTS, AND/OR REPAIRS TO EQUIPMENT MAINTAIN THE SAME FACTOR OF SAFETY AS ORIGINAL DESIGNED EQUIPMENT? (18A.02, 18.E.04)			
11. ARE DRUMS FOR LOAD LINES EQUIPPED WITH AT LEAST ONE POSITIVE HOLDING DEVICE, APPLIED DIRECTLY TO THE MOTOR SHAFT OR SOME PART OF THE TRAIN GEAR? (18.E.00)			
12. IS THERE SUFFICIENT CABLE TO ALLOW TWO FULL WRAPS OF CABLE ON DRUMS AT ALL WORKING POSITIONS? (18.E.07)			
13. ARE ADEQUATE HEADLIGHTS, TAIL-LIGHTS AND TURN SIGNALS PROVIDED AND ARE THEY IN PROPER OPERATING CONDITION? (19.A.00, 18.A.10)			
14. ARE ALL APPROVED BRAKES ON WHEELED EQUIPMENT AND IN GOOD OPERATING CONDITION? (18.A.01, 18.A.02, 18.A.10, 18.A.00)			
15. DO WINDSHIELDS HAVE WIPERS IN PROPER OPERATING CONDITION? (18.A.10, 18.A.00)			
16. ARE REAR VIEW MIRRORS PROVIDED? (19.A.10)			
17. ARE OPERATING LEVERS EQUIPPED WITH LATCH OR OTHER DEVICES TO PREVENT ACCIDENTAL STARTING? (19.A.01)			

CHECK LIST	Yes	No
18. IS ENGINE EQUIPPED WITH POWER-OPERATED STARTING DEVICE IN OPERATIVE CONDITION? (10.A.24)		
19. DO ALL PRESSURE VESSELS HAVE VALID INSPECTION CERTIFICATES? (21.A.01, 21.B.01, 21.C.01, 21.D.01)		
20. ARE REVERSE SIGNAL ALARMS ON EQUIPMENT? (10.B.01)		
21. ARE BELTS, GEARS, SHAFTS, ELECTRICAL CONTACTS, ETC., ADEQUATELY GUARDED? (10.B.03, 10.A.04)		
22. ARE ALL HOT PIPES AND SURFACES SUITABLY GUARDED? (10.B.04)		
23. ARE FUEL TANKS LOCATED SO THAT SPILLS OR OVERFLOWS WILL NOT COME IN CONTACT WITH ENGINE OR EXHAUST? (10.B.05)		
24. ARE EXHAUSTS AND DISCHARGES SO DIRECTED AS NOT TO ENDANGER WORKMEN OR OBSTRUCT VIEW OF OPERATOR? (10.B.06)		
25. ARE GUARDS IN PLACE ON EQUIPMENT WITH DROP TYPE SKIP PAN? (10.B.07)		
26. ARE ADEQUATE SEATS PROVIDED FOR ALL RIDERS? (10.A.07, 10.B.01, 10.B.02)		
27. ARE TIRES IN SERVICEABLE CONDITION? ARE TESTING/INSPECTIONS DOCUMENTED? (10.A.01, 10.A.02)		
28. ARE STEERING LINKAGE AND TIE ROD IN GOOD OPERATING CONDITION? ARE TESTING/INSPECTIONS DOCUMENTED? (10.A.01)		
29. ARE DUMP BODIES PROVIDED WITH HOLDING DEVICE OR OTHER SUITABLE DEVICE FOR LOCKING BODY IN RAISED POSITION? (10.A.02)		
30. ARE TAILGATE DUMPING DEVICES SO ARRANGED THAT OPERATOR WILL BE IN THE CLEAR WHILE DUMPING LOADS? (10.A.02)		
31. ARE TRIP-HANDLES PROVIDED ON TAILGATES TO FACILITATE HANDLING? (10.A.02)		
32. IS AIR HOSE FREE FROM LEAKS OR DEFECTS? (10.A.07)		
33. ARE SAFETY LASHINGS FOR QUICK MAKE-UP TYPE CONNECTIONS PROVIDED? (10.B.02, 12.A.10)		
34. IS ACCEPTABLE SPARK ARRESTOR INSTALLED AND WORKING? (10.B.06, 10.B.02)		
35. DO HEATING DEVICES COMPLY WITH REFERENCES? (08.B, 12.B)		
36. DOES WELDING EQUIPMENT COMPLY WITH CODE REQUIREMENTS? (14.A.01, 14.A.02, 14.A.02, 10.A.04)		
37. IS EQUIPMENT ADEQUATELY GROUNDED? (14.B.02, 14.B.02, 10.A.02)		
38. DO ELECTRICAL COMPONENTS COMPLY WITH CODE? (10.A.01)		
39. ARE REQUIRED PRESSURE, TEMPERATURE OR RELIEF GAGES AND VALVES INSTALLED AND OPERABLE? (21.A.10, 21.A.11, 08.B.02)		
40. ARE APPROVED SEAT BELTS AND ROLL-OVER PROTECTION PROVIDED? (10.B.10, 10.B.06)		
41. IS RECOMMENDED PREVENTIVE MAINTENANCE BEING FOLLOWED? (10.A.02)		

CHECK LIST	Yes	No
42. DO HELICOPTER CRANES MEET CONSTRUCTION REQUIREMENTS? (18.E.01, 18.E.04, 18.E.10)		
43. DO HYDRAULIC JACKS MEET SPECIAL SAFETY CONDITIONS? (18.E)		
44. IS CONCRETE EQUIPMENT FITTED WITH ADEQUATE SAFETY DEVICES? (18.E.02, 18.E.03, 18.E.06, 18.E.07, 18.E.08)		
45. ARE ELEVATING AND ROTATING WORK PLATFORMS IN CONFORMANCE WITH ANSI A92.2? (18.M.01)		
46. DO CONVEYORS, CABLEWAYS, AND RELATED EQUIPMENT CONFORM TO ANSI B20.01? (18.E.01)		
47. ARE PILE DRIVERS EQUIPPED WITH ALL APPROPRIATE SAFETY DEVICES? (18.E)		
48. DO MATERIAL HOISTS CONFORM TO ANSI A10.3? (18.E)		
49. DO PASSENGER ELEVATORS CONFORM TO ANSI A10.4? DO TEMPORARY HOISTS IN ACCORDANCE TO ANSI A10.22? (18.M.01)		
50. DO HAND AND POWER TOOLS COMPLY WITH APPLICABLE ANSI STANDARDS? (SEC 18)		
<i>The following six questions apply to Cranes and Hoisting Equipment only and need not be answered for other construction equipment.</i>		
51. IS HIGH VOLTAGE SIGN POSTED? (18.E.08, 18.E.09)		
52. IS EQUIPMENT FITTED WITH POSITIVE STOPS FOR ROTATION WHEN NEAR POWER LINES? (18.E.08)		
53. IS THERE ANY VISIBLE EVIDENCE OF DAMAGE TO BOOM? (18.A.01, 18.E.01)		
54. IS THE BOOM POSITION INDICATOR OPERATING AND VISIBLE TO OPERATOR? (18.E.04, 18.E.10, 18.E.09, 18.F.03, 18.E.04)		
55. HAVE ALL OPERATORS HAD A CURRENT PHYSICAL EXAMINATION? (88.A.01, 88.E.03)		
56. IS BRAKING EQUIPMENT CAPABLE OF EFFECTIVELY BRAKING, LOWERING AND SAFELY HOLDING A LOAD OF AT LEAST THE FULL RATED LOAD AS REQUIRED? (18.E.04)		
REMARKS:		
<p>CERTIFICATION: I hereby certify that this item of equipment is in good operating condition and that it meets all above requirements except as noted in my remarks.</p>		
<p>_____ SIGNATURE OF COMPETENT MECHANIC</p>		<p>_____ DATE</p>
<p>_____ SIGNATURE OF SUPERINTENDENT/QUALITY CONTROL ENGINEER</p>		<p>_____ DATE</p>